



INDIAN INSTITUTE OF TECHNOLOGY MADRAS

FACULTY EXPERTISE

DEPARTMENTS

[Department of Aerospace Engineering](#)

[Department of Applied Mechanics](#)

[Department of Biotechnology](#)

[Department of Chemical Engineering](#)

[Department of Chemistry](#)

[Department of Civil Engineering](#)

[Department of Computer Science & Engineering](#)

[Department of Electrical Engineering](#)

[Department of Engineering Design](#)

[Department of Humanities and Social Science](#)

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[Department of Metallurgical and Materials Engineering](#)

[Department of Ocean Engineering](#)

[Department of Physics](#)



INDIVIDUAL FACULTY PROFILE

**DEPARTMENT
OF
AEROSPACE ENGINEERING**

LIST OF FACULTY

Amit Kumar

Bharath Govindarajan

Bhaskar K

Joel George M

Luoyi Tao

Mahesh S

Manikandan Mathur

Murthy H S N

Muruganandam T M

Nagabhushana Rao Vadlamani

Nagendra Gopal K V

Nandan Kumar Sinha

Rajesh G

Ramakrishna M

Ramakrishna P A

Ranjith M

Sameen A

Santanu Ghosh

Satadal Ghosh

Satya R Chakravarthy

Senthil Murugan M

Shankar Ghosh

Shantanu Shashikant Mulay

Shyam Keralavarma

Sriram P

Sriram Rengarajan

Sujith R I

Sunetra Sarkar

Velmurugan R



Dr. Amit Kumar

PhD, Case Western Reserve University, USA

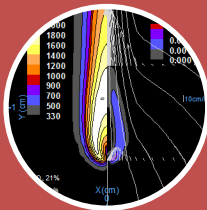
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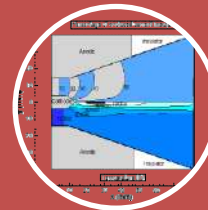
<http://www.ae.iitm.ac.in/~amitk>



- Combustion: Fire Safety Research on earth and in space (microgravity)
- Propulsion: Rocket and spacecraft propulsion, Electric propulsion



Modeling of spreading flames over solid fuels and their extinction in space and in normal gravity environments



Numerical modeling of a Magneto Plasma Dynamic (MPD) thruster



A study on the shock pattern over an obstruction in a rectangular channel at high subsonic flows to understand Deflagration to Detonation (DDT) phenomena

FIRE SCIENCE AND PROPULSION

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Dr. Bharath Govindarajan

PhD, University of Maryland College Park, USA

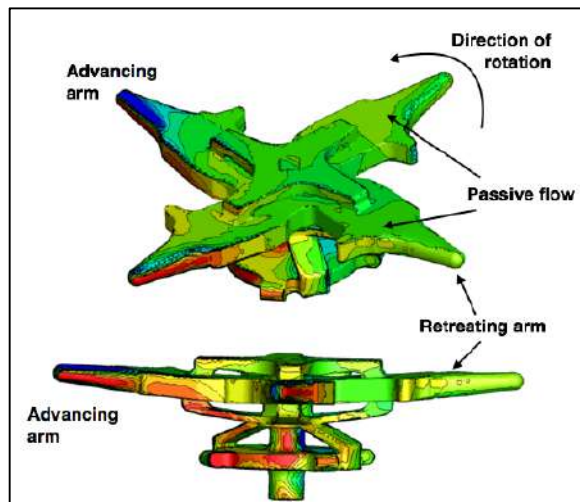
Assistant Professor, Aerospace Engineering

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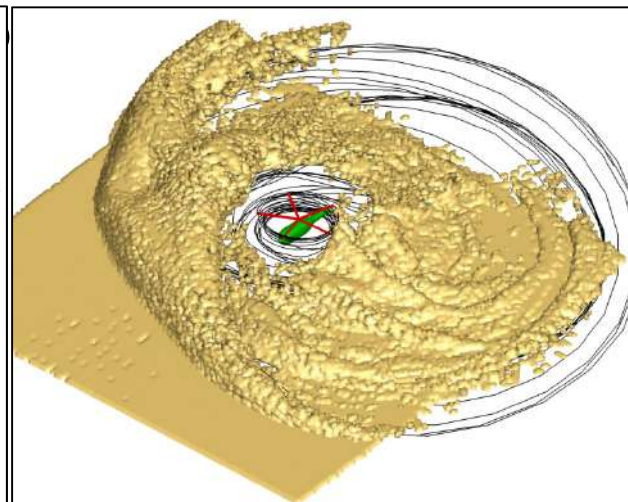
<https://www.mgbharath.com/>



- Numerical modeling of aerodynamics flows: Vortex methods, particle methods
- CFD: Rotorcraft flows, FVM based solvers, moving/deforming (overset) meshes



Surface pressure distribution on a rotating rotor hub (RANS-CFD)



Single main rotor encountering brownout conditions (vortex method)



Quad-Rotor Bi-Plane Tail-sitter configuration for efficient VTOL/forward flight



Dr. K Bhaskar

PhD, IIT Madras

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- Beams, Plates and Shells/ Statics, Dynamics and Stability
- Three-dimensional Analysis using Theories of Isotropic / Anisotropic Elasticity
- Theoretical Modelling of Composite Laminates

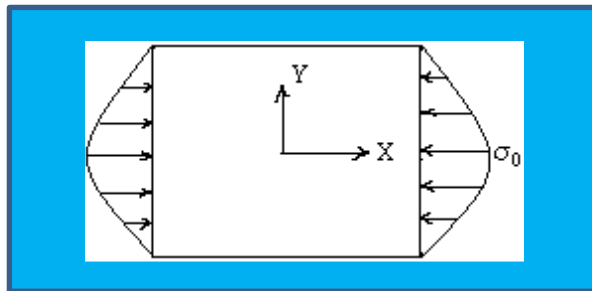
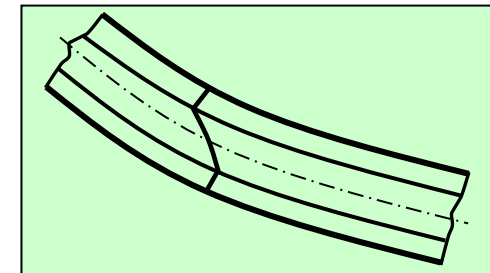


Plate buckling under non-uniform compression



A zigzag type higher-order laminate model



Dr. Joel George M

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Assistant Professor, Aerospace Engineering
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- Navigation, guidance, and control of aerospace vehicles
- Flight dynamics
- Multi-agent systems theory as applied to multiple Unmanned Aerial Vehicle missions

Immediate objectives include setting up a multi-vehicle facility, with quad-rotor platforms, to develop and test various decentralized control and estimation algorithms



Dr. Luoyi Tao

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- Continuum Mechanics: Issues on the foundation of constitutive theory
- Turbulence Modelling: Application of information theory, optimal control and optimization
- Interested in mathematical model construction and analysis of (physical) systems and processes within the constraint of information/data availability.



Dr. S Mahesh

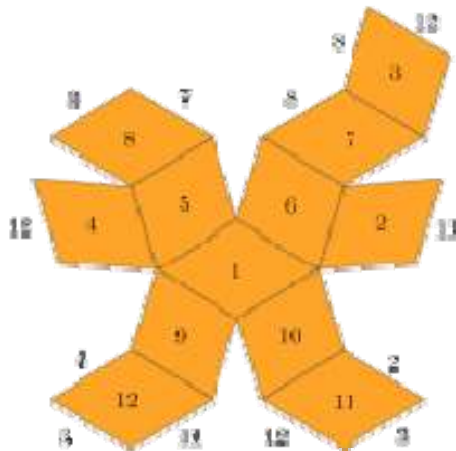
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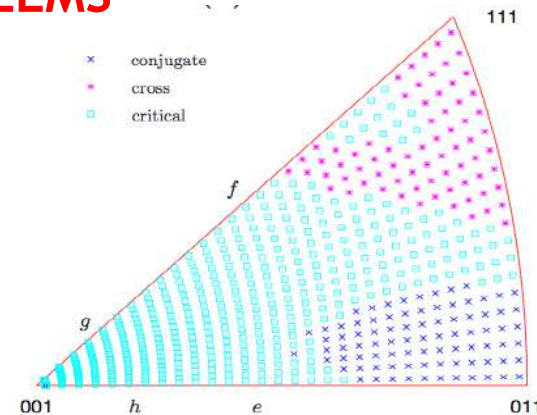
Major Areas of Research

- Solid mechanics analysis of aerospace materials
- Plasticity, fracture, and creep modeling and experimentation

SOME RECENT RESEARCH PROBLEMS



Micromechanical modeling of creep rupture in steels



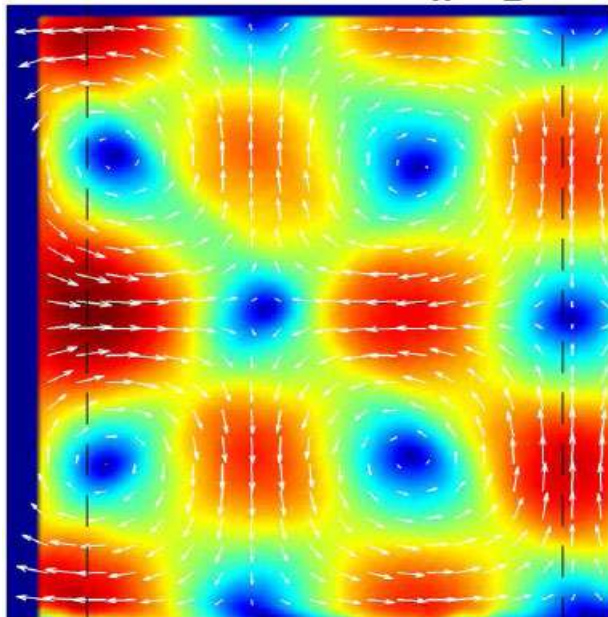
Continuum model of substructure formation during plastic deformation



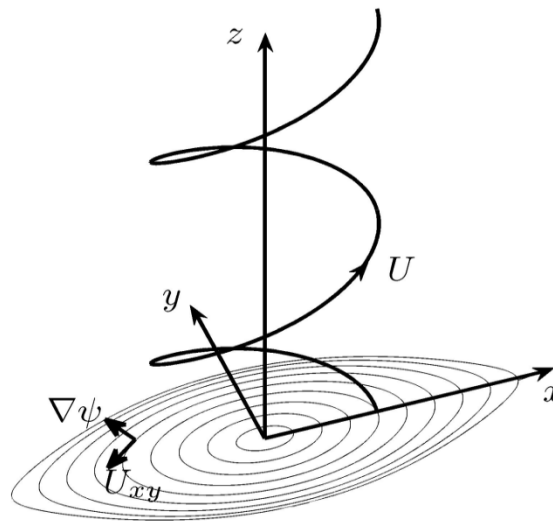
Dr. Manikandan Mathur
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Professor, Aerospace Engineering
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<https://sites.google.com/site/mathur2m/>



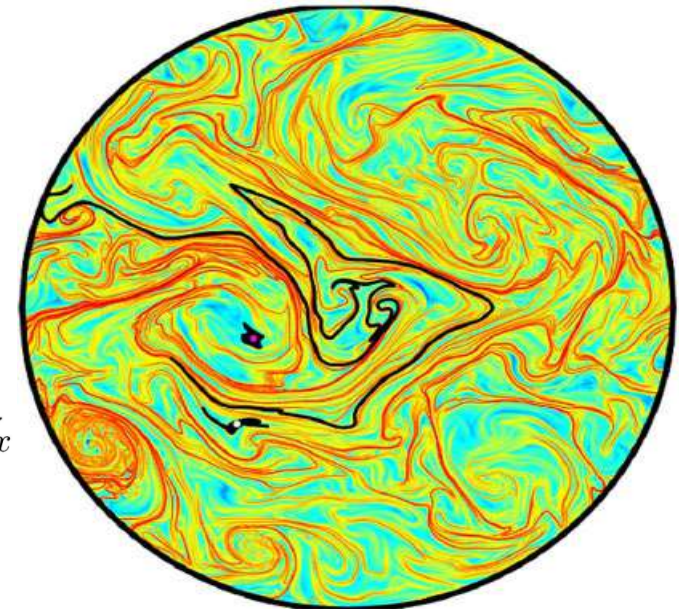
- Rotating and Stratified Flows - Bistability, Internal Gravity Waves,
- Vortex Stability - Non-parallel flows, Compressible flows, Magneto hydrodynamics
- Lagrangian Coherent Structures (LCS) - Mixing of passive and diffusive tracers



Internal waves in the lab



A swirling jet



Mixing in Turbulence



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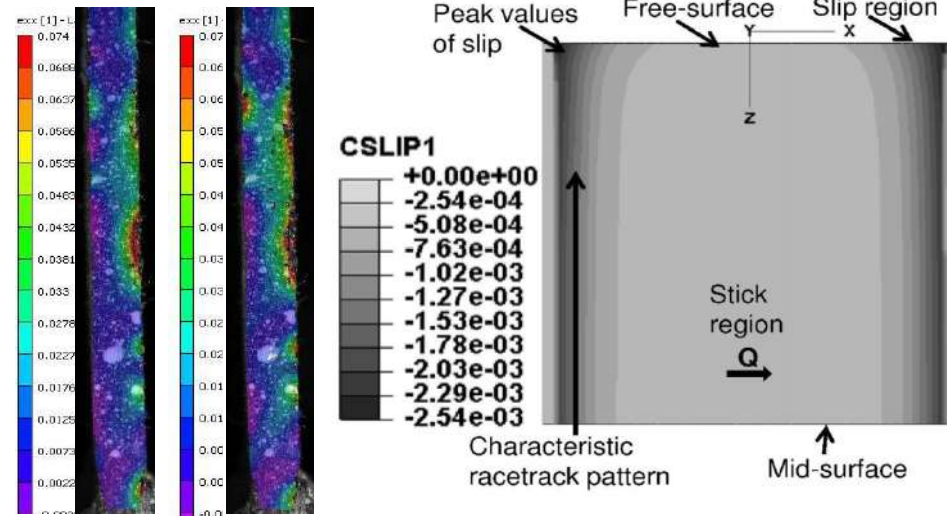


Major Areas of Research

Damage mechanisms in metals & composites (fatigue & fracture), contact mechanics & tribology, fretting, constitutive modeling of visco-elastic materials

Currently Working on:

1. Damage evolution around machined holes in composites due to fatigue loads: damage mapping using NDT (*digital image correlation-DIC, infra-red thermography*); modeling - continuum & stochastic.
2. Fretting fatigue of polycrystalline & single crystal material: experimental studies; analytical modeling to obtain stresses; life estimation using multi-axial fatigue parameters & fracture mechanics.
3. Manufacturing of fine grained materials using machining for severe plastic deformation: mechanical characterization
4. Three dimensional (3D) effects in contacts
5. 2D contact analysis of functionally graded & coated materials
6. Constitutive modelling of solid



Future Interests:

Modeling of biological contacts



Dr. T M Muruganandam

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- Flame stabilisation, Burner Development, Blowout prediction, Precursors to blowout, detection of imminent blowout, unsteady combustion: experimental & analytical
- Optical diagnostics of high speed and reacting flows: Spectroscopic diagnostics, Chemiluminescence, Mie Scattering, LII, PLIF, TDLAS, Schlieren, Tomography (TDLAS, PLIF, Schlieren)
- High speed flows, intakes studies, unsteady movement of shocks, Shock-Boundary Layer Interaction(SBLI), Micro Vortex Generators.

Flame Loss/Stabilisation

Multiple stabilisations

Stagnation stabilisation loss

Shear stabilisation

Cold flow

Precursor

LBO precursor

Swirl stabilization

Diagnostics

TDLAS

H2O spectrum

Mie scattering of reactants

Shock Dynamics

Intake start/ unstart

Shock in diffuser

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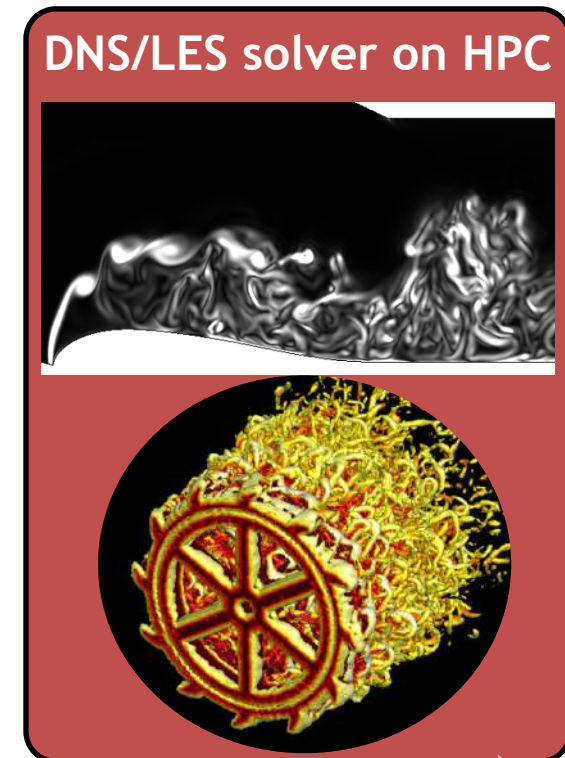
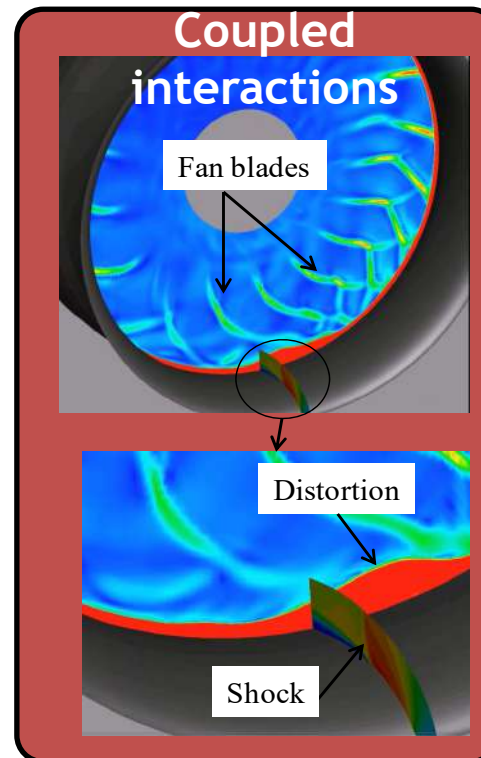
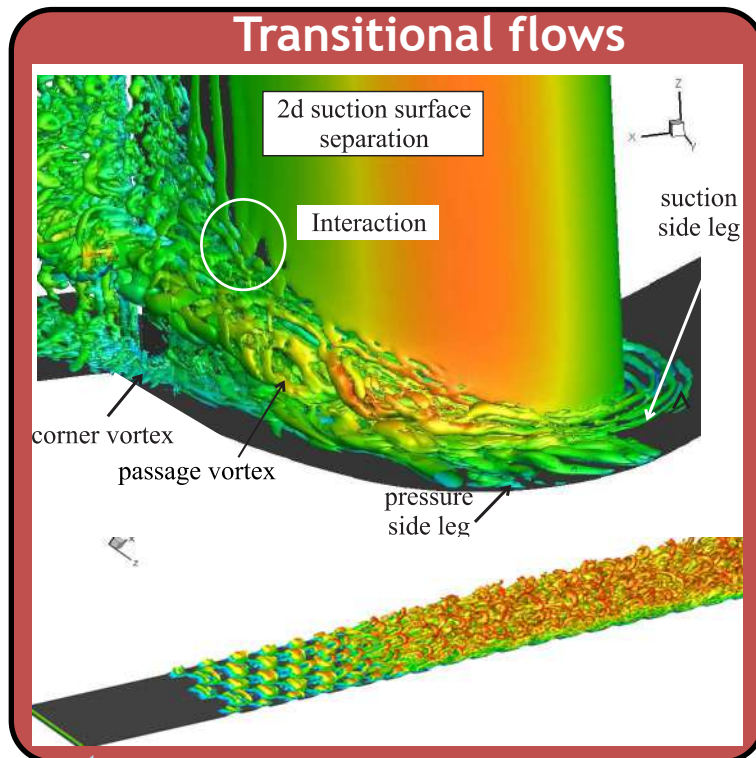
Dr. Nagabhushana Rao Vadlamani

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- CFD for Turbomachines: DNS, LES, Hybrid RANS/LES, Low-order modelling
- Transition to turbulence, Coupled interactions, flow control
- High-order solver COMP² development, High performance computing (HPC)



Develop numerical frameworks to predict complex flow physics in turbomachines

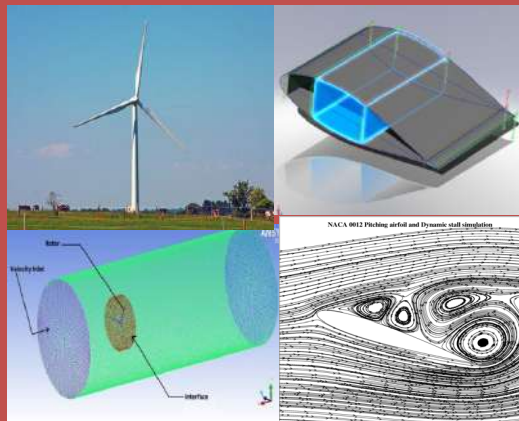
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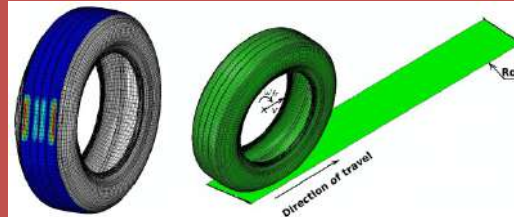
Dr. K V Nagendra Gopal
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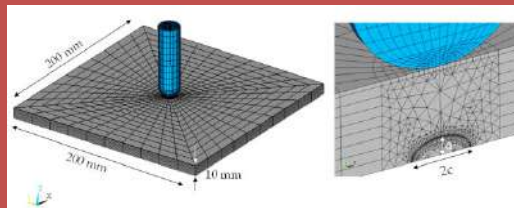
- Aero elasticity of wind turbines, design of smart composite blades using aero elastic tailoring; analytical and computational modelling using coupled numerical methods
- Analytical and computational modeling of the mechanics of multifunctional structures made of advanced materials, multi-scale modelling, dynamics of automotive tyres
- Fracture mechanics - Crack growth analysis in metallic and composite structures



Modelling aeroelastic behaviour of Wind Turbine Rotors using coupled FEA-CFD methods: Dynamic stall



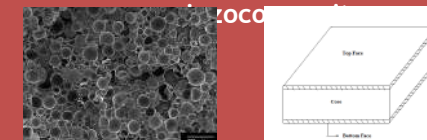
Tyre Dynamics; Rolling Resistance Estimation



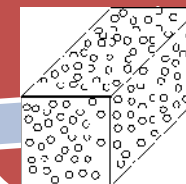
Low velocity impact in functionally graded plates with cracks



Fiber-matrix debonding in composites



Foam core sandwich



Modelling crack growth in particulate composites using XFEM

Modelling of the Mechanics of Multi-functional and Multi-physics Systems

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Dr. Nandan Kumar Sinha

PhD, IIT Bombay, India

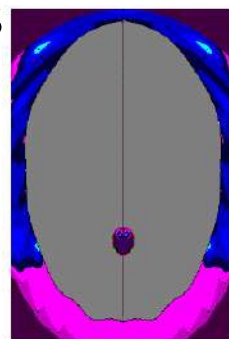
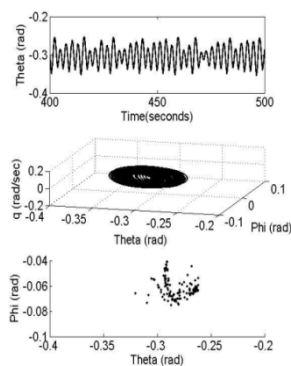
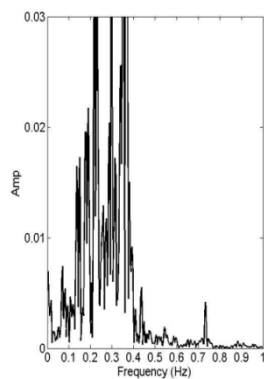
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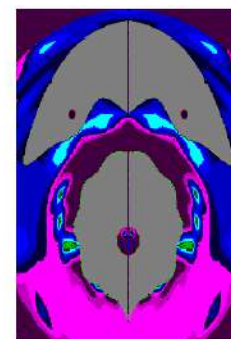
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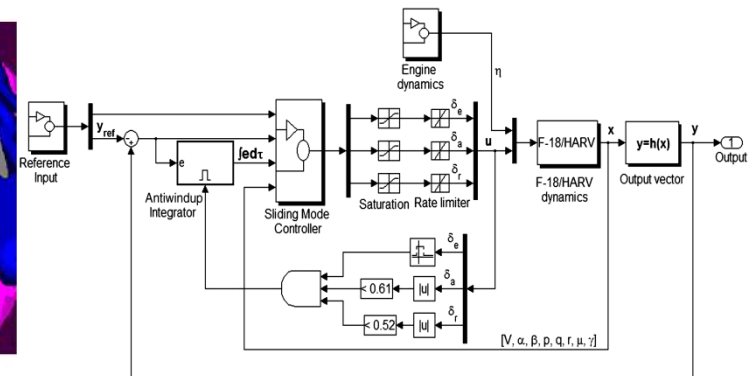
- Nonlinear dynamics, bifurcation & chaos: Modeling nonlinear phenomena in dynamical systems exhibiting bifurcations and chaos under parametric variations
- Advanced six dof simulation: Missile-aircraft engagement simulation with/without flares, optimization of countermeasure system parameters
- Flight dynamics and control: Inverse design of vehicles, controller development for maneuvers/accident simulation, high angle-of-attack



(a). No flare



(b). With flare



Design, modelling, simulation, and control of aerospace vehicles

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Dr. G Rajesh

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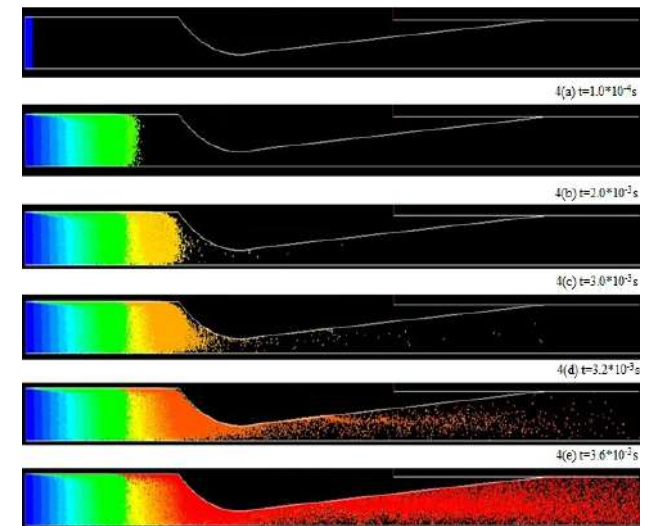
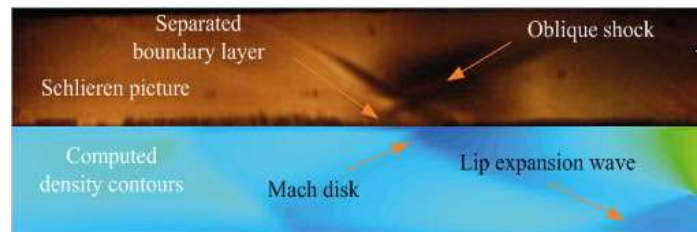
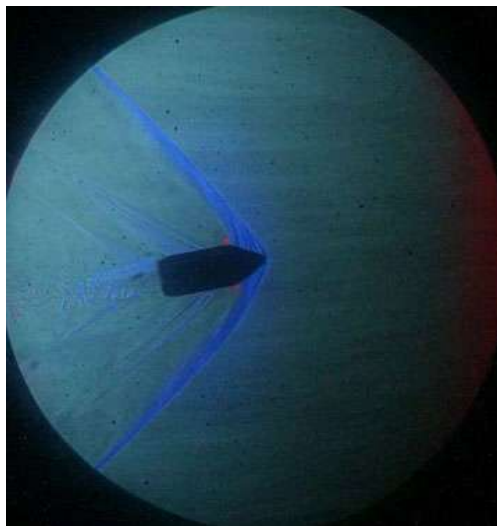


- Launch Dynamics, Unsteady Aerodynamics
- Wind Tunnel, Shock Tube and Gas Gun Experiments
- Shockwave dynamics

Projectile and sabot design
Re-entry aerodynamics
Transonic vehicle design

Vacuum ejector systems High altitude
system design Altitude adaptation
nozzles

Transdermal drug delivery
Needle-less biolistic systems



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Dr. Ramakrishna M

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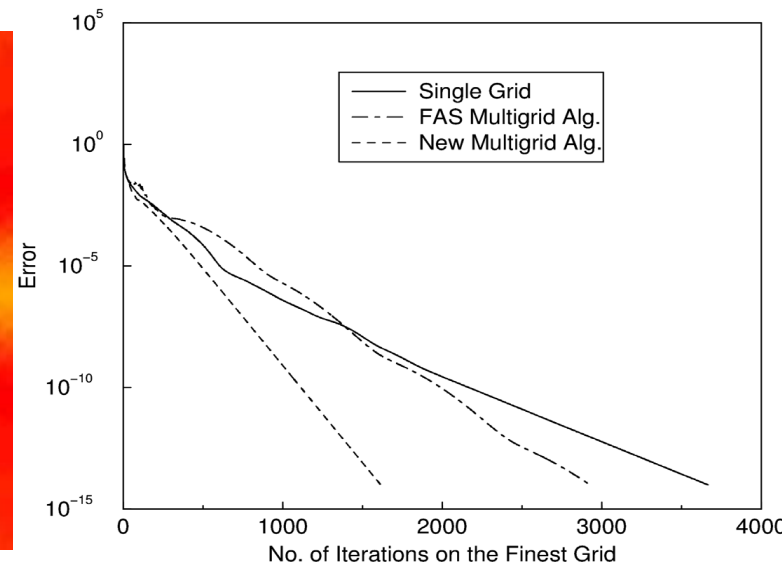
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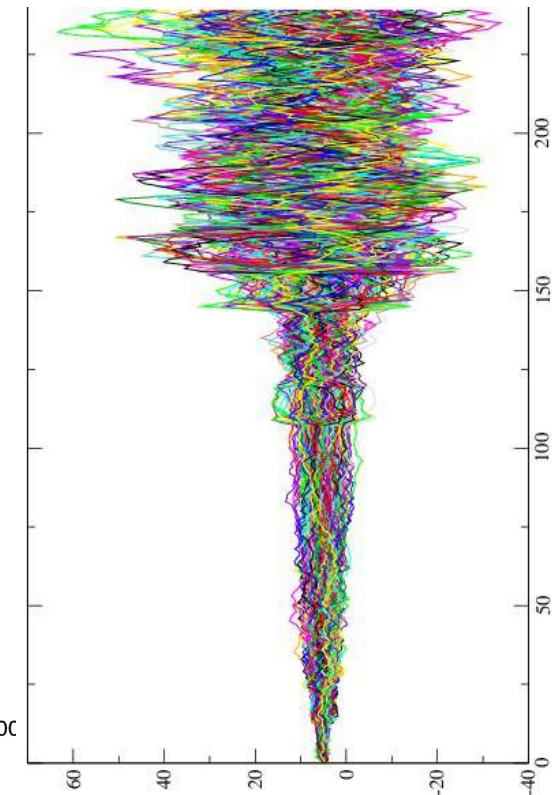
- Aerodynamics / Fluid mechanics
- Develop new numerical schemes / algorithms



Mach 3.0 Flow past a cylinder



Convergence plot for a new Multi-grid scheme



Stochastic differential eq & Monte-Carlo methods



Dr. Ramakrishna P A

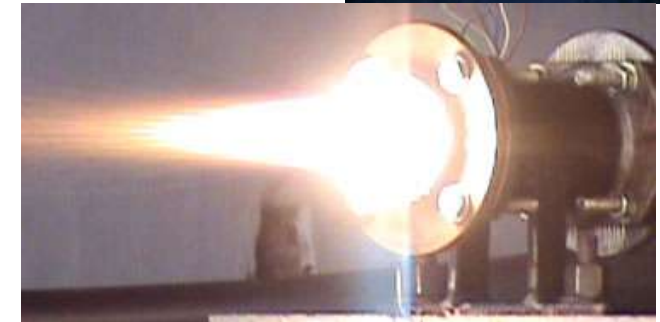
Professor, Aerospace Engineering

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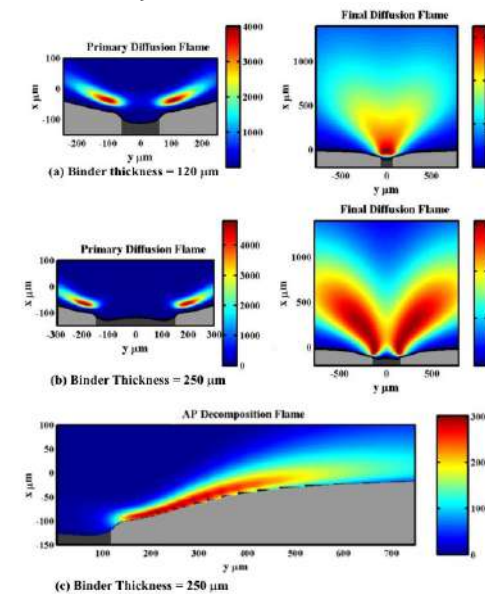


Major Areas of Research

- Modeling the combustion of solid propellants
- Understanding the mechanism of solid propellant catalyst action
- Understanding the energy separation mechanism in vortex tubes
- Development of high burn rate solid propellants
- Development of fast burning hybrid rocket fuels
- Development of fuel rich propellants for scramjets and ramjets
- Development of high power to weight ratio IC engines



Hybrid rocket motor



Flame structure of composite propellant

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Major Areas of Research

Aerodynamics and dynamics of:

- Helicopters
- MAVs
- Wind turbines



Dr. A Sameen

PhD, Indian Institute of Science, Bangalore

Professor, Aerospace Engineering

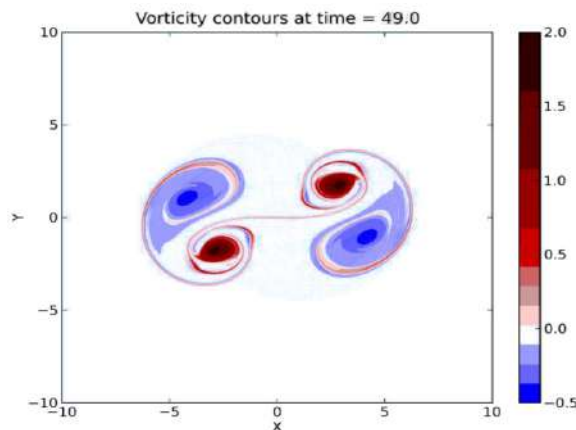
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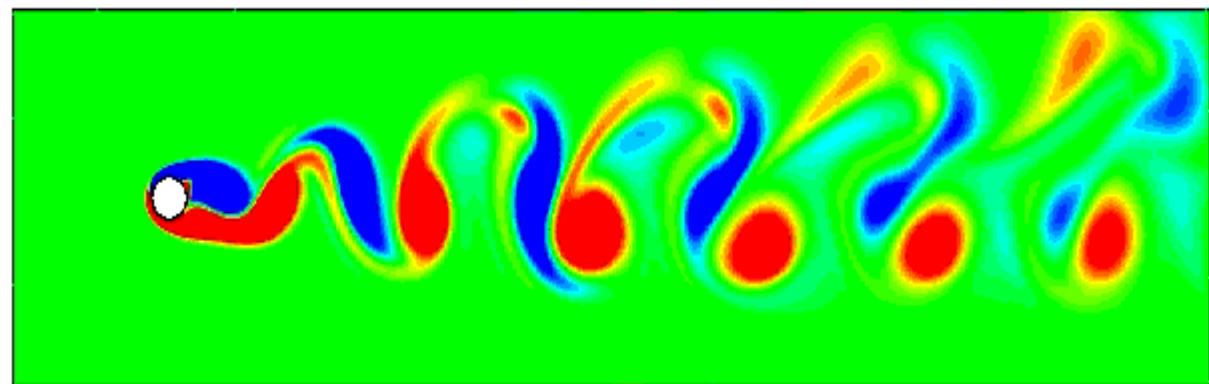


- *Vortex and vorticity dynamics, boundary layer flows, flow control*
- *Computational and experimental fluid dynamics*
- *Stability, transition and turbulence in classical and quantum fluids*
- *Thermal convection and mixing*

Vortex behaviours Turbulence in wall jet, bluff body wakes, vortex mergers



Flow control: heating, hydrophobic surface, wall suction, magnetic forcing.
Separation delay, lift augmentation, transition control.



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Dr. Santanu Ghosh

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Assistant Professor, Aerospace Engineering

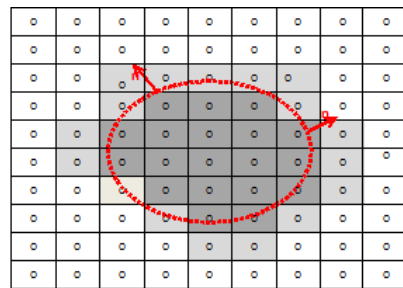
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<http://www.iitm.ac.in/~sghosh1/index.htm>

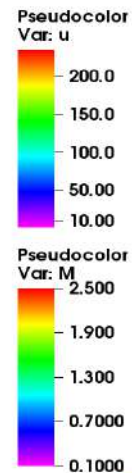


Major Areas of Research

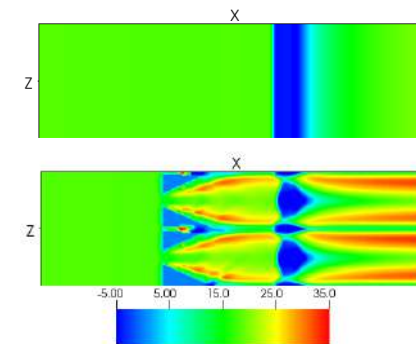
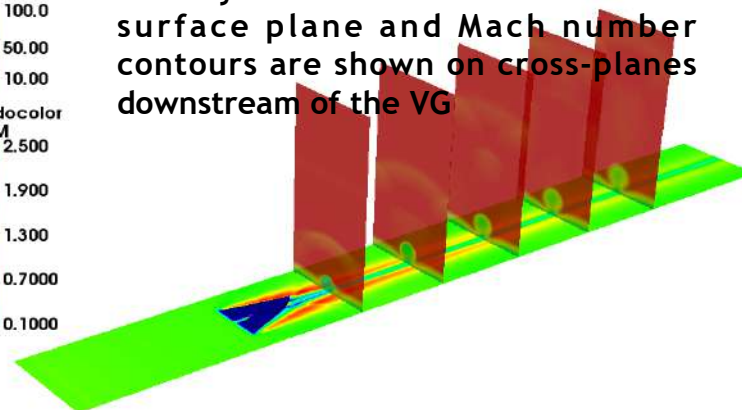
- *Computations of high-speed turbulent flows*
- *Shock/boundary layer interaction and its control*
- *Application of immersed-boundary methods*



Top: Schematic of Cartesian Grid surrounding an embedded surface; Bottom: Iso-surface of a control device



3-D view of the flow field around a slotted-ramp VG in $M = 2.5$ flow. Axial velocity contours are shown on a near surface plane and Mach number contours are shown on cross-planes downstream of the VG



Near surface axial velocity contours ; Top: SBLI at $M = 2.5$ with no control; Bottom: SBLI $M = 2.5$ with flow control using an array of 3 mm high VGs

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Dr. Satadal Ghosh

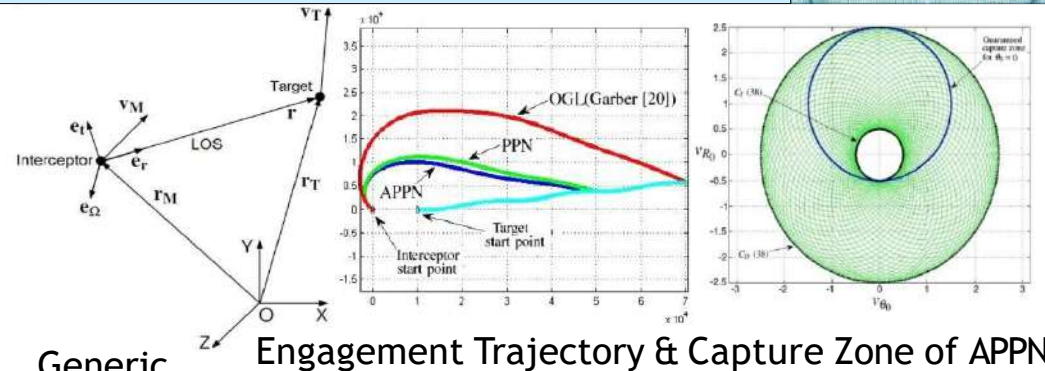
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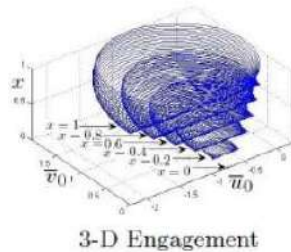
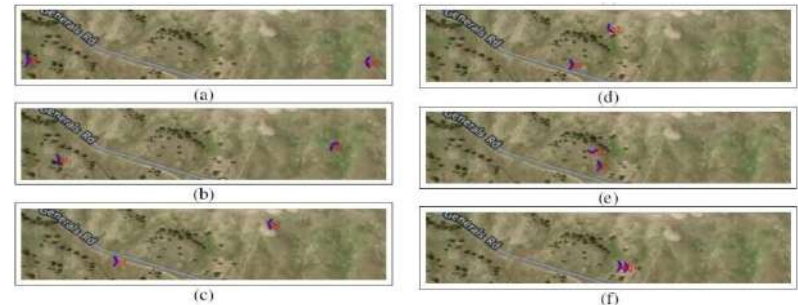
Major Areas of Research

- Guidance and Control of autonomous aerial vehicles
- Cooperative or adversarial search and capture / contain
- Autonomous unmanned aircraft systems (UAS) mission test-bed
- Autonomous fleet management
- Guidance for spacecraft applications

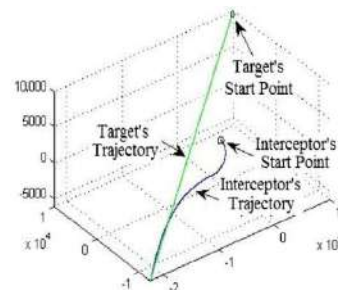


Generic Engagement Geometry

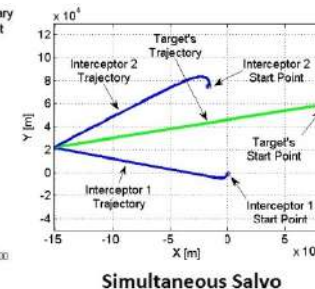
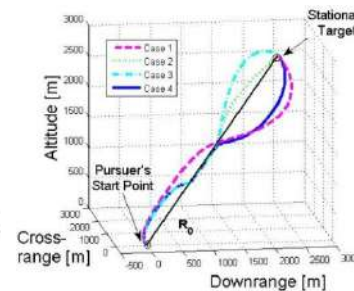
Engagement Trajectory & Capture Zone of APPN



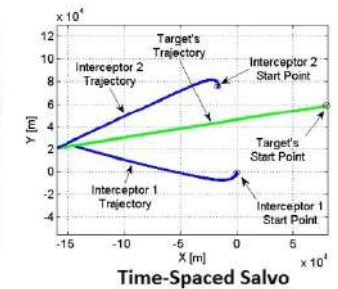
Capture Zone of Retro-PN



Impact/Approach Angle Control



Simultaneous Salvo



Time-Spaced Salvo

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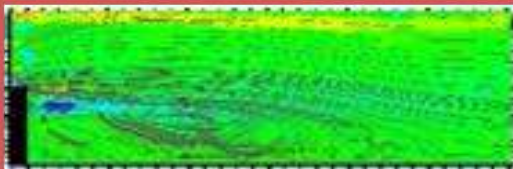


- Combustion instability in gas turbines/ramjets/rockets: experiments & computations, laminar and turbulent flames
- Laser diagnostics of flow, spray, and combustion: PIV, PDPA, LDV, PLIF, tomography
- Nano-aluminium production and combustion, solid propellant combustion, solid rocket combustion instability
- Coordinator, National Centre for Combustion Research and Development (NCCRD)

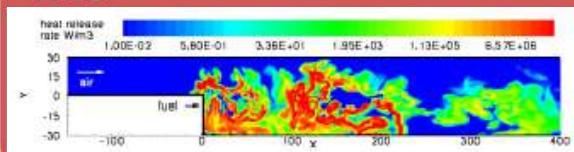
Combustion instability



PIV



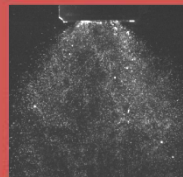
LES



Laser diagnostics



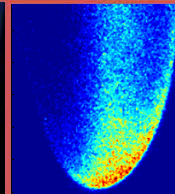
PDPA



Spray

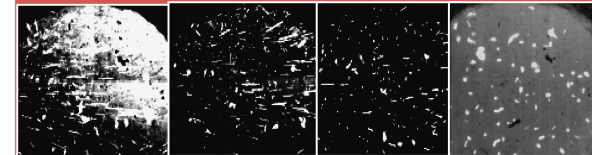


Triple flame



OH-PLIF

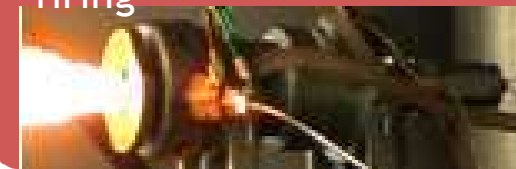
Nano-aluminium/rockets



Wire explosion

Nano-Al

Rocket firing



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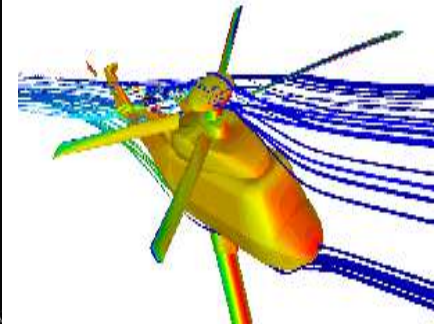
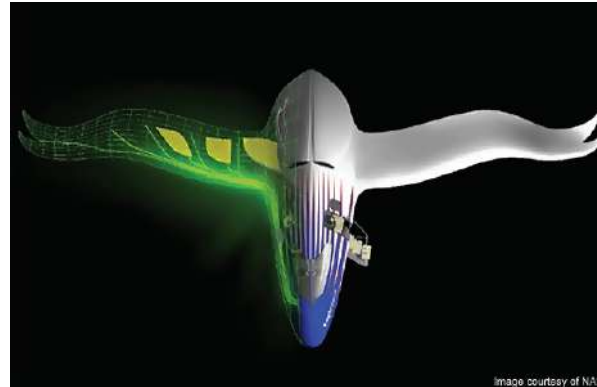


Dr. M Senthil Murugan
Aero-Electro-Mechanics & Systems (AIMS) lab
Assistant Professor, Aerospace Engineering
044-2257-4027; drsen@iitm.ac.in
<https://sites.google.com/view/aimsiiitm>



Major Areas of Research

- *Nonlinear Dynamics & Control*
- *Aero-Servo-Elasticity*
- *Metamaterials*
- *Morphing Structures*
- *Morphing Aircraft*
- *Rotorcraft/Helicopters*
- *Spacecraft*



(Image courtesy: Nasa, ESA, DLR)

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Dr. Shankar Ghosh

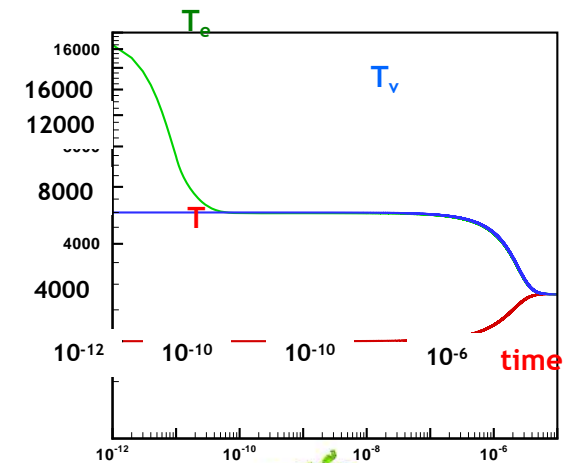
PhD, University of Minnesota, USA
Assistant Professor, Aerospace Engineering
044-2257-4023; gshankar@ae.iitm.ac.in
<http://www.iitm.ac.in/~gshankar/gshankar.htm>



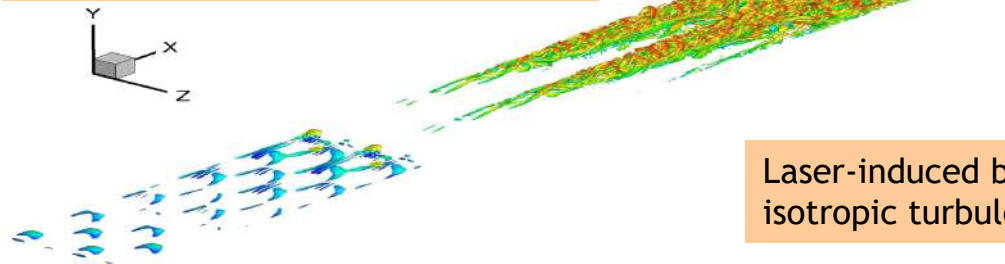
Major Areas of Research

- *Computational fluid dynamics*
- *Numerical simulations of hypersonic turbulent flows*
- *Non-equilibrium effects*
- *Laser-induced breakdown*

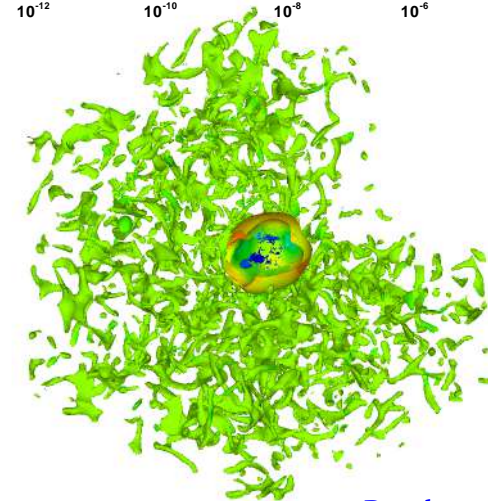
Nonequilibrium model for air



Transition to turbulence at hypersonic speeds



Laser-induced breakdown in isotropic turbulence



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Dr. Shantanu Shashikant Mulay

PhD, Nanyang Technological University, Singapore

Associate Professor, Aerospace Engineering

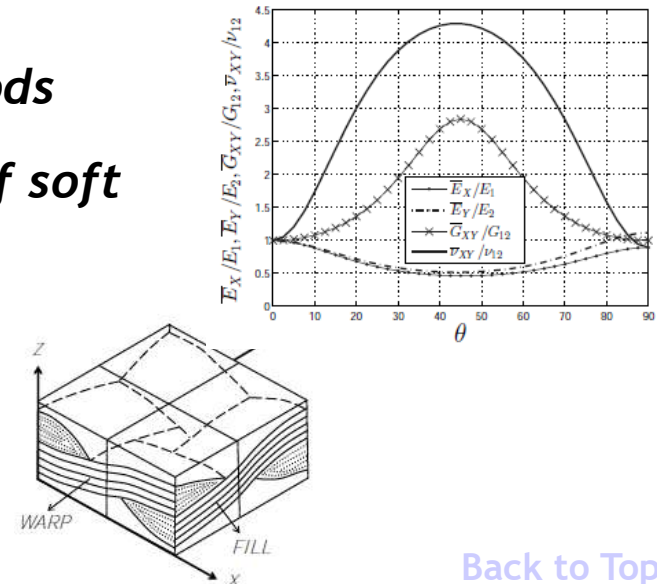
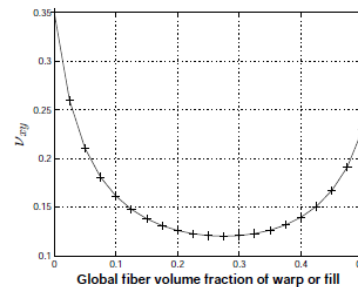
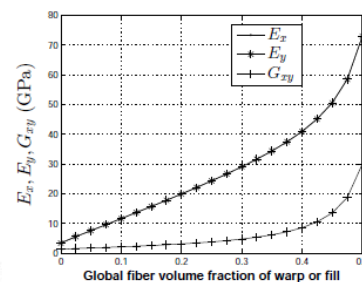
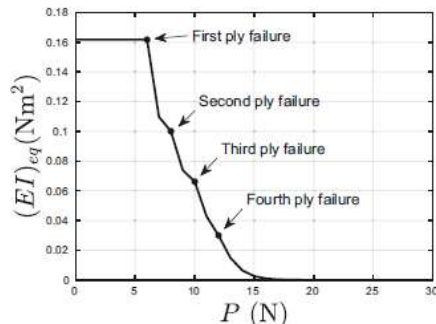
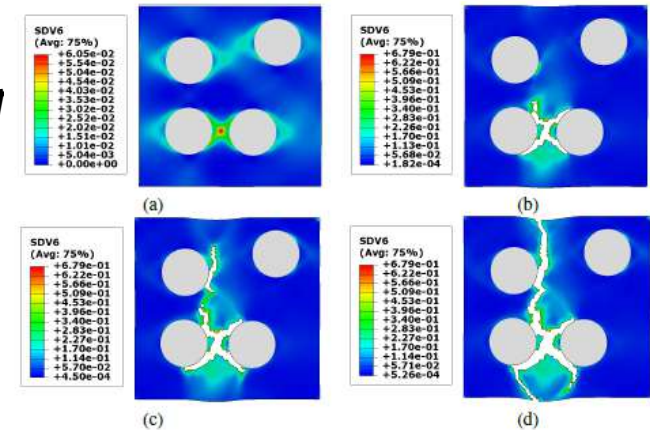
044-2257-4016; ssmulay@ae.iitm.ac.in

<http://www.ae.iitm.ac.in/~ssmulay>



Major Areas of Research

- Continuum mechanics, large deformation materials
- Constitutive modelling of composite materials
- Local and nonlocal damage-healing mechanics
- Viscoelastic material modelling
- Development of novel numerical meshless methods
- Multi-physics coupled continuum deformation of soft materials (hydrogels)



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Dr. Shyam Keralavarma

PhD, Texas A&M University, USA

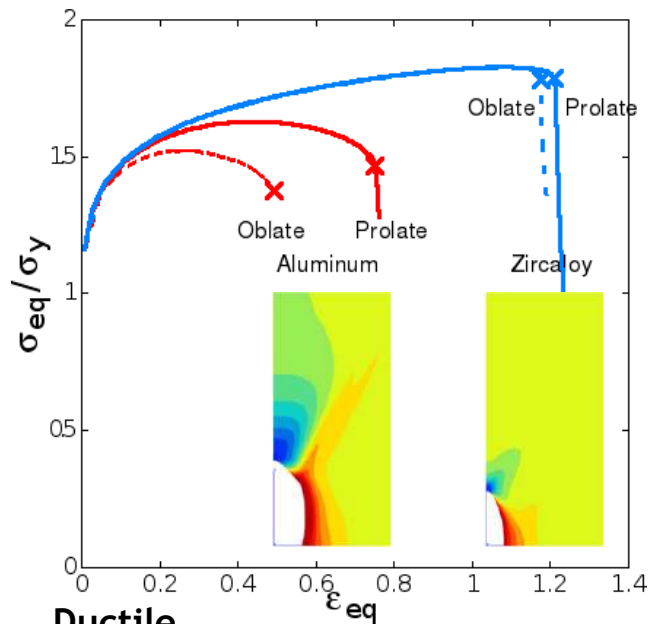
Assistant Professor, Aerospace Engineering

044-2257-4009; shyam@iitm.ac.in

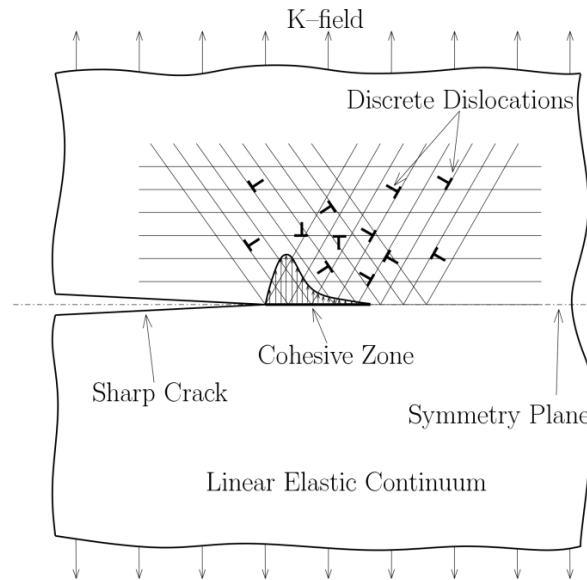
<http://www.ae.iitm.ac.in/people/faculty/shyam.html>



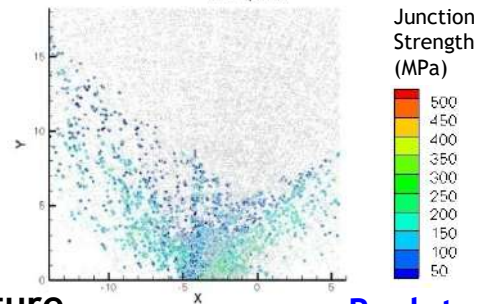
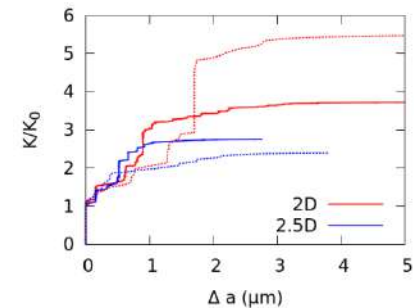
- **Plasticity: discrete dislocation plasticity, crystal plasticity, development of continuum constitutive models using micromechanics.**
- **Fracture Mechanics: ductile fracture by void growth, low triaxiality fracture, discrete dislocation simulation of crack-tip plasticity.**
- **Multi-scale Materials Modelling: development of multi-scale models for plasticity, dynamic strain aging, creep and fracture in metals.**



Ductile Fracture



Cleavage Fracture



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Dr. P Sriram

PhD, Georgia Institute of Technology, USA

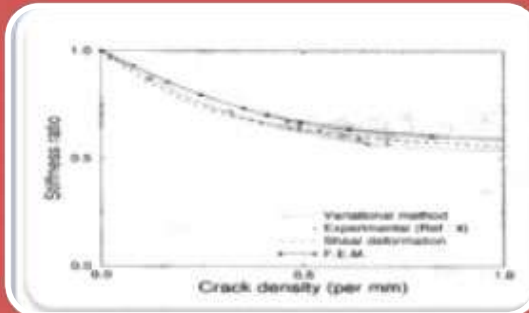
Professor, Aerospace Engineering

044-2257-4007; sriram@iitm.ac.in

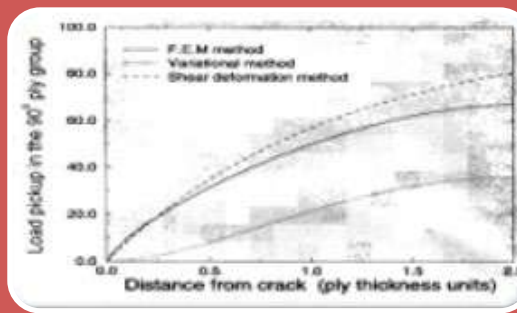
<http://ae.iitm.ac.in/~sriram>



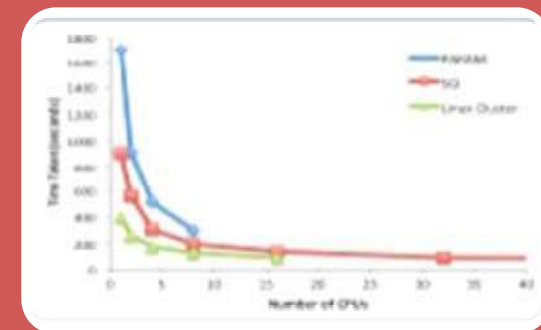
- Fatigue and Fracture Mechanics
- Composite Materials
- Parallel Computing



Approximate Modeling
of Delamination



Progressive Damage of
Layered Composite



Parallel Speed up -
Various architectures



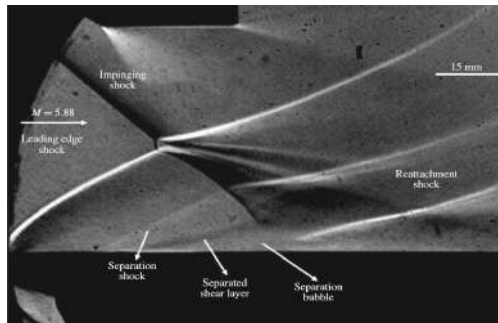
Dr. Sriram Rengarajan

Assistant professor, Aerospace Engineering
044-2257-4020; r.sriram@iitm.ac.in, r.sriram@ae.iitm.ac.in
<https://www.iitm.ac.in/info/fac/r.sriram>
<https://scholar.google.co.in/citations?user=IAIQA6wAAAAJ&hl=en>

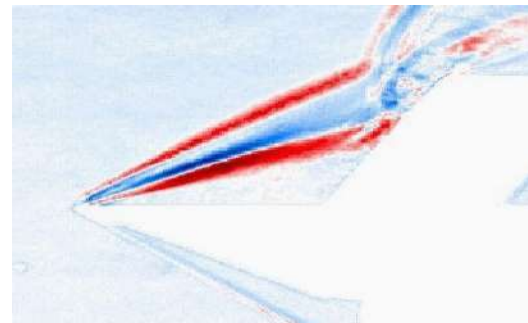


Major Areas of Research

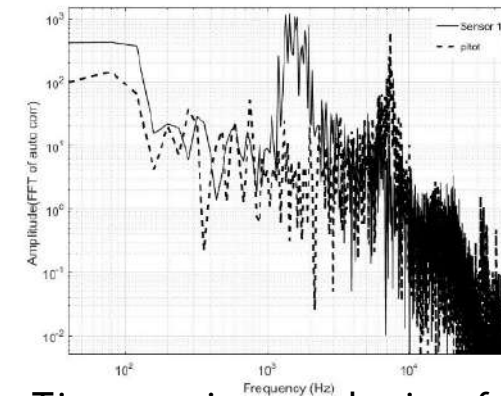
- Unsteady high-speed flows
- Shockwave boundary layer interaction
- Flow control



Shockwave boundary layer interaction



Dynamic mode decomposition analysis of shock induced unsteady leading edge separation



Time series analysis of unsteady pressure signals



Dr. R I Sujith

PhD, Georgia Institute of Technology, USA

Professor, Aerospace Engineering

044-2257-6012; sujith@iitm.ac.in

<http://www.ae.iitm.ac.in/~sujith>



- Research Area: Combustion Instability; Focus Nonlinear dynamics; precursors
- Research Area: Optical flow diagnostics; Focus PIV, PLIF, LDV & PDPA, high speed imaging & image processing



Combustion Instability in Aero & land based gas turbines



Application of laser diagnostics to study combustion Instability



Fundamental studies on laboratory flames

← Understanding combustion instability, and mitigate it in industrial applications →



Dr. Sunetra Sarkar

PhD, Indian Institute of Science, India

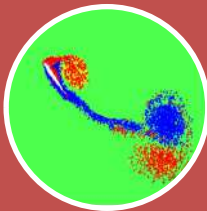
Professor, Aerospace Engineering

044-2257-4024; sunetra@iitm.ac.in

<http://www.ae.iitm.ac.in/~sunetra/sunetra1.htm>



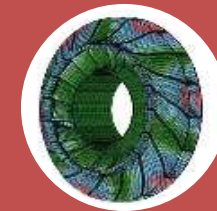
- Unsteady Aerodynamics of Flapping Bodies, Fluid-Structure Interactions
- Nonlinear Aero elasticity, Uncertainty Quantification
- Computational Fluid Dynamics, Particle Based Tools



Resolving the flow-field of flapping insects and MAVs



Wind turbine rotor aero elasticity with nonlinearities and uncertainties



Impeller acoustoelasticity and effect of dense gases on the combined fluid-structure dynamics

← Unsteady Aerodynamics and Fluid-Structure Interactions of Engineering Systems →

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Dr. R Velmurugan

PhD, Indian Institute of Technology, Delhi

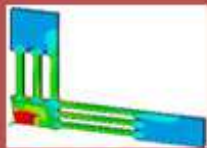
Professor, Aerospace Engineering

044-2257-4017 ramanv@iitm.ac.in

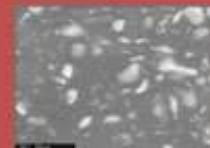
<http://www.iitm.ac.in/ramanv>



- Research Area/Focus 1 : Composite Materials
- Research Area/Focus 2 : Nano Composites
- Research Area/Focus 3 : Impact Mechanics and Structural Crashworthiness



Characterization studies of Composite Materials (polymer, metallic and natural composites)



Characterization and analytical studies of composites materials with nano fillers for improvement of functional applications



Studies of different composite materials for impact loading and crashworthiness



INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF APPLIED MECHANICS

LIST OF FACULTY

Abhijit Chaudhuri

Anubhab Roy

Anuradha Banerjee

Arockiarajan A

Arul Prakash K

Arun K Thittai

Babji Srinivasan

Baburaj A P

Ganesh Tamadapu

Ilaksh Adalkha

Lakshmana Rao C

Mahesh V Panchagnula

Manivannan M

Pijush Ghosh

Prasad Patnaik B S V

Raghavendra Sai V V

Ramakrishnan S

Ramasubba Reddy M

Ramesh K

Rinku Mukherjee

Sarith P Sathian

Satyanarayanan S

Saumendra K Bajpai

Sayan Gupta

Shaikh Faruque Ali

Sivakumar M Srinivasan

Sujatha N

Vagesh D Narasimhamurthy

Varadhan S K M

Vengadesan S



Dr. Abhijit Chaudhuri

PhD, Indian Institute of Science, Bangalore, India

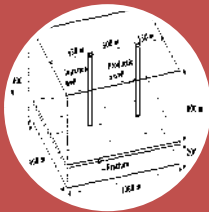
Associate Professor, Applied Mechanics

044-2257-4074; abhijit.chaudhuri@iitm.ac.in

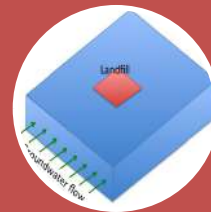
<http://apm.iitm.ac.in/fmlab/abhijit/index.html>



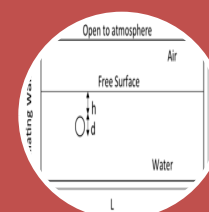
- Geothermal system: Coupled processes simulation
- Subsurface hydrology: Conditional and inverse stochastic analysis
- Fluid structure interaction, Water waves



Geothermal heat extraction,
Carbon sequestration



Groundwater hydrology,
contamination from
landfill/nuclear waste repository.



Flow induced vibration, wave
interaction to automatic
underwater vehicle.

← **Alternative energy resources and environmental safety assessment** →



Dr. Anubhab Roy

Assistant Professor, Applied Mechanics

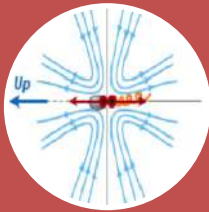
044-2257-4080; anubhab@iitm.ac.in

<https://home.iitm.ac.in/anubhab/>

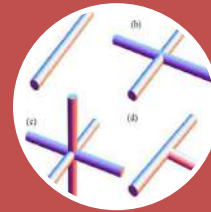


Major Areas of Research

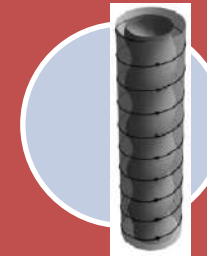
- Living fluids - Dynamics of swimming microorganisms
- Hydrodynamic Stability
- Suspension Mechanics



Active stresses due to swimming bacteria



Orientation dynamics of anisotropic particles in viscous fluids



Stability of rotating flows

← Applying modeling and simulations to solve problems in fluid mechanics →

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Dr. Anuradha Banerjee

PhD, University of Glasgow, UK

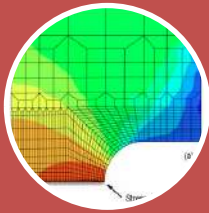
Professor, Applied Mechanics

044-2257-4075; anuban@iitm.ac.in

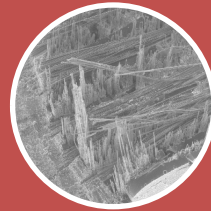
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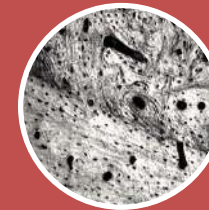
- Fracture and Fatigue of Materials
- Biomaterials/Hard Tissues
- Composites



Fracture Models



Material Characterization



Mechanics of Bone

← Theoretical, Experimental and Computational Mechanics of Materials →



Dr. A Arockiarajan

PHD, University of Kaiserslautern, Germany

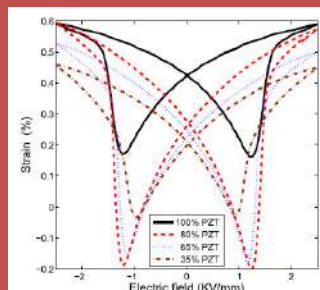
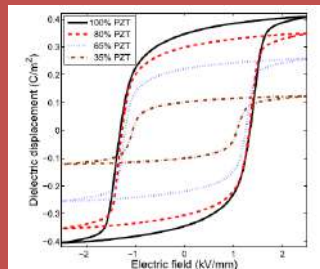
Professor, Dept. of Applied Mechanics

044-2257-4070; aarajan@iitm.ac.in

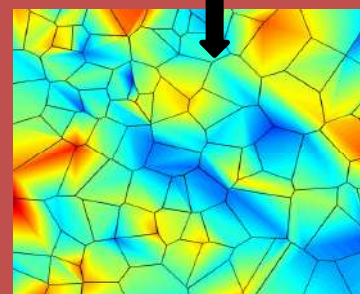
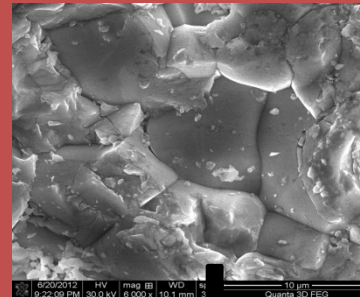
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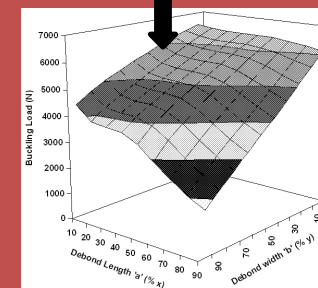
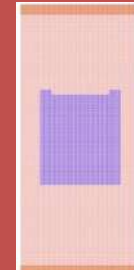
- Smart/Functional Materials
- Material Modelling
- Experimental characterization



Performance of ferroelectrics



Microstructural modelling



Debonding on composites



Dr. K Arul Prakash

PhD, Indian Institute of Technology Kanpur, India

Associate Professor, Applied Mechanics

044-2257-4066; arul@iitm.ac.in

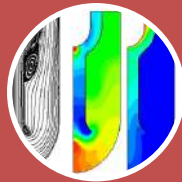
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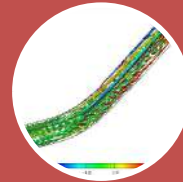
Major Areas of Research

- Computational Fluid Dynamics and Heat Transfer - Development of Algorithms
- Turbulence Modeling, Large Eddy Simulation and related techniques
- Thermal Hydraulics
- Aerodynamics, Fluid Structure Interaction

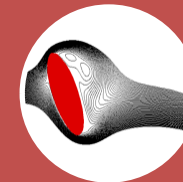
Applications



Thermal Hydraulics -
Accelerator Driven nuclear
reactor System



Large Eddy Simulation -
Cooling duct of Ariane II
rocket engine



Aerodynamics -
Fluid flow characteristics
past elliptic cylinder

Energy and Environment

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Dr. Arun K Thittai



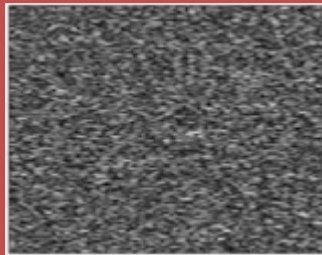
Associate Professor, Applied Mechanics (Biomedical Engineering)

044-2257-4053; akthittai@iitm.ac.in

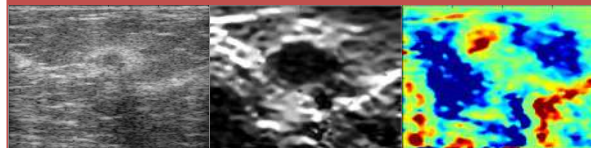
<https://home.iitm.ac.in/akthittai/>

Major Areas of Research

- Biomedical Ultrasound Imaging (Clinical and Pre-clinical)
- Ultrasound Elastography
- Ultrasound guided Treatment monitoring
- Ultrasound Guided Biopsy

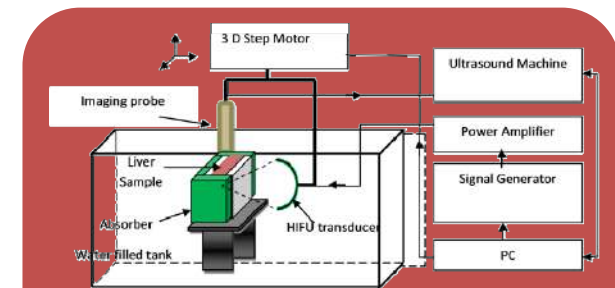


Ultrasound Image Formation Techniques for Biomedical Applications



Sonogram Shear Strain Axial-strain Axial-Shear Strain

Ultrasound Elastography
Measurement and Imaging of the Tissue Elastic Properties



High Intensity Focused Ultrasound (HIFU) Treatment and Real-time monitoring of it by Ultrasound Imaging Techniques

← Exploiting Ultrasound Signals for Wide Ranging Bio-Medical Applications →

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Dr. Babji Srinivasan

PhD, Texas Tech University University, USA

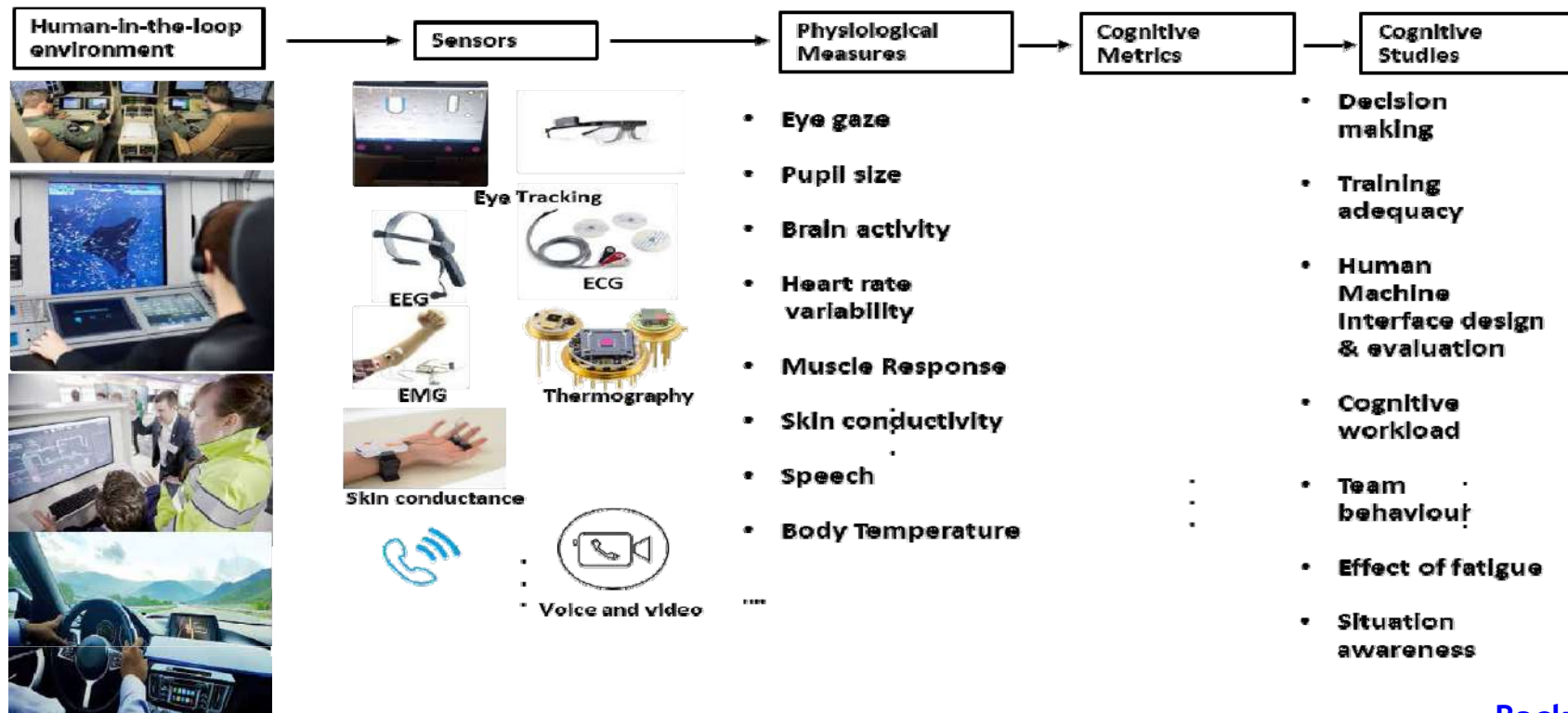
Associate Professor, Applied Mechanics

044-2257-4085; babji.srinivasan@iitm.ac.in



Major Areas of Research

Cognitive Systems Engineering, Human Cyber Physical Systems, Neuroergonomics, Physiological Control Systems



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Dr. A P Baburaj

PhD, IISC Bangalore, India

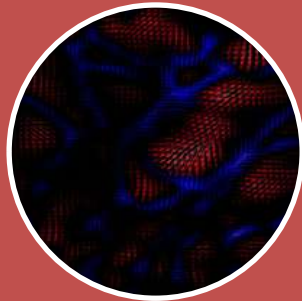
Associate Professor, Applied Mechanics

044-2257-4065; apbraj@iitm.ac.in

<http://apm.iitm.ac.in/fmlab/raj/index.html>

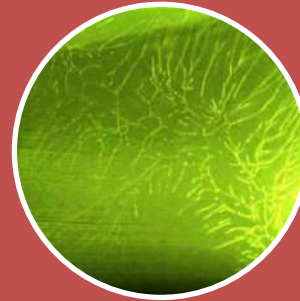


Turbulent convection



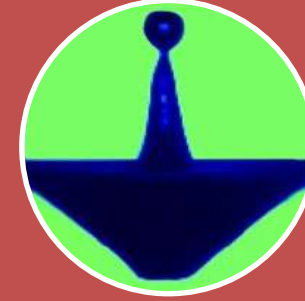
Top view of the velocity field just above a horizontal hot surface

Transport across membranes



Pattern of density driven mass transfer above a horizontal membrane

Interfacial phenomena



Last two stages of bubble collapse at an interface

The research encompasses study of organised motion in turbulence, pattern formation, interaction of boundary layers with ambient flows, dynamics of bubbles, drops and aerosols.

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Dr. Ganesh Tamadapu
PhD, IIT Kharagpur
Assistant Professor, Applied Mechanics
044-2257-4081; gt@iitm.ac.in
<https://apm.iitm.ac.in/ganesh.html>





Dr. Ilaksh Adlakha

Assistant Professor, Applied Mechanics

044-2257-4082; ilaksh.adlakha@iitm.ac.in

<https://home.iitm.ac.in/ilaksh.adlakha/>



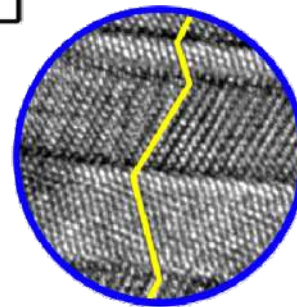
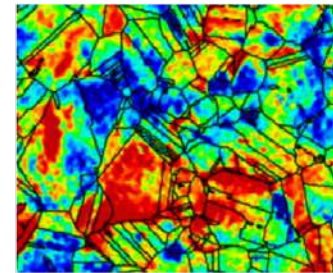
Integrated Research Vision

Stress Assisted Corrosion
Hydrogen Embrittlement
Application of Data Science in Mechanics
Lightweight Alloys
Role of Grain Boundaries during Fatigue



Crystal Plasticity

Phase Field Modeling

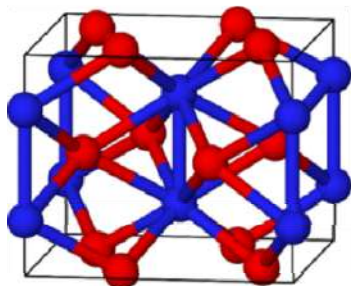


Mechanical Testing

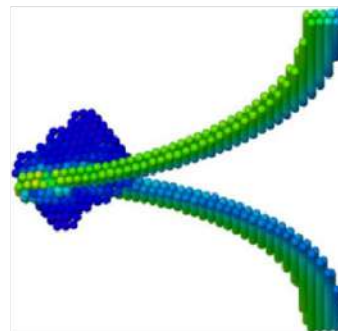
Fatigue
Nanoindentation
Hopkinson Bar

Electrochemical

Potentiodynamic Measurements
EIS



QM/MM
DFT



Atomistic Simulations

Characterization

DIC SEM
EBSD TEM

MultiScale Mechanics Lab

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Dr. C Lakshmana Rao

Doctor of Science, Massachusetts Institute of Technology, USA

Professor, Applied Mechanics

044-2257-4059; lakshman@iitm.ac.in

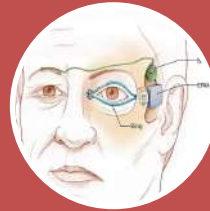
<http://apm.iitm.ac.in/smlab/clr/index.html>



- Ballistic Impact and Blast Mitigation on Structures
- Characterization of Piezopolymers
- Buckling Control of Structures using Smart Materials



MILITARY VEHICLES



SENSORS AND
ACTUATORS



SPACE STRUCTURES



Dr. Mahesh V Panchagnula

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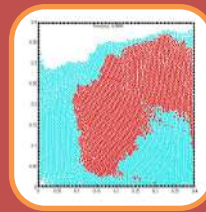
<http://apm.iitm.ac.in/fmlab/mvp/index.html>



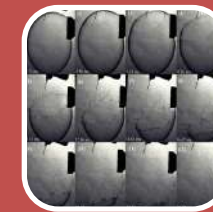
- Liquid Atomization and Spray Combustion
- Multiphase Fluid Mechanics
- Wetting and contact angle hysteresis



Wetting and hysteresis
(Microscale)



Wet granular flows
(Mesoscale)



Sprays
(Macroscale)

← Multiscale multiphase flows - spanning a range of length and time scales →



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- Haptics/Touch Feedback, Medical Simulation, Advanced Robotics
- Biomechanics: Soft Tissue Multiscale Modeling and Simulation
- Quantitative Physiology: Arterial Pulse Modeling and Simulation

**Laparoscopic
Simulator
Hardware
For Haptic
Feedback
Designed In
house**



**Mannequin
Based
Simulation
For Training
on
Diagnosing
and Treating
Heart Attack**



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Dr. Pijush Ghosh

PHD, North Dakota State University, USA

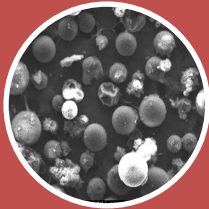
Associate Professor, Applied Mechanics

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http://apm.iitm.ac.in/smlab/pijush/Pijush_index.html



- Self-Healing Materials/Focus 1
- Polymer Thin Films/Focus 2
- Molecular Dynamic Simulation/Focus 3



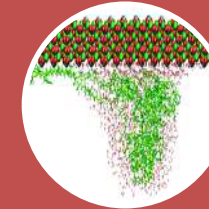
Self-Healing of Cracks in polymeric matrix

Surface Modification applying Microencapsules



Polymer Functional (thermal, anti-hydration) Coatings

Polymer Ceramic (cement) Interface



Organic-Inorganic Interaction at the interface

Mechanics of Polymeric and Protein Molecules

Automobile, Aviation, Polymer Composites, Construction Materials Industries >> Mechanics of thin films, nanocomposites, interface mechanism, polymeric nanofilms, microencapsulations, MD simulations

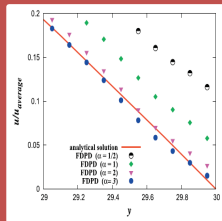
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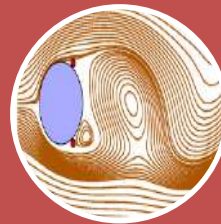
Dr. Prasad Patnaik BSV
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- Development of schemes for Fluid dynamics (both continuum and mesoscopic simulations)
- Control of vortices : through drain tanks, past bodies, through heat exch. etc.
- Flow Structure Interaction (FSI) : vortex induced vibrations, blast mitigation etc.



Development of numerical methods for both continuum and Particle based simulations. A typical DPD simulation is depicted.



Analysis of bluff and streamlined configurations. Development of control strategies for the suppression of vortex induced oscillations.



Application specific design and analysis problems : development of shock capture methods for blast mitigation devices (DRDO), vortex suppression in drain tanks (ISRO), gas entrainment studies (IGCAR) etc.

Fluid Dynamics simulations ranging from mesoscopic to continuum scales

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Dr. V V Raghavendra Sai

PhD from IIT Bombay, INDIA

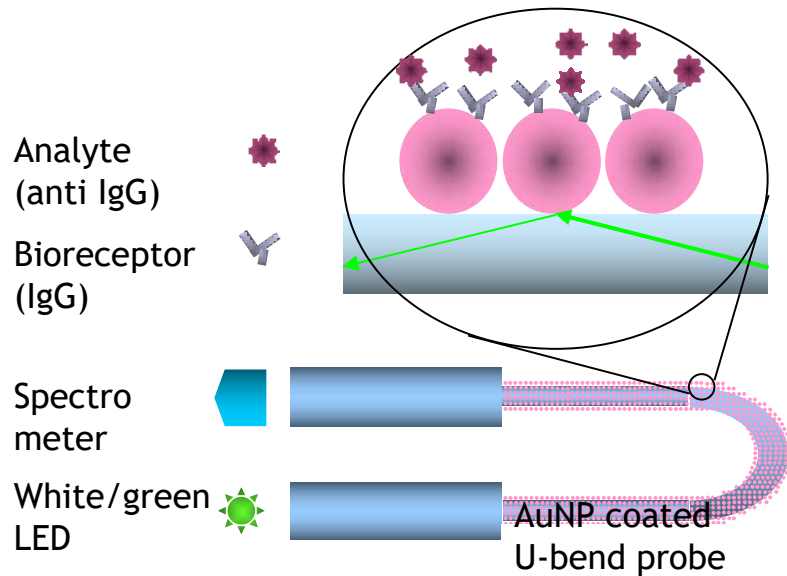
Associate Professor, Applied Mechanics

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<http://apm.iitm.ac.in/biomedical/sai/index.html>

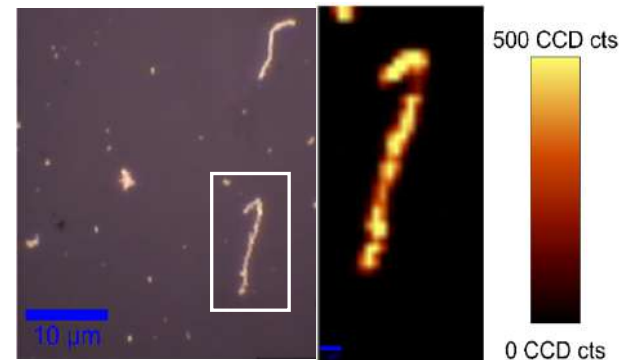
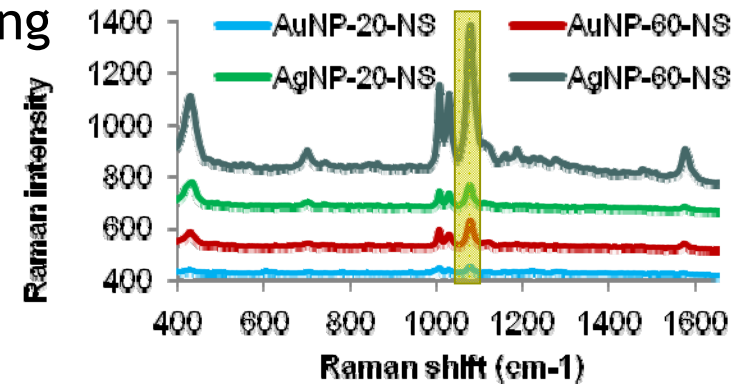


- Localized surface plasmon resonance (LSPR) and surface enhanced Raman scattering (SERS) based Optical Biosensors
- Clinical diagnosis & Environmental monitoring
- Detection of Explosives and Toxins



LSPR based Fiber optic biosensors for model analyte (IgG)

V V R Sai, et al 2009. *Biosens. & Bioelectron.*, 24, 2804-09;



SERS mapping of AgNP 60nm coated SiO₂ Nanosprings

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Dr. S Ramakrishnan

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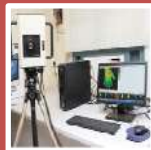
<http://apm.iitm.ac.in/biomedical/ramki/index.html>



- **Brain Image Analysis** - Characterization of Brain micro structure and Tractography in conditions such as Alzheimer's disorders.
- **Infrared Thermal Image Analysis** - Analysis of physiological variables using medical infrared thermograph in Human Breast and Hand.
- **Biomedical Instrumentation** - Enhancing the diagnostic relevance of medical equipment.
- **Signal analysis** - EMG signal generation, modeling, diagnosis of myopathy and neuropathy
- **Calibration of Medical Devices** - Design and development of test schemes for calibrating and standardizing medical devices



Brain Image
Analysis



Thermal Image
Analysis



Instrumentation
& Calibration



EMG Signal
Analysis



Dr. M Ramasubba Reddy

PhD, IISc, India

Professor, Applied Mechanics

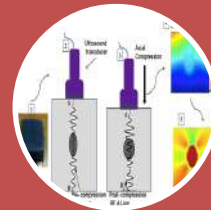
044-2257-4057; rsreddy@iitm.ac.in



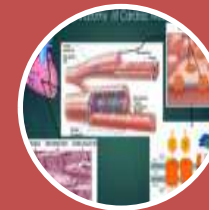
- Biomedical Instrumentation
- Biomedical Signal and Image Processing
- Computational Biology



Brain Computer
Interface



Ultrasound stiffness
imaging



Physiological
Modeling

← DIAGNOSIS, THERAPEUTIC AND REHABILITATION ENGINEERING →

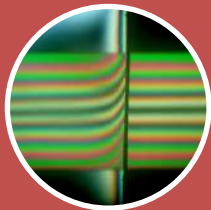
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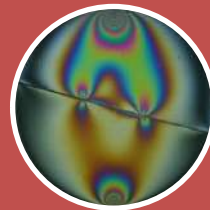
Dr. K Ramesh
PHD, IIT Madras, India
Professor, Dept. of Applied Mechanics
044-2257-4058; kramesh@iitm.ac.in
<http://apm.iitm.ac.in/smlab/kramesh/index.html>



- Experimental Mechanics/Digital Photoelasticity
- Fracture Mechanics/Stress field evaluation
- Educational Technology/Innovative use of Multimedia



Glass Stress
Analysis



Failure Analysis



Development of
e-Books/e-Teacher



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Dr. Rinku Mukherjee

PHD, North Carolina State University, USA, 2004

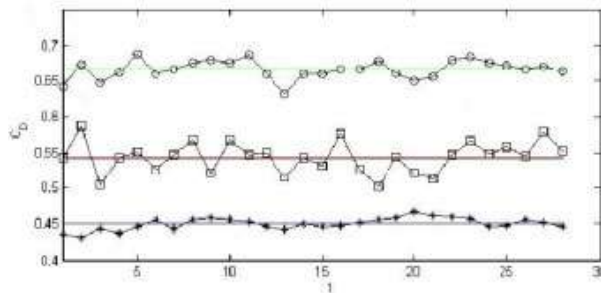
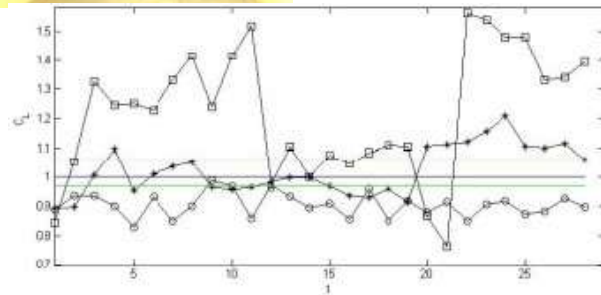
Professor, Applied Mechanics

Scopus ID: 55535113700 Researcher ID: M-2111-2013

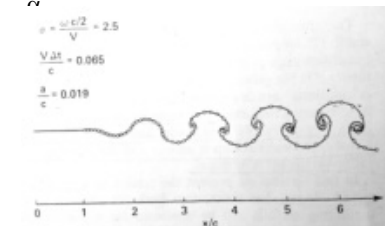
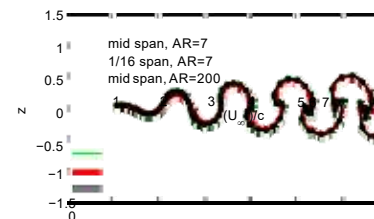
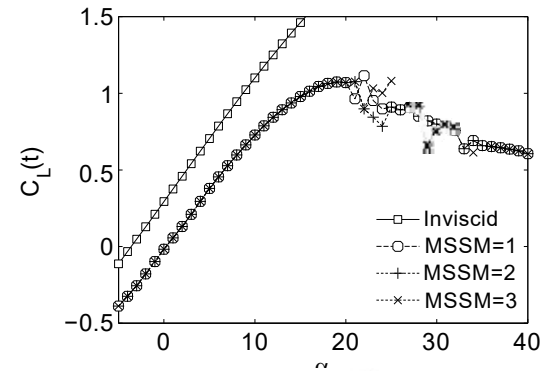
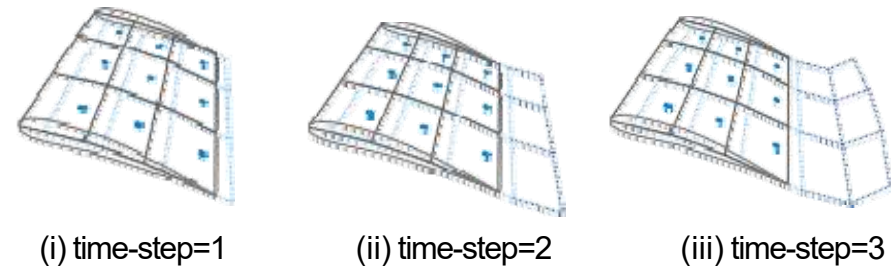
Aerodynamics (High-Alfa, Unsteady, Applied), Boundary Layers

044-2257-4058; rinku@iitm.ac.in

<http://home.iitm.ac.in/rinku>



* $\alpha = 9^\circ$ — Mean $C_d = 0.45$ at $\alpha = 9^\circ$
 □ $\alpha = 12^\circ$ — Mean $C_d = 0.54$ at $\alpha = 12^\circ$
 ○ $\alpha = 15^\circ$ — Mean $C_d = 0.67$ at $\alpha = 15^\circ$



(i) Present work (ii) Literature
Unsteady Aerodynamics

Experimental High-Alfa Aerodynamics

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Dr. Sarith P Sathian

PhD, IIT Madras, India
Professor, Applied Mechanics

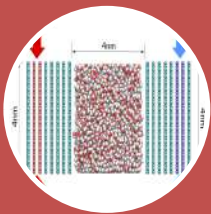
044-2257-4062; sarith@iitm.ac.in

<http://www.apm.iitm.ac.in/>;

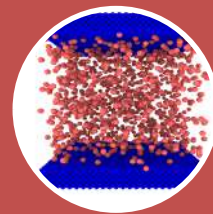
<https://sites.google.com/site/sarithshomepage/profile/dr-sarith-p-sathian>



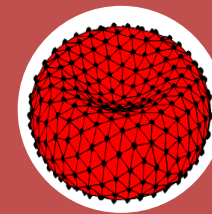
- Nanofluidics & Nanoscale heat transfer
- Compressible fluid flows & Molecular Gas Dynamics
- Computational Physics & Soft Matter simulations



Nanoscale heat
transfer & Desalination



Gas sensing and gas
transport



Modeling of Red Blood
Cells

← BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH →



Dr. Satyanarayanan S

Assistant Professor, Applied Mechanics

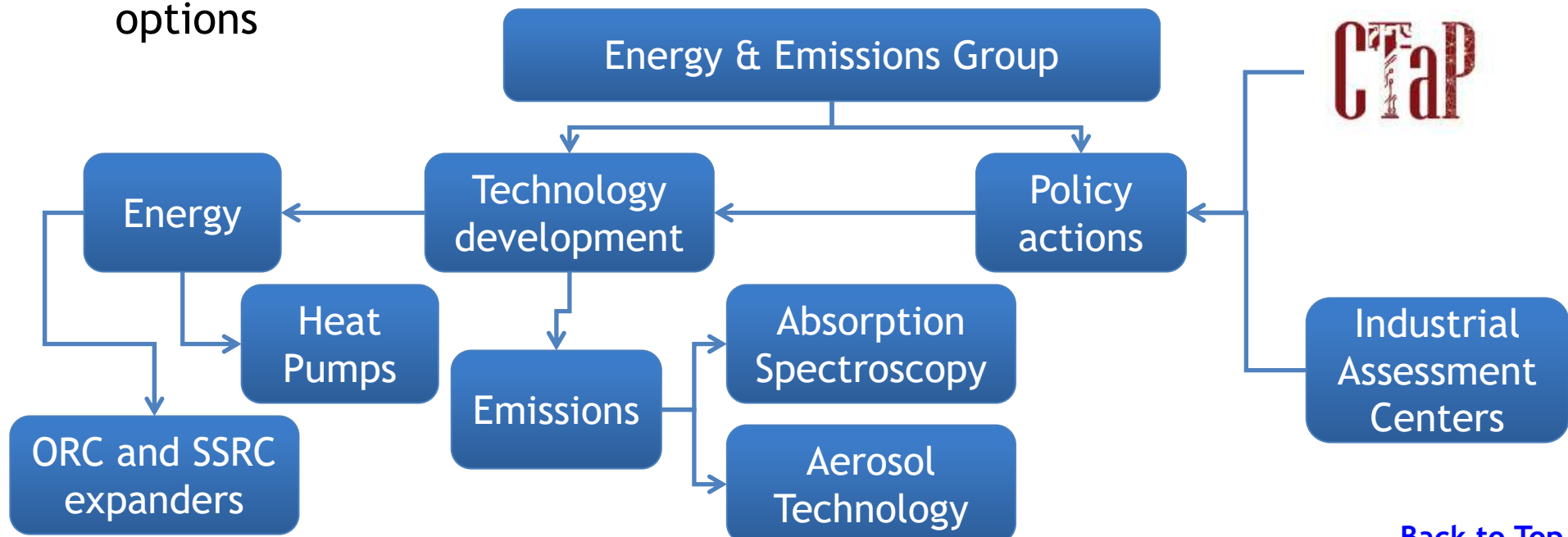
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Major Areas of Research

- Aerosol Science and Technology Applications
- Emissions measurement and control
- Efficient utilization of energy through recovery, reuse and renewable options



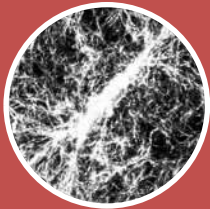
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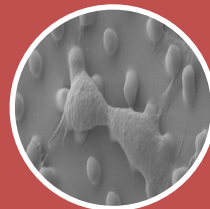
Dr. Saumendra K Bajpai
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<http://home.iitm.ac.in/sbajpai/lab-overview.html/>



- Cell mechanics and tissue-remodeling
- Multiple-scale characterization of soft-matter
- Bio-mimetic systems, design, and applications



3D cell-invasion



Cellular traction



Tissue mechanics

← Assay development, diagnostics, and device design →



Dr. Sayan Gupta

PhD, Indian Institute of Science, Bangalore

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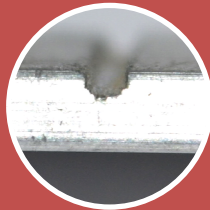
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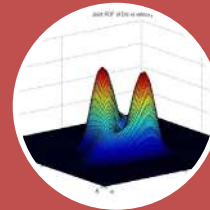
- Vibrations, Nonlinear dynamics and Chaos, Stochastic Dynamics
- Stochastic Load Modeling, Structural Reliability, Stochastic Finite Elements
- Damage detection & Life Assessment, Structural Health Monitoring



Stochastic load modeling in Fluid Structure Interaction problems, eg., wind turbines, offshore platforms



Detection of fatigue cracks from vibration measurements in aging infrastructure



Analysis of turbine blades for aero-elastic failures & random fatigue damage in stochastic flow



Energy harvesting from wind in bladeless windmills

Applications in stochastic dynamical systems

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Dr. Shaikh Faruque Ali

PhD, IISC, India

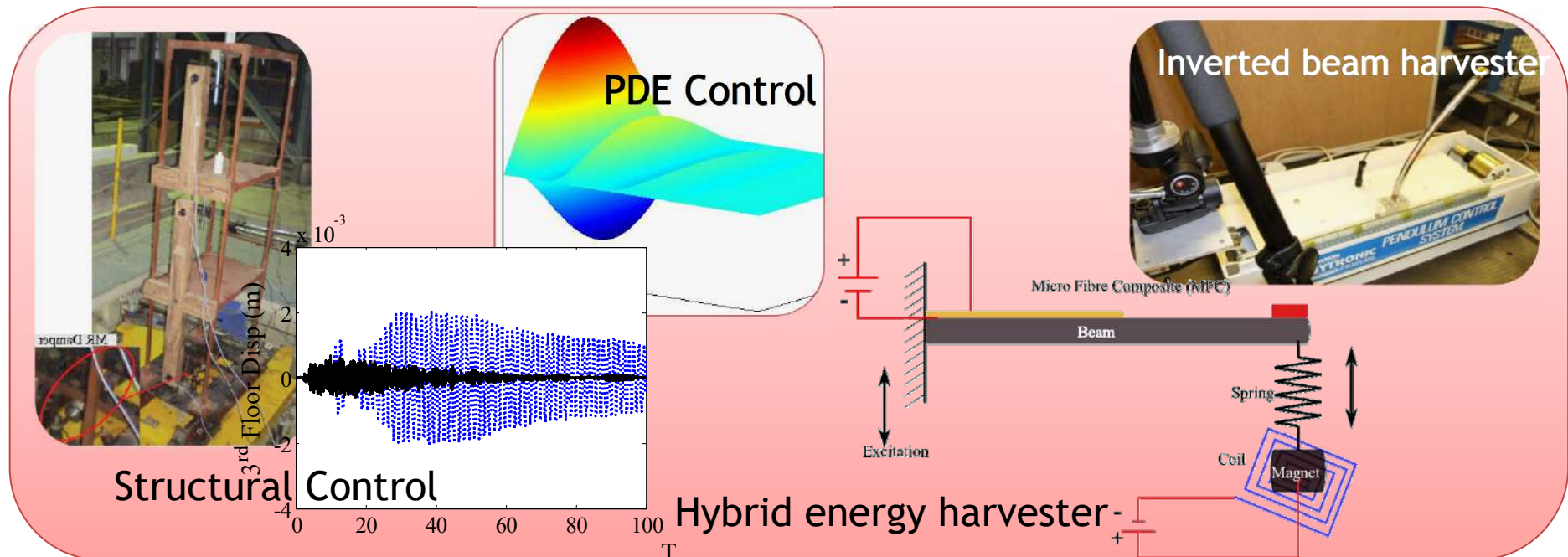
Associate Professor, Applied Mechanics

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- Structural vibration and control
- Dynamics and control of nonlinear systems
- Nonlinear and hybrid energy harvesting



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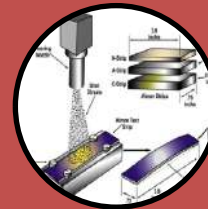
Dr. Sivakumar M Srinivasan
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- Structural Mechanics / Analysis and design of thermo-mechanical structures
- Inelasticity of materials / modeling mechanics of plasticity, creep and fatigue
- Smart materials & composites / Shape mem alloys, piezos and magnetic
- Research Area/Focus 3



Smart Structures &
Composites



Modeling mechanical
processing effects



Low cycle fatigue of
materials & structures

Inelastic Analysis and design of materials and engineering structures



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- Non destructive imaging of tissue using laser speckle techniques
- Optical signal / image processing
- Biomedical optical spectroscopy instrumentation for in vivo diagnostics



Laser speckle contrast
imaging for assessment
of blood flow



Processing of laser
Doppler signals for
analysis of
hemodynamics



Diffuse reflectance
spectrum analysis for
tissue hemoglobin
assessment

NON-INVASIVE TISSUE DIAGNOSTICS USING DIFFERENT OPTICAL TECHNOLOGIES

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Dr. Vagesh D Narasimhamurthy

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Associate Professor, Applied Mechanics

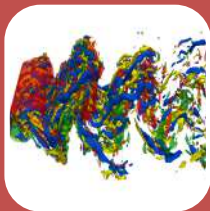
+91-44-2257-4079; vagesh@iitm.ac.in

<https://home.iitm.ac.in/vagesh/>

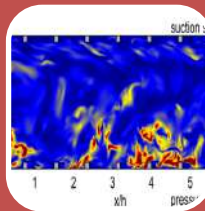


Major Areas of Research

- CFD, DNS, transition & turbulence, bluff-body flows, wall-bounded flows
- Turbulent premixed combustion, gas-explosion safety
- Gas dispersion, two-phase flows (particulate dispersion)



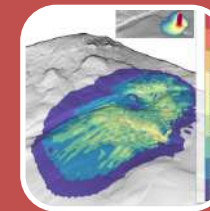
Direct numerical simulation of transitional and turbulent bluff-body flows



Direct numerical simulation of wall-bounded turbulent flows: mixing, Coriolis force and roughness effects



Turbulent premixed combustion modeling: Industrial gas-explosion safety analysis



Two-phase gas- and particulate-dispersion modeling of flammable, toxic or asphyxiating fluids

← Computational fluid dynamics (CFD) studies ranging from laboratory to industrial scale →

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Research Areas

Description

Neuromechanics

The neural basis of Biomechanics, understanding the central nervous system control strategies responsible for movement generation

Motor Learning

Understanding the mechanisms that underlie learning motor tasks, from simple, daily movements to special movements in art and sport

Rehabilitation

Development of Assist devices to be used in Rehabilitation of patients with neuro-motor disorders, such as stroke

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- Insect Aerodynamics/ Aerodynamics of low flying insect under different operating condition
- Bubble transport in a micro channel/Investigation of a PFC bubble transport through a micro channel with bifurcation at different roll angle
- Bluffbody aerodynamics/characterisation of flow regime for elliptic cylinders



Pair of dipole formation
at the end of upstroke



PFC bubble lodging at
the bifurcation of a
microchannel oriented at
45° roll angle



Identification of
different flow regimes
for flow past elliptic
bodies



INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF BIOTECHNOLOGY

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LIST OF FACULTY

Amal Kanti Bera

Athi Narayanan Naganathan

Baskar R

Chandra T S

Chandraraj Krishnan

Gopala Krishna Aradhyam

Guhan Jayaraman

Hamsa Priya Mohana Sundaram

Himanshu Sinha

Karthik Raman

Karunagaran D

Kesavan V

Madhulika Dixit

Mahalingam S

Manoj N

Michael Gromiha M

Nathiya Muthalagu

Ninitha A J

Nirav Pravinbhai Bhatt

Nitish R Mahapatra

Rajamanickam Murugan

Rama Shanker Verma

Rayala Suresh Kumar

Sanjib Senapati

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Srinivasa Chakravarthy V

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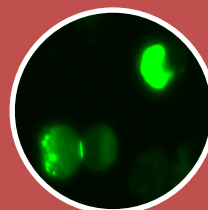
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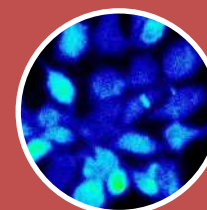
- Structure-function relationship of Ion Channels
- Regulation of Ion Channels
- Ion channels associated with Stroke and Heart attack



Patch clamp



Gap junction



Calcium signaling

Electrophysiology of Ion Channels

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Dr. Athi Narayanan Naganathan

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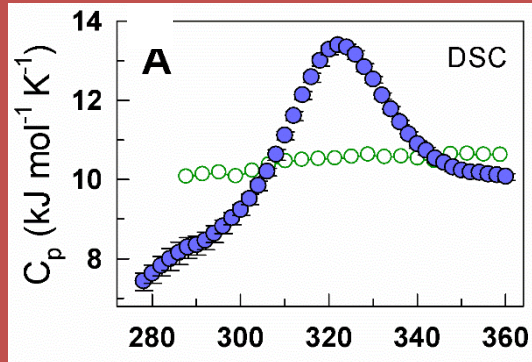
Assistant Professor, Biotechnology

044-2257-4140; athi@iitm.ac.in

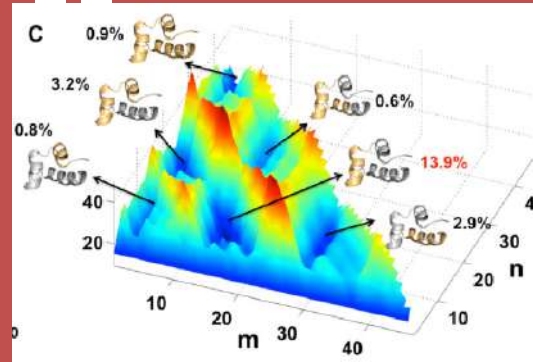
<http://www.biotech.iitm.ac.in/Faculty/ProteinBiophysicsLab/>



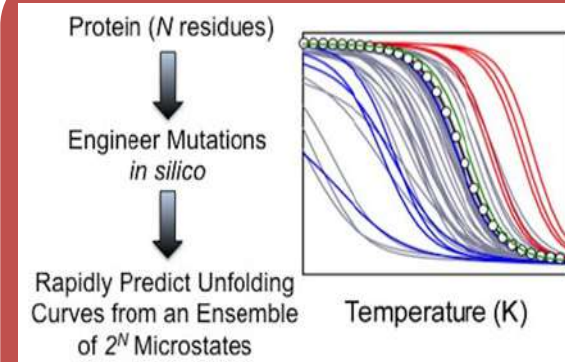
- Experimental Spectroscopic Characterization of Protein Conformational Behavior and its Relation to Function (Folding-Function Landscape)
- Modeling/Predicting Folding and Fitness Landscapes Using Statistical Methods
- Probing Folding/Dynamics through Coarse-Grained and Molecular Simulations



Equilibrium/Kinetics



Functional Landscapes



Protein Design

Experimental/Computational Characterization of Protein Folding Landscapes

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Dr. R Baskar

PhD, University of Maryland, USA

Associate Professor, Biotechnology

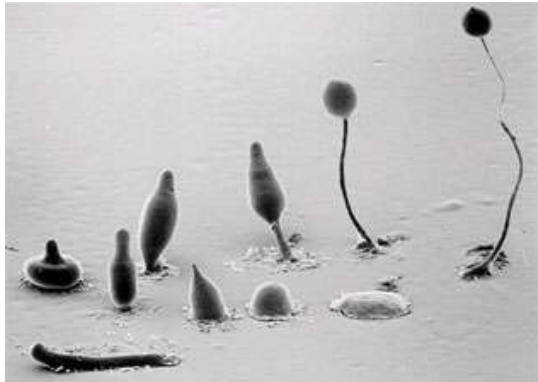
044-2257-4110; baskar@iitm.ac.in

<http://www.biotech.iitm.ac.in/Rbaskar>



Major Areas of Research

- Pattern formation in cellular slime molds
- Estimating spontaneous mutation rates and meiotic recombination frequency during different biological events in flowering plants

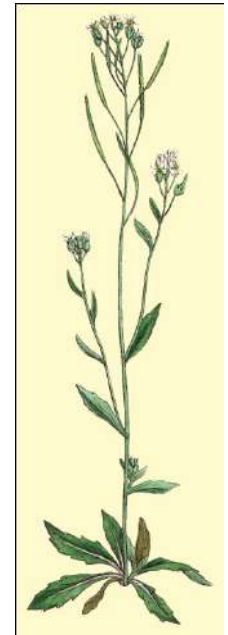


Dictyostelium as a model to investigate:

1. Mechanisms of caffeine action
2. Volatile mediated chemotaxis
3. Ageing

Arabidopsis as a model to investigate:

1. Somatic mutation rates upon parental ageing, hybridization
2. Meiotic recombination rates



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Dr. Chandra Sainathan (T.S.Chandra)

PHD, Indian Institute of Science, India

Emeritus Professor, Biotechnology

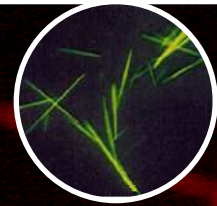
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- Industrial Biotechnology- salt tolerant enzymes, riboflavin B-vitamins animal feed, antioxidants, nutraceuticals from millet grains, genetic and metabolic engineering in fungi
- Environmental Bioprocesses- biogas, composting, bioconversion of red sea algae carrageenan to alcohol
- Nanobiotechnology-biosynthesis magnetite nanoparticles, electrospun nanomembranes for food packaging, nanoparticle-coated bioelectrodes biofuel cells



Applied Microbiology Biogas collection from Jatropa oil seed cakes



Genetically engineered Fluorescent fungal filament and riboflavin crystals



Bread spoilage prevented by electrospun nanomembrane

← Applied Microbiology and Nanobiotechnology →

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Dr. Chandraraj Krishnan

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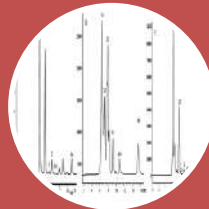
<http://www.biotech.iitm.ac.in/faculty/kcr.php>



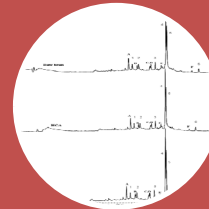
- Biomass conversion/ Cellulosic bioethanol
- Functional Foods/ Oligosaccharides and phenolic acids
- Recombinant Enzymes/Amylases, Cellulases, Xylanases, Proteases



Cellulosic ethanol used as automobile fuels by blending with petrol



Functional oligosaccharides used as prebiotics in food products



Phenolic acids used as antioxidants in food formulations



Amylases, cellulases, xylanases, proteases applied in textile, bioethanol and leather industries

Conversion of Low Cost Agricultural Residues into Fuels and Chemicals

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Dr. Gopala Krishna Aradhyam
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<http://www.biotech.iitm.ac.in/faculty/agk/home.html>



The Signal Transduction Lab

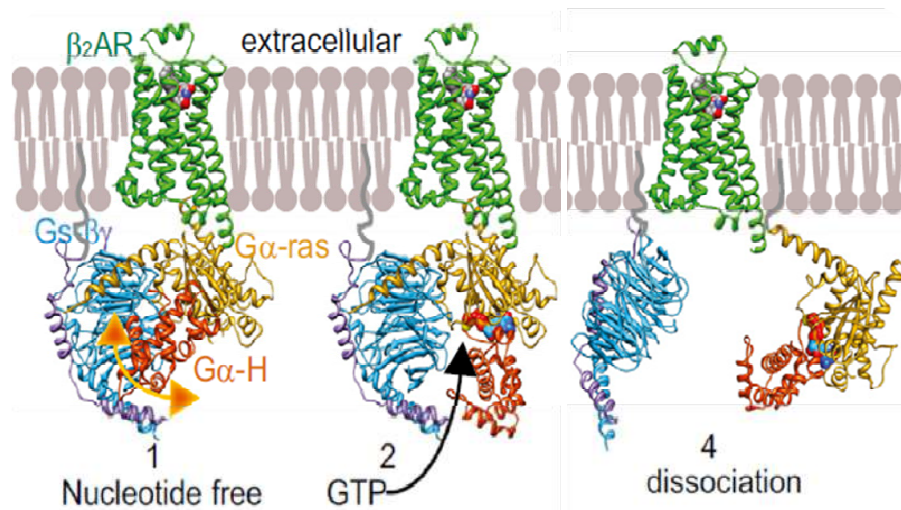
G Protein Coupled Receptors (GPCRs)

Ca²⁺-binding proteins

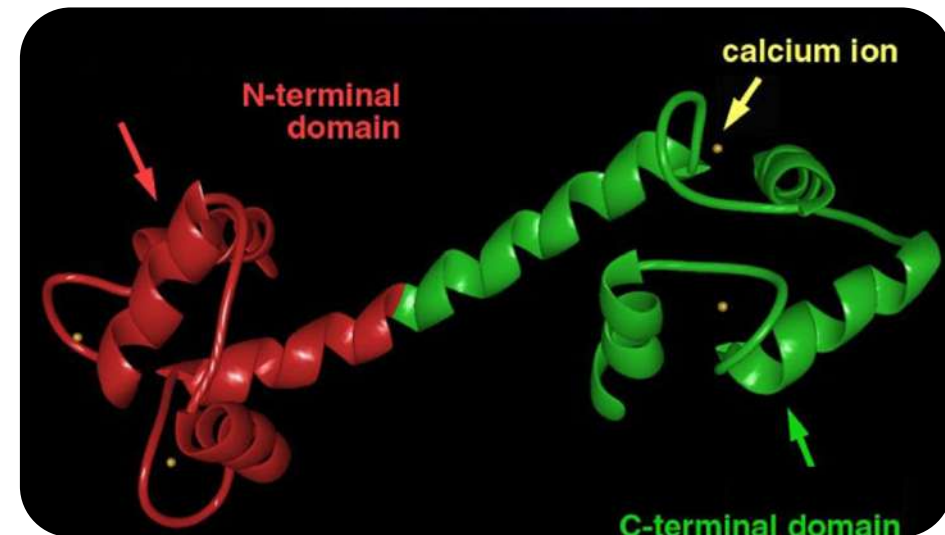
- The general focus of research in our lab is protein structure-function and biochemistry.
- Elucidating novel functions of proteins.

BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH

Signal Transduction by Membrane proteins



Signal Transduction by Ca²⁺-binding proteins



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Dr. Guhan Jayaraman

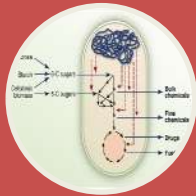
PhD, Rensselaer Polytechnic Institute, USA

Professor, Biotechnology

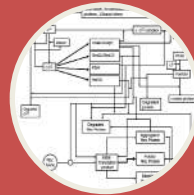
044-2257-4108; guhanj@iitm.ac.in



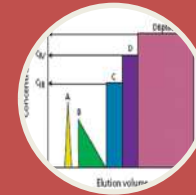
- Metabolic Engineering for Biopolymers and Biofuels production
- Bacterial Systems Biology - Analysis of Metabolic and Gene Regulatory Networks
- On-line Monitoring of Bioprocesses using Spectroscopic Techniques
- Process Chromatography for Protein Purification



Metabolic Engineering of
Lactic Acid Bacteria
High Molecular Weight
Hyaluronan



Analysis of Bacterial Stress
Response Networks



Displacement Chromatography
Simulated Moving Bed
Chromatography

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Dr. Hamsa Priya Mohana Sundaram

PhD, The Ohio State University, USA

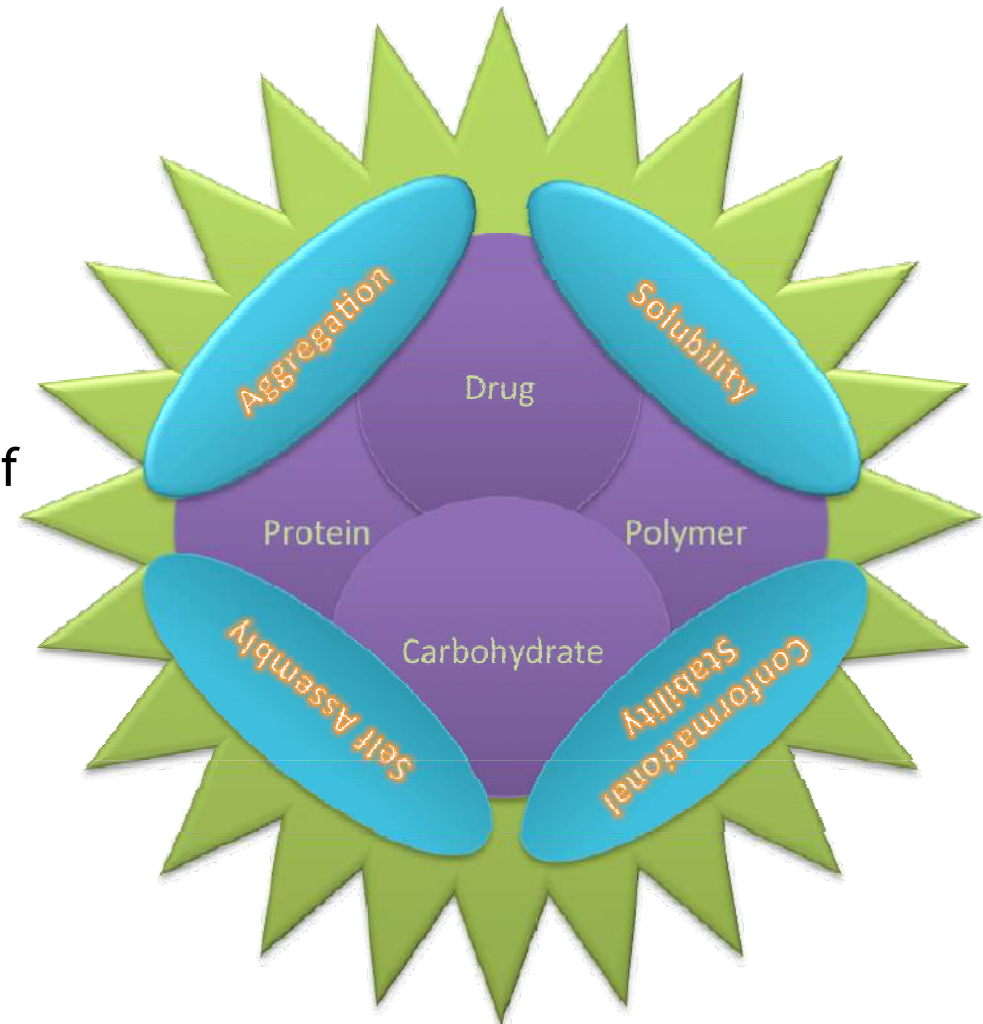
Assistant Professor, Biotechnology

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Major Areas of Research

- Computational biophysics
- Protein aggregation
- Protein solubility and stability
- Computational characterization of materials for therapeutics
- Self assembly of nano drug delivery carriers
- Drug-polymer conjugates
- Bio-molecular simulations
- Multi-scale modeling



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Dr. Himanshu Sinha

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Dr. Karthik Raman

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Associate Professor, Biotechnology

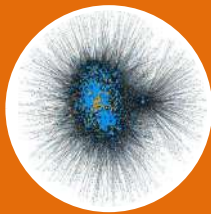
Bhupat & Jyoti Mehta School of Biosciences

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<https://home.iitm.ac.in/kraman/lab>



- Computational Systems Biology/Modelling of Complex Biological Systems
- *In silico* Modelling for Metabolic Engineering
- High-performance Computing for Biology
- Synthetic Biology/Design of Biological Networks



Biological Network
Analysis



in silico Metabolic
Engineering



Synthetic
Biology

← Systems-level modelling of complex biological networks →

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Dr. Karunagaran D

PHD, Sri Krishnadevaraya University, India

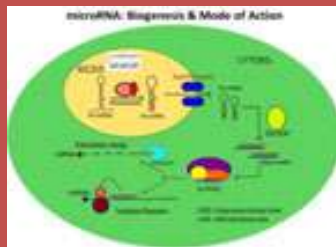
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- Role of miRNAs
- Aberrations in signaling
- Mechanisms of potential anticancer agents



Target prediction and experimental validation
Functional characterization - Effects of miRNAs on signaling pathways



Aberrations in NF- κ B, TGF- β , Wnt and apoptosis signaling in cancer cells/tumors



Molecular mechanisms of Apoptosis induced by phytochemicals (curcumin, emodin, plumbagin, allicin etc), marine alkaloid analogs and organic compounds

CANCER BIOLOGY

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V Kesavan

Ph.D

Associate Professor, Biotechnology

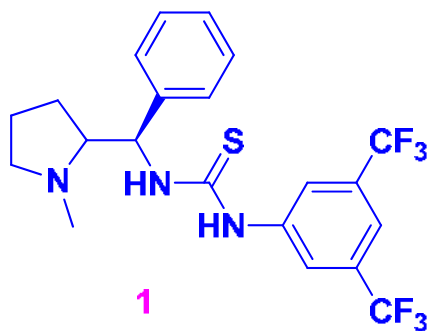
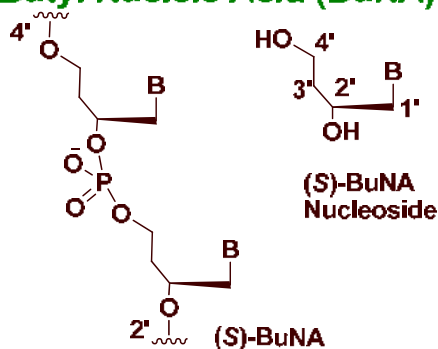
044-2257-4124; ykesavan@iitm.ac.in

<http://www.biotech.iitm.ac.in/Kesavan>

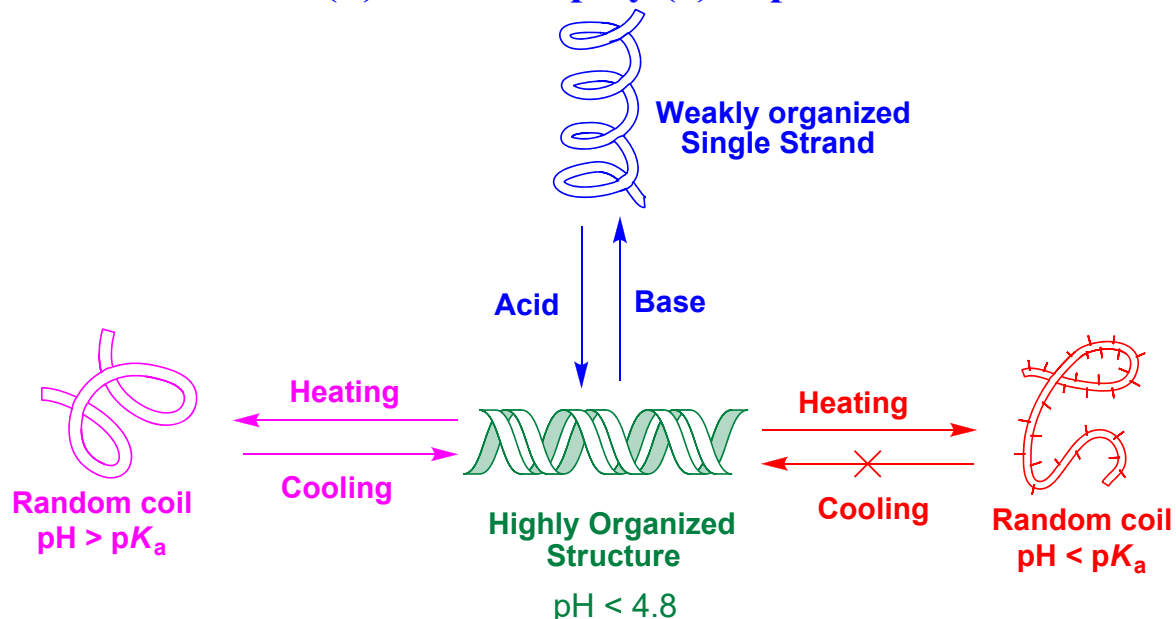


- Development of acyclic nucleic acid and molecular devices
- Development of organo catalysts from proline
- Exploration of covalent inhibition of cysteine kinases using NCEs

Butyl Nucleic Acid (BuNA)



(S)-BuNA of poly (a) at pH 7.0



Vipin Kumar *et al.* *Org. Biomol. Chem.* 2013, 000, and *RSC Adv.*

2013, 000, 000. Anandagam *et al.* *Org. RSC Adv.* *Under revision*

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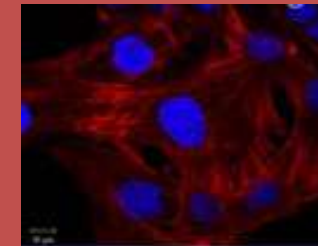
- Endothelial Progenitors and Glucose Metabolism
- Endothelial Dysfunction and Shear Stress
- Atherosclerosis
- Research Area/Focus 3



Therapeutic Neo-vascularization



Functional Food



Vascular Grafts

← Cardio-Vascular Dysfunction in Diabetes and Metabolic Syndrome →

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Tumor Biology

- Cross-talk between tumor suppresser genes and oncogenes
- Nucleolar GTPases and ribosome biogenesis
- Functional characterization of Ras effectors

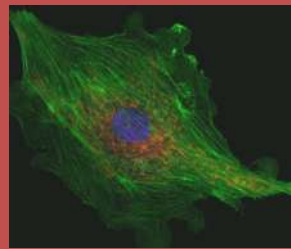
Molecular pathogenesis of HIV

- Host-virus interaction, Neutralizing antibodies

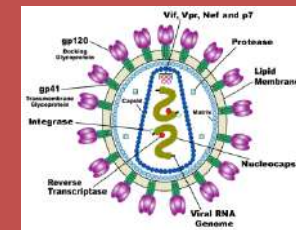
Tumor Bio-Bank



Tumor Biology



Molecular pathogenesis of HIV



Laboratory of Molecular Cell Biology

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➤ Protein Structure and Function

Structural biochemistry of enzymes for biotechnology applications

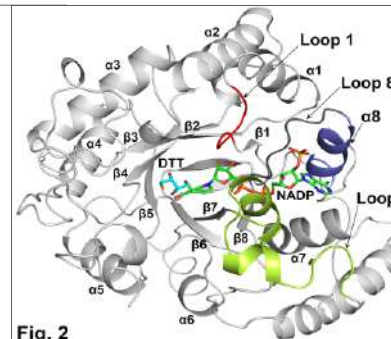
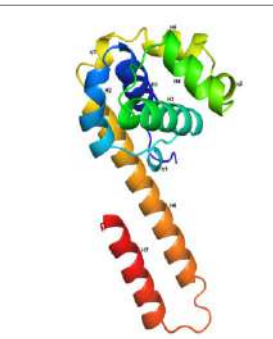
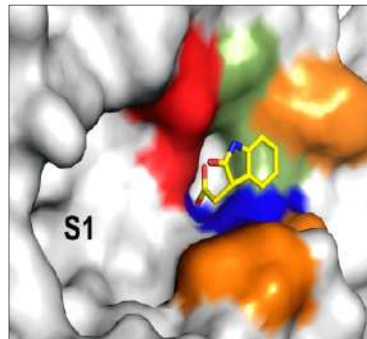


Fig. 2

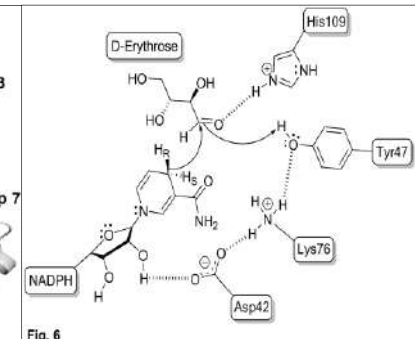
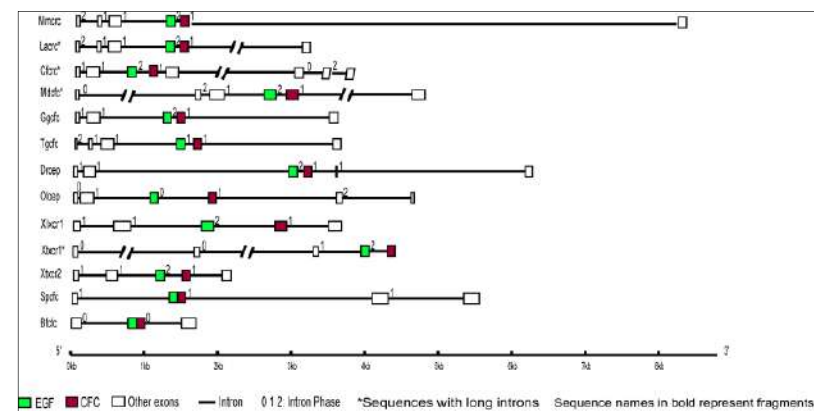
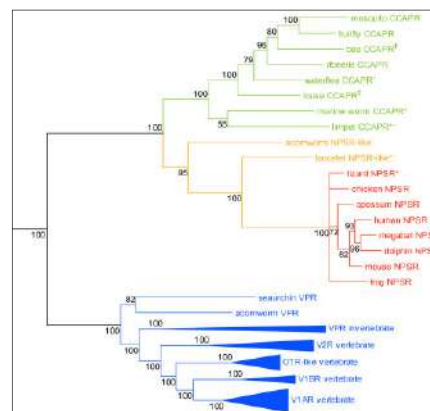


Fig. 6

➤ Molecular Evolution

Comparative genomics of membrane bound proteins



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Dr. M Michael Gromiha

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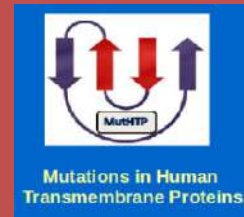
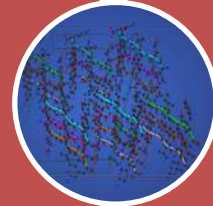
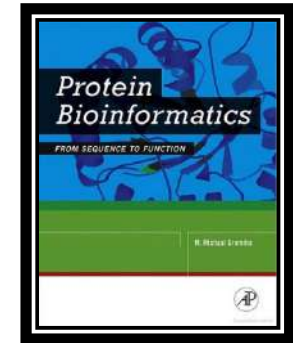
<https://www.iitm.ac.in/bioinfo/Gromiha/>



- Protein structure and function: binding affinity and aggregation rate
- Disease causing mutations in transmembrane proteins
- Deep learning and next generation sequence analysis: cancer, Alzheimer and Parkinson diseases

**Protein
Folding,
Stability,**

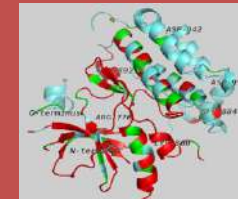
**Aggregation
Interactions**



Mutations in Human Transmembrane Proteins

1. Mutational effects on binding affinity of protein complexes.
2. Prediction of aggregation prone regions and aggregation rates

1. Disease causing mutations in membrane proteins
2. Sequence and structural parameters for membrane proteins
3. Developing databases and tools



1. Identify cancer mutations using deep learning
2. NGS analysis: Neurodegenerative disorders
3. Structure based drug design

Structure-Function Relationship in Proteins and their Complexes: Applications to Drug Design

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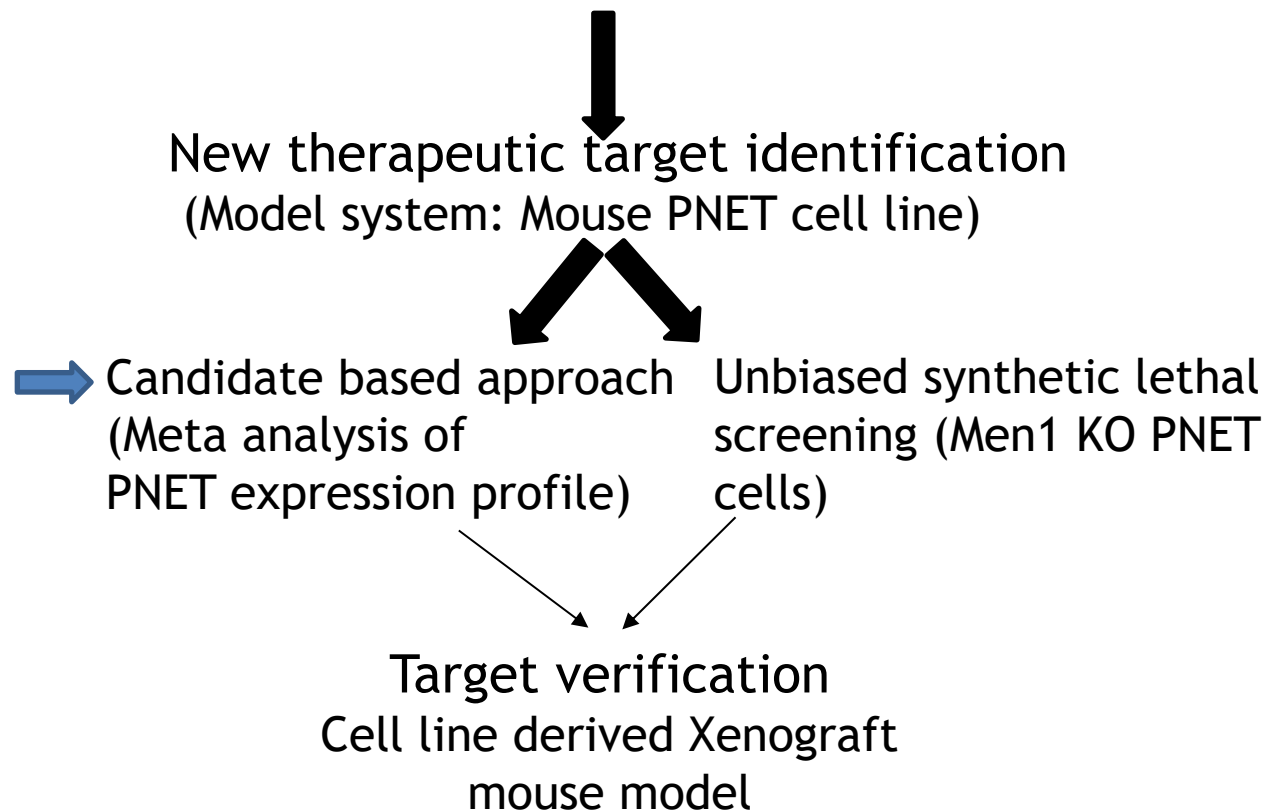


Pancreatic neuroendocrine tumours (PNET)

Area of Research
Cancer Biology

Sub-Domain
Pancreatic Cancer

Work Flow





Dr. Ninitha AJ

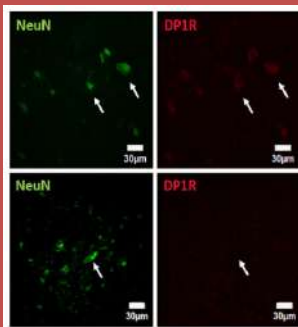
PhD, Michigan State University, USA

Assistant Professor, Biotechnology

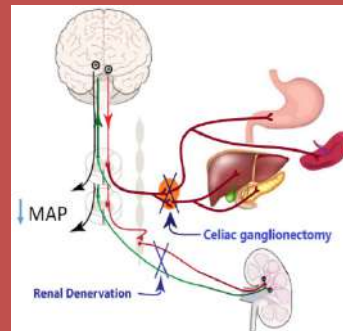
044-2257-4135; ninitha@iitm.ac.in



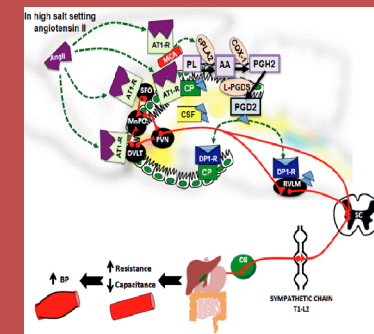
- Cardio metabolic diseases: novel pathways and drug discovery
- Peripheral neuromodulator for device development and therapy
- Role of PARPs in hypertension, diabetes, and heart failure



Cell
Signaling



Peripheral
neuromodulator



Long-term control
of Blood pressure

Neuromodulator and Cardio metabolic Research Lab

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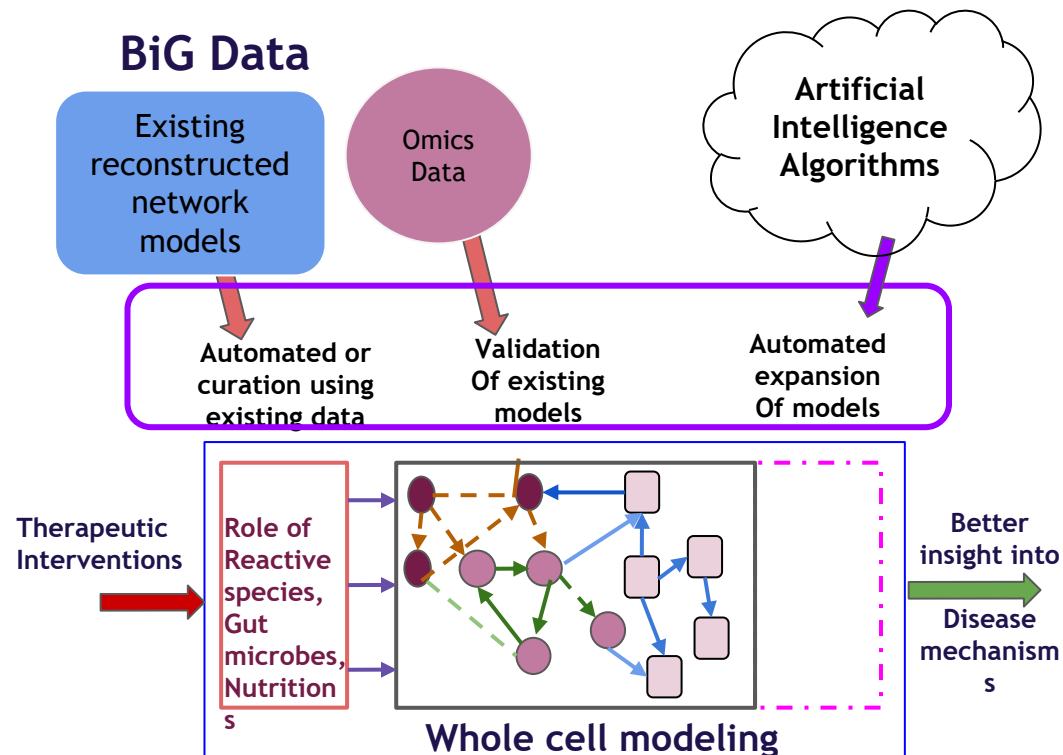
Dr. Nirav Pravinbhai Bhatt

PhD, École polytechnique fédérale de Lausanne (EPFL), Switzerland
Assistant Professor, Biotechnology
044-2257-4129; niravbhatt@iitm.ac.in

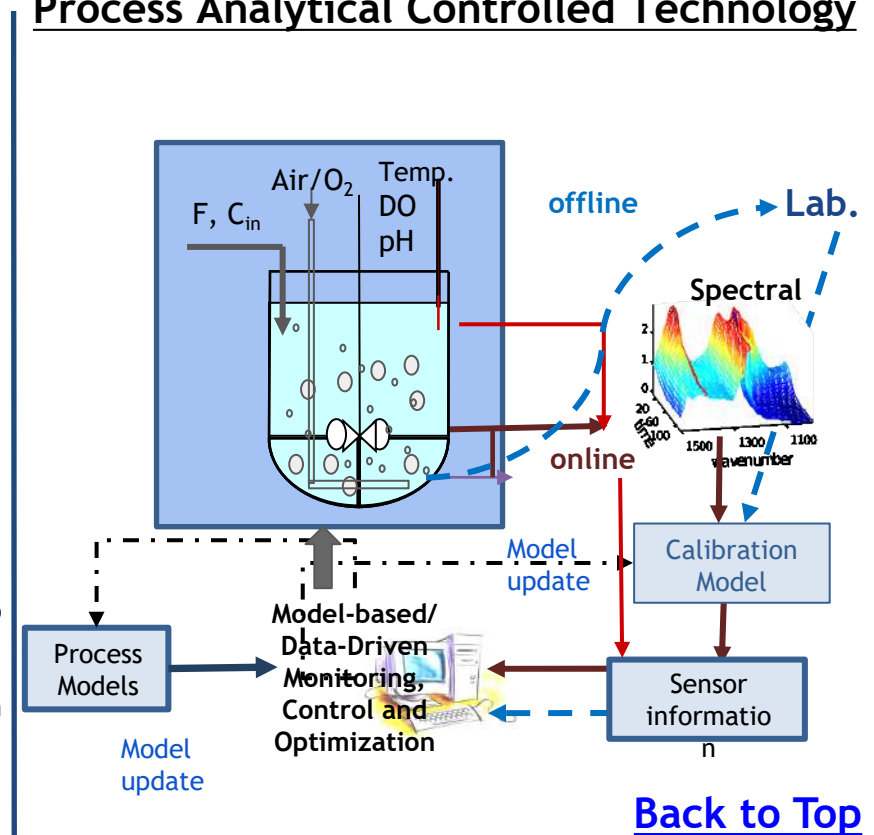


- Process Analytical Controlled Technology for (Bio-)processes
- Physically Interpretable ML/AI for Biological and Engineering Applications
- Network Control and Learning Theory for Understanding Diseases and Therapeutics

Therapeutic Strategies for Diseases



Process Analytical Controlled Technology





Dr. Nitish R Mahapatra

PhD, Indian Institute of Chemical Biology, Kolkata

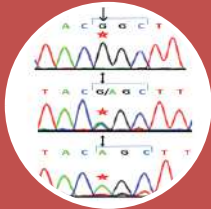
Professor, Biotechnology

044-2257-4128; nmahapatra@iitm.ac.in

<https://biotech.iitm.ac.in/faculty/nitish-r-mahapatra/>



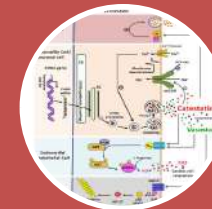
- Functional Genomics and Biomarker Discovery
- Transcriptional and Post-transcriptional Gene Regulation
- Molecular Medicine



Discovery of genetic variations



Structure of nicotinic receptor



Molecular signal transduction

← MOLECULAR BASES OF CARDIOVASCULAR AND METABOLIC DISORDERS →

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Dr. Rajamanickam Murugan

PhD, T.I.F.R Mumbai, India

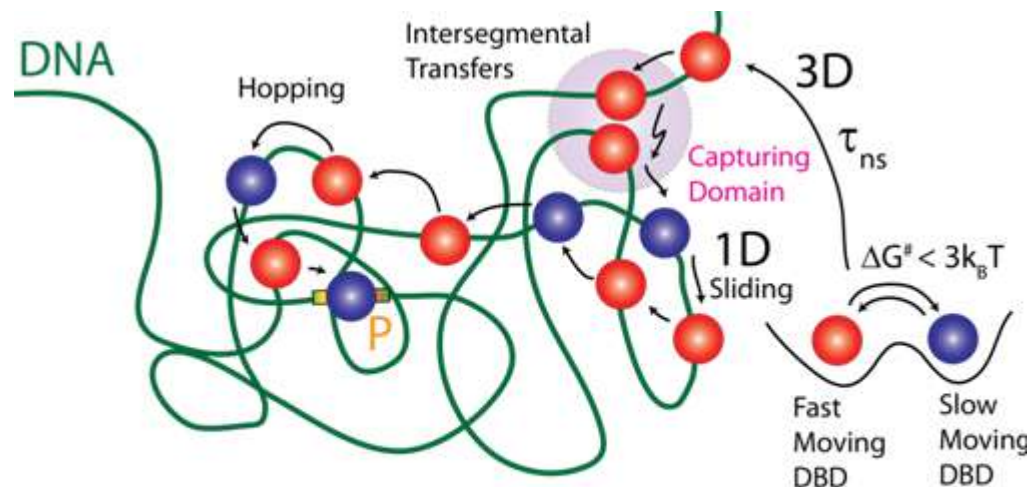
Assistant Professor, Biotechnology

044-2257-4116; rmurugan@iitm.ac.in

<http://www.biotech.iitm.ac.in/Murugan>



- Theoretical Biology and Biophysics
- Computational/Systems Biology
- Rate Processes in Biology



$$\tau_s = (N/L) (L^2/6x_d + \tau_{ns})$$

Understanding the dynamics of transcription factors helps to further our unravel the design principles connected with the existence of life.

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Dr. Rama Shanker Verma

PhD, Jawaharlal Nehru University New Delhi

Professor, Biotechnology

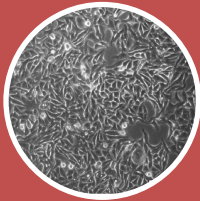
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<http://www.biotech.iitm.ac.in/faculty/verma/index.html>



- Development of Stem Cell based Cardiac Tissue and Liver organ
- Construction of Novel Immunotoxins
- Fanconi Anemia
- Development of Nanotherapeutics

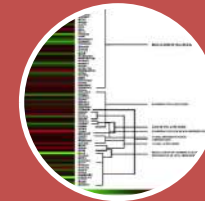
Developing patch and liver organ using biodegradable material and 3D Bio printing using stem cells Targeted anticancer therapy with recombinant immunotoxins Gene expression profiling of Fanconi anemia and Identifying marker genes Drug delivery in cancer stem cell



Trans differentiation of stem cells and tissue regeneration



Immunotoxins for Cancer Therapy



Biomarker studies of Fanconi Anemia

BROAD DESCRIPTION OF THE AREA OF RESEARCH

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- Cancer Biology
- Small molecule inhibitors and drug resistance
- Indigenous antibodies for diagnostic applications



Cancer Biology



Drug resistance



Diagnostic antibodies

Aiming novel diagnostic and therapeutic reagents for Cancer

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- Molecular dynamics of proteins and structure-function study
- Protein-ligand and protein-protein docking
- Atomic simulations of Green solvents: Ionic Liquids and supercritical CO₂ (scCO₂)

Structure based drug
discovery

Ionic liquids for
biomolecular
preservations

scCO₂: a new
generation solvent in
chemical industries?

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Dr. Sathyanarayana N Gummadi

PhD. IIT Madras, INDIA

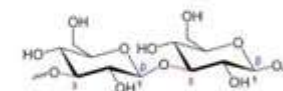
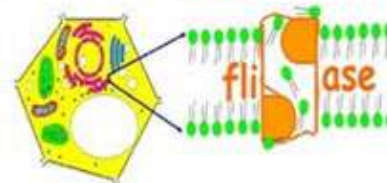
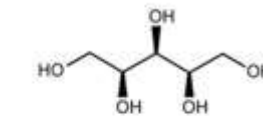
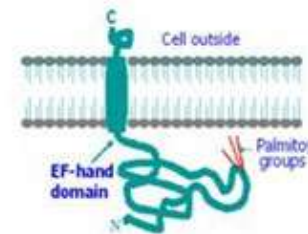
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044-2257-4114; gummadi@iitm.ac.in

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- Microbial and Enzymatic Process for Caffeine Degradation
- Bioprocess Development for Production of Biopolymers, Xylitol, Enzymes
- Biochemistry of Flippases



Fundamental biosciences to industrial applications

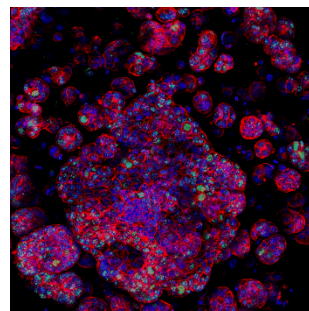
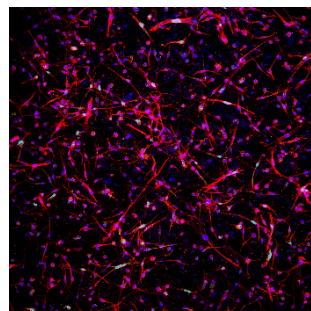
[Back to Top](#)



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- Biomaterials: Natural and synthetic hydrogels for mammalian cell culture and in vitro disease modeling
- Cancer: Mechanisms of tumorigenesis, metastasis and tumor dormancy
- Microfluidics: In vitro models of vascularized tissue microenvironments for drug delivery and cellular crosstalk



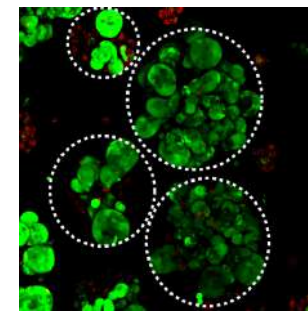
Breast cancer cells (left: MDA-MB-231, metastatic and right: MCF7, non-metastatic) cultured within PEG-fibrinogen hydrogels

CANCER LATENCY & METASTASIS
Cancer Cell Quiescence
Dynamic ECM Modulation
Cancer Stem Cells
Metastatic Relapse

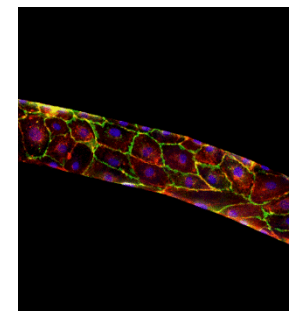
CANCER TISSUE ENGINEERING
Engineered approaches for modeling cancer & associated pathologies

OBESEITY & INSULIN RESISTANCE
Systemic Inflammation
Metabolic Imbalance
Vascular Dysfunction
Tumor Progression

CHEMOTHERAPY-INDUCED INJURY
Vasculopathy
Hepatotoxicity
Nephrotoxicity
Neuronal Degeneration



Cancer cells encapsulated in hydrogel microspheres



Endothelial cells in microfluidic channels

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Dr. Smita Srivastava

PhD, IIT DELHI, INDIA

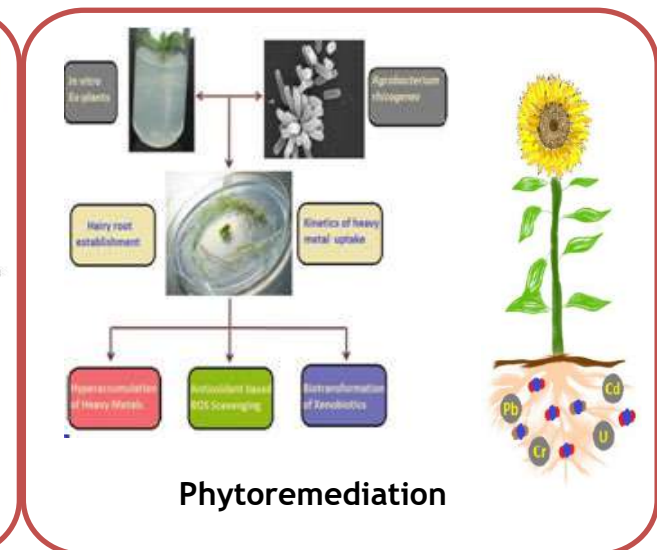
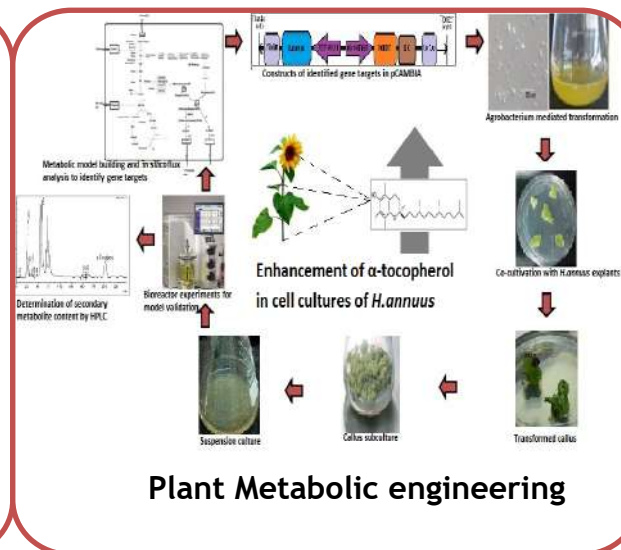
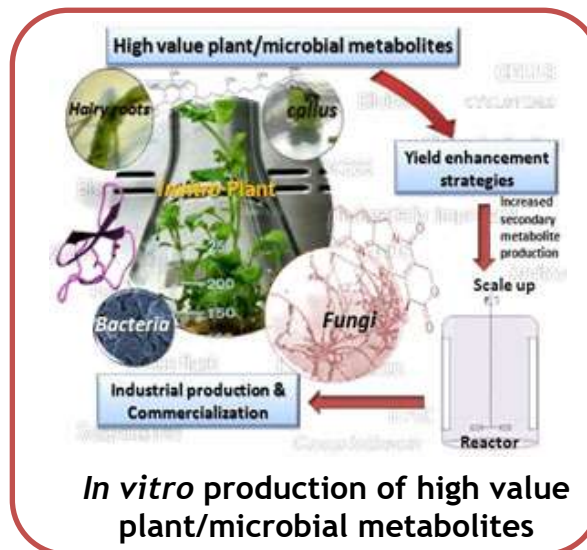
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- Plant cell technology
- Microbial technology



Applied/Industrial Biotechnology

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Professor, Biotechnology
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http://www.biotech.iitm.ac.in/faculty/CNS_LAB/home.html



Research Area: Computational Neuroscience

Objective 1:

Develop a comprehensive Computational model of Basal Ganglia, a part of the brain affected in Parkinson's Disease

Application:

The model developed has potential Application in Deep Brain Stimulation Surgery for PD.

Objective 2:

Using computational modeling, study the role of vascular dynamics on neural activity.

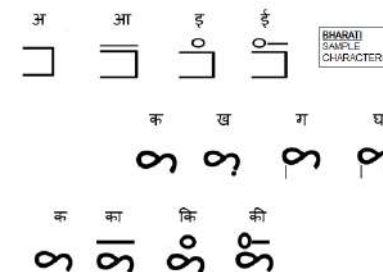
Application: Leads to the radical notion of vascular computation



Research Area:

Indian Language Technology

Develop a new script called Bharati.
The script can represent 9 major Indian scripts. Simple and easy to learn.



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K Subramaniam

Professor, Department of Biotechnology

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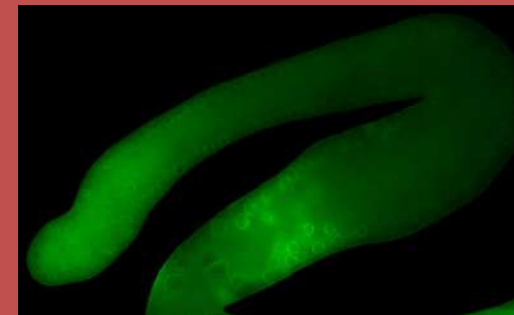
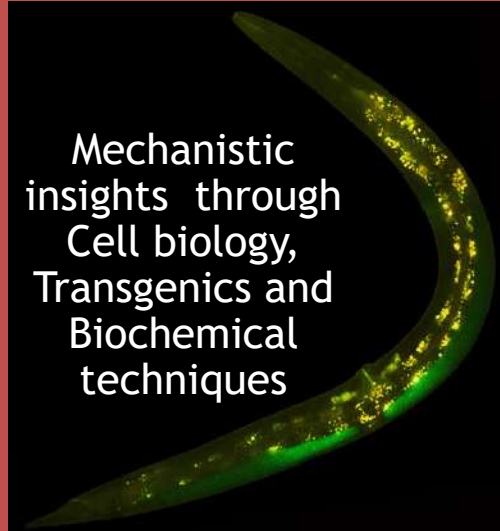
Major Areas of Research

- Control of self-renewal and differentiation decisions in adult stem cells
- Developmental biology of germ cells
- Translational control of germ cell decisions



Forward and reverse genetic approaches using the free-living nematode *Caenorhabditis elegans* as a model organism

Mechanistic insights through Cell biology, Transgenics and Biochemical techniques



PUF proteins and translational control of gene expression in the germ line

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G K Suraishkumar

PhD, Drexel University, Philadelphia, USA

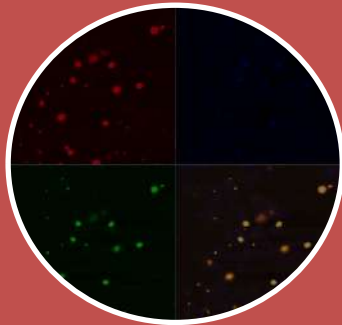
Professor, Biotechnology

044-2257-4105; gk@iitm.ac.in

<https://biotech.iitm.ac.in/research/faculty/suraishkumar-g-k>



- Improved cancer treatment strategy through reactive species (RS) rhythms
- Improved bioprocess strategies (RS-based) - e.g. improved algal bio-oil production
- Interesting cell phenomena (RS-based)



Interesting cell phenomena



Improved cancer treatment



Bioprocess strategies

← Quantitative Understanding and Manipulation of Biological Systems (RS-based) →

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Dr. Vani Janakiraman
PhD, UPMC, Paris, France
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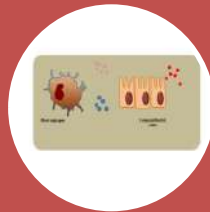
<https://biotech.iitm.ac.in/research/faculty/vani-janakiraman/>

Major areas of research

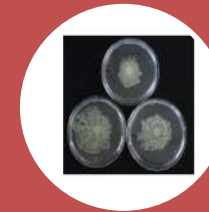
- Understanding immune evasion and delineating factors that tilt the inflammatory balance
- Understanding the role of novel immune receptors and pleiotropic cytokines in modulating immune responses
- Understanding bacterial communication



Immune evasion



Immune
receptors/cytokines



Bacterial
communication

← Understanding host-pathogen interaction in tuberculosis - The immunological aspects →

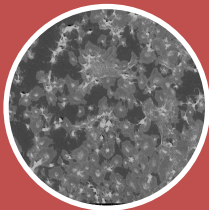
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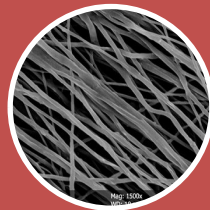
Dr. Vignesh Muthuvijayan
PhD, Oklahoma State University, USA
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- Surface modification of polymeric materials
- Novel biomaterials as tissue engineering scaffolds
- Development of drug delivery systems



Haemo
compatibility



Tissue engineering
scaffolds



Controlled drug
delivery

← BIOMATERIALS AND TISSUE ENGINEERING →

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INDIVIDUAL FACULTY PROFILE

**DEPARTMENT
OF
CHEMICAL ENGINEERING**

LIST OF FACULTY

Abhijit P Deshpande

Aravind Kumar Chandiran

Arun K Tangirala

Basavaraj M Gurappa

Ethayaraja Mani

Himanshu Goyal

Jithin John Varghese

Kannan A

Nagarajan R

Niket Kaisare

Preeti Aghalayam

Pushpavanam S

Raghuram Chetty

Rajagopalan Srinivasan

Rajnish Kumar

Ramanathan S

Ramnarayanan R

Ravi R

Ravikrishna R

Renganathan T

Rengasamy R

Shankar Narasimhan

Sreenivas Jayanti

Sridharakumar Narasimhan

Sumesh P Thampi

Susy Varughese

Swapna Singha Rabha

Tanmay Basak

Tarak K Patra

Upendra Natarajan

Vinu R



Dr. Abhijit P Deshpande

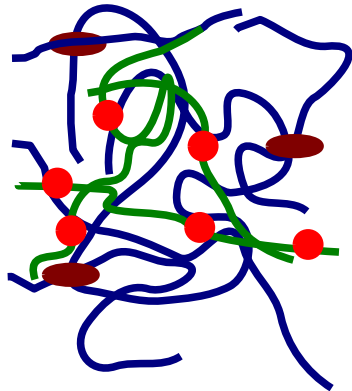
Professor, Chemical Engineering

044-2257-4169; abhijit@iitm.ac.in

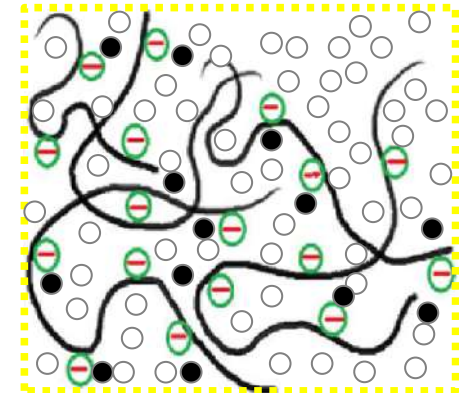
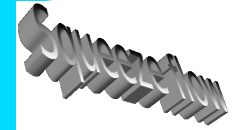
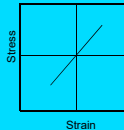
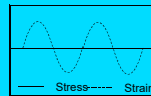
<http://www.iitm.ac.in/~abhijit>



- Polymeric systems: aggregation, gelation, rheology
- Ionic polymers, Polysaccharides
- Wettability and composite processing



Small and large amplitude oscillatory shear



Representative publications:

- Majhi A., Pardhi T. K. and Deshpande A. P., International Journal of Multiphase Flow, (2015)
- Kodavaty J. and A. P. Deshpande, Journal of Applied Polymer Science, (2014)
- Jacob A. J., Deshpande A. P., Bouteiller L., Journal of Non-Newtonian Fluid Mechanics, (2014)
- Prathyusha K. R., Deshpande A. P., Laradji M., Kumar P. B. S., Soft Matter (2013)

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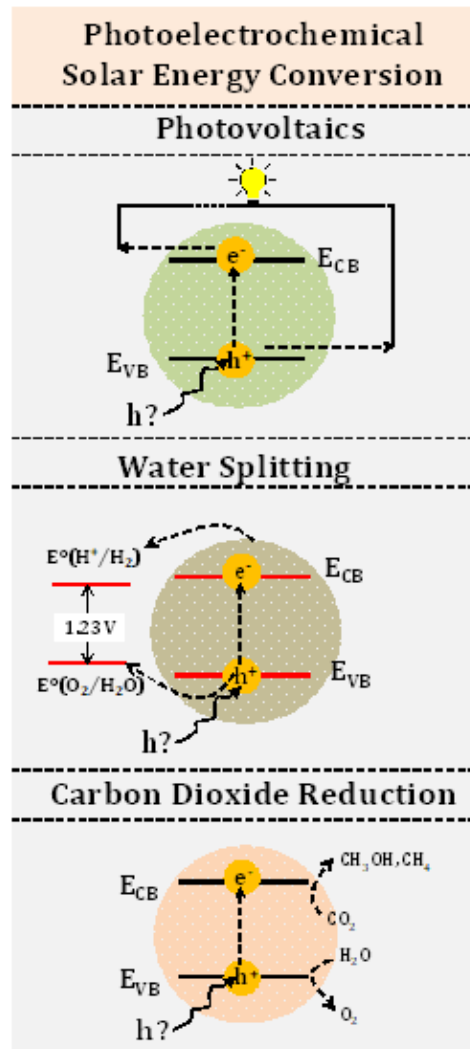
Aravind Kumar Chandiran

PhD, Gratzel's Group, Swiss Federal Institute of Technology

Assistant Professor, Chemical Engineering

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<http://scholar.google.com/citations?user=D18I3fcAAAAJ>



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Dr. Arun K Tangirala

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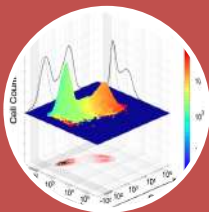
Professor, Chemical Engineering

044-2257-4181; arunkt@iitm.ac.in

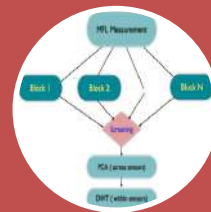
<http://www.che.iitm.ac.in/~arunkt>



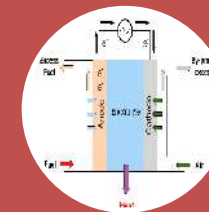
- Process Control, Identification & Monitoring
- Control loop performance assessment
- Data-driven process analysis and control



Systems Biology



Process & Pipeline
Health Monitoring



Energy Systems

← SYSTEMS ENGINEERING & INFORMATION-THEORETIC APPROACHES →

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Dr. Basavaraj M Gurappa

PhD, KU Leuven, Belgium

Associate Professor, Chemical Engineering

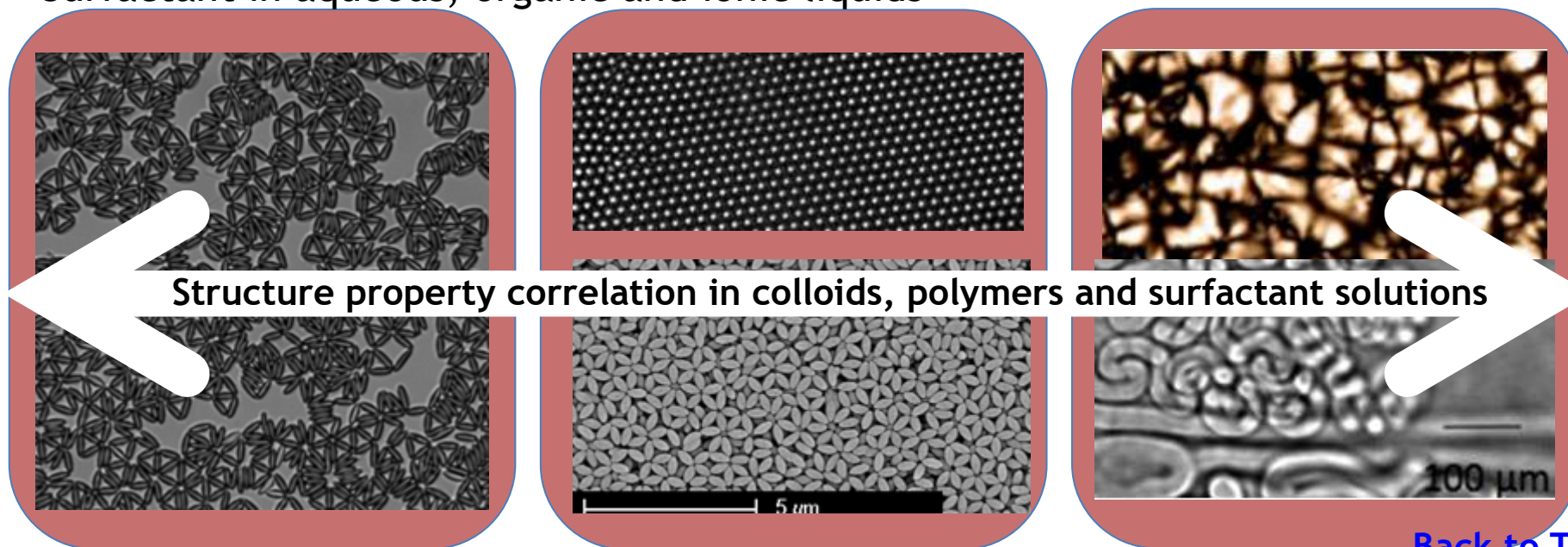
044-2257-4164; basa@iitm.ac.in

<http://www.che.iitm.ac.in/~basa>



Research Area: Colloids and Interface Science

- Self-assembly of colloids and nanoparticles
- Rheology and microstructure of suspensions
- Structure and surface rheology of complex fluid interfaces, Emulsions, Foams
- Surfactant in aqueous, organic and ionic liquids



Structure property correlation in colloids, polymers and surfactant solutions

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Dr. Ethayaraja Mani

PhD, IIT Bombay, India

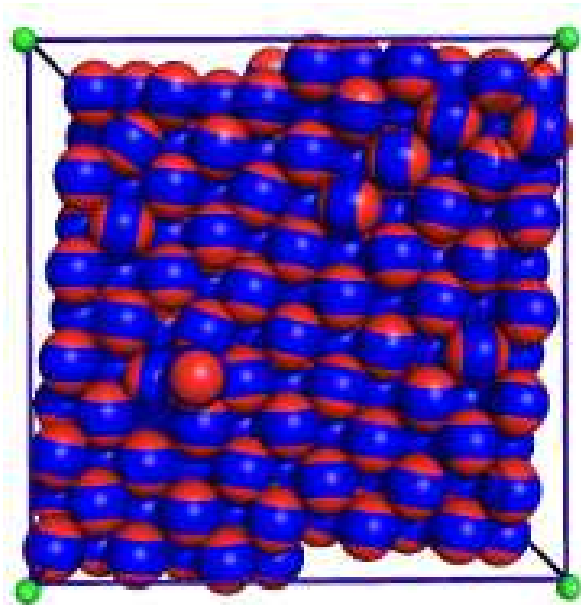
Associate Professor, Chemical Engineering

044-2257-4157; ethaya@iitm.ac.in

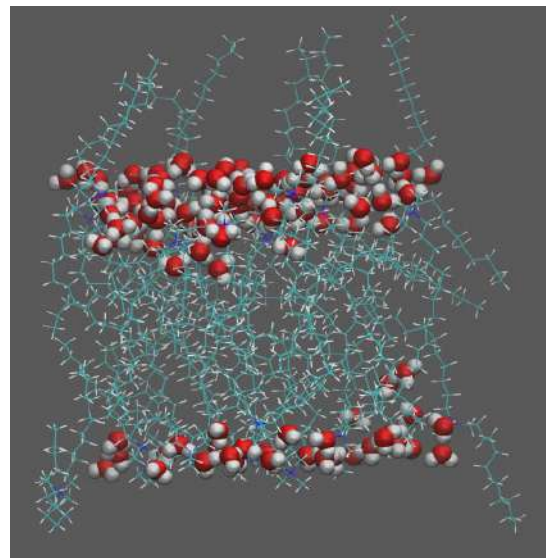
<http://www.che.iitm.ac.in/~ethaya/ethaya/Home.html>



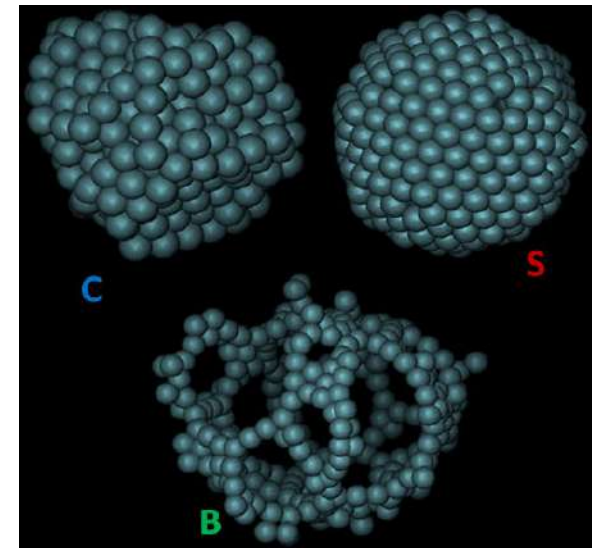
- Self-assembly of patchy colloids
- Molecular simulation of softmatter
- Stochastic simulation of formation of nanostructures



Crystal of Patchy Colloids



Surfactant Bilayer



Soft-colloid Stabilized Emulsions

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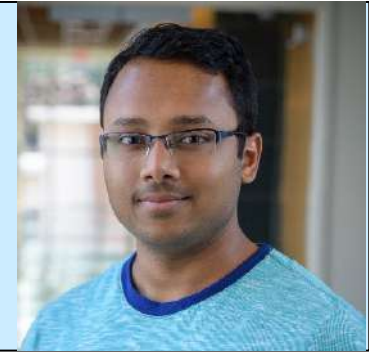
Dr. Himanshu Goyal

PHD, Cornell University, USA

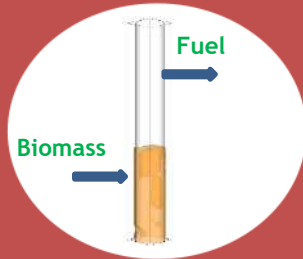
Assistant Professor, Chemical Engineering

044-2257-4183; goyal@iitm.ac.in

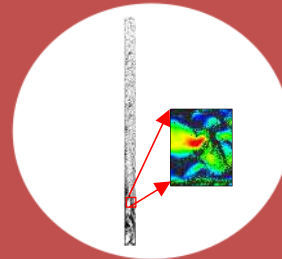
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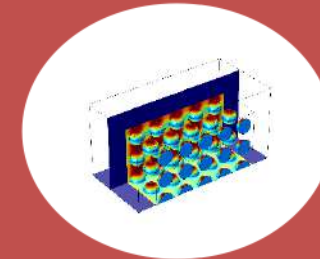
- Research Area/Focus 1: Multiscale modeling of reactive multiphase flows
- Research Area/Focus 2: Process intensification using microwaves
- Research Area/Focus 3: Uncertainty quantification in simulation predictions



Biomass into biofuels
and chemicals



Chemical-looping
combustion



Process
intensification

Develop a computational platform to create design tools for clean energy systems

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Dr. Jithin John Varghese

PhD, Nanyang Technological University, Singapore

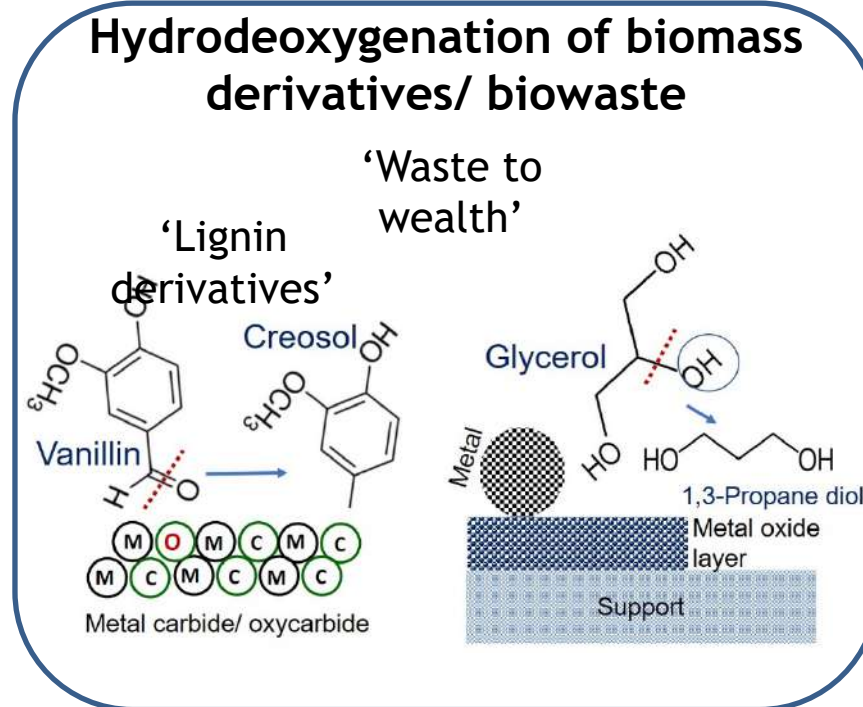
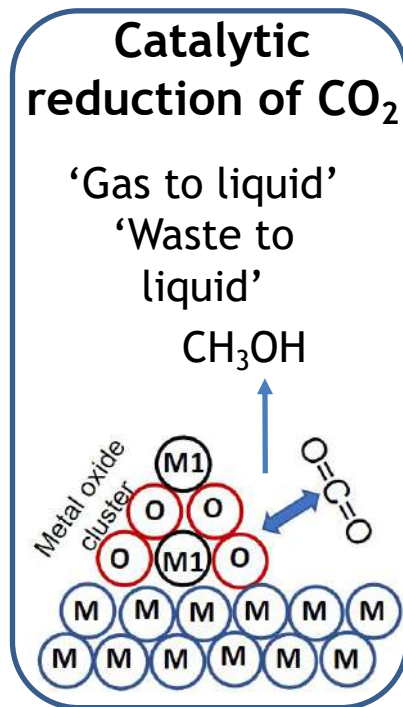
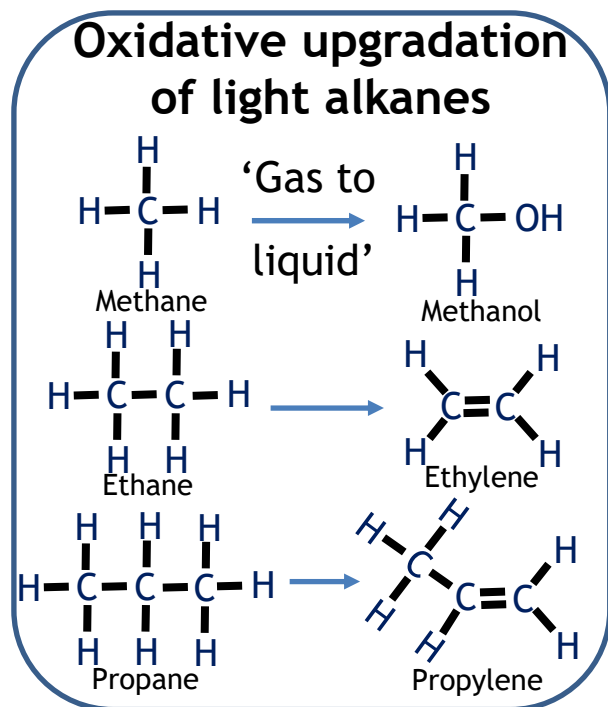
Assistant Professor, Chemical Engineering

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- Natural gas to alcohols/ olefins
- Carbon dioxide to liquids
- Biomass derivatives to chemicals

Computational catalyst design,
multiscale modelling, bottom up
catalytic reaction engineering



Computational Catalysis: Towards Sustainable Chemical Reaction Engineering

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Dr. Kannan A

PhD, McMASTER University, Canada

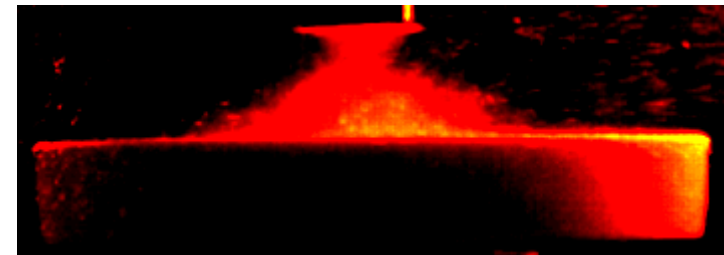
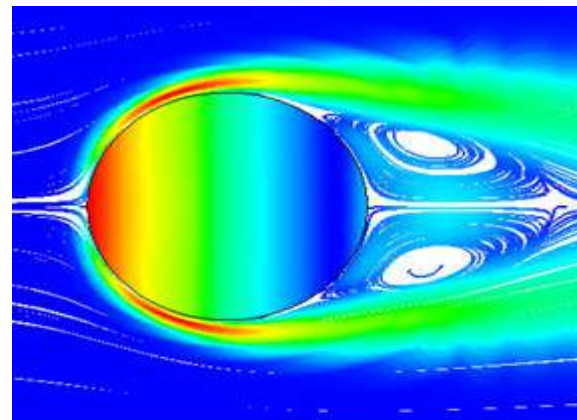
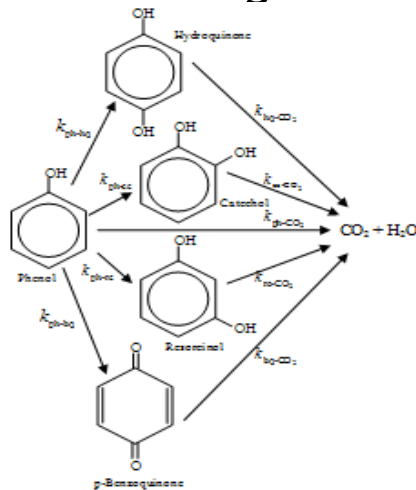
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- Intensification of Transport and Reaction Rates in Environmental Pollution Control, Separation Processes and Thermal Food Processing
- Innovative Process Equipments for Environmental Pollution Control
- Modelling and Simulation of Chemical and Environmental Processes



Reaction pathway in a photocatalytic reactor

CFD based fluid flow patterns and convective heat fluxes around a food particle

Ultrasound jet impinging on a spinning disk to enhance mass transfer

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Dr. R Nagarajan

PhD, Yale University, USA

Professor, Dept. of Chemical Engineering

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- Ultrasonic process intensification
- Particulate phenomena in cleanrooms
- Synthesis of nano-materials & nano-composites



Sono-enhancement of: dyeing of textiles, heat-transfer in furnace tubes, removal of ash and sulfur from coal, destratification of cryogenic fuels, reactive breakdown of pollutants, surface cleaning of semiconductor wafers, atomization of liquid fuels



Particle generation, transport, deposition and adhesion in controlled environments; cost-effective cleanroom designs



Sono-fragmentation for nanoparticle synthesis; sono-processing of nano-composites and nano-emulsions- process optimization

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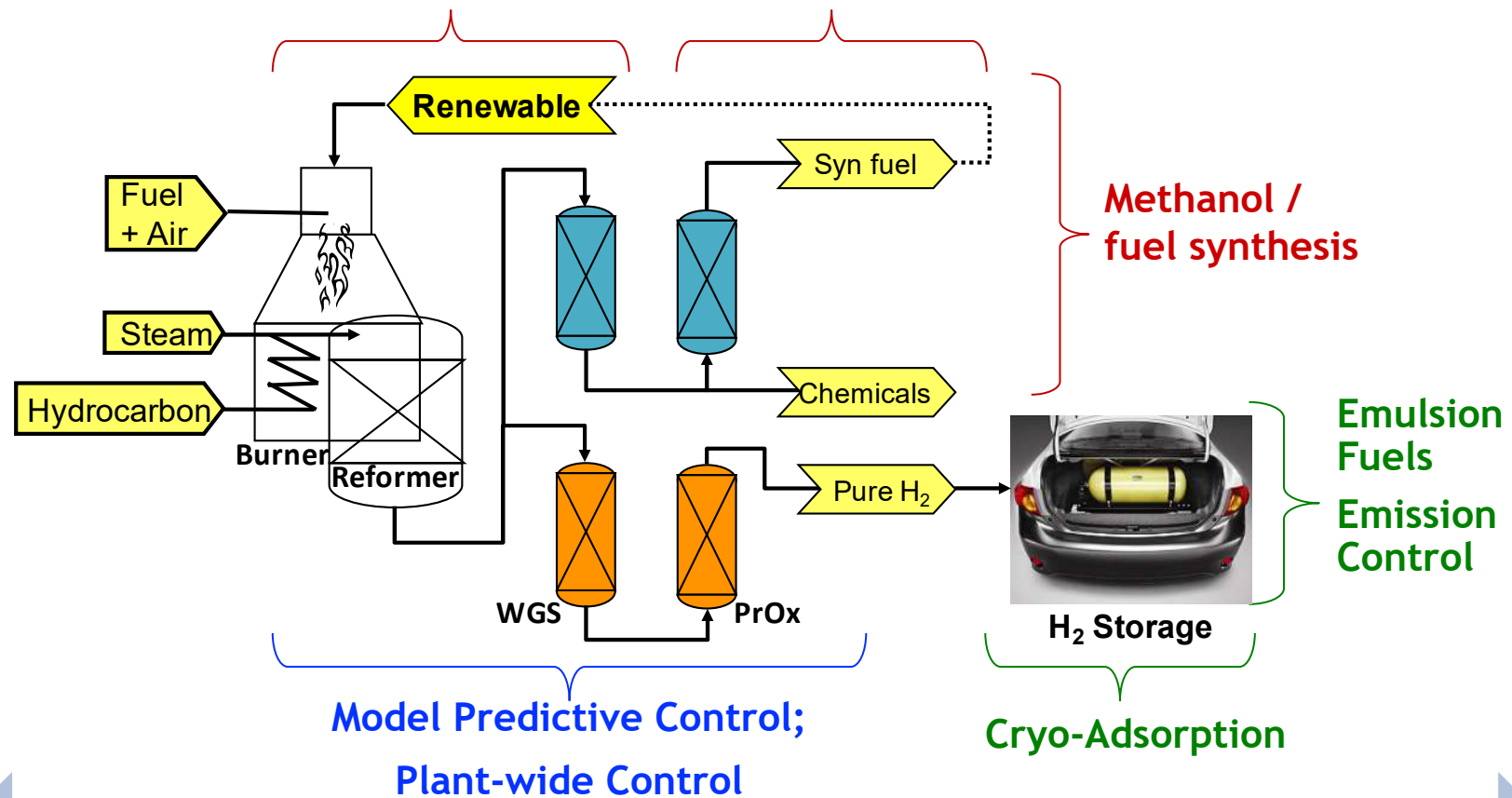


Dr. Niket Kaisare
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Micro-Combustion

H₂ generation in microreactors



Research in Energy: Catalysis, Combustion and Control

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Dr. Preeti Aghalayam

PhD, Univ. of Massachusetts Amherst, USA

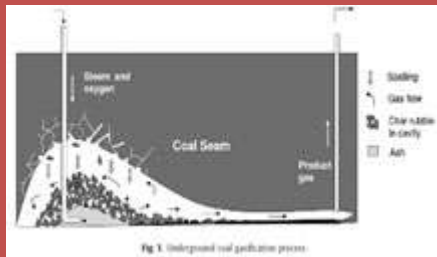
Professor, Chemical Engineering

044-2257-4185; preeti@iitm.ac.in

<http://www.aghalayam.com>

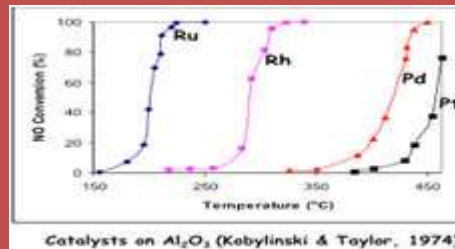


- **Coal Gasification:** *In-situ utilisation of deep coals; Kinetic Experiments; Modeling*
- **Catalytic Converters:** *Detailed chemistry for catalytic reduction of NO*
- **Reaction Mechanisms:** *Reduction of detailed reaction mechanisms*



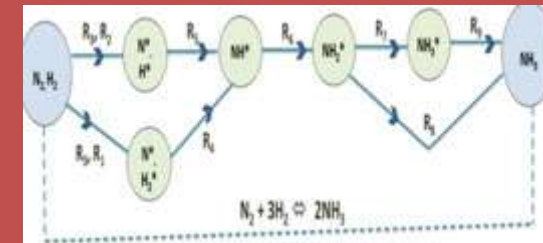
Underground Coal Gasification:

Cavity studies & Process models



Automotive Catalytic Converters:

Surface reaction mechanisms & Catalyst Selection



Detailed Reaction Mechanisms:

Analysis, Reduction Methodologies

MICROKINETIC MODELING; LAB-SCALE EXPERIMENTS; FUNDAMENTAL STUDIES

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Dr. S Pushpavanam

PhD, University of Florida, USA

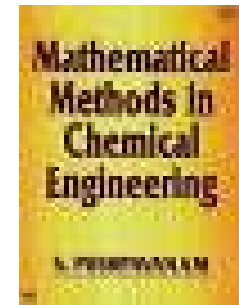
Professor, Chemical Engineering

044-2257-4161; spush@iitm.ac.in

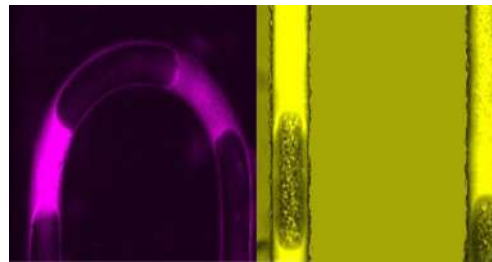
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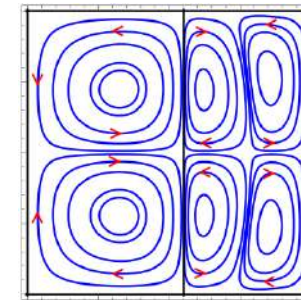
- Two phase flows and interfacial transport
- Micro flows: Hydrodynamics and Mass Transport
- Mathematical Modeling and Nonlinear Dynamics



Molten Flows



Microfluidics



Fundamentals

← Mathematics + Physics ---> Smarter Engineering →



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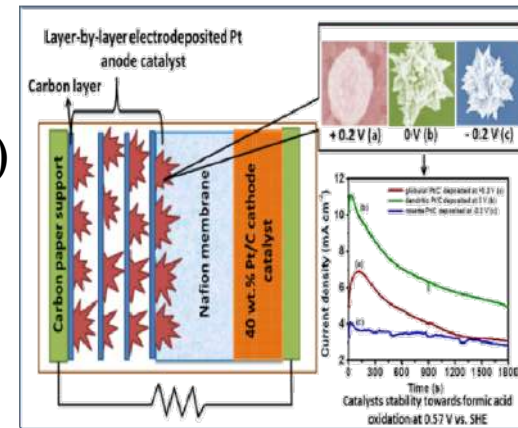


Dr. Raghuram Chetty
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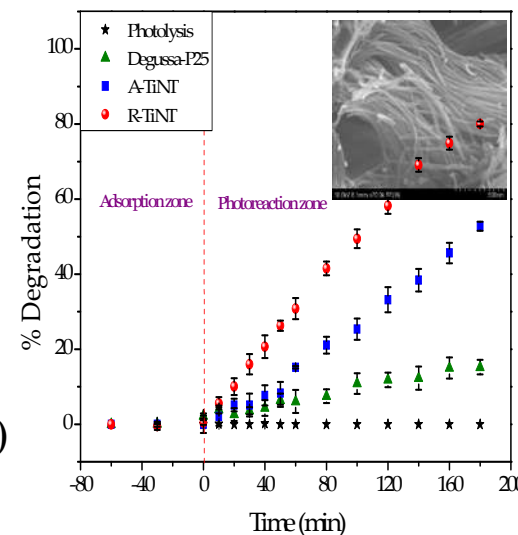


Research Interest

- Fuel Cells (Electrocatalyst, Bipolar Plates)
- Redox Flow Batteries (Vanadium Flow Battery)
- Conversion of CO₂ into Chemicals
- Electrochemical & Photochemical Wastewater Treatment
 - Electrochemical Reduction of Nitrate
 - Heavy Metal (Chromium) Removal
 - Photocatalytic Degradation (Dyes, Pharmaceuticals)
 - Water Desalination (Anti Fouling RO Membranes)



Different morphologies of Pt catalysts synthesized by electrochemical deposition by varying the potential.



Photodegradation of Rhodamine-B with different crystalline TiO₂ nanotubes (TiNT) phase as compared to commercial P25 nanoparticles.

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Dr. Rajagopalan Srinivasan

Professor, Chemical Engineering

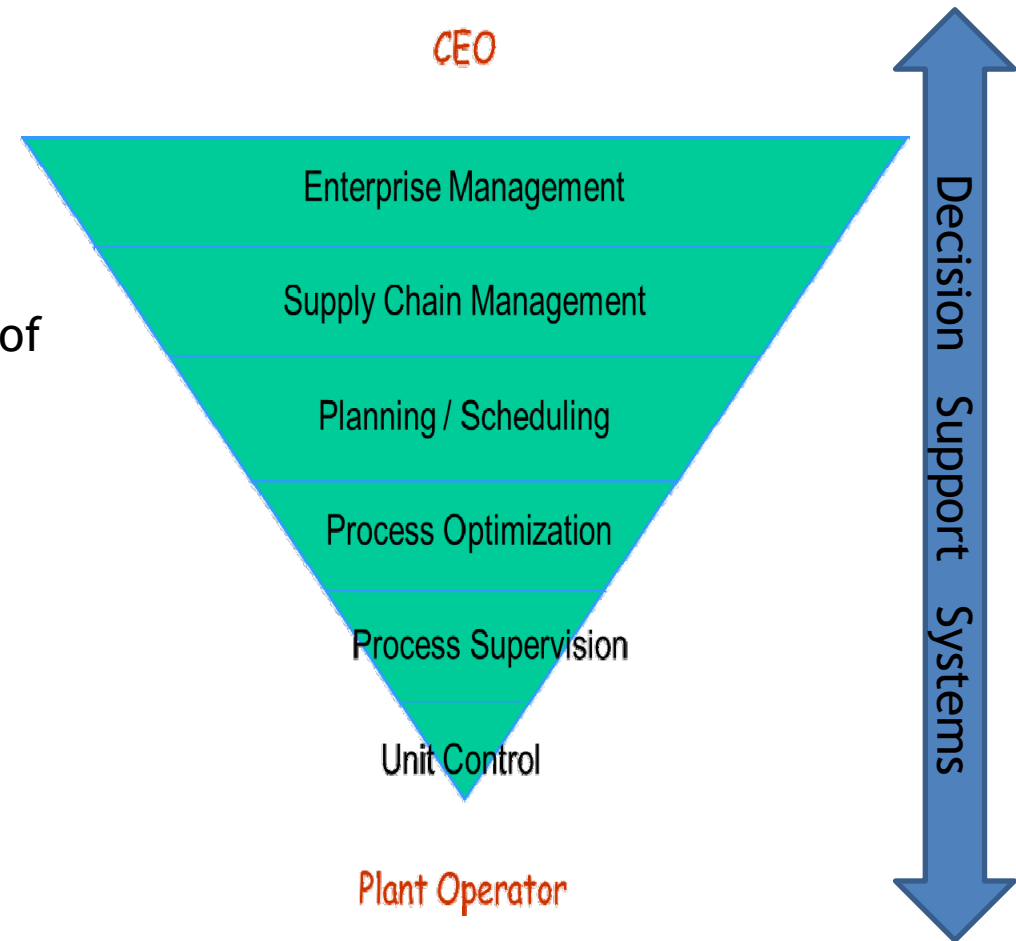
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Major Research Areas

- Safety, Sustainability & Resilience of complex systems
- Cognitive Engineering
- Supply Chain Management & Enterprise Optimization



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Dr. Rajnish Kumar

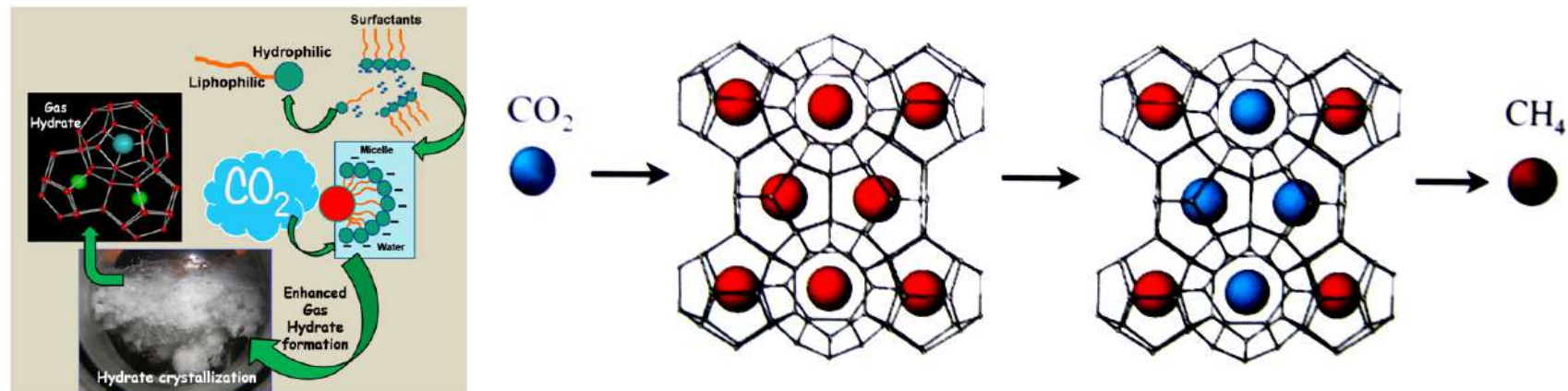
Associate Professor, Chemical Engineering

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Major Areas of Research

- Methane recovery from natural gas hydrate; methane storage and transportation
- Gas separation through molecular selection and enclathration; CO₂ capture
- Process development and scale up; biomass upgradation through HTL



Gas Hydrates: Opportunities for Innovative Energy Selection

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A

Electrochemistry.
Corrosion, Electroplating

Corrosion monitoring and control.
Electroplating, process optimization

B

Nonlinear Electrochemical
Impedance Spectroscopy
(NLEIS) development

Mechanistic analysis of
electrochemical reactions

Technique development.
Nonlinear electrochemical Impedance
Spectroscopy (NLEIS)

C

Semiconductor Processing -
Chemical
Mechanical Planarization - CMP

Metal, Oxide and STI CMP

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Dr. R Ravi

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- Thermodynamics
- Transport
- Statistical Mechanics

Phase
equilibrium

Multicomponent
mass transfer

Property
Estimation

← Mathematical modeling and theoretical analysis →

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Dr. R Ravikrishna

PhD, Louisiana State University, USA

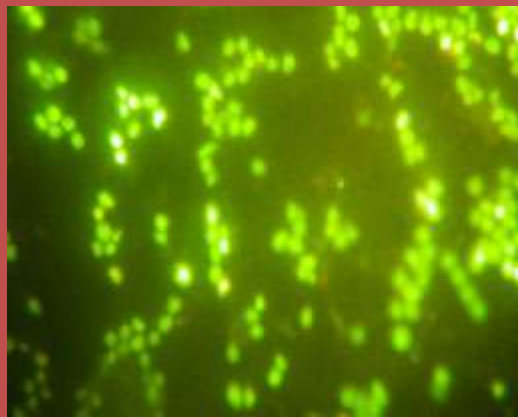
Professor, Chemical Engineering

044-2257-4175; rrk@iitm.ac.in

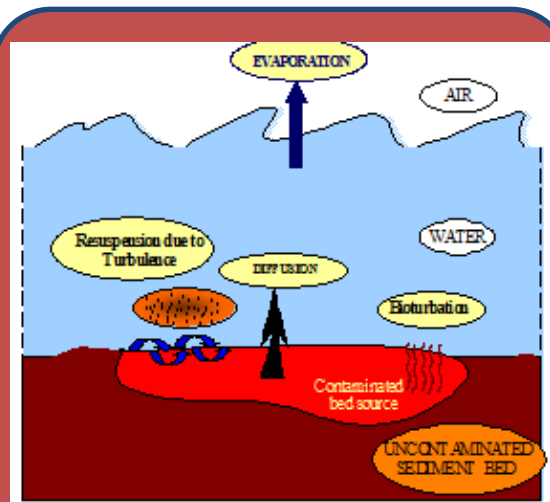
<http://www.che.iitm.ac.in/~rrk>



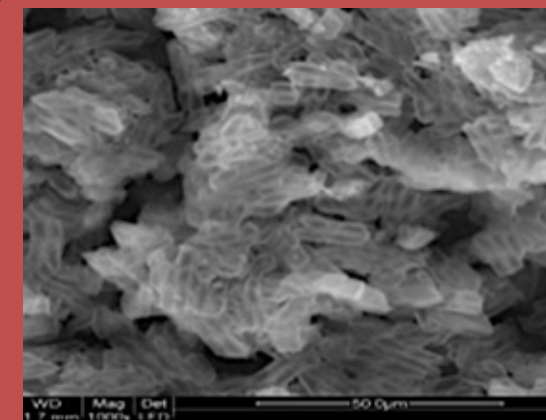
- Fate and Transport of Pollutants in the Environment
- Assessment and Remediation of Contaminated Sediments
- Development of Waste Treatment Technologies



Bioaerosol Release
from solid waste
surfaces



Chemical Release
Rates from Sediments



Photocatalytic
Degradation of Organic
Chemicals

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Dr. T Renganathan

PhD, IIT Madras, India

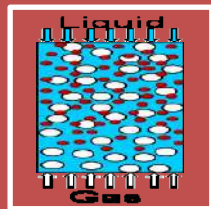
Associate Professor, Chemical Engineering

044-2257-4186; renga@iitm.ac.in

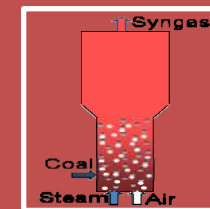
<http://www.che.iitm.ac.in/faculty.php?fid=20>



- Multiphase systems - Inverse fluidized bed
- Gasification - Fluidized bed gasifier



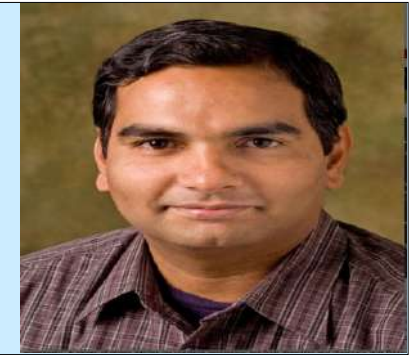
Hydrodynamics of inverse fluidized bed



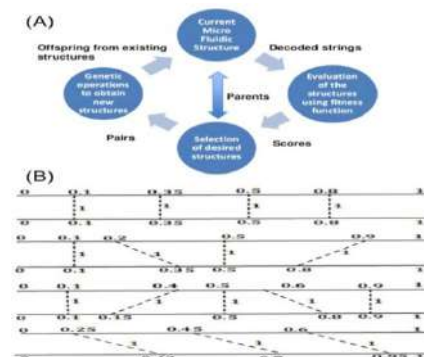
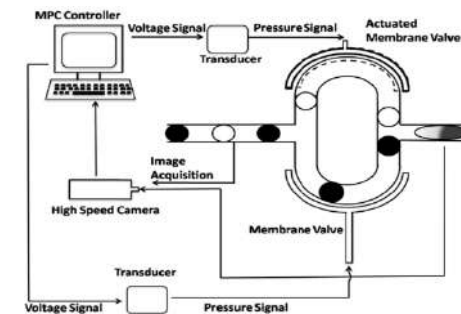
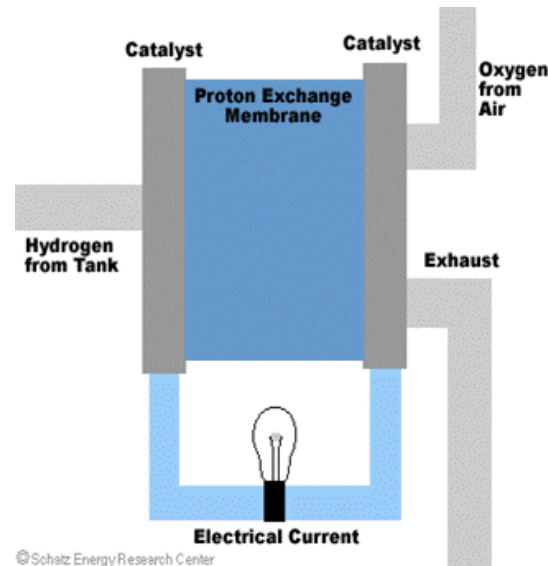
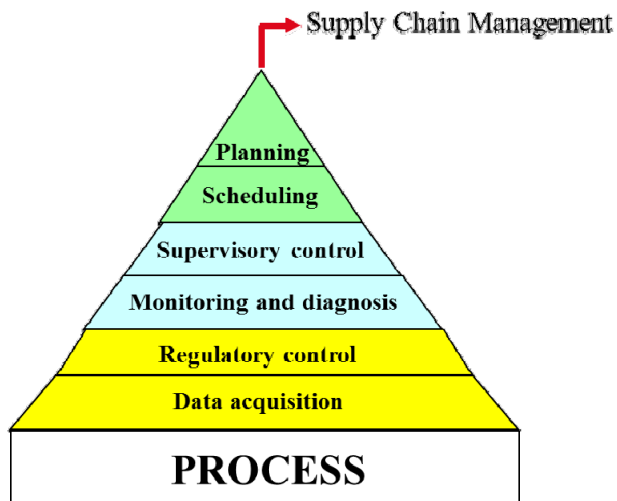
Simulation of fluidized bed gasifier



Dr. R Rengaswamy
Professor, Chemical Engineering
044-2257-4159; raghur@iitm.ac.in



- Process Systems Engineering
- Fuel Cell Research
- Computational Droplet-based Microfluidics Research



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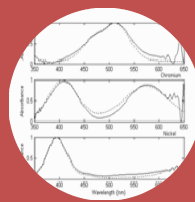
Dr. Shankar Narasimhan
PhD, Northwestern University, USA
Professor, Chemical Engineering
044-2257-4165; naras@iitm.ac.in
<http://www.iitm.ac.in/~naras>



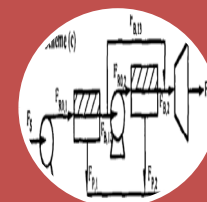
- PROCESS DESIGN - Sensor networks, Pipeline networks, Heat Exchanger Networks
- DATA ANALYTICS - Data reconciliation, Multivariate data analysis, Fault Diagnosis
- PROCESS OPTIMIZATION AND CONTROL - Solar powered RO networks



Pipeline networks
monitoring and control



Extracting pure spectra
from mixture spectra -
source separation



Optimal design, operation
and control of battery less
solar powered RO networks

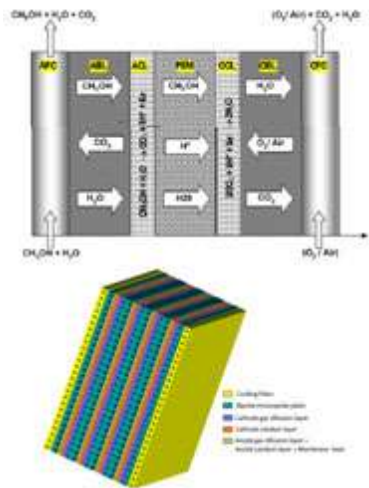
[Back to Top](#)



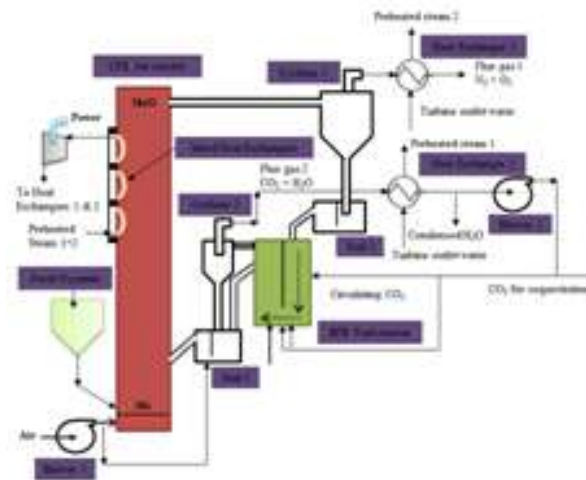
Dr. Sreenivas Jayanti
PhD, Imperial College, London, UK
Professor, Chemical Engineering
044-22574168; sjayanti@iitm.ac.in
<http://www.che.iitm.ac.in/~sjayanti/>



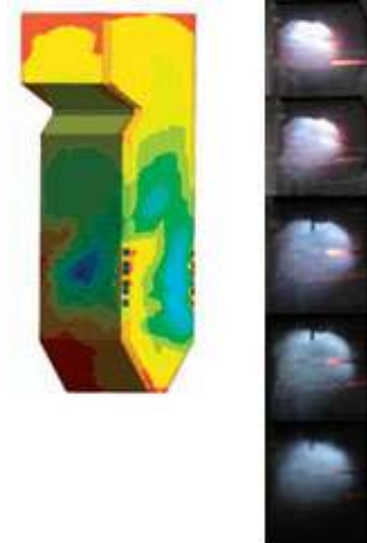
- Combustion: Oxy-fuel combustion; chemical looping combustion
- Electrochemical devices: Fuel cells; redox flow batteries
- Multiphase flow: computational fluid dynamics, heat transfer



Cell and stack level studies of fuel cells



System level studies of chemical looping combustion



Experimental and CFD studies of oxycoal combustion [Back to Top](#)



Sridharakumar Narasimhan

Professor, Chemical Engineering

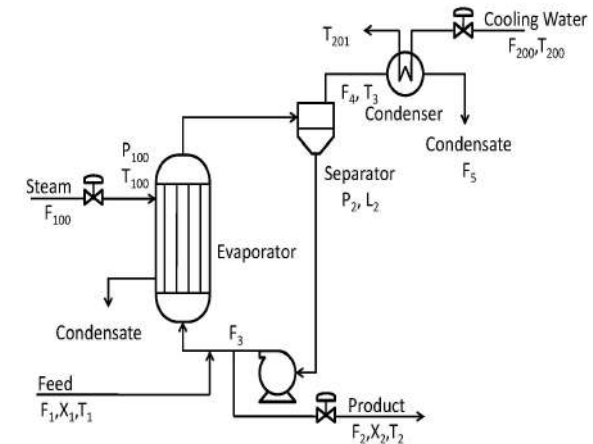
044-2257-4177; naras@iitm.ac.in

<http://www.iitm.ac.in/~naras>



Research focus

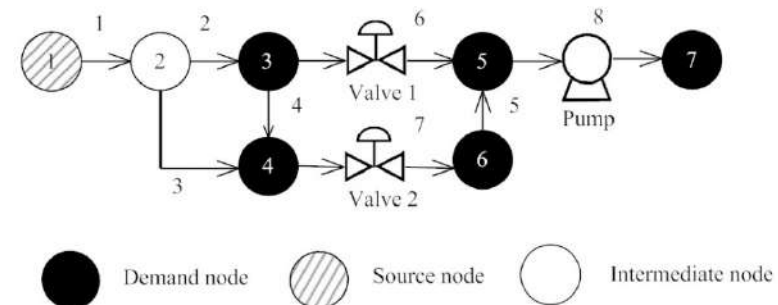
- Process systems engineering
- Sensor placement and scheduling
- Efficient control relevant model generation
- Optimal operation and design



Approach: Formulate and solve tractable (e.g., **convex**) optimization problems to guarantee performance

Applications

- Water treatment and distribution
- Pipeline operations
- Systems biology, imaging



● Demand node ◌ Source node ○ Intermediate node

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Dr. Sumesh P Thampi

Assistant Professor, Chemical Engineering

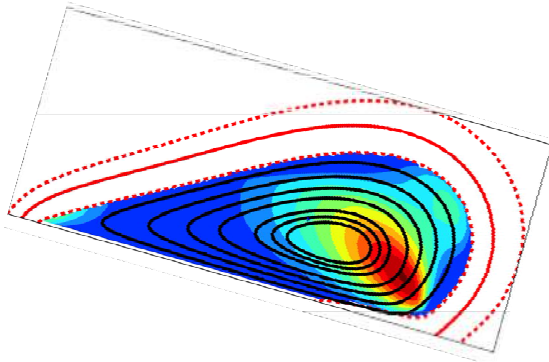
044-2257-4169; sumesh@iitm.ac.in

<http://www.che.iitm.ac.in/~sumesh>

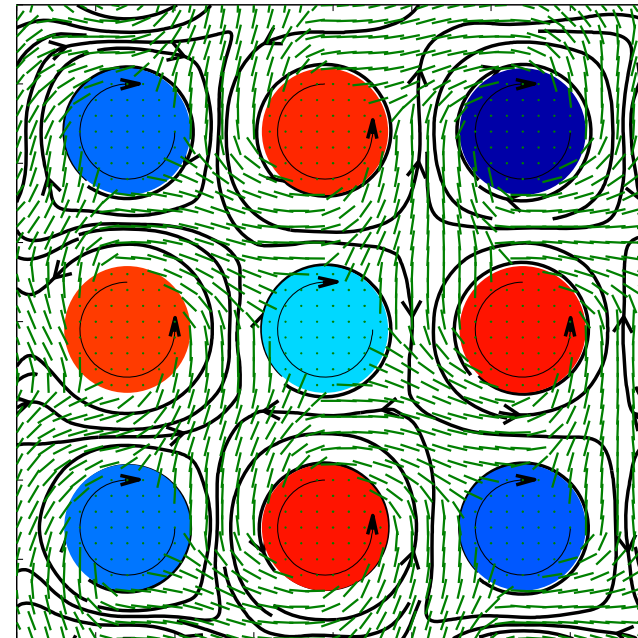


Major Areas of Research

- Hydrodynamics of complex fluids
- Collection motion in active matter
- Interfacial fluid mechanics



Sliding-rolling motion of a drop on an inclined surface - streamlines and vorticity contours



Counter rotating colloidal discs to power micro-machines exploiting nemato-hydrodynamics of active turbulence

Application of fluid mechanics on soft and biological matter

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Dr. Susy Varughese

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Major Areas of Research

➤ Physics and mechanics of polymeric materials

- dynamic mechanical behavior of polymers
- vibration damping and isolation using polymers
- Filler-polymer interactions

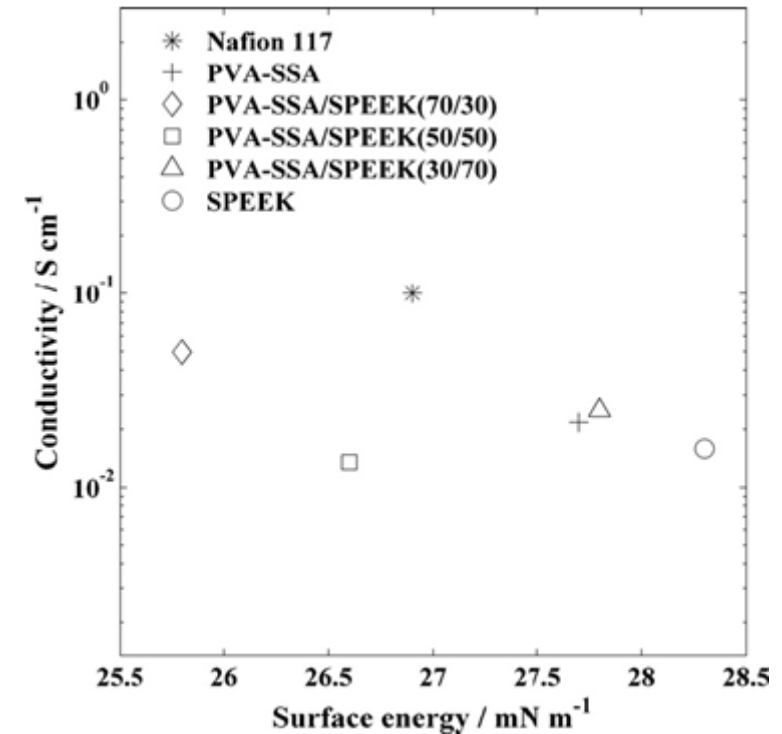
➤ Conducting polymers

- Processing aspects related to inkjet printing & drying of drops
- Wetting and surface energy
- Electromechanical behaviour of conducting polymer films

➤ Ionically conducting polymers

- Fuel cell membrane materials
- Diffusion through membranes
- Structure and morphology
- Shape memory behavior

➤ Recycling of polymers and composites



P. Kanakasabai et al., *Journal of Power Sources* 196 (2011) 946-955

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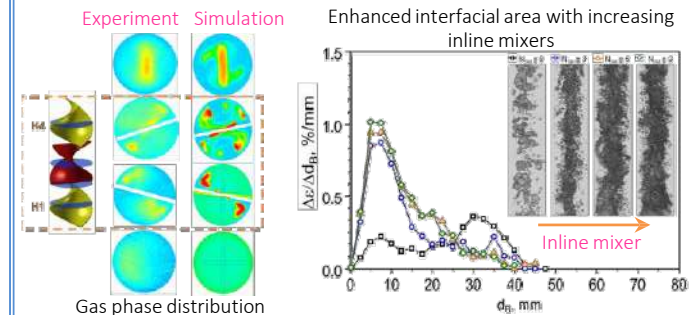
Dr. Swapna Singha Rabha
 PhD, Indian Institute of Technology Delhi, India
 Assistant Professor, Indian Institute of Technology Madras, India
 : 044-2257-4191; srabha@iitm.ac.in



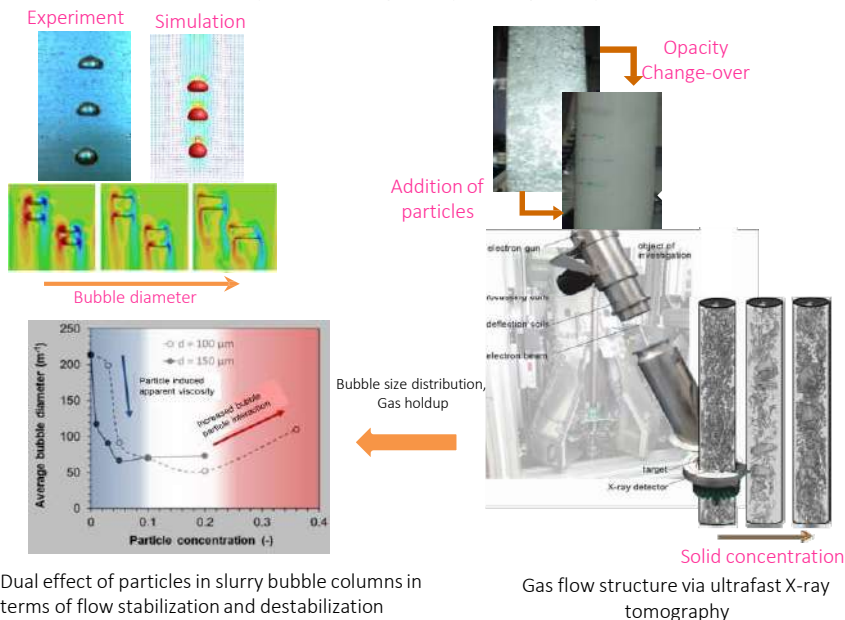
Research areas

- Microscopic gas-liquid flows
- Three phase suspension systems e.g. gas-liquid-solid flows
- Process intensifications
- Carbon capture
- Transport in porous media.

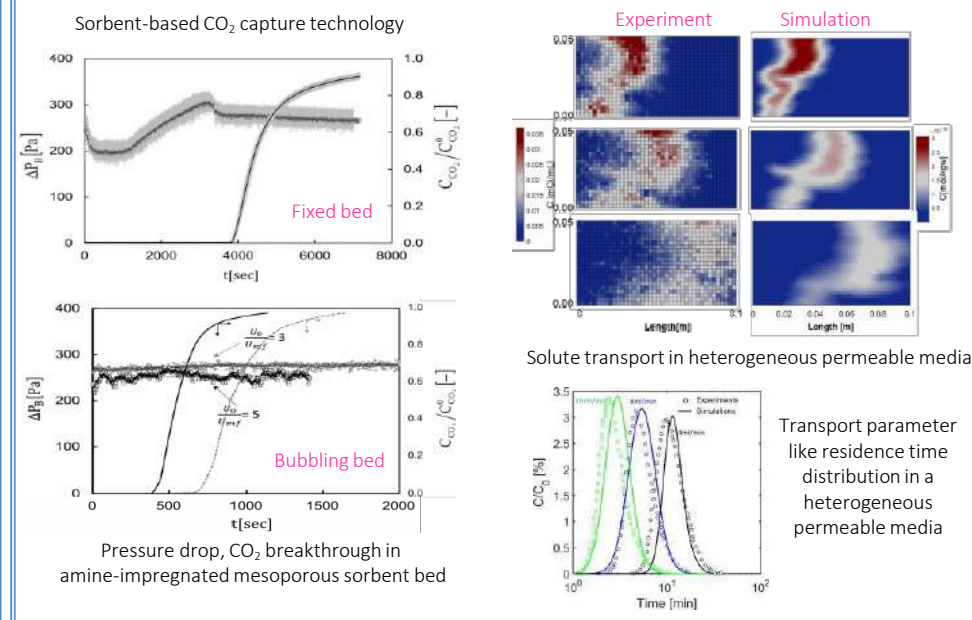
Energy efficient gas-liquid contacting device



Bubble dynamics in gas-liquid & gas-liquid-solid flows



Carbon capture and storage





Dr. Tanmay Basak
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<http://www.che.iitm.ac.in/~tanmay/>



- **Microwave Assisted Material Processing**
 - Computational Electromagnetics
 - Chemical Reacting Systems
 - Material Invariant Characteristics
 - Closed Form Analysis
 - Scattering Effect

- **Computational Fluid Flow and Heat Transfer**
 - Heat Flow visualization and Thermal Management
 - Thermodynamics and Irreversibility: Entropy Generation Minimization

- **Finite Element Method and Modeling**

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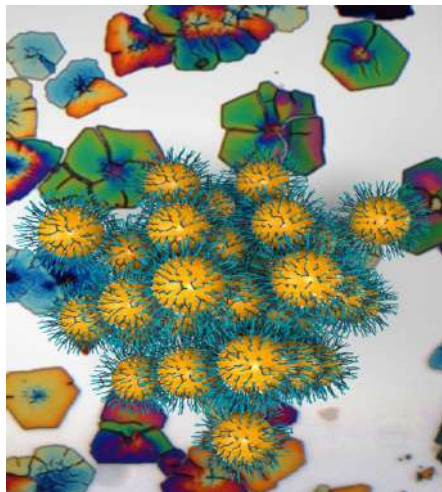


Dr. Tarak K Patra

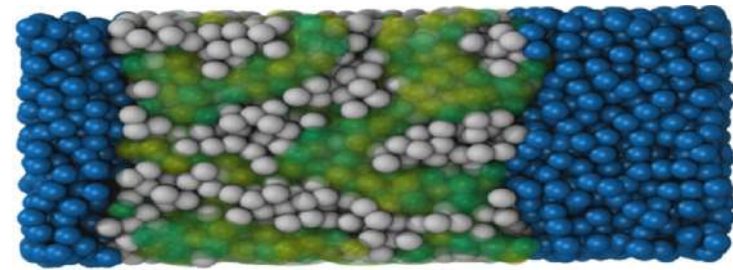
PhD, IIT Kanpur, Post-Doc, Argonne National Laboratory
Assistant Professor, Chemical Engineering



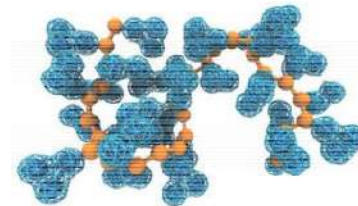
- High Throughput Materials Design
- Molecular Simulations and Machine Learning
- High Performance Computing and AI
- Polymeric Ionic Liquids
- Nanoparticle Supercrystals
- Glassy Materials



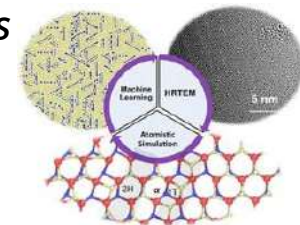
Computational design of highly stable nanoparticle supercrystals



Engineering polymer architecture for high ion conductivity and mechanical properties



Modeling Structure-property correlations in polymer glasses



Phase transition in 2D materials

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Dr. Upendra Natarajan

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University of Akron, USA

Professor, Chemical Engineering

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- Molecular Theory, Simulation and Modeling
- Macromolecular Science and Engineering
- Hybrid Materials and Composites

FMCG - Shampoo,
Conditioner,
Detergents, Cosmetics,
Superabsorbents,
structured dispersions

Polymer-based
Coatings, liquid
dispersions

Advanced structural
Materials



Dr. R Vinu

Associate Professor, Chemical Engineering

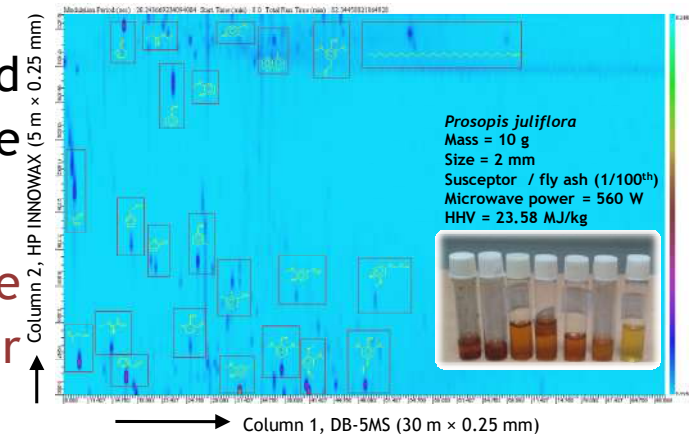
044-2257-4187; vinu@iitm.ac.in

<https://sites.google.com/site/vinuresearch/>

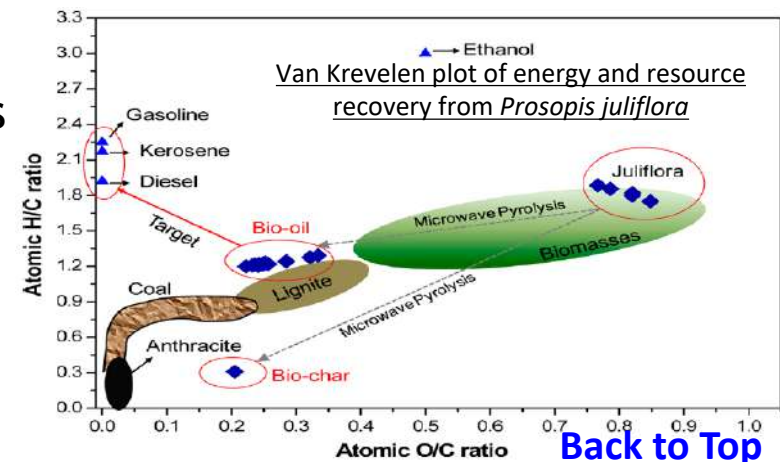


Current Research Areas

- ✚ Catalytic fast pyrolysis of biomass, algae and polymers in micro-pyrolysis systems with online analysis using GC/MS and FT-IR
- ✚ Microwave assisted pyrolysis of renewable feedstocks (biomass, plastic wastes, MSW) for energy and resource recovery and nanomaterials
- ✚ Characterization of solid, liquid and gaseous fuels
- ✚ Deconstruction and pretreatment of biomasses using non-conventional techniques
- ✚ Characterization and degradation of engine oils
- ✚ Selective photocatalytic conversion of biomass constituents
- ✚ Microkinetic modeling using continuum and stochastic techniques



2D-GC/MS TIC of bio-oil from *Prosopis juliflora* biomass via microwave pyrolysis



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INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF CHEMISTRY

LIST OF FACULTY

Amrendra Vijay

Anbarasan P

Archita Patnaik

Arnab Rit

Arti Dua

Ashok Kumar Mishra

Baskaran S

Beeraiah Baire

Bhyrappa P

Chandrakumar N

Debashis Chakraborty

Dhamodharan R

Dillip Kumar Chand

Edamana Prasad

Hema Chandra Kothamarthi

Indrapal Singh Aidhen

Kartik Chandra Mondal

Kothandaraman Ramanujam

Mahiuddin Baidya Md

Mangala Sundar K

Masilamani Jeganmohan

Muraleedharan K M

Narasimha Murthy N

Pradeep T

Rajakumar Balla

Ramesh Gardas

Ranga Rao G

Sangaranayanan M V

Sanjay Kumar

Sankararaman S

Sekar G

Selvam P

S R K C Sharma Yamijala

Sundargopal Ghosh

Venkatakrisnan P

Vidyasagar K



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<http://chem.iitm.ac.in/faculty/avijay/>



- Optics of Complex Materials
- Quantum Magnetism, Quantum Many-Body/Field Theory, Double-time Greens Functions
- Non-Equilibrium Statistical Mechanics - Boltzmann Transport Theory
- Continuous Phase Transitions and Quantum Critical Phenomena
- Topological Fluid Dynamics
- Quantum Dynamics, Semi classical Mechanics and Electrodynamics
- Electronic Structure Theory (Molecular and Condensed Phase systems)
- Ro-Vibrational Spectroscopy, Quantum Scattering Theory and Quantum Rate Theory
- Computational Materials Science, Catalysis and Surface Sciences

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Dr. Anbarasan P

PHD, Indian Institute of Science, India

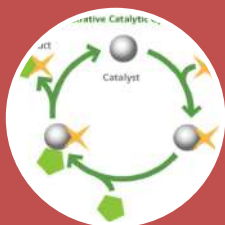
Associate Professor, Chemistry

044-2257-4216; anbarasansp@iitm.ac.in

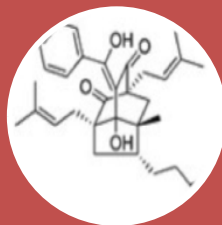
<http://chem.iitm.ac.in/professordetails/profanbarasan/profanbu/>



- Transition Metal Catalysis - Functionalization of Carbenes and Strong Bonds
- Organocatalysis - Development of New Brønsted Acid
- Conversion of sugar and carbon dioxide to valuable chemicals



Catalytic Process



Natural Products



Bio-Refinery

Synthesis (Application) Driven Catalysis

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Dr. Archita Patnaik

PHD, Banaras Hindu University, India

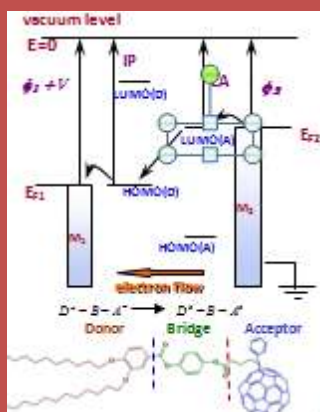
Professor, Chemistry

044-2257-4217; archita@iitm.ac.in

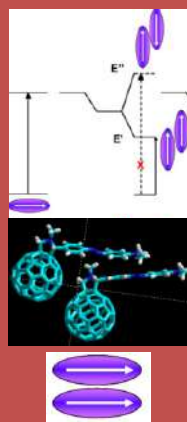
<http://chem.iitm.ac.in/professordetails/prof.archita/index.html>



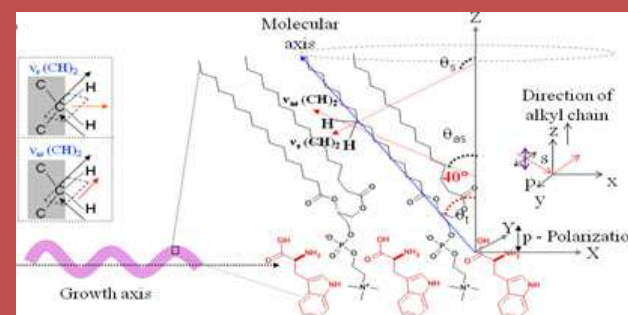
- Molecular Nanoscience and Electronics: Molecular junctions: Donor-Bridge - Acceptor dyads as molecular rectifiers and configurational switches
- Colloids and Interfaces: Molecular self-assembly and functional materials, Stimuli responsive aggregates with finite curvature
- Colloids and Interfaces: Real-time polarized spectroscopy of interfaces: Bio-membranes and catalysis



A Molecular Rectifier



J Aggregates in Optoelectronics



Large curvature lipid helices from trans-membrane tryptophan interaction: Quantification of molecular tilt



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Assistant Professor, Chemistry

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<http://www.iitm.ac.in/info/dept/CY>



Major Areas of Research

- Synthesis, Structure and Catalytic application of organometallic compounds
- Development of new ligand systems for Poly-nuclear complexes
- Novel Main-group compounds for small molecule activation
- Non-transition metal based hydrogen economy



Organometallic
Synthesis



Catalysis

Be	B	C	N	O	F		
Na	Mg	Al	Si	P	S	Cl	Ar
K	Ca	Ga	Ge	As	Se	Br	Kr
	Sr	In	Sn	Sb	Te	I	

Main-group Chemistry

← Organometallic and Main-group Chemistry →

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Dr. Arti Dua

PHD, IISc, Bangalore, India
Associate Professor, Chemistry

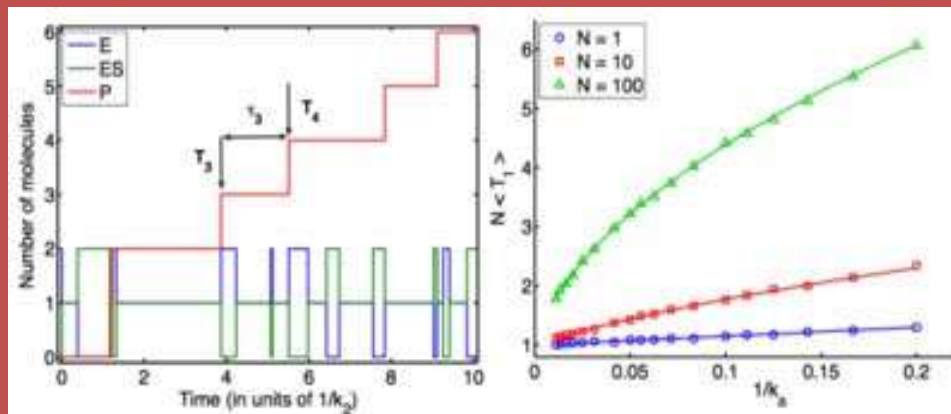
044-2257-4236; arti@iitm.ac.in

<http://chem.iitm.ac.in/professordetails/profartidua/index.htm>

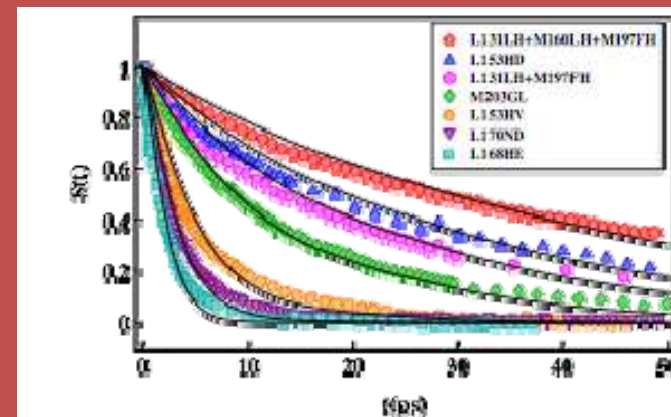


- Stochastic Processes in Chemistry and Biology
- Statistical Mechanics of Polymers and Biopolymers
- Biophysical Chemistry

BROAD DESCRIPTION OF THE AREA OF RESEARCH



- Stochastic kinetics of chemical and biochemical reactions for small number of reactants
- Enzyme kinetics at cellular level
- Stochastic gene expression
- Single-enzyme catalysis



- Models of electron transfer reactions in protein matrix
- Non-Markovian models for protein conformational fluctuations
- Counterion condensation in polyelectrolytes

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Dr. Ashok Kumar Mishra

PhD, IIT Kanpur, India

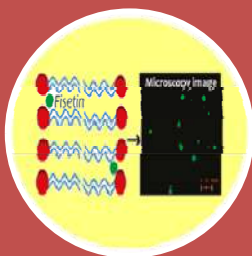
Professor, Chemistry

044-2257-4207; mishra@iitm.ac.in

<http://chem.iitm.ac.in/professordetails/profmishra/index.html>

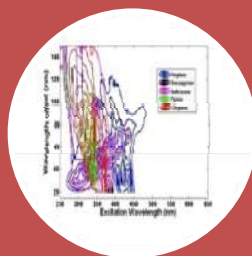


- Developing Fluorescent Molecular Probes and Imaging Dyes
- Introducing New Paradigms in Analysis of Complex Multifluorophoric Systems
- Developing Miniaturized Fiber Optic Fluorimeters with Novel Design Features



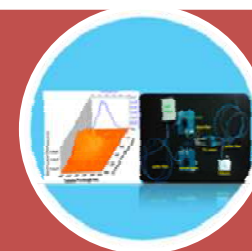
Fisetin, an Excited State Prototropism (ESPT) based fluorescent molecular probe introduced for lipid bilayer membranes: Reports on membrane properties and shows potential as an imaging dye.

(J. Phys. Chem. B 2011, 115, 9962-9970)



The newly introduced 'Total Synchronous Fluorescence Spectroscopy' combines well with chemometric methods for the simultaneous quantification of polycyclic aromatic hydrocarbons in water samples

(Anal. Methods, 2011, 3, 2616-2624)



'White light excitation fluorescence' (WLEF) introduced as a low cost, portable and non-destructive analytical technique for *in situ / online* analysis; viz. Quantification of pharmaceuticals in biofluids, Composition of fuel blends and adulterants in fossil fuels

(Anal. Methods, 2011, 3, 362-368; Fuel, 10.1016/j.fuel.2013.02.043).

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Dr. S Baskaran

PHD, IIT Kanpur, India

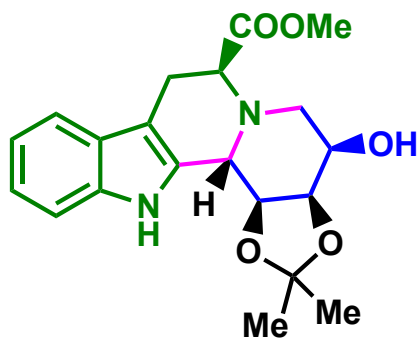
Professor, Chemistry

044-2257-4218; sbhaskar@iitm.ac.in

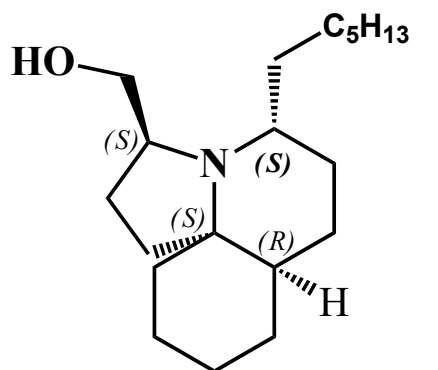
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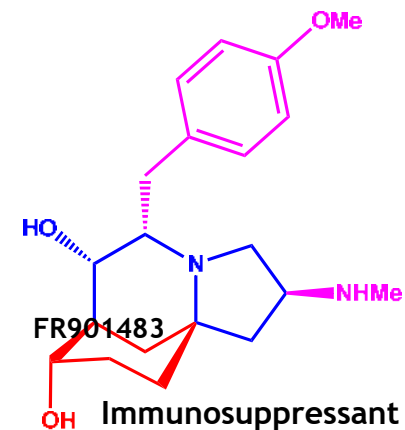
- Development of new strategies in Organic Synthesis
- Synthesis of Biologically active Natural Products
- Drug Design of Pharmaceutical Importance



Antidiabetic agent



(-)-Lepadiformine A
Anticancer agent



FR901483
Immunosuppressant

Stereoselective Synthesis of Biologically Active Molecules

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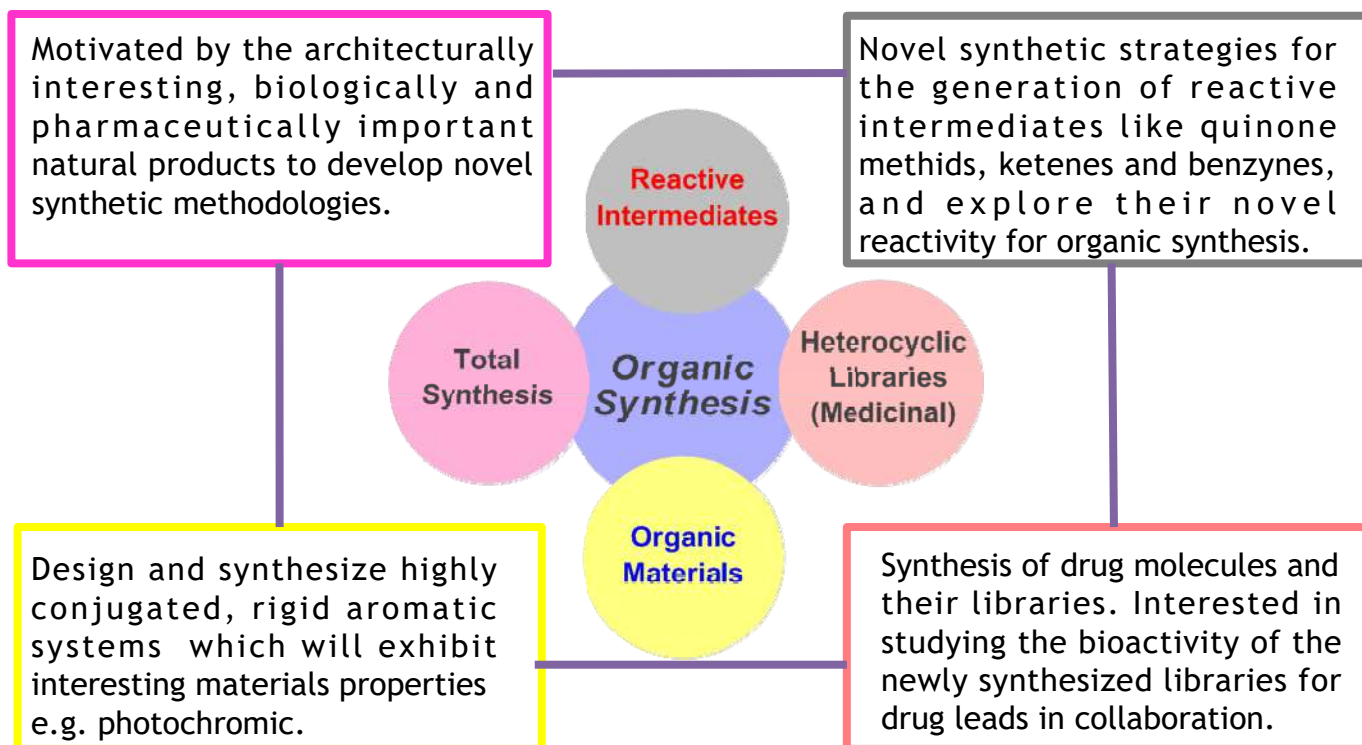


Dr. Beeraiah Baire

PhD., IISc Bangalore, India
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044-2257-4206; beerut@iitm.ac.in

<http://chem.iitm.ac.in/professordetails/beeraiahbaire/>





Dr. Bhyrappa, P

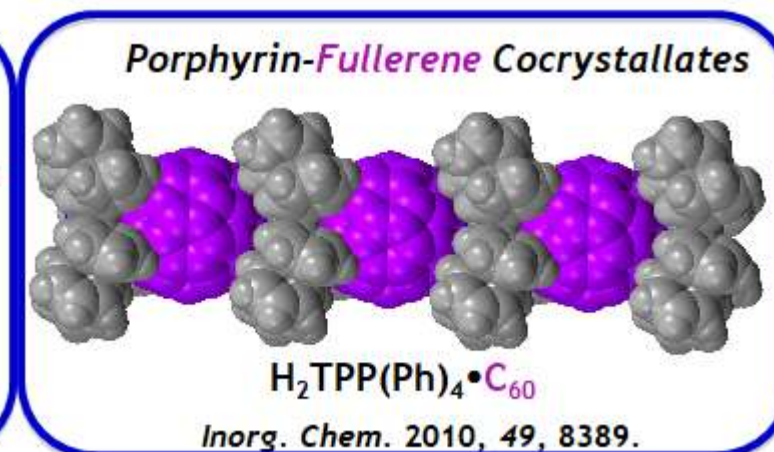
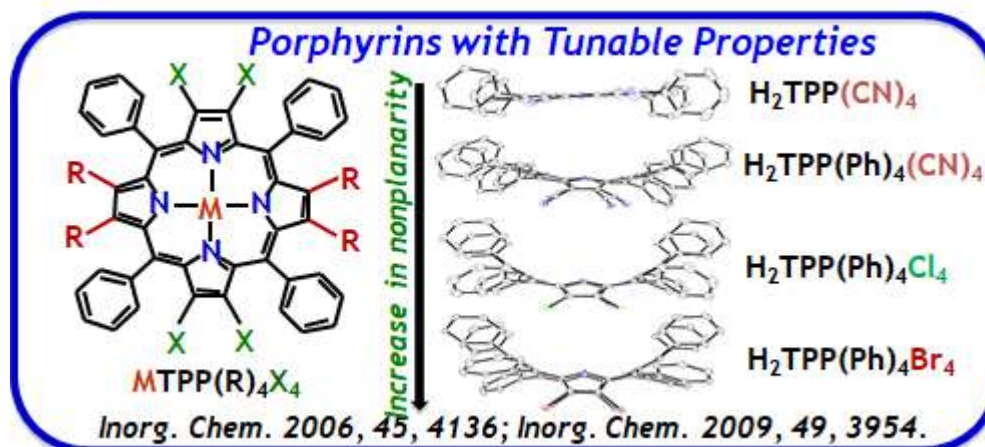
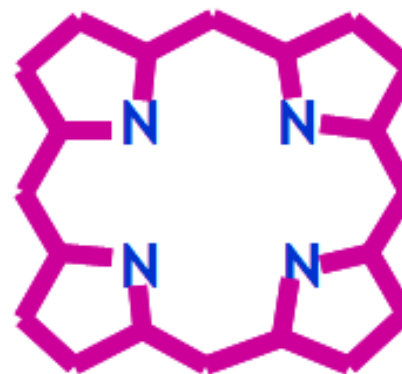
PhD., IISc., Bangalore
Professor, Chemistry

+91 44 2257 4222; byra@iitm.ac.in
<http://chem.iitm.ac.in/faculty/bhyrappa/>



Major Areas of Research

- Biomimetic Models
- Porphyrin Synthesis
- Tunable Macrocyclic Properties
- Supramolecular Chemistry
- Materials Chemistry (DSSCs)
- Catalysis



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Dr. N Chandrakumar

PhD, IIT Kanpur, India

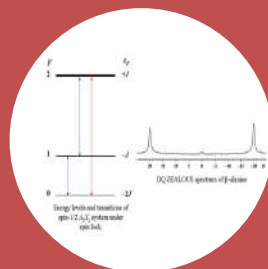
Emeritus Professor, Chemistry

044-2257 4920; nckumar@iitm.ac.in

<http://chem.iitm.ac.in/professordetails/chandrakumar/index.htm>

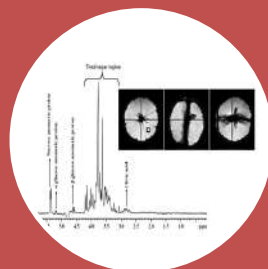


- Spin Dynamics and High Resolution NMR - Methodology development
- Spatially Resolved Magnetic Resonance - NMR Microimaging and MRS
- Dynamic Nuclear Polarization - Multi-band, multinuclear time domain DNP



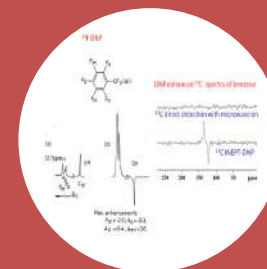
Rotating frame NMR techniques for accelerated spin dynamics, eg. ZEALOUS: a new experiment for “amplifying” homonuclear scalar couplings

Novel optimal homonuclear rare spin correlation experiments in direct and indirect detection modes with enhanced sensitivity



Volume Localized Spectroscopy (MRS) for Process Monitoring, eg. Fruit Ripening

MRI and MRS techniques for: *in vitro* drug dissolution studies; electrochemical applications, eg. membrane permeability studies and *in situ* fuel cell imaging under load



¹⁹F and ¹³C DNP in solution state

Differential DNP enhancement for structural information

Spatially resolved DNP

High Resolution Magnetic Resonance (MR) Spectroscopy and Spatially Resolved MR

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Debashis Chakraborty (Dr.rer.nat.)

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Professor, Chemistry

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- Organometallic Synthesis/Catalysts for Biodegradable Polymers and Copolymers
- Organometallic Synthesis/Catalysts for CO₂ Utilization and Sequestering
- Organic Synthesis/Metal Mediated Catalysis for Organic Reactions
- Organometallic Catalysts for Olefin Polymerization



Polymer from Corn



Polymerization using CO₂



Green Catalytic Systems for Organic Synthesis

← FROM LABORATORY TO INDUSTRY →

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Dr. R Dhamodharan

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<http://www.iitm.ac.in/http://chem.iitm.ac.in/>

<https://sites.google.com/site/welcometoprofdhamodharangroup/>



- Controlled Radical Polymerization - Block Copolymers of Complex Architectures
- New Applications Using Biopolymers (Chitin, Cellulose, Rubber, Natural Gums)
- Polymer Light Emitting Diodes (PLED) and Electroluminescent (EL) Materials - Synthesis and Applications in Solar Energy Harvesting



Controlled Release of
Nutrients Minerals and
Water to Soil from
Biodegradable Polymer
Matrices (Sea Shell)



Environmental
Remediation (Oil Spill,
Metal ion Removal, Waste
and Dye Water Treatment)



PLED and EL Materials

← BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH →

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Dr. Dillip Kumar Chand

PhD, IIT Kanpur, INDIA

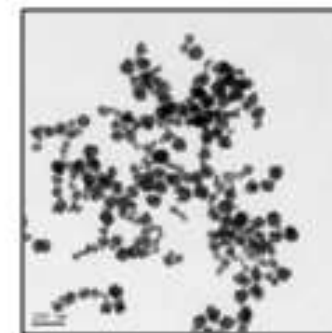
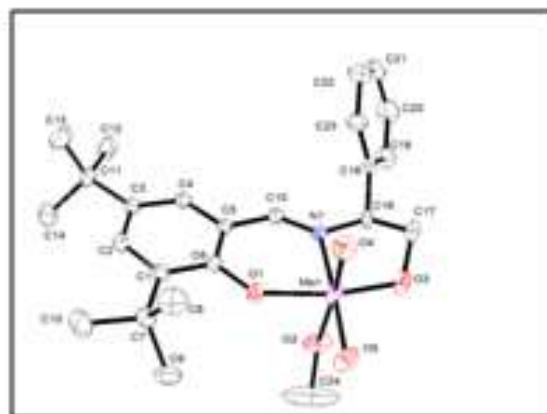
Professor, Chemistry

044-2257-4224; dillip@iitm.ac.in

<http://chem.iitm.ac.in/professordetails/profdillip/index.htm>



- Supramolecular Chemistry: Self-assembled coordination cages from palladium(II) and organic ligands.
- Homogeneous catalysis: Molybdenum containing catalysts for organic transformation reactions.
- Nanoscience: Synthesis and functional (e.g. catalysis) aspects of metal nanoparticles.

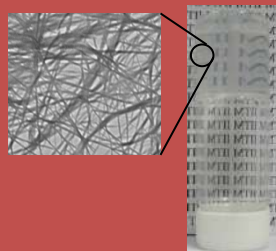




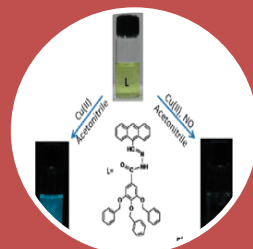
Dr. Edamana Prasad
PHD, Kerala University, IN
Professor, Chemistry
044-2257-4232; pre@iitm.ac.in
<http://www.chem.iitm.ac.in>



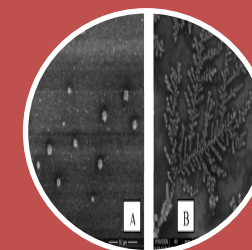
- Self Assembly of Macromolecules
- Photophysics of the Self Assembled Systems



Developing Novel Gel Systems



Developing Sensors for Anions, Toxic Metal Ions



Develop Fundamental Knowledge about the Mechanism of Self Assembly in Macromolecules

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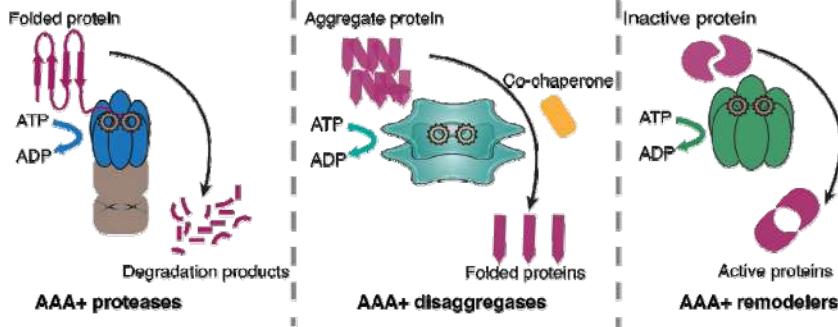


Dr. Hema Chandra Kotamarthi
 PhD, Tata Institute of Fundamental Research
 Assistant Professor, Chemistry
 044-2257-4213; hemachandra@iitm.ac.in
<http://chem.iitm.ac.in/faculty/hemachandra/>

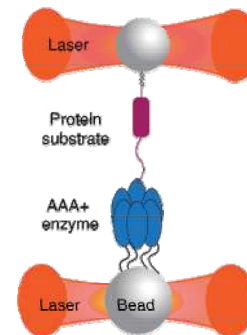


- Experimental Biophysical Chemistry/ Single-molecule biophysics
- ATP-dependent bio-molecular motors
- Protein folding/unfolding, degradation and disaggregation

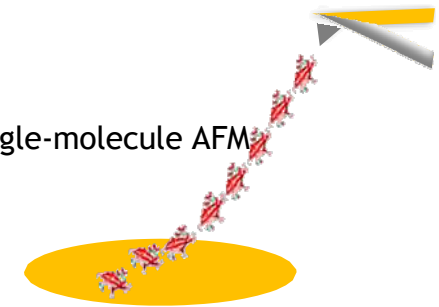
ATP-dependent molecular motors involved in protein remodeling



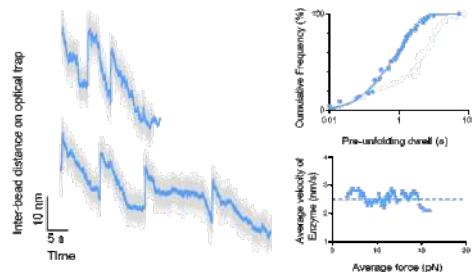
Tools for single-molecule force-spectroscopy



Single-molecule AFM



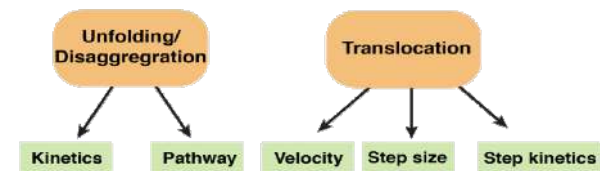
Representative data traces



Enzyme properties measured using single-molecule force spectroscopy

Protein unfolding force/
Enzyme stalling force

Motor
Mechanisms



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Dr. Indrapal Singh Aidhen

PhD, University of Pune, India

Professor, Chemistry

044-22574219; isingh@iitm.ac.in

<http://chem.iitm.ac.in/professordetails/profsingh/index.htm>



- Synthetic Organic/Carbohydrate Chemistry
- Synthesis of Biologically important Molecules
- Developing Methodologies/Building blocks for Target Driven Synthetic Endeavours

Major research interests have been in three directions. The first direction aims at developing *novel* Synthetic equivalents based on Weinreb amide (WA) functionality and their applications in synthesis of important molecules. The second direction aims at the synthesis of important and challenging targets from the realm of carbohydrate chemistry. The chosen targets belong to the class of C-glycosides and Aza-analogues. The third direction aims at developing new synthetic strategies and building blocks for biologically/medicinally important molecules.



Dr. Kartik Chandra Mondal
PhD, Karlsruhe Institute of Technology Germany
Assistant Professor, Chemistry
044-2257-4228; csdkartik@iitm.ac.in
<http://chem.iitm.ac.in/faculty/kartik/>





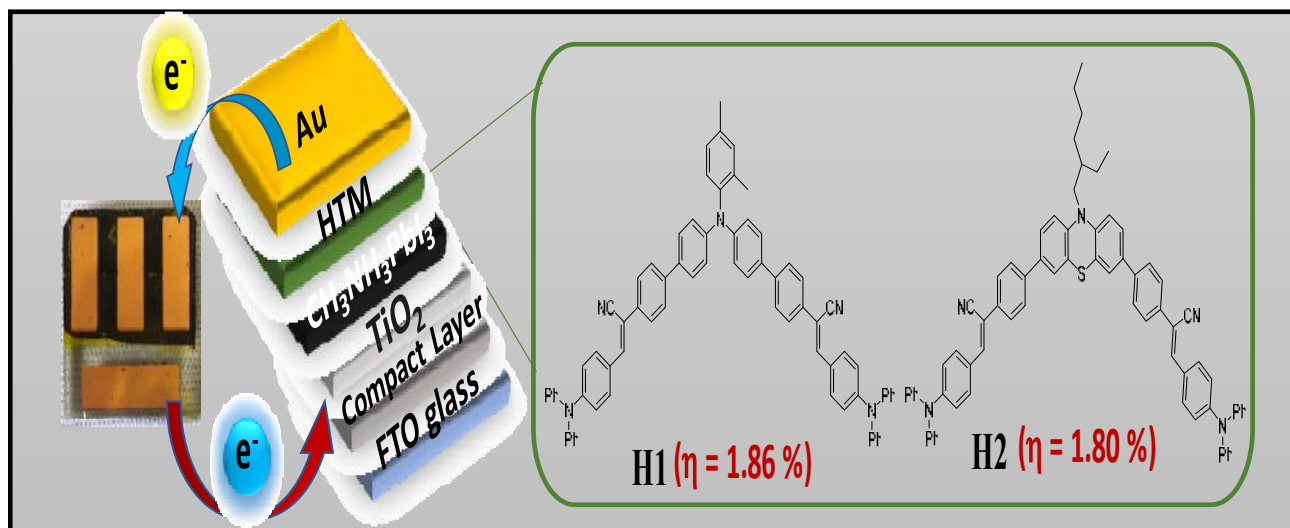
Dr. Kothandaraman Ramanujam
PhD, Karlsruhe Institute of Technology Germany
Associate Professor, Chemistry
044-2257-4228; csdkartik@iitm.ac.in
<http://chem.iitm.ac.in/faculty/kartik/>



Areas of Interest:

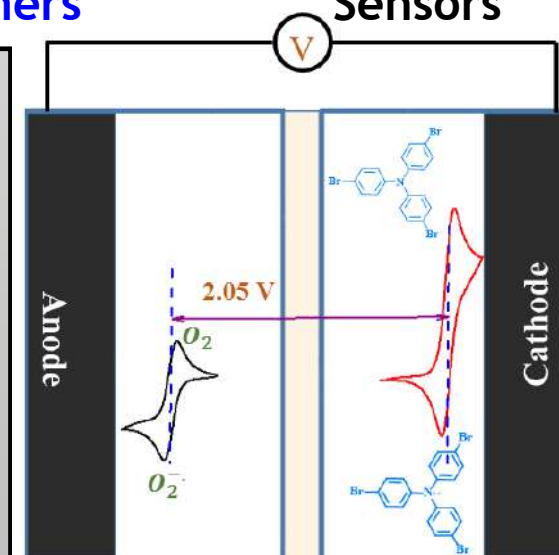
- Dye Sensitized Solar Cells Perovskite Solar Cells
- Redox Flow Battery (Vanadium and Organic)
- Organic electrode Materials for Li/Na ion Batteries

Flexible Battery



Molecularly Imprinted Polymers

Sensors



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Dr. MD Mahiuddin Baidya

PhD, LMU Munich, Germany

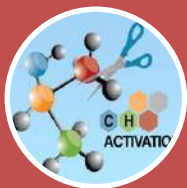
Associate Professor, Chemistry

044-2257-4212; mbaidya@iitm.ac.in

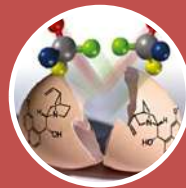
<http://chem.iitm.ac.in/faculty/baidya/>



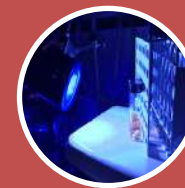
- Transition Metal Catalyzed C-H Bond Activation
- Asymmetric Synthesis with Nitroso Compounds
- Visible Light Photocatalysis for organic synthesis
- Synthesis of Natural Products and Bioactive Compounds



C-H bond activation



Chiral synthesis



Visible-light catalysis

← Designer Catalysis and Organic Synthesis →

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Dr. Mangala Sundar K

PhD., McGill University, Montreal, Quebec, Canada

Professor, Chemistry

044-2257-4220; mangal@iitm.ac.in

<http://chem.iitm.ac.in/faculty/mangal/>





Dr. Masilamani Jeganmohan

Associate Professor, Chemistry

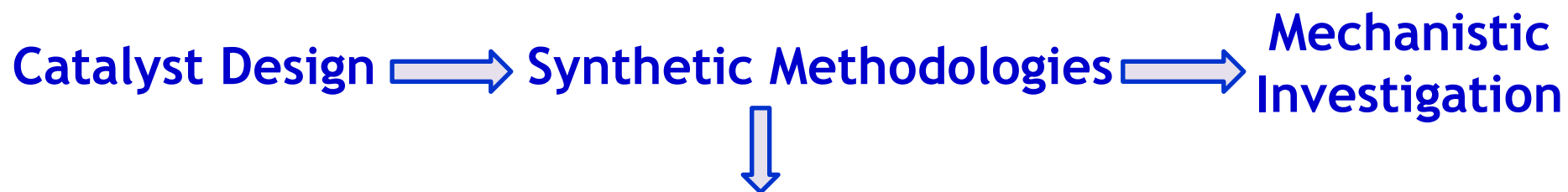
044-2257-4211; mjeganmohan@iitm.ac.in

<http://www.iitm.ac.in/info/dept/CY>



Major Areas of Research

- Transition metal complexes as catalysts in organic synthesis:
 - Metal-catalyzed C-H bond functionalization reactions
 - Metal-catalyzed cyclization and addition reactions
- Asymmetric synthesis by using chiral metal complexes as catalysts
- Natural products and biologically active molecules synthesis



- Natural Products
- Biologically active molecules
- Chiral Organic Molecules

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Dr. Muraleedharan K M

PhD., NIIST Trivandrum (Kerala University), India

Professor, Chemistry

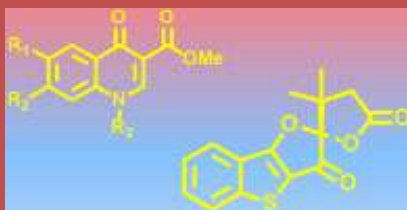
044-2257-4233; mkm@iitm.ac.in

<http://www.chem.iitm.ac.in/professordetails/profmurali/page/index.html>



Research Areas:

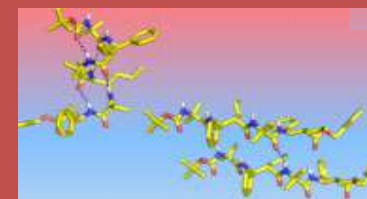
- Synthesis of biologically active organic compounds
- Synthetic peptides for therapeutic applications
- Development of soft organic materials through controlled self-assembly



Organic Synthesis



Drug design



Synthetic mimics of
Peptides and
carbohydrates

Bio-Organic and Medicinal Chemistry

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Dr. N Narasimha Murthy K M

PhD., IISc, Bangalore,

Professor, Chemistry

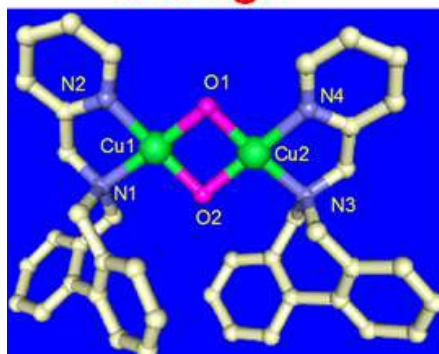
044-2257-4233; murthy@iitm.ac.in

http://www.chem.iitm.ac.in/Faculty_murthy.html

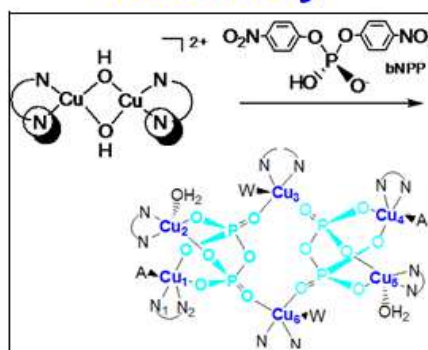


- Bioinorganic chemistry of copper and iron
- Activation of O₂, stabilization of M-O₂ adducts, their spectroscopy and catalysis
- Design of binuclear DNA metallohydrolases model for cleavage of P-O bond
- Self-assembly of iron-oxo aggregates
- ¹H NMR and EPR spectroscopy of paramagnetic metal complexes

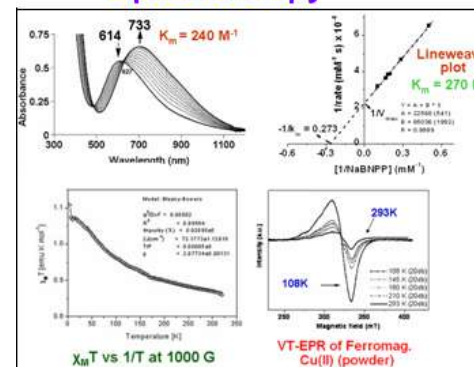
Design



Reactivity



Spectroscopy



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T. Pradeep

PhD. (Indian Institute of Science, India)

Professor, Chemistry

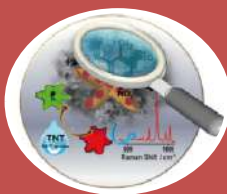
+91-44-2257-4208; pradeep@iitm.ac.in

<http://www.iitm.ac.in/component/faculty/138/pradeep/>

Most updated link: <http://www.dstuns.iitm.ac.in/t-pradeep.php>



- **Research Area/Focus 1:** Molecular and nanoscale materials
- **Research Area/Focus 2:** Drinking water purification
- **Research Area/Focus 3:** Ice chemistry



Advanced Sensors



Water Purification



Ice Chemistry

← Diverse nanomaterials and their properties in the context of affordable clean water; with emphasis on understanding phenomena →

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Dr. Rajakumar Balla

Professor, Chemistry

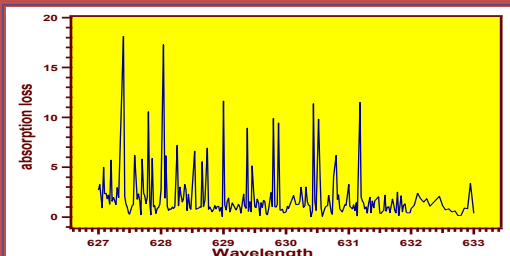
+91-44-2257-4231; rajakumar@iitm.ac.in



- Atmospheric lifetimes of VOCs, CFC/HFC alternatives, biogenically and anthropogenically emitted compounds. Absorption cross-sections and quantum yields of trace and transient species in the Earth's atmosphere; Global Warming Potentials; Ozone depletion and production potentials
- Cavity Ring Down Spectroscopy; Pulsed Laser Photolysis - Laser Induced Fluorescence
- Single Pulse Shock Tube studies on combustion of fuels/bio-fuels - Atomic Resonance Absorption Spectroscopic (ARAS) techniques
- Computational studies and kinetic simulations



Cavity Ring Down Spectrometer



Absorption spectrum of molecular oxygen



Single Pulse Shock Tube (For combustion studies)

Laboratory of Atmospheric and Combustion Processes

All the above are fabricated / developed at IITM

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Dr. Ramesh Gardas

PhD, South Gujarat University, India

Associate Professor, Chemistry

044-2257-4248; gardas@iitm.ac.in

<http://www.iitm.ac.in/component/faculty/138/gardas>



- Ionic Liquids
- Solution Thermodynamics
- QSPR and Group Contribution Methods



Green Solvents



Phase Equilibria



Process & Product
Design

← Experimental and Predictive Thermodynamic Data →

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Dr. G Ranga Rao

PhD, Indian Institute of Science, India

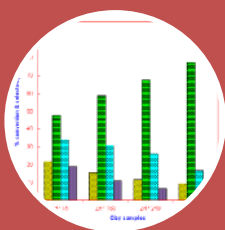
Professor, Chemistry

044-2257-4226; grrao@iitm.ac.in

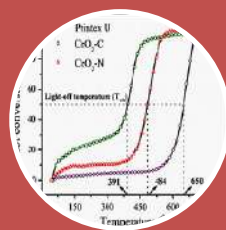
<http://chem.iitm.ac.in/departement.html>



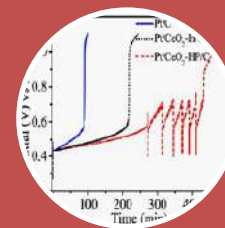
- Surface and nanomolecular catalysis: rare earth oxides, transition metal oxides and polyoxometalate compounds
- Solid state electrochemistry : electrocatalysis and supercapacitors
- Materials chemistry : porous materials, hybrid and functional materials



Pillared catalysts



Soot combustion activity



Eliminating CO poison on Pt

Materials chemistry : synthesis, catalysis, electrocatalysis, solid state electrochemistry



M V Sangaranarayanan

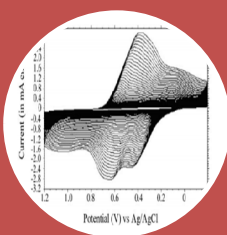
PhD, IISc Bangalore

Professor, Chemistry

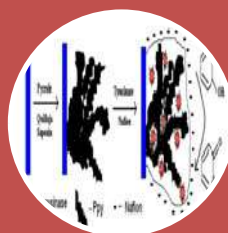
044-22574209; sangara@iitm.ac.in



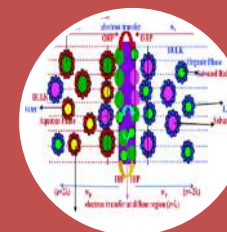
- Modelling of Electrochemical Interfaces
- Biosensors and Super capacitors
- Electron transfer at liquid/liquid interfaces



Super Capacitors



Biosensors



Liquid/Liquid
interfaces



Dr. Sanjay Kumar

Professor, Chemistry

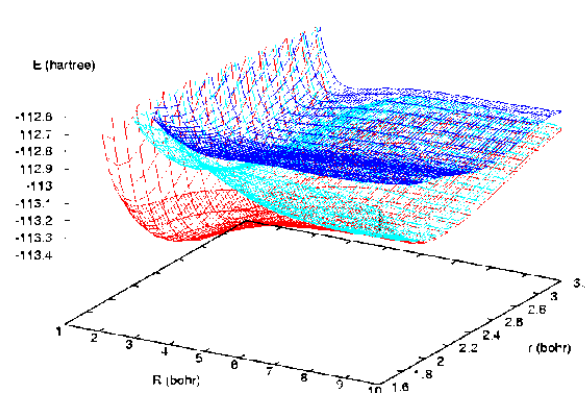
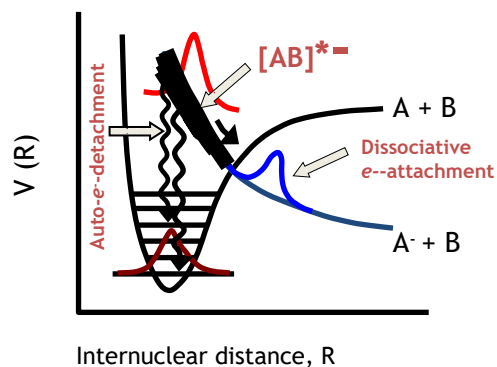
044-2257-4227; sanjay@iitm.ac.in

<http://www.iitm.ac.in/info/fac/sanjay>



Major Areas of Research

- Theoretical Chemistry, Quantum Molecular Reaction Dynamics
- High level *ab initio* bound-state quantum calculations and quantum dynamics of fundamental elementary chemical reactions
- Ion-molecule and low-energy resonant electron-molecule collisions, nonadiabatic (beyond the Born-Oppenheimer approximation) dynamics
- Computational modeling of chemical (organic) reactions & their mechanistic pathways



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Dr. S Sankararaman

PhD, University of Victoria, BC, Canada

Professor, Chemistry

044-2257-4210; sanka@iitm.ac.in

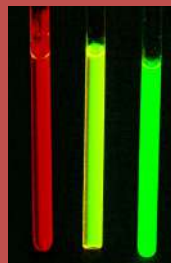
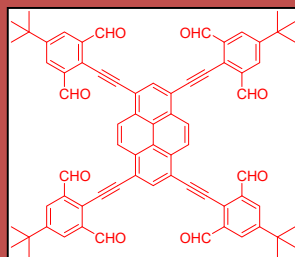
<http://chem.iitm.ac.in/professordetails/profsankaraman/index.htm>



- Synthetic and mechanistic organic chemistry - acetylene and olefin chemistry
- Synthetic Organometallic chemistry and catalysis - NHC-metal chemistry

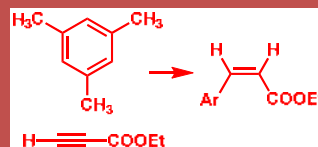
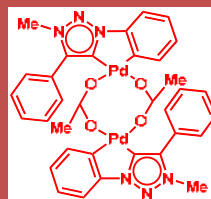
➤ Catalytic hydroarylation of alkyne using NHC-Pd catalyst

Molecules for photonics and electronics applications



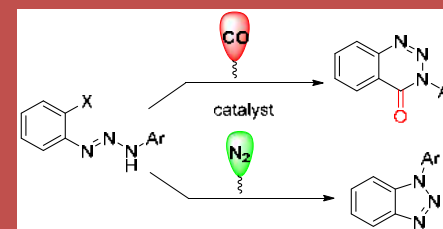
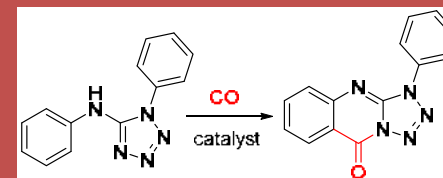
Org. Lett. **2006**, *8*, 2739-2742
Org. Biomol. Chem., **2010**, *8*, 2260-2266

NHC-Pd Catalyst (hydroarylation reaction)



Organometallics, **2011**, *30*, 1689-1694
Tetrahedron Lett., **2009**, *50*, 5834-5837

Catalytic carbonylative annulations



J. Org. Chem., **2017**, *82*, 11487
Eur. J. Org. Chem., **2016**, 4817

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Dr. G Sekar

PhD. (IIT Kanpur, India)

Professor, Chemistry

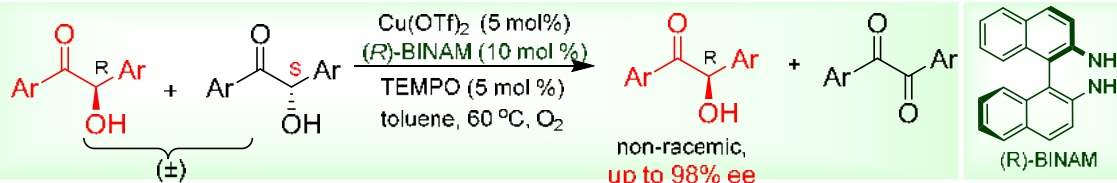
044-2257-4229; gsekar@iitm.ac.in

<http://chem.iitm.ac.in/faculty/sekar/>

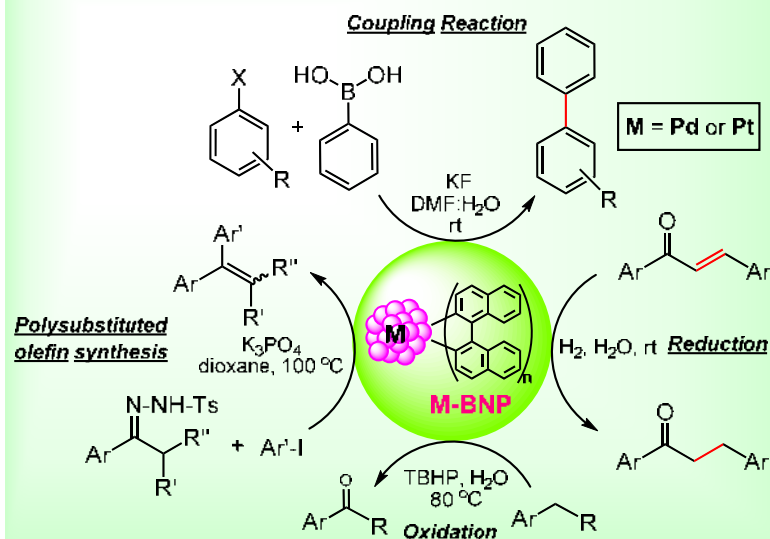


- Asymmetric synthesis
- Metal nanocatalysts
- Halogen bonding catalysis

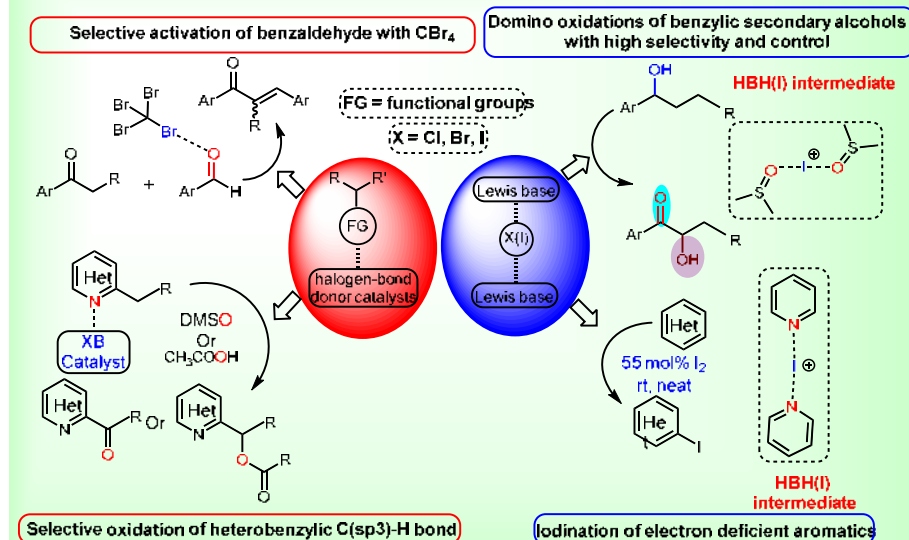
Enzyme Model: Biomimetic, Enantiomer Differentiating, Oxidation of Alcohols by Chiral Copper Complex



Metal nanocatalysts (covalent bond stabilization)



Halogen bonding catalysis



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Dr. P Selvam

PhD, IIT-Madras

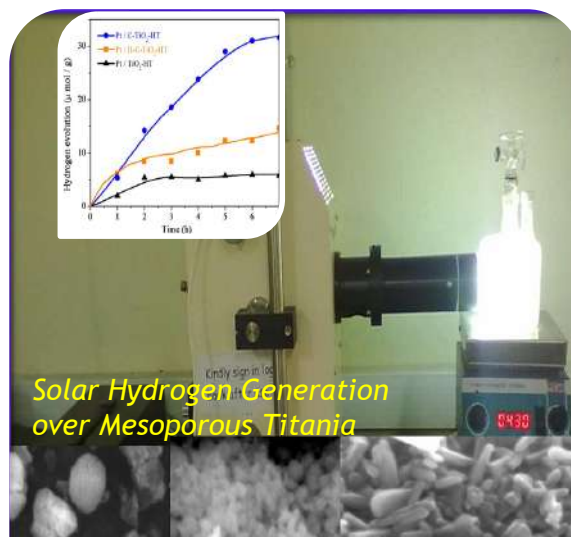
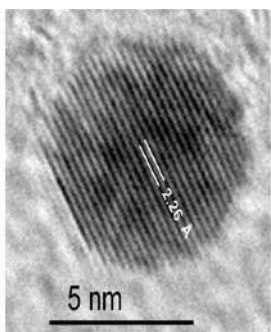
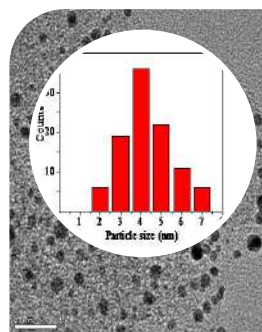
Professor, Chemistry & NCCR

044-2257-4235; selvam@iitm.ac.in

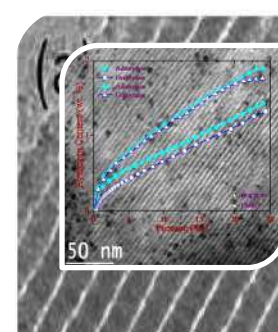
<http://www.nccr.iitm.ac.in/staff/selvam.htm>



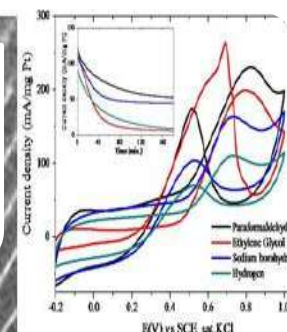
- GREEN CHEMISTRY AND CATALYSIS, BIOMASS CONVERSION, FUEL CELLS
- H₂ ENERGY, CO₂ PHOTOREDUCTION, NO_x REDUCTION AND VOC ABATEMENT
- ORDERED POROUS MATERIALS (ZEOLITE-TYPE) FOR ORGANIC TRANSFORMATION



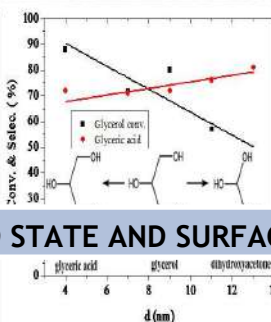
Solar Hydrogen Generation over Mesoporous Titania



Hydrogen Storage and Fuel Cell Electrode via Platinum supported Mesoporous Carbons



Biomass Conversion over Nano-Gold



SOLID STATE AND SURFACE CHEMISTRY / NANOSTRUCTURED MATERIALS AND HETEROGENEOUS CATALYSIS



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Dr. S R K C Sharma, Yamijala

PhD, Jawaharlal Nehru Centre for Advanced
Scientific Research

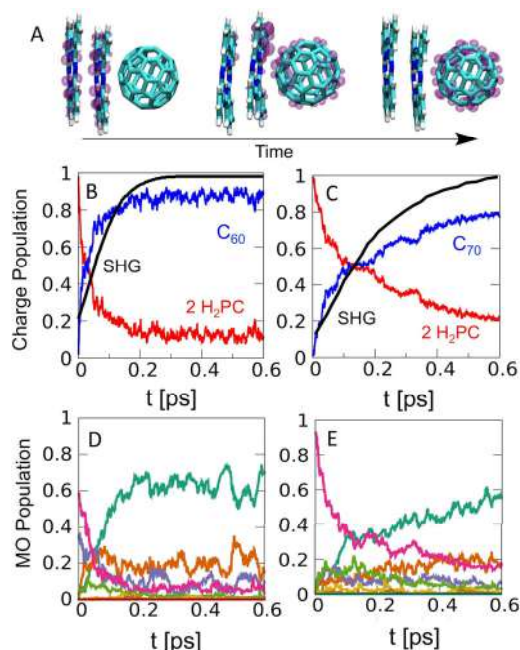
Assistant Professor, Chemistry

044-2257-4xxx; chaitanya@iitm.ac.in

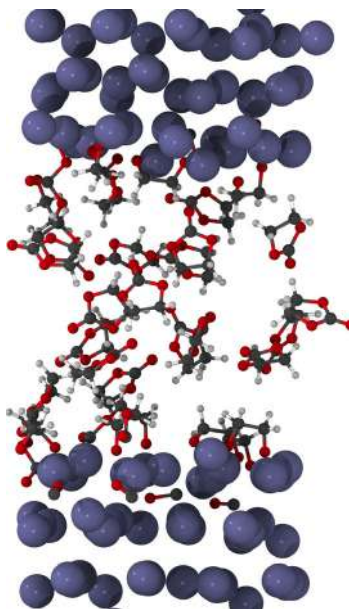
<http://chem.iitm.ac.in/faculty/chaitanya/>



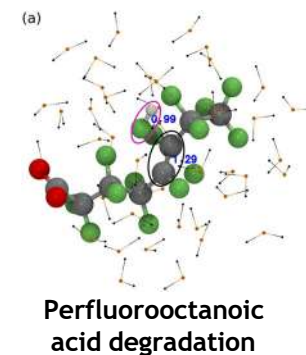
- Development, implementation, and application of nonadiabatic molecular dynamics methods
- Understanding the microscopic mechanism of batteries, and water-pollutants degradation
- External-energy assisted catalysis



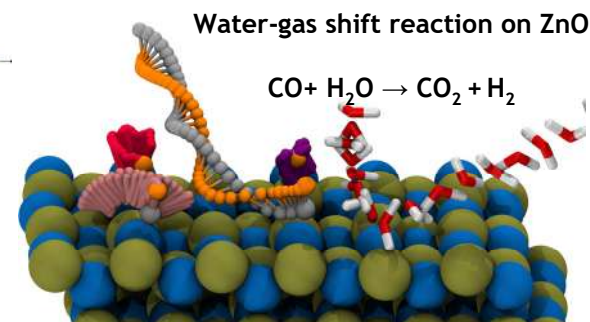
Implementation and application of FSSH method



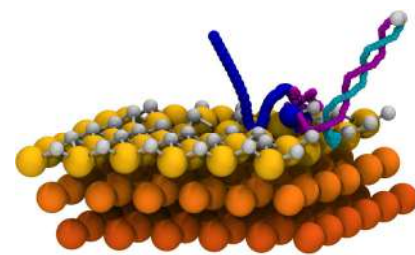
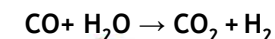
Solvent degradation mechanism in a Calcium-battery



Perfluorooctanoic acid degradation



Water-gas shift reaction on ZnO



Formation mechanisms of ammonia on a Cu-surface in a N_2/H_2 plasma environment.

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Dr. Sundargopal Ghosh

Professor, Chemistry

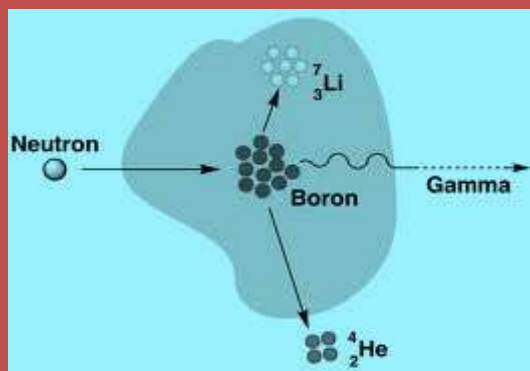
044-2257-4230; sghosh@iitm.ac.in

<http://chem.iitm.ac.in/professordetails/profghosh>

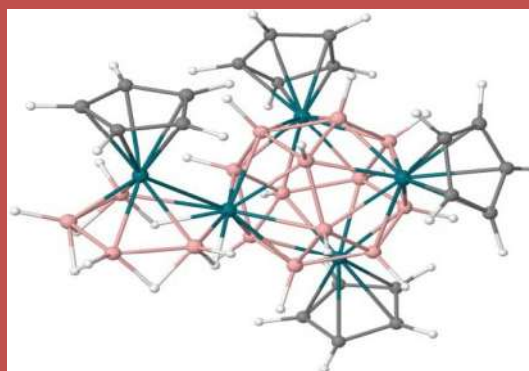


Major Areas of Research

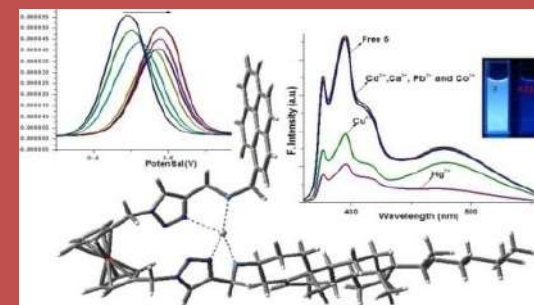
- Synthetic main group cluster chemistry, mainly polyhedral borane.
- Rare-earth metallaborane clusters; Metal-borides from metallaboranes.
- Metallaboranes in catalysis: Functionalization of hydrocarbons; catalytic cyclotrimerization of alkynes.
- Molecular recognition: Design and synthesis of new ferrocene derivatives containing boron centered functionalities.



Boron Neutron Capture Therapy



Supraicosahedral Clusters



MgB₂ the Superconductor
Multichannel Probe for Metal Ions

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Dr. Venkatakrishnan P

PhD, IIT Kanpur India

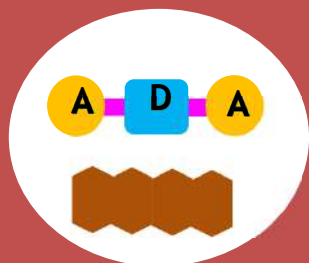
Assistant Professor, Chemistry

044-2257-4230; pvenkat@iitm.ac.in

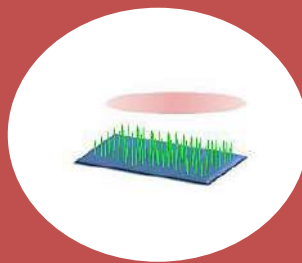
<http://chem.iitm.ac.in/professordetails/Venkatakrishnan.pdf>



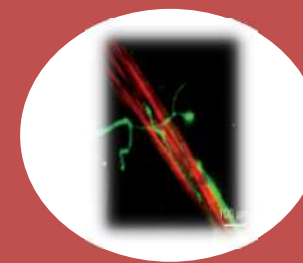
- Organic Electronics - Organic Materials for Solar Cells and Transistors
- Organic Sensors - Developing Organic Materials for Solid-State Sensing
- Organic Photonics - Brilliant Organic Emitter Dyes for Bio-Imaging



Organic Electronics



Organic Sensors



Organic Photonics

Functional Organic Materials for Electronics and Photonics

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Dr. K Vidyasagar

PhD, Indian Institute of Science, India

Professor, Chemistry

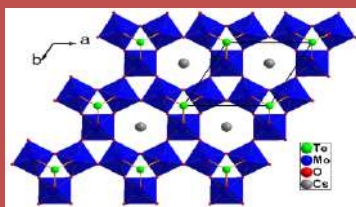
044-2257-4221; kvsagar@iitm.ac.in

<http://chem.iitm.ac.in/professordetails/profvidyasagar/index.htm>

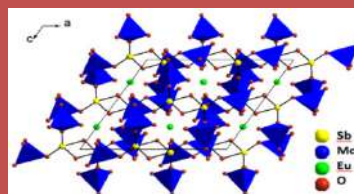


- Syntheses, structure and properties of NEW solid state compounds
- Oxides, Chalcogenides and Organo-phosphonates
- Potential applications: SHG activity, luminescence, ion-exchange etc.

SHG activity of $\text{Cs}_2\text{Mo}_3\text{TeO}_{12}$

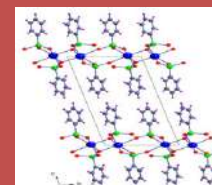


Photoluminescence of $\text{Eu}_2\text{Mo}_4\text{Sb}_2\text{O}_{18}$



Organophosphonate + RNH_2
↓
Intercalated product

Brönsted acidity of $\text{Na}(\text{HO}_3\text{PPh})(\text{H}_2\text{O}_3\text{PPh})$



SOLID STATE CHEMISTRY

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INDIVIDUAL FACULTY PROFILE

DEPARTMENT
OF
CIVIL ENGINEERING

LIST OF FACULTY

Alagappan Ponnalagu

Alagusundaramoorthy P

Amlan K Sengupta

Arul Jayachandran

Arun Menon

Ashwin Mahalingam

Atul Narayan S P

Balaji Narasimhan

Benny Raphael

Bhargava Rama Chilukuri

Boominathan A

Chandan Sarangi

Chandrasekhar Annavarapu Srinivas
(Profile yet to be uploaded)

Dali Naidu Arnepalli

Devdas Menon

Dodagoudar G R

Gangolu Appa Rao (Profile yet to be
uploaded)

Gitakrishnan Ramadurai

Indumathi M Nambi

Karthik K Srinivasan

Koshy Varghese

Lakshmi Priya Subramanian

Lelitha Devi Vanajakshi

Ligy Philip

Maji V B

Manu Santhanam

Mathava Kumar S

Meher Prasad A

Mohan S

Murali Krishnan J

Murty B S

Murty C V R

Nageswara Rao B

Phanisri Pradeep Pratapa

Piyush Chaunsali

Radhakrishna G Pillai

Raghukanth S T G

Rajagopal K

Ramamurthy K

Ramesh Kannan Kandasami

Ravindra Gettu

Robinson R G

Rupen Goswami

Sachin S Gunthe

Saravanan U

Satish Kumar S R

Satyanarayana K N

Shiva Nagendra S M

Sivakumar Palaniappan

Sivanandan R

Soumendra Nath Kuiry

Srinivasan K (Profile yet to be uploaded)

Subhadeep Banerjee

Sudheer K P

Surender Singh

Tarun Naskar

Thyagaraj T

Veeraragavan A

Venkataraman Srinivasan

Venu Chandra



Dr. Alagappan Ponnalagu

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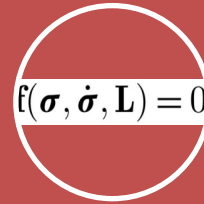


Major Areas of Research

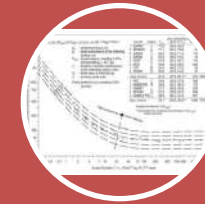
- Modelling of ballistic and blast resistant structures
- Impact studies of fast moving projectile on nuclear domes
- Damage modelling
- Aortic dissection and Aneurysm



Develop experimental setup to study the ballistic and blast impact on structures



Developing a robust model taking into account the current drawbacks



Developing a safety criterion for ballistic and blast prone structures

← Dynamic response of viscoelastic materials subjected to ballistic and blast impact →

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Dr. P Alagusundaramoorthy

PhD., IIT Madras, India

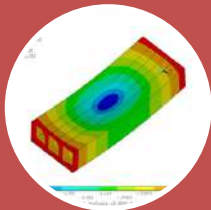
Professor, Civil Engineering

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<http://www.civil.iitm.ac.in/faculty#st>



- Advanced Composite Structures
- FRP Composites in Retrofitting and Rehabilitation of Structures
- Heat Straightening Process of Steel Structures



FRP Composites in Civil Infrastructure, Ship Structures, Offshore Oil Platforms and Aircraft Structures



Static and Seismic Strengthening of Concrete, Steel and Masonry Structures with GFRP and CFRP Composites



Heat Straightening Process for Damage in Strong Axis, Weak Axis, Twisting and Bulging of Steel Structural Members



Amlan K Sengupta, PE

PhD, Missouri University of Science & Technology Rolla, USA

Professor, Civil Engineering

044-2257-4277; amlan@iitm.ac.in

<http://www.iitm.ac.in/component/faculty/70/amlan/>



- Behaviour of reinforced and pre-stressed concrete members
- Earthquake engineering as applicable to building design
- Assessment of concrete bridge decks for deterioration



Shear Walls



Building Frames



Bridge Decks

Numerical analysis and experimental investigation of structural concrete members

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Dr. Arul Jayachandran
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- Stability design of structural steelwork
- Cold-formed/ Light Gauge Steel structures
- Glass structural engineering



LGS / Cold formed steel housing



Advanced analysis and design of structural steelwork



Structural Glass and façade engineering

← **Steel and glass blended for sustainable structures in India** →

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Dr. Arun Menon

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- Structural Safety of Historical Monuments
- Seismic Behaviour, Assessment and Retrofit of Masonry Structures
- Seismic Risk Assessment of Structures at Urban Scale



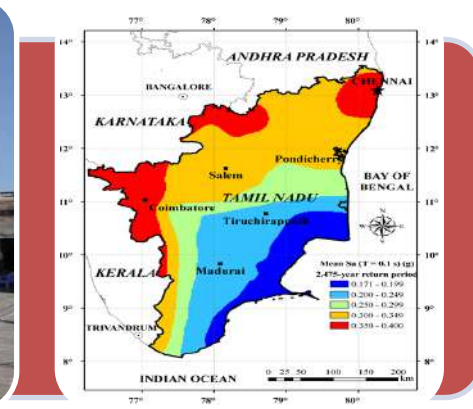
**STRUCTURAL
MODELLING &
ANALYSIS**



**SEISMIC BEHAVIOUR
OF MASONRY**



**FIELD &
LABORATORY
INVESTIGATIONS**



**SEISMIC HAZARD
ANALYSIS**



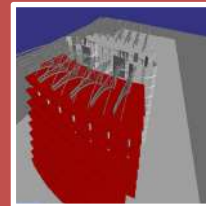
Dr. Ashwin Mahalingam
PhD, Stanford University, USA
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044-2257-4318; mash@iitm.ac.in
http://www.civil.iitm.ac.in/new/?q=ash_edu



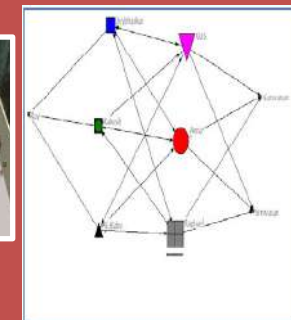
- Infrastructure Policy and Public Private Partnerships
- Virtual Planning, Design and Construction
- Sustainability and Globalization in the Architecture, Engineering and Construction (AEC) Industry



Infrastructure Policy: When should PPPs be selected? How can they best be structured? What challenges arise as these projects are operational ?



Virtual Planning, Design and Construction: Can Stakeholder Input be brought into planning using IT tools? How can project planning be optimized using visualization? How can technology adoption be enhanced?



Sustainability and Globalization: How can Virtual Teams in the AEC industry work together effectively? How can they design and create a sustainable built environment?



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- Bitumen
- Bituminous concrete
- Granular materials
- Cement paste and fresh concrete



Experimental
characterization

$$\begin{aligned} \dot{\epsilon}(\mathbf{T}, \dot{\mathbf{T}}, \dots, \mathbf{D}, \dot{\mathbf{D}}, \dots) &= 0 \\ \mathbf{T} \cdot \mathbf{D} - \rho \dot{\psi} &\geq 0 \end{aligned}$$

Modeling within the
framework of continuum
mechanics



Prediction of field
performance

Material characterization and performance prediction

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Dr. Balaji Narasimhan

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Associate Professor, Civil Engineering

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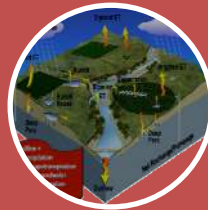
<http://www.iitm.ac.in/component/faculty/70/nbalaji/>



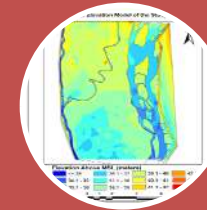
- Remote Sensing and GIS
- Hydrological Modeling
- Irrigation water management



Crop Evapotranspiration,
Inter-basin water transfer,
Irrigation efficiency



Impact of climate and
landuse changes on the
water resources



Floods & droughts extent,
magnitude, duration and
frequency

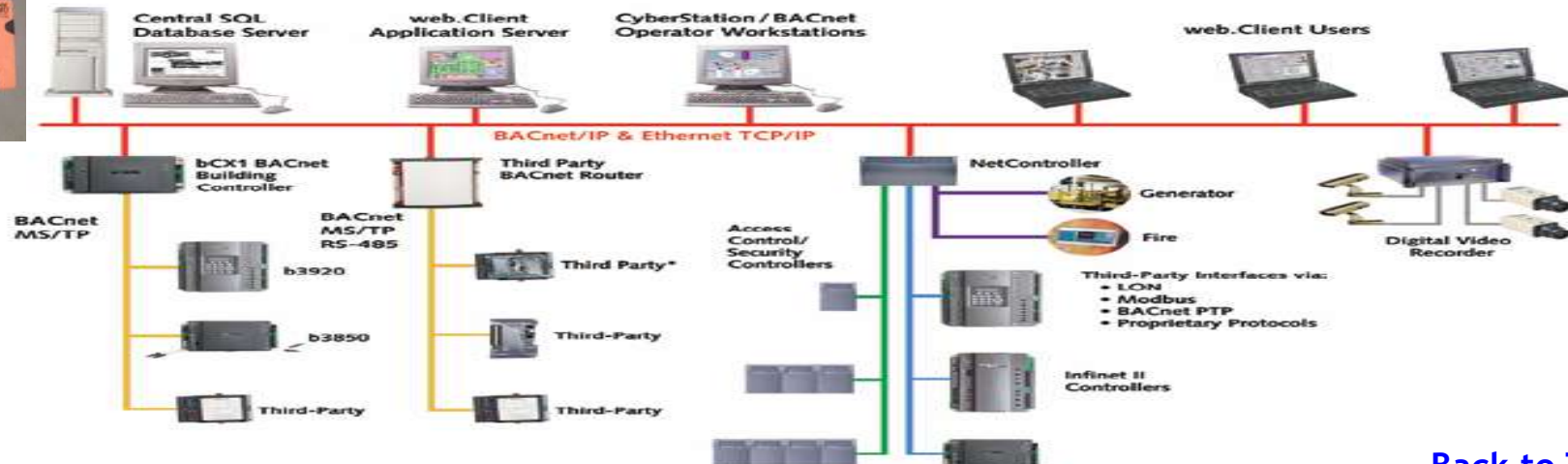
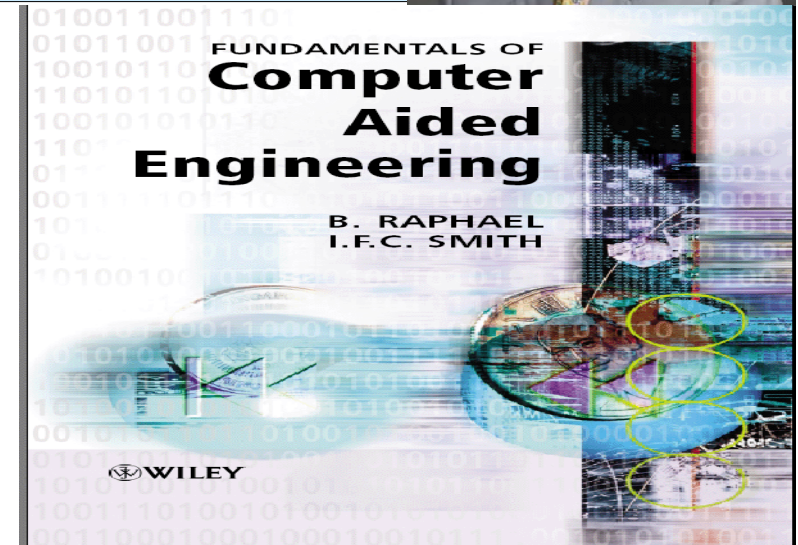


Dr. Benny Raphael
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044-2257-4310; benny@iitm.ac.in
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Major Areas of Research

- Building Automation and Control
- Computer Aided Engineering: Modeling, Optimization, Data mining
- Energy efficient buildings: Sustainable and smart building



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Dr. Bhargava Rama Chilukuri

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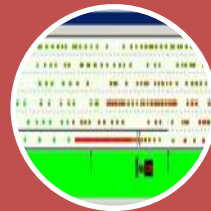


Major Areas of Research

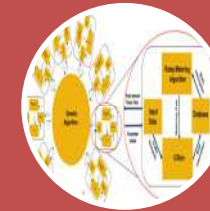
- Traffic Flow Theory of Homogenous and Heterogeneous Traffic
- Numerical Simulation of Traffic Flow Models
- Optimal Control of Traffic Systems



Develop analytical models for homogenous and heterogeneous traffic flow based on empirical data



Numerical simulation of the traffic flow models to validate and fine-tune them



Optimal control of traffic systems and traffic network flow



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Dr. A Boominathan

PhD, MGSU, RUSSIA

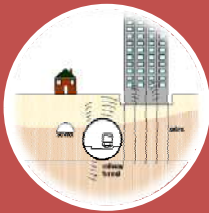
Professor, Civil Engineering

044-2257-4275; boomi@iitm.ac.in

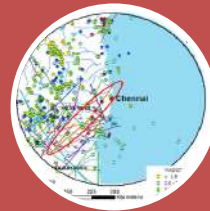
<http://www.iitm.ac.in/component/faculty/70/boomi/>



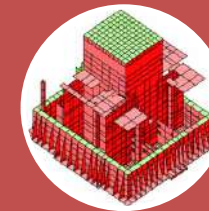
- Soil Dynamics and Liquefaction
- Earthquake Geotechnical Engineering
- Foundations subjected to Cyclic and Dynamic loads



Underground Train induced Vibrations, Liquefaction Analysis and Ground Improvement



Seismic Hazard and Site Amplification Analysis, SASW/MASW/Seismic Cross Hole/Refraction Tests



Seismic-Soil-Pile group-Structure Interaction, SFSI Analysis of Nuclear Structures

← Foundations for Vibratory Machines, Vibration Mitigation , Dynamic Soil/Pile Testing →

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Dr. Chandan Sarangi

PhD, IIT Kanpur, India

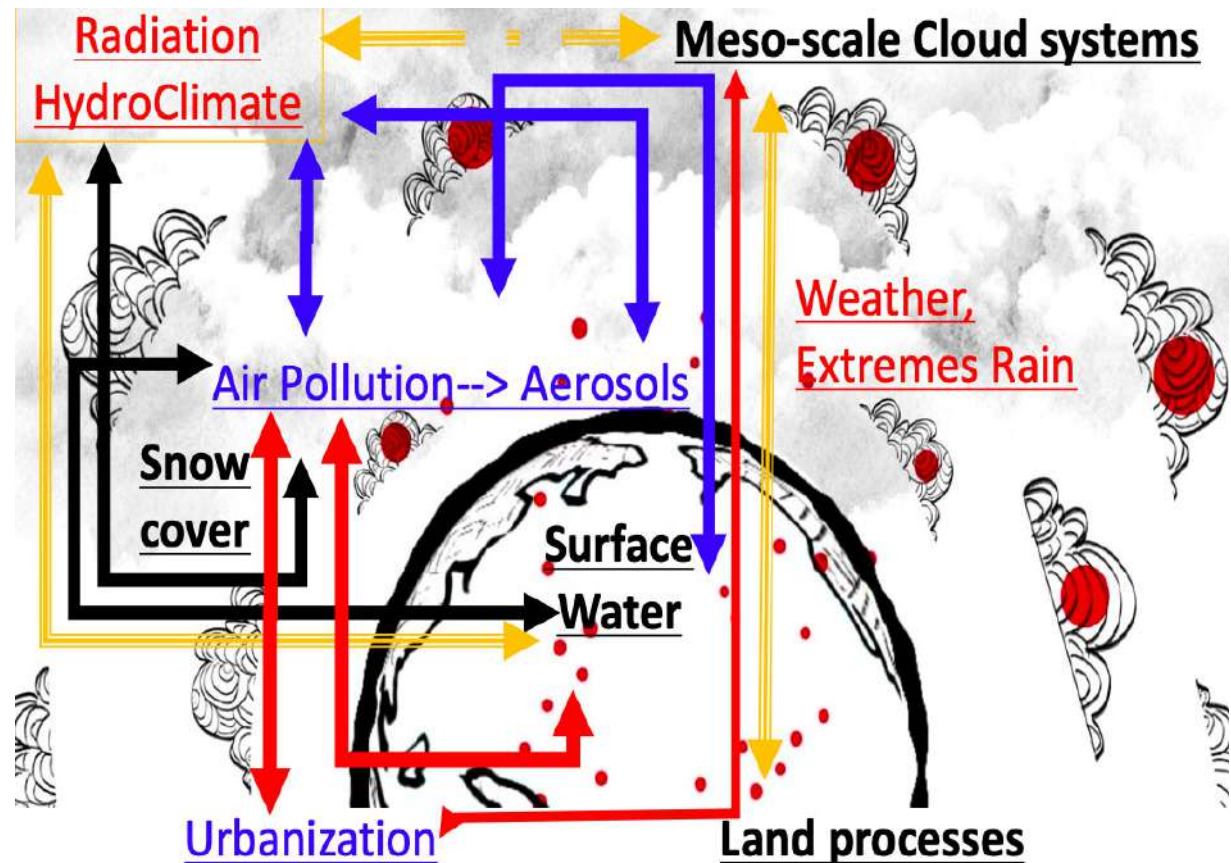
Assistant Professor, Civil Engineering

chandansarangi@iitm.ac.in



Major Areas of Research

- Impact of aerosols (particulate air pollution) on hydrometeorological processes (clouds, rainfall, fog, transpiration)
- Impact of dust deposition on Himalayan hydrology
- Modelling fate and transport of aerosols at regional and global scale
- Relative role of aerosols on temperature and extreme rainfall over Megacities



Aerosols and Hydro-Meteorology (ahm) Lab

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Dr. Chandrasekhar Annavarapu Srinivas

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Assistant Professor, Civil Engineering

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Dr. Dali Naidu Arnepalli

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- Geosequestration of Carbon for Mitigation of Green House Gases
- Design of Barrier Systems and Their Long Term Performance
- Geoenvironmental Engineering
- Unsaturated Behaviour of Geomaterials and Geosynthetic Clay Liners



*Geosequestration of
Green House Gases*



*Service life Prediction
of Geosynthetics*



*Geomaterial
Contaminant
Interaction*

FUNDAMENTAL BEHAVIOUR OF GEOMATERIALS



Devdas Menon

Professor, Civil Engineering

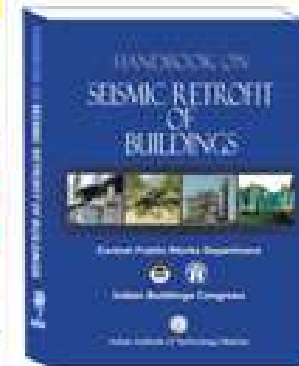
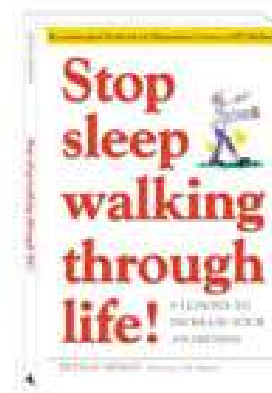
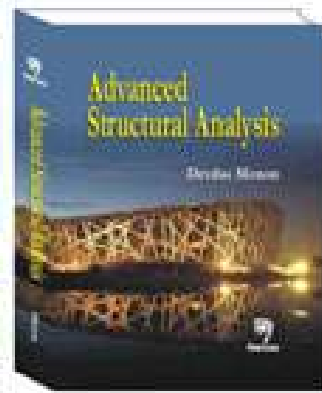
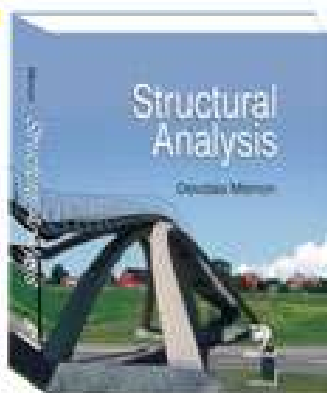
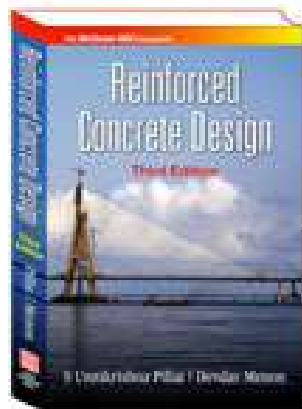
2257 4253 ; 9884078303; dmenon@iitm.ac.in

www.devdasmenon.com



Major Areas of Interest

- Structural Concrete - Design
- Structural Analysis & Reliability
- Bridge Engineering
- Affordable Rapid Mass Housing
- Wind & Earthquake Engineering
- Self Awareness





G R Dodagoudar

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Seismic reliability analysis,
Computational geomechanics

G

Geotechnical earthquake engineering,
Seismic-soil structure interaction

Analysis of rain-induced slope instability,
Seismic microzonation of urban centres

Landslide hazard and risk analysis,
Fuzzy logic in geotechnics

R

Contaminant transport modelling, Stochastic
soil dynamics

Nonlinear finite element analysis

D

Analysis and design of piled-raft foundation
systems, Performance-based earthquake
geotechnics

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- Dynamic Traffic Assignment
- Transportation Network Modelling
- Econometric and Optimization Models in Transportation



Intelligent Transportation
Systems



Sustainable Transportation



Pedestrian and Road Safety

← Technological and management solutions for a safe and sustainable transportation system →



Dr. Indumathi M Nambi

PhD, Clarkson University, USA

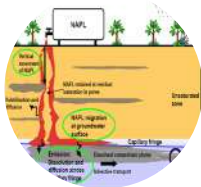
Professor, Civil Engineering

044-2257-4289; indunambi@iitm.ac.in

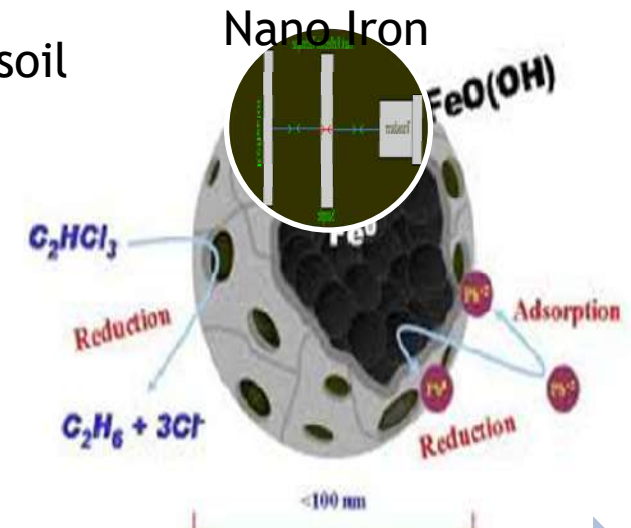
http://www.iitm.ac.in/indu_edu



- Ground Water Contamination including NAPL /Transport and Remediation
- Industrial Wastewater Treatment/Physical and Chemical Processes
- Water and Waste Water /Tertiary treatment for reuse



Mercury entrapped in soil



Experimental Studies span from pore scale to lab scale and field scale

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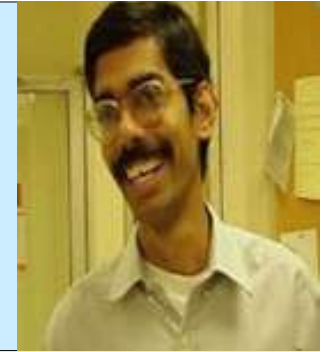
Dr. Karthik K Srinivasan

PhD, The University of Texas at Austin, USA

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044-2257-4282; karthikks@iitm.ac.in

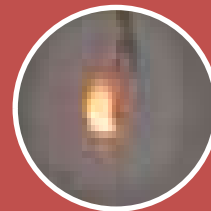
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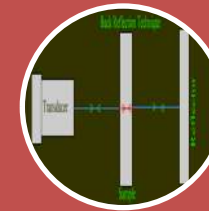
- Travel Demand Modeling
- Transportation Network Optimization and Reliability
- Intelligent Transportation System



Transportation Planning
and Evaluation



Advanced Traveler
Information Systems



Transport Routing and
Congestion Reduction



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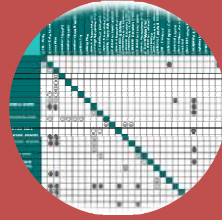
<http://www.civil.iitm.ac.in/people/faculty/koshy/>



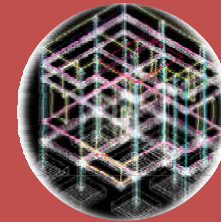
- Automation in Construction
- Design Information Management
- Computer Integrated Project Delivery



Automated Crane
Lift Planning



Design-Construction Interface
Management on Fast-Track Projects



Building Information Modeling for
Lean Project Delivery

Automation and Information Technologies for Built Environment Projects

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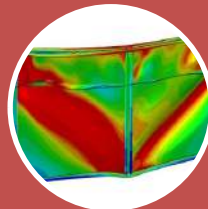


Major Areas of Research

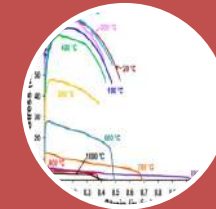
- Stability of steel structures
- Numerical and computational analysis of stability models
- Structural - Fire engineering



Collapse of members due to instability



Analysis of stability models



Structural fire engineering



Dr. Lelitha Devi Vanajakshi

PhD, Texas A&M University, USA

Professor, Civil Engineering

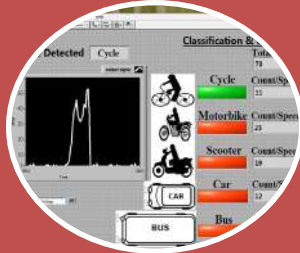
044-2257-4291; lelitha@iitm.ac.in

<http://www.iitm.ac.in/component/faculty/70/lelitha/>

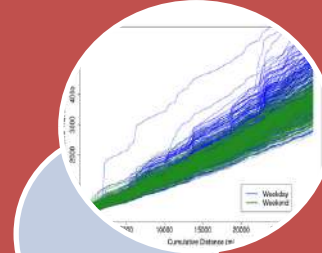


Major Areas of Research

- Traffic Flow Modeling
- Traffic Operations
- Intelligent Transportation Systems



Traffic Data Collection –
Development of sensors,
Evaluation of sensors



Data Collection and Modeling–
Traffic data analysis,
Empirical and mathematical
modeling of transportation
systems



Intelligent Transportation
Systems Applications
–Prototype development and
field implementations

Modeling, Development and Implementations of ITS Solutions for Indian Traffic

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- Bioremediation of Contaminated Water, Soils, Air and Aquifers
- Water Treatment and Rural Water Supply
- Domestic and Industrial Wastewater Treatment, Recycle and Reuse



To cleanup soils , aquifers and air contaminated with organic and inorganic toxic pollutants



Water quality assessment and providing tailor made centralized and point of use water treatment technologies



Sustainable Wastewater management using centralized/decentralized and onsite systems

← Pollution Abatement, Drinking water quality assessment and treatment →



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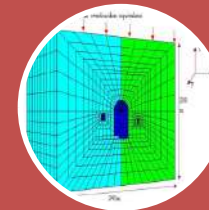
- Rock mechanics / Geotechnical Engineering
- Behaviour of jointed rocks
- Underground excavation and slope stability



Rock mechanics /
Geotechnical engineering



Behaviour of jointed rocks



Underground excavation
and slope stability





Dr. Manu Santhanam

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http://www.civil.iitm.ac.in/new/?q=manu_rp



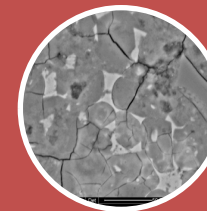
- Chemistry of cementitious materials
- Durability and long term performance of concrete
- Microstructural characterization and non-destructive evaluation of concrete



Special concrete



ND condition assessment



Concrete in aggressive conditions

Research covers this range of aspects related to concrete applications



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Major Areas of Research

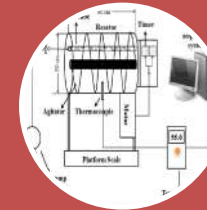
- Water and Wastewater Treatment
- Emerging Contaminants/Micro-Pollutants Removal
- Bioremediation of Contaminated Systems and Biogenic Metal Removal



Technology for Emerging Contaminants/Micro-Pollutants Removal



Membrane Bioreactor for industrial wastewater treatment



Reactor for high-rate composting of solid waste

Application of technologies for water, wastewater and solid waste management

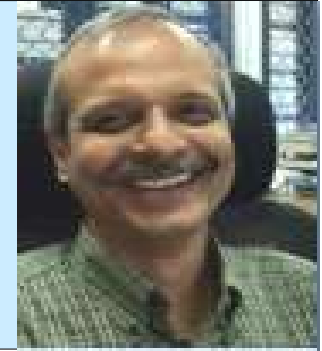
[Back to Top](#)



A MEHER PRASAD

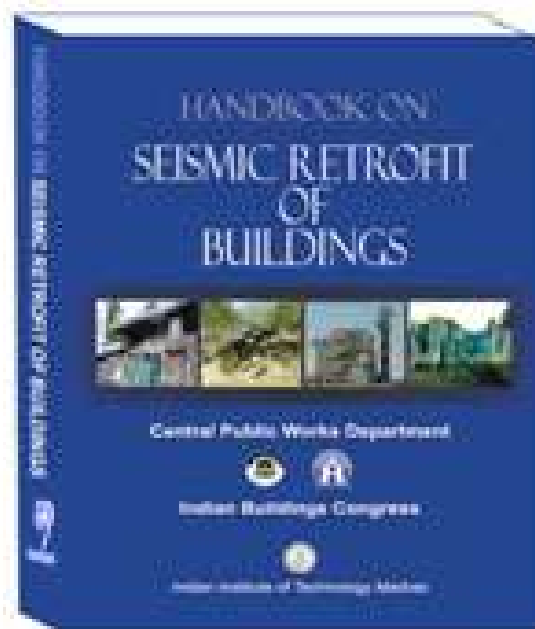
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Major Areas of Interest

- Structural Dynamics
- Structural Analysis & Reliability
- Structural Health Monitoring
- Affordable Mass Housing
- Wind & Earthquake Engineering
- Computational Mechanics





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Areas of Expertise

- Environmental Systems Modeling
- Water and Wastewater Treatment
- Sustainability Engineering
- Environmental Impact Assessment
- Water Resources Systems Modeling
- Hydraulic Modeling of Rivers, and Lakes
- Ground Water Assessment and Modelling

Current Research Works

- Modeling of Ground Level Ozone using Data Mining
- Assessment and Remediation of the Pollution in Wetlands
- Real - time Groundwater Control for Mining Operations
- Treatment of Leachate from Municipal Solid Waste Open Dumpsite using Combined Bioreactor - Composite Block Technique
- Optimization of Water Use and Waste Generation in Pharmaceutical Industries through Green Engineering Principles
- Assessment and modelling the fate of Persistent and Bio accumulative (P&B) Emerging Contaminants (ECs) in wastewater
- Advanced Oxidation Process for Open Dumpsite Leachate Treatment
- Modeling of Microbial Contaminant Transport in Water Distribution Systems
- Municipal Solid Waste Treatment using Bioreactor Landfill Technology
- Effluent Management in Textile Industry
- Development of Integrated Operation of Multi-Reservoir System with Meta Heuristics Modelling
- Treatment of beach sands contaminated during oil-spill
- Plasma Reactor Technology for Hazardous waste Management



Contaminant Transport Modeling & Data Mining



Sustainable Environment and Development



Water, Air, and Land Pollution Abatement

← EARTH ALLOWS YOU TO STAND; LET IT STAND THE WAY IT IS →

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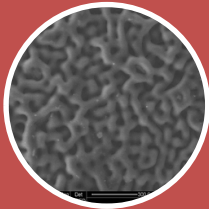


Dr. J Murali Krishnan

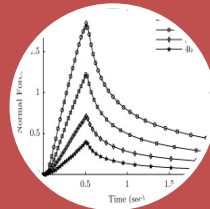
PhD, IIT Madras, India
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- Asphalt Rheology
- Viscoelasticity
- Pavement Engineering



Development of Binders



Non-linear Models



Stress-strain analysis





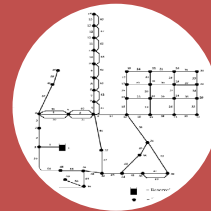
Dr. B S Murty
PhD, Washington State Univ., Pullman, USA
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- Open-Channel Flow Modeling
- Closed Conduit Flows
- Groundwater Resources Management



Modeling of flow and transport of pollutants in open channels for quantity and quality management



Analysis of steady and transient flows in pipe systems, optimal design, condition assessment



Simulation and management models for groundwater resources utilization and aquifer remediation

Computational Hydraulics for Management of Water Resources

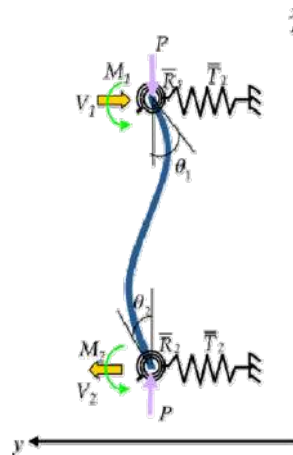
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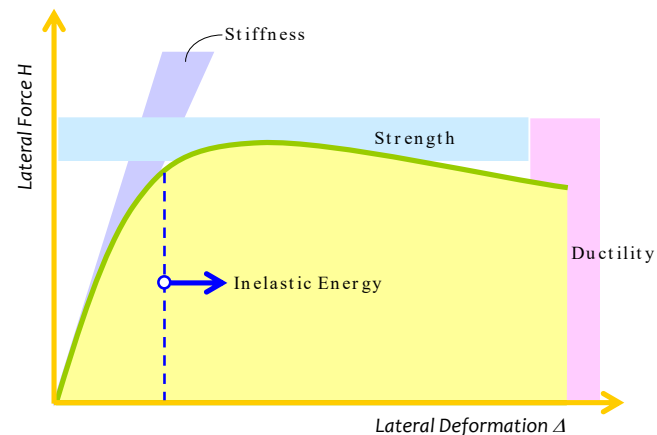
C V R Murty
PhD, CalTech, USA
Professor, Civil Engineering
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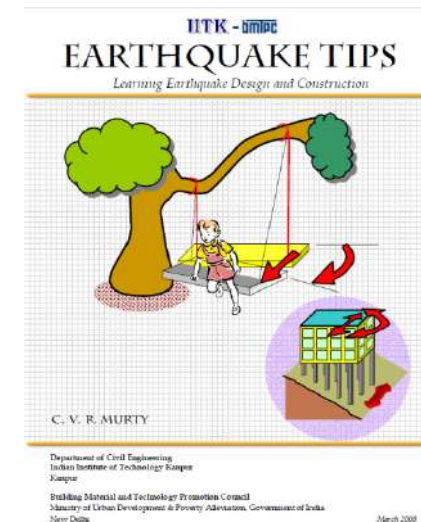
- Nonlinear Seismic Behavior of Structures
- Earthquake-Resistant Design of Buildings and Bridges
- Seismic Design Codes; Books in Earthquake Engineering



**Geometric and
Material Nonlinearity**



**Displacement-Based Seismic Design
Earthquake Engineering**



Codes and Books



Dr. B Nageswara Rao
PhD, University of Iowa, USA

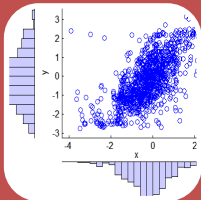
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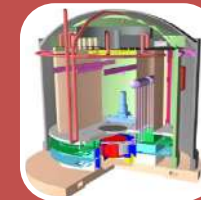
- Computational solid mechanics, finite element analysis, meshless analysis
- Fracture mechanics, micromechanics and homogenization methods
- Structural reliability & optimization, fuzzy structural analysis, dimension reduction methods



Data Analysis–Statistics,
Distribution



FEM/Meshless–Stress/Displ. /
Damage/Fatigue/Creep/
Fracture/Corrosion



Probabilistic Methods,
Reliability, Sensitivity,
Design Optimization, NDE
Scheduling



Dr. Phanisri Pradeep Pratapa

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Major Areas of Research

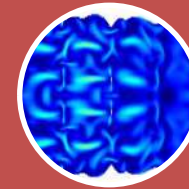
- Origami-based engineering for novel structures and materials
- Meta-materials for civil engineering applications
- Structural dynamics of lattice systems



Design origami lattices
for target properties



Explore the mechanics of
lattice systems



Understand the dynamics
of lattice structures

← Lattice-based structures and materials for engineering applications →



Dr. Piyush Chaunsali

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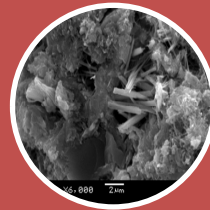


Major Areas of Research

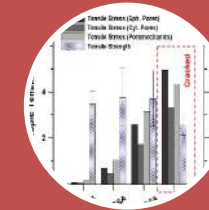
- Cement chemistry and concrete durability
- Processing-microstructure-performance relationships of low CO₂ cements
- Characterization of industrial by-products for their beneficial reuse



Synthesize low CO₂ cements from industrial by-products



Develop Processing-microstructure-performance relationship



Large-scale application and performance modeling

← Valorization of industrial by-products in novel cementitious materials →

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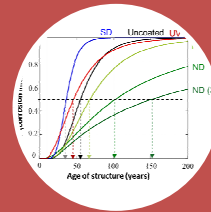
Dr. Radhakrishna G Pillai
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- Understanding corrosion and its effects on concrete structures
- Testing/modelling the corrosion & durability parameters of concrete structures
- Durability of repairs & cathodic protection in concrete structures



Assessing corrosion in concrete structures



Estimating service life of concrete structures



Extending service life of concrete structures

Protecting and saving concrete structures from the menace of corrosion

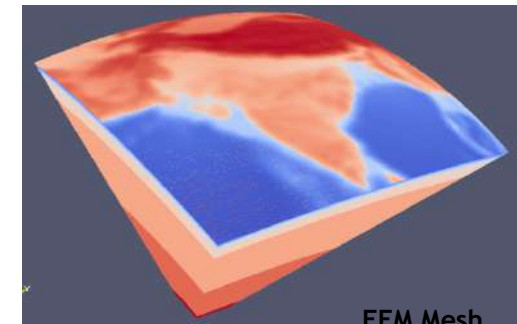
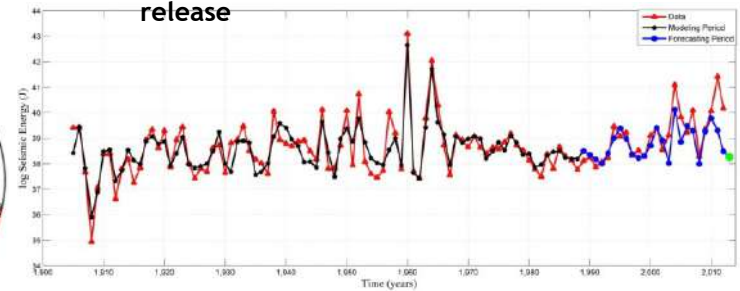
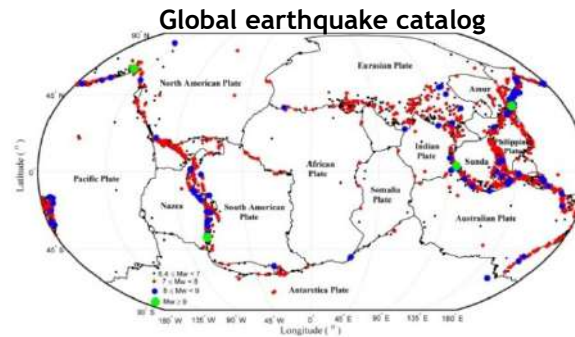


Dr. Raghukanth S T G
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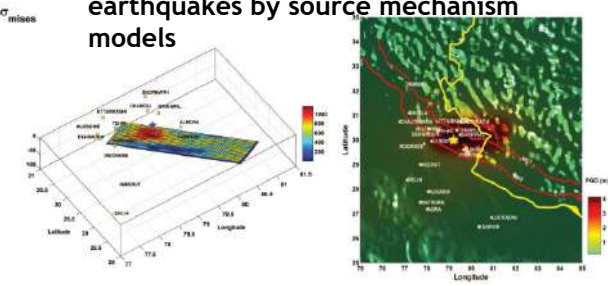
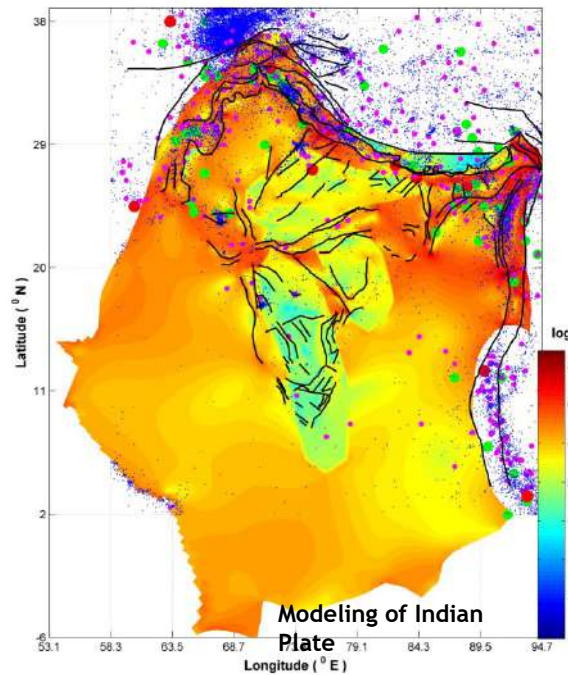
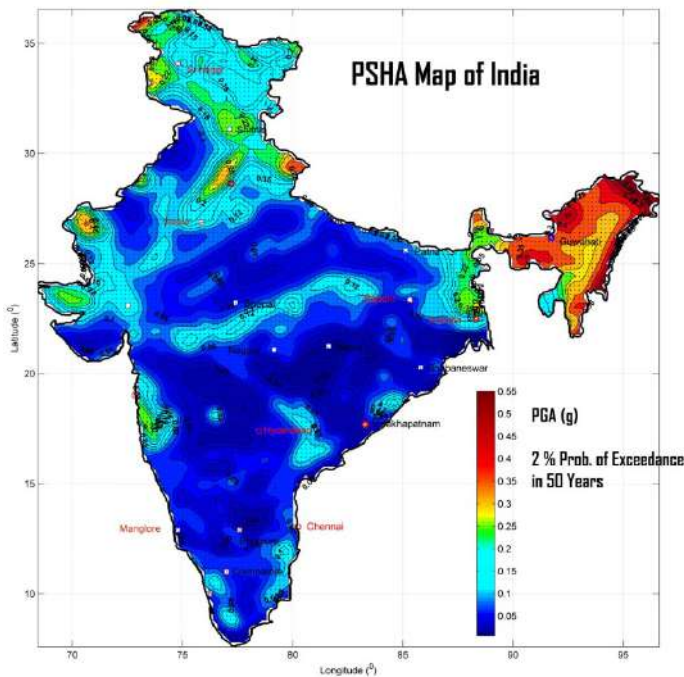


- Natural Hazards
- Risk Assessment
- Wave Propagation
- Structural Dynamics
- Earthquake Engineering

Forecasting of Global earthquake energy release



Ground motion simulation for earthquakes by source mechanism models



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- Geosynthetics and Reinforced Soil Structures
- Ground Improvement
- Finite Elements applied to geomechanics



Geosynthetics for Sustainable Shoreline Protection



Construction of Expedient Road Bases



Construction of Very High Retaining Walls using Geosynthetics



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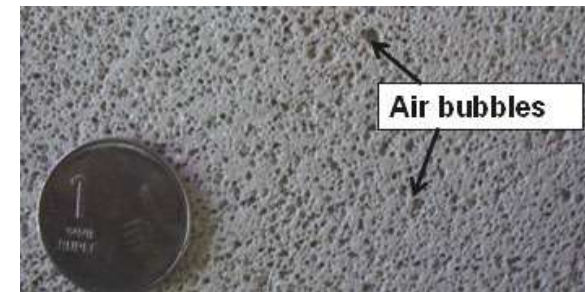


Major Areas of Research

- Lightweight ash based aggregates
 - Aggregate manufacturing procedures
 - Quality assessment of fly ash aggregates
- Aerated & foam concrete blocks/bricks
 - Manufacturing procedures
 - Effect of admixtures on engg. properties
- Interlocking brick masonry
 - Increasing the construction speed
 - Strength of masonry units/systems



Sintered & cold-bonded fly ash aggregates



Aerated concrete system



An Interlocking Block Masonry System

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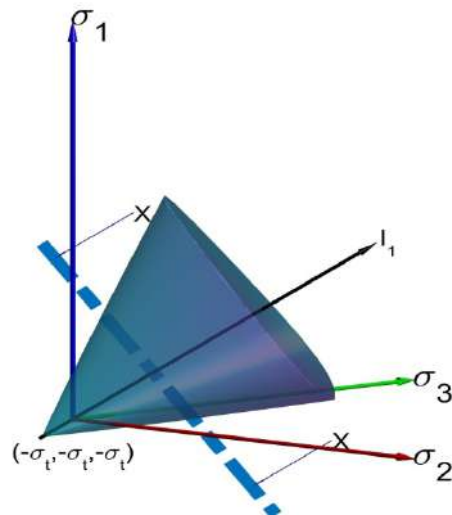


Ramesh Kannan Kandasami, PhD,
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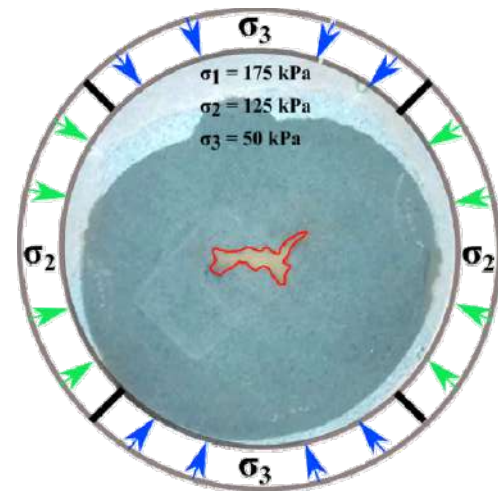


Areas of research:

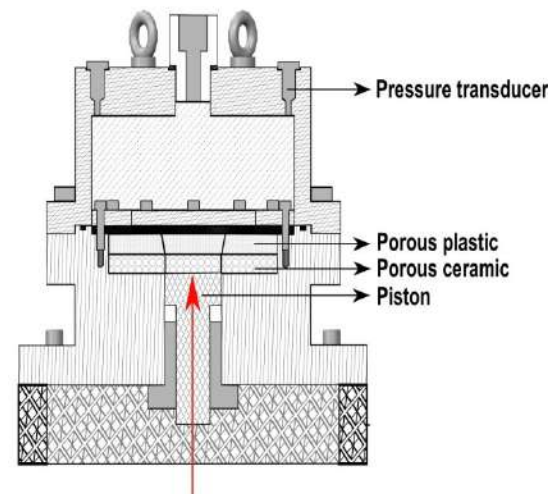
1. Constitutive behavior of transitional geo-materials
2. Hydraulic fracturing
3. Wellbore strengthening
4. Bio-inspired geotechnics



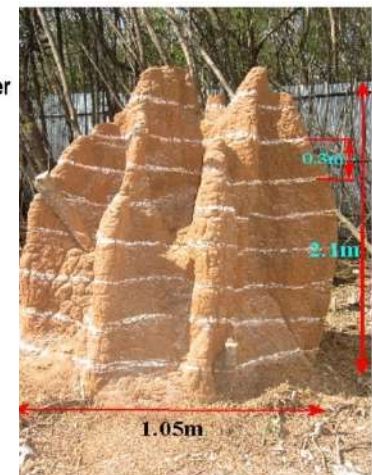
Failure locus for cohesive-frictional geo-materials



Fracture propagation in an anisotropic granular system



Rupture device to determine the strength of filter cake across different fracture width



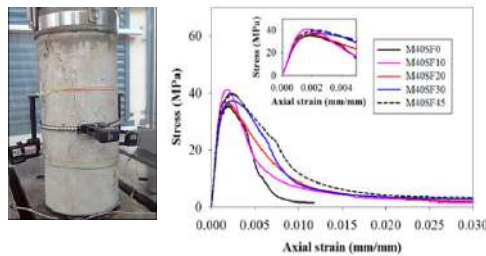
Strength and stability of termite mounds



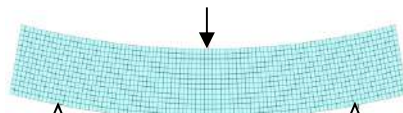
Dr. Ravindra Gettu
 PhD, Northwestern University, USA
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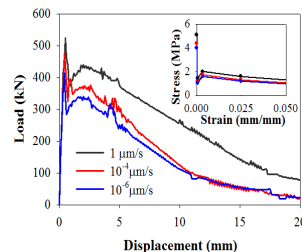
- High Performance concrete, Self Compacting Concrete
- Fibre and Textile reinforced Concrete
- Sustainability assessment of concrete systems



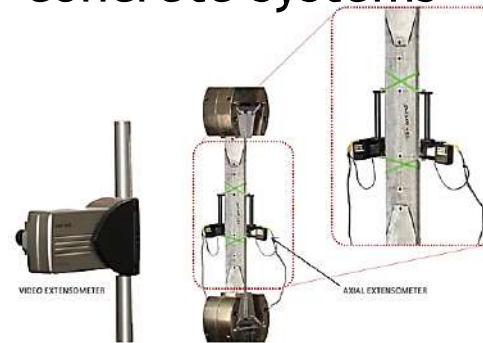
Compressive stress-strain response



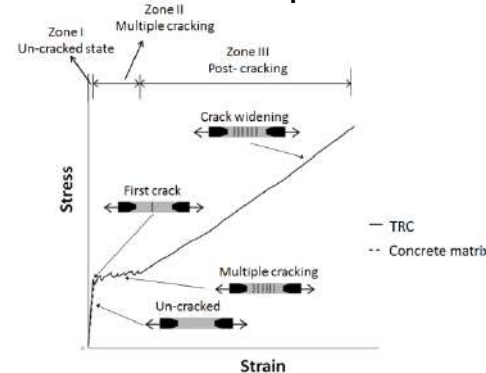
Finite element modelling of FRC tunnel segment



Flexural and tensile (inset) response



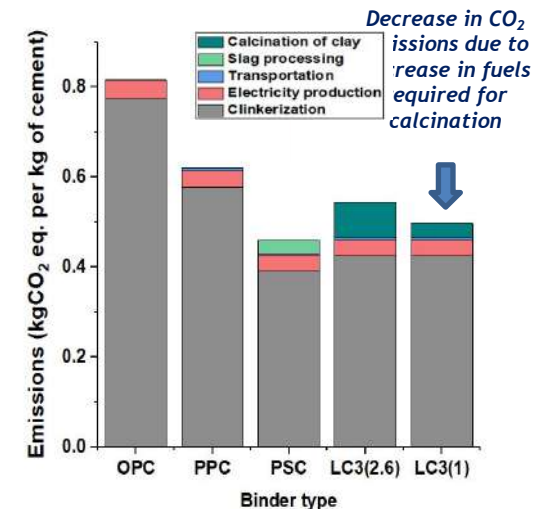
Tensile test setup for TRC



Typical response of TRC with 4 layered textile under tensile loading



Flexural creep testing



LCA of different cements (Indian case)

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Dr. R G Robinson

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- Soft Clay Engineering
- Ground Improvement
- Physical modelling



Vacuum consolidation



Piles in expansive soils



Flowable fills

← GEOTECHNICAL ENGINEERING →

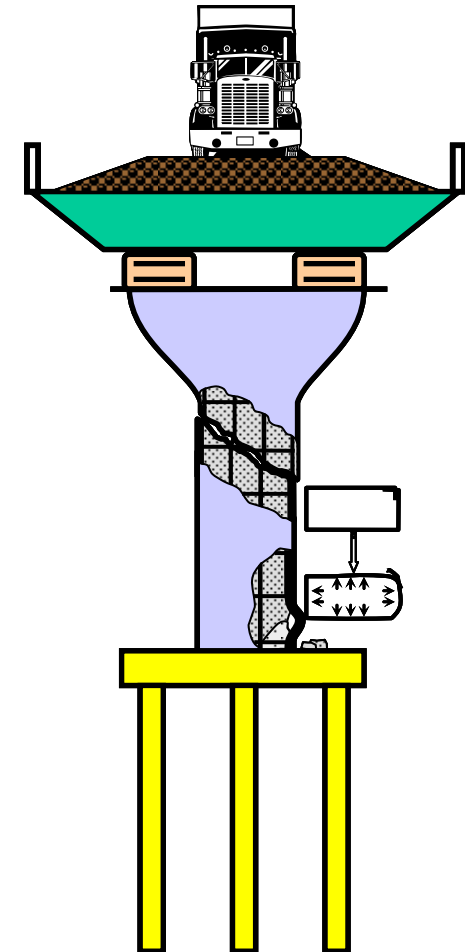
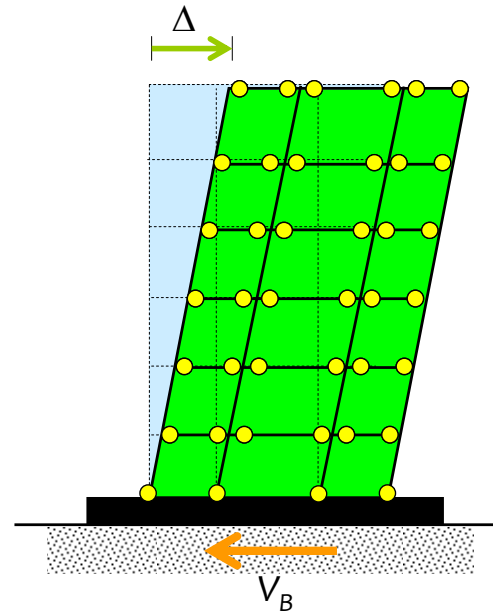
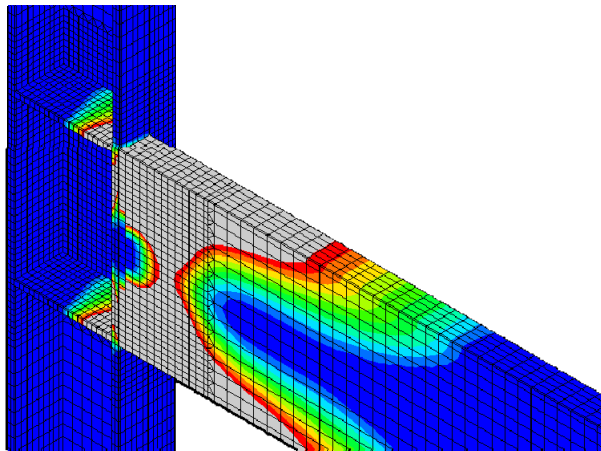
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- Earthquake Resistant Design of Buildings and Bridges
- Nonlinear Behaviour of Structures
- Steel Structures



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Dr. Sachin S Gunthe

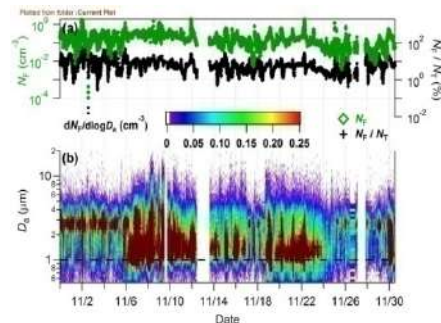
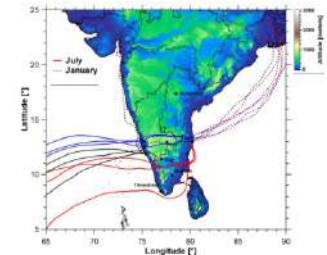
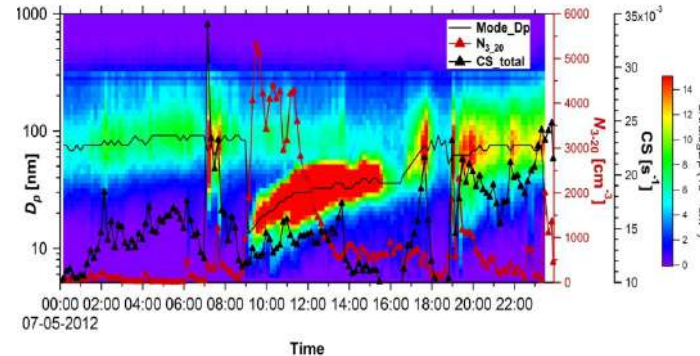
PhD, Indian Institute of Tropical Meteorology, India
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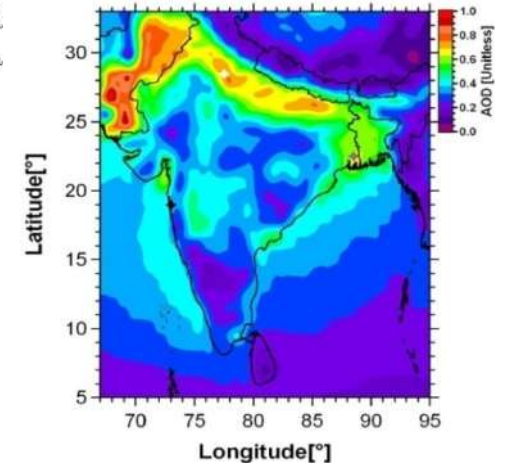
- Properties and interaction of atmospheric aerosols including bioaerosols
- Role of atmospheric aerosols in Earth system science
- Aerosol cloud precipitation interaction - Indian monsoon



Field campaigns



Laboratory studies



Numerical simulations



Dr. U Saravanan

PHD, Texas A&M University, USA

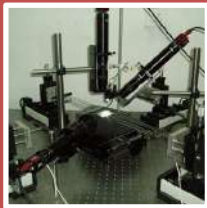
Professor, Civil Engineering

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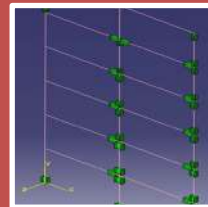
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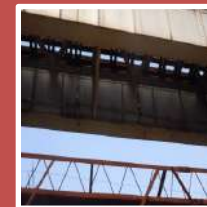
- Constitutive modeling
- Nonlinear analysis
- Structural health monitoring



Setup for testing elastomers



Hybrid model for analyzing frames



Determining load spectrum on a rail bridge

← Next generation constitutive models and analysis algorithms for safer and economical design →



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- Structural Engineering / Design of Steel Structures
- Structural Engineering / Earthquake Resistant Design & Seismic Testing



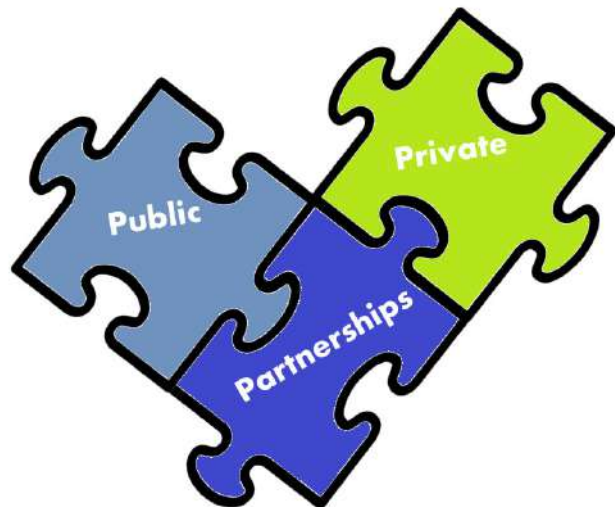


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Major Areas of Research

- Infrastructure & Construction Project Management
- Public Private Partnerships - Risk Management, Capacity Building
- Construction Procurement & Contracts
- Construction Mechanisation





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RESEARCH INTERESTS

URBAN AIR QUALITY MANAGEMENT	Emission inventory, air quality monitoring, modelling , source-receptor modelling and control strategies
VEHICULAR POLLUTION MODELLING	Deterministic, statistical and artificial neural network approaches
INDOOR AIR QUALITY	Monitoring, modelling and control strategies
INDUSTRIAL AIR POLLUTION CONTROL	Design of air pollution control equipments and environmental impact assessment
ENVIRONMENTAL DATA ANALYSIS	Multivariate data analysis and environmental auditing

Urban Air Quality Management

Indoor Air Quality Management

Industrial Pollution Control

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Dr. Sivakumar Palaniappan

PhD, Arizona State University, USA

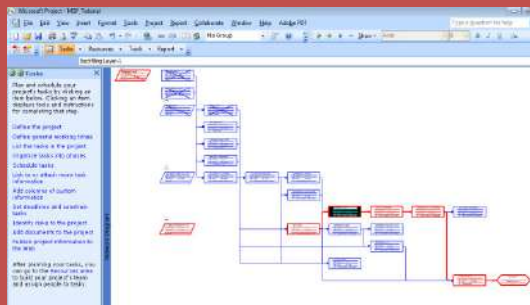
Assistant Professor, Civil Engineering

044-2257-4258; sp@iitm.ac.in

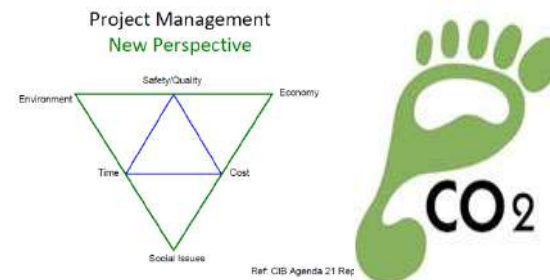
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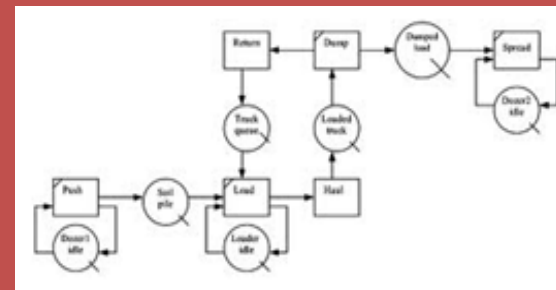
- Construction Project Planning and Control, Information Technology Applications in Project Management
- Sustainable Construction: Life cycle energy use in buildings, carbon footprint of construction processes
- Modelling and Simulation of Construction Processes using discrete event simulation



Planning, Monitoring and Control of Construction Projects



Energy use and carbon emissions of construction processes



What-if scenarios evaluation for construction planning using discrete event simulation

← Construction Project Management, Sustainability in Construction, Modelling and Simulation →



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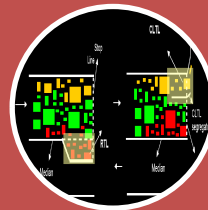
<http://www.iitm.ac.in/component/faculty/70/rsiva/>



- Congestion Management
- Traffic Simulation and Analysis
- Intelligent Transportation Systems (ITS)



Congestion Analysis Using
GPS, Traffic Management



Microscopic Simulation of
Heterogeneous Traffic,
Capacity Analysis



ATMS and ATIS Modelling
and Evaluation

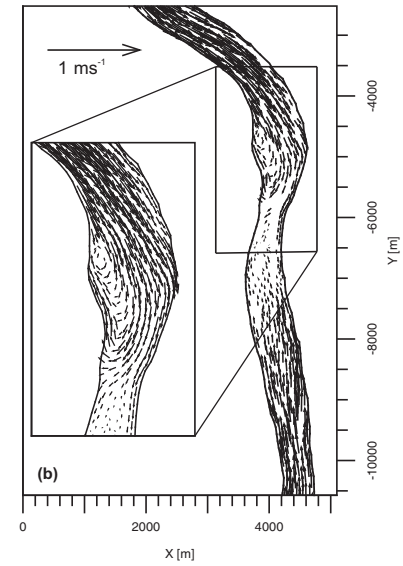
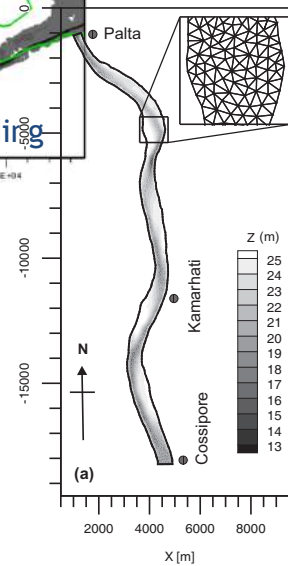
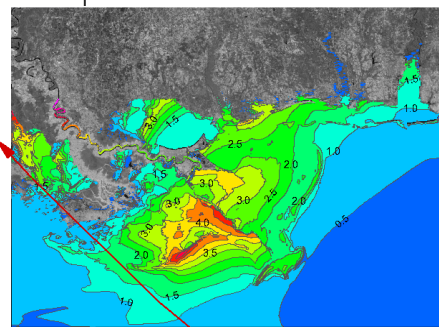
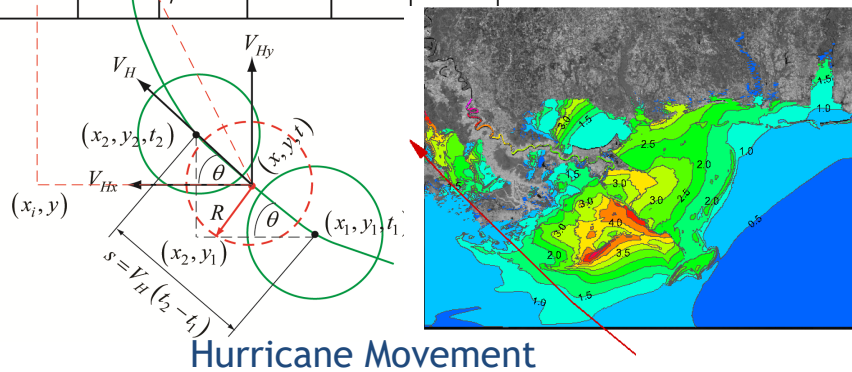
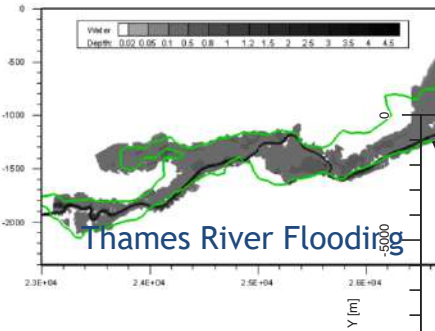
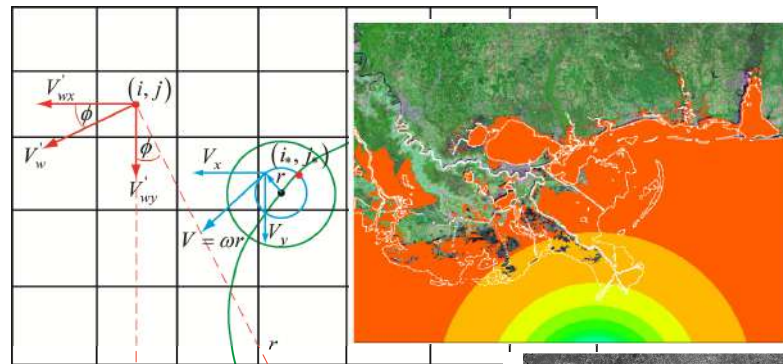
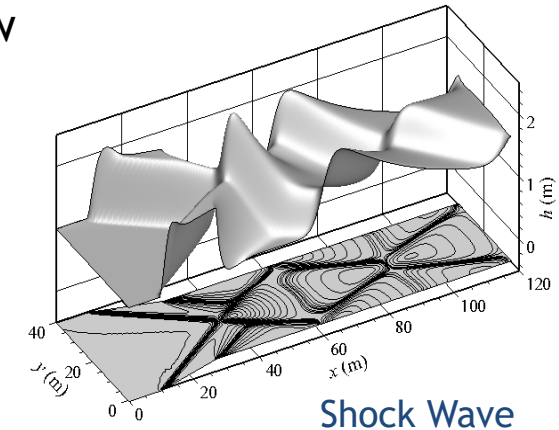
← Traffic Analysis and Management, Intelligent Transportation Systems →



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- Computational hydraulics - river, coastal and dam-break flow
- Modelling of hurricane and tsunami wave propagation
- Modelling of sediment transport in rivers and coasts
- Experimental study on dam-break and river flow



River Flow

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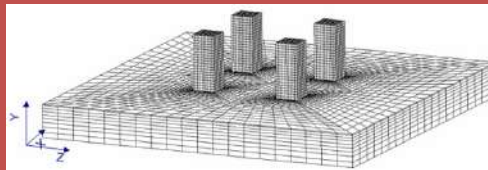
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- Soil Dynamics and Earthquake Engineering
- Constitutive Relationship of Soil
- Finite Element Modelling
- Physical modelling and laboratory testing



Centrifuge Modelling



Numerical Simulations for
Large Scale Problems



Safe and Economic
Design

Advanced earthquake resistant design of foundation



Dr. K P Sudheer

PHD, IIT Delhi, India

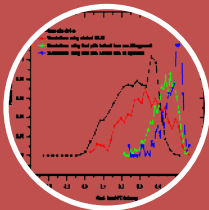
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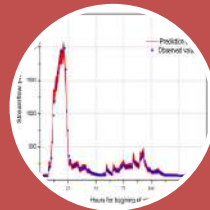
<http://www.iitm.ac.in/component/faculty/70/sudheer>



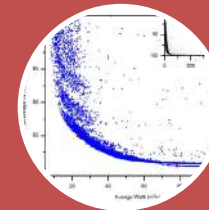
- Hydrologic Modeling
- Predictions in Ungauged Basins (PUB)
- Uncertainty and Sensitivity Analysis



Distributed Hydrological
Models for PUB



Hydrologic Prediction
Band



Construction of
Prediction band

← Employing Distributed Hydrological Models for Water Resources Assessment →

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- Pavement Material Characterization
- Cement Concrete Pavements
- Recycling of C&D Waste, Agricultural & Industrial Waste



Pavement Demolition Waste



Concrete Pavement



Agricultural Waste (Bagasse Ash)



Building Demolition Waste



Pavement Structural
Evaluation via FWD



Field Instrumentation to Evaluate
Load & Warping Stresses [Back to Top](#)



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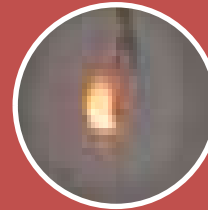
<https://www.iitm.ac.in/info/fac/tarunnaskar>



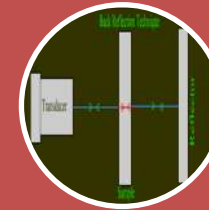
- NDT
- Inverse Analysis
- Surface Wave Propagation



Subsurface exploration



Non Destructive Testing



Signal Processing

BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH

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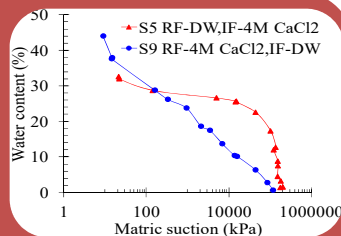
- Unsaturated soil behaviour
- Ground improvement
- Geoenvironmental engineering



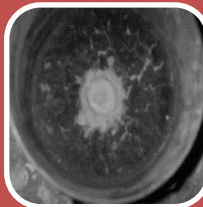
SWC Cell

Ongoing research:

Physico-chemical effects on soil-water characteristic curves of compacted and geosynthetic clay liners



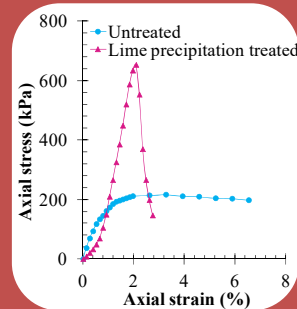
SWCCs



Lime slurry permeation

Ongoing research:

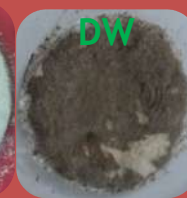
Deep stabilization of expansive soils by lime precipitation technique



Stress-strain curves



GCL



GCL after 2nd drying



Ongoing research:

Effect of physico-chemical factors on behavior of compacted and geosynthetic clay barriers
Effect of physico-chemical factors on collapse behaviour of soils



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- Pavement Engineering / Pavement Management System
- Sustainable Road Infrastructure / Recycling of Pavement Materials
- Traffic Engineering and Management / Road Safety



Pavement Maintenance and
Asset Management of Road
Infrastructure



Recycling of Pavement
Materials for Sustainable
Road Infrastructure



Engineering Measures to
Enhance Road Safety Under
Mixed Traffic



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➤ Major Areas of Research

- Process based eco-hydrological models of vegetated land surfaces
- Climate change impact on food and water security
- Experimental manipulation of crop micro climate environment



Develop an experimental greenhouse facility to study plant behavior under various microclimatic conditions



Develop a high resolution 3D explicit architecture plant canopy and root system ecohydrological model



Predict impact of climate change on future food and water security and suggest mitigation measures

← Predict the response of vegetation under abiotic stresses and climate change →

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- Experimental Hydraulics
- Sediment Transport
- Cohesive Sediment Dynamics
- River Training and Scour Protection Works



Acoustic Doppler
Velocimeter
(Velocity measurement)



Annular flume
(to study about sediments)



Field application

Laboratory to field to prevent sediments at hydraulic structures



INDIVIDUAL FACULTY PROFILE

**DEPARTMENT
OF
COMPUTER SCIENCE
& ENGINEERING**



Dr. Akanksha Agrawal

Ph.D., University of Bergen, Norway

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Parameterized Computational Geometry

Parameterized Complexity

A paradigm to deal with hard problems. Each instance has an integer called the parameter.

Typical Goals:

Fixed parameter tractability: Limit the exponential factor in the runtime of the algorithm to the parameter alone.

Kernelization: Polynomial time preprocessing algorithm to reduce the instance size to a function of the parameter.

Computational Geometry

Some problems from the field, to be studied in the realm of Parameterized Complexity:

Fundamental Visibility Problems: Art Gallery and Terrain Guarding, and their variants.

Graph Modification to Geometric Graphs: Make at most k modification to the given graph, to obtain geometric graphs like Delaunay graphs, geometric intersection graphs, etc.

Classical Graph Problem on Geometric Graphs: Obtain (more) efficient algorithms for classical graph problems when restricted to geometric graphs like unit disc graphs, unit square graphs, etc.



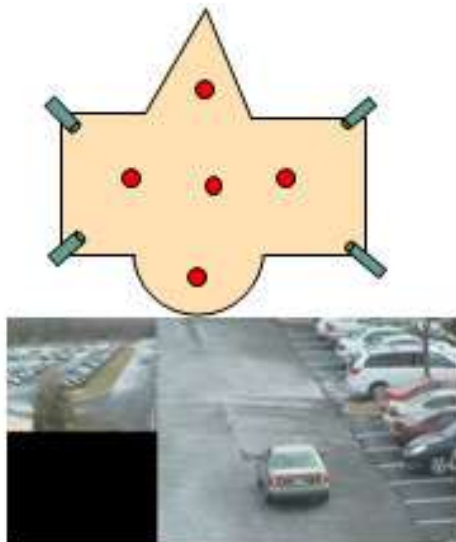
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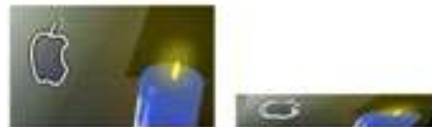


Computer Vision

- Multi-Camera Security and Surveillance
- Contour-based Object Detection & Recognition
- Feature Detection and Description



After Stitching





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Primary areas of Research

- Algorithmic Machine Learning
- Learning to Rank
- Multi Armed Bandits

Application Domains of Interest

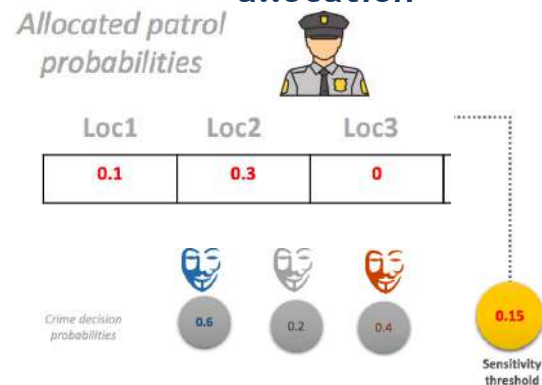
- Education
- Healthcare
- Transportation

Research directions

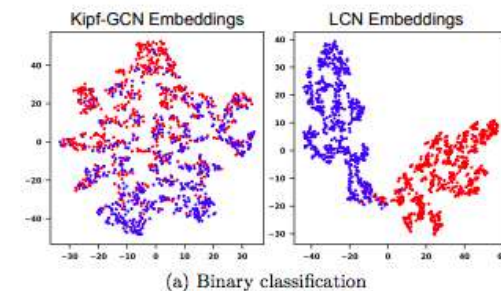
Optimal and efficient ranking from pairwise comparisons



Combinatorial Semi Bandits Algorithms for resource allocation



Learning Representations on Graphs and Networks



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Dr. Ayon Chakraborty

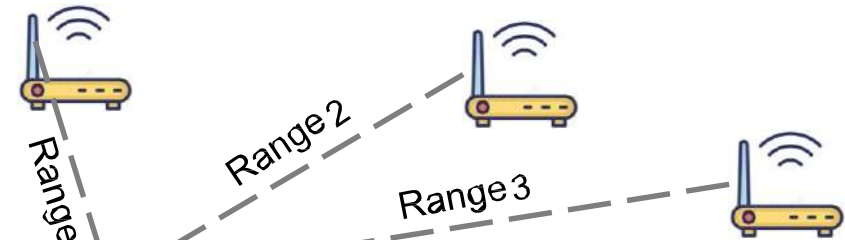
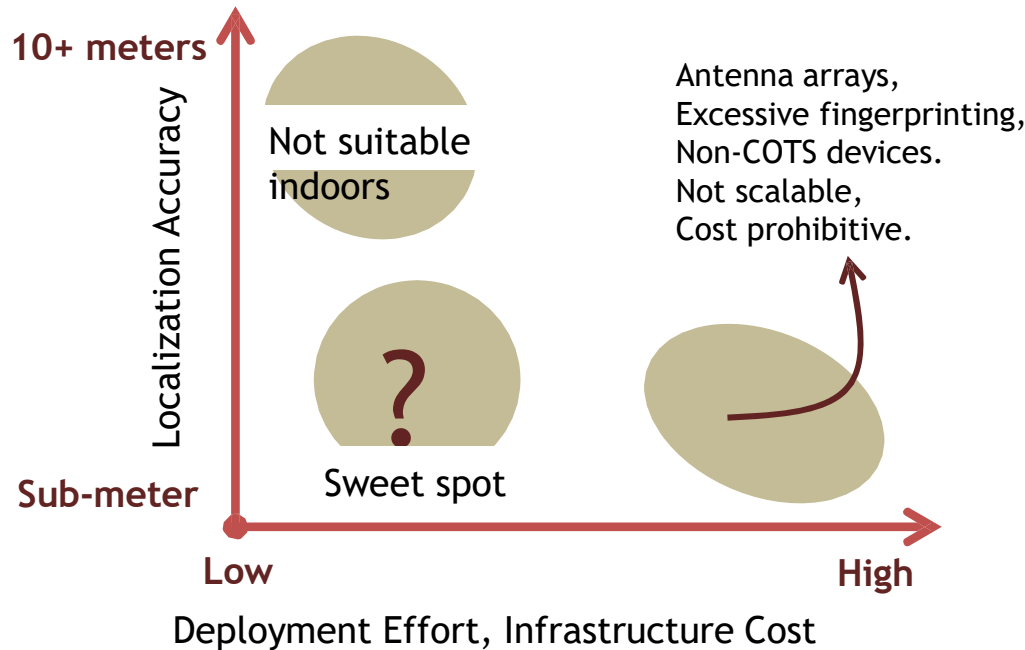
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Wi-Fi Based Indoor Localization



Ranging: Range is obtained from Wi-Fi Time-of-Flight (ToF/FTM) estimated on-chip directly from the channel impulse response (CIR). FTM: Fine Time Measurement

Localization: The APs are situated at known locations. “Accurate” range estimates from the client device to the three APs is good to estimate the device’s exact location.

However, Ranging Accuracy =

$F(\text{LOS / NLOS, channel bandwidth, user mobility})$

Build testbed suitable for conducting ToF / range estimation experiments (using Wi-Fi FTM enabled radio/drivers)

Evaluate ranging accuracy as a function of NLOS / LOS environments, indoors/outdoors, channel bandwidth and user mobility.

Develop end-to-end system for evaluation of tracking accuracy for a mobile user in various outdoor / indoor settings.

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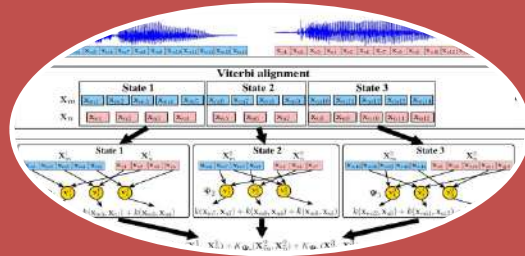
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044-2257-4363; chandra@cse.iitm.ac.in

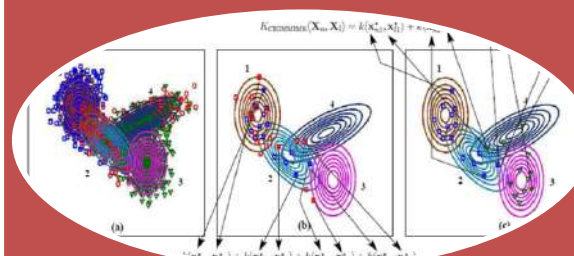
<http://www.cse.iitm.ac.in/chandra>



- Machine Learning for Speech Technology
- Kernel Methods for Pattern Analysis
- Content based Information Retrieval



Support Vector Machines based Approaches to Acoustic Modeling for Speech Recognition



Design of Dynamic Kernels for Speech and Image Data



Scene Image Retrieval using Kernel Methods



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Major Areas of Research

- **Hardware Security**
 - Side Channel Analysis
 - Hardware Trojans
 - PUFs
- **Cryptography**
 - Implementations in Hardware and Software
- **Operating Systems**
 - Secure Operating Systems Design



Dr. Deepak Khemani

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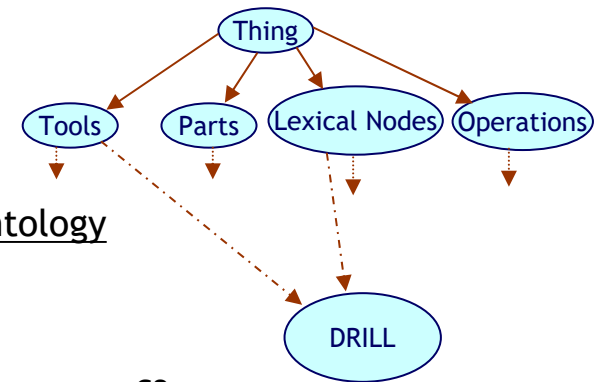
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- Artificial Intelligence/Knowledge Representation and Reasoning
- Artificial Intelligence/Automated Planning
- Artificial Intelligence/Memory Based Reasoning



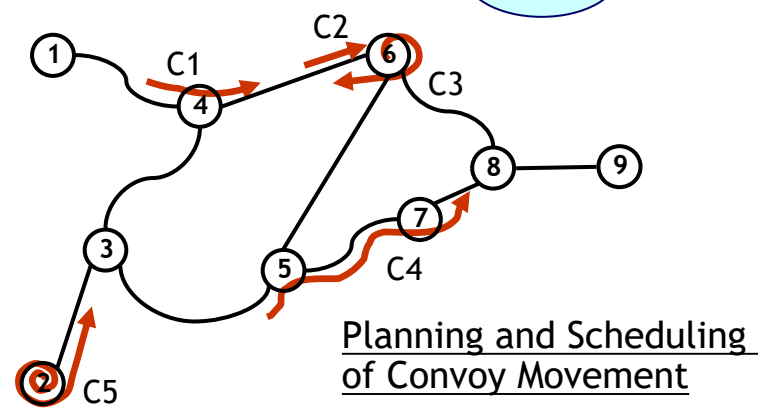
Automotive Ontology

Retrieve
Reuse
Record
Revise & Retain
Case Base

Marketing Design
Training
Analysis

Sl. No.	Case No.	Case Title	Case Description	Case Status
1	001	Soil Test Report	...	...
2	002	...	...	...
3	003	...	...	...
4	004	...	...	...
5	005	...	...	...
6	006	...	...	...
7	007	...	...	...
8	008	...	...	...
9	009	...	...	...
10	010	...	...	...

Knowledge Management with Case Based Reasoning



Planning and Scheduling of Convoy Movement

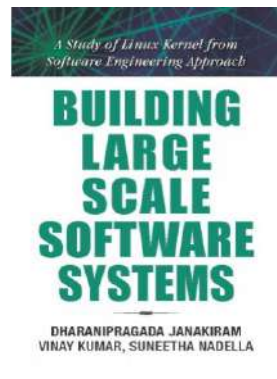
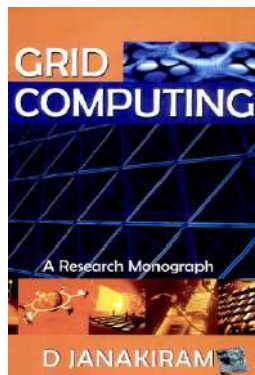


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Major Areas of Research

- Distributed Systems, Grid Computing and Cloud Computing
- Service Oriented Architectures for Operating Systems
- Big Data Analytics and Database Systems
- Internet of Things (IoT)
- Sensor Device Integration into Cloud Systems
- Android Security
- Research Challenges in Building Large Scale Software Systems



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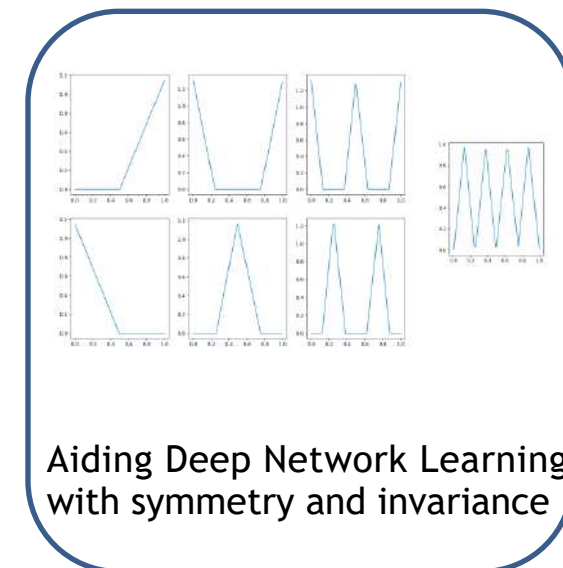
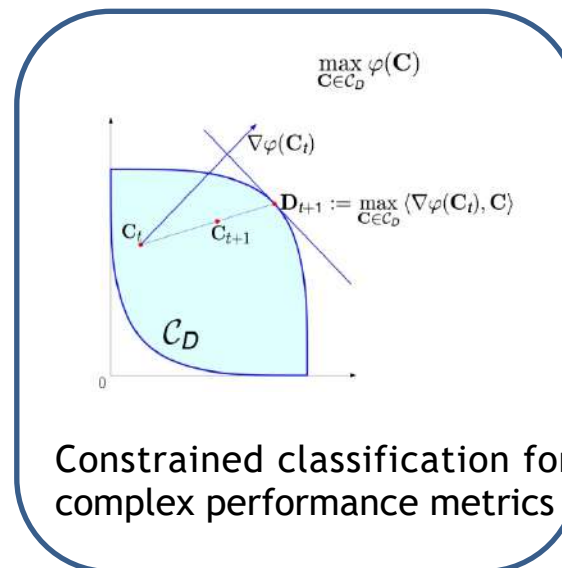
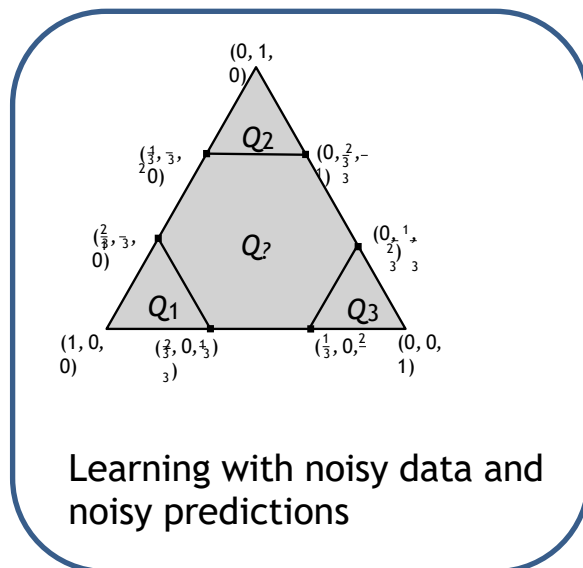


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Major Areas of Research

- Machine learning with Noisy/Weak Labels
- Theoretical Foundations of Deep Learning
- Optimising Complex Performance Measures in Machine Learning



Geometry and Optimisation based approaches for Machine Learning

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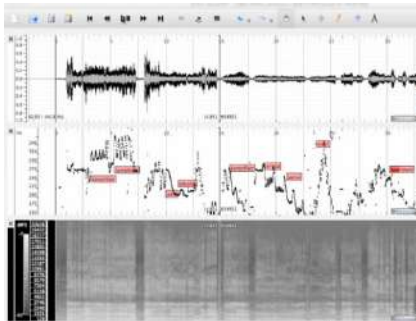
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- Speech and Music Signal Processing
- Network Traffic Analysis
- Machine learning for Speech, Music, Network Traffic Data

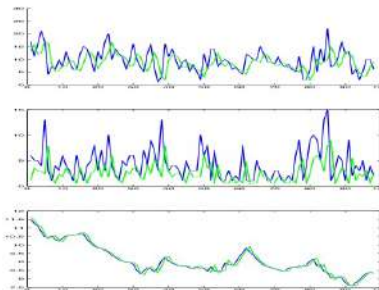


Music Analysis

- Tonic identification
- Motif discovery
- Transcription of Mridangam strokes

IBM Faculty Award 2006

Rais Ahmed Moerial Lecture Award 2012

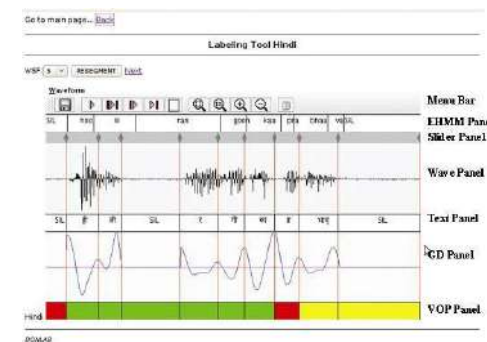


Network tranffic analysis

- User profiling
- Anomaly detection
- Topic Analysis

Screen Reader: Manthan Award Finalist 2012

TTS: GE Research Innovation Award 2013



Speech Processing

- Segmentation of speech
- Speaker Verification
- Keyword spotting

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Dr. Jayalal Sarma

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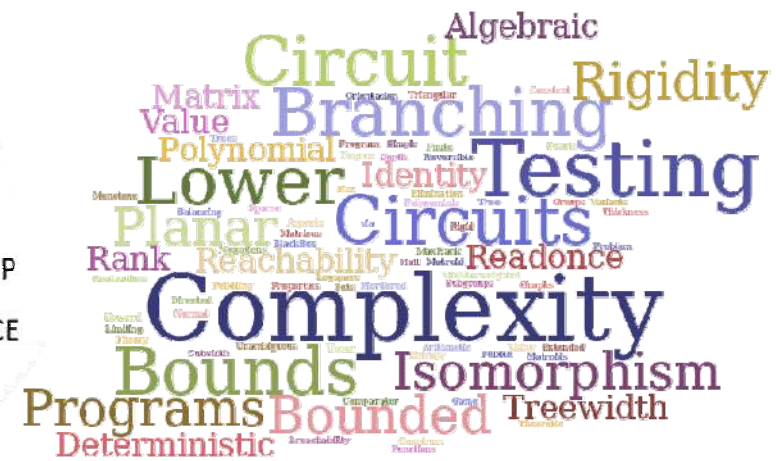
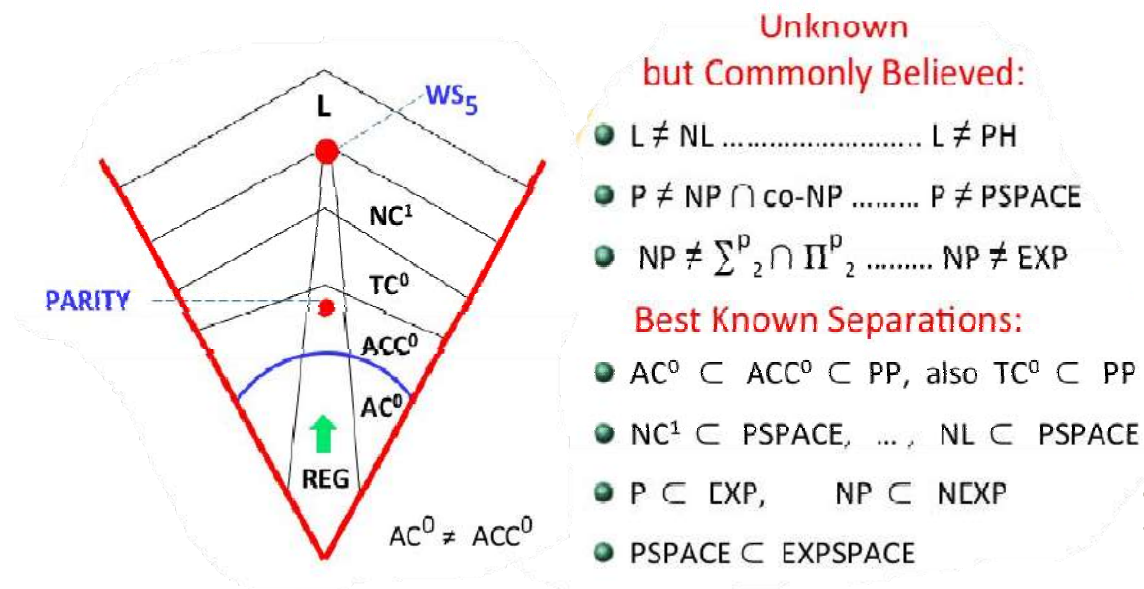
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Areas of Research:

- Theoretical Computer Science, Computational Complexity Theory
- Structural, Arithmetic & Boolean Circuit Complexity
- Algebra and Computation, Pseudo-randomness, De-randomization





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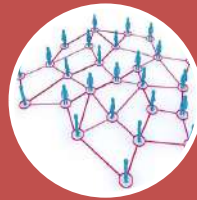


Algorithms at large including:

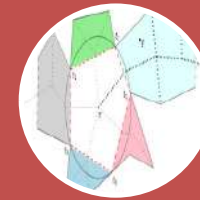
- Distributed Algorithms
- Computational Geometry
- Online Algorithms



Big Data



Networks



Geometry



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V. Kamakoti specializes in the areas of VLSI Design and Computer Architecture. His specific interests include power-aware design and testing of digital circuits, secure compute and network architectures, wireless sensor networks and thermal imaging based embedded systems for medical diagnosis.

He is one of the co-founders of the Reconfigurable Intelligent Systems Engineering (RISE) group. The RISE Lab is involved in development of indigenous secure computing and networking platforms.



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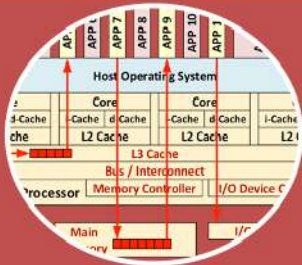
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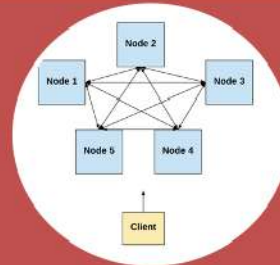
<http://kartiknagar.github.io>



- Automated Formal Verification
- Program Analysis
- Programming Languages



CONCURRENT
SYSTEMS



DISTRIBUTED
SYSTEMS



SECURITY
AGAINST ATTACKS

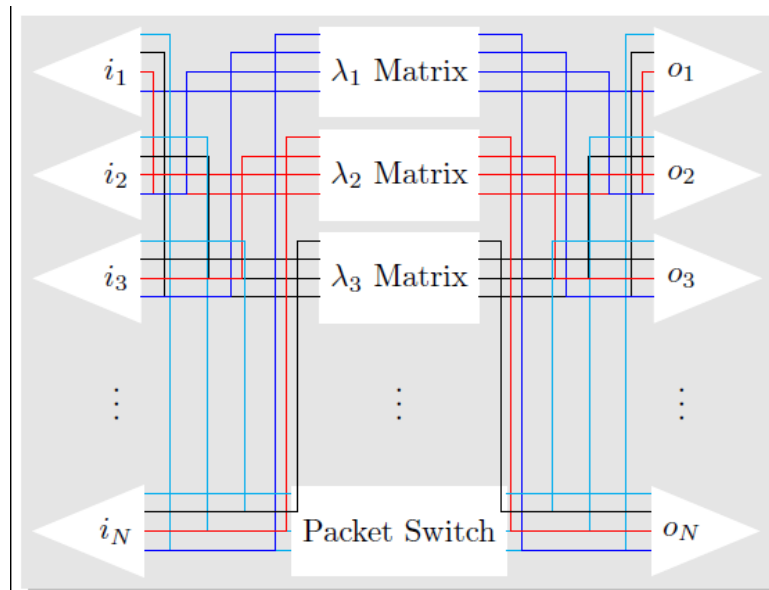
← PROVABLE SAFETY AND SECURITY OF MODERN COMPUTING SYSTEMS →



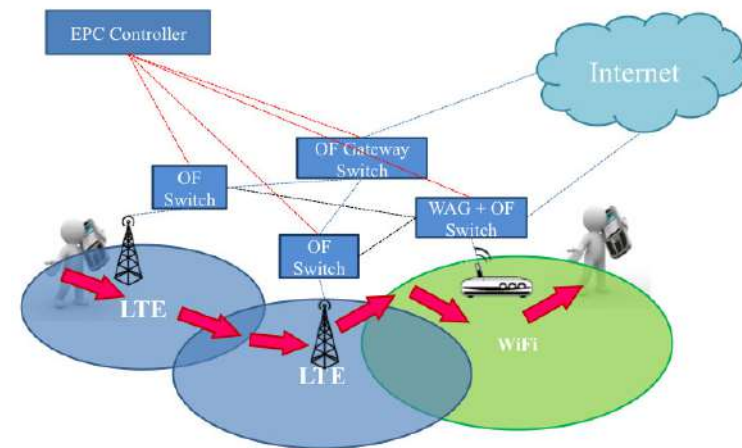
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- Computer Networks: Software Defined Networking, Data Center Networks
- Computer Networks: Wireless Networks, Optical Networks



Hybrid Optical-Packet DCN Switch



SDN Based LTE EPC

Network Protocols and Algorithms: Design, Analysis and Implementation



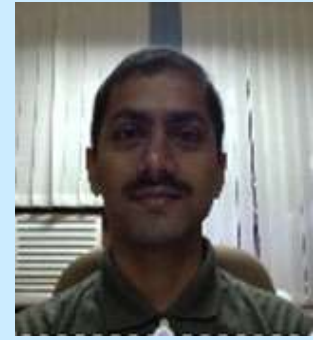
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- Compiler Optimizations - Optimizations for multicore systems
- Compiler Optimizations - Semantics preserving optimizations.
- Language design for performance and programmability.
- Software security - Security for mobile applications

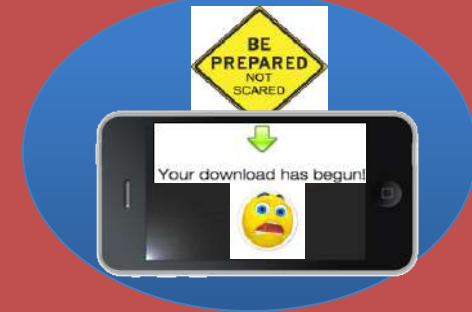


Serial programs and
Multicore systems

\$ g++ a.cc -o a.out

Q: a.cc == a.out?

Semantics preserving
compilers



Secure Mobile Apps

← Performance, Programmability and Security in Software Systems →

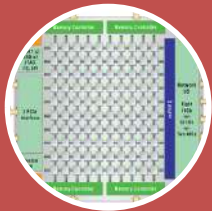
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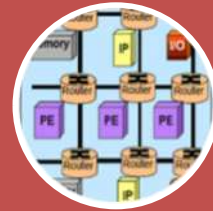
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<http://www.iitm.ac.in/mutyam>



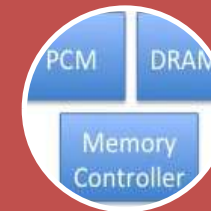
- Multi-core Architectures
- Network-on-Chip
- Emerging Memory Technologies



Shared resource
management in multi-core
processors



Optimizing communication
among cores of a multi-
core processor



Dealing with hybrid
memory systems



Dr. Manikandan Narayanan

Associate Professor, Computer Science & Engg. (CSE)
Core Faculty, Initiative for Biological Systems Engg. (IBSE)
Robert Bosch Centre for Data Science and AI (RBC-DSAI)

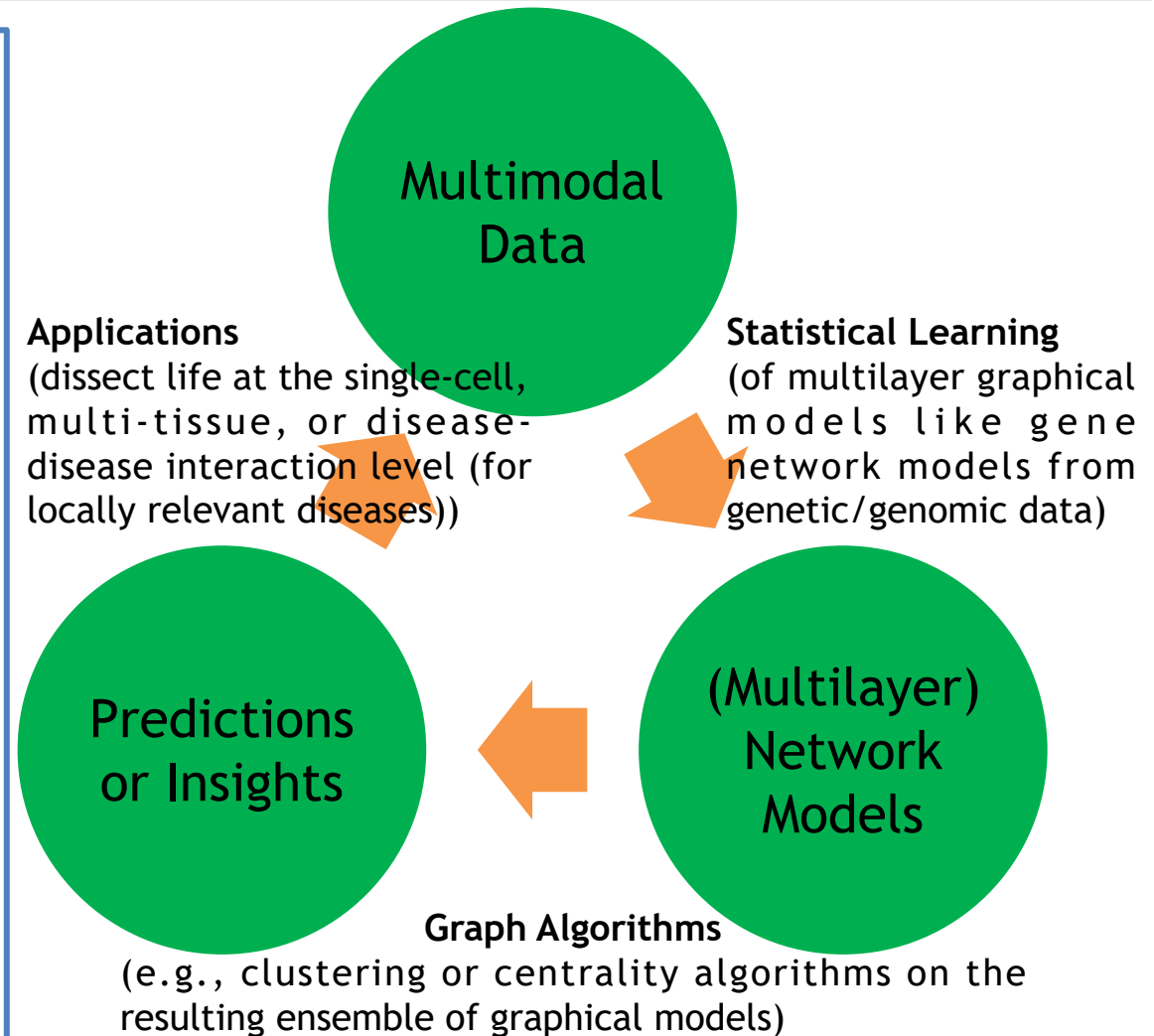
044-2257-4375; nmanik@cse.iitm.ac.in
<http://www.maninarayanan.com>



Major Areas of Research

Computational methods (multilayer graphical models, ensemble graph algorithms) that've crucial applications in biology and beyond!

- Bioinformatics and Computational Biology; Systems Biology/Genomics of Health and Disease
- Complex (Multilayer) Network Models and Graph Algorithms; Integrative Data science



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Dr. Meghana Nasre

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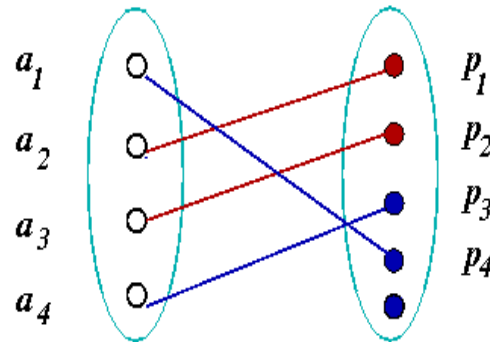
<http://www.cse.iitm.ac.in/~meghana>



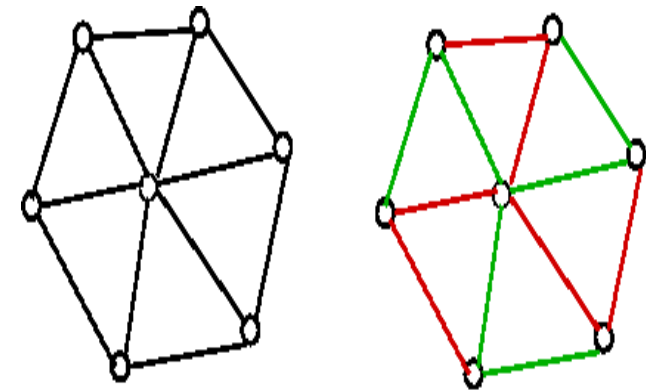
Major Areas of Research

- Graph Theory, Algorithms
- Matchings in graphs under preferences

	p_1	p_2	p_3	p_4	p_5
a_1	1	2	4	3	
a_2	1	3	5	4	2
a_3	2	1	3		
a_4	3	1	2	5	4



Popular Matching



Rainbow Connectivity



Dr. Mitesh M Khapra

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- Developing robust evaluation metrics for Natural Language Generation
- Developing NLP tools and technologies for Indian languages
- Evaluating robustness of NLP systems to adversarial attacks



Evaluation Metrics
for NLP



NLP for Indian
languages



Adversarial attacks
on NLP systems

Develop robust, interpretable NLP tools for Indian languages



N S Narayanaswamy

Indian Institute of Technology Madras, India

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- Algorithms, Complexity, Combinatorics, Combinatorial Optimization
- Software Systems for Resource allocation, Scheduling
- Software Systems for Knowledge Representation and automated planning
- System design for Electronic Voting

Algorithms Analysis for
running time and
solution optimality
Studies on Special
classes of inputs

Domain Classification
using Ontologies and
Automated Planning
Techniques

Design of systems using
knowledge
representation,
automated planning,
optimization algorithms

← Domain Knowledge, Efficient Optimization Algorithms →

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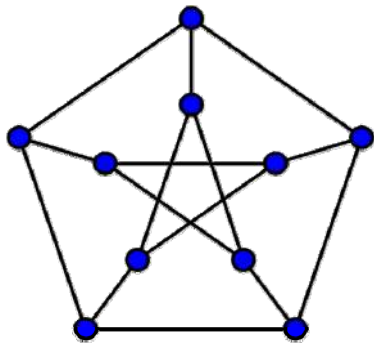
Nishad Kothari

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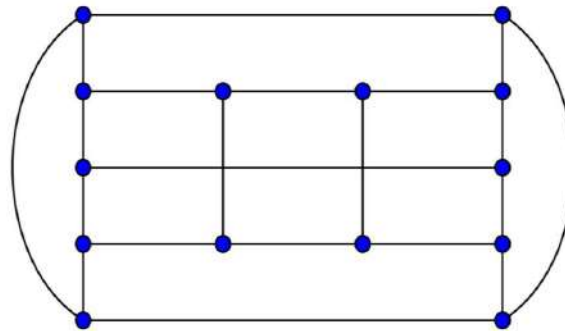


Research Areas: Matching Theory, Structural Graph Theory

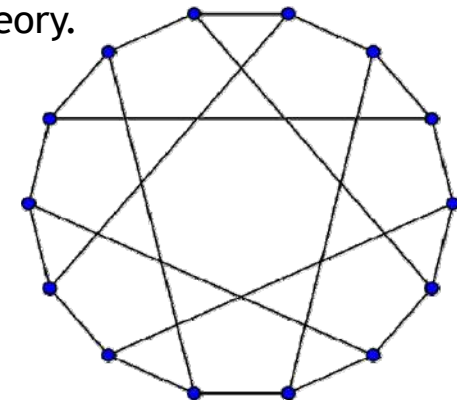
- One of the main objectives is to find NP and co-NP characterizations of graph classes; for example:
 - Classes motivated by Combinatorial Optimization: *PM-compact* graphs, *Birkhoff-von Neumann* graphs
 - Classes defined by excluding certain matching minors: *K4-free* graphs, *prism-free* graphs
 - Classes motivated by theoretical physics and enumerative combinatorics: *Pfaffian* graphs
- Developing induction tools (i.e., generation theorems) that are useful in characterizing graph classes
- Discovering graphs that play a special role in certain areas of Graph Theory.



Petersen Graph



The Trellis



Heawood Graph

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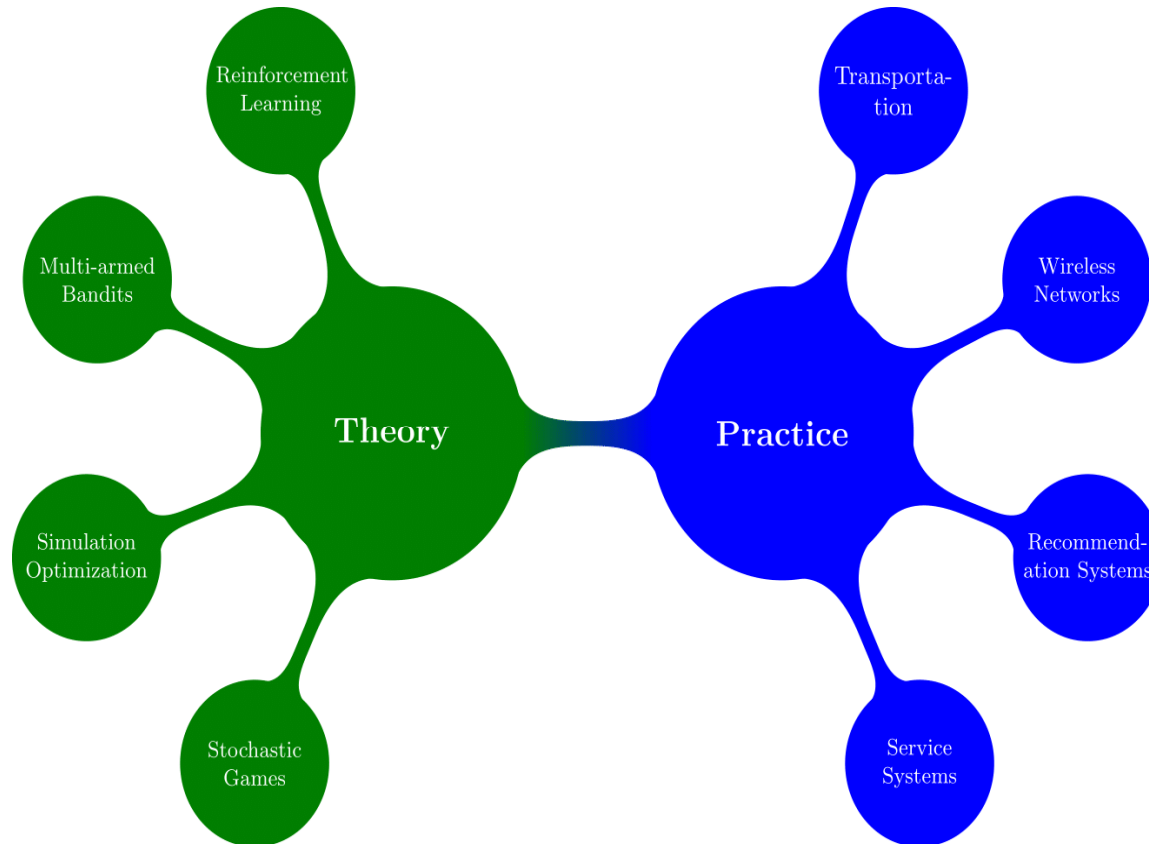


Prashanth L. A.

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Sequential decision making under uncertainty

How to take decisions that maximize the rewards accumulated in the long run?

Need an algorithm that

- is **efficient, autonomous**
- handles **uncertainties** and multiple timescales
- is **model-free** and **scalable**



Dr. Pratyush Kumar

PHD, ETH Zurich, Switzerland

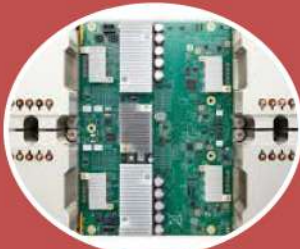
Assistant Professor, Computer Sci. & Engg.

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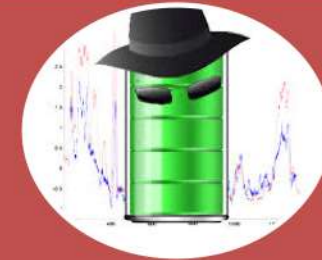
- Combining systems thinking with deep learning to design systems considering non-functional properties of time, energy, security, and variable effort inference
- Correct-by-construction design of cyber-physical systems meeting hard end-to-end timing constraints with application in safety-critical systems



Hardware Accelerators
for Deep Learning



Formal design of
Embedded Systems



Adversarial attacks on
Deep Learning

← Move towards secure and always-available ubiquitous intelligence →

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Major Areas of Research

- Computational Complexity Theory
- Algebraic Complexity Theory
- Combinatorial Commutative Algebra
- Analysis of Algorithms
- Computational problems on algebraic and combinatorial structures



Dr. Ravindran B

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Rupesh Nasre

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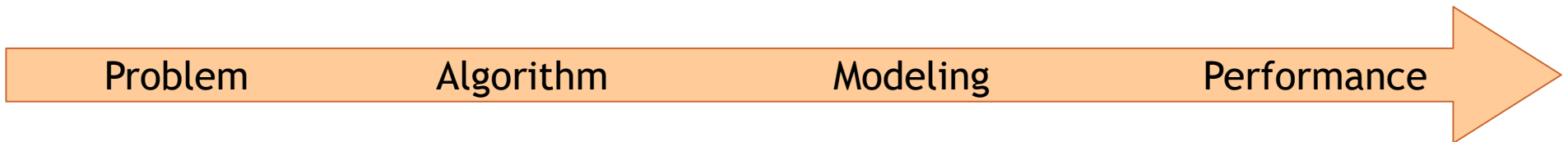
044-2257-4374; rupesh@iitm.ac.in

<http://www.cse.iitm.ac.in/~rupesh>



Major Areas of Research

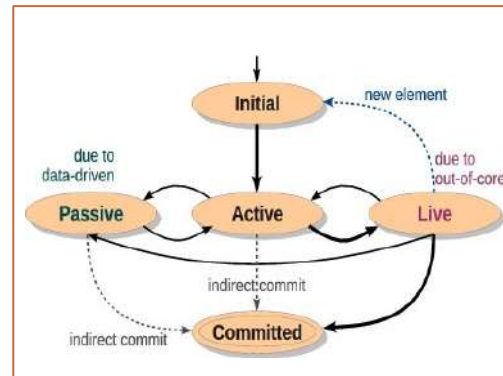
- Parallelization
- Compilers
- Domain Specific Languages



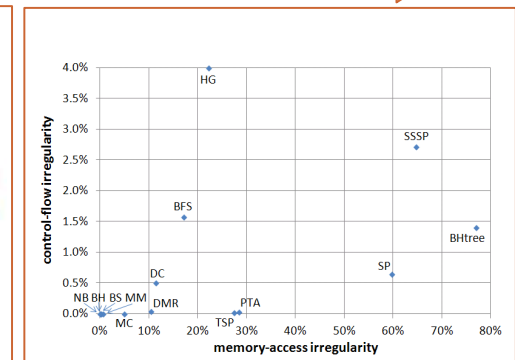
```

Graph [nodes(node: Node, dist: int),
      edges(src: Node, dest: Node)]
Source: Node
initDist = [nodes(node n, dist d) →
            [d = source] 0]
relaxEdge = [nodes(node p, dist dp),
             nodes(node q, dist dq),
             edges(src p, dest q),
             pd + 1 < qd] → [qd = pd + 1]
init = forall nodes
bfs = iterate Edge
main = init; bfs
  
```

Shortest Paths Computation



Optimization and Code Generation



Performance Measurement

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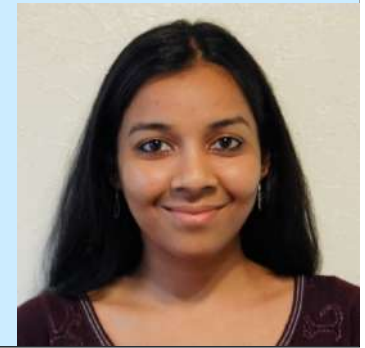
Dr Shweta Agarwal

PhD, University of Texas at Austin

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044-2257-4384; shweta@iitm.ac.in

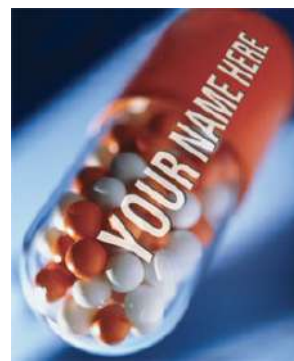
<http://www.cse.iitm.ac.in/~rupesh>



- Cryptography, particularly **post-quantum cryptography** from hard lattice problems
- Applications of **Blockchain** technology to socially relevant problems
- **Computing on encrypted data** to enable machine learning on encrypted data
- **Resolving conflict between utility and privacy** in age of big data



Secure Cloud computing



Patient private medicine



Patient private medicine

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Dr. Sreenivasa Kumar P

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Dr. Sukhendu Das

Professor, Computer Science and Engineering

+91-44-2257-4367; sdas@iitm.ac.in

http://www.cse.iitm.ac.in/~sdas, .../~vplab



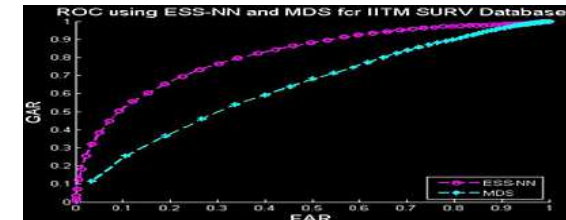
Major Areas of Research

CBVR using DMST-CSS and Hyper-strings Recognition



Unconstrained Face

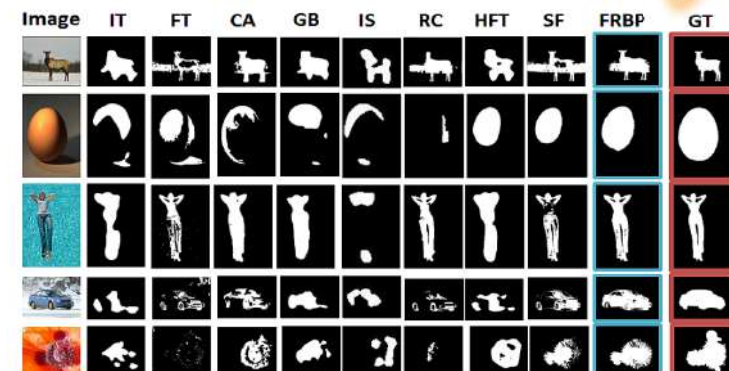
- EDT
- ESS
- Subband



SLAR for "Smart CBIR"



Domain Adaptation, Saliency (FRBP), Soft object and biped dynamics



← Unifying Visual Perception and Visualization for cognitive intelligence algorithms →

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Dr. Sutanu Chakraborti

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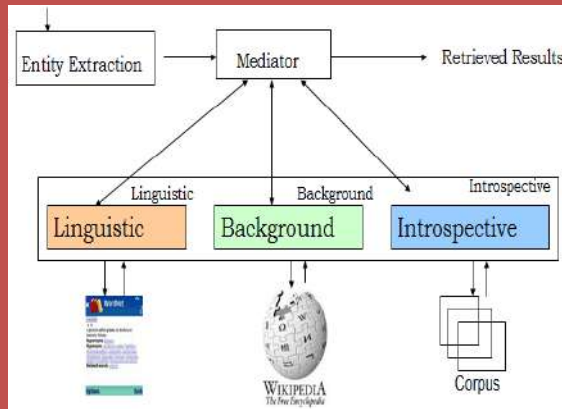


- Text and Web Analytics
- Machine Learning for Knowledge Acquisition
- Cognitive Aspects of Language and Memory

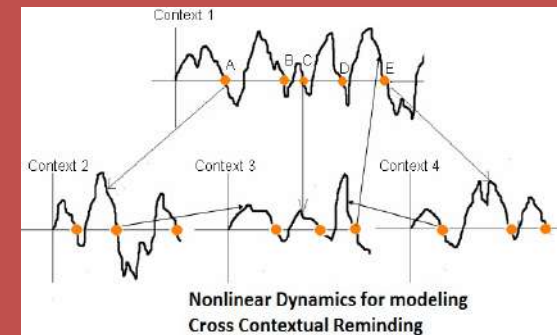
Search, Recommendation and Corporate Memory Systems



Machine Learning for Natural Language Processing



Looking into the Future: Non-conventional models of cognition (language and memory)



COMPUTATIONAL MODELS OF LANGUAGE, MEMORY AND LEARNING



Dr. Yadu Vasudev

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Areas of Research

- Sublinear Algorithms
 - Property testing algorithms for large sparse graphs
 - Distributed algorithms on sparse networks
- Computational Complexity Theory
 - Complexity of isomorphism problems
 - Randomness in computation



INDIVIDUAL FACULTY PROFILE

DEPARTMENT
OF
ELECTRICAL ENGINEERING

LIST OF FACULTY

Abhishek Sinha

Amitava Dasgupta

Ananth Krishnan

Anbarasu Manivannan

Andrew Thangaraj

Anil Prabhakar

Aniruddhan S

Anjan Chakravorty

Aravind R (Profile yet to be uploaded)

Arun Karuppaswamy B

Arun D Mahindrakar

Arun Pachai Kannu

Avhishek Chatterjee

Balaji Srinivasan

Bharath Bhikkaji

Bhaskar Ramamurthi (Profile yet to be uploaded)

Bhaswar Chakrabarti

Bijoy Krishna Das

Boby George

Debdutta Ray

Deepa Venkitesh

Deleep R Nair

Devendra Jalihal

Enakshi Bhattacharya

Gaurav Raina

Giridhar K

Harishankar Ramachandran

Jagadeesh Kumar V

Janakiraman Viraraghavan

Jayaraj Joseph

Kalyan Kumar B

Kamalesh Hatua (Profile yet to be uploaded)

Kaushik Mitra

Krishna S

Krishna Jagannathan

Krishna Vasudevan

Lakshminarasamma

Mahesh Kumar

Manivasakan R

Mathiazhagan C

Mohanshankar Sivaprakasam

Nagendra Krishnapura

Nandita Dasgupta

Nitin Chandrachoodan

Pradeep Kiran Sarvepalli

Puduru Viswanadha Reddy

Qadeer Ahmad Khan

Rachael Kalaimani

Radha Krishna Ganti

Rajagopalan A N

Ramalingam C S (Profile yet to be
uploaded)

Ramkrishna Pasumarthy

Ravinder David Koilpillai (Profile yet to
be uploaded)

Sarathi R

Saurabh Saxena (Profile yet to be
uploaded)

Shanthi Pavan

Shanti Bhattacharya

Sheetal Kalyani

Shivananju B N

Shreepad Karmalkar

Soumya Dutta

Sridharan K

Srikrishna Bhashyam

Srirama Srinivas

Swarup K S

Uday Khankhoje

Umesh S (Profile yet to be uploaded)

Venkatesh T G (Profile yet to be
uploaded)

Venkatesh Ramaiyan

Vinita Vasudevan



Dr. Abhishek Sinha

PhD, MIT, USA

Assistant Professor, Electrical Engg.

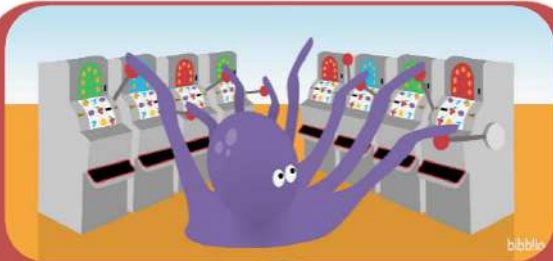
044-2257-4410; abhishek.sinha@iitm.ac.in



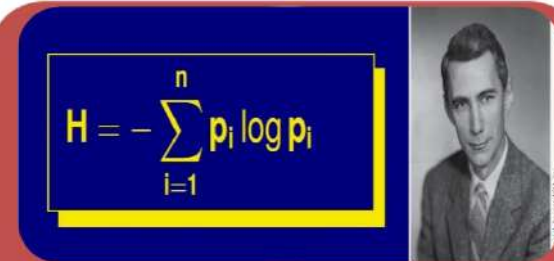
- Research interest: Theoretical Machine Learning, Network Control, and Information Theory
- Please visit <https://home.iitm.ac.in/abhishek.sinha/> for details on my research



Scheduling for 5G



Bandit
Algorithms



Information
Theory





Dr. Amitava DasGupta

PhD, IIT Kharagpur, India

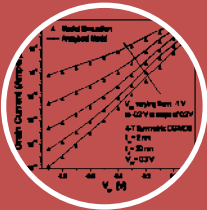
Professor, Electrical Engineering

044-2257-4416; adg@ee.iitm.ac.in

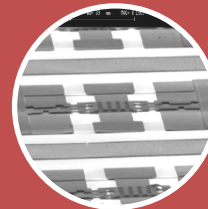
<http://www.ee.iitm.ac.in/~adg/>



- Research Area/Focus 1: Device Modelling (Mu`GFETs, LDMOS, HEMTs, QM effects)
- Research Area/Focus 2 : MEMS: Design, Fabrication & Characterization
- Research Area/Focus 3 : Silicon and Compound Semiconductor Technology



Subthreshold Current in
4-T DG MOSFETs



RF MEMS switch



Violet light emission
from GaN based LED



Ananth Krishnan

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Associate Professor, Electrical Engineering

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Major Areas of Research

- Design, Fabrication and Characterization of Plasmonic devices
- Design, Fabrication and Characterization of Optical Metamaterials
- Wafer scale photonic devices



Dr. Anbarasu Manivannan

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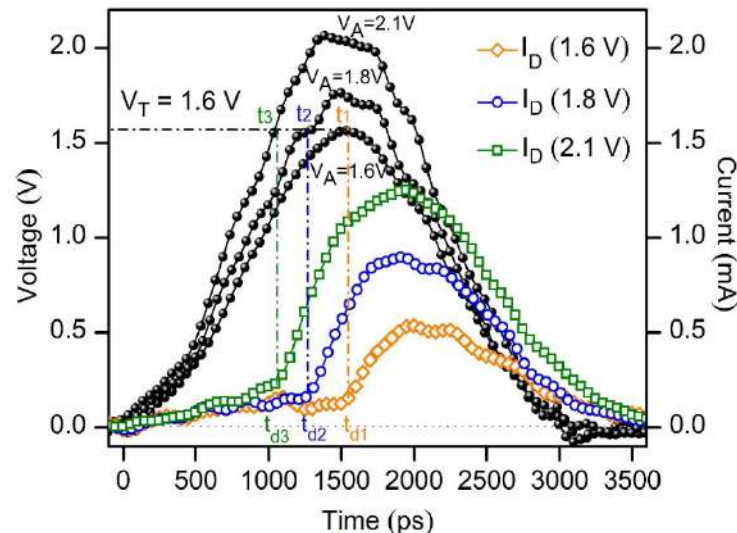
<https://anbuchalcogen.wixsite.com/anbarasu>



Research Specialization

- Phase Change Memory (PCM) for high speed Non-volatile RAM & universal memory
- Novel two-terminal Selector Devices & 3D cross-point memory architectures
- Phase change materials for neuromorphic computing and Photonic applications

Sub-ns switching in AgInSbTe PCM devices



Research Thrusts

- Design of novel materials for high-speed NVRAM
- Development of prototype PCM with SRAM-speed
- Novel phase change photonic memory device
- Multi-bit data storage technology
- Phase change photonic memory & Optoelectronic devices
- Phase change synaptic devices and neuromorphic computing

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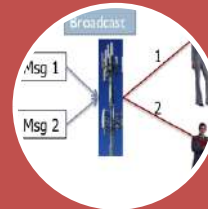
Dr. Andrew Thangaraj
PhD, Georgia Tech, Atlanta, USA
Professor, Electrical Engineering
044-2257-4424; andrew@ee.iitm.ac.in
<http://www.ee.iitm.ac.in/~andrew>



- Theory and implementation of modern error control codes
- Coding for multi-terminal communication problems
- Wireless and wireline network coding



PHYSICAL LAYER SECURITY



NEAR CAPACITY
COMMUNICATIONS



NETWORKS AND
DISTRIBUTED STORAGE

← CODING FOR COMMUNICATION SYSTEMS AND NETWORKS →



Dr. Anil Prabhakar

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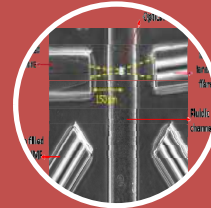


Major Areas of Research

- Photonic & Quantum Technologies & Applications (quantum.iitm.ac.in)
- Quantum Networks, Quantum Computing, Quantum Machine Learning
- Assistive technologies and Rehabilitation Engineering (create.iitm.ac.in)



Quantum Information
Communication, Computing



Optofluidic
Flow Analyzer



Wearable Assistive
Rehabilitation Devices

← Quantum and Embedded systems for societal benefit →

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- CMOS RFIC design
- Phase-locked loops and frequency synthesizers
- IC design for Biomedical Applications

Transceivers for
Wireless
Communications

Industrial Electronics

Biomedical
Instrumentation



Dr. Anjan Chakravorty

PHD, IIT Kharagpur, India
Professor, Electrical Engineering

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- SiGe Heterojunction Bipolar Transistors/ Modeling of Non-Quasi-Static Effects
- Laterally Diffused MOSFETs/ Modeling of Self-Heating & Snapback Effects
- Nano FETs/ Modeling of Charges and Non-Reciprocal Capacitances



Communication
Circuits



Automotive Circuits



High-Speed Digital
Switching



Dr. Aravind R
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Dr. Arun Karuppaswamy B
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Major Areas of Research

- AC micro-grids
- Grid-connected inverters
- Switched Mode Power Supplies
- Power Electronics

Hardware Development

- ❖ Inverter Design
- ❖ DSP Board Design
- ❖ Converter Design
- ❖ Filter Design

Control, Comm. and UI

- ❖ Digital Control (DSP)
- ❖ CAN Communication
- ❖ Python Based UI

Some Project Areas

- ❖ Inv. Ct Mode Control
- ❖ Volt Mode Control
- ❖ Anti-Islanding
- ❖ EMI Filter Design
- ❖ Ultra-Cap Storage



Dr. Arun D Mahindrakar

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- Nonlinear Control/Underactuated robots
- Experimental work / Mobile robots
- Formation control of multiple robots/Aerial vehicles



Underactuated robots



Mobile robots



Aerial Vehicles



Dr. Arun Pachai Kannu

Associate Professor, Electrical Engineering

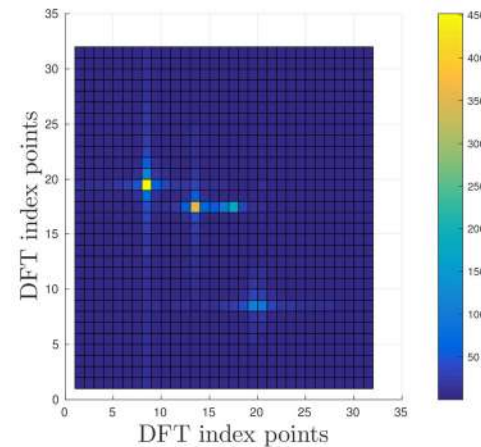
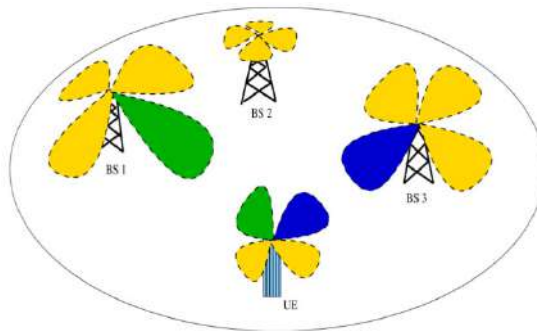
044-2257-4463; arunpachai@ee.iitm.ac.in

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Major Areas of Research

- Signal Processing in Millimeter Wave Beam-forming Systems
- Massive Random Access and Media Based Modulation Techniques
- Theory and Applications of Sparse Signal Recovery



Detection and Estimation Problems in Wireless Communications

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Dr. Avhishek Chatterjee

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<https://www.iitm.ac.in/info/fac/avhishek>



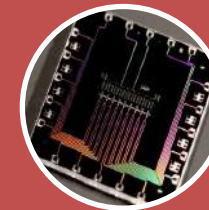
- **Stochastic networks:** communication and social networks; crowdsourcing; fault tolerant computing; quantum information systems
- **Network inference:** inferring network phenomena; learning on networks; neural networks



Communication and
social networks



Crowdsourcing



Stochastic information
processing

← Mathematical and data driven study of real life stochastic systems and networks →

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- High Power & Ultrashort Pulse Fiber Lasers
- Fiber Bragg Gratings
- Distributed Fiber Sensors

Laser-Based
Material Processing

Structural Health
Monitoring

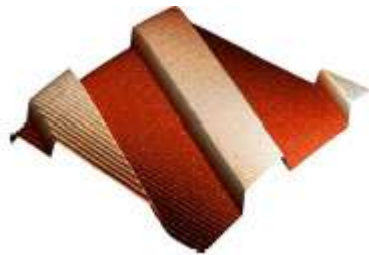
Real-time Power
Monitoring



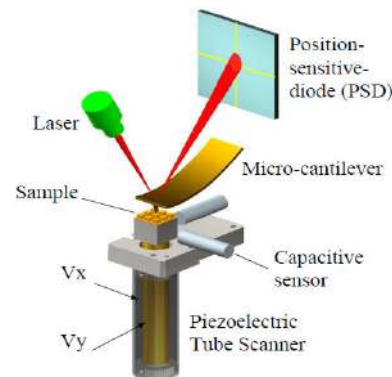
Dr. Bharath Bhikkaji
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<http://ee.iitm.ac.in/~Bharath>



- Modeling and Control of Flexible Structures
- Vibration control of Smart Structures
- Portfolio Analysis and Selection



**Atomic Force
Microscopes**



Nanopositioners



Finance

← System Identification, Control Design & Statistical Signal Processing →



Dr. Bhaskar Ramamurthi
PhD., University of California, USA
Director, IIT Madras
Professor, Electrical Engineering
044-2257-4403; bhaskar@ee.iitm.ac.in
<http://www.ee.iitm.ac.in/user/bhaskar/>





Dr. Bhaswar Chakrabarti

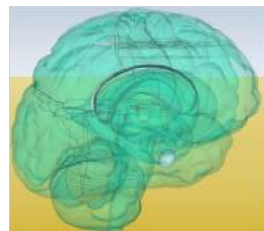
PhD, UTDallas, USA

Assistant Professor, Electrical Engineering

044-2257-4413; bchakrabarti@iitm.ac.in

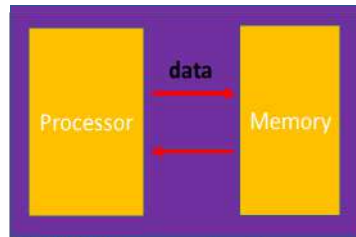


- Ultimate scalability of resistive memories with 2-dimensional heterostructures
- Design and development of 2-d RRAMs; performance evaluation; device model
- Develop neuromorphic circuit applications



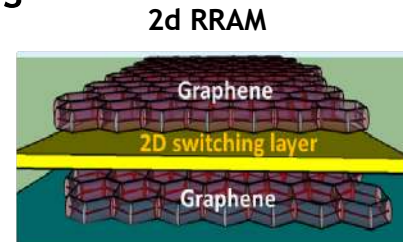
Brain

10 W power consumption
Fault tolerant Massively parallel

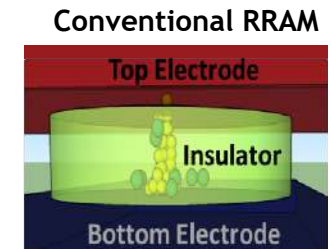


Von-Neumann Machine

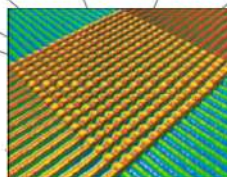
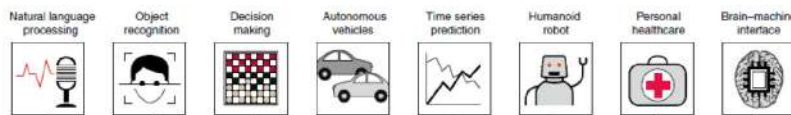
100 W/cm² power consumption
Very low defect tolerance Serial processing



2d RRAM
Low variability, switching power



Conventional RRAM
Higher variation, switching power



Tunable and non-volatile conductance of certain materials can be used to emulate synaptic connectivity in neural networks

Q. Xia and J. J. Yang, Nat. Mat., vol. 18, 309(2019)

Targets (3 year)

- ❑ Process development for all-2d resistive memory fabrication
- ❑ 2d-resistive memory prototype fabrication
- ❑ Electrical and physical characterization of developed device
- ❑ Development of device models

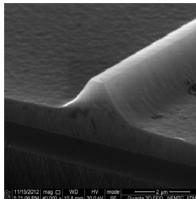
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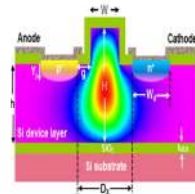
Dr. Bijoy Krishna Das
PhD, University of Paderborn, Germany
Professor, Electrical Engineering
044-2257-4459; bkdas@iitm.ac.in
<http://www.ee.iitm.ac.in/~bkdas>



- Silicon Photonics & Optical Interconnect for Communications
- Integrated Optoelectronics for Sensor Devices
- Nonlinear Integrated Optics



Low-loss Trimmed Waveguide Structure in SOI (0.06 dB/mm)



Waveguide PIN Phase-Shifter in SOI (Modeling & Fabrication)



Fiber Pigtailed & Packaged DWDM Channel Interleaver (100 GHz)



Dr. Bobby George

PHD- IITM, Post-doc.-TU Graz, Austria

Associate Professor, Electrical Engineering

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- Sensors and Instrumentation for
 - Automotive and Transportation Applications
 - Biomedical Applications/Healthcare Technologies
 - Industrial Applications



Seat Occupancy
Sensor for air bag
control

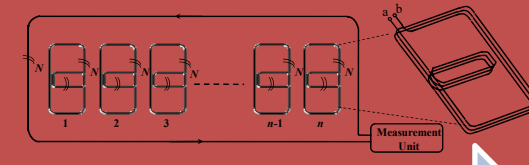
Brake wear
sensor



Non contact ECG



New Loop sensor for
intelligent transportation



Sensors and Electronic Instrumentation

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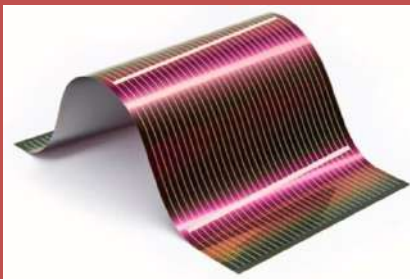
Dr. Debdutta Ray

PHD, TIFR, Mumbai, India
Assistant Professor, Electrical Engineering
044-2257-4479; dray@ee.iitm.ac.in

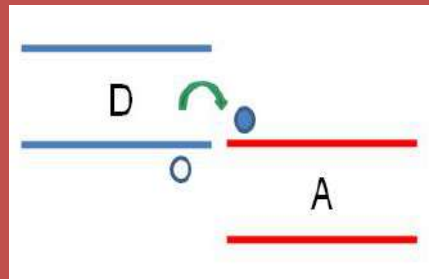


Major Areas of Research

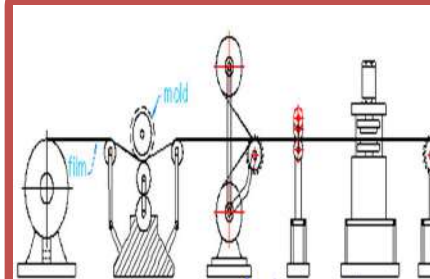
- Organic Solar Cells (OSOL)
- Novel organic devices
- Study of material for roll-to-roll processing
- Large area devices
- Organic field effect transistors (OFET)
- Organic doping
- Engineering thin film morphology



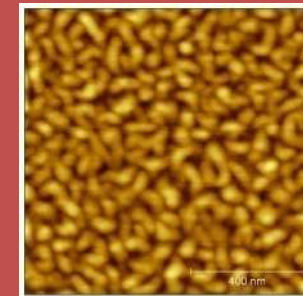
Organic solar cells



Organic doping



Roll-to-roll processing



Engineering morphology



Dr. Deepa Venkitesh

PhD, IIT Bombay, India

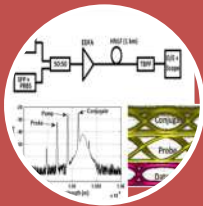
Associate Professor, Electrical Engineering

044-2257-4466; deepav@iitm.ac.in

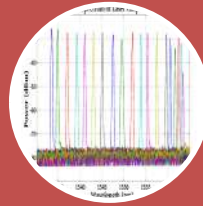
http://www.ee.iitm.ac.in/facs_deepa



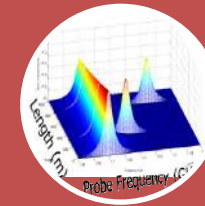
- All-optical signal processing in high-speed communication systems
- Development of fiber lasers for specific applications in different wavelength ranges
- Distributed temperature and strain sensors using nonlinear optics



Optical Wavelength
Conversion



Tunable fiber laser



Distributed Temperature
and Strain sensors

Applications of nonlinear optics

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Deleep R Nair

Associate Professor, Electrical Engineering

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- Semiconductor devices: Device Design, Fabrication, Characterization and Numerical modeling
- RF MEMS
- Circuit - Device interactions



Devendra Jalihal

Professor, Electrical Engineering
Coordinator, RuTAG-IITM & Indian Language SMS taskforce

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Research Areas

- Wireless Communication
- DSP for Communications
- MIMO Receiver Techniques

Research projects

- Indo-UK Cross Layer Energy Efficiency
- DISANET - Emergency Communications
- Tata Power - Battalion Communication System
- Project Guidance: M.Tech (30+), DD (10) B.Tech (30+)

Awards & Publications

- *Journals (15), Conferences (60)*
- *Sponsored Research projects as PI (total value ~ 680 Lakhs)*

Research Scholars (over last 5 years)

	Ph.D.	MS
Completed	1	5
In Progress	2	1
Project Staff	8	

	Since 2008
Citations	150
h-index	6
i10-index	7

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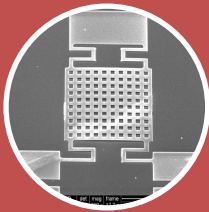


Enakshi Bhattacharya

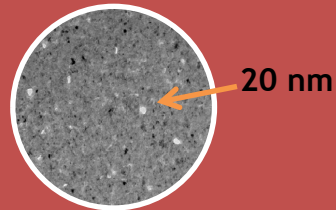
PhD, TIFR Mumbai, India
Professor, Electrical Engineering
044-2257-4419; enakshi@ee.iitm.ac.in
<http://www.ee.iitm.ac.in/~enakshi/>



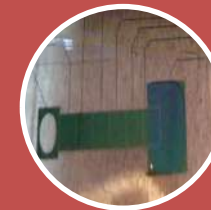
- MEMS and NEMS
- Biosensors and BioMEMS
- Semiconductor materials and devices



MEMS processes and sensors



Silicon nanoporous membranes



Bio sensors/MEMS digital microfluidics

← Processes, devices and sensors in amorphous, porous, poly and crystalline silicon →



Dr. Gaurav Raina

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Associate Professor, Electrical Engineering

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Research Areas

- Control and Nonlinear Systems
- Performance Modelling of Communication & Transport Networks
- Mobile Payments, Security, Commerce



Dr. K Giridhar

PhD (Univ. of California, Santa Barbara, 1993)

Professor, Electrical Engineering

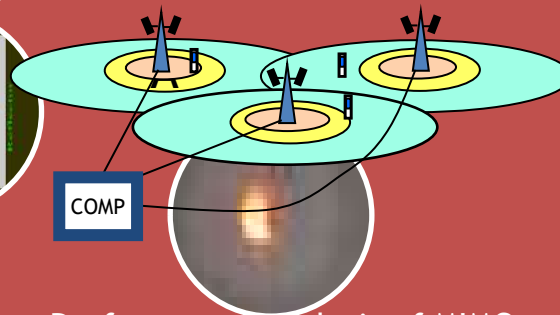
+91 44 2257 4420; giri@ee.iitm.ac.in

<http://www.iitm.ac.in/ee/~giri>

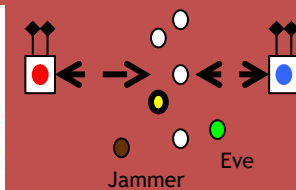
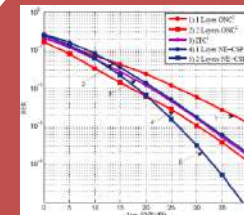
- Adaptive Signal Processing for Broadband Wireless Communications
- Interference Aware Estimation, Detection, Scheduling, and Rate Adaptation
- Wireless Standards, Future Het-Nets, Strategic Comm., and Performance Analysis



LTE/4G+/WiFi Wireless Hardware Design & Proof of Concept Test-Bed Development



Performance Analysis of MIMO-OFDM Mobile Broadband Access Networks



Advanced Transceiver Algorithms for Interference Limited Systems and for Strategic Communications

← Wireless Communications for Civilian and Strategic Use - Research, Design, Analysis →

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- Physical Layer Optical Links
- Quantum descriptions of Optical Links
- Edge Plasma Physics
- Computational Electro Magnetics

I work on problems where stochastic effects are present, and where quantum corrections need to be computed. Many of my students work on computational problems in Electromagnetics, both in optics and in plasma physics.



Dr. Jagadeesh Kumar V

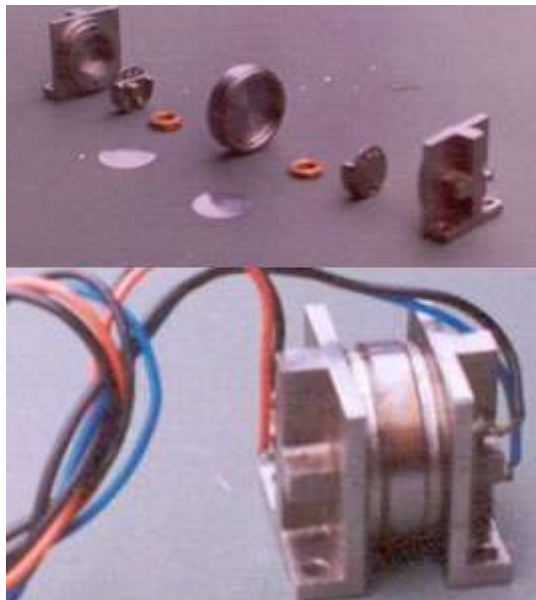
Professor, Electrical Engineering

044-2257-6406; vjk@iitm.ac.in

http://www.ee.iitm.ac.in/facs_vjkumar



- Electrical, Electronic and Biomedical Instrumentation
- Sensors and signal conditioning
- Measurements on properties of ferromagnetic materials



Variable Reluctance Type
Pressure Transducer



Calibration free pulse
oximeter



Brake wear sensor for
heavy vehicles

Applying analog and digital electronics for Sensing and Measurements

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Dr. Janakiraman Viraraghavan

PhD, IISc Bangalore, India

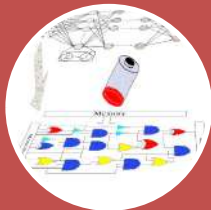
Assistant Professor, Electrical Engineering

044-2257-4485; janakiraman@iitm.ac.in

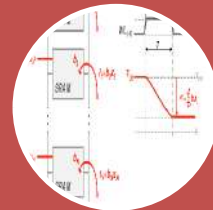
<http://www.ee.iitm.ac.in/janakiraman>



- Low Power Circuit Design Techniques for Machine Learning Hardware
- In Memory Computing
- Statistical Analysis in VLSI



Machine Learning
Accelerators



Computing in SRAM



Statistical Compact
Model Extraction

← Enabling energy efficient AI inference on the edge of the communication network →

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Dr. Jayaraj Joseph

PhD, IIT Madras, India

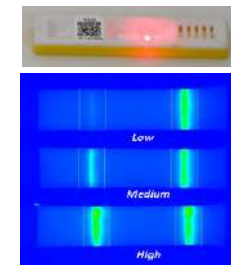
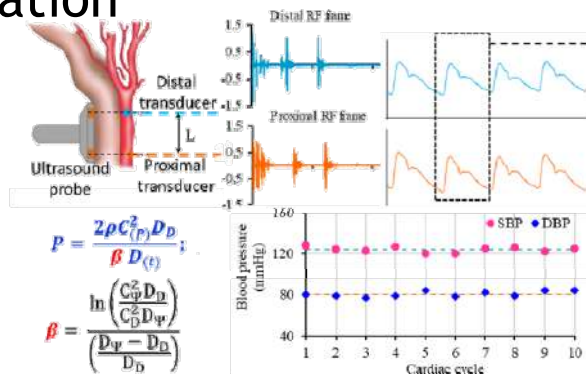
Assistant Professor, Electrical Engineering

044-2257-5439; jayaraj@iitm.ac.in

<https://scholar.google.com/citations?user=jkACmbEAAAJ&hl=en>



- Medical Devices and Healthcare Technology
 - Image free ultrasound for vascular health diagnosis & early screening
 - Point of care diagnostics
 - Unobtrusive physiological monitoring
- Sensors and Instrumentation



Vascular Ageing

ARTSENS® : Image-free ultrasound tech. for early vascular diagnosis

Cuff-less Central Blood Pressure Modelling, Sensors and Devices
Clinically reliable cuff less BP

Point of care diagnostics
Quantitative fluorescent imaging
Rapid immunoassay kits

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Dr. B Kalyan Kumar

PhD, IIT Kanpur, India

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<http://www.iitm.ac.in/component/faculty/72/bkalyan/>



- Power System Stability
- Flexible AC Transmission Systems (FACTS)
- Power Quality
- Power System Optimization



Dr. Kamalesh Hatua

PhD, Indian Institute of Science, Bangalore

Professor, Electrical Engineering

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Dr. Kaushik Mitra

PhD, University of Maryland, College Park, USA

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- Research Area/Focus 1: Computational Imaging (CI)
- Research Area/Focus 2: Image Processing and Computer Vision
- Research Area/Focus 3: Machine/Deep learning for CI

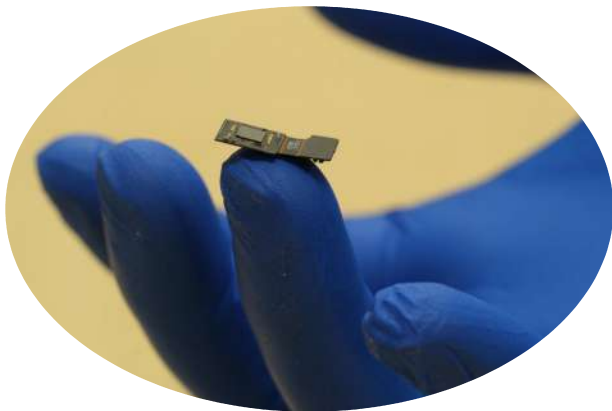
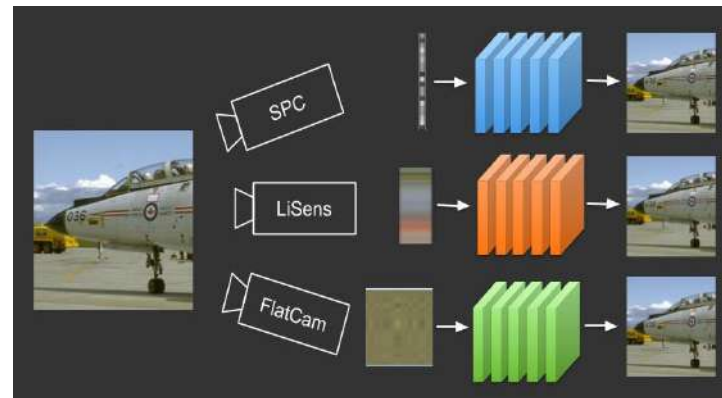


Image reconstruction and inference for Lensless Cameras



Solving inverse problems in CI



Light field acquisition and processing



Dr. S Krishna

PhD, Indian Institute of Science, India

Assistant Professor, Electrical Engineering

044-2257-4448; krishnas@iitm.ac.in

<http://www.ee.iitm.ac.in/~krishnas>



➤ Power System Stability Analysis and Control

Problems I have worked on:

- Under frequency load shedding scheme
- Detection of voltage collapse and corrective action
- Strategy for transient stability improvement using braking resistor and excitation system
- On-line dynamic security assessment: computational aspects



Dr. Krishna Jagannathan

PhD., Massachusetts Institute of Technology

Associate Professor, Electrical Engineering

044-2257-4469; krishnaj@ee.iitm.ac.in

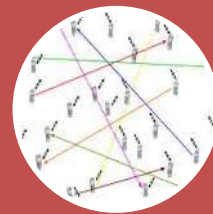
<http://www.ee.iitm.ac.in/~krishnaj/>



- Wireless Networks: Resource Allocation, Cross Layer Control
- Distributed Control and Optimization of Complex Networks
- Stochastic Modelling and Performance Analysis



LTE Resource Allocation



Large Wireless
Networks & Distributed
Operation



Real-Time Road Traffic
Control





Dr. Krishna Vasudevan

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Professor, Electrical Engineering

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- PMSM/BLDC Motor drives
- Power Electronics for Renewables
- Grid Integration of Renewables

Motor control , Electric vehicles, Electromagnetic Actuators

Power Converters for solar, battery applications

Power Converters and control for grid integration



Dr. Lakshminarasamma

PhD, Iisc Bangalore, India

Associate professor, Electrical Engineering

044-2257-4462; lakshmin@iitm.ac.in

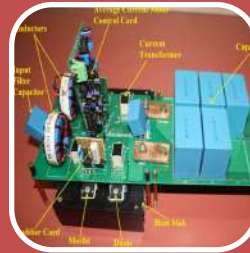
http://www.ee.iitm.ac.in/facs_lakshmin



- DC DC Power Converters, Modeling, Analysis and Design
- High Frequency Converters and Inverters for Renewable Energy Applications



33 W 500 kHz DC DC Converter Designed and Implemented for space craft Applications.



2 kW Interleaved Boost DC DC Converter High Power Applications, Operated in Interleaved and Paralleling



A 500 W 100 kHz 48 - 400 V Soft switching DC DC Bridge converter

Finds Applications for Aircraft, solar/Fuel cell fed power supplies



Dr. Mahesh Kumar
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- Power Quality Monitoring, Analysis and Interpretation
- Application of Power Electronics in Power Systems: Custom Power Devices
- Renewable Energy Grid Interactive and Grid OFF Systems



Based on monitored data of industrial plants, their detailed performance evaluations are carried out. Also, based on the study of analyzed data, interpretation can be made to avoid serious consequences of power quality problems.



Custom Power Devices are used to eliminate power quality related problems such as unbalance, reactive power, harmonics etc., in power distribution systems. Control, Design and development of these devices are the core issues which are being addressed.



Custom power devices are basically power electronic based controllers and find numerous applications in renewable energy systems. Efficient grid interactive inverters, their design and control for optimal power sharing with the local grid and loads are important aspects which are explored and investigated.



Dr. R Manivasakan

PhD, IIT Bombay

Assistant Professor, Electrical Engineering

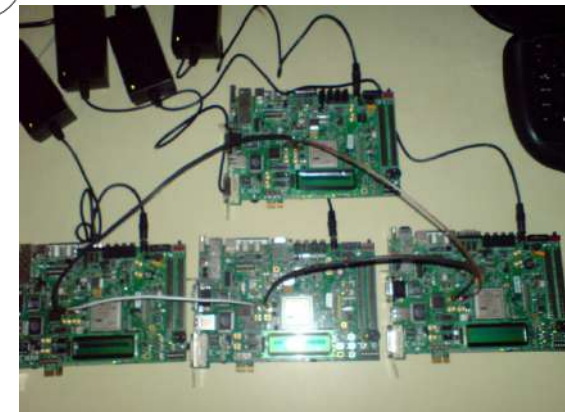
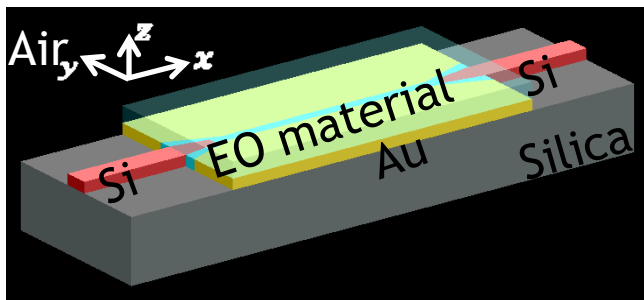
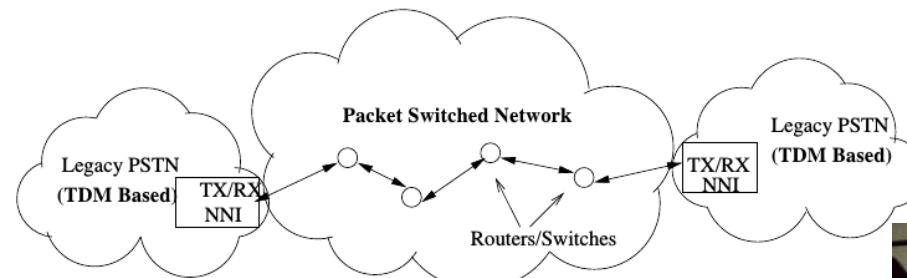
044-2257-4330; rmani@ee.iitm.ac.in

<http://www.ee.iitm.ac.in/~rmani/>



Major Areas of Research

- Optical Networks: PHY and Layer 2
- Queueing Theory and its Applications to Communication networks
- TDM over PSI



Performance Analysis of Communication Networks (Optical and Wireless)

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Dr. C Mathiazhagan

Asst. professor, Electrical Engineering
044-2257-4431; mathi@ee.iitm.ac.in



Major Areas of Research

- Analog and digital circuits, Instrumentation



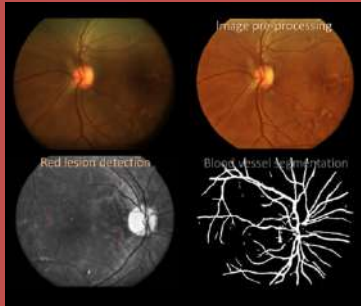
Dr. Mohanasankar Sivaprakasam

PhD - University of California Santa Cruz, USA

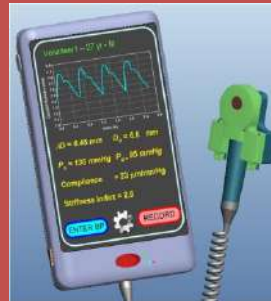
Associate Professor, Electrical Engg
+91-9884511692; mohan@ee.iitm.ac.in



- Healthcare technologies
- Biomedical devices and instrumentation
- Medical signal/image processing



Screening



Diagnosis



Therapeutic



Dr. Nagendra Krishnapura

PhD, Columbia University, USA

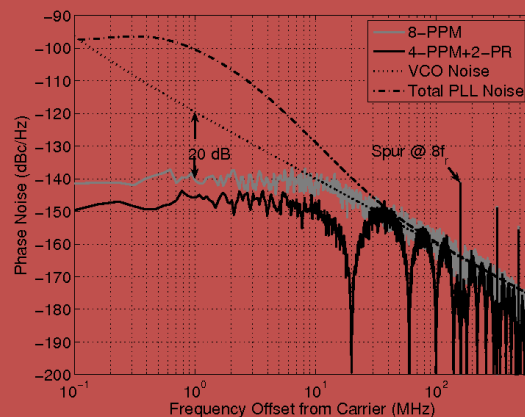
Associate Professor, Electrical Engineering

044-2257-4444; nagendra@iitm.ac.in

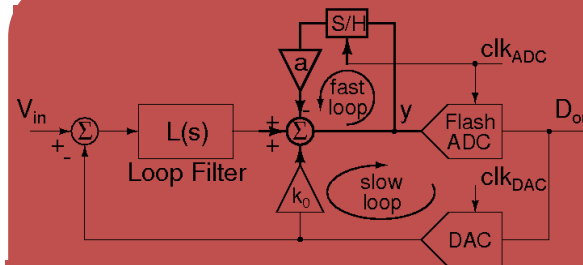
<http://www.iitm.ac.in/~nagendra>



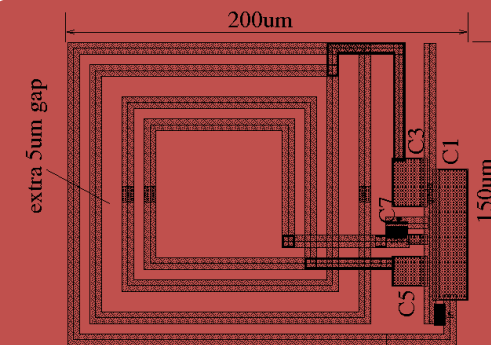
- Analog integrated circuit design
- RF integrated circuit design
- Circuits and systems education



Randomization
reduces PLL spurs



Additional fast loop
overcomes speed
limit of DS ADC



Multi-tap inductor
enables compact
filters

Increase speed and precision, and reduce power and area of ICs

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Dr. Nandita DasGupta

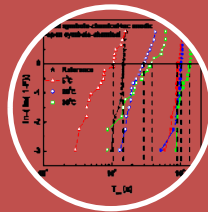
PhD, IIT Madras, India
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044-2257-4422; nand@ee.iitm.ac.in
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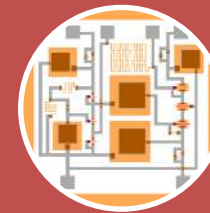
- Research Area/Focus 1: Thin oxides and High-k Dielectrics
- Research Area/Focus 2 : III-V Semiconductor Devices
- Research Area/Focus 3 : Micromachining for MEMs & photonic devices



Pigtailed InGaAs/InP p-i-n
Photodetector with
micromachining for fibre
coupling



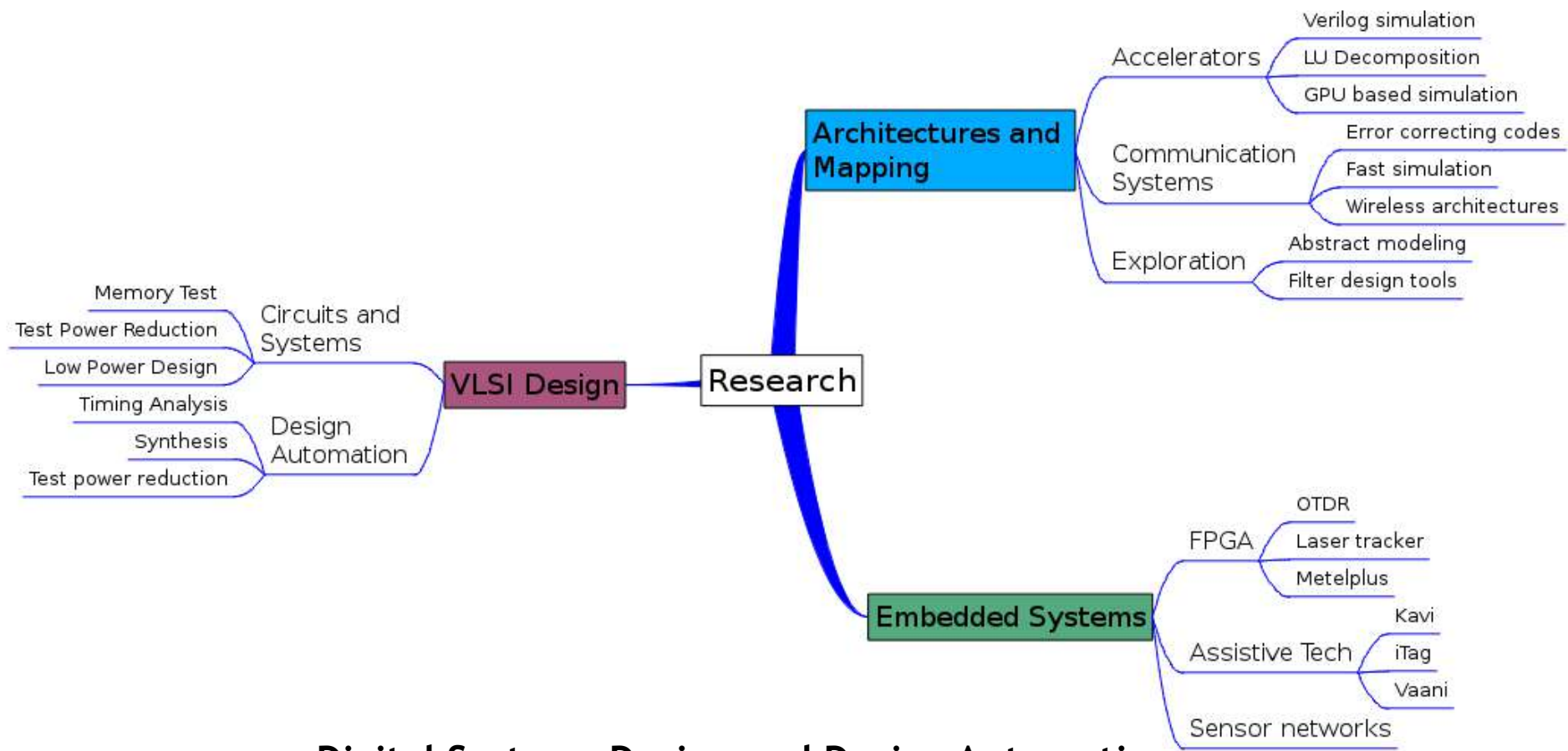
Improvement in the
reliability of thin oxides
with ac anodization



GaAs MESFET-based
Transimpedance
preamplifier



Dr. Nitin Chandrachoodan
PhD, Univ. of Maryland, College Park, USA
Associate Professor, Electrical Engg.
044-2257-4432; nitin@iitm.ac.in
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Digital Systems Design and Design Automation

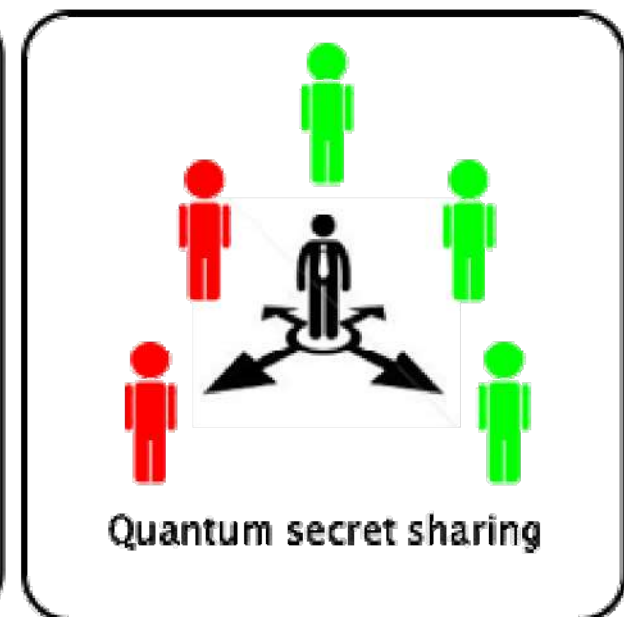
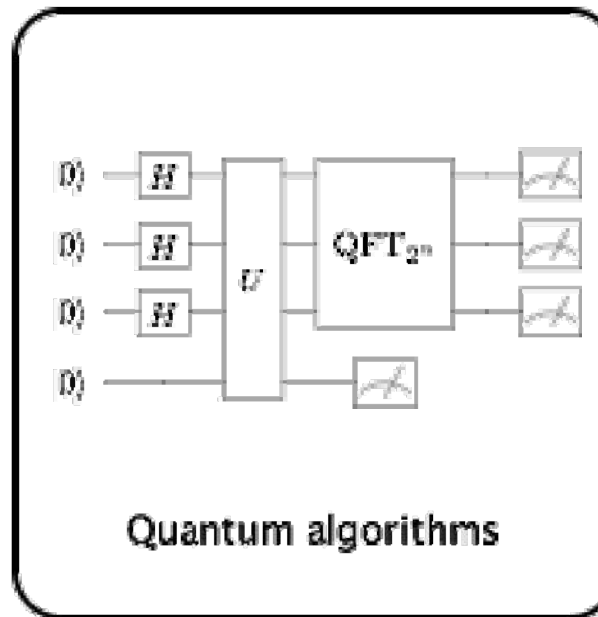
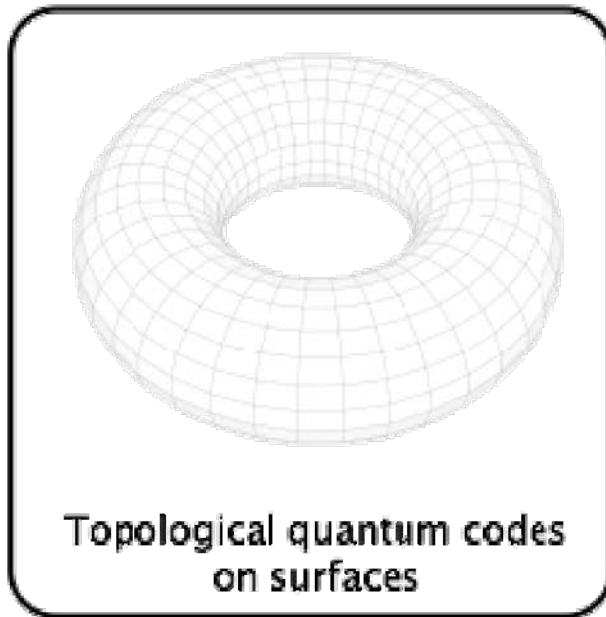


Dr. Pradeep Kiran Sarvepalli

PhD, Texas A&M University, USA
Assistant Professor, Electrical Engineering
044-2257-4473; sarvepalli@iitm.ac.in
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- Classical and quantum error correction
- Quantum algorithms
- Quantum cryptography



Quantum information processing



Dr. Puduru Viswanadha Reddy

Associate Professor, Electrical Engg.

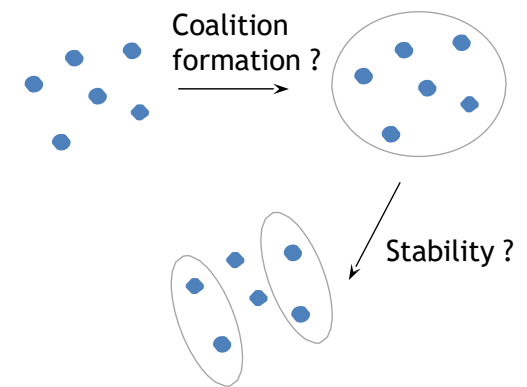
044-2257-4486; vishwa@iitm.ac.in



Major Areas of Research

- Control systems
- Game theory
- Optimal control
- Operations research

Game theory



Multi-agent control systems



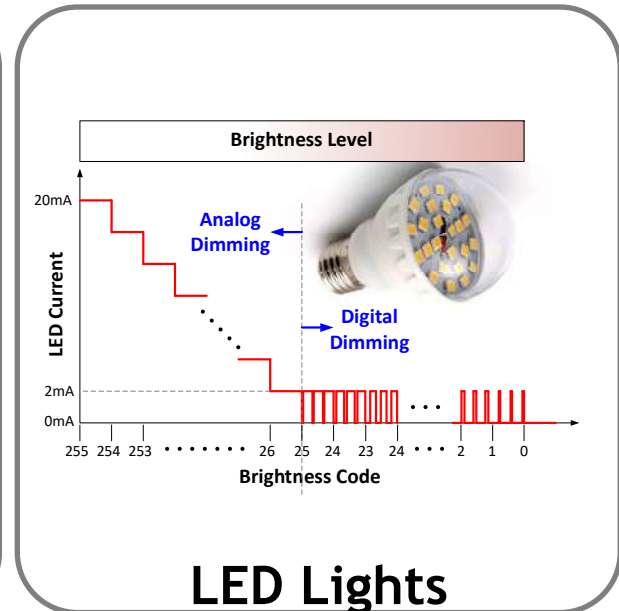
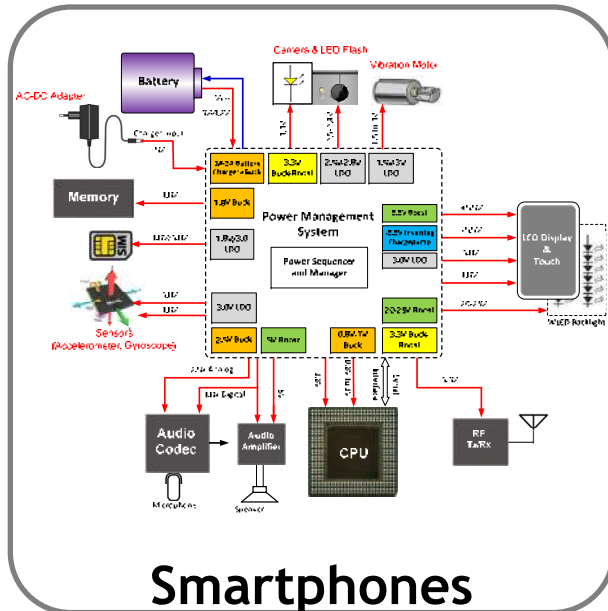
[Back to Top](#)



Dr. Qadeer Ahmad Khan
PhD, Oregon State University, USA
Assistant Professor, Electrical Engineering
044-2257-4484; qkhan@ee.iitm.ac.in
<http://www.ee.iitm.ac.in/qkhan>



- Analog and Mixed Signal Circuits: Voltage/Current reference, low power circuits, PVT detection and compensation, voltage and current sensors
- Power Management Integrated Circuits: Voltage regulators, DC-DC Converters, LED drivers, battery chargers, energy harvesting





Dr. Rachel Kalaimani

Assistant Professor, Electrical Engineering

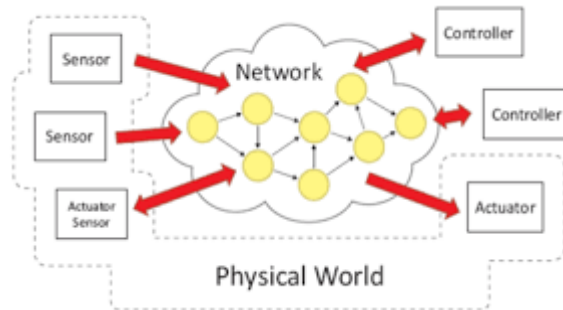
044-2257-4487; rachel@ee.iitm.ac.in

<http://www.ee.iitm.ac.in/rachel>

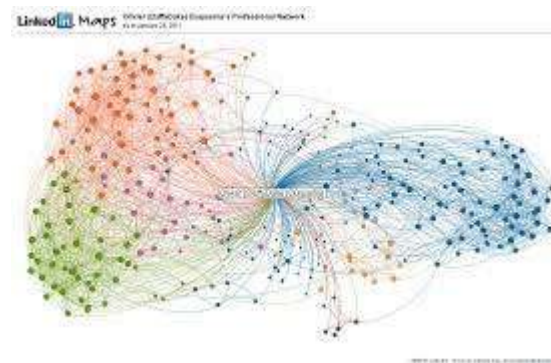


Major Areas of Research

- Optimization and control of complex dynamical systems
- Networked control systems
- Learning based control



Stabilizing NCS subject to SNR constraints on channel along with scheduling



Optimizing the control energy in complex dynamical systems by modifying the network topology

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Dr. Radha Krishna Ganti

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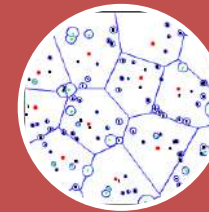
- Wireless Networks
- Stochastic Geometry
- Information Theory



Implementation of
superposition coding on
SDR

$$P(SIR \geq \theta) = \frac{1}{1 + \rho(\theta, \alpha)}$$

Probability, Stochastic
Geometry, Information
Theory



HetNets, Cellular
Networks, Adhoc
Networks

BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH



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Shape from
Motion Blur



Digital Heritage
Reconstruction



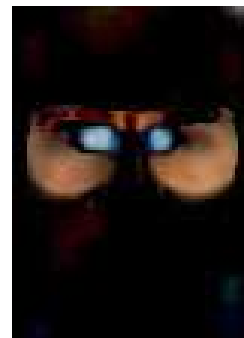
Non-Uniform De-
blurring n HDR



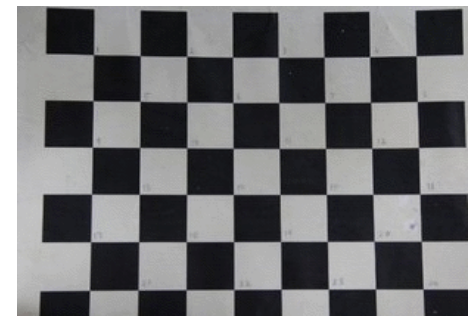
Super-resolution Matting



Face Recognition in
Occlusion and Blur



Underwater Imaging



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<http://www.ee.iitm.ac.in/~csr/>





Dr. Ramkrishna Pasumarthy

PHD, University of Twente, The Netherlands

Associate Professor, Electrical Engineering

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- Mathematical Modeling
- Control of physical systems
- Simulations of Large scale infrastructures

Cloud Computing

Industrial Automation

Computational
mechanics



Dr. Ravinder David Koilpillai
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Dr. R Sarathi

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- Condition monitoring of power apparatus adopting Multi sensor fusion Technique
- Pulsed power technique for nano particle production and sterilisation of liquid foods
- Development of high performance nanocomposites for electrical insulation



Theoretical and experimental studies to identify the location of discharges in power apparatus especially in transformers by measuring UHF signals generated by discharges and by triangulation process



Facility for generation of nano particles by wire explosion process and for use of nano aluminium for Rocket propellant.

Pulsed power technique for sterilisation of liquid foods.



Optimisation of nano fillers in nano composites for obtaining good electrical, thermal and mechanical properties for various electrical insulation applications.



Dr. Saurabh Saxena
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Dr. Shanthi Pavan

PhD, Columbia University New York, USA

Professor, Electrical Engineering

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- Analog Mixed Signal Design : A/D and D/A conversion, filters
- Microwave IC Design : Broadband equalization and beamforming
- Sensor Interfaces : Bio and inertial sensor read electronics

Data Converters &
Filters

High Speed Data Links
& Beamforming

MEMS Accelerometers
and Gyroscopes,
Biosensors



Dr. Shanti Bhattacharya

Professor, Electrical Engineering

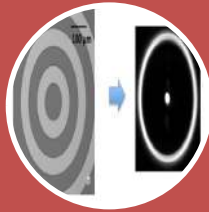
044-2257-4438; shantib@iitm.ac.in

<https://sites.google.com/site/appliedopticsgroup/>

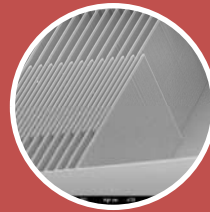


Major Areas of Research

- Design and fabrication of diffractive optical elements
- Design and fabrication of Optical MEMS
- Fibre and free space-based Optical Metrology systems (eg OCT, spectroscopy)



Diffractive optics for Beam Shaping.
Converting a Gaussian beam into a focused ring



Comb drive for actuation of micro-optics

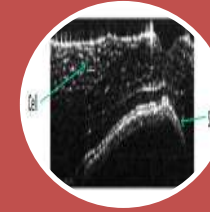


Image measured with a fibre based OCT system working at 1550nm. Cucumber Slice - Depth: 1.4 mm in air; Width: 8 mm

← Devices, Systems, Components to control light, extract information, make measurements. →

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Dr. Sheetal Kalyani

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Associate Professor, Electrical Engineering

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- Robust statistics based estimation/detection approaches and outlier detection.
- Applications of extreme value theory to problems in wireless networks/systems.
- Statistical learning theory and its applications.

Receiver algorithms and link abstraction for OFDM/OFDMA based systems

Analysis of model misspecification and robust solutions

Cross layer optimization across MAC and PHY layers in wireless systems



Dr. Shivananju B N

PhD, Indian Institute of Science, India

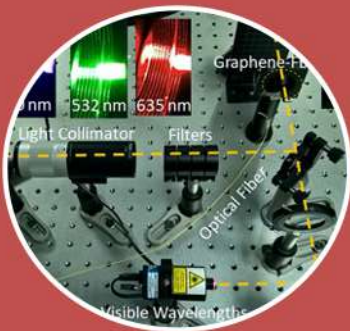
Assistant Professor, Electrical Engineering

044-2257-5408; shivananju@iitm.ac.in

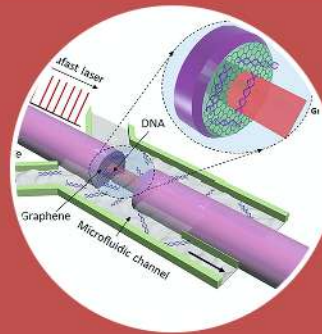
<http://www.ee.iitm.ac.in/user/shivananju/>



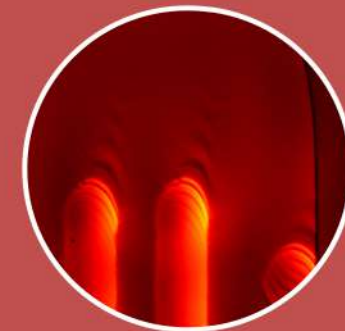
- Two-dimensional Materials Based Photonics and Optoelectronics Applications
- Biochemical Photon Fingerprints for Healthcare Applications
- Polaritons and Excitons Technologies for Industrial Applications



Photonics & Optoelectronics



Biochemical Fingerprints



Polaritons and Excitons

← Future Nano-Bio-Photonics Technologies for Healthcare Applications →



Dr. Shreepad Karmalkar

PHD, IIT Madras, India

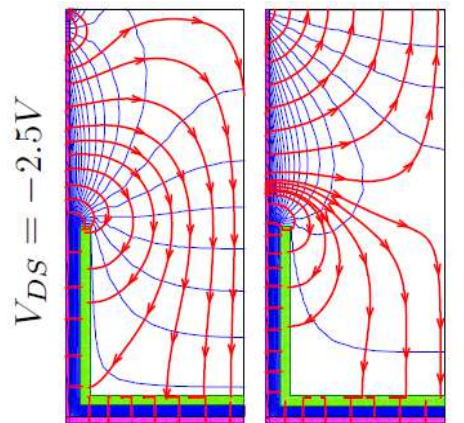
Professor, Electrical Engineering

044-2257-4409; karmk@ee.iitm.ac.in

<http://www.ee.iitm.ac.in/~karmal/>



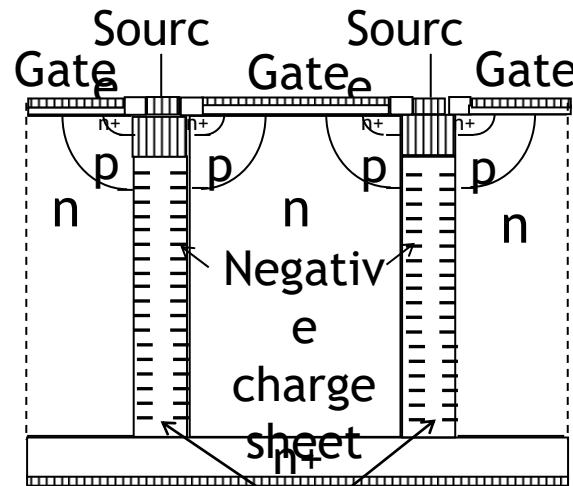
- Semiconductor Device Modeling and Fabrication
- Nanotechnology
- Education



$L_E = 0$ $L_E = 550nm$

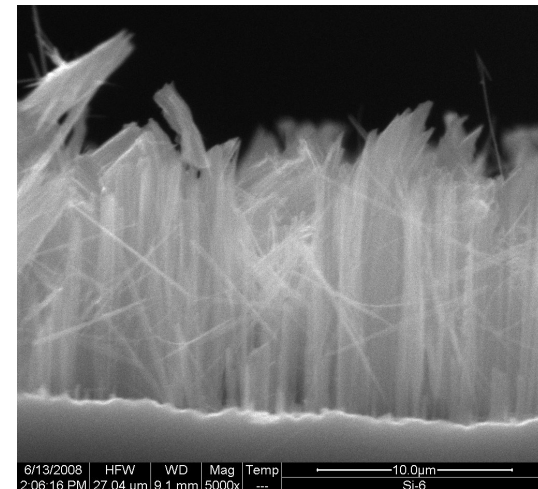
$V_{GS} = -2.5V$ and $L_{DG} = 665nm$

Nanowire devices
Electroless processing



Drain Insulator

**Power MOSFET (SiC, Si,
Superjunction), GaN HEMT**





Dr. Soumya Dutta

PHD, JNCASR, Bangalore, India Assistant
Professor, Electrical Engineering

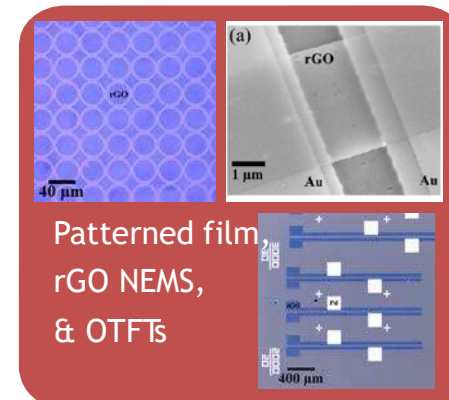
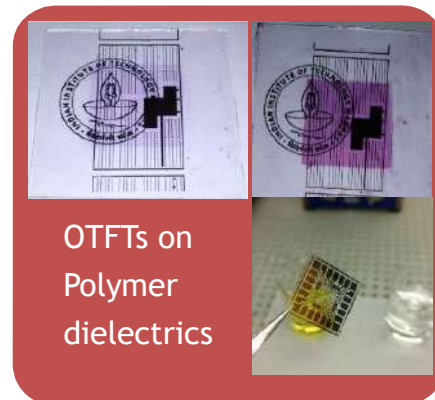
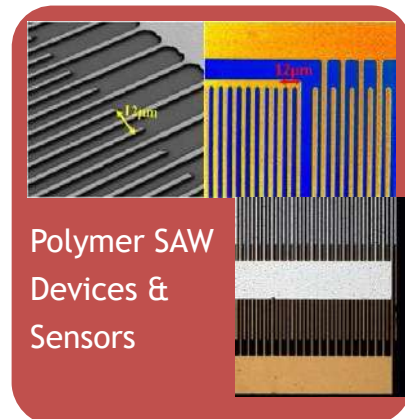
044-2257-4472; s.dutta@ee.iitm.ac.in

<http://www.ee.iitm.ac.in/user/s.dutta/>



Major Areas of Research

- Organic Solar Cell (OSC) / Perovskite Solar Cells
- Organic Thin Film Transistors (OTFTs) and Circuits
- Reduced Graphene Oxide (rGO) based NEMS and Microelectronic Devices
- Ferroelectric Polymer based Surface Acoustic Wave (SAW) Devices
- Organic LED and AMOLED Display



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Dr. K Sridharan
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Major Areas of Research

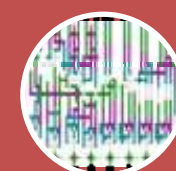
- VLSI Architectures for autonomous systems and DSP; FPGA-based design and implementation
- Sensor-based planning and control for mobile robots, cooperative robot navigation and rendezvous
- Video stabilization and stitching - Algorithms and VLSI architectures
- Design of digital circuits in emerging device technologies, reliability studies



FPGA-based Robotics



Cooperative Robotics



Digital Nano-circuits

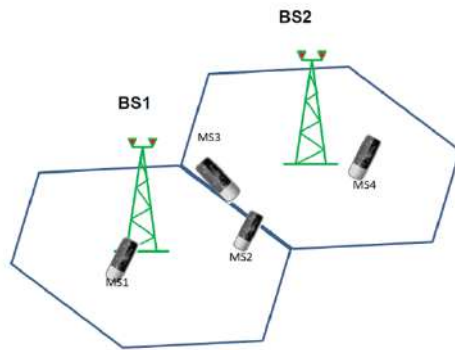


Dr. Srikrishna Bhashyam

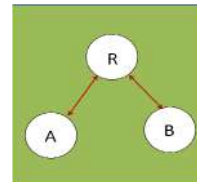
PhD, Rice University, USA
Professor, Electrical Engineering
044-2257-4439; skrishna@iitm.ac.in
<http://www.ee.iitm.ac.in/~skrishna/>



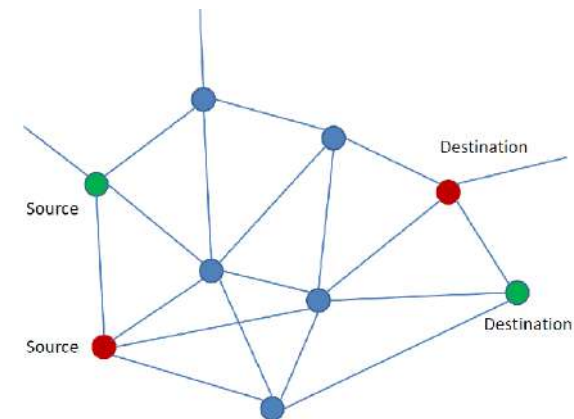
- Multi-hop multi-flow wireless communication: Capacity, protocols and codes
- Network resource allocation: Centralized and distributed optimization
- Statistical signal processing methods



Cellular Networks



Wireless LANs



Sensor Networks

← COMMUNICATION AND INFORMATION THEORY →



Dr. Srirama Srinivas
PHD, NIT Warangal, India
Associate Professor, Electrical Engineering
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- Multilevel Inverters, PWM control & diagnostics
- Integration of distributed energy systems with utility grid
- Control algorithms for DC-DC and DC-AC Converters

Electrical
machines & Drives

Microgrids

Renewable Energy



Dr. K S Swarup

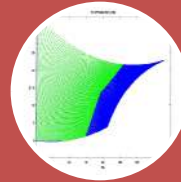
PhD, IISc Bangalore, India
Professor, Electrical Engineering, IITM
044-2257-4440; ksswarup@iitm.ac.in
http://www.ee.iitm.ac.in/facs_swarup



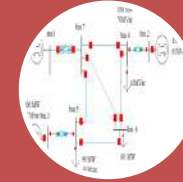
- Power Systems, Operation, Optimization, Planning, Deregulation and Control
- Energy Management Systems / SCADA, Smart Grid, Automation and Protection
- Soft Computing, Intelligent Systems, Evolutionary Computational Intelligence



Power System Operation,
Optimization and Planning



Energy Management Systems,
Automation and Protection



Intelligent Networks for
Power Grids

← ENERGY MANAGEMENT SYSTEM APPLICATIONS FOR POWER GRIDS OF THE FUTURE →

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Uday Khankhoje

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- Numerical ElectroMagnetics and Optics Lab (NEMO)
- Inverse problems in electromagnetics
- Microwave remote sensing of the Earth and Moon

Breast cancer
detection using
microwave +
m a c h i n e
learning

S o i l m o i s t u r e
detection on Earth

Ice detection on Moon
& a n a l y s i s o f
Chandrayaan data

Physics based WiFi
propagation and
source placement
studies

□ EXAMPLES OF RESEARCH APPLICATIONS ⇒



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Dr. Venkatesh Ramaiyan

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- Distributed Medium Access in Ad hoc Wireless Networks
- Cross-layer Resource Allocation and QoS Provisioning in Cellular Networks
- High Rate Communication Networks for Control Applications



WiFi Hot Spots



3G/4G Browsing



Sensor Networks

← Provisioning and Performance Evaluation in Wireless Networks →

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Dr. Vinita Vasudevan

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- Circuit Noise, Timing, Power, leakage analysis
- Reduced order modelling
- System simulation and optimization

Some problems I have worked on:

- Fast and accurate statistical timing analysis of digital circuits
- Analysis of clock jitter in sigma-delta converters
- Optimum scheduling of data parallel tasks in partially reconfigurable systems



INDIVIDUAL FACULTY PROFILE

DEPARTMENT
OF
ENGINEERING DESIGN

LIST OF FACULTY

Asokan Thondiyath

Balkrishna C Rao

Ganapathy Krishnamurthi

Jayaganthan R

Kavitha Arunachalam

Krishna Kumar R

Nilesh J Vasa

Niravkumar Patel

Palaniappan Ramu

Ramanathan M

Sandipan Bandyopadhyay

Saravana Kumar G

Shankar Ram C S

Srikanth Vedantam

Srikanthan Sridharan

Tuhin Subhra Santra

Venkatesh Balasubramanian



Dr. Asokan Thondiyath

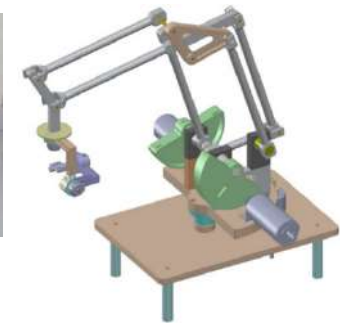
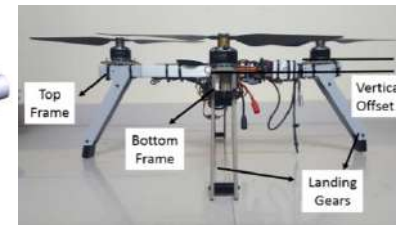
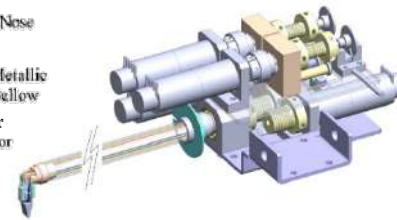
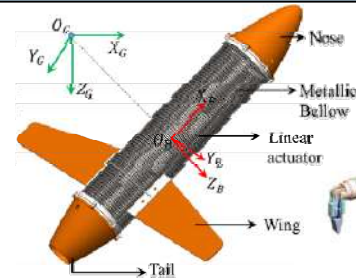
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- Robotics
- Mechatronics
- Automation
- Medical Devices



Design

- Autonomous underwater robots
- Surgical robots
- Variable buoyancy systems
- Medical / rehabilitation devices
- Aerial robots
- Multimodal robots
- New Product Development

Dynamics

- Mathematical modelling and Simulation
- Analysis of 6dof motion dynamics
- Dynamic path planning and obstacle avoidance
- Localisation and Mapping

Control

- Guidance, Navigation and Control for Autonomous operation
- Control algorithms for improved performance
- Hybrid Control architectures for robot control

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Dr. Balkrishna C Rao

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Major Areas of Research

- Severe Plastic Deformation (SPD) for creating nanocrystalline metals and alloys
- Sustainable manufacturing and additive manufacturing of metals
- Innovations for a sustainable future



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Dr. Ganapathy Krishnamurthi

PHD, Purdue University, USA

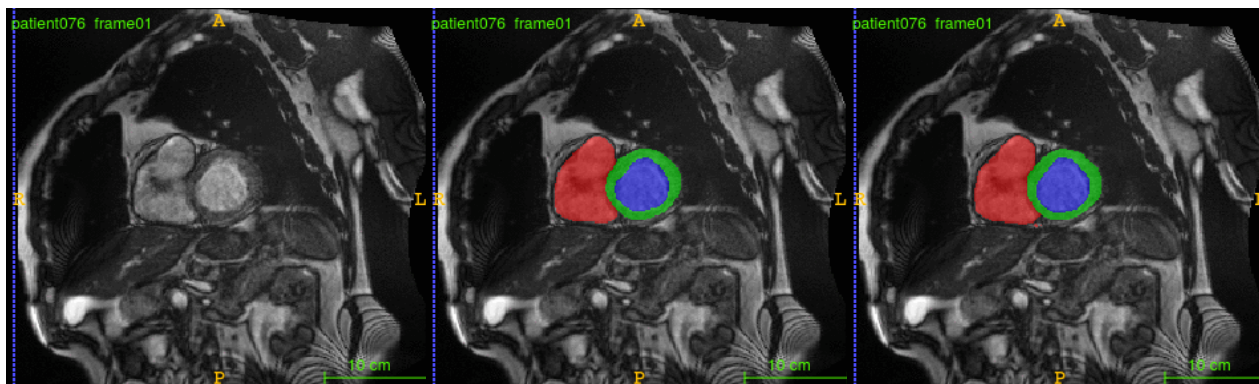
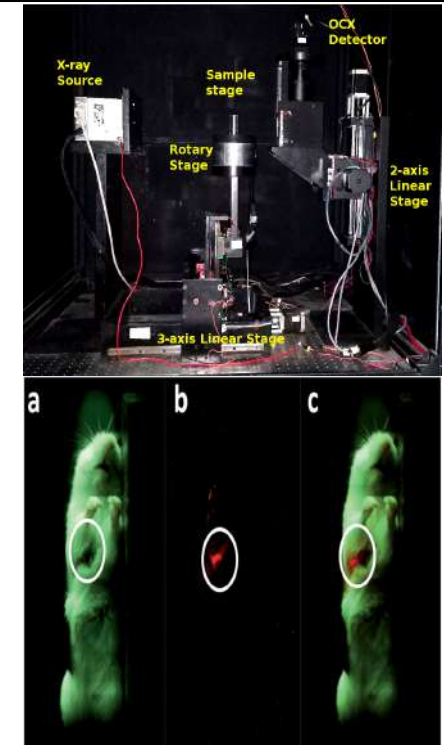
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- Developing multi-modal pre-clinical imaging systems
 - Developing software for medical image analysis
1. In close collaboration with Radiologists, we develop methods for automated analysis of medical images towards obtaining useful diagnostic and prognostic information.
 2. We validate these methods on publicly available databases as well as using data from our radiologist collaborators.
 3. We also develop low-cost pre-clinical imaging systems for enabling in-vivo imaging of rodent disease models.
 4. Our focus is on developing low cost in-vivo fluorescence imaging systems as well as x-ray micro-CT systems



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Dr. R Jayaganthan

PhD, Indian Institute of Technology Madras, India

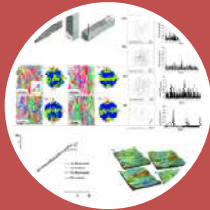
Professor, Engineering Design

044-2257-4735; edjay@iitm.ac.in

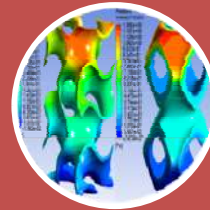
<https://ed.iitm.ac.in/team.html>



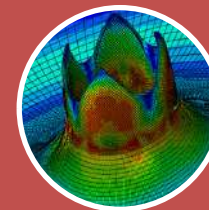
- Additive Manufacturing of Automotive, Aerospace, and Biomedical Structural Materials
- Fatigue, Fracture & Impact Mechanics
- Finite Element Modeling & Simulation of Deformable Solids
- Machine Learning for Life Time Prediction of Structural Materials



Materials' Microstructural Design for Environmental Protection



Materials Design for Automotive, Aerospace and Biomedical Applications



Finite Element Analysis of Deformable Solids for Crash worth Structures

← **Materials Design for Aerospace, Automotive and Bio-medical Applications** →

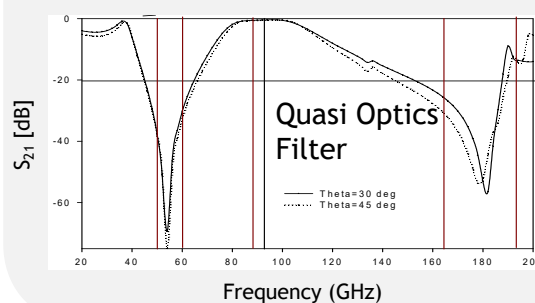
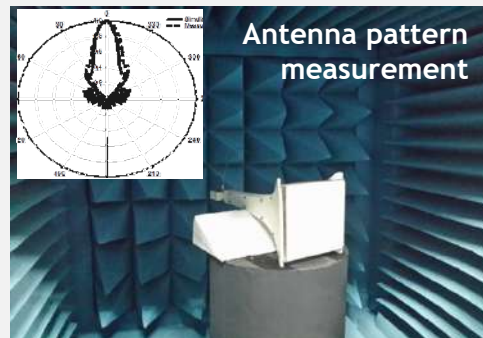


Dr. Kavitha Arunachalam
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Associate Professor, Engineering Design
<http://ed.iitm.ac.in/~akavitha/index.html>

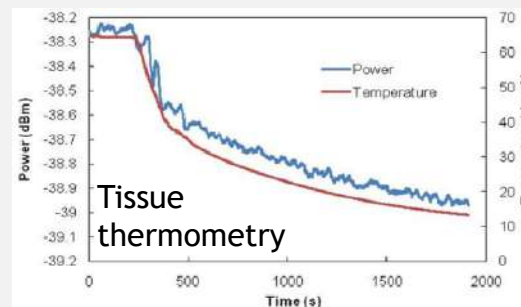


- Antennas, Filters, Microwave Circuits
- EM Medical Devices - Thermal therapy, Diagnostic
- EM Nondestructive Evaluation (NDE) - Microwave, Eddy Current Inspection

Antenna, Filter Design

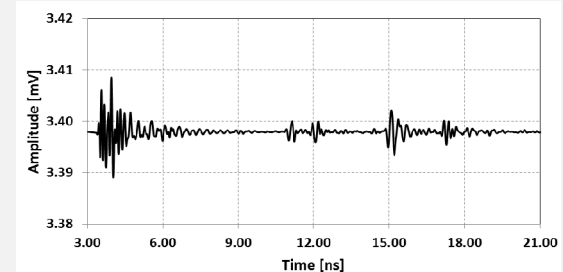


EM Medical Devices

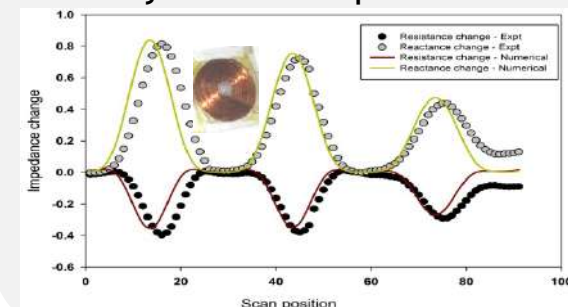


EM NDE

Microwave remote inspection



Eddy current inspection



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Dr. R Krishna Kumar

PhD, IIT Madras

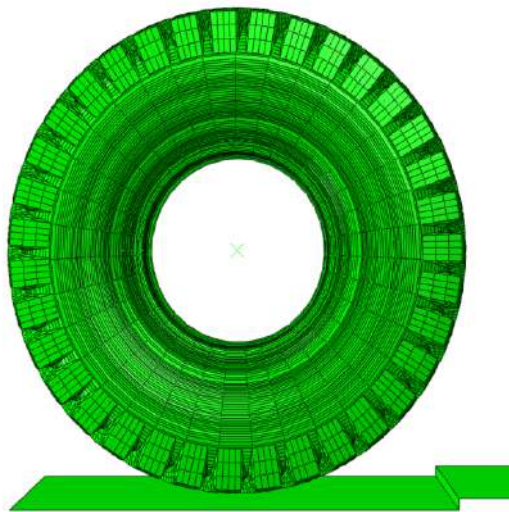
Professor, Engineering Design

044-2257-4661; rkkumar@iitm.ac.in

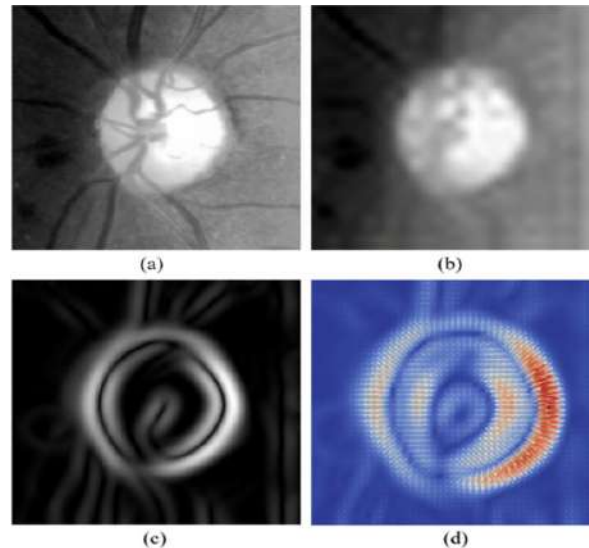
<http://www.iitm.ac.in/ED>



- Non-linear Finite Element / Tire mechanics and Biomechanics
- Biomedical Signal Processing/Cardiovascular
- Biomedical Image Processing/Diabetic Retinopathy, Cardiac imaging, image guided surgery



Tire Mechanics



Optic Disc Detection



Five lead wireless ECG

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Nilesh J Vasa

Dr. Eng., Kyushu University, Japan

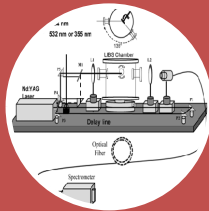
Professor, Engineering Design

+91-44-2257-4706; njvasa@iitm.ac.in

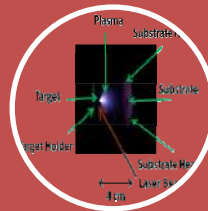
<http://ed.iitm.ac.in/~vasa/>



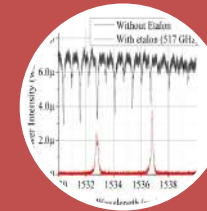
- Laser assisted sensing, Laser induced breakdown spectroscopy (LIBS) based sensing
- Laser assisted micro-manufacturing, annealing, texturing of thin films
- Optical coherent tomography technique for biomedical applications



LIBS for elemental analysis



Laser assisted
micro-manufacturing



Laser assisted sensing

← **Opto-Mechatronics Laboratory : Application of Lasers in Engineering** →



Dr. Niravkumar Patel

PhD, Worcester Polytechnic Institute, USA

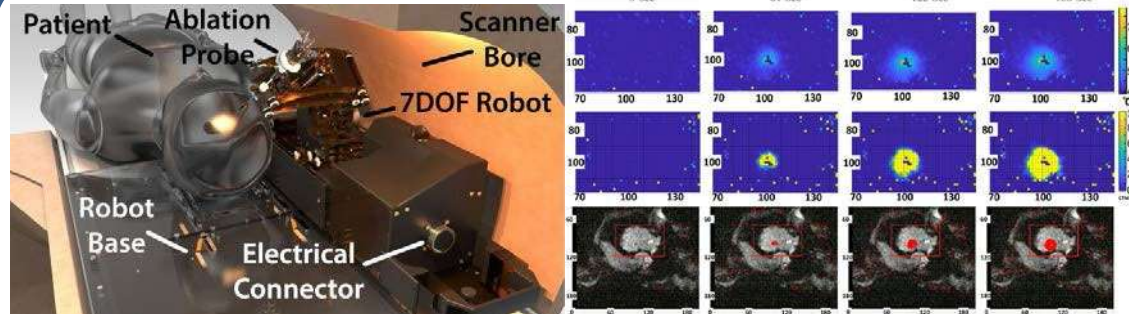
Assistant Professor, Engineering Design

044-2257-4737; niravpatel@iitm.ac.in

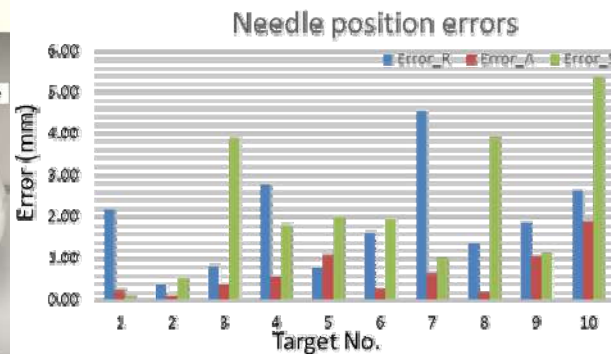
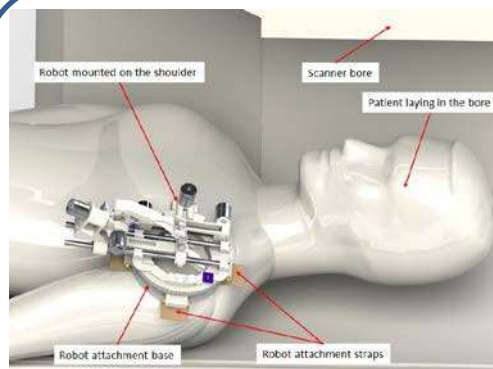
nirav.robotics@gmail.com



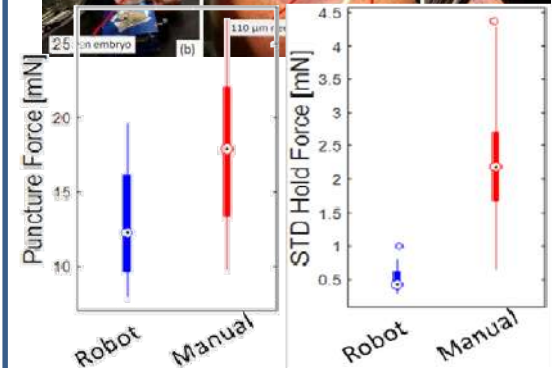
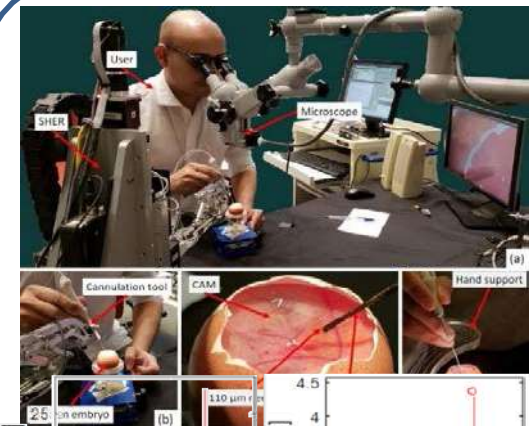
- Image guided, robot assisted minimally invasive interventions
- Autonomy in robot assisted minimally invasive surgeries



MRI guided robotic systems for brain tumor ablation and results from *in vivo* porcine studies



MRI guided robotic systems for shoulder arthrography and results from human cadaver studies



Robot assisted retinal vein cannulation and results from wet phantom studies using CAM



Dr. Palaniappan Ramu

PhD, University of Florida, Gainesville, USA

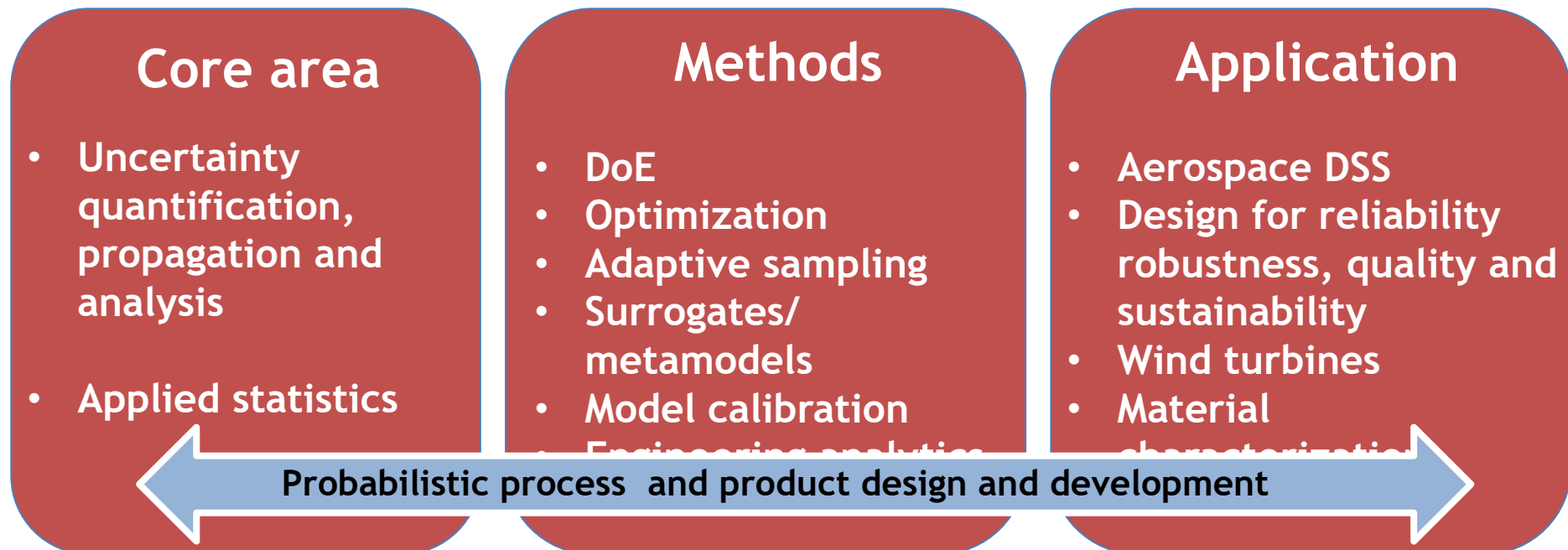
Associate Professor, Engineering Design

044-2257-4738; palramu@iitm.ac.in

<http://www.ed.iitm.ac.in/~palramu/>



- Treatment of uncertainties in engineering design
- Design space exploration and surrogate enabled optimization
- Engineering analytics and decision sciences





Dr. M Ramanathan

PhD, Indian Institute of Science, India

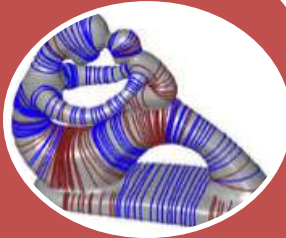
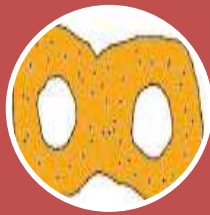
Associate Professor, Engineering Design

044-2257-4734; mraman@iitm.ac.in

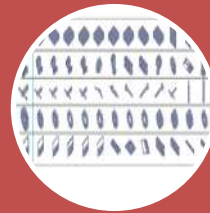
<http://ed.iitm.ac.in/~raman>



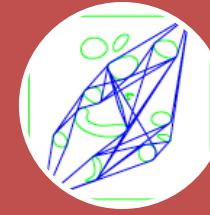
- Geometric and solid modeling / Analysis of Mesh Models and Point-sets
- Image processing (including biomedical)/Primitive extraction from images
- Computational geometry in curved world/Shortest path, Voronoi diagram



Shape Reconstruction,
Animation



Content-based Shape/Image
retrieval, Image
reconstruction



Path Planning / Mould
separation / Protein
structural analysis





Dr. Sandipan Bandyopadhyay
PhD, Indian Institute of Science, Bangalore
Associate Professor, Engineering Design
044-2257-4733; sandipan@iitm.ac.in
<http://www.ed.iitm.ac.in/~sandipan>



- Computational kinematics
- Mechanics, control, and design of parallel robots
- Design of mechanisms and products



Singular manifold of the general hexagonal Stewart platform manipulator



MaPaMan: a 3-DoF spatial parallel robot



An improved hand-driven tricycle with suspensions

← From equations to embodiment →



Dr. G Saravana Kumar

PhD, IIT Kanpur, India

Associate Professor, Engineering Design

044-2257-4736; gsaravana@iitm.ac.in

<http://ed.iitm.ac.in/~gsaravana>



Development of representational and computational tools for virtual and physical prototyping applied to arrive at solutions to design problems.

➤ CAD/CAE/CAM

➤ Engineering Optimization

➤ Additive Manufacturing

➤ Nature Inspired Computing

Design and Analysis of Implants

Composition / Porosity controlled Object CAD and Layered Manufacturing

Optimal design of TWB steels for good formability

Optimal design of mechanisms

Optimal Design

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Dr. C S Shankar Ram
PhD, Texas A&M University, USA
Professor, Engineering Design
+91-44-22574705; shankarram@iitm.ac.in
<http://ed.iitm.ac.in/~shankarram>

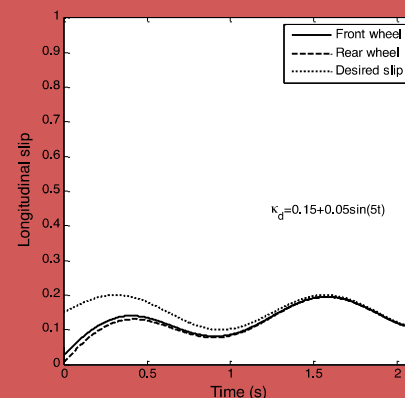


Major Areas of Research

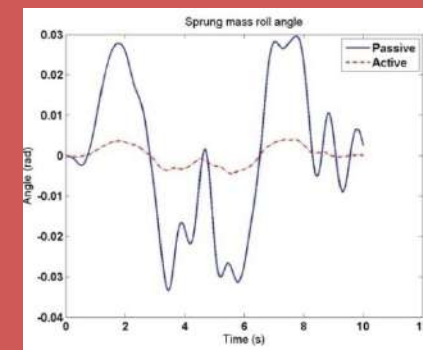
- Mathematical Modelling of Dynamic Systems, Control, Fault Diagnosis, Automotive Systems, Vehicle Dynamics, Transportation Systems
- Brakes - Model based analysis, control and diagnosis of electro-pneumatic brakes for heavy commercial vehicles, antilock braking system, vehicle stability control, regenerative braking
- Suspension - Active suspension for heavy commercial vehicles, rollover detection and prevention



Brake Systems Lab



Slip Control



Roll Control

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Dr. Srikanth Vedantam

SCD, Massachusetts Inst. of Technology, USA

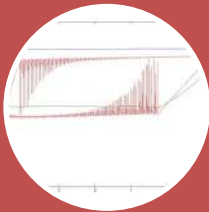
Professor, Engineering Design

044-2257-4739; srikanth@iitm.ac.in

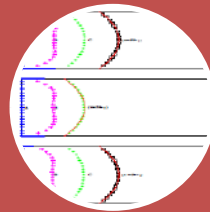
<http://ed.iitm.ac.in/~srikanth>



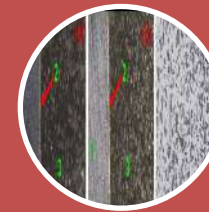
- Mechanics of Smart Materials and Functionally Graded materials
- Hydrodynamics of flow in microchannels
- Discrete computational mechanics



Shape memory reinforced
composites for impact
resistant structures



DNA separation and
manipulation of biological
cells in microchannels



Functionally graded materials
for brake applications



Dr. Srikanthan Sridharan

PhD, Univ. of Illinois at Urbana-Champaign, USA

Assistant Professor, Engineering Design

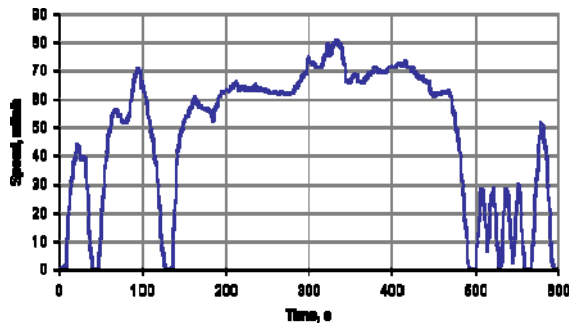
+91-44-22574748, srikanthan@iitm.ac.in

<https://home.iitm.ac.in/srikanthan/>



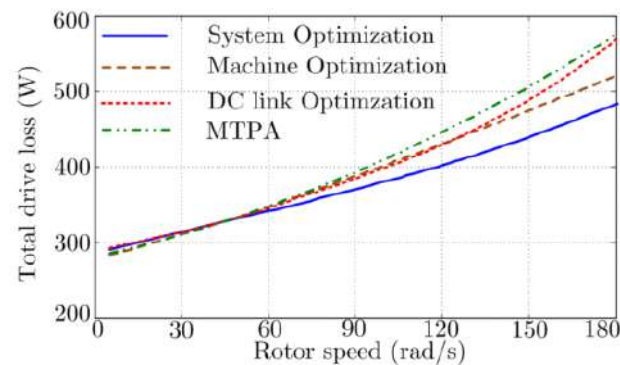
- Modeling and control of e-drive systems for electrified vehicles (EV)
- Component-level design /sizing of e-drive system
- EV battery modeling and characterization

Drive-cycle based control techniques



Vehicle speed profile in an example drive cycle

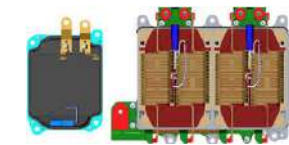
E-drive loss comparison among different control methods



Design of passive components of e-drive system



Capacitors



Inductors

Source: Presentation at SAE World Congress Experience 2017



Dr. Tuhin Subhra Santra

Ph.D, National Tsing Hua University, Taiwan

Assistant Professor, Engineering Design

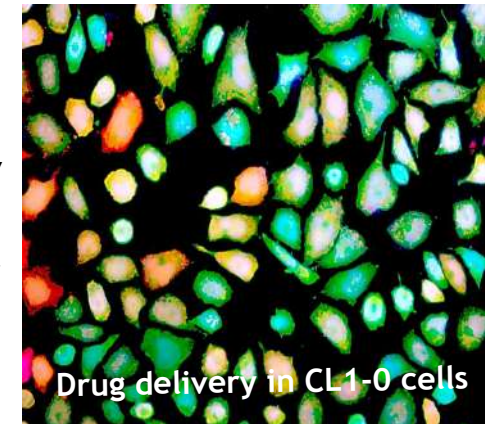
044-2257-4747; tuhin@iitm.ac.in

<https://ed.iitm.ac.in/~tuhin/>

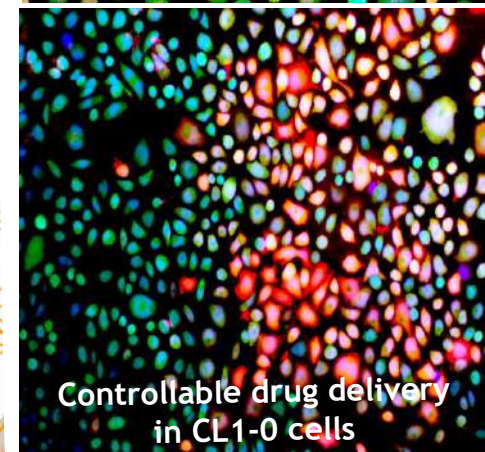


- Bio-Micro/Nano Electro Mechanical Systems (Bio-MEMS/NEMS)
- Biomedical Micro/Nano Devices
- Biofabrication
- Cell Chip/Lab on a Chip
- Nanomedicine
- Bionanomaterials

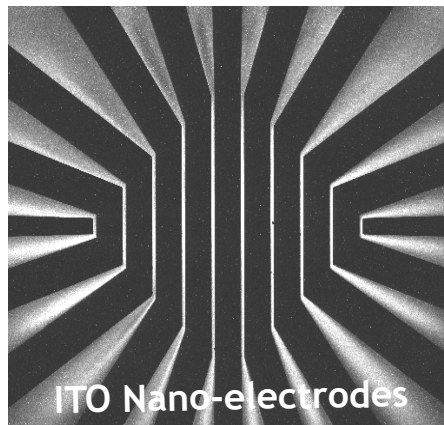
“We are developing micro/nano fabricated chips for massively parallel high throughput single cell therapy and diagnostics using different physical mechanisms such as electrotherapy, laser therapy, mechanotherapy etc.”



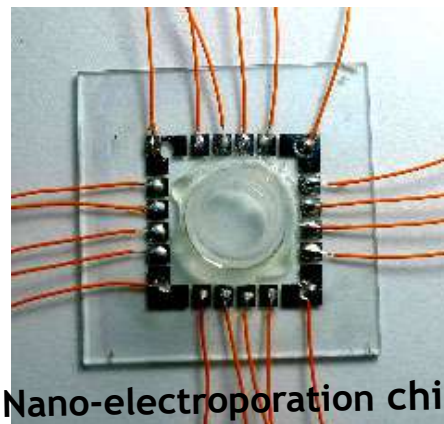
Drug delivery in CL1-0 cells



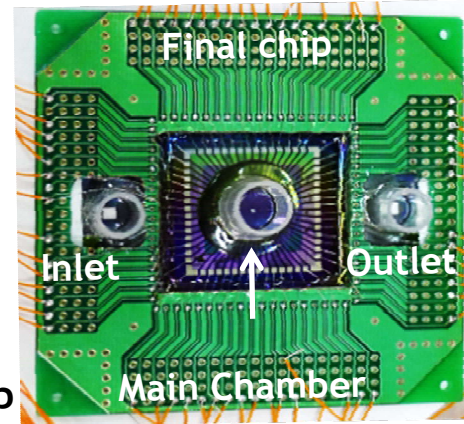
Controllable drug delivery in CL1-0 cells



ITO Nano-electrodes



Nano-electroporation chip



Final chip
Inlet
Main Chamber
Outlet

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Dr. Venkatesh Balasubramanian

PhD, Louisiana Tech University, USA

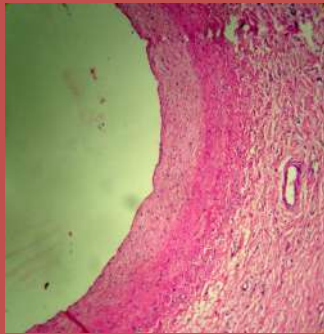
Professor, Engineering Design

044-2257-4117; chanakya@iitm.ac.in

<http://www.ed.iitm.ac.in/~vb/>



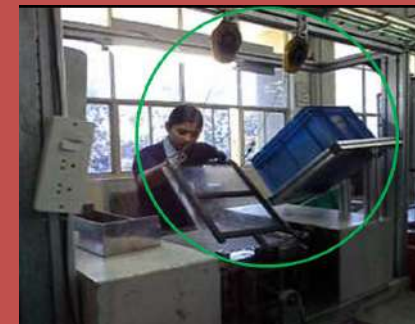
- Medical Devices and Implants
- Human Factors and Ergonomics
- Innovation and Manufacturing Strategy



- Tissue Engineering
- Biomaterial Development
- Electro-mechanical Devices/ Ortho Devices



- Driver Fatigue
- Occupant Safety
- Occupational Biomechanics duct & Process Design



- RBG Risk Scaling
- RBG Innovation Ladder
- Sustainable Manufacturing
- Manufacturing Strategies



INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF
HUMANITIES
AND
SOCIAL SCIENCE

LIST OF FACULTY

Aditya Kolachana

Anindita Sahoo

Anup Kumar Bhandari

Avishek Parui

Aysha Iqbal Viswamohan

Binitha V Thampi

Dhanavel S P

Divya A

Hemachandra Karah (Profile yet to be uploaded)

Joe Thomas Karackattu

John Bosco Lourdusamy

Jyothirmaya Tripathy

Kalpana K

Mathangi Krishnamurthy

Merin Simi Raj

Millind Brahme

Muraleedharan V R

Prema Rajagopalan

Rajesh Kumar

Roland Wittje

Sabuj Kumar Mandal

Santhosh R

Santhosh Abraham

Santhosh Kumar Sahu

Satya Sundar Sethy

Solomon Benjamin

Sonika Gupta

Sreekumar Nellickappilly

Srilata K

Subash S

Sudarsan Padmanabhan

Sudhir Chella Rajan

Suresh Babu M

Swarnalatha Rangarajan.

Tabraz S S

Umakant Dash

Vipin P Veetil



Dr. Aditya Kolachana

PhD, IIT Bombay

Assistant Professor, Humanities & Social Sciences

044-2257-4544; aditya@iitm.ac.in

<https://hss.iitm.ac.in/team-members/aditya-k/>



Major Areas of Research - History of Science and Technology in India

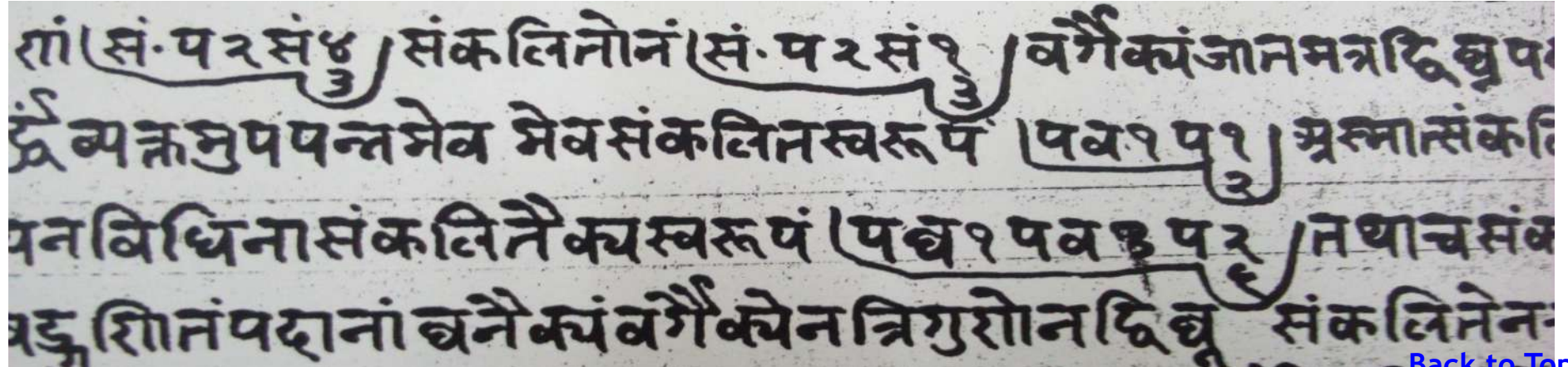
Focus:

- Development of mathematics and astronomy in India Manuscriptology
- Scientific literature in Sanskrit

Outcomes:

- Authentic accounts of the development of science in India
- Publication of important scientific texts written in Sanskrit, with translation and notes using modern scientific notation Development of alternative pedagogical techniques

Below: A manuscript of the mathematical commentary *Nisr̥ṣṭārthadūtī* depicting algebraic notation in Sanskrit



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Anindita Sahoo

Associate Professor, Humanities and Social Sciences
044-2257-4534, anindita@iitm.ac.in/sahoo.anindita@gmail.com
<https://hss.iitm.ac.in/team-members/anindita-sahoo/>



Theories of Natural Language,
Cognition and Computation

A

Issues related to Faculty of Language
Evolution of Language
Comparative studies of Language

Linguistic Typology,
Syntax-morphology Interface
Variation Studies

B

Syntactic Typology of South Asian Languages
Grammatics of Indian English
Diachronic studies of grammaticalization

Technique development.
Nonlinear electrochemical Impedance
Spectroscopy (NLEIS)

Pragmatics and Discourse Analysis
Computational Sociolinguistics NLP

C

Effects of Social context on Language
Data Mining and Content Analysis
Language and Identity



Dr. Anup Kumar Bhandari

PhD (in Quantitative Economics), Indian Statistical Institute
Associate Professor, Humanities and Social Sciences

044-2257-4531, anup@iitm.ac.in

<http://www.hss.iitm.ac.in/anup/index.html>



Major Areas of Research

- Production Economics, with special emphasis on Productivity and Efficiency Analysis
- Applied Industrial Economics
- Issues related to Indian Banking and Indian Financial Markets



Dr. Avishek Parui

PhD, Durham University, UK

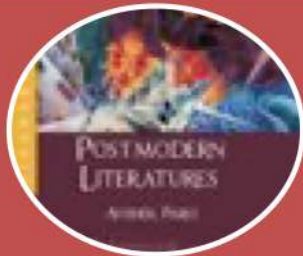
Assistant Professor, Humanities & Social Sciences

044-2257-4535; avishekparui@iitm.ac.in

<https://hss.iitm.ac.in/team-members/avishek-parui/>



- Memory Studies
- Masculinity Studies
- Medical Humanities



Imperial Masculinities

Political, cultural and literary constructions of Masculinity

Gender, literature and culture

ROWMAN &
LITTLEFIELD

Culture and the Literary
Matter, Metaphor, Memory
AVISHEK PARUI

Cognitive Humanities and AR/VR/XR
technology

Culture and History

Sites of Production and
Preservation: museums, archives
and monuments



Narratives of Contagion and
Consumption

Trauma Studies

Sleepless Cities: Brain Studies and
Urban Studies

← MEMORY STUDIES RESEARCH NETWORK: Academia Industry Collaborations →

<https://www.memorystudiesiitmadrass.com>

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Dr. Aysha Iqbal Viswamohan
Professor, Humanities & Social Sciences
044-2257-4521; draysha@iitm.ac.in
<http://www.hss.iitm.ac.in/aysha/index.html>



Major Areas of Research

- Film Studies
- Drama and Contemporary Fiction
- Popular Culture



Film Studies



Drama



Popular Culture

Literature, Media, Culture

[Back to Top](#)



Dr. Binitha V Thampi

PhD, Institute for Social and Economic Change,
Bangalore, India

Associate Professor, Humanities and Social Sciences

044-2257-4528;binithathampi@iitm.ac.in



- Gender and Development
- Decentralised Planning and Governance
- ICTs for Development

Gender critique of public policies and engendering of development

Analysis of governance reform initiatives and decentralized planning

Digital divide and the inclusion



Dr. Dhanavel S P

Professor, Humanities and Social Sciences

044-2257 4522; dhanavelsp@iitm.ac.in

<http://www.hss.iitm.ac.in/dhanavel>

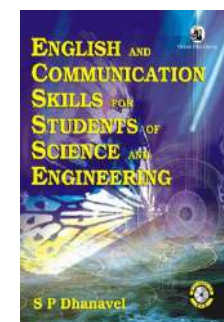
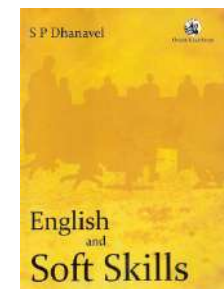
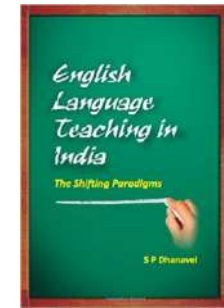


Major Areas of Research

- Indian English Drama
- American Poetry
- English Language Teaching, Communication and Soft Skills

Recent Books

- English Language Teaching in India: The Shifting Paradigms (New Delhi: Tata McGraw-Hill, 2012)
- English and Soft Skills (Hyderabad: Orient BlackSwan, 2010)
- English and Communication Skills for Students of Science and Engineering (Chennai: Orient BlackSwan, 2009)



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Dr. Divya A

Assistant Professor DoHSS, IITM

044-2257 4542 ; divya@iitm.ac.in

Lecture 3D: Realism, Gender in Tagore's Kabuliwala

Tagore on Realism

- “I am surprised when you say that my short stories are lyric in appeal...I'd like to emphasise that there was never any want of realism in them. I've written what I have seen, deeply felt and directly experienced.”
- “If you think it over you'll see that the real picture of Bengali families had its artistic and authentic representations in my short stories” (See *Prabasi*, May 1941)



Dr. Hemachandran Karah
PhD, University of Cambridge, UK
Assistant Professor, Humanities and Social Sciences
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Dr. Joe Thomas Karackattu

Assistant Professor, Humanities and Social Sciences

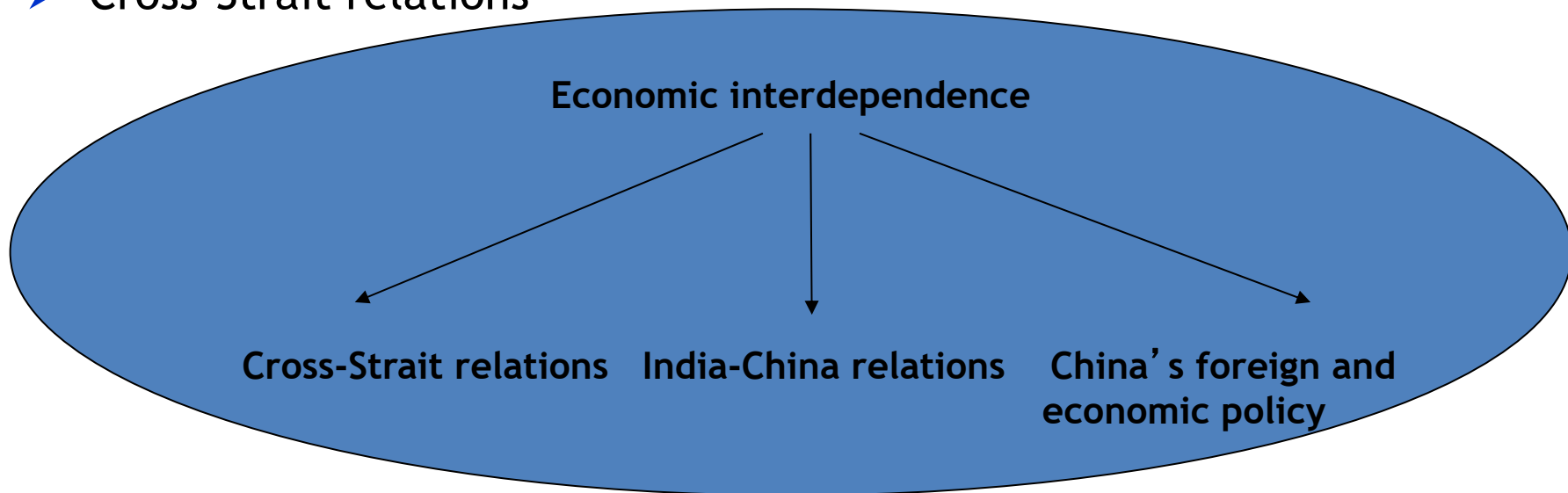
044-2257 4511 ; joe@iitm.ac.in

<http://www.hss.iitm.ac.in/joethomas/index.html>



Major Areas of Research

- Economic interdependence and conflict
- India-China relations
- Cross-Strait relations



How conflict stands to be deterred, informed, or transformed by the value of economic linkages at the inter-state level

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Dr. John Bosco Lourdusamy

D.Phil [University of Oxford, UK]

Assistant Professor, Humanities and Social Sciences

044-2257 4511; 94440 18510; jbl@iitm.ac.in; jbl.hss@gmail.com

Fax: 044-2257 4502

<https://hss.iitm.ac.in/team-members/john-bosco-lourdusamy/>



Areas of expertise: History of Science, Technology and Medicine in colonial India.

Current specific areas of focus:

- Global circulation of crops
- Flows of botanical knowledges
- Rise of plantations



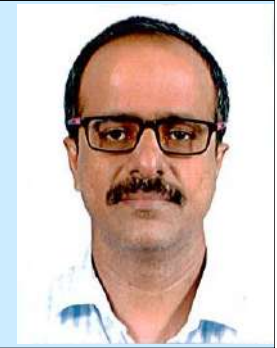
Dr. Jyotirmaya Tripathy

PhD, IIT Kharagpur, India

Professor, Humanities and Social Sciences

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<https://hss.iitm.ac.in/team-members/jyotirmaya-tripathy/>



- Cultural Studies
- Culture and Development
- Contemporary India

Questions around culture and identity; cultural criticism; postcolonial cultures

How culture mediates development thought and practice; development as a process; development narratives

Indian cultural expressions; Indian thought on nation and nationalism; Indian development Cultures

← BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH →



Dr. K Kalpana

PHD, Madras Institute of Development Studies

Assistant Professor, Humanities and Social Sciences

044-2257-4520; kkalpana@iitm.ac.in

<http://www.iitm.ac.in/component/faculty/75/kkalpana/>



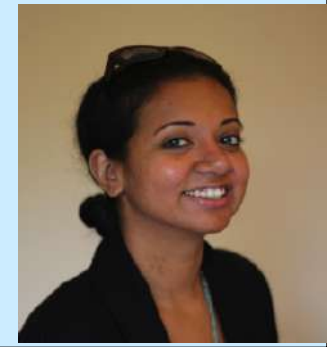
- Gender and Development / Women's Studies
- Shifting Paradigms of State-Civil Society Relationships

Understanding how the socio-political dynamics of gender, class and caste mediate and shape Indian women's experience of development in post-Independence India

Critical analysis of the shifting relationships between the Indian state and civil society actors in the delivery of public and social services



Dr. Mathangi Krishnamurthy
Assistant Professor, Humanities and Social Sciences
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<http://www.hss.iitm.ac.in/mathangi/index.html>



Major Areas of Research

- The anthropology of globalization
- Labor, body, and gender
- The politics of the Indian middle-class

The relationship between globalization, the new middle-classes, forms of labor, and production of body, kin, and

An ongoing book project, this investigates the formation of call centers as both precursors and

project investigates new forms of labor as practised in the gestational surrogacy industry and will solicit funding from



Dr. Merin Simi Raj

Assistant Professor, Humanities and Social Sciences

merinsimiraj@gmail.com



Major Areas of Research

- Indian English fiction - historicizing texts and textualizing history; nation-writing; secularism and Indianness debate; visibility from marginalized locations - gender, caste and region
- Literary Historiography Studies - the writing of literary histories in India; questioning the foundations and frameworks; Nationalism and the politics of inclusion/exclusion
- Caste studies and Dalit writing - caste and secular nationalist imaginings; discourse of denial and castelessness; construction of new knowledge subjects



Opening up Indian English fiction as a ground for insurrections, possibilities and destabilizations



How the recovery/inclusion of certain texts/traditions/events change the 'story' of a particular literature/genre/nation



How other frames of references affect the dominant meaning making processes

Examining the conditions/terms of production and reception of knowledge and its institutionalization

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Dr. Milind Brahme

PhD (JNU, India)

Associate Professor, Humanities and Social Sciences

044-2257-4508; brahme@iitm.ac.in

<http://www.hss.iitm.ac.in/milind/index.html>



- Research Area - Modern German and Comparative Literature
- Research Area - Education - School and Higher Education in India
- Teaching Area - Literary Theory, Literary Criticism, German Language and Literature

Areas of Application of Research

German Language and Literature:

- My research in this area does not have any direct application. Indirectly it informs my teaching as well as research guidance in English and German Literary Studies.

Education:

- Research Guidance
- Research based Consultancy in the form of Monitoring the Sarva Shiksha Abhiyan in Tamil Nadu for the MHRD since 2008
- Evaluation of Pedagogical Interventions and Innovations in School Education - for the Tamil Nadu Government as well as private non-profit institutions

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Dr. VR Muraleedharan

PhD (IIT Madras)

Professor, Humanities and Social Sciences

044-22574506, vrm@iitm.ac.in

<http://www.hss.iitm.ac.in/muraleedharan/index.html>



- Healthcare Economics (Focus on Financing mechanisms and HR policies); Dr. UmakantDash is my research partner. Collaborative research project with 10 Institutions from 7 countries, supported by DFID, UK; <http://resyst.lshtm.ac.uk>
- History of Healthcare in South India (Focus on Institutional history, role of technology in health care and Patient Autonomy); Dr John Lourdasamy and Dr N Sreekumar are co-researchers.
- Healthcare Technology Assessment (Focus on methodologies for economic evaluation of healthcare technologies.) In collaboration with NHSRC, Delhi.

As a part of an International Consortium of 10 Research Institutions, our focus of research is on the design and implementation of innovative financing mechanisms and human resources policies that will help build resilience and responsiveness of health system to promote health and health equity . This study is funded by DFID UK up to 2016.

This project is funded by the Wellcome Trust UK for three years up to 2015, coordinated by Dr John Lourdasamy and Dr Sreekumar. I focus on how introduction of various technologies changed the public perception of medical profession in early 20th century. Dr John and Dr Sreekumar are looking at the history of medical institutions in Madras city, and concept of patient autonomy as practiced by indigenous medical practitioners,

During the next five years, I intend to work on methodologies for undertaking economic evaluation of medical technologies in poor resource settings, such as in India, where access to quality care remains the most critical issue.

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Dr. Prema Rajagopalan
PhD, Indian Institute of Technology, Kanpur
Associate Professor, Humanities and Social Sciences
[044-2257-4513](tel:044-2257-4513); prema@iitm.ac.in



RESEARCH INTERESTS:

- Sociology of Science
- Sociology of Work
- Built Environment and Society



Mainly interested in scientific community studies institution building in science.



Have researched on changing complexion of caste based occupations and women in the profession of science.



Undertaken consultancy and sponsored research on housing the poor and the post - disaster rehabilitation.

← Interested in any development issue from a sociological perspective →



Dr. Rajesh Kumar

PhD, University of Illinois at Urbana-Champaign, USA

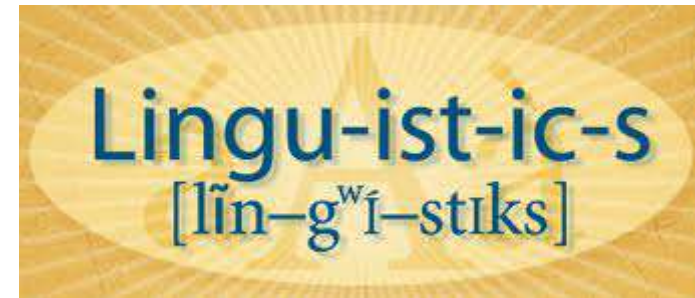
Associate Professor, Humanities and Social Sciences

044-2257-4537; rajesh@iitm.ac.in

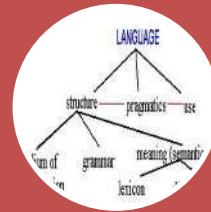
<http://www.hss.iitm.ac.in/rajesh/index.html>



- Language in Education
- Structure of South Asian Languages
- Sociolinguistics



Organization of language at the levels of sounds, words, and sentences.



Linguistic competence and performance, relationship between language and society, and relationship between language and human mind.



Applications of the fundamental ideas of language learning/acquisition for teaching in general and teaching of second/foreign language in particular.

← Understanding nature and structure of natural language and its applications →



Roland Wittje

PhD, University of Illinois at Urbana-Champaign, USA

Associate Professor, Humanities and Social Sciences

044-2257-4540; roland@iitm.ac.in

<http://www.hss.iitm.ac.in/index.php/faculty/institute-faculty?id=60>

Research Interests:

- History of the physical sciences and engineering of the late 19th and 20th century
- Global history of science and technology
- History of scientific collections, research technology and scientific practice
- History of science education and technical training
- History of acoustics



Dr. Sabuj Kumar Mandal

Assistant Professor, Humanities and Social Sciences

044-2257-4532; sabuj@iitm.ac.in

<http://www.hss.iitm.ac.in/sabuj/index.html>

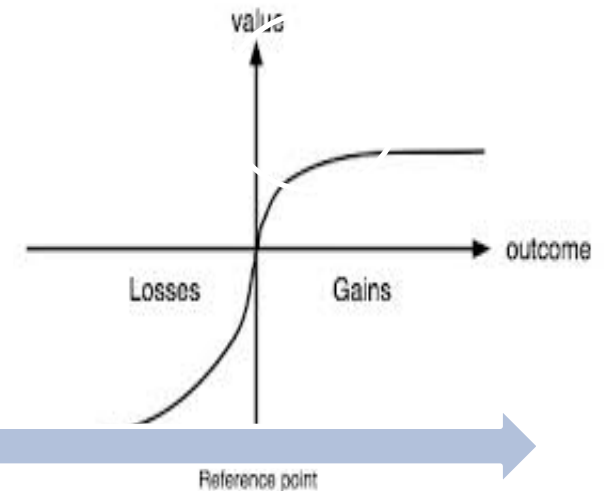


Major Areas of Research

- Energy and Environmental Economics
- Efficiency and Productivity Analysis(frontier approach)
- Industrial Economics & Applied Econometrics
- Behavioral Economics



Industrial Energy Efficiency





Dr. R Santhosh

PhD, ISEC Bangalore, India
Associate Professor, Humanities and Social Sciences

044-2257-4517; rsantho@iitm.ac.in
www.hss.iitm.ac.in/santhosh/index.html



- Research Area: Sociology of Religion, Islam
- Research Area: Development Studies and globalization
- Research Area: Social Movements and state

Changing articulation of religion in the contemporary world.

Role of Islamic activism and charity in the fields of social welfare and public health in Kerala.

New Social movements and identity question



Dr. Santhosh Abraham

Assistant Professor, Humanities and Social Sciences

044-2257-4536; abraham@iitm.ac.in

<http://www.hss.iitm.ac.in/abraham/index.html>



Major Areas of Research

- Colonial Courts, Legal Pluralism, Customary Laws, Conflicts
- Mental Asylums and Legal Norms in Colonial South India
- Territorial Logics of Malabar and South Canara: History and Land in the Social Construction of Law



Colonial Courts, Native
Laws, Conflicts



Colonialism, Psychiatry,
Mental Asylums



History and Land in the
Social Construction of
Law

← Colonialism, Courts, Law, Land, Medical Institutions →

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Dr. Santosh Kumar Sahu

PhD, IIT Bombay, India

Assistant Professor, Humanities and Social Sciences

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<https://hss.iitm.ac.in/team-members/santosh-kumar-sahu/>



- Applied Energy Economics and Climate Change
- Industrial Ecology and Policy
- Applied Industrial Economics



Energy Efficiency



Industry-Environment



Innovation-Industrial Ecology

Microeconometrics



<https://sites.google.com/view/sksahuiitm/home>

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Dr. Satya Sundar Sethy

PhD, Central University of Hyderabad, India
Associate Professor, Humanities & Social Sciences

044-2257-4509; satyasundar@iitm.ac.in
<http://www.hss.iitm.ac.in/satya/index.html>



- Research Area: Philosophy of Language, Analytical Philosophy
- Research Area: Contemporary Western Philosophy
- Research Area: Information and Communication Technologies (ICTs) in Education



Semantic and Mental
Representations



Meaning, Truth, Belief System, and
Knowledge



Assessment and Evaluation, Quality
Assurance, Pedagogy and Andragogy
of Learning, Instructional Design



Dr. Solomon Benjamin

Ph.D. Massachusetts Institute of Technology
Associate Professor, Humanities and Social Sciences

044-2257-4538; solly.benj@iitm.ac.in



Major Research Areas

- **Trans-National Urbans: Indian and Chinese Urbanism as a ‘South’ Theory:** Co-producing Indian and Chinese Urbanisms: With researchers at the Hong Kong Baptist University, Chinese University of HK, CRIT Mumbai, this networks works on the idea of ‘Co-produced Urbanism to re-think the urban not as bounded but inter-connected ideas and practices. Preliminary funding from the Indian Council of Social Science Research.
- **Logics of Non-Metro Urbanization:** SUBURBIN (Subaltern Urbanisation in India) funded by the ‘ANR’ French National Research Agency <http://suburbin.hypotheses.org/701> With more than 30 collaborators in India and France, coordinated with the CHS Delhi, CPR Delhi, IFP Pondicherry, the project analyses the logics of small town large village urban agglomerations.
- **Spatializing Peri-Urban Claims: Land, Politics, and Economy:** Research network focusing on metro-peripheries as part of *Global Suburbanisms: Governance, Land, and Infrastructure in 21st Century*: With fifteen ‘co-applicants’ more than 40 collaborators in a long term international research collaborative funded under the Major Collaborative Research Initiatives (MCRI), Social Science and Humanities Research Council (SSHRC), Canada) http://www.yorku.ca/city/?page_id=222



‘Repair’ or ‘Reconstitution’ in Indian China Bazaars: An issue of conceptual and empirical significance

‘Chieftain’ House in South Canara and it’s Chinese Vase: Mediations via ‘customary’ claims underpin non-metro urbanisation, with trans-national trade links

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Dr. Sonika Gupta

Mphil & PhD: JNU, India

Associate Professor, Humanities and Social Sciences

044-2257-4523: sonika@iitm.ac.in



- International Relations & Chinese Politics
- Tibet Studies & Himalayan Borderlands
- Chinese Foreign Policy



Tibetan exile community,
Indo-Tibetan Borderlands



China's Ethnic Policy, Cross
Relations, China's Territorial
Disputes, Internet in China



IR Theory, Cosmopolitanism,
Citizenship

← BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH →

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Dr. Sreekumar Nellickapilly
PhD, Hyderabad Central University
Professor, Humanities and Social Sciences
044-22574514, srkumar@iitm.ac.in
<http://www.hss.iitm.ac.in/sreekumar/index.html>



- Bioethics and the History of Healthcare in South India (Focus on Patient Autonomy, Institutional history and the role of technology in health care); Dr John Lourdusamy and Prof. V.r.Muraleedharan are co-researchers.
- Traditional/Indegenous Medicine (Focus on Scientific and Ethical aspects) supported by INSA, New Delhi.
- Philosophical, phenomenological, scientific and hermeneutical dimensions of human reality and human wellbeing.
- Research Area/Focus 2
- Research Area/Focus 3

Philosophical, Phenomenological and Scientific Conceptions of Human Wellbeing

This project is funded by the Wellcome Trust UK for three years upto 2015, coordinated by

V.R.Muraleedharan. I focus on the problem of Patient Autonomy and Wellbeing with

This project is funded by the Indian National Science Academy, New Delhi and it tries to

cultural aspects related to the traditional Ayurveda practitioners of Kerala who are known as Parambarya Vaidyas.

The phenomenological and philosophical conceptions of human being. This is a broad

from both the western and Indian philosophical traditions.



Dr. K Srilata

PhD, Hyderabad Central University
Professor, Humanities and Social Sciences

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<http://www.hss.iitm.ac.in/srilata/>



- Theories of Creativity and Creative Writing Research
- Indian Literatures in Translation
- Children's Literature; Women's Writing



Writing



Literary Translation



Reading Literary Texts
and Contexts

← The focus of my work is the literary text and its social context. →



Subash S

PhD, IIT Bombay

Associate Professor, Humanities and Social Sciences

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<http://www.hss.iitm.ac.in/subash/index.html>



Major Areas of Research

- Foreign Direct Investment
- Economics of Innovation and Technological Change
- International Trade



Dr. Sudarsan Padmanabhan

PhD (Pondicherry Univ & Univ of South Florida)
Associate Professor, Humanities and Social Sciences

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<http://www.hss.iitm.ac.in/sudarsan/index.html>



- Social and Political Philosophy (Focus on Social, Political and Cultural Theories and Institutions): Dr. JyotirmayaTripathy is my research partner. India EU Study Centre Project (IESCP) - 2010-2011 - www.iescp.net - Result of India - EU Joint Action Plan - Strong emphasis on EU studies, teaching, research and student exchange
- Erasmus Mundus Consortium (IBIES) with Aarhus University, Denmark - Collaborative teaching, student exchange and research partnerships with 19 national and international universities funded by the European Union. (www.erasmus.iescp.net) - 2013-2016
- Erasmus Mundus Asia Lot - MAE - Erasmus Mundus Consortium with Aarhus University (<http://www.mae-erasmus.iescp.net/>) - Proposal stage

My area of current research is the construction of Indian social imaginary. I am interested in the pre-colonial, colonial and post-colonial social, political and economic institutions that influenced the formation of Indian nation and state. An attempt to create an Indian social imaginary is simultaneously an endeavour to create a moral order. The Constitution of India best exemplifies an attempt to institutionalize India's post-colonial, non-hierarchical, and democratic moral order.

The India EU Study Centre Programme funded by the EU was envisioned by the EU-India Joint Declaration to increase mutual cooperation in Higher Education. The research group at IIT Madras was called the Centre for Comparative EU Studies (CCEUS). The broad areas covered by the Centre were philosophy, political sciences, literature, culture studies, and international relations. More specifically, social and political theory, postcolonial, poststructural and postmodern cultural debates, contemporary debates in international relations, especially, problematizing nation-state and cosmopolitanism.

The EU Study Centre has conducted several international workshops, seminars and conferences with its European and Indian partners. The outcome of this partnership is two edited volumes published by Routledge, India. *The Democratic Predicament: Cultural Diversity in Europe and India* (2013) is edited by Dr. Jyotirmaya Tripathy and Dr. Sudarsan Padmanabhan and the second volume titled politics in the *Global Age: Critical Reflections on Sovereignty, Citizenship, Territory and Nationalism* edited by Dr. Sonika Gupta and Dr. Sudarsan Padmanabhan by Routledge Publishers is forthcoming.



Dr. Sudhir Chella Rajan

Deny, University of California, Los Angeles

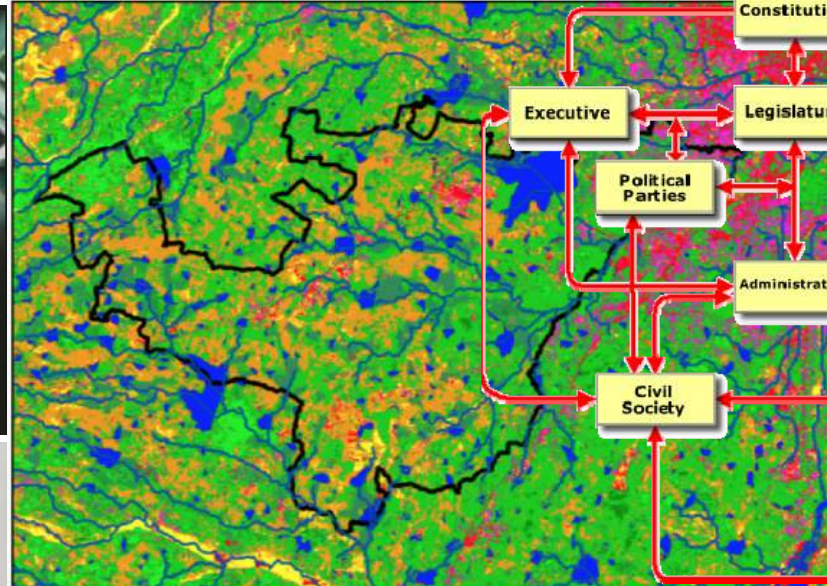
Professor, Dept. of Humanities and Social Sciences

044-2257-4525; scrajan@iitm.ac.in

<https://hss.iitm.ac.in/team-members/sudhir-chella-rajan/>



- Political theory and the environment: automobility; climate change; resource curse; transport and urban policy
- Periurban initiative: armatures and enclaves; bypasses and youth; community gardening; repair cultures
- Corruption studies: big histories; grand corruption; social theories of elite networks and emergence



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Dr. M Suresh Babu

PhD (JNU, New Delhi)

Professor, Humanities and Social Sciences

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<http://www.hss.iitm.ac.in/sureshbabu/index.html>



Major Areas of Research

- Industrial Economics
- Trade and Development
- Education and Human Capital



My research has been on Competition, Entry Barriers and Productivity Growth in Indian Manufacturing Industries



I am currently interested in the issues related to unorganized manufacturing sector in India, especially innovations and growth



I have been associated with the monitoring of Sarva Sikha Abhayan in Tamil Nadu and the implementation of ICT in schools

← Industrial Performance/Applied Macroeconomics/Innovations and Human Capital →

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Dr. Swarnalatha Rangarajan
PHD, University of Madras, India
Professor, Humanities and Social Sciences
044-2257-4519, swarna@iitm.ac.in
<http://www.hss.iitm.ac.in/swarnalatha/index.html>



- Ecocriticism
- American Literature
- Early Modern English Literature



Representation of environmental debates in cultural spaces-ecofeminism, econarratives from the Global South, bioregionalism, ecophilosophy place studies



The diverse genres of 18th, 19th and 20th American Literature- with a special focus on the writings of Thomas Wolfe



Shakespearean drama - the greening of Shakespeare studies



Dr. S S Tabraz

Assistant Professor, Humanities and Social Sciences

044-2257-4533; tabraz@iitm.ac.in



Major Research Areas

- Politics of West and South Asia
- Theories of International Relations
- US mediation in conflicts in West Asia especially Israeli-Palestinian Conflict





Dr. Umakant Dash

PhD (IIT Kanpur)

Professor, Humanities and Social Sciences

044-22574516, dash@iitm.ac.in

<http://www.hss.iitm.ac.in/umakant/index.html>



- Healthcare Economics (Equity, Efficiency and Governance)
- Efficiency Analysis (Data Envelopment Analysis)
- Financial Economics (Fixed Income Securities, Derivatives Market)



Part of an International Consortium of 10 Research Institutions, RESYST, the focus is on generating evidences which would enhance the resilience and responsiveness of health systems in promoting health and health equity. This project is funded by the Department for International Development, UK. <http://resyst.lshtm.ac.uk>

Efficiency Analysis of Sectors: the Banking Sector and Health Systems



Healthcare Purchasing Arrangements: intend to work on governance issues pertaining to purchasing of health care services in India, where access to basic care remains one of the challenge in achieving Universal Health Care.

← Healthcare Economics/Efficiency Analysis/Derivative Market →

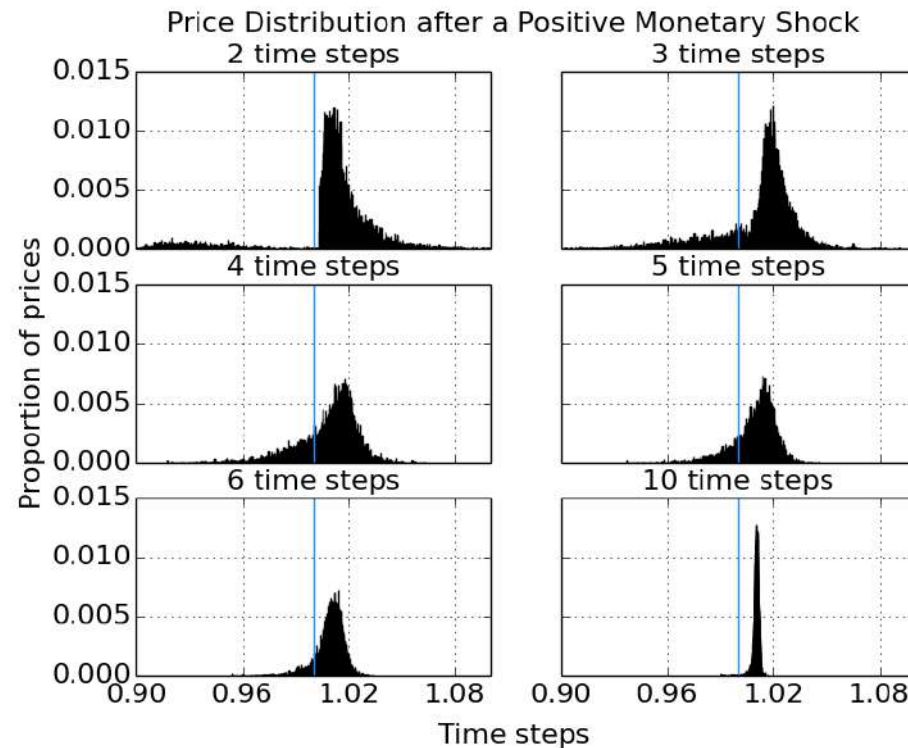


Dr. Vipin P Veetil

PhD, George Mason University, USA
Assistant Professor, Humanities and Social Sciences
044-2257-4543; vipin@iitm.ac.in



- Agent-based Computational Economics
- Monetary Economics
- Macroeconomics



Distribution of price changes after a positive monetary shock



INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF MANAGEMENT STUDIES

LIST OF FACULTY

Amit R K

Arshinder Kaur

Arun Kumar G (Profile yet to be uploaded)

Kamalanabhan T J

Krishna Prasanna

Lata Dyaram

Madhumathi Rajendran

Nandan Sudarsanam

Nargis Pervin

Prakash Sai L

Rahul R. Marathe

Rajendran C

Richa Agrawal

Rupashree Baral

Saji K Mathew (Profile yet to be uploaded)

Srinivasan G

Sundarraaj R P

Thenmozhi M

Thillai Rajan A

Usha Mohan

Vaibhav Chawla

Varisha Rehman

Vijayalakshmi V



Dr. R K Amit

PhD, IISc Bangalore, India

Associate Professor, Management Studies

044-2257-4575; rkamit@iitm.ac.in

<http://www.doms.iitm.ac.in/amit.htm>



- Game Theory
- Decision Theory
- Operations Research



Relational Contracts
in Supply Chains



Inventory Games



Combinatorial
Auctions



Dr. Arshinder Kaur

PhD, IIT Delhi, INDIA

Associate Professor, Management Studies

044-2257-4553; arshinder@iitm.ac.in

<http://www.iitm.ac.in/arshinder>



- Supply Chain (SC) Management/ SC Coordination, SC contracts, Closed-loop SC
- Inventory Management/ Newsboy model and Operations Research Applications
- Strategic Sourcing/Evaluation and selection of suppliers



Automobile and auto
components



Castings



Agro food products





Dr. Arun Kumar G

PhD, IISc. Bangalore, India

Assistant Professor, Mechanical Engineering

044-2257-4563; garun@iitm.ac.in

<https://doms.iitm.ac.in/index.php/arun-kumar-g>





Dr. TJ Kamalanabhan
PhD, University of Madras, India
Professor, Management Studies
044-2257-4556; tjk@iitm.ac.in



Specialization: Human Resource Management and Organizational Behavior

Courses: Talent Management, Performance Management, Training & Development and Compensation Management

Current research: Stress and Burnout, Employee Turnover, Performance Dimensions in Hospitals , Corporate Communication

- **DAAD Fellowship**
- Publications in National & International Journals
- Multiple Workshops
- **SIDBI Corpus Fund**

Entrepreneurship



- KNU University, Daegu, South Korea
- Multimedia University, Malaysia
- University College of Tech & Mgmt, Malaysia
- MUST University, Iran

Visiting Faculty



- **Erasmus Mundus Fellowship**
- Diversity Management
- Organizational Change
- **Discipline Lead**

Organization Behavior



- **Fulbright Fellowship**
- Business Consulting
- Cross Cultural research and development
- **HR Lab at IIT Madras**

Corporate HR



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Dr. Krishna Prasanna
PhD, University of Madras, India
Professor, Management Studies
044-2257-4571; pkp@iitm.ac.in
<http://www.doms.iitm.ac.in/pkp.html>



- Fixed Income Markets
- Financial Risk Management
- Corporate Governance



Fixed Income
Markets



Financial Risk
Governance models



Liquidity Risk in
Financial Markets





Lata Dyaram

Ph.D (Indian Institute of Technology Madras)
Associate Professor, Management Studies

044-2257-4567; lata.dyaram@iitm.ac.in



➤ Major Areas of Research

- Organizational Behavior, Leadership and Organization Development (L&OD), Human Resource Management
- Cognition, spontaneous mental states and goal directed behavior across contexts
- Behaviorism combining elements of philosophy, methodology, and psychological theory



Perception, reasoning,
sense making, learning



Emotions intertwined
with personality,
dispositions & motivation



Biological Drives, Learned
motives, Needs, goals a

← Spectrum of Cognition, Emotion and motivational processes to study human behavior →



Dr. Madhumathi Rajendran

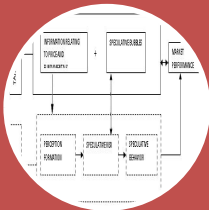
PhD, Madras University, India

Professor, Management Studies

044-2257-4565; rmm@iitm.ac.in



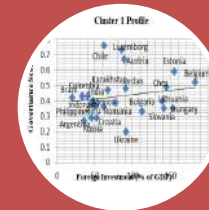
- Capital Markets
- Corporate Governance
- International Finance



Valuation of
Financial Assets



Governance and
Firm Performance



Evaluation of
Financial Risk





Dr. Nandan Sudarsanam

PhD, Massachusetts Institute of Technology, USA

Assistant Professor, Management Studies

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Advancement of Algorithmic techniques for solving problems and achieving objectives

Core Methodologies Advanced

- Experimentation
- Data Mining/ Machine Learning
- Decision-making under uncertainty
- Applied Statistics

Research Approach Deployed

- Simulation of Meta Models

$$y(x_1, x_2, \dots, x_n) = \beta_0 + \sum_{i=1}^m \beta_i x_i + \sum_{i=1}^m \sum_{j>i}^m \beta_{ij} x_i x_j + \varepsilon$$

$$x_i \sim NID(0, \sigma_x^2) \quad i \in 1 \dots m$$

$$x_i \in \{+1, -1\} \quad i \in m+1 \dots n$$

$$\varepsilon \sim NID(0, \sigma_\varepsilon^2)$$

$$\Pr(\delta_i = 1) = p$$

$$\Pr(\delta_{ij} = 1 | \delta_i, \delta_j) = \begin{cases} p_{00} & \text{if } \delta_i + \delta_j = 0 \\ p_{01} & \text{if } \delta_i + \delta_j = 1 \\ p_{11} & \text{if } \delta_i + \delta_j = 2 \end{cases}$$

$$f(\beta_i | \delta_i) = \begin{cases} N(0, 1) & \text{if } \delta_i = 0 \\ N(0, c^2) & \text{if } \delta_i = 1 \end{cases}$$

$$f(\beta_{ij} | \delta_{ij}) = \frac{1}{s_1} \begin{cases} N(0, 1) & \text{if } \delta_{ij} = 0 \\ N(0, c^2) & \text{if } \delta_{ij} = 1 \end{cases}$$

Domains of Application

- Engineering Systems
- Demographic and Census Data
- Financial Data
- Manufacturing and Product Design



Dr. Nargis Pervin

PhD, National University of Singapore, Singapore

Assistant Professor, Management Studies

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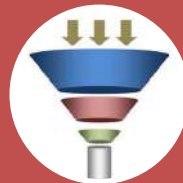
<http://www.doms.iitm.ac.in/domsnew/index.php/nargis-pervin>



- Social Network Mining
- Recommender System
- Mobile App Analytics
- Big Data Analytics



Social Network Analytics



Recommender Systems



Mobile App Analytics





Dr. L Prakash Sai
PhD, IIT Madras, INDIA
Professor, Management Studies
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- Strategy and Policy Studies
- Technology Foresight and Innovation
- Competitiveness and Business Excellence



Manufacturing



Information
Technology



Education



Healthcare





Dr. Rahul R Marathe

PHD, Iowa State University, USA
Associate Professor, Management Studies

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<http://www.doms.iitm.ac.in/rahul.htm>



- Mathematical and statistical modeling
- Stochastic processes
- Optimization

Manufacturing

Analytics

Uncertainty modeling



C Rajendran Dr.rer.pol.h.c., FNAE, AvH Fellow

PhD, Indian Institute of Technology Madras, India

Professor & RAGS Family Foundation Institute Chair, Management Studies

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- Production and Operations Management
- Logistics and Distribution Management
- Inventory & Supply Chain Management, and Analytics
- Optimization Algorithms, Heuristics, Evolutionary & Swarm Intelligence Algorithms



Logistics & Distribution



Inventory Optimization



Scheduling in
Manufacturing & Service
Systems



Analytics

BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH

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Dr. Richa Agrawal

Ph D, IIT Bombay, India

Associate Professor of Marketing, Dept. of Management Studies

044-2257-4564; richa@iitm.ac.in

<http://www.doms.iitm.ac.in/richaagrwal>



- Relationship Marketing - Relational Behaviour, Communities & Networks
- Scale Development
- Contemporary Marketing Areas: Green marketing, Luxury marketing, etc.



Customer Insights



Marketing Measures



Relationships,
Communities and
Behaviors



Dr. Rupashree Baral

PhD, IIT Bombay, India

Associate Professor, Management Studies

044-2257-4561; rupashree@iitm.ac.in

<http://www.iitm.ac.in/component/faculty/76/rupashree/>



- Research Area 1: Work-Family Dynamics
- Research Area 2: Diversity/Generational Differences at the Workplace
- Research Area 3: Technology and Human Interface: Problems and Prospects



Work-Family Dynamics



Diversity/Generational
Differences at the
Workplace



Technology and Human
Interface: Problems and
Prospects



Saji K Mathew

PhD, IIT and Management Gwalior

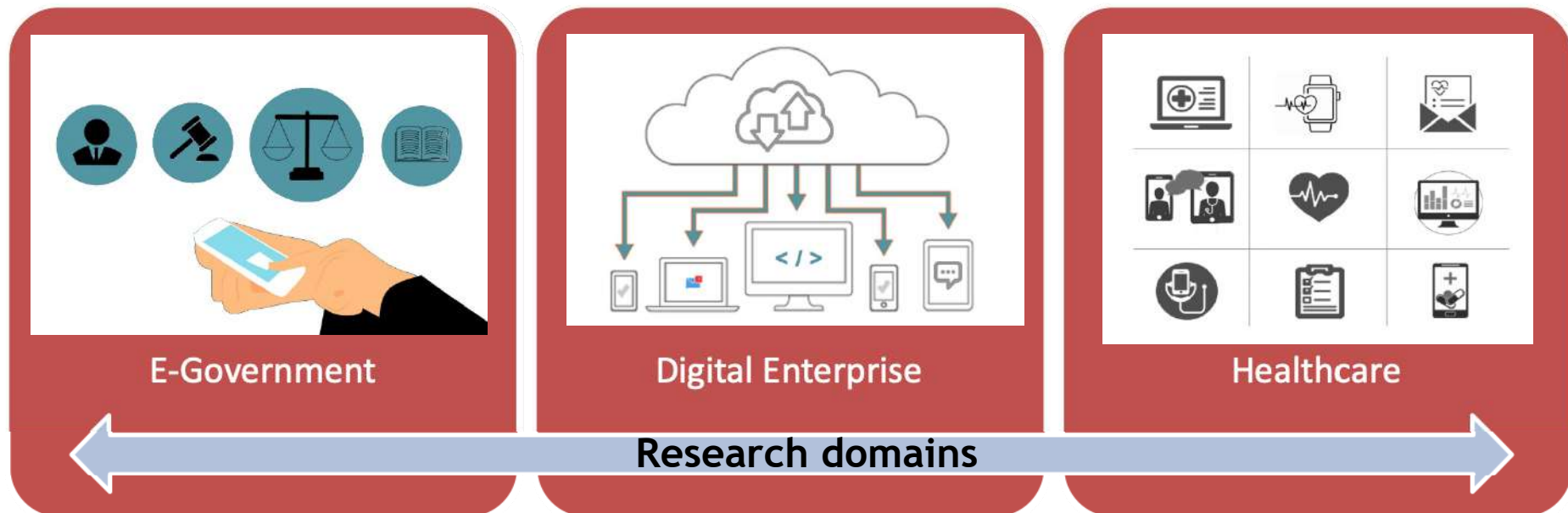
Professor, Management Studies

044-2257-4573; saji@iitm.ac.in

<http://doms.iitm.ac.in/index.php/skm>



- Web Personalization, Information Privacy
- Business Analytics, Business Value
- Digital Platforms, Business Strategy





G Srinivasan
PHD, IIT Madras
Professor, Management Science
044-2257-4560; gsrini@iitm.ac.in
<http://www.doms.iitm.ac.in>



- Cellular Manufacturing
- Supply Chain Modeling
- Sequencing and Scheduling.

Operations Research
Applications

Manufacturing Systems
Management

Supply Chain
Management



Dr. R P Sundarraj

PhD, University of Tennessee at Knoxville

Professor, Management Studies

044-2257-4558; rpsundarraj@iitm.ac.in

<http://www.doms.iitm.ac.in/domsnew/index.php/sundarraj-rp>



Major Areas of Research

- Electronic negotiation and applications
- Analytics
- Innovation management
- Supply chain management

Prior experience

- Qatar University, Doha
- University of Waterloo, Canada
- Clark University, USA



Cloud computing negotiation,
pricing, services



Analytics



Technology innovation in
firms

← Applying Operations research and behavioral models to technology design and adoption →



Dr. Thenmozhi M

PhD, University of Madras, India
Professor, Management Studies



044-2257-4562; mtm@iitm.ac.in

<http://www.doms.iitm.ac.in/thenmozhi.htm>, <http://ssrn.com/author=567794>

Specialization: Corporate Finance and Strategy, Corporate Valuation, Financial Markets, Computational Finance, Forecasting and Time Series Modeling, Stock and Commodity Derivatives.

Courses: Financial accounting, Cost Management, Financial Management, Financial Institutions and Markets, Computational Finance, Fixed Income Securities :Trading and Strategy, Investment Management, Empirical Research in Finance, Options and Futures.

Current research: Cash holdings and Governance, CBHI scheme Performance, Intraday Price discovery and Volatility Spillover, India VIX and Risk Management, Liquidity in Currency Options, Crude Oil Pricing.

Fulbright-Nehru
Visiting Lecturer
Fellowship 2010-11

European Union
Erasmus Mundus
Scholarship 2009-10

Australian Government
Endeavour Executive
Award, 2007

Series	Aggregated Money Policy Test	MSRP Policy Test	MSRP Policy Test
	Statistics	Statistics	Statistics
Return	-18.841	-3.4334	-31.110
Volatn	-23.747	-3.4331	-175.31
Volatility	4.3072	-3.4331	-7.0187

Corporate Finance and Strategy

Impact of diversification
Strategy on Firm Performance:
Entropy Approach

Cross-border Mergers and
Acquisitions involving
emerging markets

Series	Aggregated Money Policy Test	MSRP Policy Test	MSRP Policy Test
	Statistics	Statistics	Statistics
Return	20.310	26.5485	2.475
Volatn	28.589	26.8959	2.70
Volatility	26.766	27.0443	2.76

Financial markets

Effect of macroeconomic
variables on Bond market
volatility in BRIC Countries

Volatility Spillover in Bullion
and Energy futures and Spot
Markets



Financial Modeling

Forecasting Stock Index Returns
using ARIMA-SVM, ARIMA-ANN,
and ARIMA-Random Forest
Hybrid Models.

Multi-objective and Multi-
strategy Optimization Stock
Trading Model using Support
Vector Machines and Ant
Colony optimization

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<http://www.iitm.ac.in/thillai.htm>



Private Equity and Venture Capital

- Annual India venture capital and private equity report series
- Value addition by venture investors
- Non-financial risk management by private equity investors



Infrastructure Finance

- Private equity in infrastructure
- Project finance in high risk environments
- Impact of PPP on costs and overruns
- Impact on PPP on project outcomes viz., access, cost, price, quality, and efficiency



Corporate Finance

- Real options
- Corporate social responsibility
- Sources of SME funding and impact of performance



Dr. Usha Mohan

PHD, Indian Statistical Institute, INDIA

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<http://www.doms.iitm.ac.in/usha.html>



- Quantitative Models in Supply Chain Management
- Socially Relevant Applications of Operations Research
- Combinatorial Optimization

Order Management in MTO environments and Design of Sales force Incentives

Design of Food Supply Chains to improve Food security and Scheduling patients in Health Care Delivery Systems

Pick up and Delivery Vehicle Routing Problems

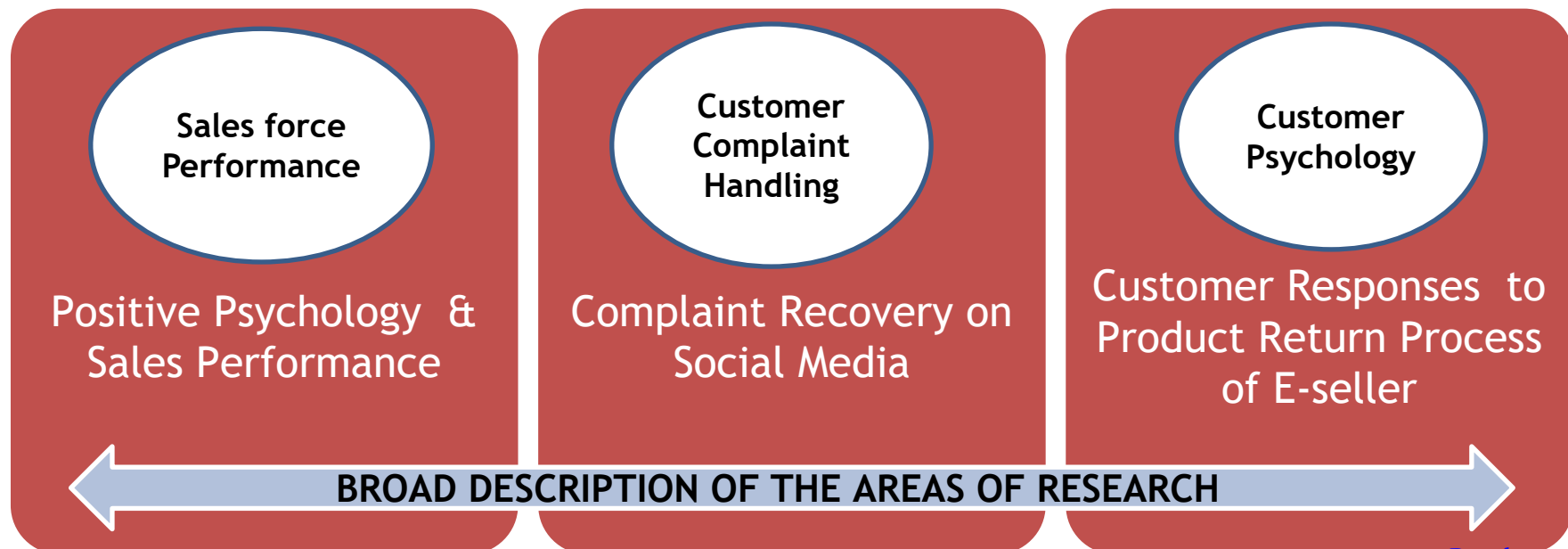


Dr. Vaibhav Chawla

FPM (PhD), IIM Kozhikode, India
Assistant Professor, Management Studies
044-2257-4585; vaibhavchawla@iitm.ac.in



- Role of positive psychology constructs (such as spirituality, mindfulness, delayed gratification etc.) and social media in salesperson performance
- Exploring mechanisms to address customer complaints over social media
- Understanding customer psychology during product return in e-commerce context





Dr. Varisha Rehman

PhD, IIIT - Allahabad, India

Assistant Professor, Dept. of Management Studies

044-2257-4572; varisha@iitm.ac.in

<http://www.doms.iitm.ac.in/domsnew/index.php/varisha-rehman>



- Advertising (traditional and new media advertising)
- Consumer Behavior
- Entertainment Marketing



Cognitive , affective and
evaluation aspects of
advertising



Consumer Behavior



Entertainment Marketing

Research Spectrum

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Dr. V Vijayalakshmi

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- **Positive Organizational Behavior:** Generating Positivity in the Workplace, Happiness and Work, Workplace Emotions, Finding Meaning in Work, Strength-Based Approach to Work, Discovering Calling, Integral Leadership Development, Unlearning
- **Cross-Cultural Management:** Cultural Competence and Global Dexterity
- **Teaching, Learning and Education:** Holistic Education, Contemporary Teaching and Learning Beliefs and Practices, Creativity in Teaching-Learning



NURTURING THE INNER
YOU: FOR INDIVIDUAL,
GROUP, ORGANIZATIONAL
TRANSFORMATION



INNOVATION IN TEACHING-
LEARNING PRACTICES,
INTEGRAL EDUCATION



CROSS-CULTURAL
MANAGEMENT



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INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF MATHEMATICS

LIST OF FACULTY

Anoop T V (Profile yet to be uploaded)

Aprameyan P

Arijit Dey

Arindama Singh

Balaji R (Profile yet to be uploaded)

Chand A K B (Profile yet to be uploaded)

Chidella Srinivasa Rao

Dipramit Majumdar

Jayanthan A V

Kalpana Mahalingam

Kunal Krishna Mukhopadhyay

Narayanan N

Neelesh S Upadhye

Ponnusamy S

Priyanka Shukla

Radha R

Rama R

Ramesh Kasilingam

Santanu Sarkar

Sanyasiraju Y V S S

Sarang S Sane

Satyajit Roy

Shaiju A J

Shruti Dubey

Sivakumar K C (Profile yet to be
uploaded)

Sivaram Ambikarasan

Soumen Sarkar

Sounaka Mishra

Srinivasa Rao Manam

Sriram B

Suhas Jaykumar Pandit (Profile yet to be
uploaded)

Sumesh K

Sundar S (Profile yet to be uploaded)

Thamban Nair M

Uma V (Profile yet to be uploaded)

Venkata Balaji T E

Vetrivel V



Dr. Anoop T V

PhD, The Institute of Mathematical Sciences, India

Assistant Professor, Mathematics

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<https://home.itm.ac.in/anoop/>





Dr. P Aprameyan

Ph.D., Philipps Universität Marburg, Germany

Assistant Professor, Mathematics

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My interests lie, broadly, in analysis on spaces admitting large groups of symmetries (Lie group actions). Currently, this includes

- Analysis (harmonic analysis, microlocal analysis, spectral analysis) on Riemannian symmetric spaces and their compactifications
- Representations of real Lie groups, including a study of its relation to complex geometry
- Geometric quantization in relation to representations of Lie groups, especially real degenerations of Kähler polarizations

The unifying feature, both thematically and in the methods which are used, is the presence of, typically, a non-compact Lie group acting as symmetries. The interaction between the algebraic, analytic and geometric aspects of such groups is what enables us to obtain refined results, often with explicit formulae

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Arijit Dey

B.Sc: Presidency University, Kolkata, M.Sc/Ph.D: IMSc,
Post. Doctoral stay: CMI, TIFR (Mumbai), MPI (Bonn)

Associate Professor, Mathematics

044-2257-4635; arijit@iitm.ac.in



My broad subject of research is algebraic geometry in particular I am interested in following topics:

- Vector Bundles and Decorated sheaves over algebraic varieties, Principal Bundles over algebraic varieties.
- Toric Geometry (Bundle theoretic questions)



Dr. Arindama Singh

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- Numerical Analysis
- Knowledge Compilation
- Image Processing

APPLICATION 1

Numerical solution of singularly perturbed two-point boundary-value problems and of elliptic P D E s , u s e o f regularization methods

APPLICATION 2

A p r o p o s i t i o n a l knowledge base is converted to a set of its prime implicants or prime implicates so that conclusions can be drawn from the knowledge base comparatively easily

APPLICATION 3

PDEs are used to deblur and denoise images using regularization methods. Improvisation on the Perrona-Mallick type of P D E - b a s e d image processing is the main trick used here



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Dr. Chand A K B
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Dr. Chidella Srinivasa Rao
PhD, IISc Bangalore, India

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- Nonlinear Ordinary Differential Equations
- Nonlinear Partial Differential Equations
- Generalized Burgers Equations

Existence and
Uniqueness of solutions
of nonlinear
Ordinary differential
equations

Approximate /large time
asymptotic solutions to
generalized Burgers
equations

These partial differential
equations appear in
nonlinear acoustics



Dr. Dipramit Manjumdar

Assistant Professor, Mathematics

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Major Areas of Research

- p-adic families of modular forms and automorphic forms
- Selmer group and Iwasawa theory for modular forms
- Supply chain management

Other Areas of Interest

- Application of elliptic curves in cryptology
- Analytic number theory, specifically application of Galois representation in analytic number theory



Dr. A V Jayanthan

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- Hilbert coefficients and homological properties of Blowup algebras
- Betti numbers of affine and projective monomial curves
- Buchsbaum-Rim function, polynomial and their coefficients

Blow-up algebras arise from the process of blowing up of an algebraic variety. This is an important process in the resolution of singularities. I study homological properties, such as Cohen-Macaulayness, Gorensteinness using a certain numerical function known as Hilbert function and its coefficients.

Buchsbaum-Rim function is a generalization of Hilbert function. Though the Hilbert function and its coefficients are very well studied, the Buchsbaum-Rim function and its coefficients are not very well studied. I study these coefficients and its relation with homological properties of a given module.

Betti number of a module indicates its computational complexity. It is an important invariant in many applied areas. I study certain classes of affine and projective curves and their Betti numbers.



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Major Areas of Research

- Theory of Codes
- Theory of Biomolecular Computing
- Combinatorics of words

Study of codes relative to a set of meaningful messages



Study of structures and operations on biomolecules using formal language theory

Study of words using matrices



Kunal Krishna Mukhopadhyay

Associate Professor, Mathematics

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Major Areas of Research

- C^* and von Neumann Algebras
- Ergodic Theory, Free Probability
- Quantum Groups, Quantum Information
- Recently interested in Radom Matrices



Dr. Narayanan N

PhD, The Institute of Mathematical Sciences

Assistant Professor, Mathematics

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- Structural Graph Theory
- Combinatorial Algebra
- Combinatorics



Dr. Neelesh S Upadhye

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- Probabilistic Approximations, Estimation Methods
- Financial Time Series Modelling
- Data Science: R programming, Statistical Learning
- Subordinated Stochastic Processes, Modelling and Simulation



Dr. S Ponnusamy

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- Complex Analysis
- Quasiconformal and Harmonic Mappings
- Special Functions and Function Spaces

Main themes which I deal with include:

Bohr Phenomenon on various function spaces, Integral transforms acting on function spaces, Quasiconformal and elliptic mappings, Univalent harmonic mappings in plane and in higher dimensions, Landau and Bloch type Theorems for p -harmonic mappings in several complex variables, Inequalities concerning special functions and John disks, Characterization of domains in terms of metric inequalities.



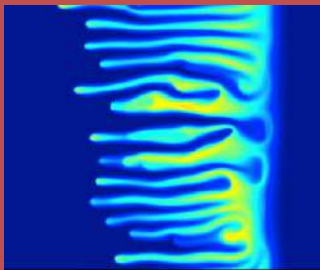
Dr. Priyanka Shukla

PhD, Jawaharlal Nehru Centre for
Advanced Scientific Research, Bangalore

Assistant Professor, Mathematics
044 2257 4609; priyanka@iitm.ac.in
<https://home.iitm.ac.in/priyanka/>

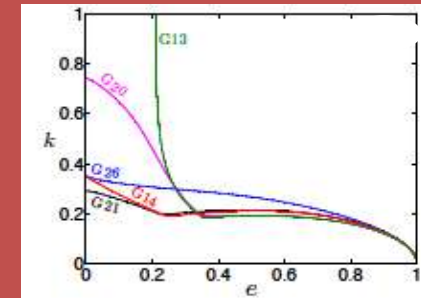
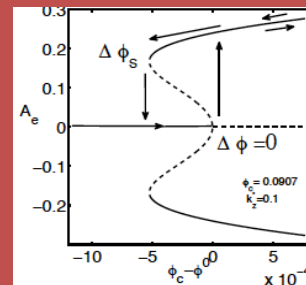
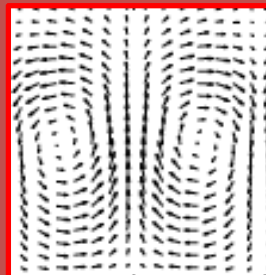


- Granular flows
- Hydrodynamic stability
- Mode interactions in fluid flows
- Kinetic theory



Chemically driven
fingering instability:
theory and simulations

Granular convection,
shearbanding, etc.
Landau equation, mode
interactions and resonance



Higher order moment
theories for rarified and
granular gases



Dr. R Radha

PhD, Institute of Mathematical Sciences, Chennai

Professor, Mathematics

044-2257-4620; radharam@iitm.ac.in

<https://math.iitm.ac.in/naru>

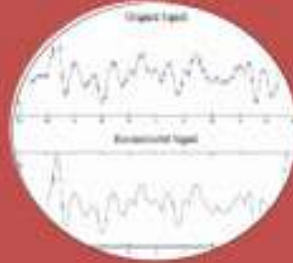


Major Areas of Research

- Harmonic Analysis on Euclidean spaces, LCA groups, Compact groups and Heisenberg group
- Frame theory, Wavelet Analysis and Invertibility of Operations
- Theory of Multipliers, Segal algebras and Bergman-Fock spaces



Hardy's inequalities for Hermite, special Hermite and Laguerre expansions



Sampling and reconstruction in shift invariant spaces



Wavelet applications to signal and image processing

Applying wavelets to Voice system and Identification of Micro calcification clusters



Dr. Rama R

Professor, Mathematics

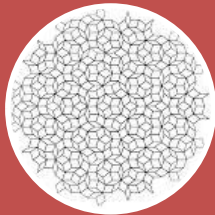
044-2257-4616; ramar@iitm.ac.in

http://mat.iitm.ac.in/home/ramar/public_html/index.html



Major Areas of Research

- Formal Languages and Automata Theory
- Molecular Computing
- Image Cryptography



Using abstract computing models for digital picture generation



Abstracting splicing operation for the generation of structured strings

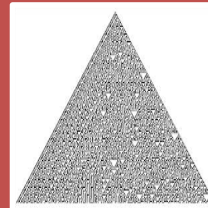


Image Cryptosystem using Cellular automata. (For pixel randomness)



Image Cryptosystem using Wavelet transformations and CRT. (For image compression)



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Dr. Ramesh Kasilingam

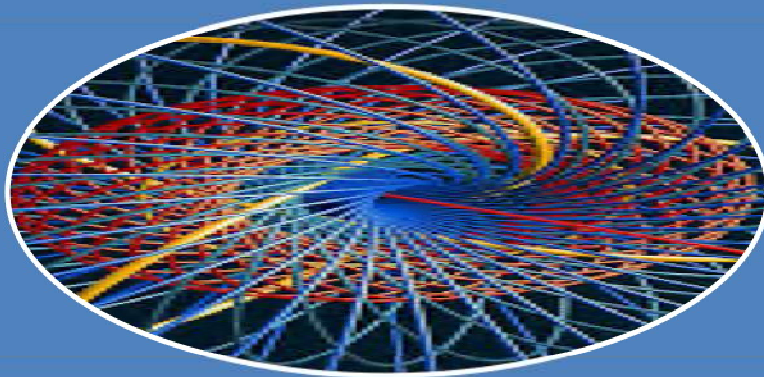
PhD, IIT Madras, India

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- Differential topology and Algebraic topology
- Surgery classification of manifolds
- Topological Data Analysis



← BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH →



Dr. Santanu Sarkar

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- Cryptology
- Computational Number Theory
- Coding Theory





Dr. Y V S S Sanyasiraju

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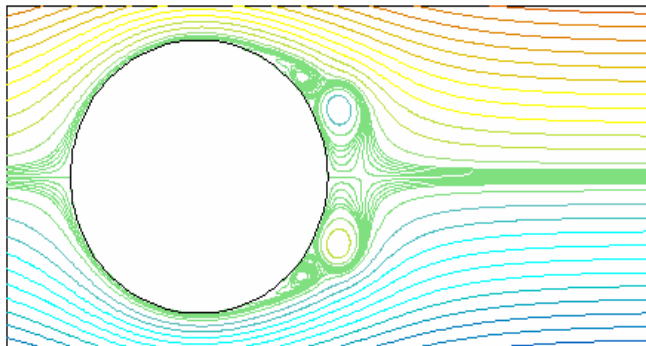
044-2257-4621; sryedida@iitm.ac.in

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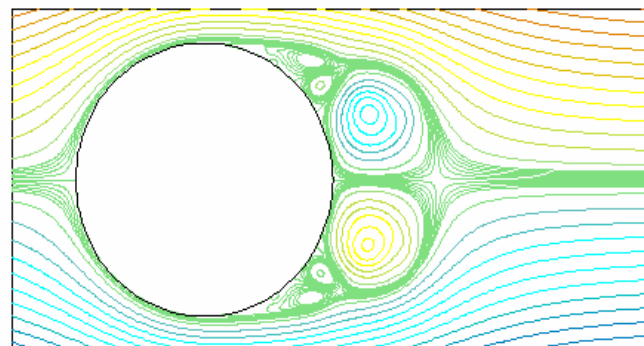


- Development of RBF based grid free schemes
- Higher order compact schemes
- Finite difference and finite volume schemes for incompressible flows

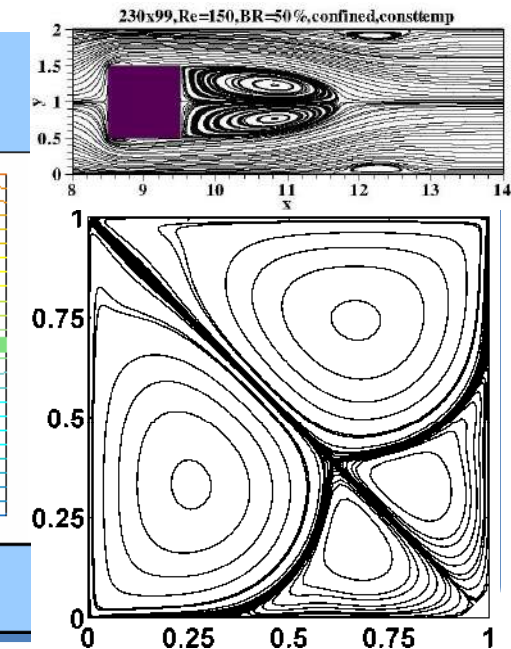
Capturing β and α phenomena for unsteady, viscous, incompressible flow past a circular cylinder using Higher Order Semi Compact scheme at Reynolds number $Re = 5000$



β phenomenon at $t = 1.5$



α phenomenon at $t = 2.5$



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Sarang S Sane

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Broad Research Interests

- My current research interests are broadly centred around commutative algebra, K-theory, geometry and topology. But I like to study anything that I find beautiful.

Some more details

One of the themes I work on is doing obstruction theory in algebra with intuition from topology.

The main question I study in this regard is to analyze the structure of various obstruction theories (e.g. Euler class groups, Chow groups, Chow-Witt groups, etc.) with the aim of studying the splitting properties of projective modules/vector bundles.

Another theme which I am currently pursuing is the study of triangulated categories. More specifically, studying special derived subcategories of the derived category of modules/sheaves for a ring/scheme.

Invariants associated to these, such as K-theory or Witt theory are also of considerable interest to me and are part of both mentioned themes.

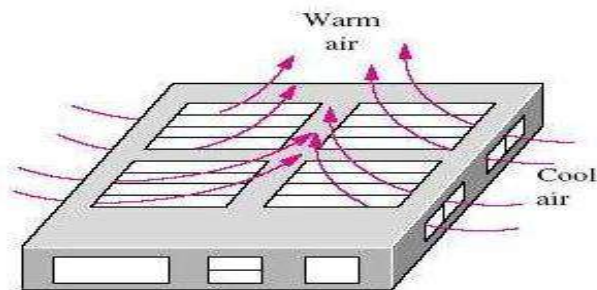


Dr. Satyajit Roy
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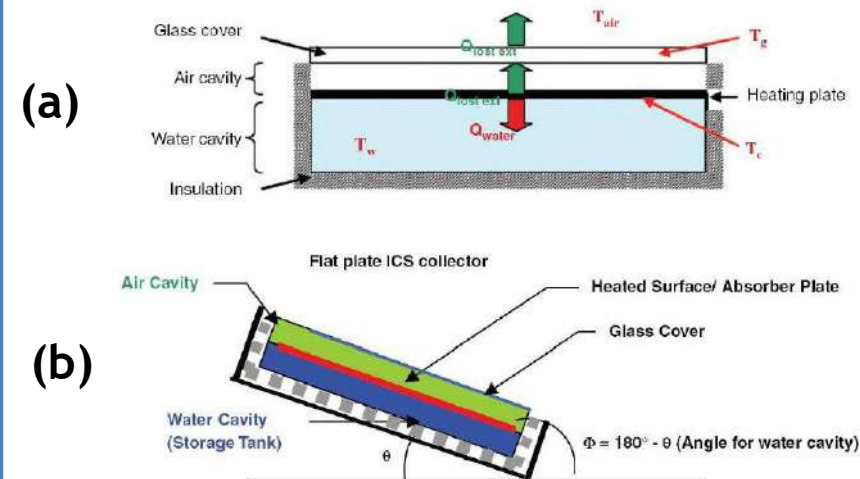
- Boundary Layer Theory
- Convective Heat and Mass Transfer
- Computational Fluid Dynamics

Cooling of Electronic Devices



Natural convection phenomena within enclosures for cooling of electronic components

Integrated Collector Storage Solar Water Heater



Natural convection phenomena within solar water heater



Dr. A J Shaiju

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- Research Area/Focus 1 SYSTEMS AND CONTROL THEORY
- Research Area/Focus 2 GAME THEORY

Study of various classes of Non-linear control systems that admit solutions in closed form.





Dr. Shruti Dubey

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Major Areas of Research

- Nonlinear Analysis of Fractional Functional Differential Equations
- Mathematical Study of Ferromagnetic Systems



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Sivaram Ambikasaran

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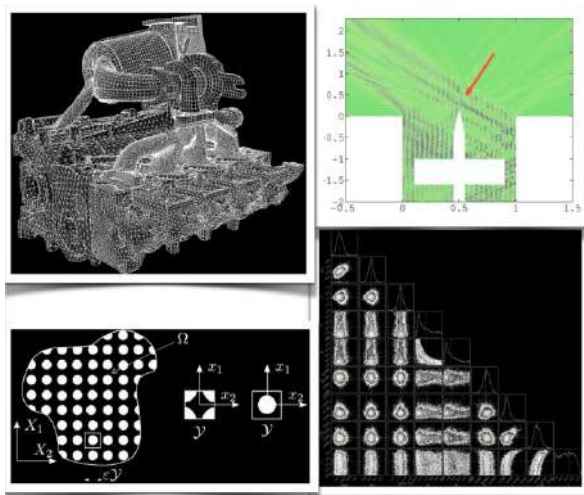
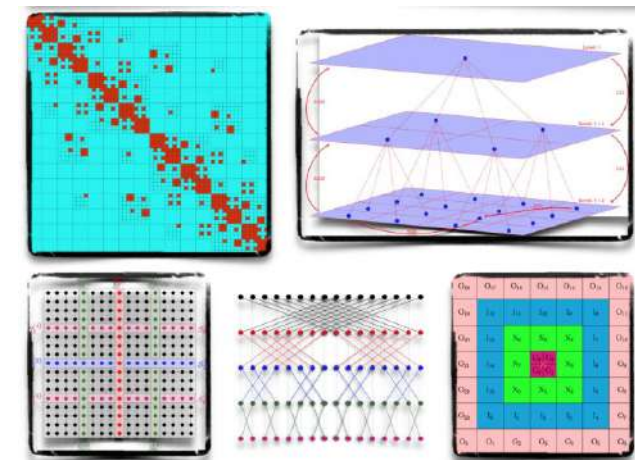
<http://sivaramambikasaran.com/>



Stable Accurate Fast Robust Algorithms & Numerics group

Theoretical & Computational Aspects of

- Numerical linear Algebra
- Approximation Theory
- Fast Stable Algorithms
- PDE's & Integral Equations



Applications include

- Acoustic & Electromagnetic scattering
- Finite Element & integral equation solvers
- Data driven physical modelling
- High dimensional statistics

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Dr. Soumen Sarkar

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Assistant Professor, Mathematics

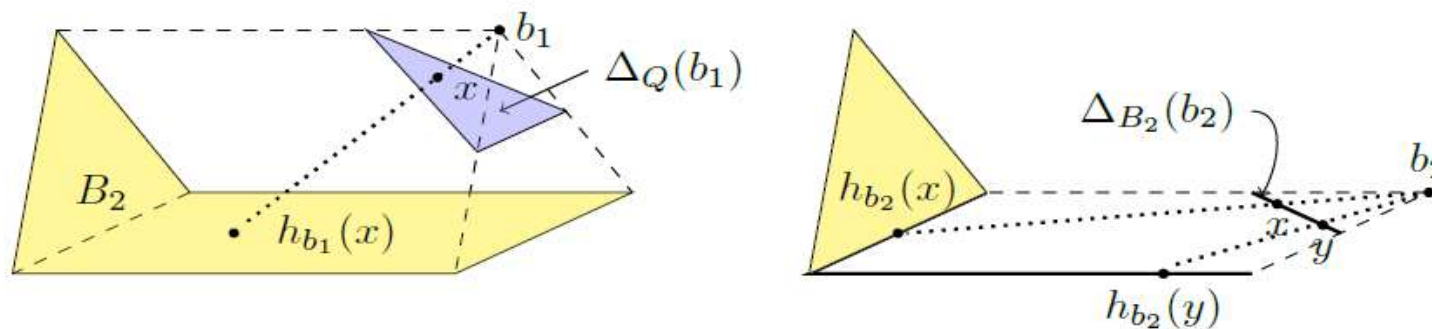
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RESEARCH INTERESTS

1. **Topology:** Algebraic Topology, Differential Topology, Toric Topology
2. **Geometry:** Toric Geometry, Convex Geometry, Differential Geometry
3. **Analysis:** Analysis on Manifolds, Functional Analysis
4. **Computing Research:** Topological Complexity of Motion Planning Algorithms, Topological Data Analysis, Persistent Homology
5. **Algebra:** Homological Algebra, Equivariant Cobordism and K-theory



The geometric interpretation of a retraction sequence



Dr. Sounaka Mishra
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- Combinatorial Optimization
- Design of Approximation Algorithms for Hard Optimization Problems
- Graph Theory

Complexity of Minimum
Dominating Set and its
variations

Approximation algorithms
for node/edge deletion
problems



Dr. Srinivasa Rao Manam

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Major Areas of Research

- Integral Equation Methods in water wave Scattering
- Wave-Bottom and Wave-Structure Interactions



Dr. B Sriram

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- Functional Analysis
- Operator Theory

Positive maps

Non-Commutative
Sets / Functions

Interpolation



Dr. Suhas Jaykumar Pandit

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Dr. Sumesh K

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Research Interests

- Operator algebras
- Operator spaces
- Quantum information
- Quantum probability

My research interests are mainly in the theory of operator algebras, specially focusing on the theory of completely positive maps, completely bounded maps, quantum dynamical semi-groups, E_0 -semigroups, product systems, dilations, representations of C^* -algebras and Hilbert C^* -modules. I also have research interests in the theory of quantum probability and the mathematical aspects of quantum information theory.

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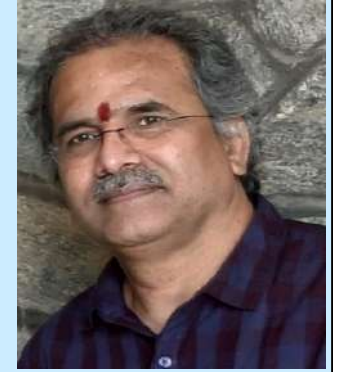
Dr. Sundar S

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- Applicable Functional Analysis
- Operator Equations
- Inverse and Ill-Posed Problems

Problems in Applications take the form of operator equations. So, in the abstract framework, one has to investigate approximate solutions of operator equations.

Such investigations are useful in obtaining numerical approximations for the solution of differential and integral equations.

Most of the inverse problems in applications are ill-posed. For stable approximate solutions for such problems, they have to be regularized using appropriate tools from Functional Analysis and Operator Theory.



Dr. Uma V

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Dr. Venkata Balaji T E

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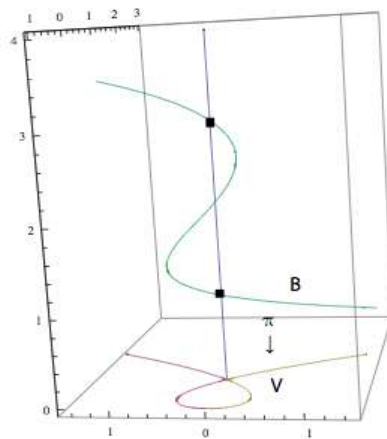
Assistant Professor, Mathematics

044-2257-4628; tevbal@iitm.ac.in

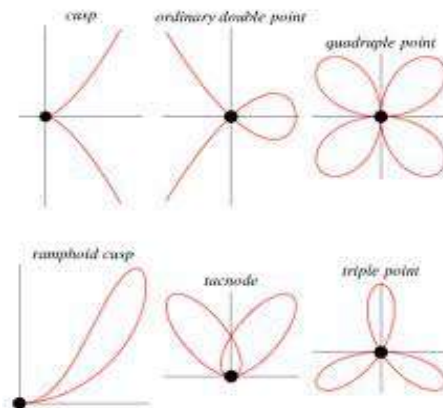
<http://www.iitm.ac.in/component/faculty/77/tevbal/>



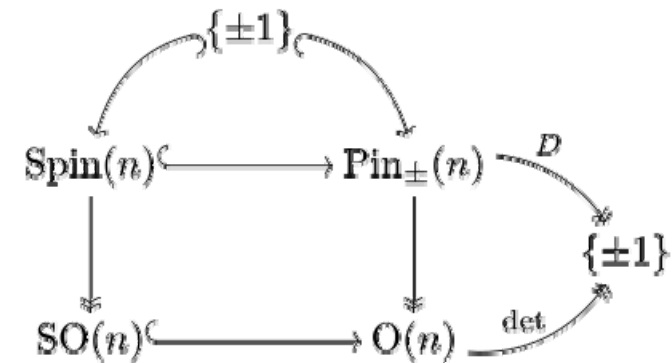
- Algebraic Geometry and Commutative Algebra
- Moduli and Classification of Vector Bundles, Quadratic Modules, Clifford Algebras
- Arbitrary Base Scheme Constructions and Specialisation Problems
- Orthogonal and Spin Groups



Desingularisations



Singularities



Clifford Algebras

For Moduli / Parameter Spaces of Degenerate Forms and Algebras

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Dr. V Vetrivel
PHD, IIT Madras
Professor, Mathematics
044-2257-4619; vetri@iitm.ac.in



- Non-linear Analysis - Solving inclusions involving set valued functions without convexity
- Non-smooth Analysis - Specifically, the sufficiency of optimality criteria for non-smooth optimization problems is focused to study how far the convexity can be relaxed. This helps extend the existing algorithms to solve non-smooth optimization problems.
- Variational Inequalities - Algorithmic approach to solve variational inequality problems and their variants has been developed which paves the way for looking at interesting applications.
- We study robustness concepts for set-valued optimization problems using set approach. This helps deal with uncertainty in data.



INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF MECHANICAL ENGINEERING

LIST OF FACULTY

Abhijit Sarkar

Amitava Ghosh

Anand T N C

Anand K

Anil Kumar Meena

Arunachalam N

Arunn Narasimhan

Arvind Pattamatta

Ashis Kumar Sen

Babu V

Balaji C

Balaji Srinivasan

Chandramouli P

Dhiman Chatterjee

Gnanamoorthy R

Hariharan K

Kameswararao Anupindi

Krishna Kannan

Krishnan Balasubramaniam

Krithika Narayanaswamy

Mallikarjuna J M

Mani A

Manivannan P V

Manoj Pandey

Mayank Mittal

Narasimhan Swaminathan

Pallab Sinha Mahapatra

Parag Ravindran

Piyush Shakya

Prabhu Rajagopal

Prakash Maiya M

Prasad B V S S S

Raghavan V

Raghu Prakash V

Raju Sethuraman

Ramesh A (Profile yet to be uploaded)

Ramesh Babu N

Ramkumar Penchaliah

Ratna Kumar Annabattula

Samuel G L

Sarit Kumar Das (Profile yet to be uploaded)

Sateesh Gedupudi

Sathyan Subbiah

Seshadri Sekhar A

Shaligram Tiwari (Profile yet to be uploaded)

Shamit Bakshi

Shankar Krishnapillai

Shyama Prasad Das

Sivasrinivasu Devadula (Profile yet to be uploaded)

Somashekhar S Hiremath

Soundarapandian S

Sourav Rakshit

Srikrishna Sahu

Srinivas Reddy K

Srinivasan K

Sujatha Chandramohan

Sujatha Srinivasan

Sundararajan T (Profile yet to be uploaded)

Sundararajan Natarajan

Sushanta Kumar Panigrahi

Varunkumar S

Venkatarathnam G

Vishal V R Nandigana

Viswanath K (Profile yet to be uploaded)



Dr. Abhijit Sarkar

PhD, IISc Bangalore, India

Associate Professor, Mechanical Engineering

044-2257-4723; asarkar@iitm.ac.in

<http://www.iitm.ac.in/component/faculty/78/asarkar/>



- Acoustics
- Vibration
- Wave Propagation

Dispersion characteristics of structural acoustic waveguides



Application areas: Noise Control in Ducts and Mufflers

Vibration of Shells



Application areas: Dynamics of sheet metal components

Applications of Mathematics to Problems in Mechanics

- Asymptotic Methods
- Computational methods
- Continuum Mechanics
- Fluid-Structure Interaction
- Signal Processing algorithms for condition monitoring, music, etc.

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Dr. Amitava Ghosh

PhD, IIT Kharagpur, India

Associate Professor, Mechanical Engineering

044-2257-4724; amitava_g@iitm.ac.in



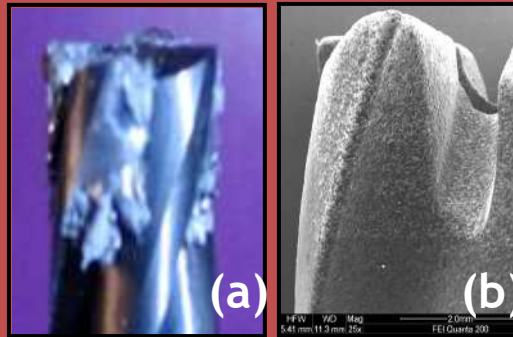
Current research activities:

- High speed machining / *Focus: nano-MQL and Cryogenic application*
- Cutting tools with soft and hard tribo-coating / *Focus: machining of Al-alloys*
- Development of single layer (SL) abrasive tool / *Focus: SL diamond dressing tool*



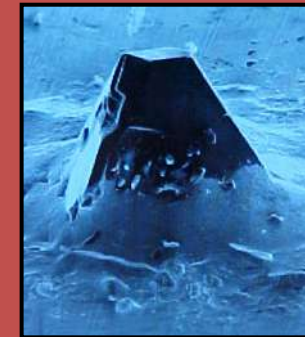
MQL

(minimum quantity lubrication)



End mill (after Al-machining)

(a) uncoated (b) graphite-x coated



Brazed cBN

(from a single layer abrasive tool)

High speed machining, grinding-Development of cutting tools-Sustainable solutions

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Dr. Anand T N C

PhD, IISc, India

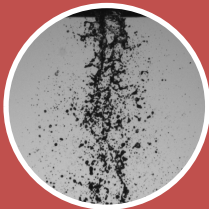
Associate Professor, Mechanical Engineering

044-2257-4715; anand@iitm.ac.in

<http://www.mech.iitm.ac.in/anand>



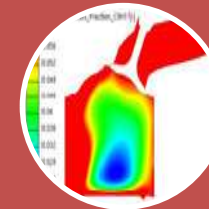
- Laser-based diagnostics for spray characterization and combustion
- Fuelling systems for engines
- CFD for I.C. Engines



Characterization of ethanol spray from a port fuel injector



Ultrasonic atomization for gasoline engines:
Low droplet sizes at even atmospheric pressure



CFD predictions of fuel-air mixing in a PFI engine

← Experimental and computational studies on sprays and combustion →

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Dr. K Anand

PhD, IIT Madras, India

Assistant Professor, Mechanical Engineering

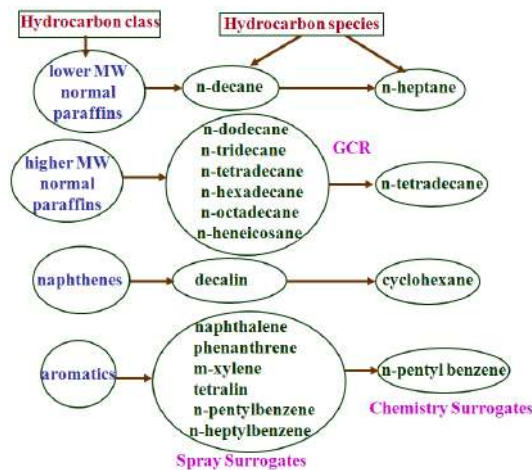
044-2257-4720; anand_k@iitm.ac.in



Major Areas of Research

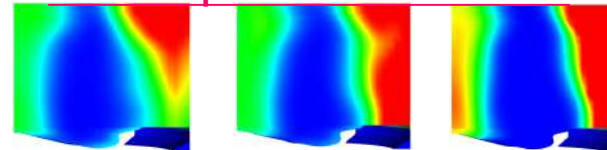
- Experimental and Numerical Investigations on Low Temperature Combustion
- Automotive Fuel Surrogate Modelling
- Developing High Efficiency, Clean Combustion Engines through Fuel Modifications

Diesel Fuel Surrogate Model Representation

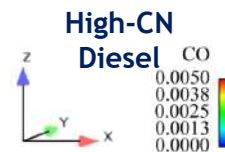
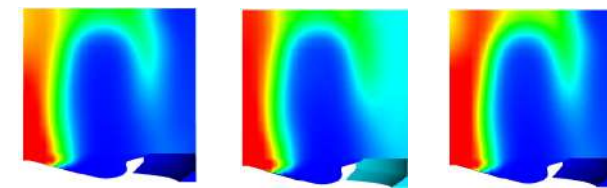


Fuel and Combustion Mode Effects

Low Temperature Combustion



Conventional Combustion



High-CN Diesel CO 0.0050
Mid-CN Diesel CO 0.0038
Low-CN Diesel CO 0.0025
In-cylinder CO at EVO Period

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Dr. Anil Kumar Meena

PhD, Arts et Métiers ParisTech, Paris, France

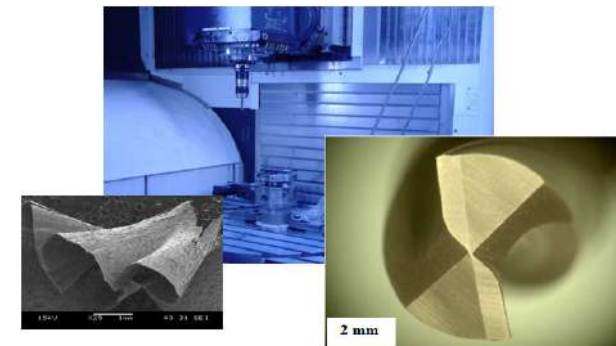
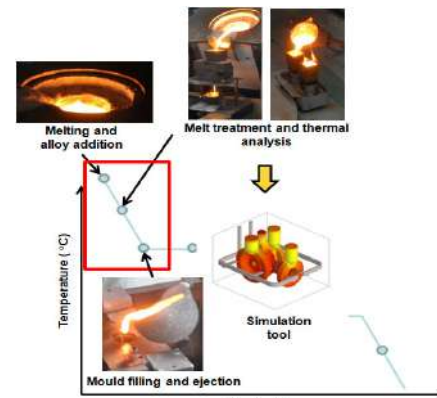
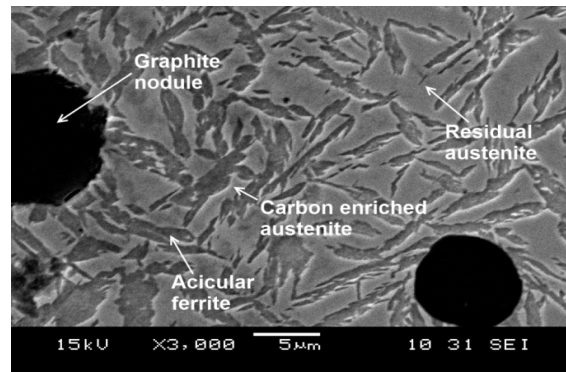
Assistant Professor, Mechanical Engineering

044-2257-4726; anilm@iitm.ac.in



Research interests:

- Casting, Heat Treatment, Microstructure and properties of ADI
- Dry and near dry machining
- High speed machining
- Sustainable manufacturing
- Light-weight alloys for automotive applications



**Microstructure & Material properties
machining**

Process route optimization

Dry and MQL

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Dr. N Arunachalam

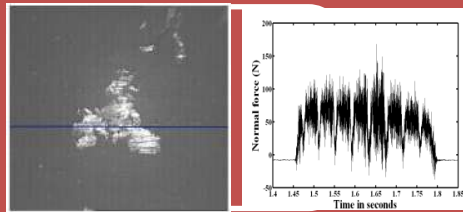
Assistant Professor, Mechanical Engineering

044-2257-4722; chalam@iitm.ac.in



Major Areas of Research:

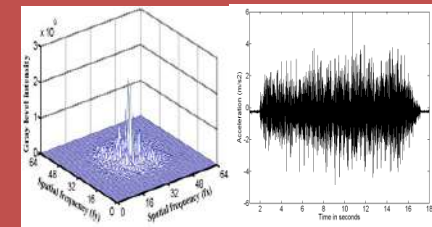
- Prognostics and health management of industrial systems
- Grinding Process modeling and control for advanced materials
- Machine vision and its applications



Multi sensor fusion for data and model based diagnosis and prognostics



Machine vision for process monitoring and control



Grinding Process modeling for MMC and CMC'S

← Applying advanced sensors and models for condition based maintenance of mechanical systems →

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Dr. Arunn Narasimhan

PhD, Southern Methodist University, USA

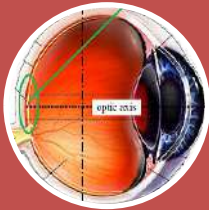
Professor, Mechanical Engineering

044-2257-4696; arunn@iitm.ac.in

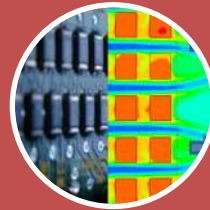
<http://www.iitm.ac.in/component/faculty/78/arunn/>



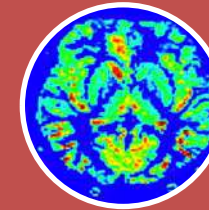
- Heat and Fluid Flow in Porous Media (sand, metal foam, electronics, bio-tissue)
- Heat and Fluid Flow in Biological Systems (Bio-heat and Bio-fluids)
- Phase Change and Convection Heat Transfer (passive cooling / thermal storage)



Retinal Laser Surgery / Retinal Drug Delivery (Bio-heat-flow Models)



Electronics Cooling as Bi-disperse Porous Media / Porous Medium Combustion / Heat Transfer Enhancement



Brain Stroke Cooling / Cryosurgery (Bio-heat-porous-medium Models)



Dr. Arvind Pattamatta

Associate Professor, Mechanical Engineering

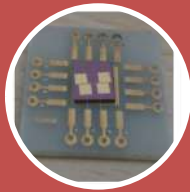
044-2257-4654; arvindp@iitm.ac.in

<http://mech.iitm.ac.in/Faculty/ap/home.php>



Major Areas of Research

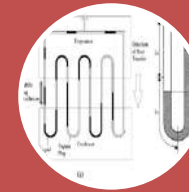
- Micro and Nano scale Heat transfer with applications in micro electronic cooling
- Two Phase flows during flow boiling in microchannels
- Computational Fluid Dynamics and Mesoscopic Numerical Methods.



Level 1: Materials
(conduction in
nanostructures)



Level 2: Heat Dissipation
from Device to Heat Sink



Level 3: Heat Removal
from Heat Sink to
Ambient

Applying Mesoscale Numerical methods for heat transfer prediction and validation with experimental techniques

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Dr. Ashis Kumar Sen

Associate Professor, Mechanical Engineering

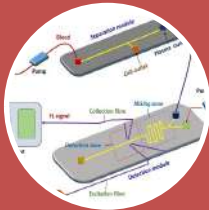
044-2257-4716; ashis@iitm.ac.in

<http://www.ashislab.in/>

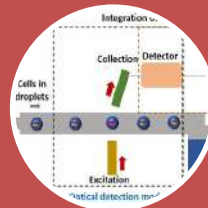


Major Areas of Research

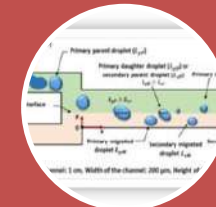
- Microfluidics Technology
- Healthcare and Lab on Chip diagnostics
- Interfacial phenomena in microfluidics



Optofluidic platform for
detection of gases in
liquids



Detection and isolation of
target cells in single-cell
format



Droplets, interfaces,
wetting

← Applying microfluidics technology for healthcare and lab on chip diagnostics →

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Dr. V BABU

PhD, The Ohio State University, USA

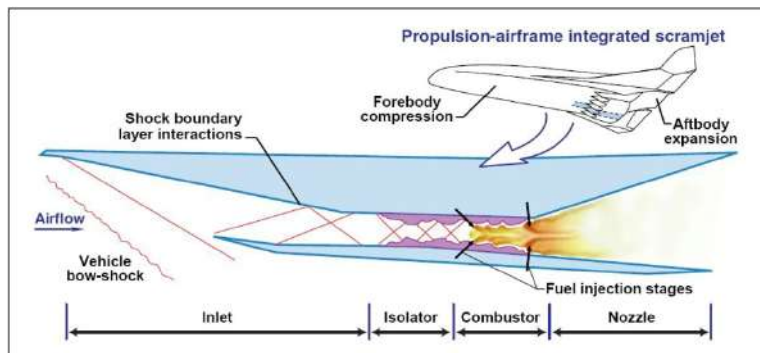
Professor, Mechanical Engineering

044-2257-4688; vbabu@iitm.ac.in

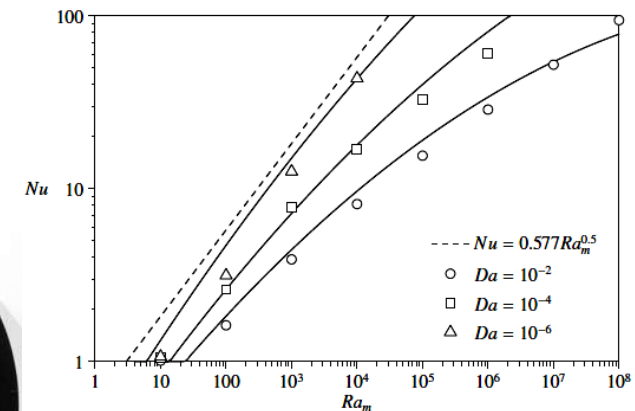
<http://www.iitm.ac.in/>



- High Speed Propulsion/Supersonic intakes; Supersonic combustion
- Computational Aero-acoustics/Prediction and mitigation
- Lattice Boltzmann method/Simulations of flow and heat transfer; HPC



Source: <http://www.nasa.gov/>



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Dr. C Balaji

PhD, IIT Madras

Professor, Mechanical Engineering

044-2257-4689; balaji@iitm.ac.in

<http://mech.iitm.ac.in/Faculty/CB/home.php>



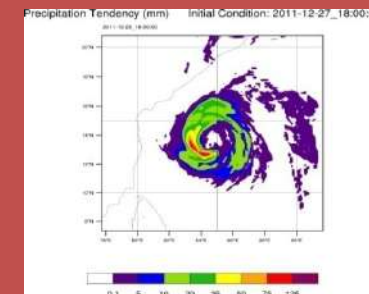
- Optimization in heat transfer
- Inverse heat transfer
- Satellite meteorology, numerical weather prediction and data assimilation



Temperature field with thermo chromic liquid crystals



Thermal optimization of phase change material based heat sinks



Prediction of 24hr accumulated rainfall for cyclone Thane

← **Heat transfer, optimization and atmospheric sciences** →



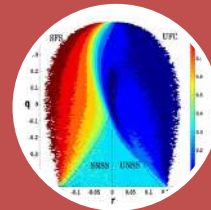
Dr. Balaji Srinivasan
PhD, Stanford University, India
Associate Professor, Mechanical Engineering
044-2257-6657; sbalaji@iitm.ac.in



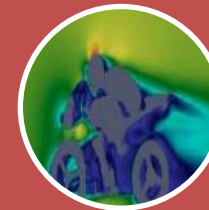
- Robust Numerical Methods for Compressible and Rarefied Flows
- Analysis and computation of Turbulent Flows
- Applied Machine Learning



Numerical Algorithms



Computation of
Turbulent Flows



Applied Machine
Learning

← We are developing Autonomous Flow Solvers for Complex Situations →

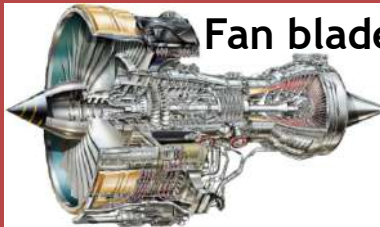


Dr. Chandramouli P

PhD, The Ohio State University, USA
Professor, Department of Mechanical Engineering
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<https://sites.google.com/site/iitmmouli/>

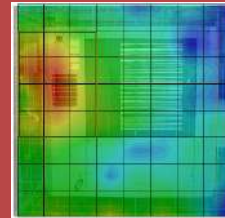


- Nonlinear Dynamics
- Noise and Vibration Control
- Fluid-Structure-Acoustic Interactions

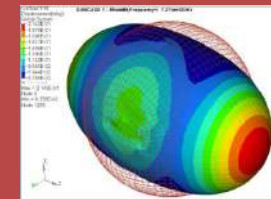


Fan blade rub

Efficient computation of large order nonlinear dynamical systems
Windmilling in aero-engines



Hybrid techniques for noise control
Double porous linings & embedded resonators



Breathing waves in submerged fluid filled tubes
Flow acoustics of fluid filled shells

← COMPUTATIONAL AND EXPERIMENTAL METHODS FOR NVH →

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Dr. Dhiman Chatterjee

PhD., Indian Institute of Science, India

Professor, Mechanical Engineering

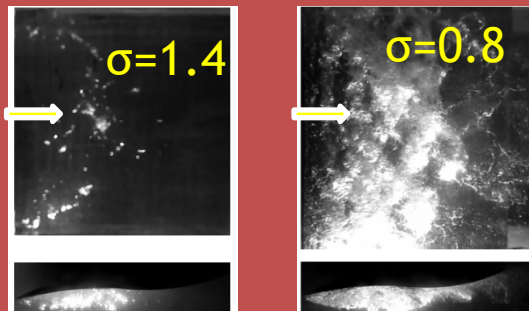
Ph: +91 44-2257 4697; Email: dhiman@iitm.ac.in

<http://mech.iitm.ac.in/Faculty/dc/home.php>

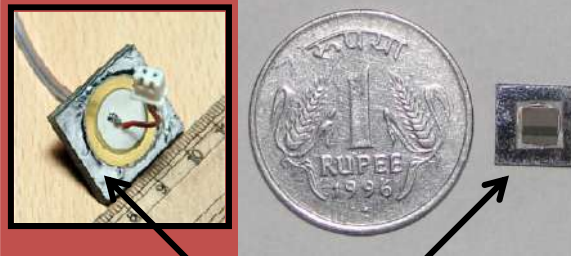


- Cavitation and two-phase flow
- Microscale flow and flow devices
- Turbomachinery

S-blade



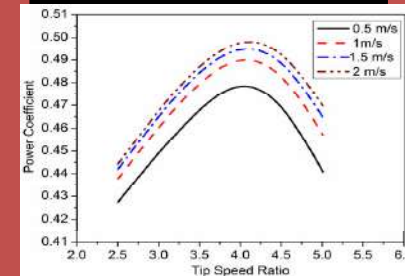
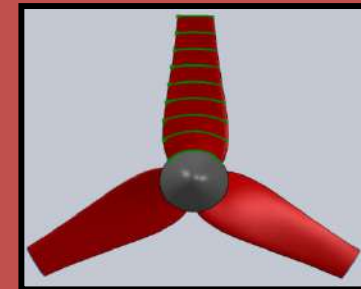
Development of cavitation over S-blade



Micropump



Micro pumping system for electronic cooling



Hydrokinetic turbine



R Gnanamoorthy, Dr Eng (Japan)

Professor, Mechanical Engineering

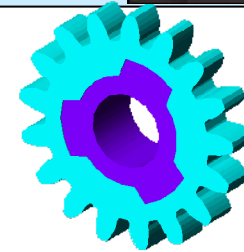
Ph: +91 44-27476302; gmoorthy@iitm.ac.in

<http://www.iitdm.ac.in/faculty.php?pid=RGM>

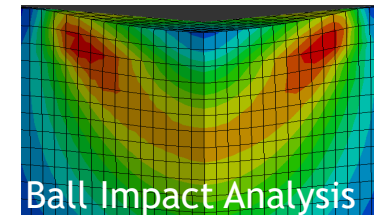


➤ Focus

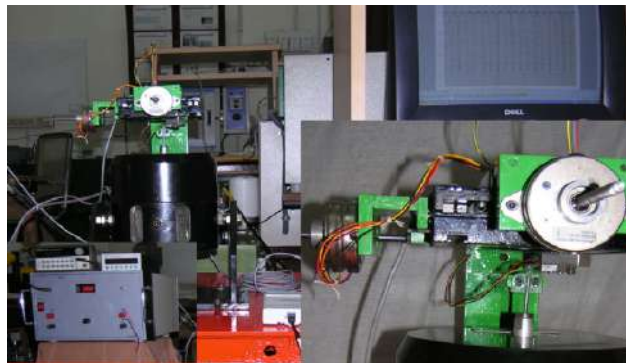
- 'Engineering' Surfaces for Improved Performance
- Damage Tolerant Design and Tribo Design
- Advanced Materials & Product Design
- High Performance Test Machines and Product Development



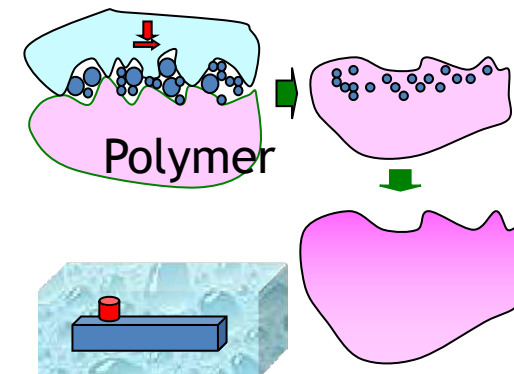
Duplex Gear



Ball Impact Analysis



'Engineering' Surfaces for Nanostructure



Damage Mechanisms

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Dr. K. Hariharan

PhD, IIT Madras, India

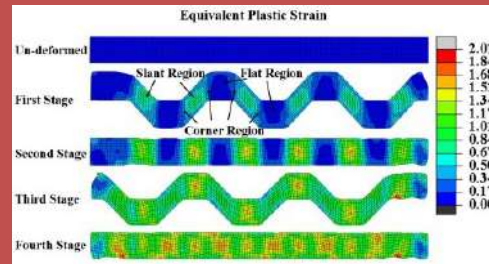
Assistant Professor, Mechanical Engineering

044-2257-4679; hariharan@iitm.ac.in

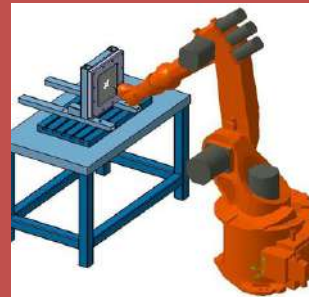
<http://www.iitm.ac.in/hariharan>



- Stress relaxation/ Servo press formability
- Electro plasticity
- Robo forming
- Severe plastic deformation

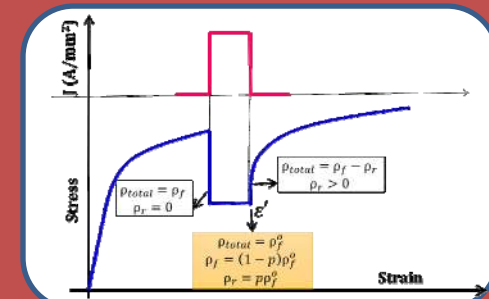


Simulation of Manufacturing Process



Formability improvement

Image © Ionut (2013) Applied Mechanics and Materials 271:416-421



Constitutive modelling of mechanical behaviour

Mechanics based manufacturing modelling

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Dr. Kameswararao Anupindi

PhD, Purdue University, USA

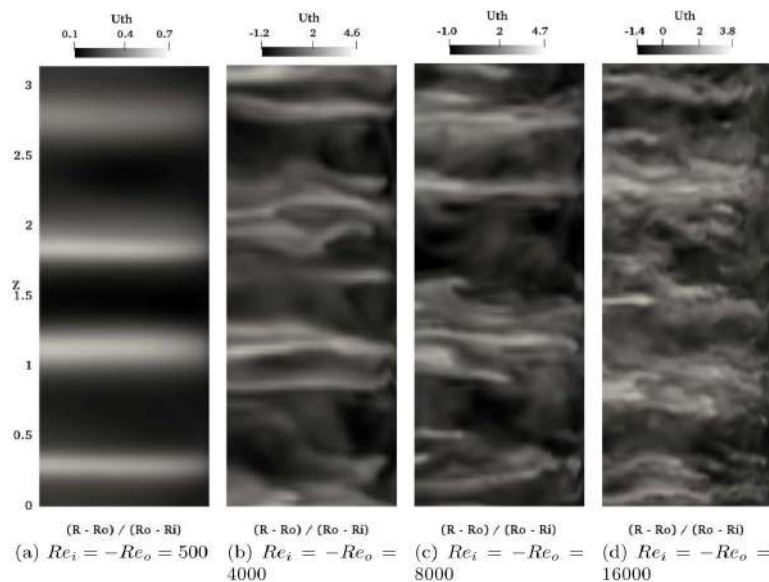
Assistant Professor, Mechanical Engineering

044-2257-4695; kanupindi@iitm.ac.in

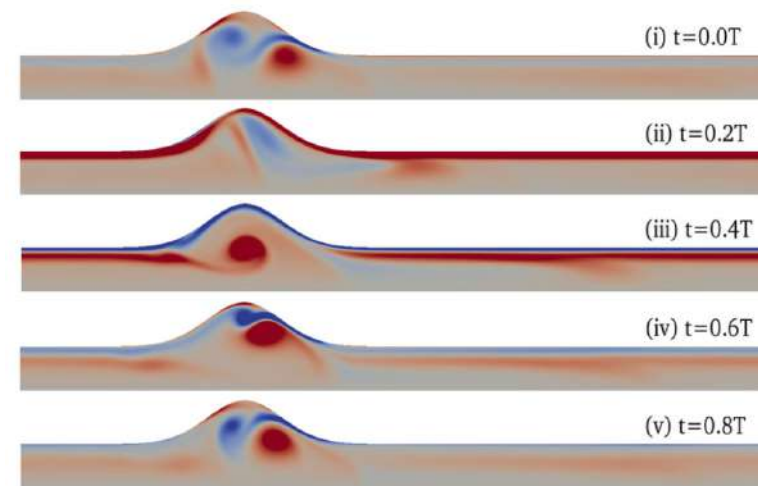
<https://home.iitm.ac.in/kanupindi/>



- Eddy-resolving simulations of turbulent flow and heat transfer
- Lattice Boltzmann methods
- Bio-fluid dynamics



Turbulent flow in a counter-rotating Taylor-Couette flow



Evolution of vorticity in abdominal aortic aneurysm

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Dr. Krishna Kannan

PhD, Texas A&M University, USA

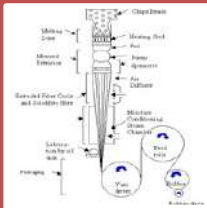
Professor, Mechanical Engineering

044-2257-4708; krishnakannan@iitm.ac.in

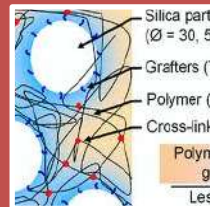
<http://www.iitm.ac.in/component/faculty/78/kkrishna>



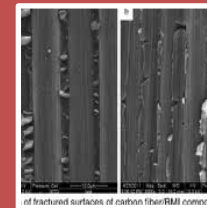
- **Broad area of research:** Continuum mechanics
- **Research focus:** Development of constitutive equations using rigorous and systematic thermodynamically frameworks describing many phenomena such as crystallization of polymeric melts, and viscoelasticity and chemical aging of polymeric materials
- **Some applications:**



Constitutive equations for
fiber spinning of
crystallizing polymeric
melts



Constitutive equations for
vulcanization of rubber and
thermo-mechanical
behavior of (viscoelastic)
filled networked rubbers



Constitutive equations for
chemical aging of
composites



Dr. Krishnan Balasubramaniam

Professor, Mechanical Engineering

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Major Areas of Research

- Non-destructive Imaging & Evaluation of Materials, Structures, Products
- Structural Health Monitoring using in-situ Sensor Systems
- Measurements of Material Properties and In-Process Parameters

GPR Testing Techniques and Models for Structures

IN-PROCESS monitoring of Cure Properties of Concrete, Polymers, and Joints

Material Property Measurements at Ambient Temperatures and Elevated temperatures up to 1500 C

← Applying Acoustic and Electromagnetic Spectrum for Industrial Measurements →

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Dr. Krithika Narayanaswamy

Assistant Professor, Mechanical Engineering

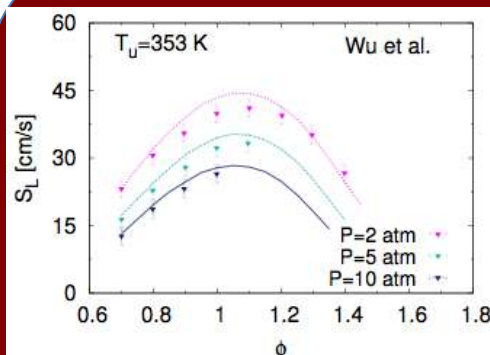
044-2257-4650; krithika@iitm.ac.in

<https://mech.iitm.ac.in/meiitm/personnal/dr-krithika-narayanaswamy/>



Major Areas of Research

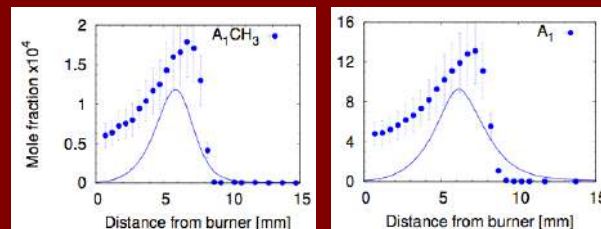
- Chemical kinetic modeling of transportation fuel surrogates
- Development of compact kinetic schemes and reduction methods
- Reactive flow simulations with accurate finite rate chemistry



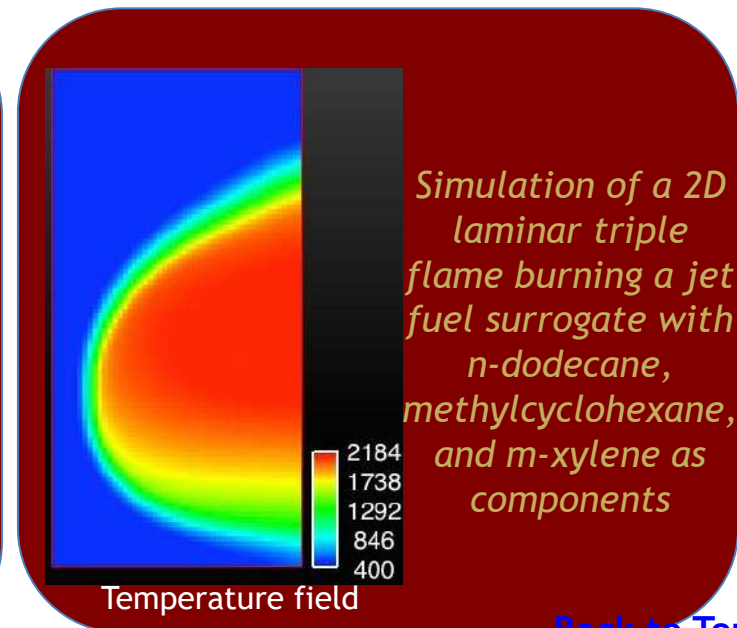
Laminar flame speeds

Symbols - experiments (literature)
Lines - simulations (using proposed kinetic scheme)

Chemical kinetic modeling of methylcyclohexane, which is a potential candidate to represent the cycloalkane class in transportation fuels



Amounts of aromatics in a rich methylcyclohexane flame



Simulation of a 2D laminar triple flame burning a jet fuel surrogate with n-dodecane, methylcyclohexane, and m-xylene as components

Temperature field

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- Alternate fuels - Vegetable oils, Biodiesel, Hydrogen, Ethanol, Methanol, LPG, Biogas, CNG
- In-cylinder flows, liquid and air interaction analysis using PIV and CFD in 4 and 2 Stroke engines
- HCCI Engines - Liquid and gaseous fuels, GDI engines



Performance and Emission characteristics of alternate fuels. Engine modifications for liquid and gaseous fuels. Combustion characteristics.



In-cylinder flows and air-fuel interaction in 4S and 2 stroke engines is done through PIV and CFD analysis



HCCI - usage of liquid and gaseous fuels for HCCI operation, engine modifications, performance, emission and combustion characteristics is done. Diesel, LPG, biogas have been tried



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IIT Madras Scholar Profile <https://iitm.irins.org/profile/10332>

Google scholar Profile: <https://scholar.google.co.in/citations?user=ugb-RSQAAAAJ&hl=en>



Absorber Refrigeration system



Solar Cold Storage

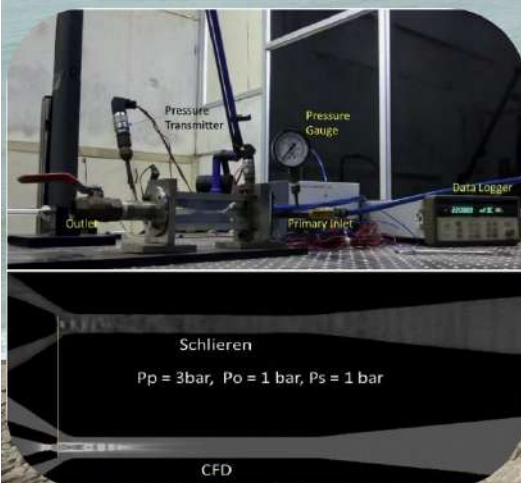


Vapour Jet Refrigeration system

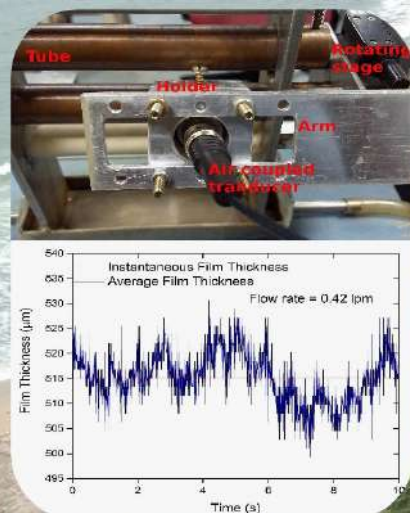


Solar Seawater Desalination system

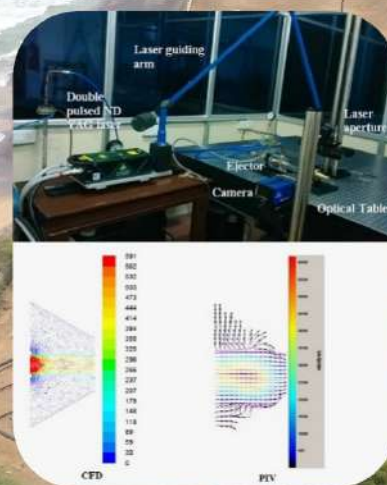
BROAD AREA OF RESEARCH



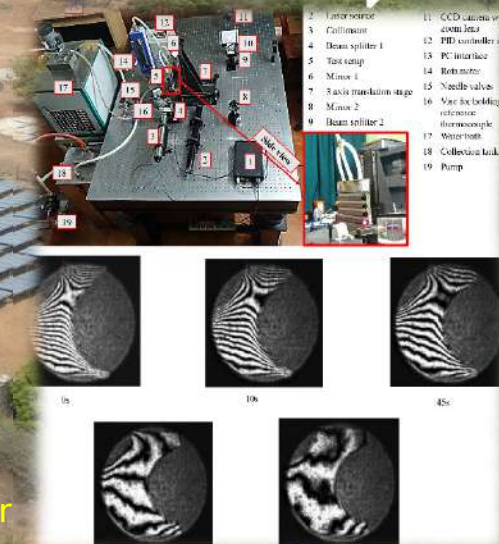
Rectangular ejector analysis



Non - Contact Air coupled Ultrasonic film thickness



PIV analysis for swirl ejector



Laser interferometry film thickness and temperature measurement

1. Laser source
2. Collimator
3. Beam splitter 1
4. Test setup
5. Motor 1
6. Gas transition stage
7. Motor 2
8. Beam splitter 2
9. CCD camera with lens
10. PDI controller
11. PC interface
12. Rot. motor
13. Needle valves
14. Valve fix bolting reference
15. Microscope
16. Water tank
17. Collector tank
18. Pump

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Dr. P V Manivannan

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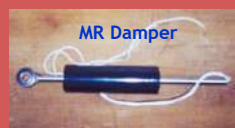
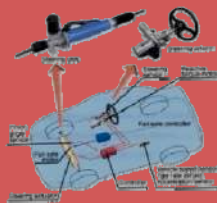
<http://www.iitm.ac.in/component/faculty/78/pvm/>



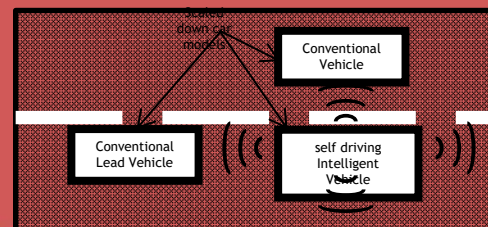
Major Areas of Research

- **Automotive Control systems:** Engine Management Systems (SI, CI, Hydrogen Fueled Engines), Electric Power Steering, Active Suspension system (MR damper), etc.
- **Robotics and Sensor Network:** Robotics / Unmanned Vehicle Guidance and Control, Sensors and Sensor Network (wired / wireless), Automated Highway System (AHS) & Intelligent Vehicles
- **Industrial automation:** Embedded Controller and Real Time Operating System (RTOS) for Mechatronic System

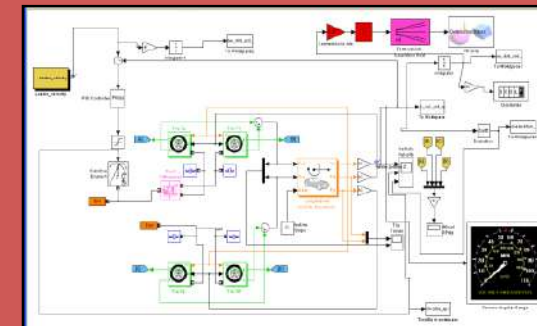
Automotive Control Systems



Automated Highway System (AHS) and Intelligent Vehicles



Real Time Embedded Controller Design (Modeling, Simulation, Optimization)



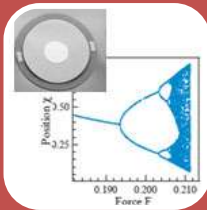
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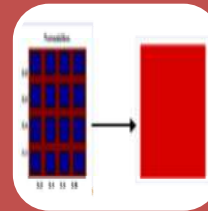
Dr. Manoj Pandey
PhD, Cornell University, USA
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044-2257-4658; mpandey@iitm.ac.in



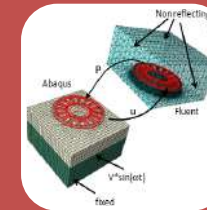
- Reduced Order Modeling and Nonlinear Dynamics of Resonant MEMS
- Finite Element based Multi scale Modelling of Elastic Plastic Applications
- Multi Physics analysis of MEMS



Nonlinear Modeling and
Analysis of MEMS



Multiscale
Modeling/Homogenization
for composites



Multi-Physics Analysis



Dr. Mayank Mittal

Assistant Professor, Mechanical Engineering

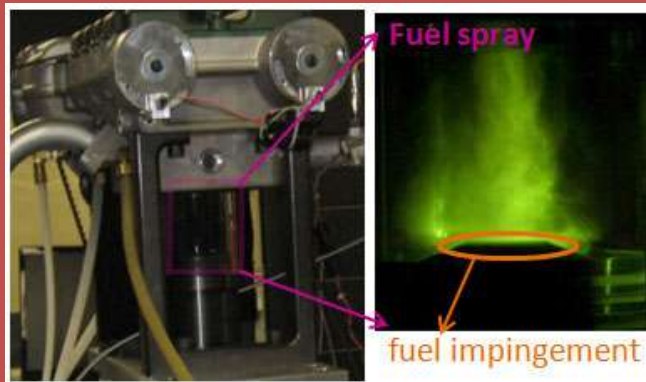
+91-44-2257-4680; mmittal@iitm.ac.in

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Major Areas of Research

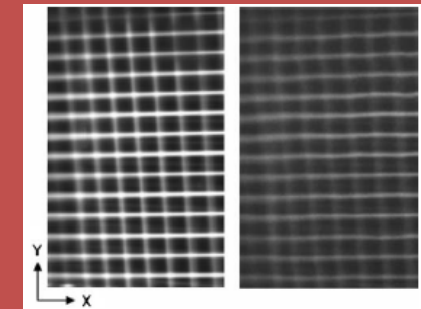
- Experimental diagnostics and modeling of advanced internal combustion engine; alternate fuels; aftertreatment system
- Laser-based diagnostics for flow and combustion
- Signal and image processing; computer vision



In-cylinder fuel spray and combustion visualization



Laser grid inside the engine cylinder



Undelayed and delayed images of molecular tagging velocimetry



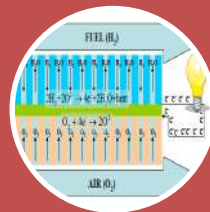
Dr. Narasimhan Swaminathan
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<http://www.iitm.ac.in/component/faculty/78/n.swaminathan/>



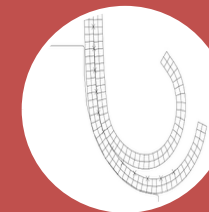
- Grain size and defect kinetics interactions in ceramics
- Material property determination using atomistic methods
- Finite element modeling of multiphysics phenomena



Radiation damage in nuclear materials with nanosized grains



Interactions between electrochemistry and mechanics in fuel cell electrolytes



Crashworthiness of composite materials

← Computational materials science and mechanics →



Dr. Pallab Sinha Mahapatra

PhD, Jadavpur University, India

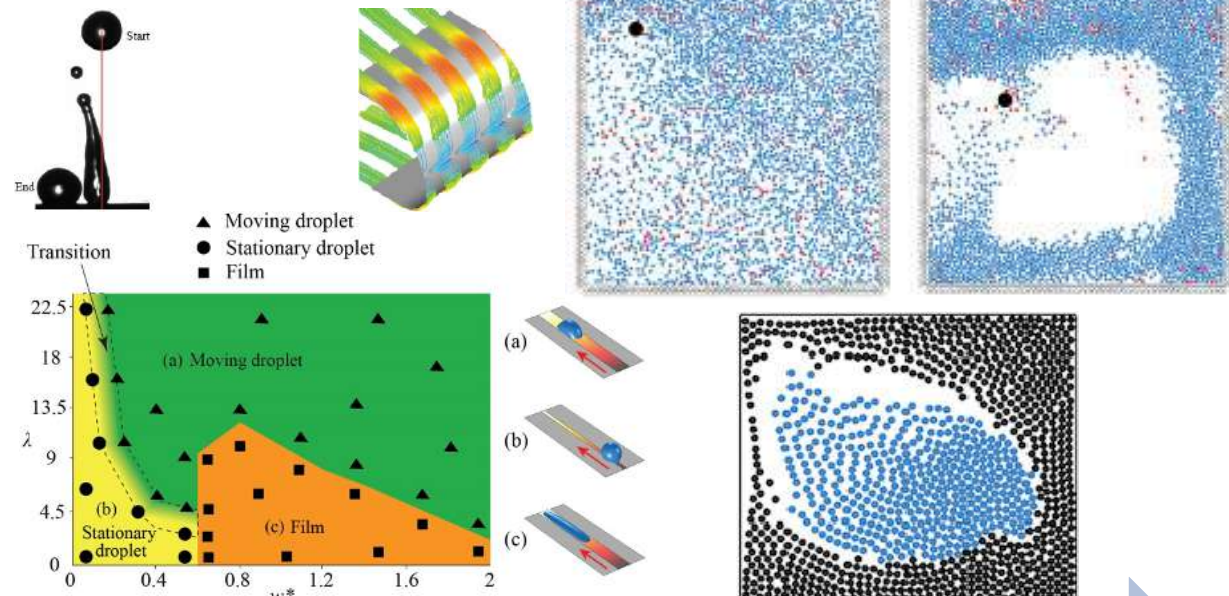
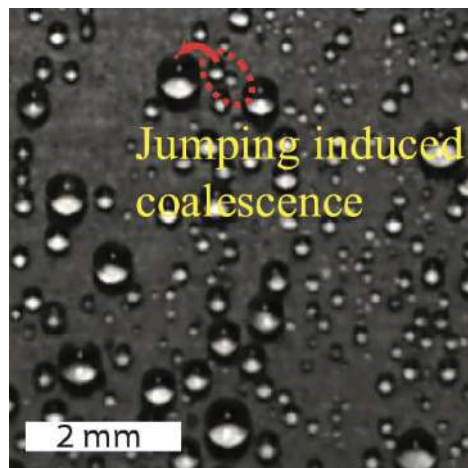
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<http://www.iitm.ac.in/pallab>



- Surface engineering: open surface microfluidics, micro texturing, wettability engineering, interfacial flows
- Multiphase heat transfer: condensation and boiling, multiphase modelling
- Self-propelled systems: collective dynamics, crowd modelling



Multiscale multiphase flows: experiments and simulations

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- Constitutive modeling of viscoelastic materials
 - Modeling of creep response in metals
 - Modeling of fatigue loading in fibre reinforced composites
-
- Linear and non-linear constitutive models for viscoelastic materials within a thermodynamic framework.
 - Development of continuum models for creep in copper.
 - Thermo-mechanical response of glass-epoxy composites: coupling between the thermal and mechanical response in composites.
 - Development of continuum models for composites and polymers and comparison to experiments involving cyclic loading.



Dr. Piyush Shakya

PhD, Texas A&M University, USA
Associate Professor, Mechanical Engineering



Major Areas of Research

- Condition monitoring
- Fault Diagnosis and Prognosis
- Innovative signal processing
- Bearings, Gears



Failed bearings samples after dismantling



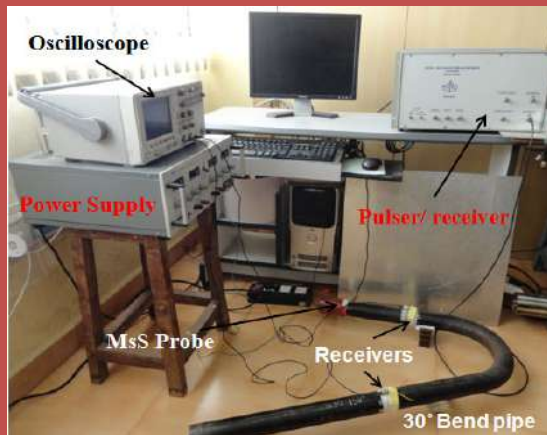
Dr. Prabhu Rajagopal

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Ultrasonic techniques for inspection, monitoring and control

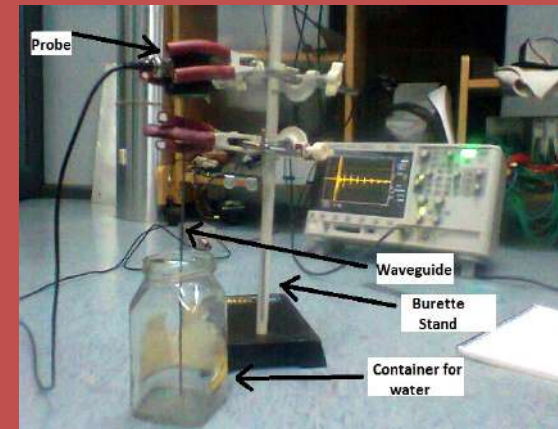
- Nondestructive Evaluation & Structural Health Monitoring
- Manufacturing Process Control



Inspection of pipe networks (e.g., Oil and Gas Industry, Heat Exchanger Tubes)



Monitor structural health (e.g., aircraft wings, ship hull, wind turbines)



Measurement of liquid level (e.g., Underground/pressurized fluid reservoir)



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- Sorption Technology
- Solid State Hydrogen Storage
- Air-conditioning and Ventilation

Sorption Technology

1. Adsorption coolers
2. Absorption systems
3. Cogeneration
4. Desalination

Solid State H₂ Storage

1. Material characterization
2. HMT and Reactor design
3. Cooling and Heat storage systems
4. H₂ compressors

Air-conditioning and Ventilation

1. Hybrid AC systems
2. Wall / Concrete and Passive cooling
3. Desiccant and Evaporative cooling
4. Industrial ventilation



Dr. B V S S Prasad

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- Turbomachines/ Gas Turbine Blade Cooling Technology
- Energy/Fluidization Technology
- Computl. and Exptl. Heat Transfer /AUSM Schemes, Heat Flux measurements



Impingement cum film cooling,
pin fin cooling, conjugate heat
transfer



Combined Cycle Power
Generation, Fluidized Bed
Boilers



CFD applied to engineering
applications like turbomachines,
Advanced computational
schemes ; Experimental
methods with heat flux
measurements



Dr. V Raghavan

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- Liquid Fuel Droplet Evaporation and Combustion - alcohols and biofuels
- Laminar Flames - Hydrogen and oxygen enhanced flames, flame stability studies
- Heterogeneous Combustion - pool flames, coal and biomass gasification



Liquid Fuel droplet
Evaporation and
Combustion



Laminar Flame studies



Heterogeneous
combustion



Dr. V Raghu Prakash, PhD. (IISc)

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- Fatigue, Fracture and Failure Analysis
- Materials Characterization
- Crash Performance
- Product Design



Life Prediction and
Residual Life Extension



Development of crash
compliant structures



New Product
Development

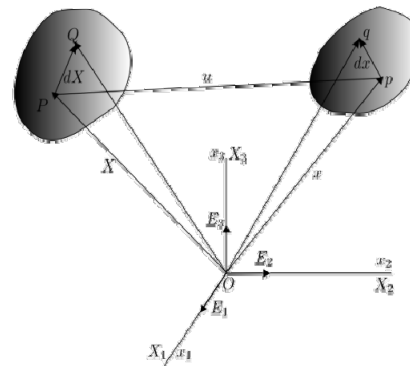


Dr. Raju Sethuraman
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Research Area/Focus : Computational Solid Mechanics

- Modeling and simulation of structural materials undergoing inelastic finite deformation





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Dr. N Ramesh Babu

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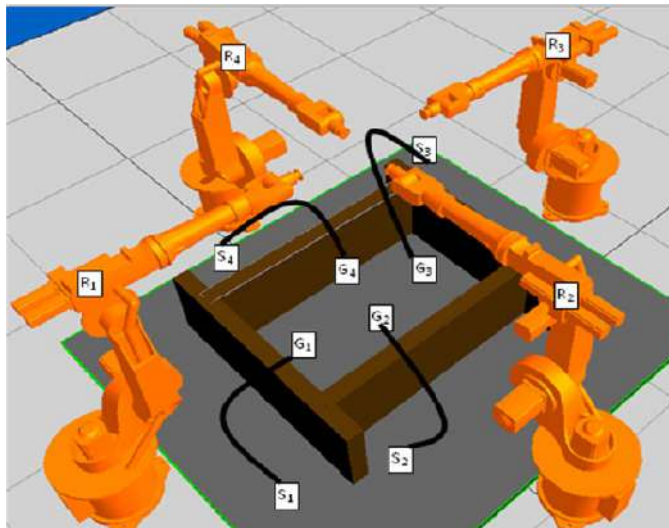


Automation in Manufacturing

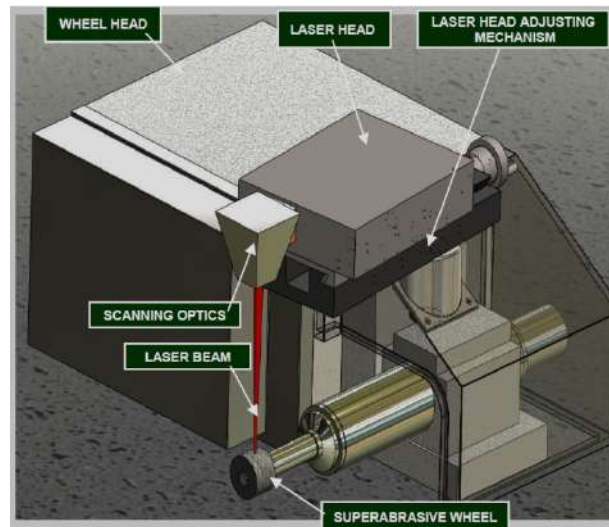
- Automation concepts in sheet metal bending, laser and water jet machining
- Motion planning of multiple robots for cooperative and coordinated manipulation
- Reverse engineering of PLC control programs
- Tool path generation for complex surface machining

Advanced Machining Processes

- Development of Next Generation Precision Grinding Machine Tool
- Laser Dressing of Super abrasive Grinding Wheels
- Macro and micro abrasive waterjet machining
- Ice bonded abrasive polishing process
- Grinding of brittle materials



Motion planning of Multiple Robots



Laser Dressing of Grinding wheel



Micro abrasive waterjet machining
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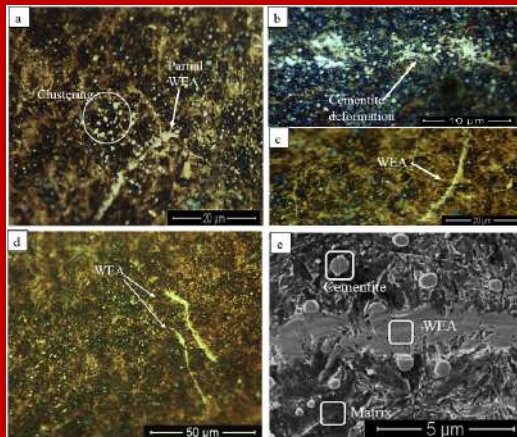
Dr. Ramkumar Penchaliah
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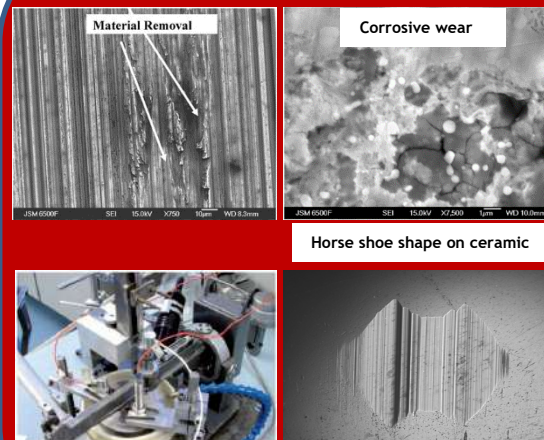
Major Areas of Research

- Automotive Tribology and Tribo design of Machine Components
- Wind Turbine Gearbox Bearing Failures (WEC)
- Surface Engineering : Surface Texture and Coatings (Bio-implants/PRCL)
- Wear Simulation models for Prediction

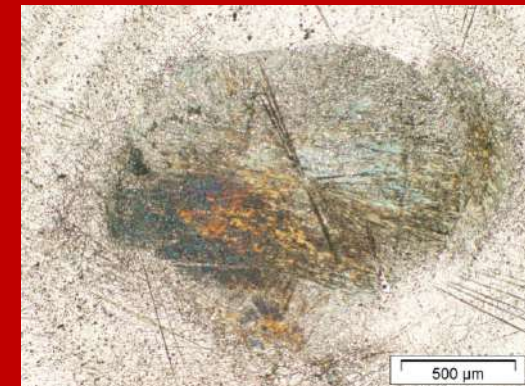
WEA Formation



Contaminants Effects



Failed DLC Tappet



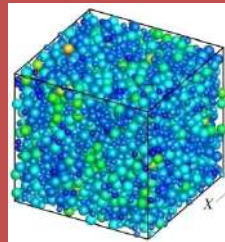


Dr. Ratna Kumar Annabattula
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<http://home.iitm.ac.in/ratna>

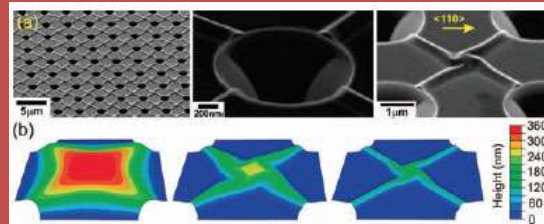


Major Areas of Research

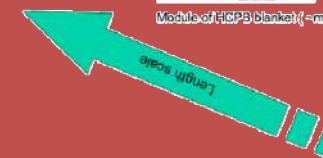
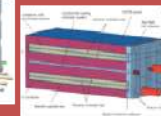
- Thermo-mechanics of Granular Materials
- Nuclear fusion, Li-Ion batteries, Thermal energy storage
- Nature Inspired Microsystem Design
- Multi-Scale Modeling of Materials



Micromechanics of granular materials for nuclear fusion



Spontaneous formation of three dimensional micro structures from pre-stressed thin films



Development of novel meso-scale computational techniques to bridge the micro and continuum length scales

Computational Solid Mechanics for Sustainable Energy and Microsystem Design

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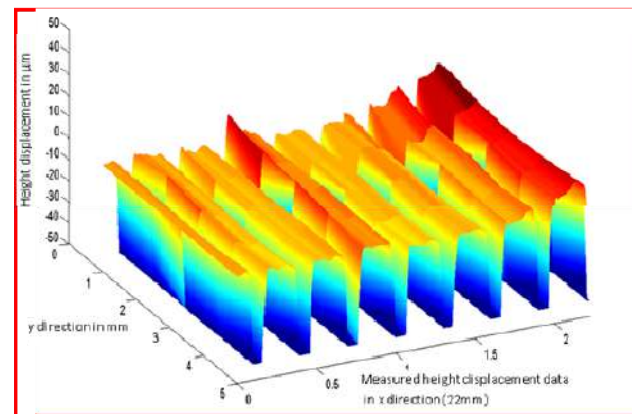


Major Areas of Research

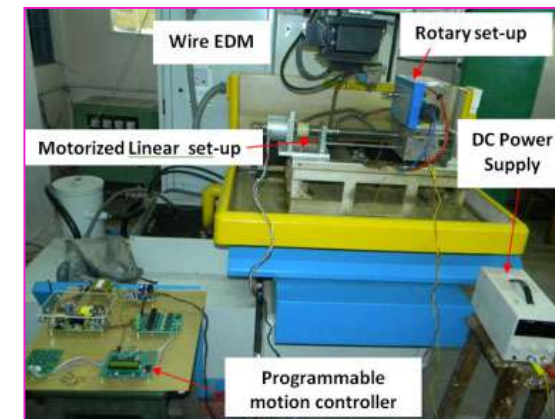
- Micro machines - process modeling
- Metrology and Computer Aided Inspection - measurement and evaluation of surface characteristics
- Wire Electrical Discharge Machining - study of machining process and characterization



Micro Machining set-up



3D profiles measured using Capacitance sensor



Wire EDM Turning set-up



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Dr. Sateesh Gedupudi

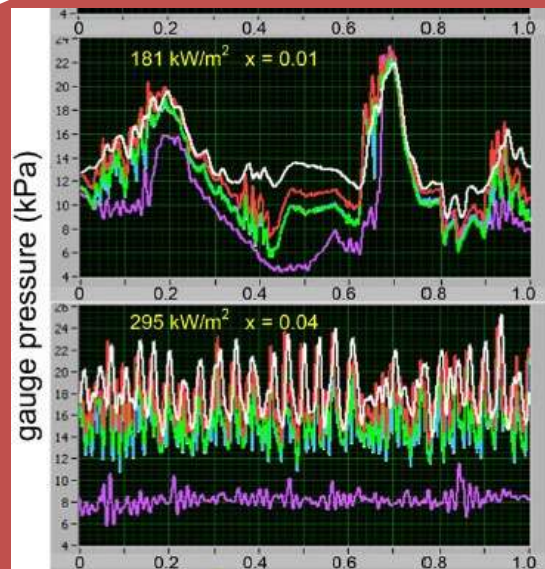
PhD, IIT Madras, India

Assistant Professor, Mechanical Engineering

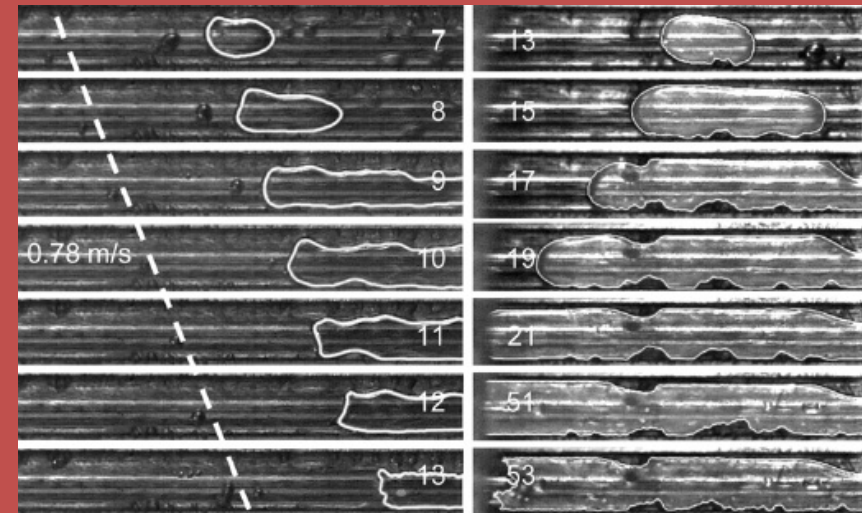
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- Phase-change heat transfer (flow boiling and pool boiling) and flow instabilities
- Heat exchangers
- Non-conventional energy sources



Local pressure fluctuations at different axial positions in a microchannel



Video images of bubble growth in a 0.6 mm D_h channel (a) without inlet compressibility and (b) with inlet compressibility (flow reversal)



Dr. Sathyan Subbiah

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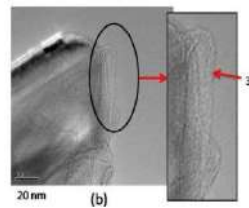
Expertise

- Machining (at all scales (meso, micro to nano))
- Abrasive polishing
- Experimental and process simulation

Industry Related Experiences

- Worked in US-Automotive manufacturing industry for 3 years
- While in academia, collaborated/ing with following industries:
- Aerospace (Rolls Royce Singapore)
- Reliance Petrochemical
- Ace Micromatic Grinding
- Saint Gobain Research India
- SVP Laser
- Titan

Machining (at all scales (meso, micro to nano))



Graphene

Exfoliation



Thin sheet film

micro-machining



Large ship

propeller



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- Rotor Dynamics
- Fault Identification and Condition Monitoring
- Tribology- Rolling element bearings and Hydro dynamic bearings



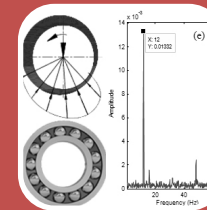
Rotating machinery:

Composite shafts dynamics;
Fault modeling and
detection; MCSA



Wind turbine:

Gearbox dynamics and
condition monitoring



Bearings & Seals:

RE bearing defects; Fluid
film bearing roughness
effects ; CFD of Seals



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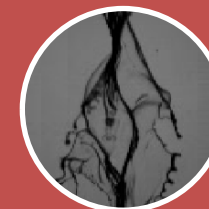
- Droplet processes (Droplet Evaporation, Droplet Impact)
- IC Engine process simulation
- Atomization and sprays



Marangoni convection during droplet evaporation can be utilized in micro-mixing



Simulation of flow and mixing processes in a gasoline direct injection engine



Atomization of liquid sheet from a impinging jet injector

DROPLET AND SPRAY PROCESSES IN ENGINES AND OTHER APPLICATIONS



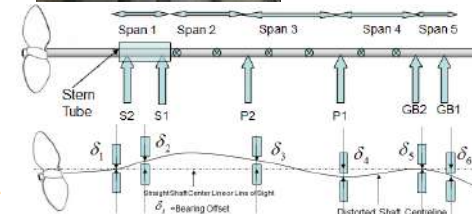
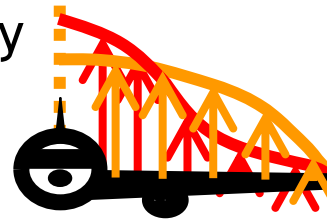
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- Optimization Methods
- Vibrations
- Machine Design
- Socially Relevant Technology



Optimization Methods:

1. Multi-Objective Optimization
2. Improved Algorithms
3. Hybrid methods
4. Applications to Machine Design, Dynamics problems

Vibrations:

1. Structural Dynamics
2. Machine Dynamics
3. Vibration Control
4. Inverse problems and Health Monitoring

Machine Design:

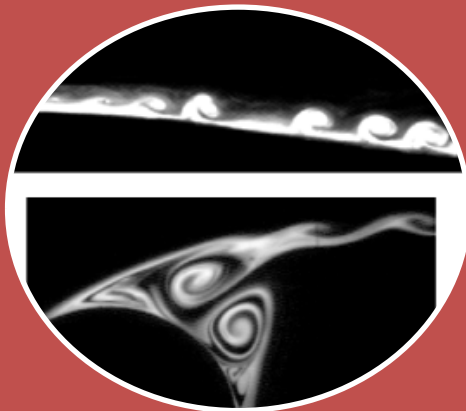
1. General Machine Design
2. Design for Socially Relevant Applications
3. Alternative Energy for Rural applications



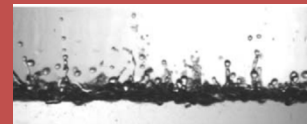
Dr. Shyama Prasad Das
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<http://mech.iitm.ac.in/Faculty/sydas/home.php>



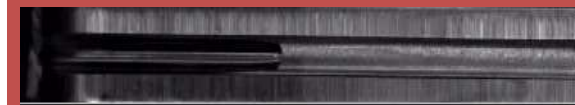
- Unsteady Hydrodynamics, Aerodynamics and Turbomachines
- Interfacial Hydrodynamics and Transport
- Phase Change Heat Transfer in Mini System



Hydrodynamic instability and boundary layer separation



Gravity and capillary waves



Pulsating heat pipe

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Dr. Sivasrinivasu Devadula

PhD, IIT Madras, India

Assistant Professor, Mechanical Engineering

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<https://mech.iitm.ac.in/meiitm/personnal/dr-sivasrinivasu-devadula/>





Dr. Somashekhar S Hiremath

PhD, IIT Madras, India

Assistant Professor, Mechanical Engineering

044-2257-4681; somashekhar@iitm.ac.in

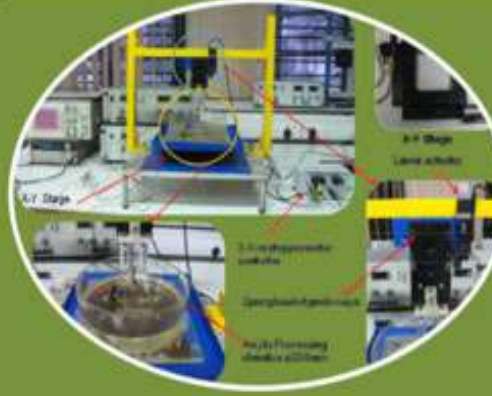
<http://mech.iitm.ac.in/PEIL%20HOME%20PAGE/Members/Prof.Somasekhar/Soma%20sekhar.html>



- Fluid Power System : Electro hydraulic Servovalves, Autonomous Actuators, Hydraulic Hybrids
- Micromachining : Micro-EDM, Micro ECSM, Micro-AJM, Micro-HAJM
- Mechatronic System : Sensor and Actuator Integration to Precision Mechanical System
- Robotics : Trajectory Planning and Control, Obstacle Avoidance etc
- Modeling & Simulation : Optimization of process parameters



Abrasive Flow Machine for Producing Nano level Finish on Complex and Inaccessible Internal Features



Micro-ECSM: Hybrid Machining Approach for Machining a Non-conducting Engineering Materials



Micro-EDM for Micro-machining of Holes and Channels for Micro Fluidic Applications & New Approach for Nano Particle Generation

Cutting-edge Interdisciplinary Research Activities and Provide Technology Transfer and Consultancy Services to Industry and Governmental agencies

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Dr. S Soundarapandian

PHD, Southern Methodist University, USA

Assistant Professor, Mechanical Engineering

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<http://www.iitm.ac.in/component/faculty/78/sspandian/>



Laser surface hardening

Laser induced phase transformations

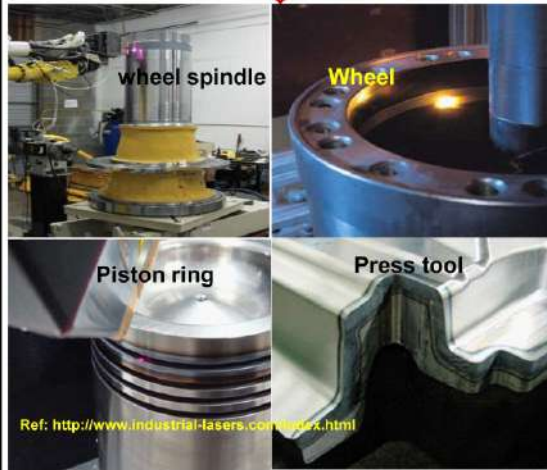
Superior resistance to heat, wear, fatigue, fracture, erosion, and corrosion

Localized surface hardening
[μm to mm levels of case depth (D)]
[10^2 to 10^3 order of magnitude of hardness (HV)]

Industrial applications

Automotive, aerospace, Defense, nuclear, and so on

Non-uniform larger surface area

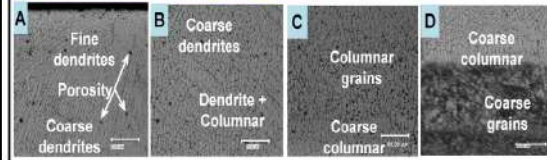
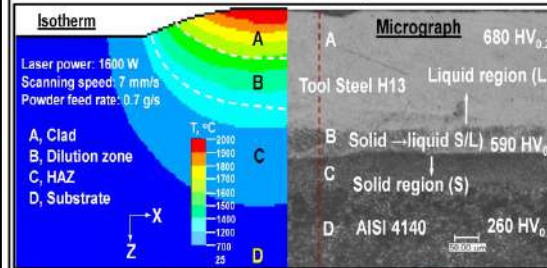
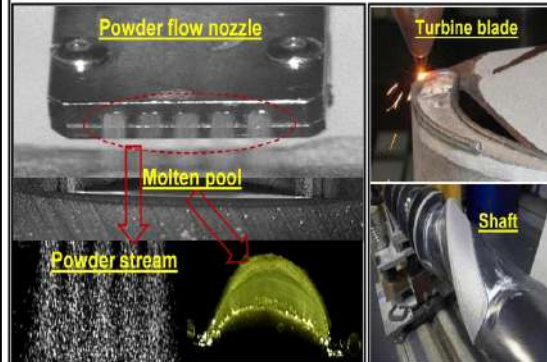


Ref: <http://www.industrial-lasers.com/index.html>

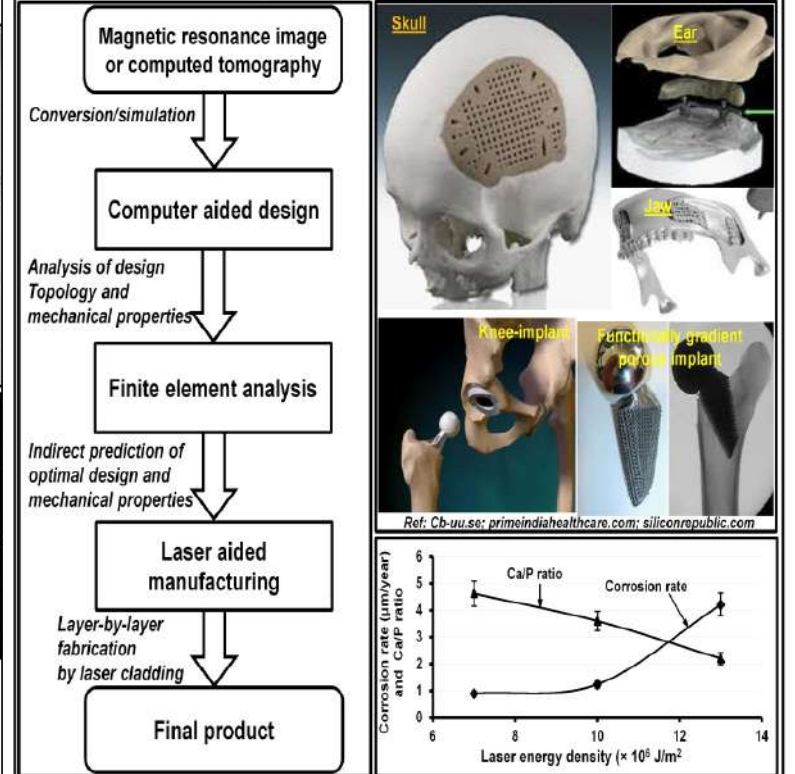
“Laser is an answer in search of a question”

Research focus: Laser-aided surface engineering (LASE)

Direct diode laser wear-resistant cladding



Laser-aided manufacturing of bio-degradable functionally gradient porous implants



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Dr. Sourav Rakshit

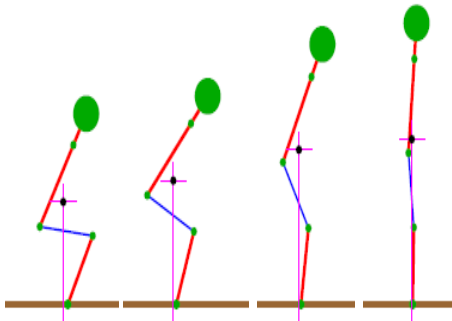
Assistant Professor, Mechanical Engineering

044-2257-4693; srakshit@iitm.ac.in

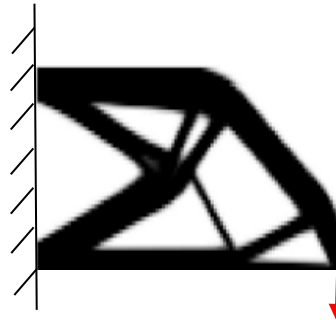
<https://mech.iitm.ac.in/meiitm/personnal/sourav-rakshit/>



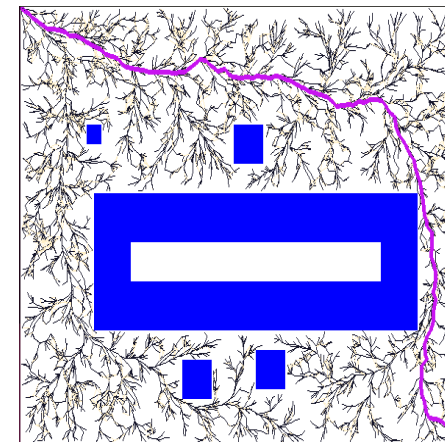
Optimization in biomechanics



Topology optimization



Robotics and motion planning





Dr. Srikrishna Sahu

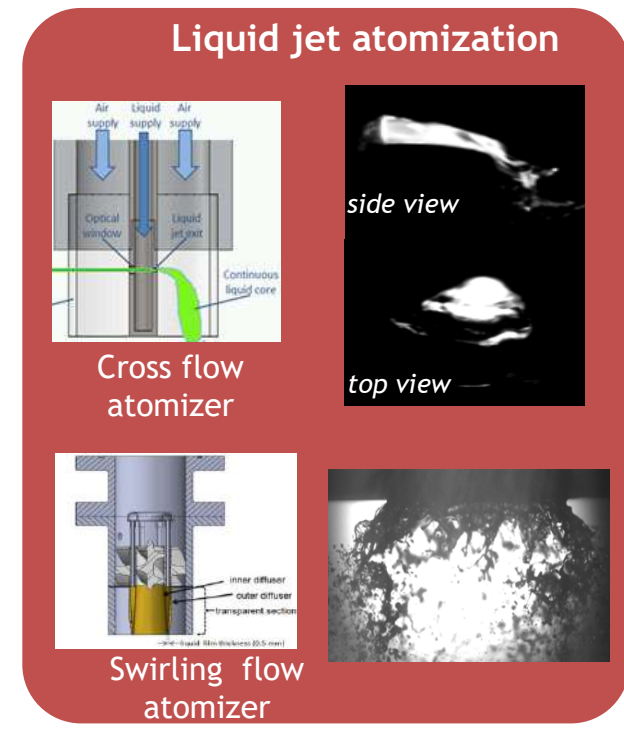
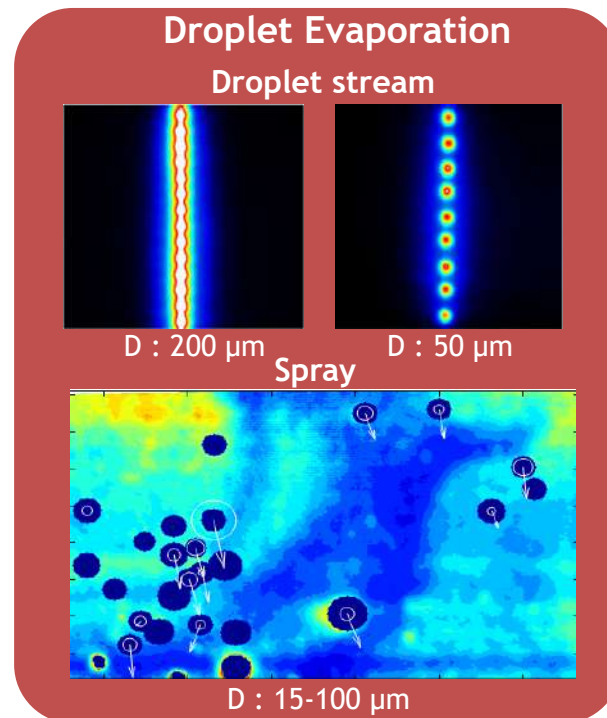
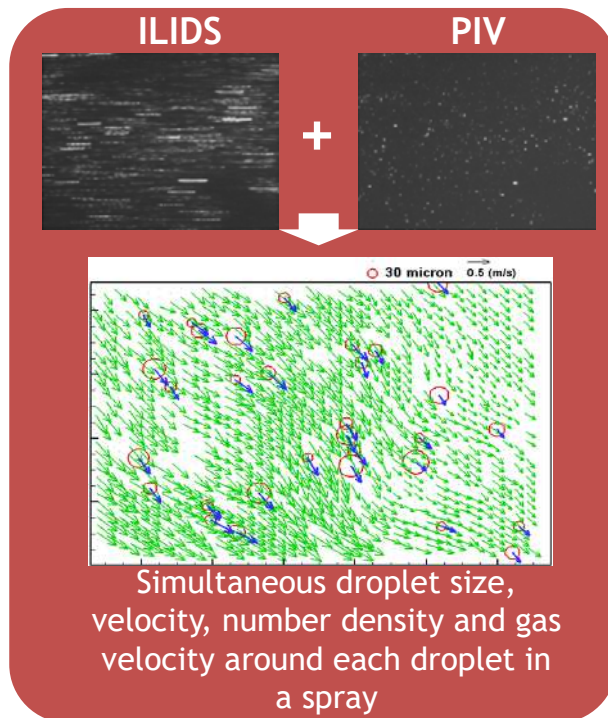
PhD, Imperial College London, UK

Assistant Professor, Mechanical Engineering

044-2257-4713; ssahu@iitm.ac.in



- Optical experimental methods for two-phase flow and combustion research: ILIDS, PIV, PLIF, Optical Connectivity
- Spray-turbulence interaction, spray evaporation, liquid jet atomization
- Image processing, POD analysis



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Dr. K Srinivas Reddy

PhD, IIT Delhi, India

Professor, Mechanical Engineering

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- Solar Energy Conversion/ Concentration Solar Power Technologies
- Estimation & Measurement of Thermo-physical Properties/Thermal Conductivity
- Energy & Environment/ 4E (Energy-Exergy-Environmental-Economic) Analyses



Design and Development of Solar Parabolic Dish Cavity Receiver Systems for Power Generation and Hydrogen Production



Integration and Optimization of High Performance Solar Concentrating Photovoltaic Systems for Cogeneration and Tri-generation



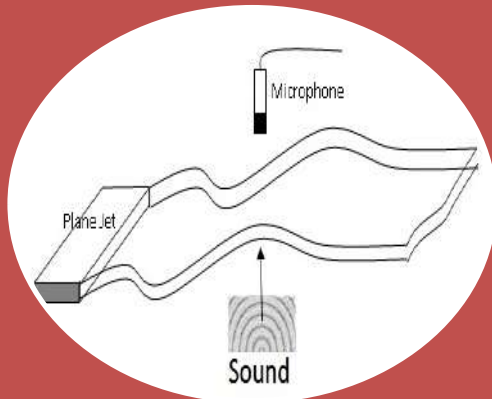
Estimation of effective thermal conductivity of two-phase engineering materials



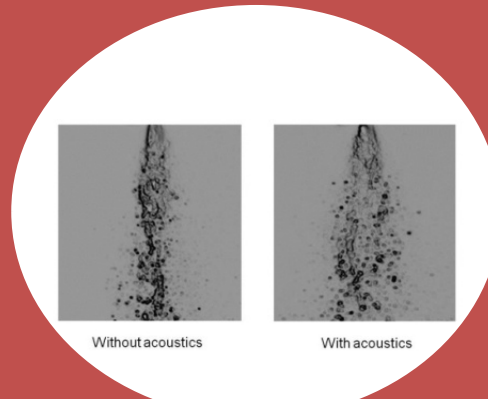
Dr. K Srinivasan
PhD, IIT Kanpur, India
Professor, Mechanical Engineering
+91 (44) 2257-4703; ksri@iitm.ac.in
<http://goo.gl/w6f6x>



- Jet Flow and Noise
- Active and Passive Control of Flow, Noise and Combustion
- Resonant Acoustics



**JET FLOW &
ACOUSTICS**



FLOW CONTROL



RESONANT ACOUSTICS



Dr. Sujatha Chandramohan

PhD, IIT Madras, India

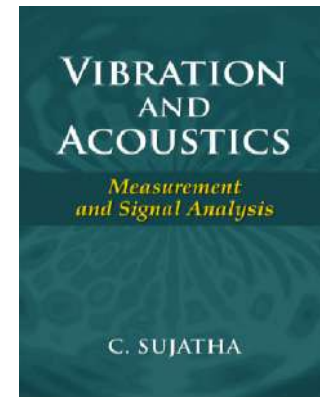
Professor, Mechanical Engineering

044-2257-4682; sujatha@iitm.ac.in

<http://www.iitm.ac.in/component/faculty/78/sujatha>



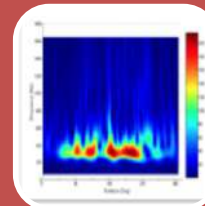
- Vehicle Dynamics
- Machine Dynamics
- Vibration Signal Analysis
- Human Body Vibration



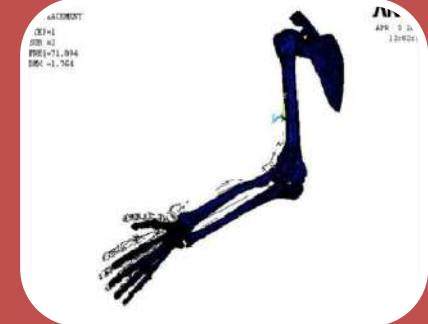
RIDE & HANDLING OF
ROAD, OFF-ROAD
AND RAILWAY
VEHICLES



MACHINERY
CONDITION
MONITORING



INSTRUMENTATION &
SIGNAL ANALYSIS



HAND ARM
VIBRATION

VIBRATION, ACOUSTICS AND SIGNAL ANALYSIS

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Dr. Sujatha Srinivasan

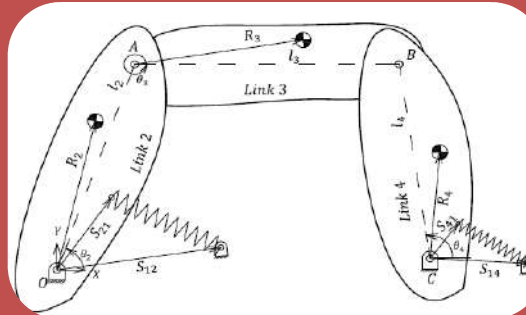
PhD, The Ohio State University, USA
Associate Professor, Mechanical Engineering
044-2257-4728/5695; sujsee@iitm.ac.in
<https://home.iitm.ac.in/r2d2>



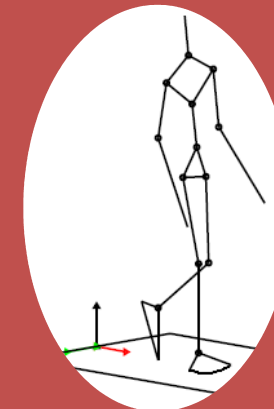
- Prosthetics, Orthotics and Assistive Devices
- Mechanisms
- Movement Biomechanics



Standing Wheelchair



Mechanisms



Biomechanics

← FOCUS: Rehabilitation Research and Device Development (R2D2) →



Dr. Sundararajan T

PhD, University of Pennsylvania, USA
Professor, Dept. of Mechanical Engineering
044-2257-4683; tsundar@iitm.ac.in





Dr. Sundararajan Natarajan

PhD, Cardiff University, Wales, UK

Associate Professor, Mechanical Engineering

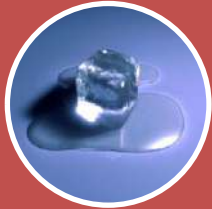
044-2257-4656; snatarajan@iitm.ac.in

<http://home.iitm.ac.in/snatarajan>

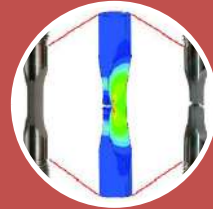


Major Areas of Research

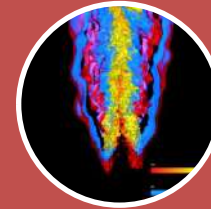
- Free and moving interfaces
- Multi-field coupled problems
- Computational Mechanics (FEM, XFEM, Meshless, Isogeometric analysis, Polygonal FEM, Scaled Boundary FEM)
- Multiscale methods



Melting/Solidification



Growth of flaw leading to complete failure



Flame front propagation

← Leverage the centrality of mathematical formulations to have an impact in variety of fields →



Dr. Sushanta Kumar Panigrahi

PhD, IIT Roorkee, India

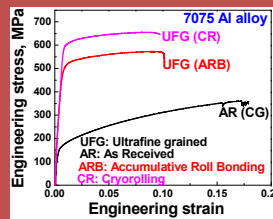
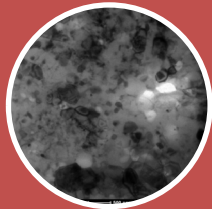
Associate Professor, Mechanical Engineering

044-2257-4742; skpanigrahi@iitm.ac.in

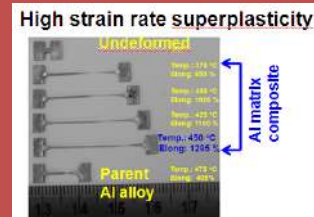
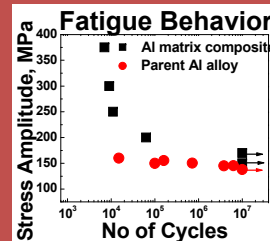
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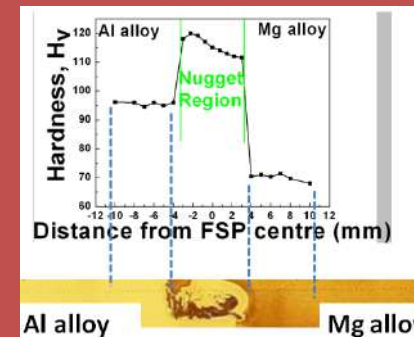
- **Development /manufacturing of advanced materials**
(Bulk ultrafine/nano grained materials, metal matrix composites, nano composites, high strain rate superplastic materials, advanced materials as per design etc.)
- **Fundamental behavior of advanced materials**
(Materials characterization, mechanical properties and machining related studies)
- **Joining and processing of similar and dissimilar materials**



Properties of Bulk UFG/Nano Materials



Behavior of Metal Matrix Nano Composites



Joining and Processing of Similar & Dissimilar Materials by Solid State Processes



Dr. S Varunkumar
Assistant Professor, Mechanical Engineering
044-2257-4717; varuns@iitm.ac.in



Major Areas of Research

- Biomass gasification and combustion
- CO kinetics and emission prediction
- Combustion instability in solid rocket motors



Dr. G Venkatarathnam
Professor of Mechanical Engineering
044-2257-4685; gvenkat@iitm.ac.in



Major Areas of Research

- Development of new generation of refrigerators and liquefiers
- Mixed refrigerant processes, refrigerant mixtures, low GWP refrigerants
- High efficiency heat exchangers, Thermodynamics, Process Simulation



Organic Rankine
cycle based systems
for power plants

Patents on Mixtures, new
mixed refrigerant liquefiers,
refrigerators

Development of next generation Refrigeration Systems and Refrigerants



Dr. Vishal V R Nandigana

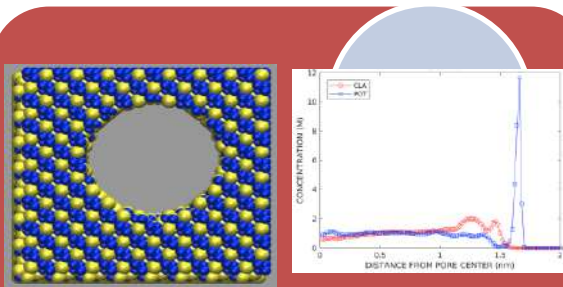
PhD, University of Illinois at Urbana-Champaign, USA
Assistant Professor, Mechanical Engineering

044-2257-4668; nandiga@iitm.ac.in

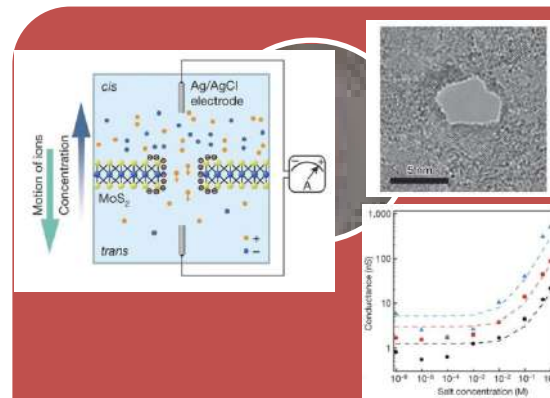
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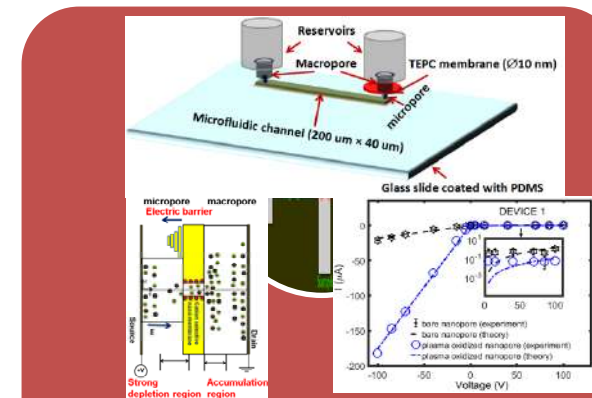
- Computational Nanofluidics - Understanding fundamental ion transport in solid-state nanochannels and nanopores
- Nanomaterials - Energy harvesting using advanced 2D MoS₂ nanomaterials
- Nano circuits - Nanofluidic based circuits like nanofluidic diodes for sensor applications



Computational nanofluidics



Nanomaterials



Nano circuits

BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH



Dr. Viswanath K
Assistant Professor, Mechanical Engineering
044-2257-4664; viswanathk@iitm.ac.in





INDIVIDUAL FACULTY PROFILE

**DEPARTMENT OF
METALLURGICAL AND
MATERIALS ENGINEERING**

LIST OF FACULTY

Ajay Kumar Shukla

Anand K Kanjarla

Balasubramanian M

Bhattacharya S S

Gandham Phanikumar

Ganesh Sundara Raman S

Hari Kumar K C

Janaki Ram G D

Kamaraj M

Ravi Sankar Kottada

Lakshman Neelakantan

Manas Mukherjee

Murty B S

Murugaiyan Amirthalingam

Parasuraman Swaminathan

Pradeep K G

Prathap Haridoss

Ranjit Bauri

Ravikumar N V

Sabita Sarkar

Sampath V

Sampath Kumar T S

Sankaran S

Satyesh Kumar Yadav (Profile yet to be uploaded)

Somnath Bhattacharyya

Sreeram K Kalpathy

Srinivasa Rao Bakshi

Subramanya Sarma V

Tiju Thomas

Uday Chakkingal



Dr. Ajay Kumar Shukla

Assistant Professor, Metallurgical and Materials Engineering

044-2257-4762; shukla@iitm.ac.in



Major Areas of Research

- Process modeling, control and optimization of iron and steelmaking
- Computational thermodynamics and its application to high temperature metallurgical processes
- Application of Artificial Intelligence (ANN, GA) to metallurgical processes



Dr. Anand K Kanjarla

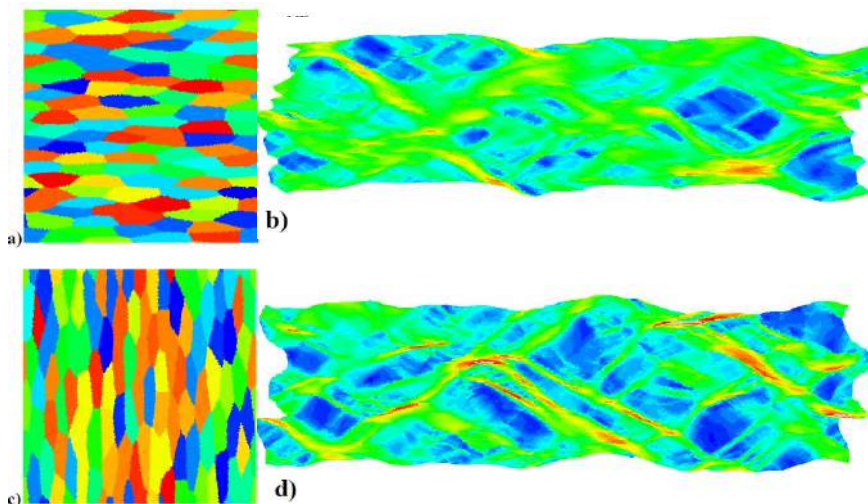
Assistant Professor, Metallurgical and Materials Engineering
044-2257-4753; kanjarla@iitm.ac.in



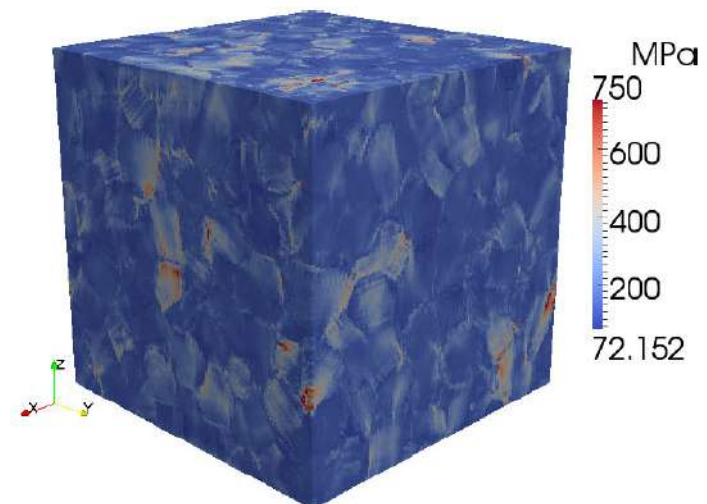
Major Areas of Research

- Micromechanical modelling of polycrystalline materials.
- Mechanical anisotropy of materials : crystallographic texture
- Mechanics of irradiated microstructures

Effect of grain morphology on shear band formation in an Aluminum alloy



Occurrence of stress concentrations close to grain boundaries in deformed Zirconium sample



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Dr. M Balasubramanian

Professor, Metallurgical and Materials Engineering

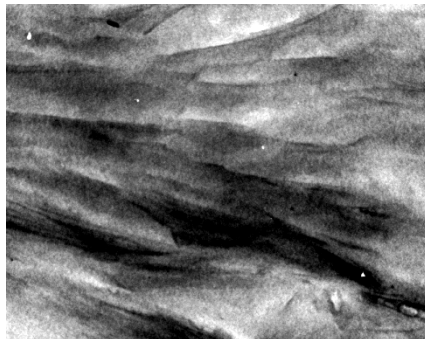
044-2257-4767; mbala@iitm.ac.in

<https://mme.iitm.ac.in/mbala/>

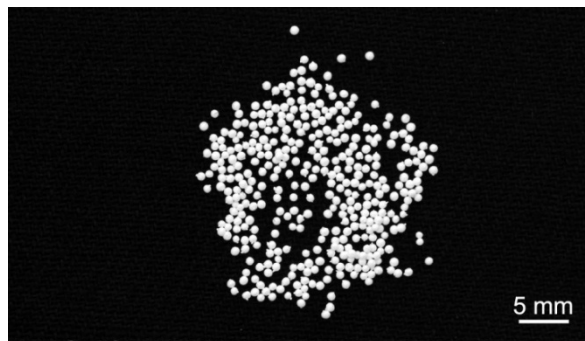


Major Areas of Research

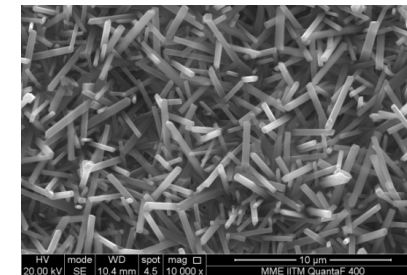
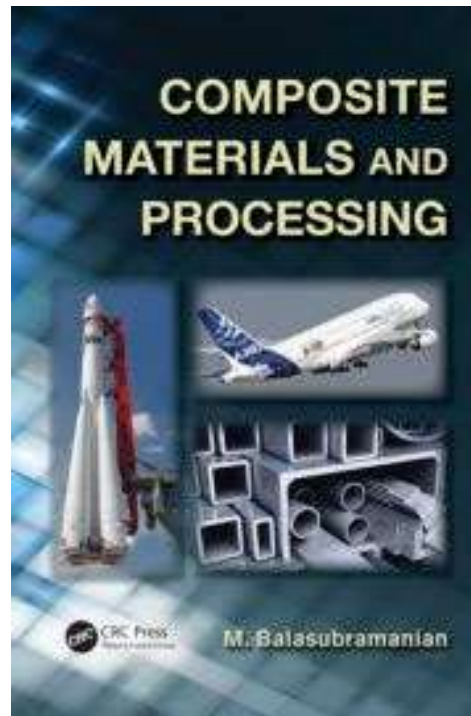
- Processing of advanced ceramics
- Processing of composite materials including nanocomposites



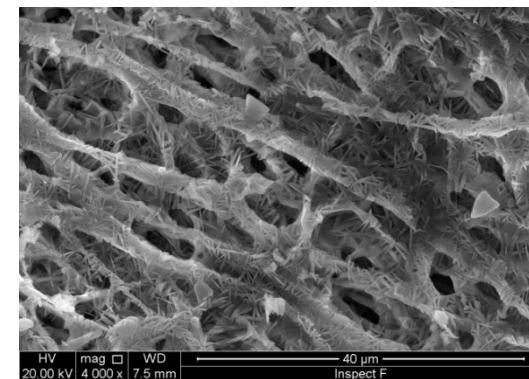
Clay-polyester nanocomposite



Alumina-zirconia minispheres



Microstructure of porous mullite



Alumina platelets formed on egg-shell membrane bio-template

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S S Bhattacharya

Professor, Metallurgical and Materials Engineering
Nano Functional Materials Technology Centre,
Materials Testing Facility - Materials Forming Lab

044-2257-4765; ssb@iitm.ac.in
<http://mme.iitm.ac.in/ssb>

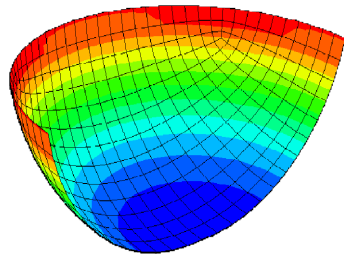


Major areas of research

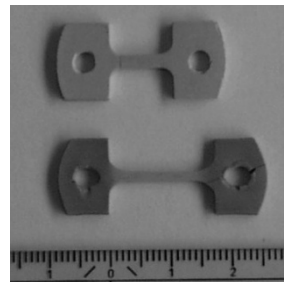
- Synthesis, Consolidation and Sintering of nanostructured materials
- Characterisation of Structural and Functional Nanocrystalline Ceramics
- Super plasticity (SP) and Superplastic Forming (SPF) of Materials
- Metal Forming and Mechanical Behaviour of materials



SPF of Ti-6Al-4V



SPF - FE Modeling



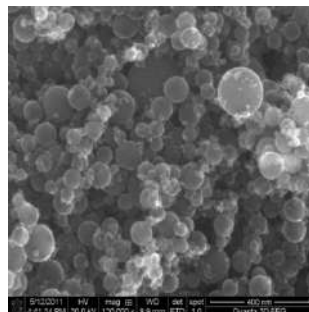
SP of nano zirconia



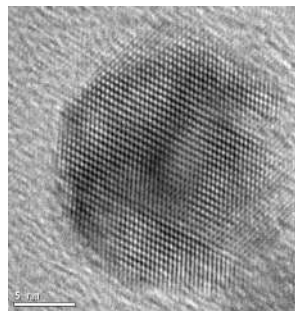
SPF/DB of nanoceramics



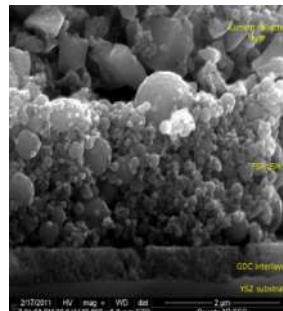
Chemical vapour synthesis set-up (top)
Flame synthesis set-up (bottom)



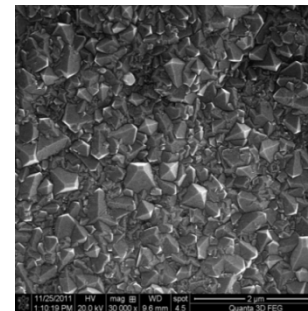
Nanocrystalline alumina



A nanotitania particle



Nano LSM for fuel cells



NCD coating on tool

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Dr. Gandham Phanikumar
Professor, Metallurgical and Materials Engineering
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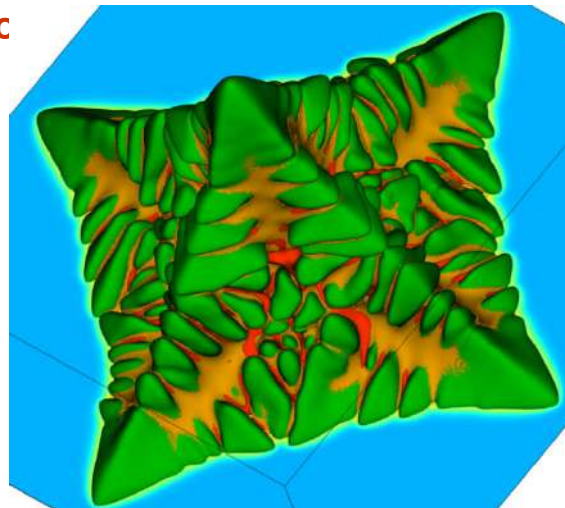
Major Areas of Research

- Solidification - experiments & modeling
- Phase field simulation of microstructure evolution
- Materials Joining

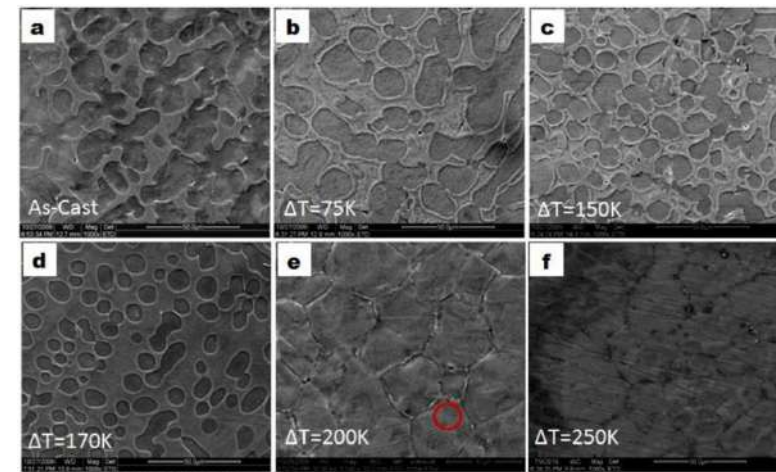
Electromagnetic Levitation
for under cooling



3D simulation of dendrite



Microstructure evolution

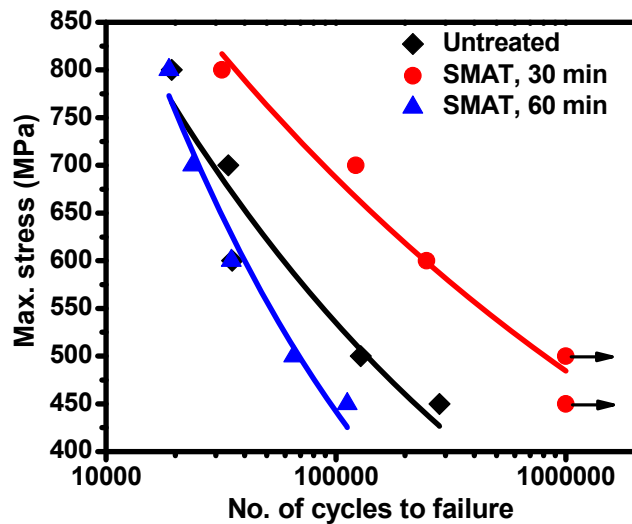




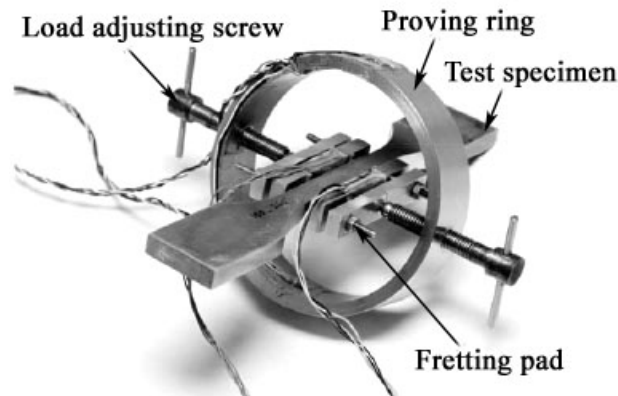
Dr. S Ganesh Sundara Raman
Professor, Metallurgical and Materials Engineering
044-22574768; ganesh@iitm.ac.in



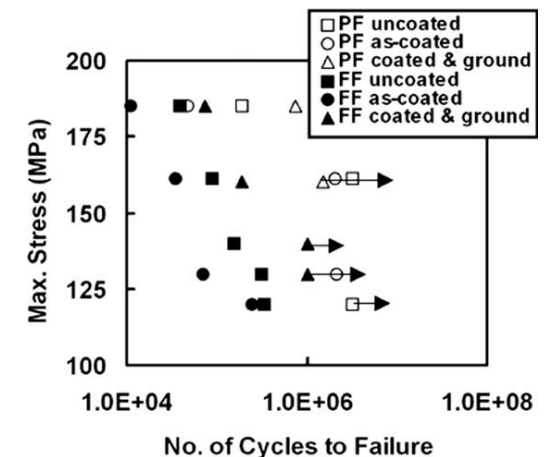
- Fatigue Behaviour of Materials and Weldments
- Fretting Fatigue and Fretting Wear
- Surface Modification, Coatings and Thermal Spray Processing



Effect of Surface Mechanical Attrition Treatment (SMAT) on Fatigue Lives of Ti-6Al-4V



Fretting Pads and Proving Ring Assembly used in Fretting Fatigue Testing



Effect of Grinding on Plain Fatigue (PF) and Fretting Fatigue (FF) Lives of AA 6061

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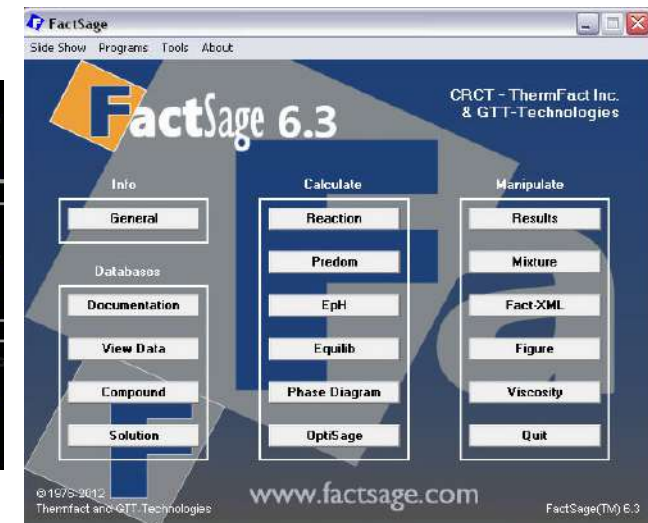
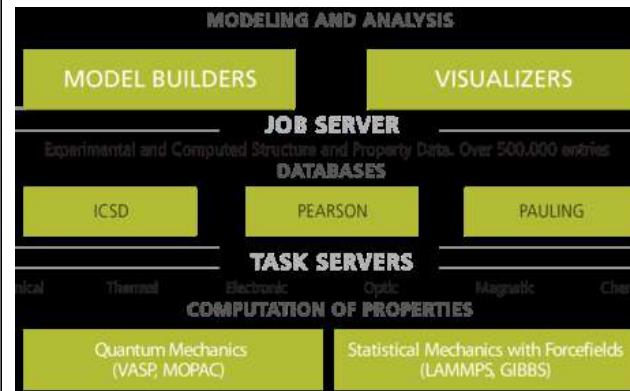
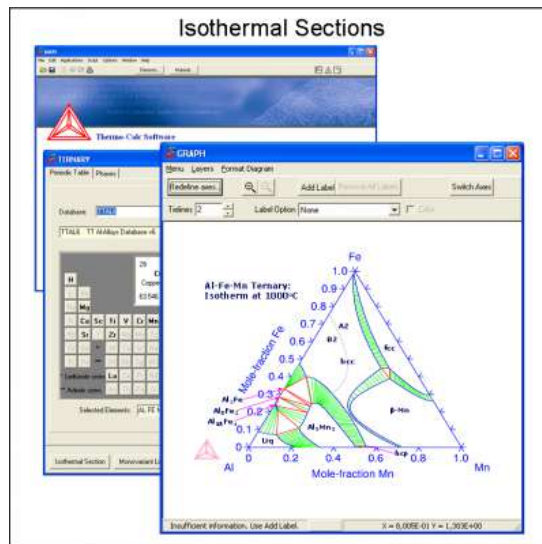
K C Hari Kumar

Professor, Metallurgical and Materials Engineering
044-2257-4766; kchkumar@iitm.ac.in



Major Areas of Research

- Gibbs Energy Modelling of Materials Employing Calphad
- Applications of Density Functional Theory in Materials Science
- Modelling of Diffusion Controlled Transformations in Ferrous and Non-ferrous Alloys



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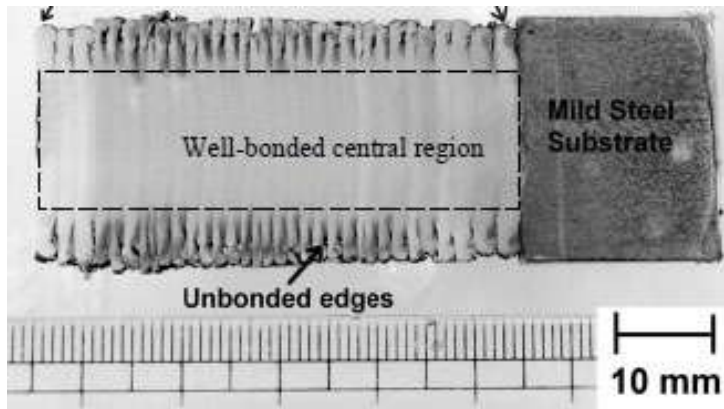


Dr. G D Janaki Ram

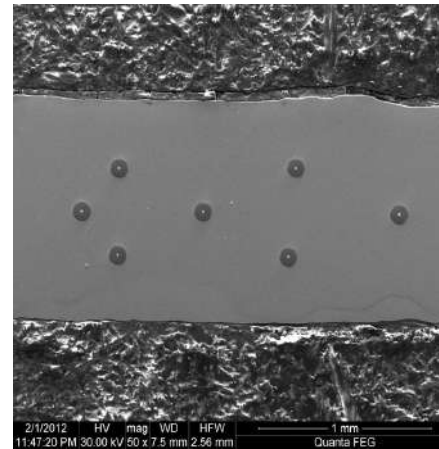
Professor, Materials Joining Laboratory
Metallurgical and Materials Engineering
+91-44-22574780, +91-9840597364, jram@iitm.ac.in



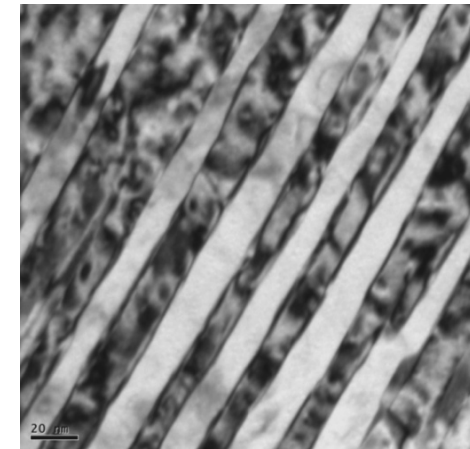
Research Interests: Welding, Additive manufacturing, Failure analysis



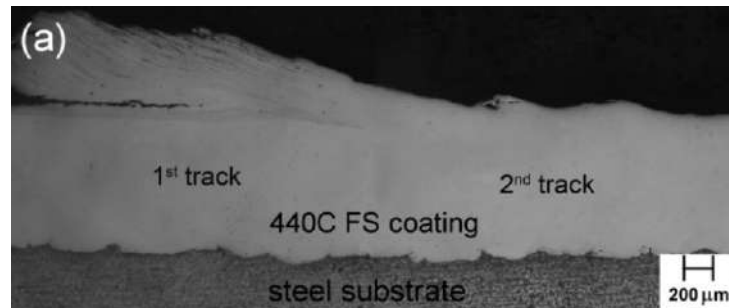
Additive manufacturing with friction processes



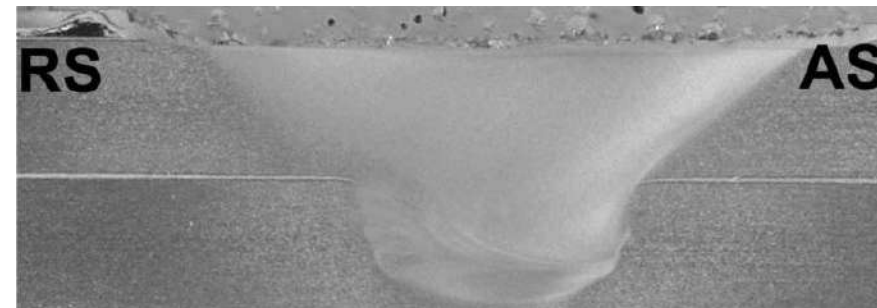
SiC fiber reinforced titanium composite



Carbide-free bainite, armor steel weld



Multi-track friction surfaced coating



Friction stir seam weld, AA 2014-T4

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Dr. M Kamaraj
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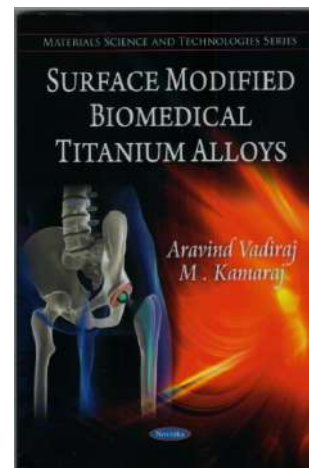


Major Areas of Research

- Life enhancement of power plants (thermal/hydro/nuclear) components by surface coatings
- Development of coatings for Bio-implants
- Wear properties: Correlations of Microstructure-process parameters

Slurry erosion wear test

Sliding wear test (Pin-on-Disc)



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Dr. Ravi Sankar Kottada
Associate Professor
Metallurgical and Materials Engineering
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Primary research interests:

- High temperature deformation of advanced materials
- Multi-component high entropy alloys and their deformation behavior
- High temperature life-term prediction of advanced materials
- Creep of magnesium-base alloys



Dr. Lakshman Neelakantan

Associate Professor, Metallurgical and Materials Engineering

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Major Areas of Research

- Corrosion characteristics of engineering materials and coatings
- Electrochemical behaviour of NiTi, NiTi-X Shape Memory Alloys (SMAs)
- Smart coatings for corrosion protection
- Electro-dissolution, -planarization and -deposition
- Micro and mechano electrochemistry
- Corrosion behaviour of Metallic Bipolar Plates



Dr. Manas Mukherjee

Assistant Professor, Metallurgical and Materials Engineering

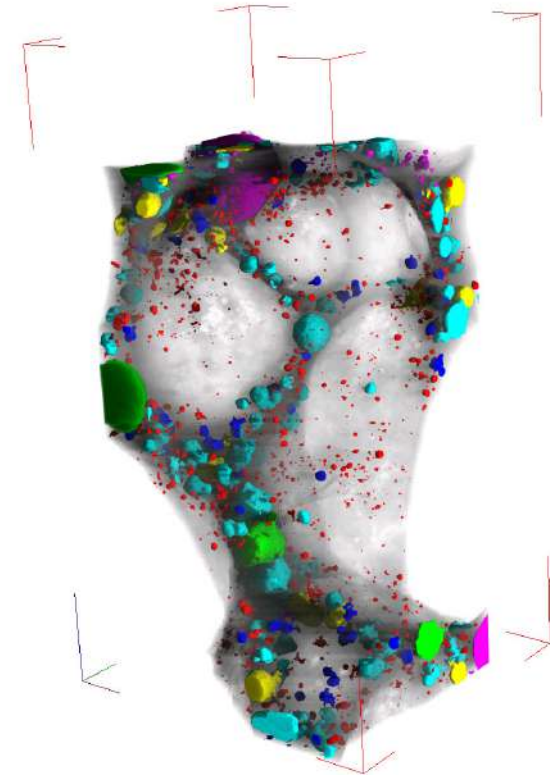
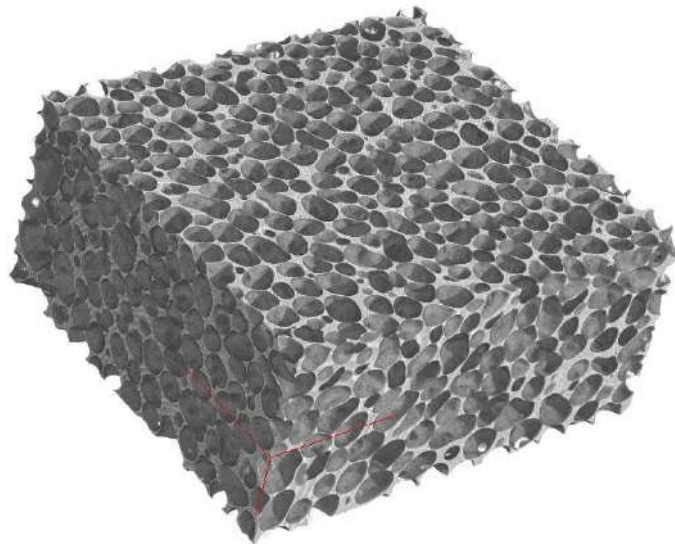
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Major Areas of Research

- Metal foams - processing and characterization
- Physics of metal foaming
- X-ray tomography-based structural analysis



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Dr. B S Murty

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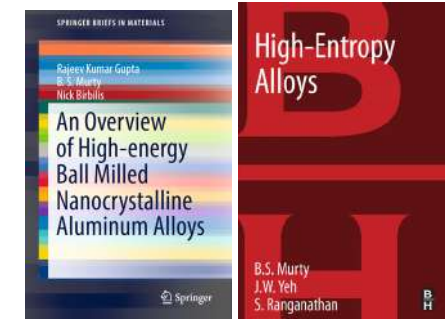
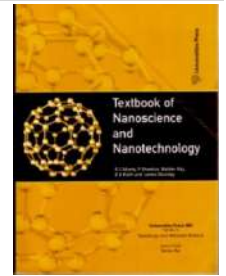


Major Areas of Research

- Development of structural and functional nano materials
- Development of high entropy alloys and bulk metallic glasses
- In-situ metal matrix composites and metal foams

Research Facilities in the Group

- Fritsch P-5 and Simoloyer high energy ball mills
- Spark plasma sintering and microwave sintering furnace
- Local Electrode Atom Probe (LEAP)
- TEM (Tecnai T12, T20)
- Dual Beam FIB (Helios)
- XRD (Panalytical)
- Nanoindenter (Hysitron)
- Dilatometer (up to 1650°C)
- DSC/TGA (up to 1500°C)



**Local Electrode
Atom Probe**



**Spark Plasma
Sintering**



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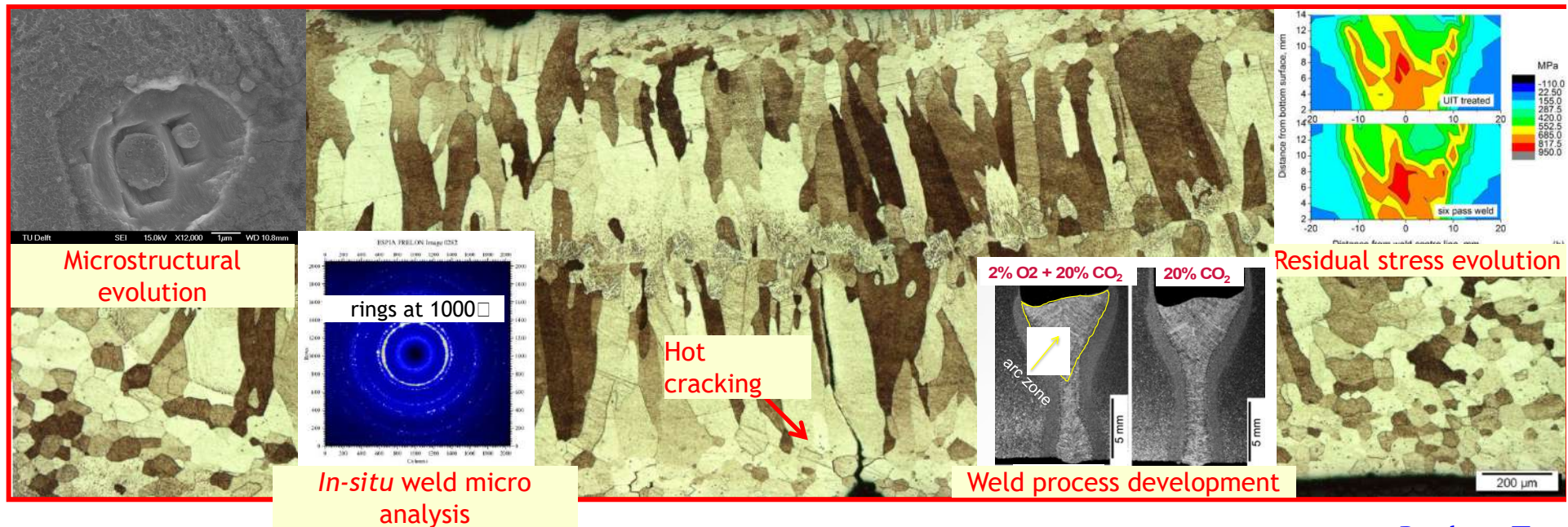


Dr. Murugaiyan Amirthalingam
Assistant Professor, Metallurgical and Materials Engg.
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<https://home.iitm.ac.in/murugaiyan/>



Major Areas of Research

- Welding metallurgy and welding processes modelling
- Steel product development and thermomechanical processing
- *In-situ* 3D synchrotron X-ray diffraction and
- Additive manufacturing



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Dr. Parasuraman Swaminathan

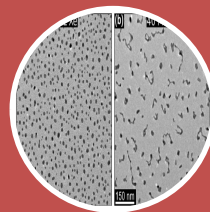
PhD, University of Illinois at Urbana Champaign, USA
Associate Professor, Metallurgy and Materials Engineering
swamnthn@iitm.ac.in



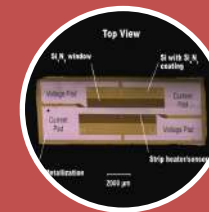
- Electronic Materials - semiconductor quantum dots
- Nanoparticle assembly by physical vapour deposition
- Nanocalorimetry - Phase transformation in thin metal/alloy films



LEDs, LASERs



Catalyst arrays



Nanocalorimetry - enthalpy measurements



Dr.-Ing K G Pradeep

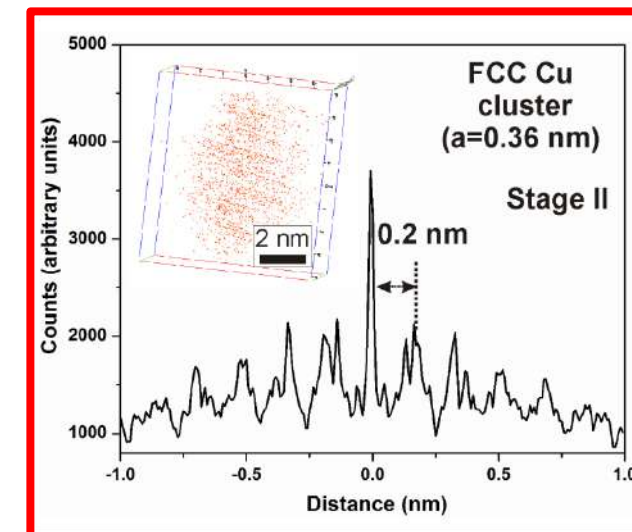
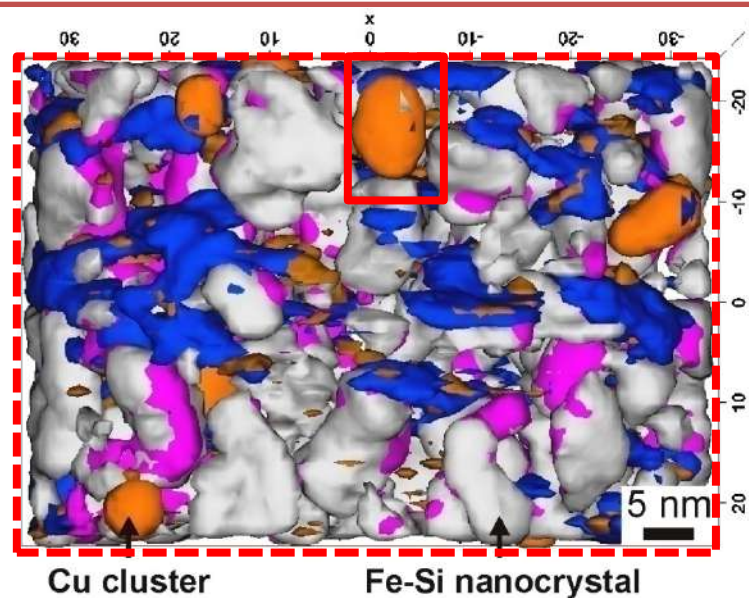
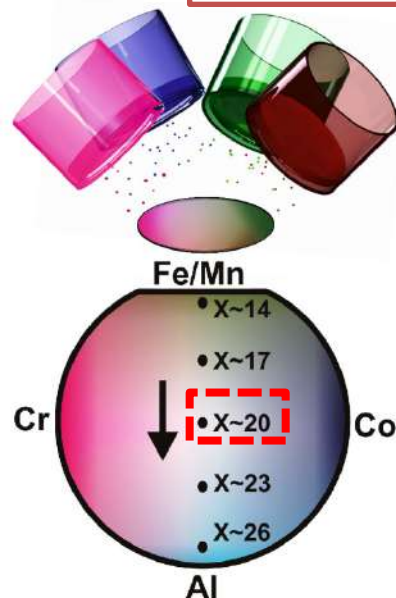
PhD, RWTH Aachen University, Germany
Assistant Professor, Metallurgical and
Materials Engineering

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- Combinatorial alloy design - Development of advanced, high strength materials
- Magnetic materials - Rare-earth free permanent magnets and nanocrystalline soft magnets
- Correlative microscopy - Methods for hierarchical nano-scale characterisation involving atom probe tomography and multiple electron microscopy methods

Combinatorial alloy design and near atomic scale characterization



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Dr. Prathap Haridoss

Professor, Metallurgical and Materials Engineering

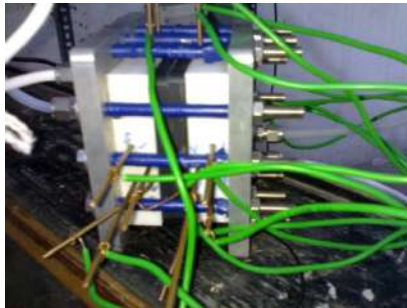
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Major Areas of Research

- Proton Exchange Membrane (PEM) Fuel Cells: Materials and Technology
- Carbon Nanotubes (CNTs): Synthesis and Applications

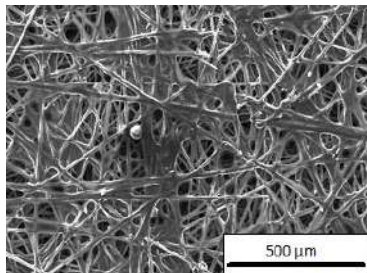
PEM Fuel Cells



Segmented fuel cell testing



Fuel cell powered bicycle, using commercially available components

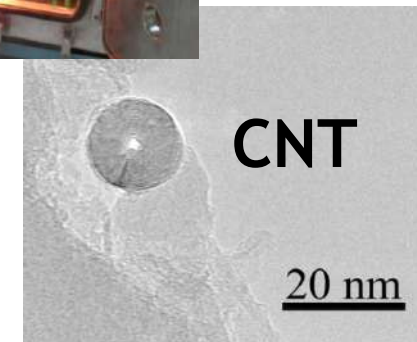
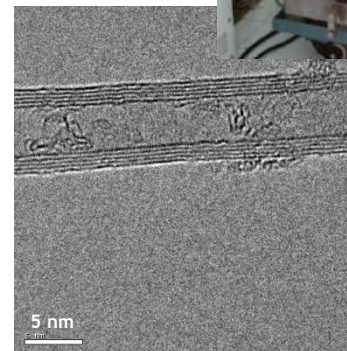


Enhanced Gas Diffusion Layer

Carbon Nanotubes



Modified Arc Discharge method for synthesis of Carbon Nanotubes



Carbon Nanotubes in different orientations

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Dr. Ranjit Bauri

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Major Areas of Research

- Solid Oxide Fuel Cells (SOFC)
- Al and Ti based Metal Matrix Composites
- Friction Stir Processing (FSP)
- EBSD, Microstructure-Property Correlation

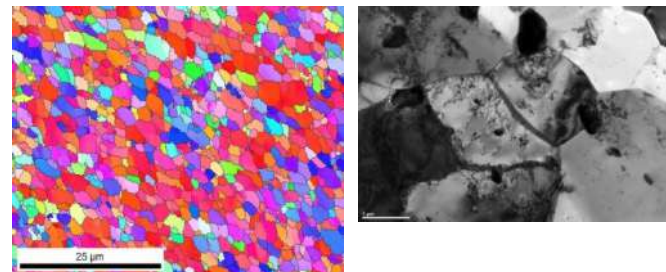
Impedance Analyzer



SOFC anode



FSP Microstructure of Al



Mini tensile tester





Dr. Rer. Nat. Ravi Kumar, N V
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044-2257-4777; nvrk@iitm.ac.in
<http://mme.iitm.ac.in/nvrk>



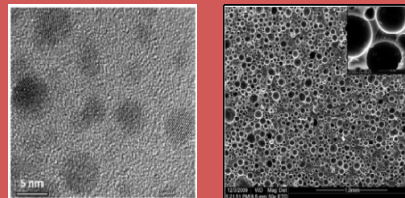
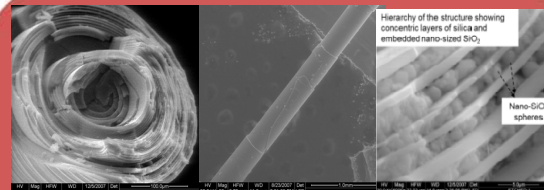
Major Areas of Research

- Processing/design of molecular precursors for structural and functional applications (Eg: UHT ceramics, transparent ceramics, thermoelectrics, coatings)
- Biomaterials & biomimetics for technological applications (Eg: Superhydrophobicity, adhesion studies)
- Spectrochemical characterization (NMR, FTIR), structural characterization (XRD, X-ray residual stress analysis, SEM, AFM, TEM)
- Evaluation of properties: Creep, thermal shock, indentation fracture mechanics, novel mechanical testing techniques

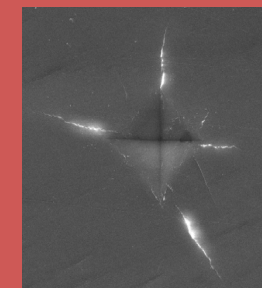
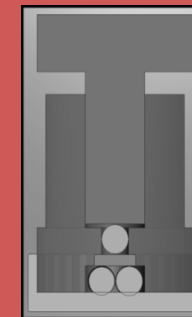
Design of molecular precursors & ceramics

14 Si	40 Zr	41 Nb	42 Mo
	72 Hf	73 Ta	74 W

Materials Chemistry



Structural Characterization



Mechanical properties

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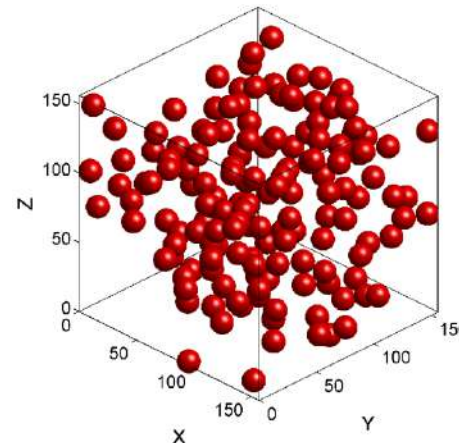
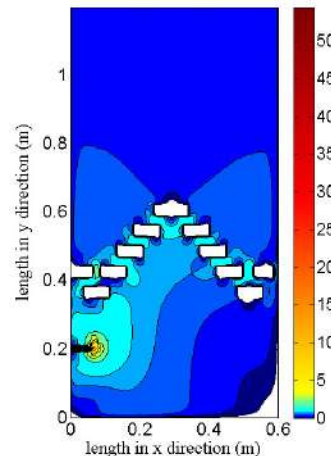
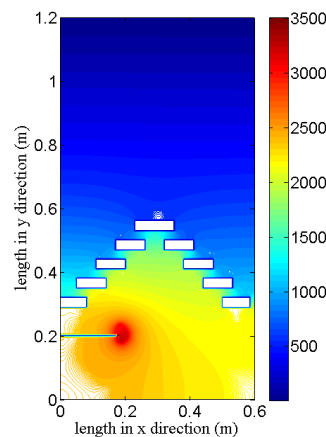
Dr. Sabita Sarkar

Assistant Professor, Metallurgical and Materials Engineering
044-2257-4755; sabita.sarkar@iitm.ac.in

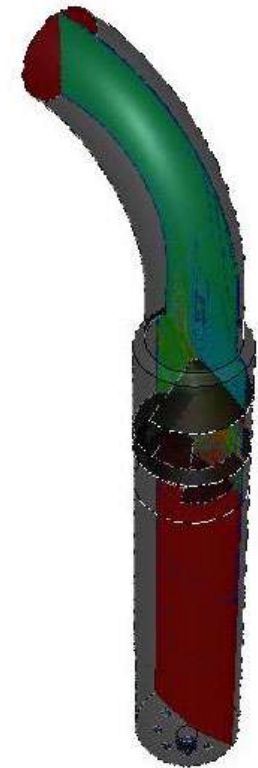


Major Areas of Research

- Process modeling/design/intensification of metallurgical and chemical processes
- Modelling and simulation of
 - Flow through packed bed, fluidized bed
 - Heat and mass transfer
 - Granular flow, multi-phase flow, reacting flow etc



Simulation of flow through randomly packed particle



Reactor design and optimization

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Dr. V Sampath

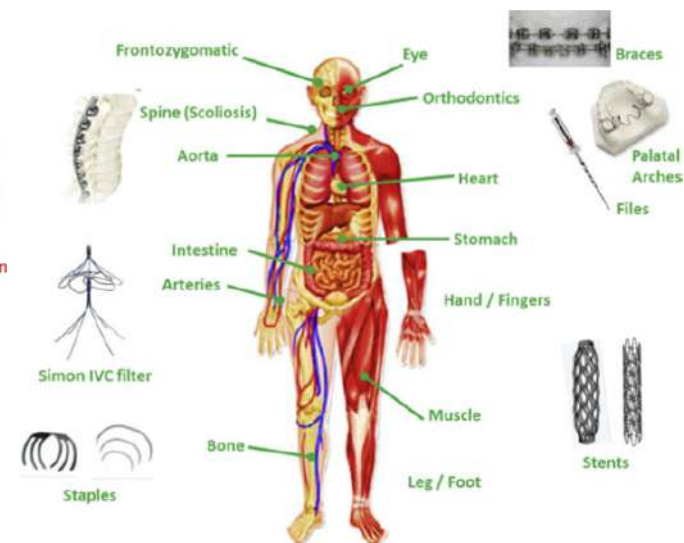
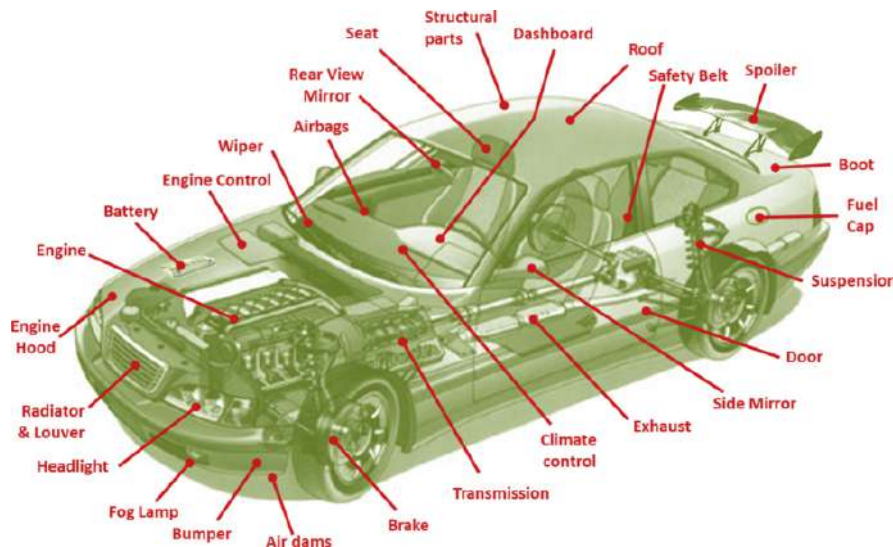
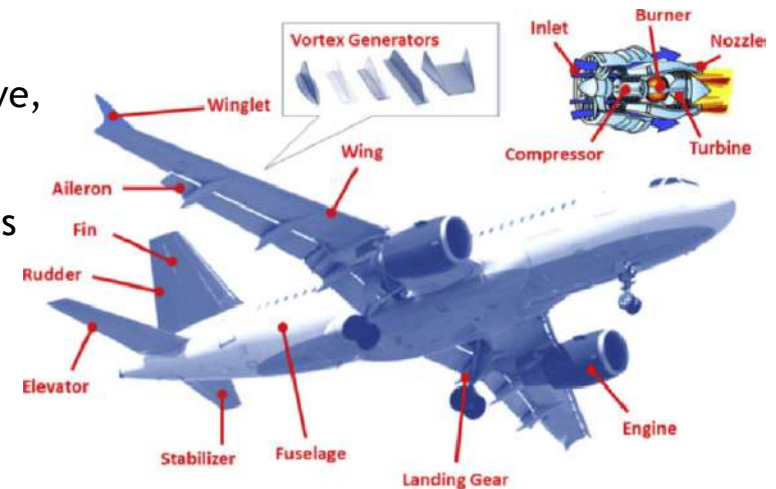
Professor, Metallurgical and Materials Engineering

044-2257-4773; vsampath@iitm.ac.in



Major Area of Research

- Novel Shape Memory Alloys and Smart Materials for Automotive, Aerospace, Biomedical and Commercial applications
- Nanocrystalline shape Memory Alloys for advanced applications
- Composites and Smart composites for structural and other applications
- Physical Metallurgy and Failure analysis of materials



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Dr. T S Sampath Kumar
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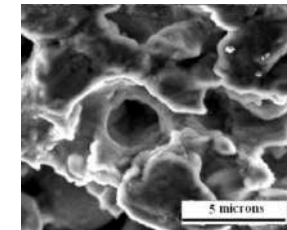


NANOSTRUCTURED BIOMATERIALS

for orthopedic and dental applications

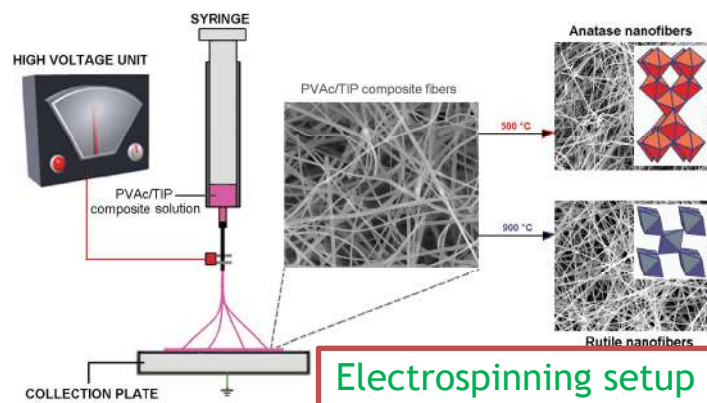
- Nanocrystalline calcium phosphate ceramics, coatings & cements
- Antimicrobial materials & drug delivery systems
- Bioresorbable & bioactive nano composites
- Nanostructured metallic implants

accelerated processing



Bioactive ball milled Ti-hydroxyapatite

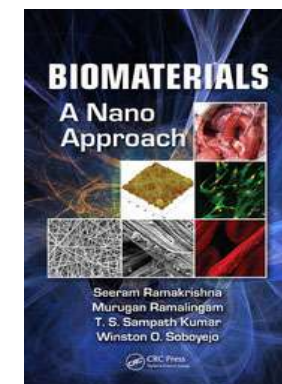
Value added engineering of egg shell & corals



Electrospinning setup



Periapical cyst with bone grafts



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Dr. S Sankaran

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Major Areas of Research

- Structural materials processing through deformation and solidification techniques
- Microstructure-mechanical behaviour relationships
- Electron microscopy

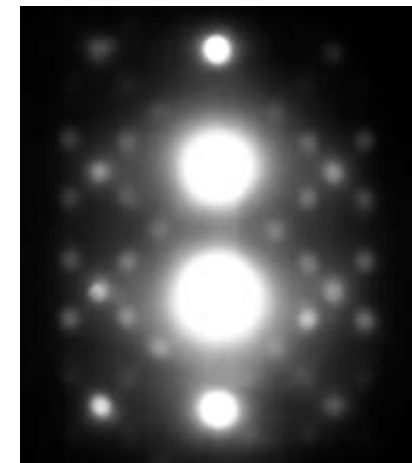
Deformation processing (rolling mill)



Metal foams



Electron microscopy



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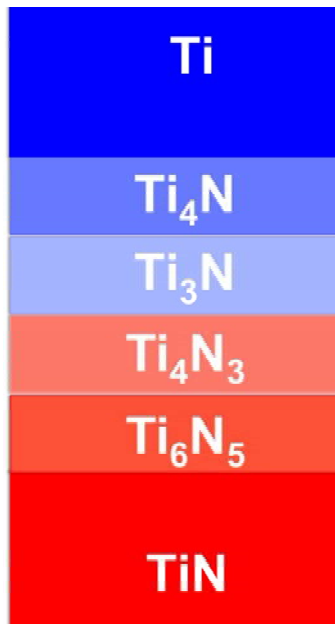


Dr. Satyesh Kumar Yadav

PhD, University of Connecticut, USA
 Professor, Metallurgical and Materials Engineering
 044-2257-4789; satyesh@iitm.ac.in
<http://www.iitm.ac.in/satyesh>



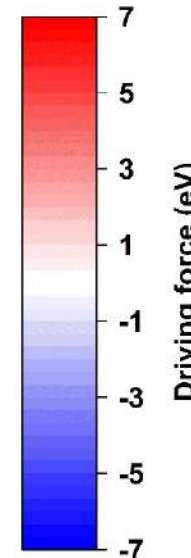
- Materials design from quantum mechanical modeling
- Machine learning to accelerate materials development
- Device materials modeling and visualization



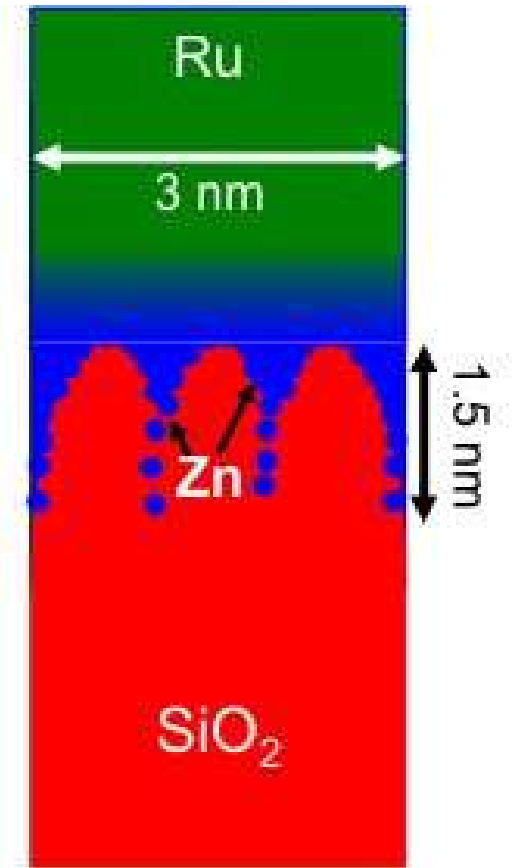
Diffused Interface

	Ti	Zr	Hf	V	Nb	Ta	Mg	Al	Cr	Fe
TiN	-1.2	-0.9	-1.3	-0.3	0.4	0.1	1.5	2.5	2.9	2.8
ZrN	-0.5	-0.2	-0.6	0.4	1.1	0.8	2.2	3.2	3.6	3.5
HfN	-0.5	-0.2	-0.6	0.5	1.1	0.8	2.3	3.2	3.7	3.5
VN	-1.7	-1.5	-1.8	-0.8	-0.2	-0.4	1.0	2.0	2.4	2.2
NbN	0.2	0.5	0.1	1.1	1.8	1.5	2.9	3.9	4.3	4.2
TaN	-0.5	-0.2	-0.6	0.5	1.1	0.8	2.2	3.2	3.7	3.5
Mg ₃ N ₂	-0.2	0.1	-0.3	0.8	1.4	1.1	2.5	3.5	3.9	3.8
AlN	2.4	2.7	2.3	3.3	4.0	3.7	5.1	6.1	6.5	6.4
CrN	-1.3	-1.0	-1.4	-0.3	0.3	0.0	1.5	2.4	2.9	2.7
FeN	-2.3	-2.1	-2.5	-1.4	-0.8	-1.0	0.4	1.3	1.8	1.6

High-throughput Computation



Driving force (eV)



Device Materials

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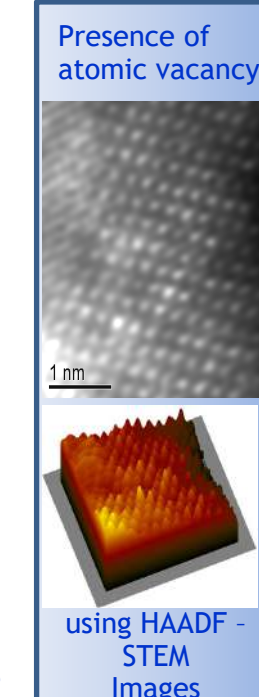
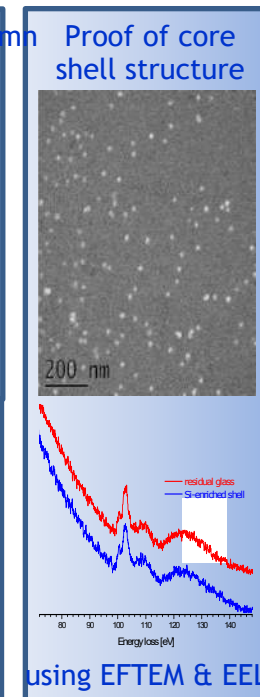
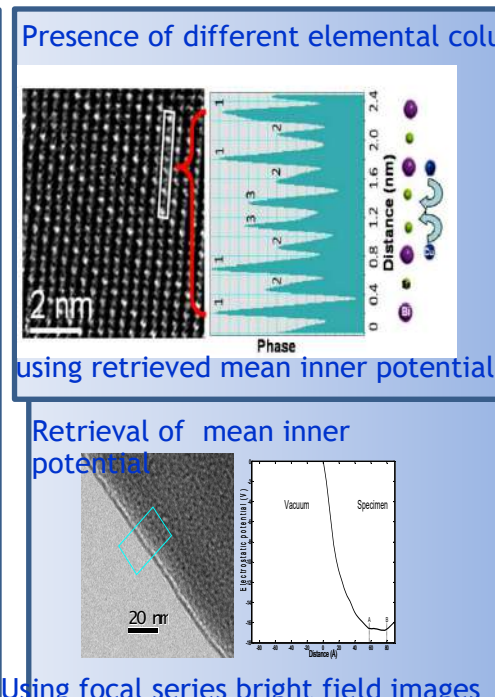
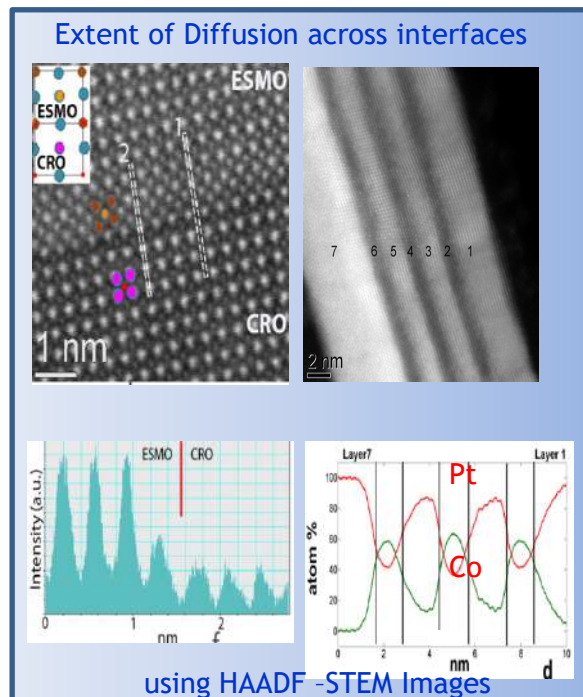


Dr. rer. nat. Somnath Bhattacharyya
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 044-2257-4760; somnathb@iitm.ac.in
<https://sites.google.com/site/nanoscopytem/home/>



Major Areas of Research

- Studying correlation of the structure and chemistry of materials at atomic scale with physical properties using Transmission Electron Microscopy
- Development of new methodology related to TEM/STEM to study materials
- Studying nano-bio conjugation using electron probe



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Dr. Sreeram K Kalpathy

Assistant Professor, Metallurgical and Materials Engineering

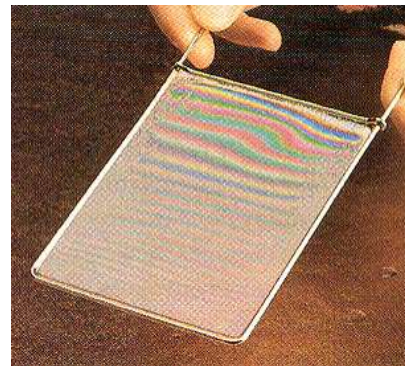
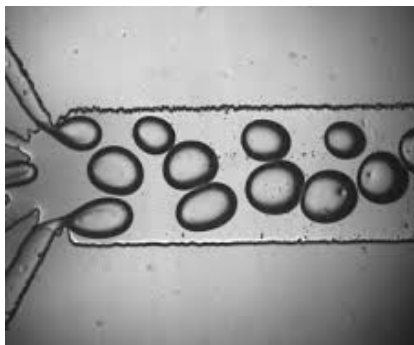
044-2257-4761; sreeram@iitm.ac.in

<https://www.iitm.ac.in/info/fac/sreeram>

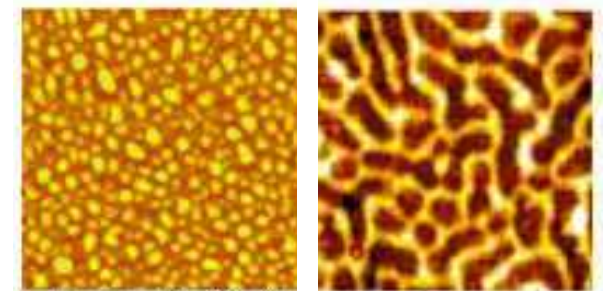
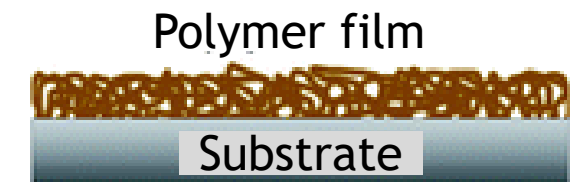


Major Areas of Research

- Colloids, Polymers, Soft Matter
- Interfacial Fluid Mechanics
- Physical Chemistry of Surfaces
- Coating and Printing Methods



Dynamics of Colloidal Foams, Bubbles, Drops, Films



**Morphological patterns
from
polymer film dewetting**

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Srinivasa Rao Bakshi

Associate Professor, Metallurgical and Materials Engineering

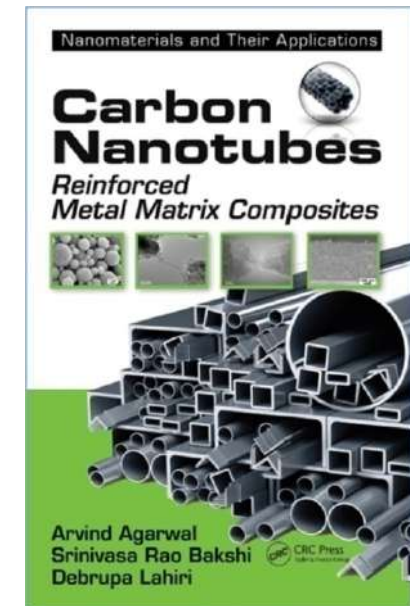
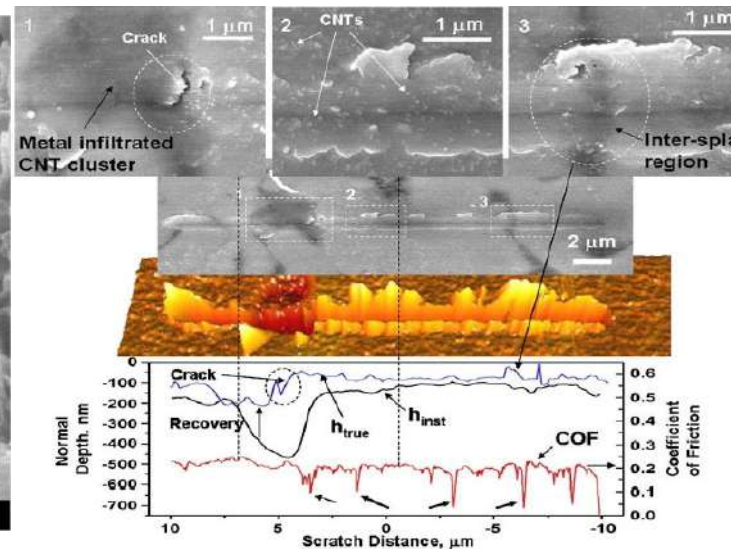
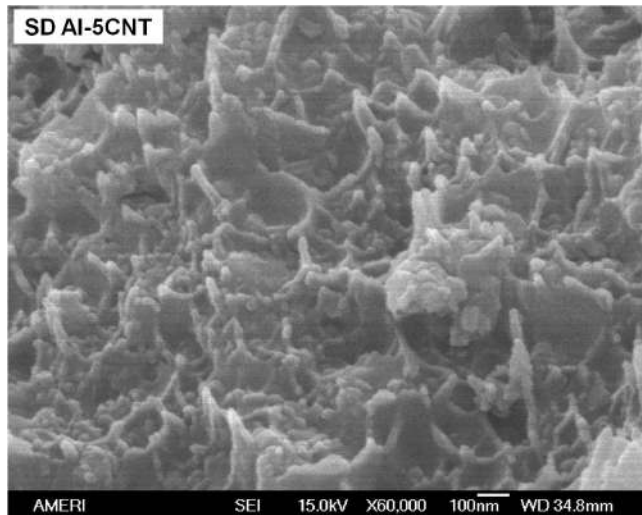
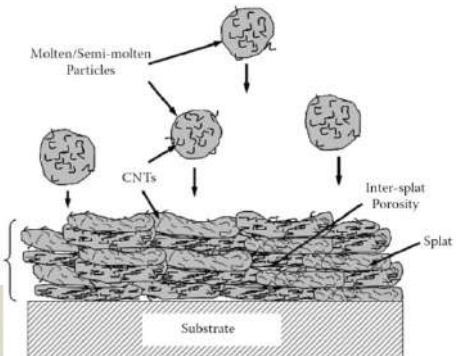
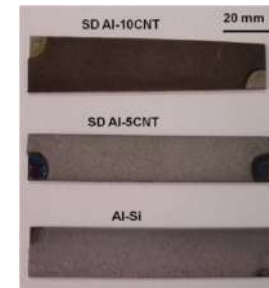
+91 44 2257 4781; M: 8056073710; sbakshi@iitm.ac.in

<http://www.mme.iitm.ac.in/sbakshi>



Major Areas of Interest

- Carbon nanotube reinforced metal matrix composites
- Thermal spray coatings and bulk structures
- Ultra-high temperature ceramic composites
- Hard metal matrix nanocomposites by reaction sintering
- Nanomechanical testing of materials



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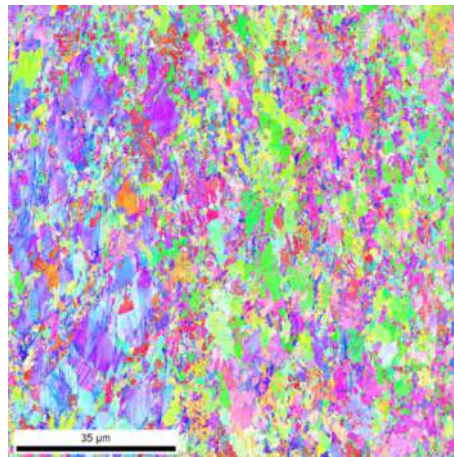


Dr. V. Subramanya Sarma
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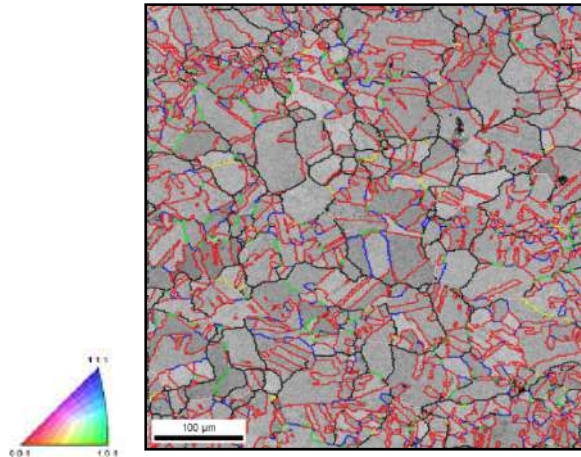


Major Areas of Research

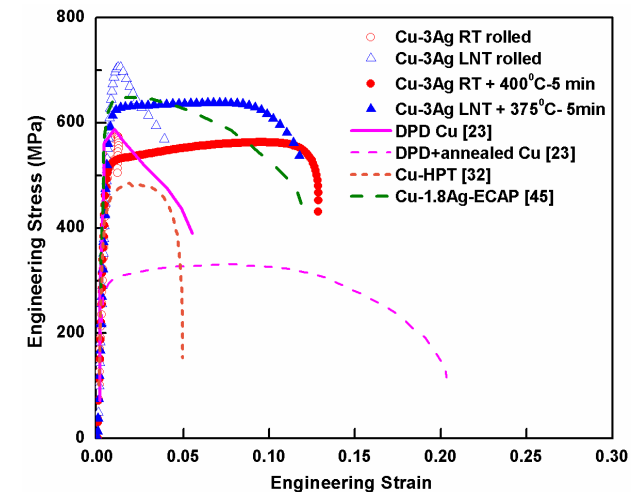
- Thermo-mechanical processing
- Bulk ultra fine grained / nanostructured metals and alloys
- Crystallographic texture and grain boundary engineering



Orientation imaging microscopy of ultrafine grained Cu-Al alloy



Grain boundary engineered austenitic stainless steel,



Tensile properties of ultra fine grained high strength and ductile Cu-Ag alloy

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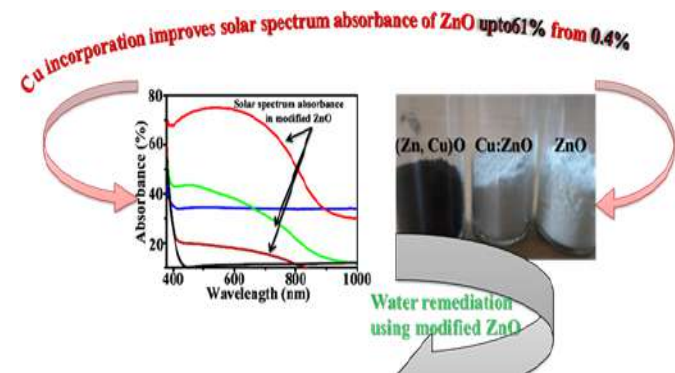
www.tijuthomas.net



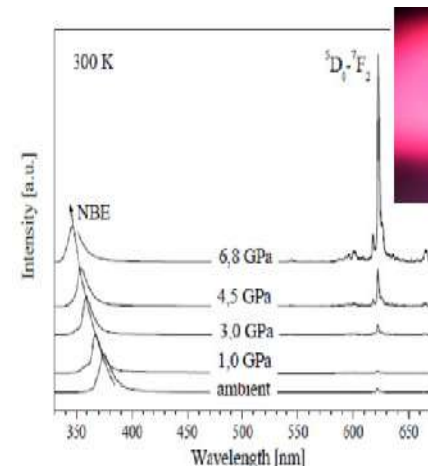
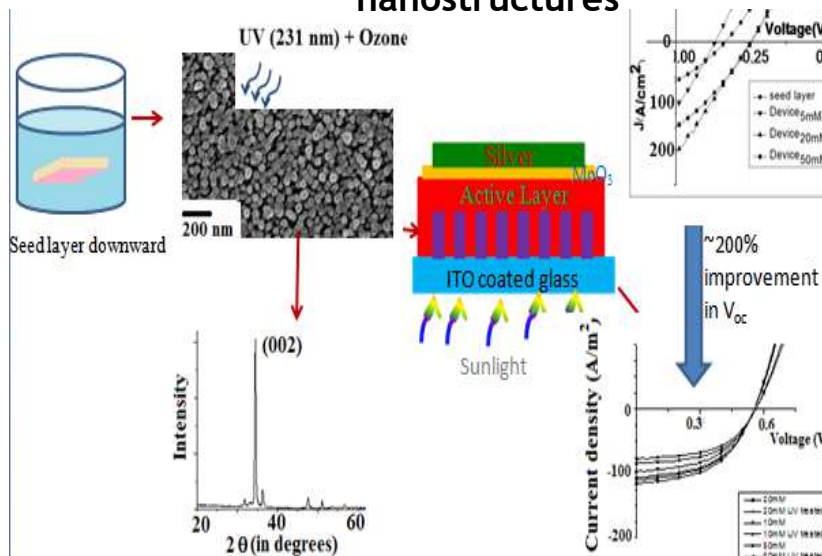
Major Areas of Research

- Energy materials
- Environmental remediation materials
- Nitrides, oxynitrides, oxides (in nano-, meso- and bulk forms)
- Photofunctional materials (for solar cells, photocatalytic applications)
- Optical materials and devices
- Surfaces, interfaces and transformation of nanostructures
- Green approaches to functional nanomaterials

Photofunctional & optical materials



Energy devices Engineered nanostructures



Light emitting Materials & devices

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Dr. Uday Chakkingal

PhD, Rensselaer Polytechnic Institute, USA
Professor, Metallurgical and Materials Engineering

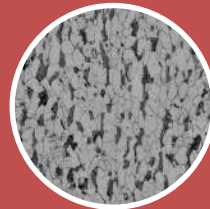
044-2257-4775; udaychak@iitm.ac.in
<http://mme.iitm.ac.in/udaychak>



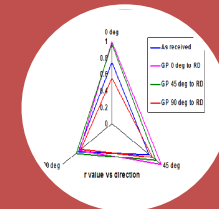
- Metal Forming Processes
- Severe Plastic Deformation Processes
- Sheet Metal Forming
- Advanced High Strength Steels



Production of Ultra fine grained Al, Ti and Mg alloys



Forming of Advanced High Strength Steel Sheets



Improvement in drawability of Al alloy sheets

BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH



INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF OCEAN ENGINEERING

LIST OF FACULTY

Abdus Samad

Abhilash Somayajula

Ananthakrishnan P (yet to be ploaded)

Bhattacharya S K (yet to be uploaded)

Deepak Kumar

Jitendra S Sangwai

Krishnankutty P

Murali Kantharaj

Nallayarasu S

Nilanjan Saha (yet to be uploaded)

Panneer Selvam R

Rajesh R Nair

Rajiv Sharma

Sannasiraj S A

Shanmugam P

Srinivasan Chandrasekaran

Sriram V

Surendran Sankunny

Suresh Kumar G

Suresh Rajendran

Tarun K Chandrayadula (yet to be uploaded)

Vijayakumar R



Dr. Abdus Samad

Associate Professor, Department of Ocean Engineering

044-2257-4826; samad@iitm.ac.in

<http://www.doe.iitm.ac.in/samad/>

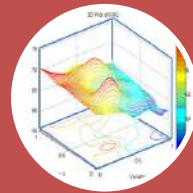


Major Areas of Research

- Ocean energy: Design and optimization of turbines
- Single and multi-objective optimization: Surrogate modelling, Genetic algorithm
- Multiphase pumps- Artificial lifts: Design optimization, Correlation development



Redesign energy harvesting turbines to get higher efficiency, power and operating range: Numerical and experimental approach



Code development for surrogate based optimization and implementation in engineering systems



Multi-phase and multi-component flow pumps: design optimization through experimental and numerical approach

← Applying CFD and optimization techniques to find optimal performances →

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Dr. Abhilash Somayajula

PhD, Texas A&M University, USA

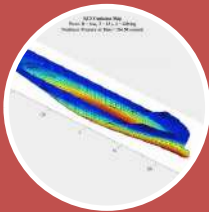
Professor, Ocean Engineering

044-2257-4823; abhilash@iitm.ac.in

<http://www.doe.iitm.ac.in/abhilash>



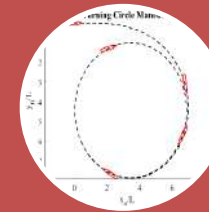
- Marine autonomy
- Hydrodynamics of ships and offshore structures
- Data driven methods for ship motion control



SIMDYN - Hydrodynamic
Response of Ships and
Offshore Structures



In-house development
of an Autonomous
Scaled Model Ship



Reinforcement Learning
for Control of
Underactuated Ships

← Hydrodynamic Response Estimation and Control of Marine Structures →



Dr. Ananthakrishnan P
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044-2257-4811; ananthakrishnan@iitm.ac.in





Dr. Bhattacharya S K

Professor, Ocean Engineering

044-2257-4803; skbh@iitm.ac.in

<http://www.doe.iitm.ac.in/skbh/>





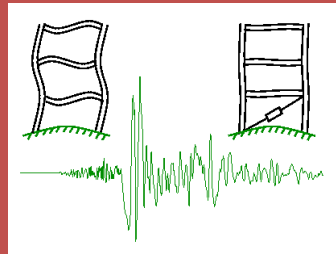
Dr. Deepak Kumar
PhD, IIT DELHI, INDIA
Associate Professor, Ocean Engineering
044-2257-4828; deepakkumar@iitm.ac.in
http://www.oec.iitm.ac.in/Asst_prof_deepak.html



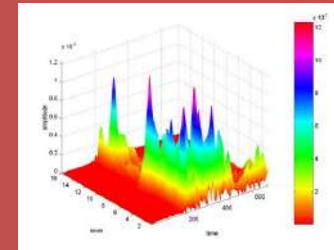
- Stochastic dynamics, control, stability of structure
- Time frequency analysis of nonlinear systems
- Experiments related to structure dynamics and control



Dynamic control of onshore and offshore structures for earthquake, wind, hydrodynamic loadings



Controlling the nature of response of onshore and offshore structures



Development and modification of techniques for analysis of system



Dr. Jitendra S Sangwai

PhD, IIT Kanpur, India

Associate Professor, Petroleum Engineering Program

Ocean Engineering

044-2257-4825; jitendrasangwai@iitm.ac.in

<http://www.iitm.ac.in/oedpt>



- Enhanced Oil Recovery
- Gas Hydrates
- Flow Assurance



Phase Equilibrium Studies
Gas Hydrates for Storage and
Transportation
Semiclathrate Hydrates



CO₂ sequestration
Emulsions and Polymer Flooding
Ionic Liquids for EOR



Wax and Asphaltene Dissolution
Microbial Degradation of Waxes
Nanofluids for Flow Assurance



Dr. P Krishnankutty

PhD, IIT Madras, India

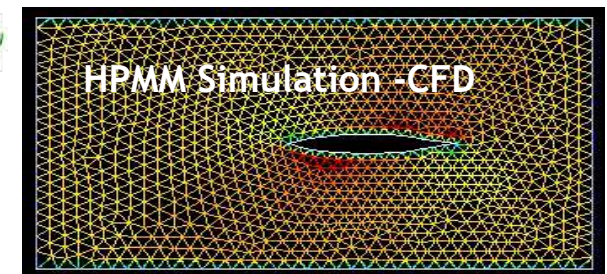
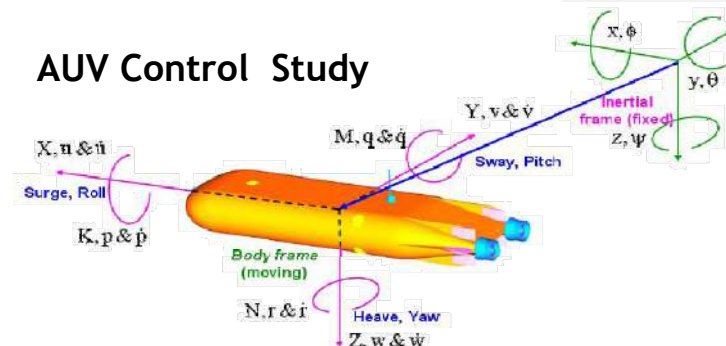
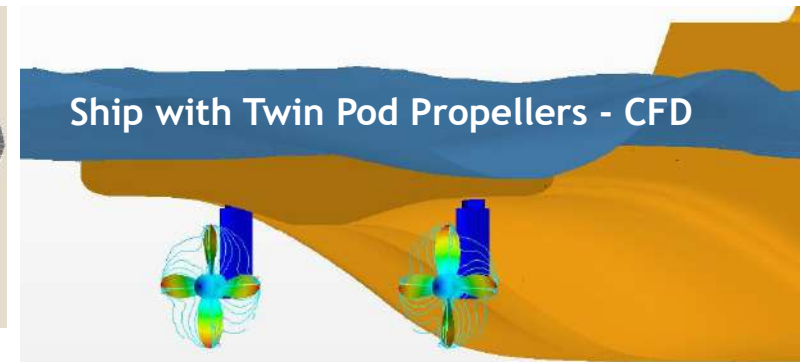
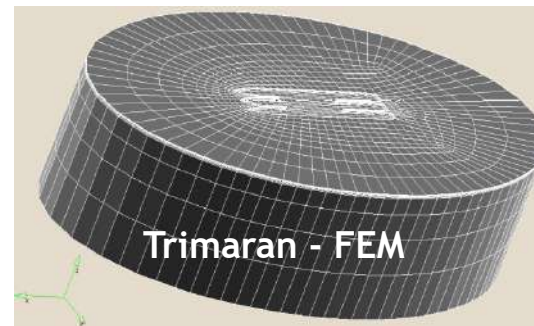
Professor, Ocean Engineering

044-2257-4820; pkrishnankutty@iitm.ac.in

<http://www.oec.iitm.ac.in/krishnankutty.html>



- Marine Hydrodynamics/Wave-Structure Interaction
- Ship Motion/ Passenger Comfort; Ship Maneuvering & Control
- Marine Vehicles/Wave Wash/ Powering & Propulsion



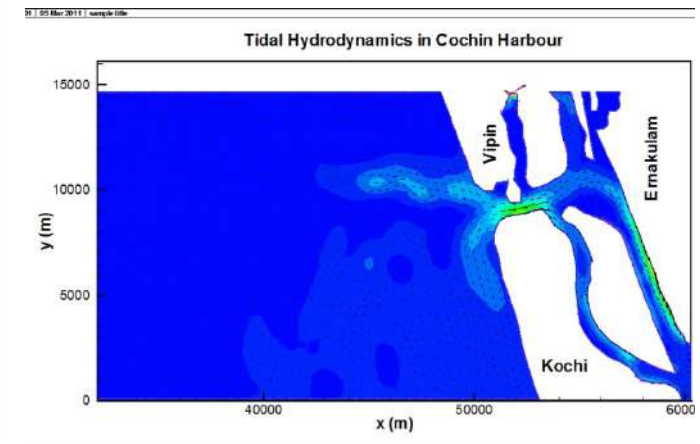
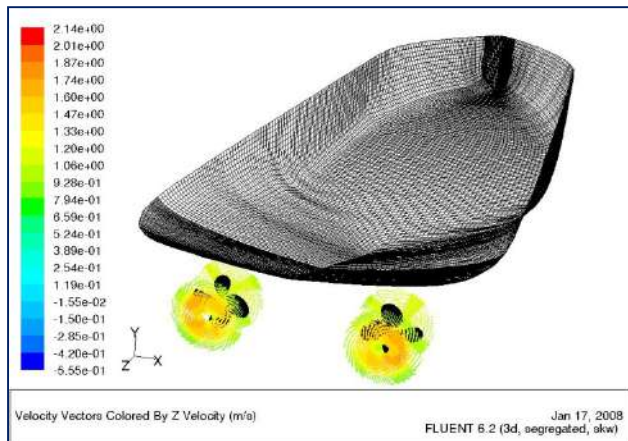
[Back to Top](#)



Dr. Murali Kantharaj
PhD, IIT Madras, INDIA
Professor, Ocean Engineering
044-2257-4816; murali@iitm.ac.in
http://www.oec.iitm.ac.in/Faculty_murali.html



- Computational Hydrodynamics using Potential flow and RANS approaches
- Free surface / dynamic boundary hydrodynamics - ALE FEM & Level sets
- Coastal hydrodynamics - tsunami - storm surge - flow vegetation interaction - morphodynamics





S Nallayarasu

PhD, National University of Singapore

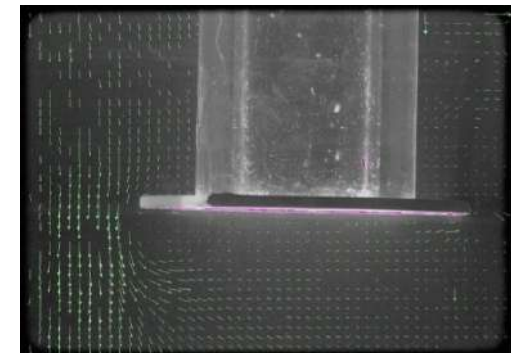
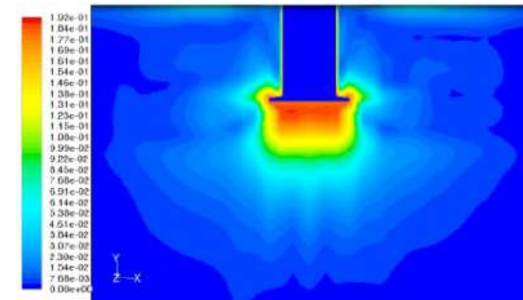
Professor, Ocean Engineering

044-2257-4819; nallay@iitm.ac.in

http://www.oec.iitm.ac.in/prof_nallayarasu.html



- Hydrodynamic response of Spar hulls
- Offshore wind energy
- Reliability in offshore structures
- Effect of heave damping plates
- Flow visualisation and VIV
- Deep water risers



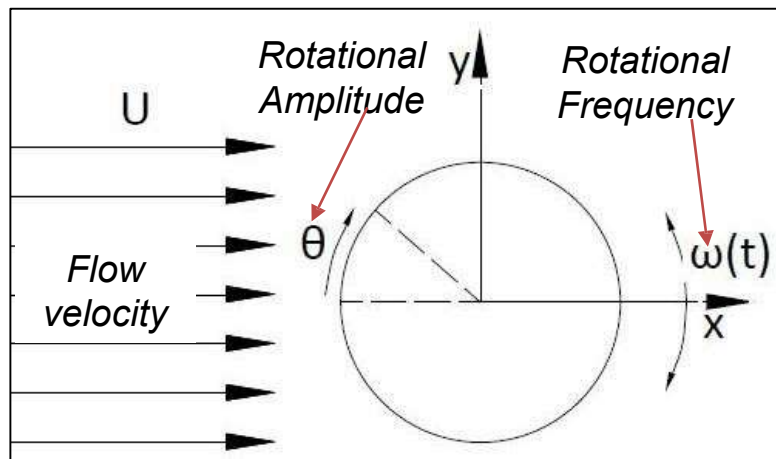


Dr. K. Narendran
 Assistant Professor, Dept. of Ocean Engineering
 044-2257-4831; knaren@iitm.ac.in



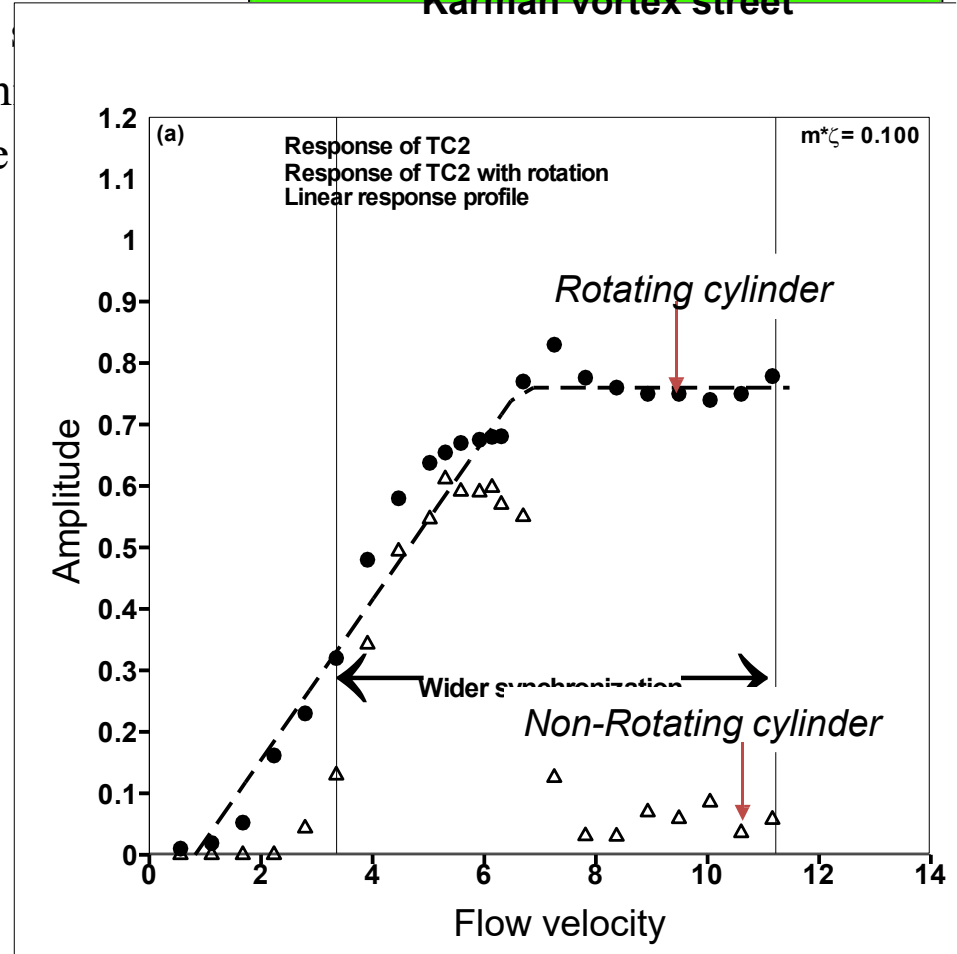
VIV enhancement of oscillatory rotation cylinder for high energy capture.

- Flow control mechanism to increase oscillations
- Widen the synchronization region by inducing oscillatory rotation
- Harness energy for wide range of flow velocities
- Investigate the flow structure and vortex dynamics



- Power benefit factor is high
- Low cost and sustainable renewable energy production
- Suitable for local communities

Karman vortex street





Dr. Nilajan Saha
PhD., IISc. Bangalore, India
Professor, Ocean Engineering
044-2257-4827; nilanjan@iitm.ac.in
<http://www.doe.iitm.ac.in/nilanjan/>





Dr. R Panneer Selvam

PhD., IIT Madras, India

Professor, Ocean Engineering

044-2257-4807; pselvam@iitm.ac.in

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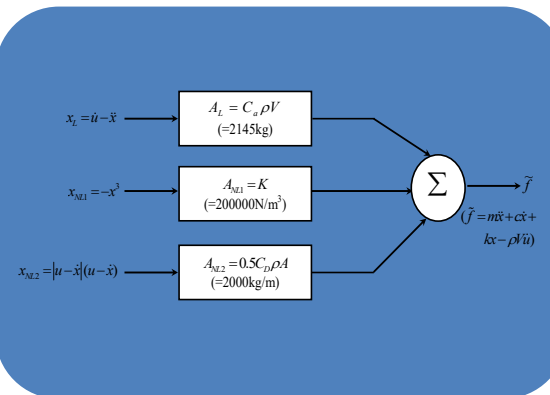


- Hydrodynamic Analysis of Offshore Structures
- Parameter Identification of Ocean Engineering Systems
- Nonlinear Dynamic Analysis of Offshore Structures



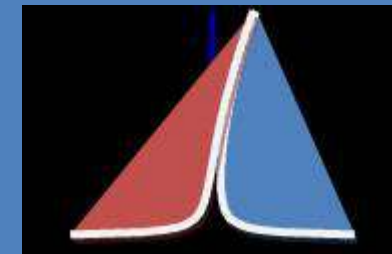
(i) Numerical and Experimental studies on Floaters for offshore wind energy

(ii) Emerging New Concepts of Offshore structures for Oil and Gas



(i) Identification of parameters of floating offshore structures - includes ships in waves and calm water

(ii) Simulation of motion of ships in



Simulation of nonlinear responses of offshore floating systems



Dr Rajesh R N

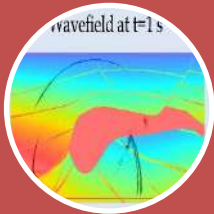
Associate Professor, Ocean Engineering

044-2257-4824; rajeshnair@iitm.ac.in

<http://www.iitm.ac.in/component/faculty/80/rajeshnair/>



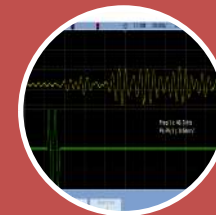
- Seismic Data Analysis & Subsurface reservoir characterization for Oil and Gas
- Ground Penetrating Radar analysis and Shallow subsurface characterization
- Laser Doppler Vibrometer measurements, Hydrofraking (Shale, Coal) and rock anisotropy



Seismic Imaging & Data analysis for oil and Gas reservoirs



GPR Data analysis



LLDV & HYDROFRAKING STUDIES (SHALE, COAL)

← Subsurface characterization : Shallow and Deep (Seismics and GPR) & Lab scale Hydrofraking & Rock anisotropy studies (Shale, Coal) →



Dr. Rajiv Sharma
PhD., IIT Kharagpur, India
Associate Professor, Ocean Engineering
+91-44-2257-4822; rajivatri@iitm.ac.in
<http://sites.google.com/site/rajivatri/>



- Computer-aided design; Design of deepwater drilling solutions and floating structures;
- Computational geometric mechanics; Computer aided geometric design, computational geometry, visualization, and their applications in design, robotics and manufacturing;
- Dynamic data driven forecasting systems; Participatory/democratic economy; and
- Iso-geometric analysis for fluids and structures.

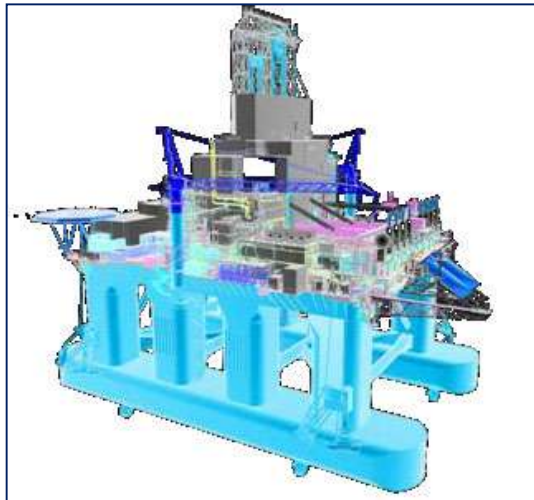


Figure 1: Designed optimum semi-submersible

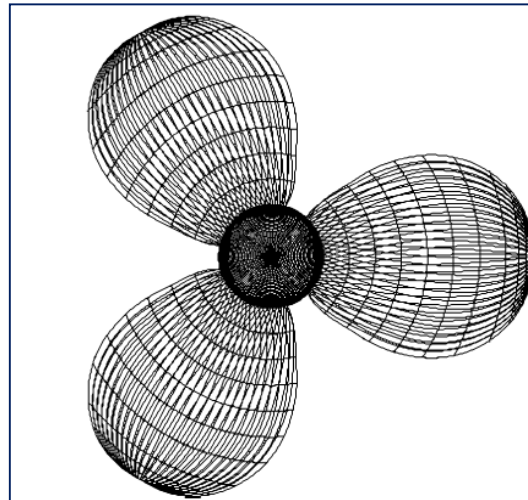


Figure 2: CAD model of a propeller.

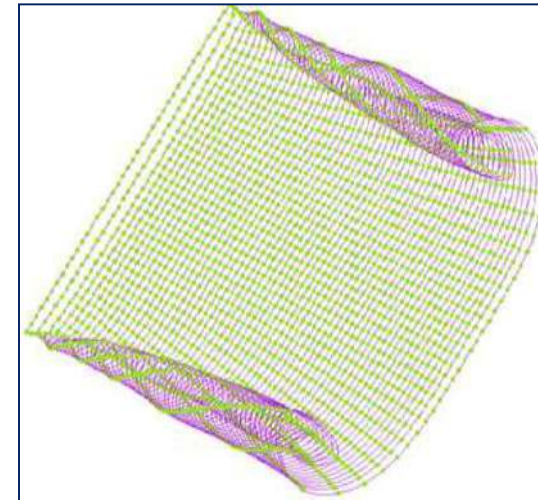


Figure 3: Computed wake behind a propeller.



Dr. S A Sannasiraj

BE (Civil Engg.), ME (Civil-Structural Engg.), PhD., (Ocean Engg.)
Professor & Head, Ocean Engineering

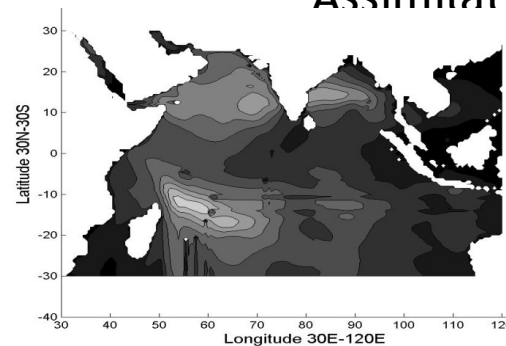
Email: sasraj@iitm.ac.in



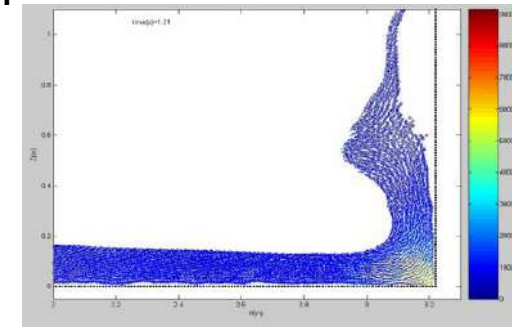
- Supervised 14 PhDs
- 80 Refereed Journal papers
- Completed 16 major research projects
- Involved in 200 Industrial projects
- FEM & SPH simulation of Nonlinear free surface waves
- Laboratory investigation of Wave Breaking & Wave impact on structures
- Wind-wave modelling and Data Assimilation



Breaking wave impact on a vertical wall



Assimilated wind-wave Prediction over Indian waters



SPH simulation of Nonlinear sloshing

BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH



Dr. P SHANMUGAM

PhD, Anna University, India
Professor, Ocean Engineering

044-2257-4818; pshanmugam@iitm.ac.in

http://www.oec.iitm.ac.in/Asst_prof_Shanmugam.html



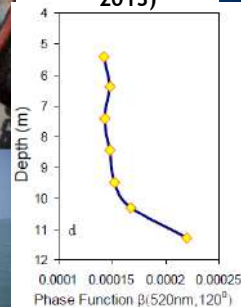
- Ocean Optics and Imaging / Focus on the study of 3-D character of underwater light fields by experiments and modelling.
- Satellite Oceanography/ Focus on the development of algorithms to retrieve ocean environmental parameters from remote sensing data.
- Ocean acoustics / Focus on the characterization of seafloor (morphology, sediment sequence, minerals, oil seepage, buried objects)

Potential applications: Underwater light fields and visibility, search and recovery, underwater optical communication, underwater object detection and image processing, sediments transport, dissolved carbon transport, detection of ocean biological hazards, Oil spill, bathymetry, internal waves, currents, eddies, fronts, and climate prediction.

Shanmugam, August 2012
Cruise Experiments



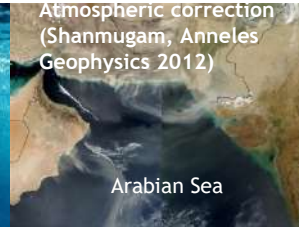
New scattering
phase function
(Sundarabalan and
Shanmugam, JQSR
2013)



Underwater detection and
typing



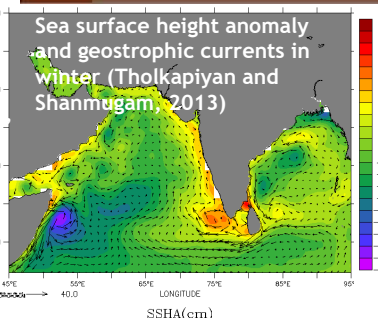
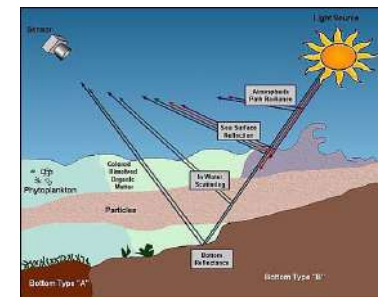
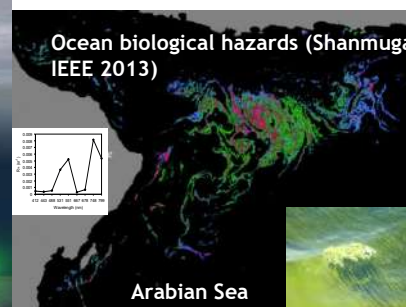
Atmospheric correction
(Shanmugam, Anneles
Geophysics 2012)



Underwater
communication



Ocean biological hazards (Shanmugam
IEEE 2013)



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Dr. Srinivasan Chandrasekaran

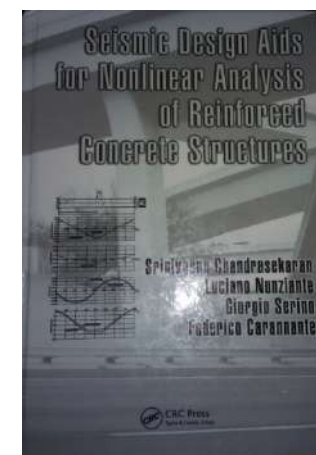
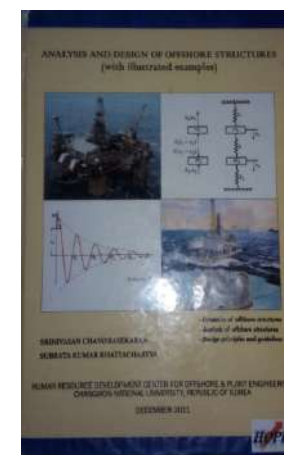
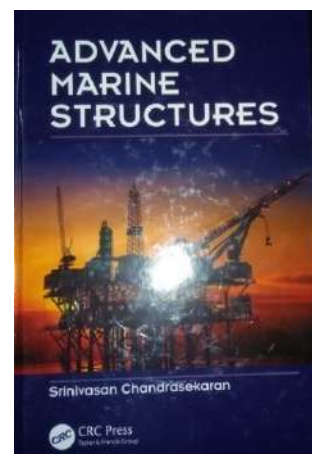
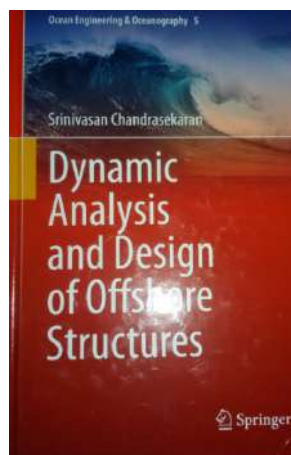
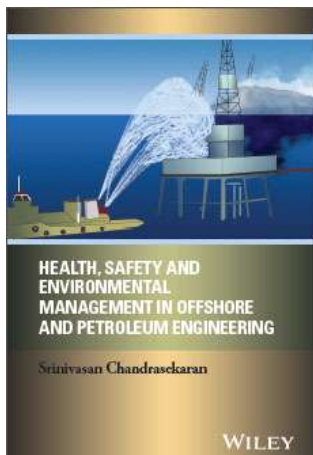
PhD, IIT DELHI, INDIA

Professor, Ocean Engg

044-2257-4821; drsekaran@iitm.ac.in



- Offshore TLPs and triceratops/ dynamic analysis of deep-water structures
- Renewable energy/Design and development of wave energy devices
- Petroleum engineering/Health, Safety and environmental management applied to oil and gas industries



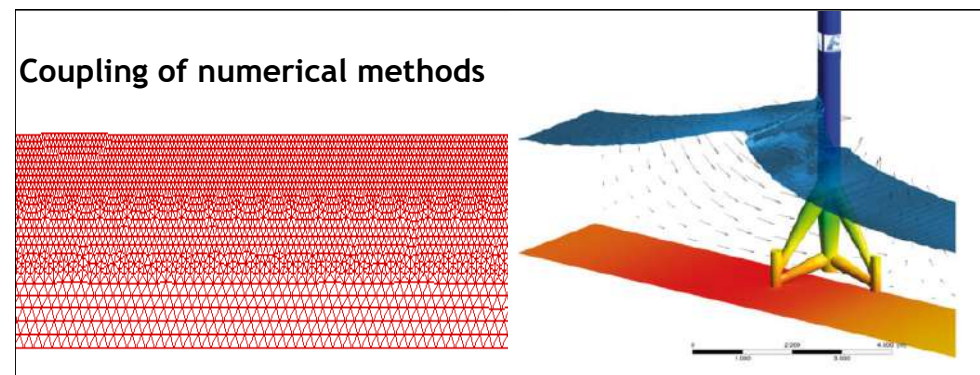
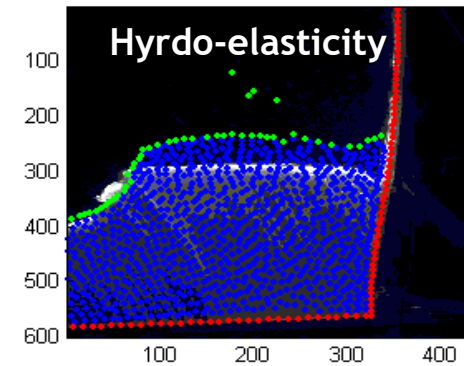
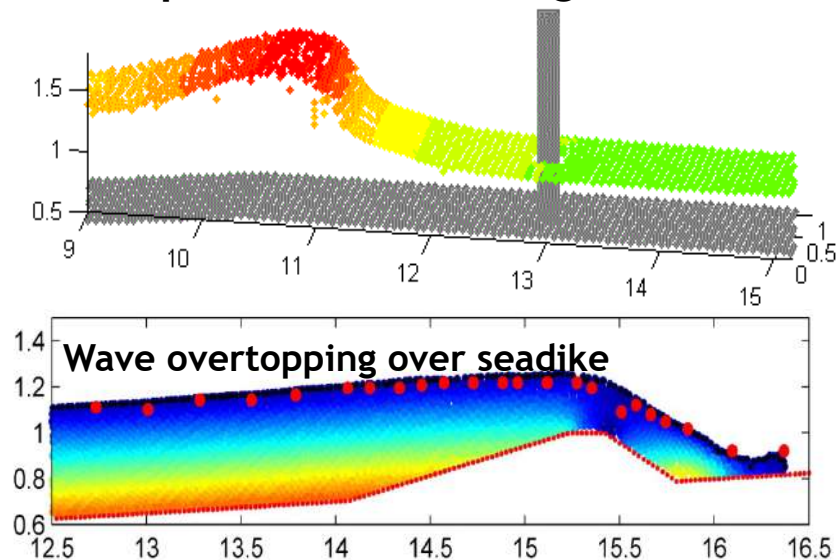


Dr. V Sriram, BE, PhD.,
Associate Professor, Ocean Engineering
044-2257 4813; vsriram@iitm.ac.in
<http://www.oec.iitm.ac.in/sriram.html>



Major Areas of Research

- Numerical modeling/computational hydrodynamics, Meshfree methods
- Hydro-elasticity
- Violent wave-current-structure interactions
- Experimental wave generation/ PIV



Wave interactions with offshore wind turbine support structure



Surendran Sankunny

PhD., Yokohama National University, Japan

Professor, Ocean Engineering

044-2257-4815; sur@iitm.ac.in

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- Ship shaped hull dynamics(experimental, theoretical & numerical)
 - a) Motion control using active fins
 - b) Influence of moon-pool shapes on moored hull
 - c) Maneuvering and optimization of ship routes
- Fracture Mechanics of metals(isotropic)and non-metals(anisotropic)
- Application of composite materials for marine construction
- Possible high-impact exploratory research themes
 - a) Applications of 3D printing in Ocean environment
 - b) Application of hydrophobic materials in Ocean environment
 - c) Wire-free instrumentation using smart phones(standard models eg: android, iphone)



Objects made in 3Dprint



Magic sand with other matrices



Fin fitted model under test



Dr. G Suresh Kumar

PhD, IISc (Bangalore), India

Professor, Ocean Engineering

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- Numerical Modeling of Fluid Flow through Fractured Reservoir/ Dual-Continuum
- Numerical Modeling of Coupled Heat and Mass Transfer / Enhanced Oil Recovery
- Anomalous Transport / Non-Darcian, Non-Fickian & Scale-Dependent Phenomena

Groundwater Flow and
Contaminant Transport
Modeling

Enhanced Geothermal
Energy (EGS) System

Radio-Nuclide Transport
in Geo-Sphere



Dr. Suresh Rajendran

Assistant Professor

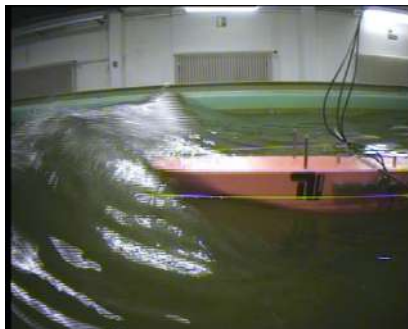
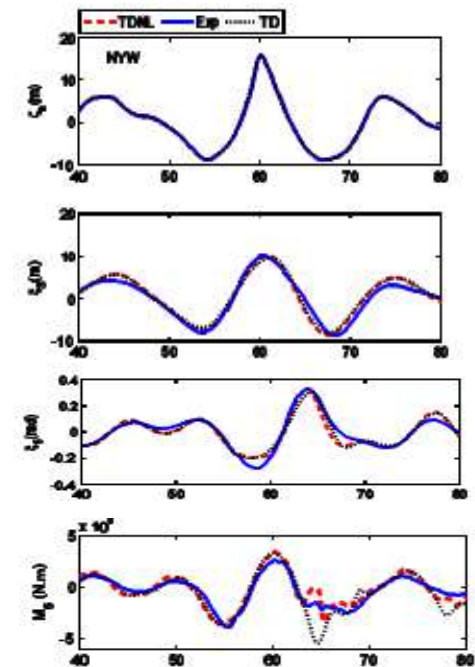
044-2257-4830; sureshr@iitm.ac.in

<http://www.doe.iitm.ac.in/sureshrajendran/>



Area of Specialization

1. Numerical modelling of nonlinear ship motions and Loads
2. Hydro elasticity of ships and offshore structures
3. Manoeuvring of ships in waves
4. Dynamic Instability of Ships



[Back to Top](#)



Dr. Tarun K Chandrayadula

PhD, George Mason University, USA

Assistant Professor, Ocean Engineering

044-2257-4808; tkchandr@iitm.ac.in

<http://www.doe.iitm.ac.in/tkachandr/>





Dr. R VIJAYAKUMAR

PhD, Indian Institute of Technology Delhi, INDIA

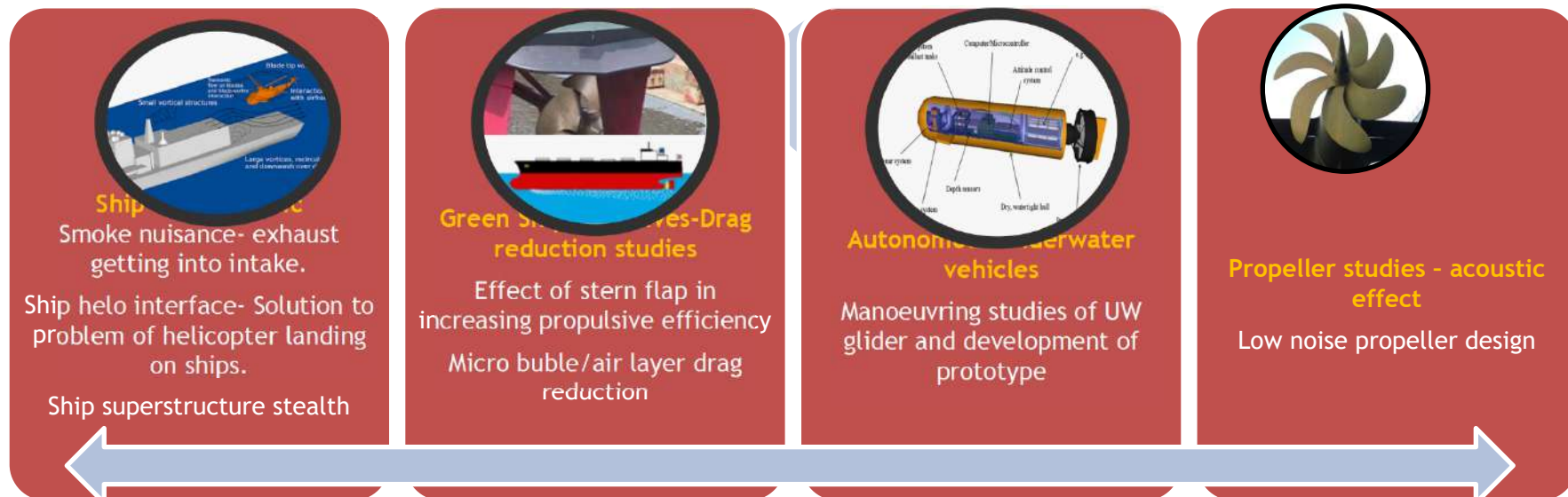
Asst Professor, Ocean Engineering

044-2257-4829; vijay2028@iitm.ac.in

<http://www.oec.iitm.ac.in/vijay2028.html>



- Ship aerodynamics- smoke nuisance , ship helo interface
- Green ship initiative- Drag reduction methodology
- Autonomous underwater vehicles- Gliders
- Propeller studies- acoustic effect
- Astern Maneuvering study in shallow water



BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH

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Dr. Vijay K G
PhD, IIT Kharagpur, India
Assistant Professor, Dept. of Ocean Engineering
044-2257-4812; vijaykg@iitm.ac.in



Research

- Title of the Project: Fluid Structure Interaction with Permeable Coastal Structures
- Research Areas (or Keywords): Coastal Engineering, Wave hydrodynamics, Fluid Structure Interaction, Dual Boundary Element Method
- Nature of work: Numerical and Experimental studies

Aim and Scope

- The main objective is to provide enhanced protection to coastal infrastructures.
- I propose to investigate various cost-effective barriers (thin slatted) through a systematic approach and quantify the wave forces.

Approach

- The preliminary approach will be based on the numerical studies. I'll develop a generalized numerical code based on the Dual Boundary Element Method (DBEM) to analyse the various configurations.
- Subsequent to finalizing the the well-behaved barrier configuration, I'll initiate works for the physical model studies in the 2m-wave flume in the department of Ocean Engineering, IIT Madras.



INDIVIDUAL FACULTY PROFILE

DEPARTMENT OF PHYSICS

[Back to
Top](#)

LIST OF FACULTY

Abhishek Misra

Aravind G

Arul Lakshminarayan

Ashwin Joy

Ayan Mukhopadhyay

Basudev Roy

Chandra Kant Mishra

Dawood Kothawala

Dillip Kumar Satapathy

Ganesan A R

Harish Kumar N

Jim Libby

Mahaveer Kumar Jain (yet to be uploaded)

Manoj Gopalakrishnan

Manu Jaiswal

Markandeyulu G

Murugavel P

B R K Nanda

Neelima M Gupte

Nirmala R

Panchanana Khuntia

Pattabiraman M

Prabha Mandayam

Prabhat Ranjan Pujahari

Prafulla Kumar Behera

Prahallad Padhan

Prasanta Kumar Tripathy

Prem B Bisht

Rajesh Narayanan (et to be uploaded)

Ramachandra Rao M S

Ramaprabhu S

Santhosh P N

Satyanarayana M V

Sethupathi K

Shantanu Mukherjee (yet to be
uploaded)

Sivarama Krishnan

Somnath Chanda Roy

Srinivas V

Sriramkumar L

Subramanian V

Sudakar Chandran

Sunethra Ramanan

Sunil Kumar P B

Suresh Govindarajan

Vaibhav Madhok

Vidya Praveen Bhallamudi

Vijayan C

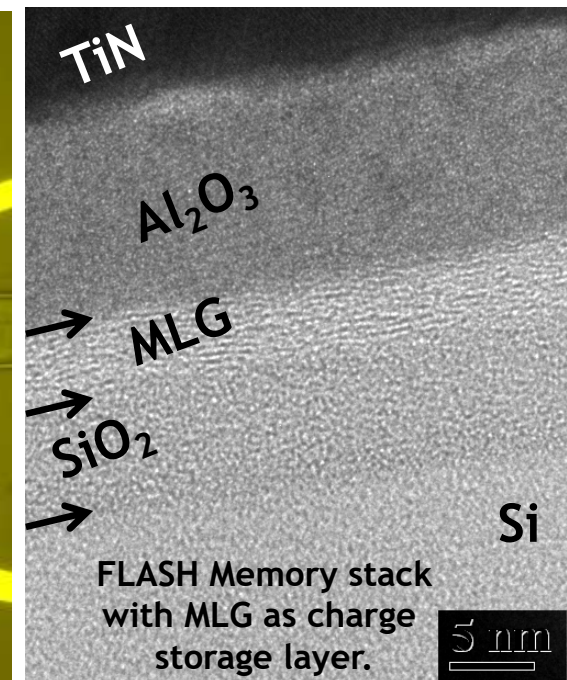
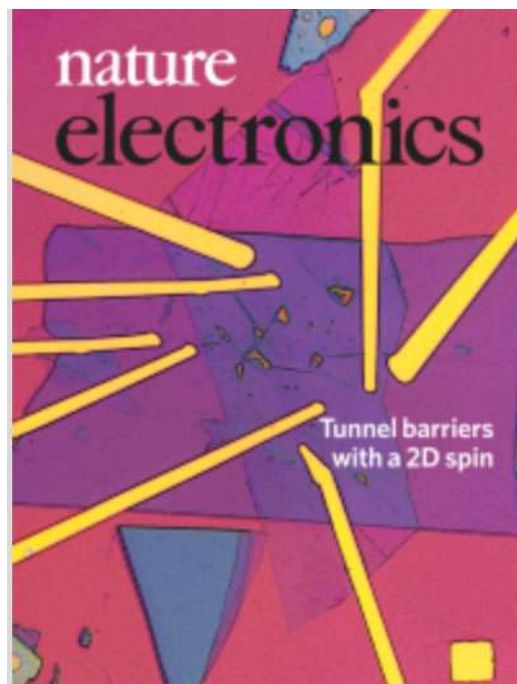
Yasir Iqbal



Dr. Abhishek Misra
PhD, EE, IIT Bombay, India
Assistant Professor, Physics
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- Electronic transport in emerging quantum materials.
- Physics and applications of 2D materials and heterostructures.
- Low energy electronics for future AI and IoT based technologies.



BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH

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Dr. G Aravind

PhD., TIFR Mumbai, India
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- Resonances in the anions of astrophysical relevance
- Photoelectron spectroscopy and iontrap studies on interstellar anions
- Multiphoton ionization studies on interstellar molecules

Anion Resonance

The role of anion resonances in the formation of smaller anions from larger ones in space is studied.

Ion trap studies

Low energy collisions occurring in interstellar medium are studied at low temperatures using multipole iontrap

Photoelectron Spectroscopy

Photoelectron spectroscopy of anions to decipher the electronic energy levels of interstellar molecules is studied.

← Atomic and molecular spectroscopy on interstellar atoms, molecules and ions →



Dr. Arul Lakshminarayan

PhD, SUNY Stony Brook, NY, USA

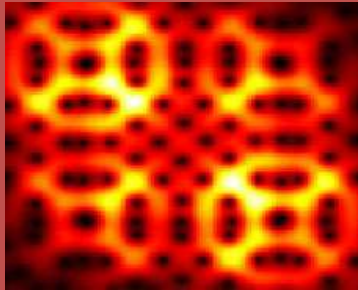
Professor, Physics

044-2257-4878; arul@iitm.ac.in

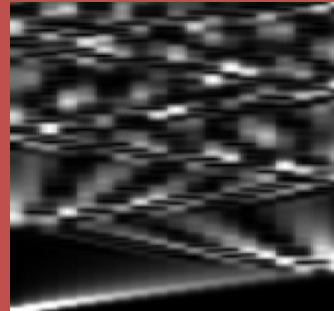
<http://www.physics.iitm.ac.in/~arul>



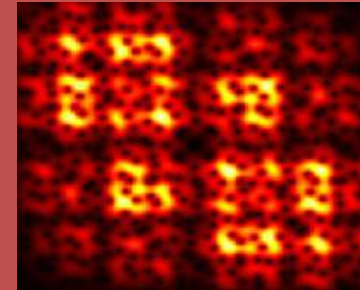
- Nonlinear Dynamics: Hamiltonian and Quantum Chaos
- Quantum Information: Entanglement. Applications to many body systems
- Statistical Mechanics: Random Matrix Theory and Extreme Value Statistics



Quantum Chaos: Simple Models to Applications



Quantum Entanglement



Random Matrix Theory and Applications

← Complex Quantum Systems, Quantum Information, Random matrix theory →



Dr. Ashwin Joy

PhD, Institute for Plasma Research, Gandhinagar

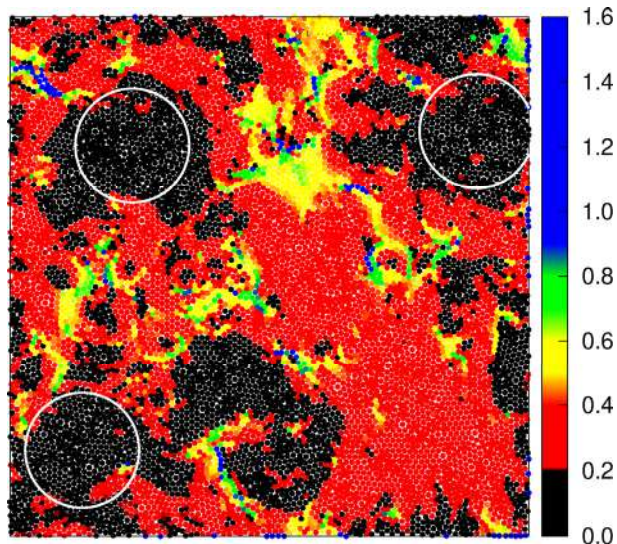
Assistant Professor, Physics

044-2257-4892; ashwin@iitm.ac.in

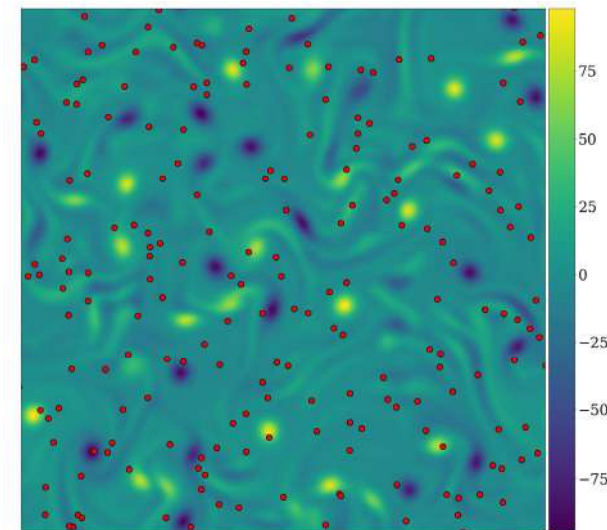
<https://physics.iitm.ac.in/ashwin/>



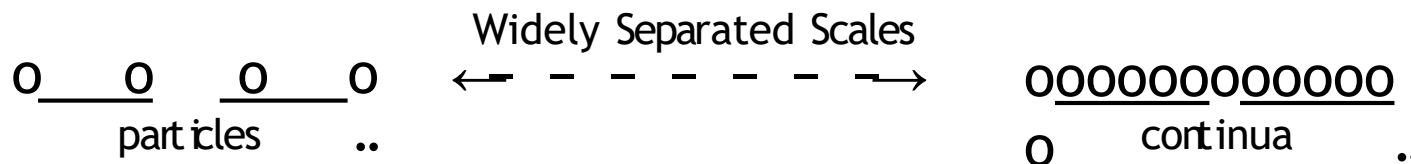
I work in soft condensed matter theory and fluid mechanics



Slow Moving Clusters in an Active Liquid



Transport in Active Turbulence



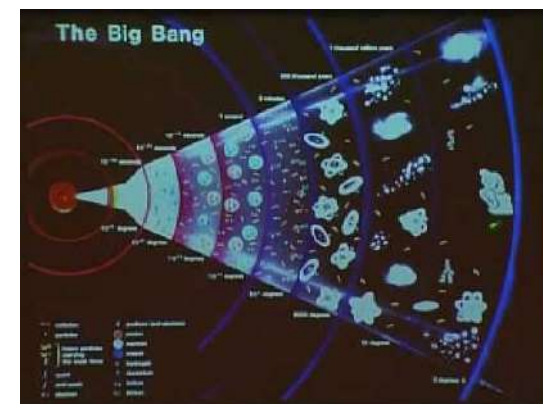
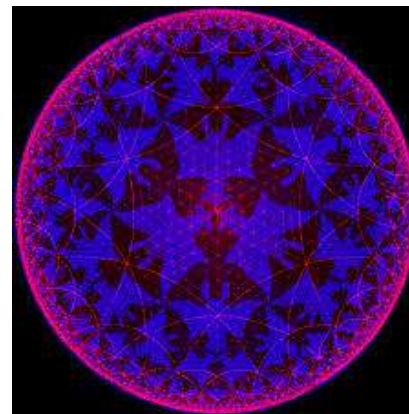
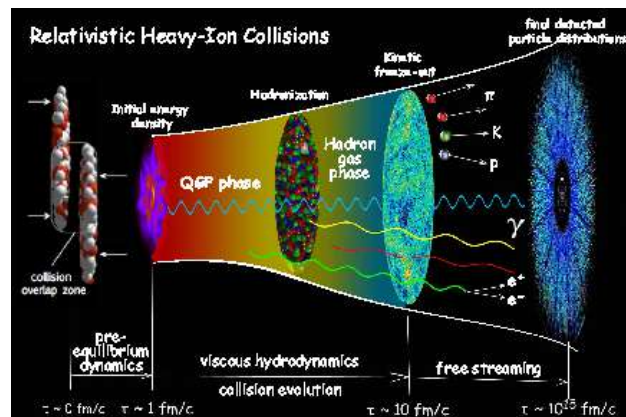


Dr. Ayan Mukhopadhyay

044-2257-4842; ayan@iitm.ac.in

Major Areas of Research

- Developing a new fundamental theoretical framework for strongly interacting & strongly correlated systems
- Applications of novel non-perturbative paradigm to confinement in QCD, Quark-Gluon Plasma and high- T_c superconductivity
- To understand the fundamentals of the holographic correspondence of string theory
- Infrared issues in quantum gravity with ramifications on the information loss paradox of black holes and the stability of our Universe



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Dr. Basudev Roy

PhD, IISER Kolkata, India

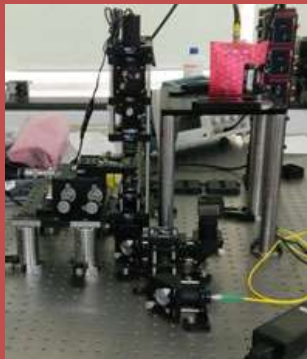
Assistant Professor, Physics

044-2257-4843; basudev@iitm.ac.in

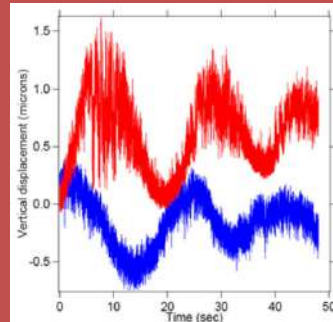
<http://basudevroy.wixsite.com/website>



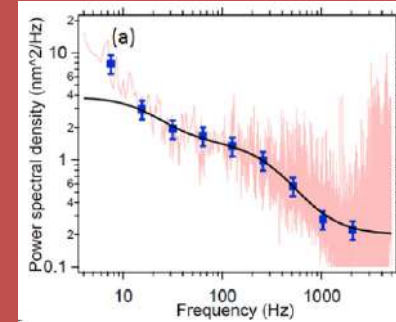
- Soft matter using optical tweezers
- Cell biology and biophysics using optical tweezers
- High resolution imaging



OPTICAL TWEEZERS



SOFT MATTER APPLICATIONS



CELLULAR RHEOLOGY

← SOFT MATTER AND BIOPHYSICS USING OPTICAL TWEEZERS →



Dr. Chandra Kant Mishra

PhD, IISc, India

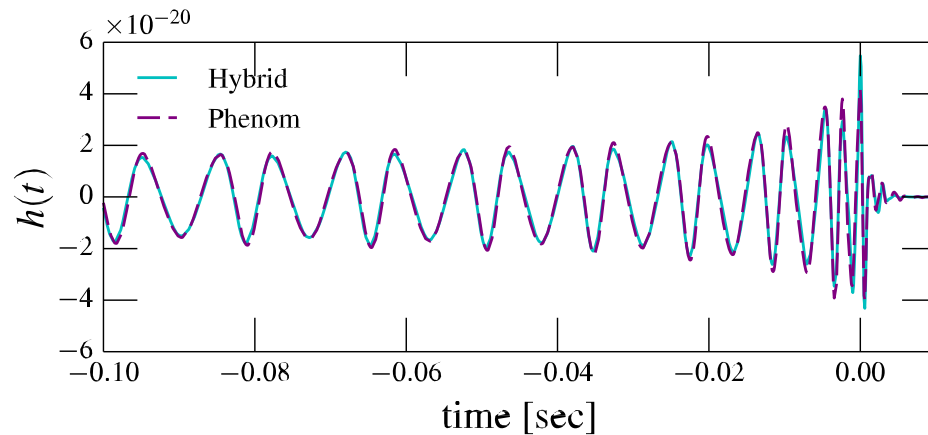
Assistant Professor, Physics

044-2257-4860; ckm@iitm.ac.in

<https://physics.iitm.ac.in/ckm>

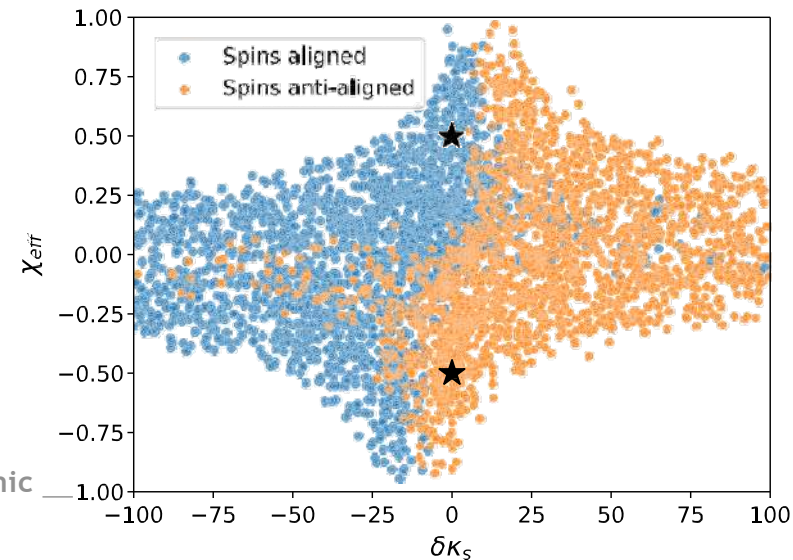


- Gravitational Waves / Waveform modelling
- Gravitational Waves / Signal processing
- Gravitational Waves / Observational tests using dynamical spacetimes



Waveforms constructed using phenomenology that closely mimic true signals and are used for analysis of data collected by gravitational wave detectors.

PHYSICAL REVIEW D 96, 124010 (2017)



Measuring parameters that characterise the true nature of compact object in a binary undergoing merger

PHYSICAL REVIEW D 100, 104019 (2019)

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Dr. Dawood Kothawala

PhD, IUCAA, PUNE

Assistant Professor, Physics

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- Thermodynamically aspects of gravity, Black hole entropy
- Statistical mechanics and thermodynamics in curved space-time
- Implications of a “minimal space-time interval”

Thermodynamically aspects of gravity, Black hole entropy:

- Thermodynamic structure of gravitational field equations
- Hawking radiation and semi-classical aspects of black hole entropy
- Horizon thermodynamics in higher derivative theories

Statistical mechanics and thermodynamics in curved space-time:

- Thermal systems in curved space-times
- Entropy of self-gravitating systems and horizon entropy
- Interplay between quantum and thermal fluctuations

Implications of a “minimal space-time interval”:

- Quantum field propagators in presence of a minimal length
- Minimal length and space-time singularities
- Quantum field theories based on deformed quantization



Dr. Dillip Kumar Satapathy

PhD, Humboldt University, Germany

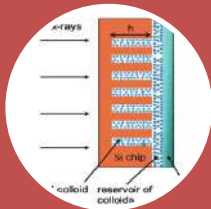
Associate Professor, Physics

044-2257-4899; dks@iitm.ac.in

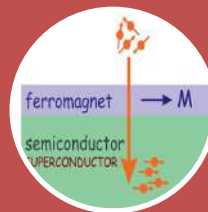
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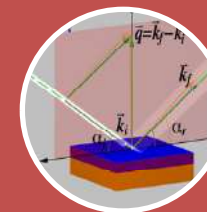
- Soft matter in confinement (confined fluids)
- Physics of complex oxide heterostructures
- Structure and dynamics of materials by X-ray and neutron scattering



Microfluidics
Friction & lubrications
Glass transition in polymer films



Spintronics
Oxide based electronics



Non-destructive characterization
of structure-property relations in
materials

← Condensed matter physics research by using scattering techniques →



Dr. A R Ganesan

PhD, IIT Madras, India

Professor, Physics

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https://www.physics.iitm.ac.in/people_files/faculty/ganesan.html



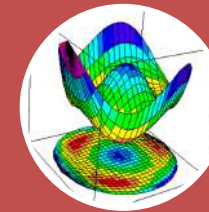
- Applied Optics and Laser Instrumentation
- Holography and Speckle Metrology
- Adaptive Optics and Vision Science



Laser based optical measurement techniques and Fiber optic sensors



Holographic and Laser speckle Interferometry for Engineering Metrology



Adaptive Optics for far field imaging and correction of human ocular aberrations

BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH

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Dr. N Harish Kumar

PhD, University of Hyderabad, India

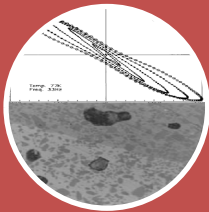
Professor, Physics

044-2257-4879; nhk@iitm.ac.in

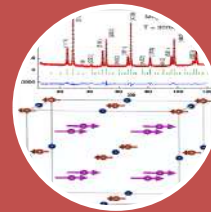
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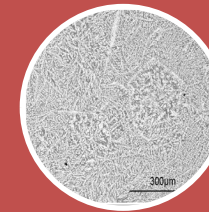
- Research Area/Focus 1 Superconductivity
- Research Area/Focus 2 Spintronics
- Research Area/Focus 3 Novel Magnetic Materials



Second generation high T_c
superconducting current leads



Half metallic Spin injection
electrodes
Dilute magnetic Semiconductors
for Magneto-optoelectronics



Novel magnetic sensors and
devices

Advanced Magnetic Materials



Dr. Jim Libby

D. Phil., University of Oxford, UK

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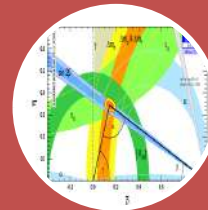
https://www.physics.iitm.ac.in/people_files/faculty/libby.html



- Experimental particle physics
- CP violation - origin of the matter anti-matter asymmetry in the universe
- Neutrino physics - studies with the India-based Neutrino Observatory (INO)



Particle detector
development for INO



Measurements of CP
violation using existing data
from collider experiments



Simulation studies for future
high luminosity flavour
factories

← Instrumentation and data analysis for particle physics →



Jatin Rath

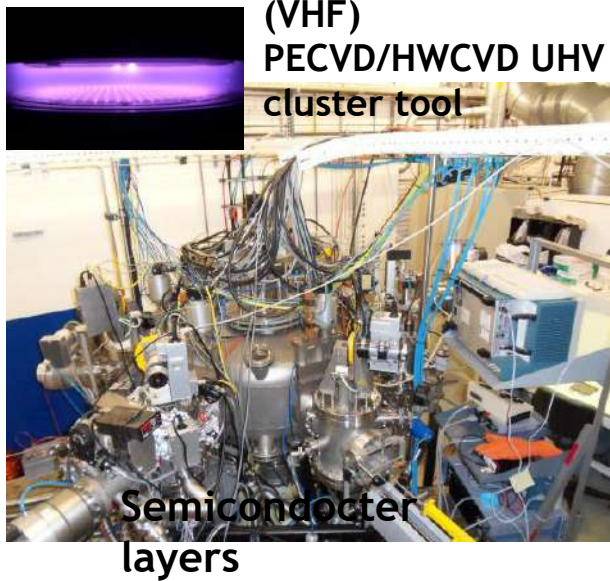
Professor, Department of Physics

+91 44 2257 4855, jkr@iitm.ac.in

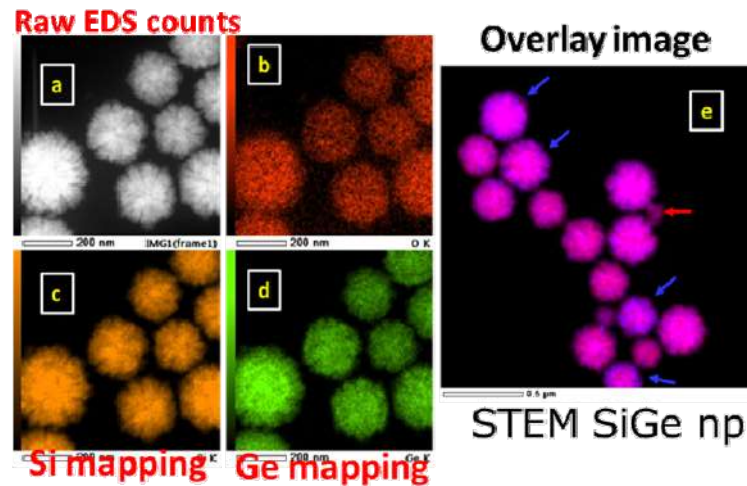
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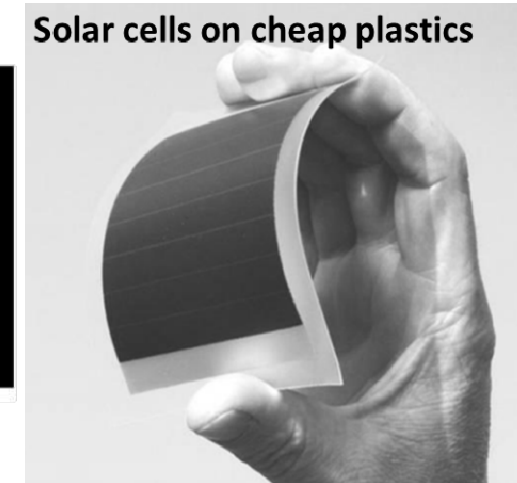
(CVD) Processing



(Nano) materials



Devices



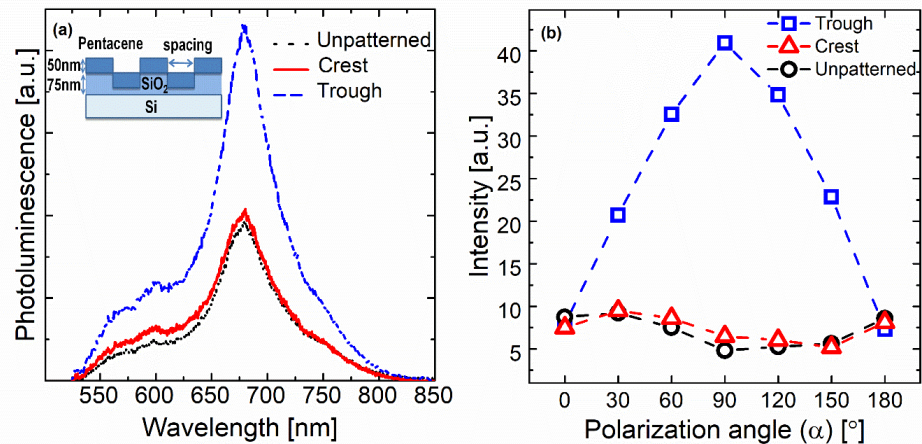


Dr. Jayeeta Bhattacharyya
PhD Tata Institute of Fundamental Research
Assistant Professor, Physics
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Major Areas of Research

- Spectroscopic study of organic semiconductor's
- Time resolved measurements - Ultrafast spectroscopy
- Investigation of carrier dynamics in THz domain



Effect of surface patterning on pentacene thin films



THz time domain spectroscopy set-up



Dr. Kasiviswanathan S

PhD, IIT Madras, India

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Dr. C V Krishnamurthy

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- Acoustic/Elastic Wave Propagation (Simulations / Experiments)
- Electromagnetic Wave Propagation (Simulation / Experiments)
- Thermal physics (Molecular Dynamics based approach / Experiments)
- High resolution capacitance sensing (Computational / Experimental aspects)

Linear and Nonlinear Wave-Matter Interactions for Imaging Applications

Heat absorption and transport in meso- and nano-scales (Fourier / non-Fourier heat conduction in complex media; and thermal imaging)

Dielectric response of materials on meso- and nano-scales



Dr. S Lakshmi Bala
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Professor, Physics
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- Open quantum systems
- Dynamical systems
- Anholonomies in classical and quantum systems

Nonclassical effects in
wavepacket dynamics, Bose
Einstein condensates

Ergodicity properties of
quantum expectation values
in light-atom interactions

Berry phases and Hannay
angles in atom optics

Theoretical aspects of the interaction of the radiation field with atoms



Dr. Mahaveer Kumar Jain

PhD, IIT Delhi, India

Associate Professor, Physics

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Dr. Manoj Gopalakrishnan

PhD, Institute of Mathematical Sciences, India

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<http://www.physics.iitm.ac.in/~manoj>

THEORETICAL STUDIES IN BIOPHYSICS AT THE LEVEL OF THE CELL

- Noise and its impact on cellular functions
- Active transport in the cell and its properties

Motor protein motion
and active vesicle
transport

Microtubule dynamics
in Cell division

Chemotaxis of micro-
organisms

← PHYSICAL MODELING OF PROCESSES IN THE LIVING CELL →



Dr. Manu Jaiswal

Graphene & 2D systems Lab

Associate Professor, Physics

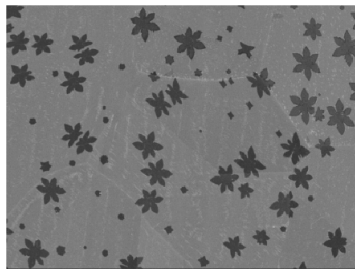
044-2257-4893; manu.jaiswal@iitm.ac.in

http://www.physics.iitm.ac.in/~manu_jaiswal/

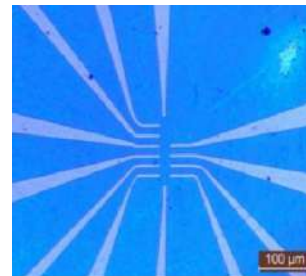


Major Areas of Research

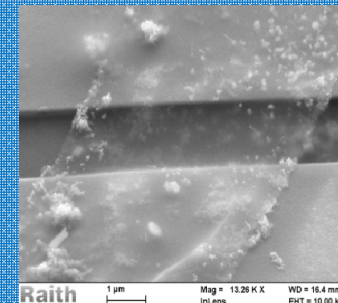
- ❖ Basic physics of 2D membranes. Graphene & 2D systems for flexible electronics
- ❖ Structure, dynamics of water in confinement. Water purification
- ❖ Interfacial phenomena in 2D. Devices and Sensors. Van der Waals heterostructures
- ❖ Mesoscopic physics of graphene & 2D systems
- ❖ Conducting polymers - soft matter and electrical transport



Growth of Graphene by
Chemical Vapor Deposition



Nanoscale transistor device
with electron-beam
lithography



Investigating Basic Physics
and Applications

← SYNTHESIS

FABRICATION

CHARACTERIZATION →

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Dr. G Markandeyu

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<http://www.iitm.ac.in/physics>



Magnetic Materials and their applications

Magnetoimpedance in Fe and Co based ribbons and thin films

Magnetic field sensor using ribbons / thin films exhibiting magnetoimpedance

Magnets with larger energy products than offered by ferrite magnets - proposal



Rare earth doped ferrite magnet materials and magnets

Magnetostriction: rare earth iron intermetallic; rare earth doped ferrites

Magnetostrictive active elements for high frequency applications and field sensing applications - proposal

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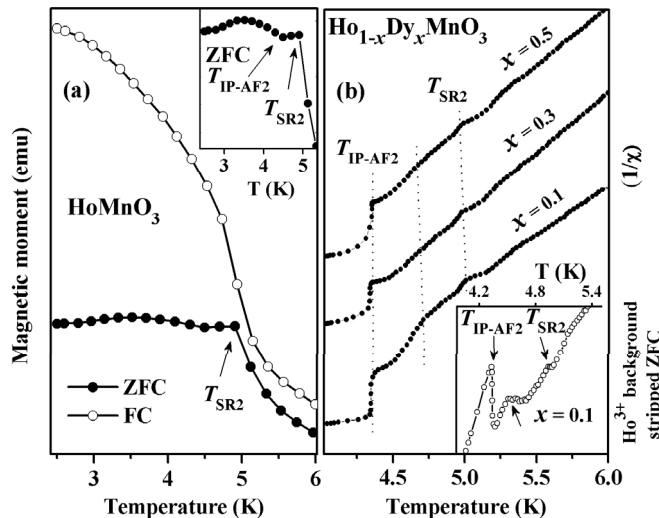
Dr. P Murugavel

Associate Professor, Physics

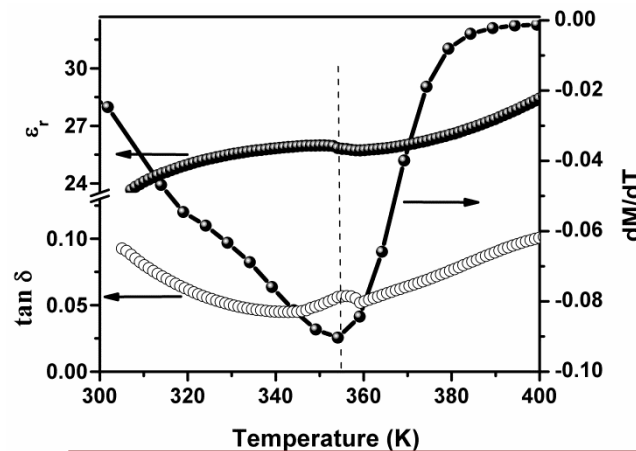
Ph: 044-2257-4897; Email: muruga@iitm.ac.in



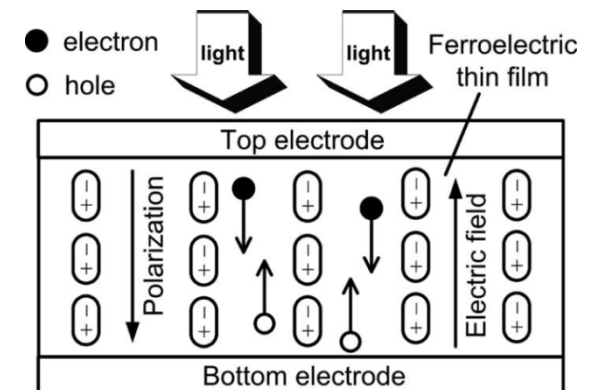
- Magnetic and dielectric studies on rare earth manganites RMnO_3 (R = rare earth)
- Magnetoelectric effect in ferroelectric-ferromagnetic nanocomposites and solid solutions
- Photoelectric effect on nonconventional oxide ferroelectrics



M-T curve showing ordering of Mn moment at low temperatures in RMnO_3



Studies revealing magnetoelectric coupling at 356 K in $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ -PVDF nanocomposite film



Photovoltaic effect in ferroelectric thin film



Dr. B R K Nanda

PhD, IIT Bombay

Associate Professor, Physics

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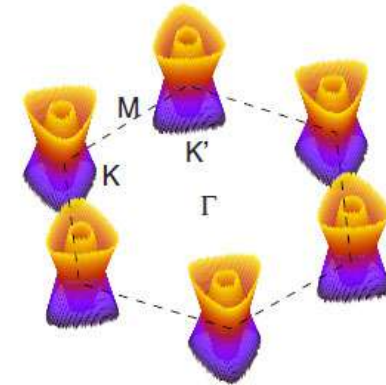
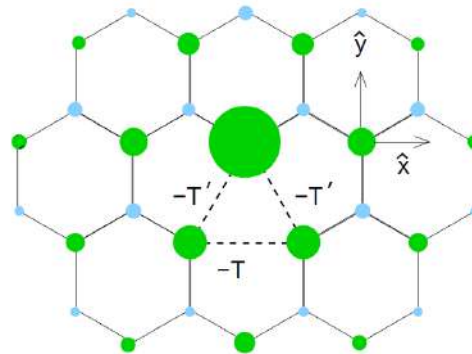
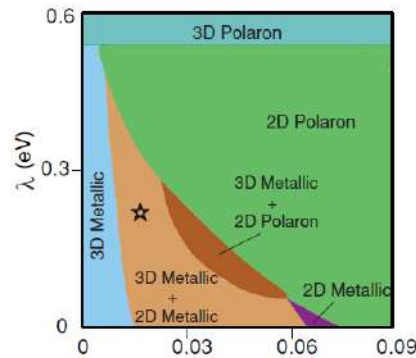
<http://www.physics.iitm.ac.in/~nandab/>



Condensed Matter Theory & Computational

- Nanoscale Electronic and Magnetic Properties:
- Oxide Interfaces/Superlattices
- Graphene

- Energy Research:
- Lithium based Cathode Materials



Phases at the $\text{LaAlO}_3/\text{SrTiO}_3$ interface as a function of electron-lattice coupling and dielectric constant

Scope for spintronic applications

Induced Spin density in monolayer graphene with a single vacancy

$$S = n \uparrow - n \downarrow \quad (+ve \text{ green} \quad -ve \text{ blue})$$

Scope for magnetism in graphene

Electric field induced Fermi surface in hexagonal bilayer graphene:

Scope for hole and electron doping

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Dr. Neelima M Gupte

Professor, Physics

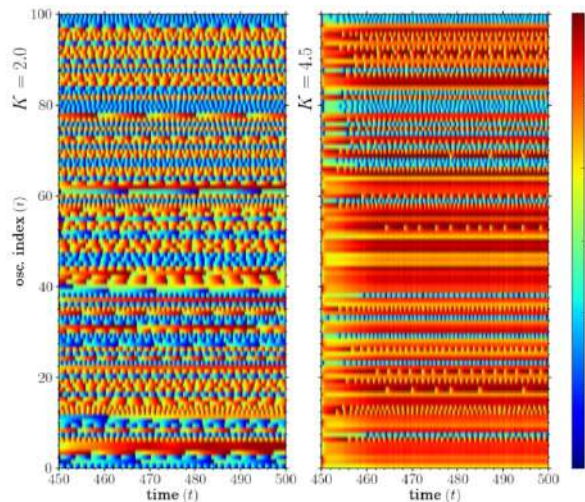
044-2257-4861; gupte@iitm.ac.in

<https://www.physics.iitm.ac.in/people/faculty/gupte.php>

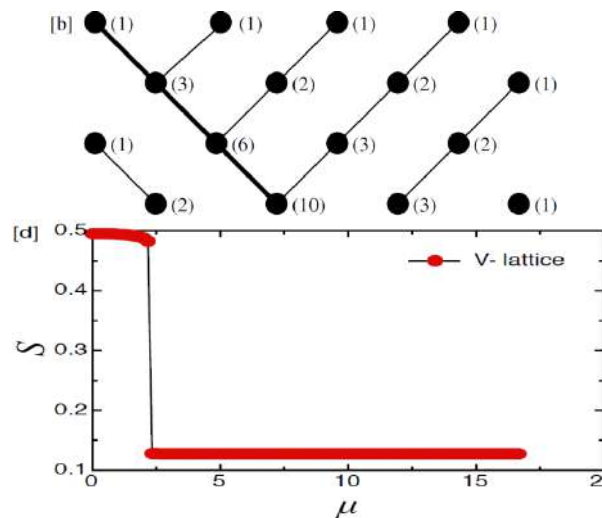


Major Areas of Research

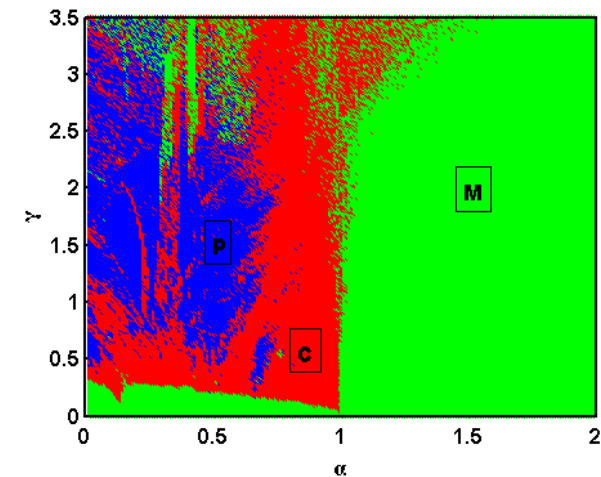
- Dynamics of spatially extended systems
- Explosive collective phenomena
- Dynamics and statistics of impurities in flows



Chimera states of oscillators



Explosive percolation



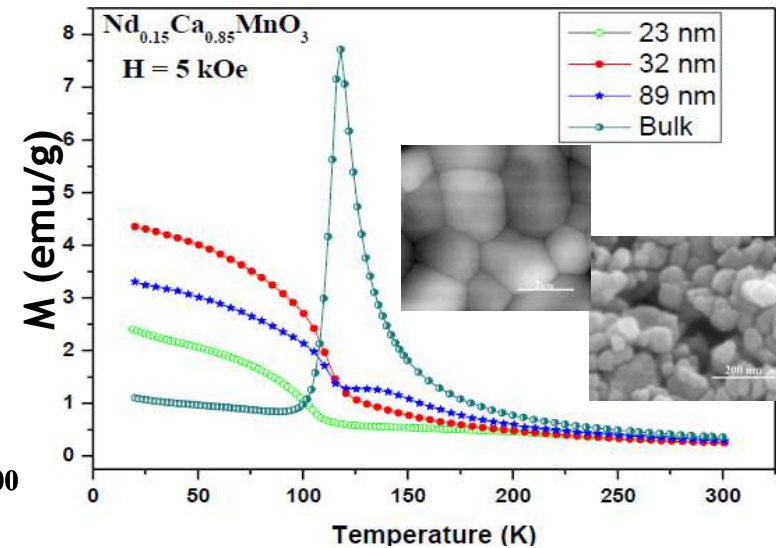
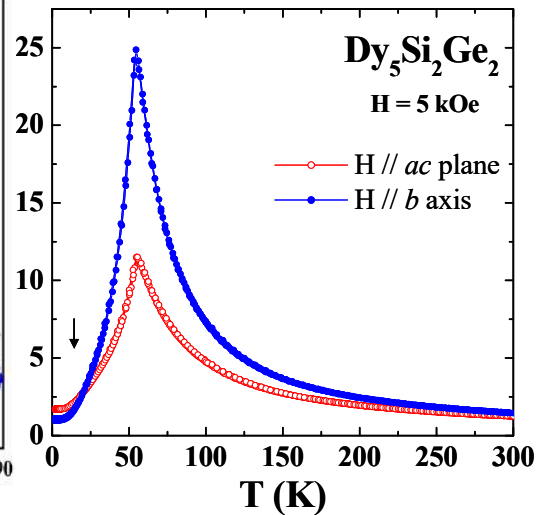
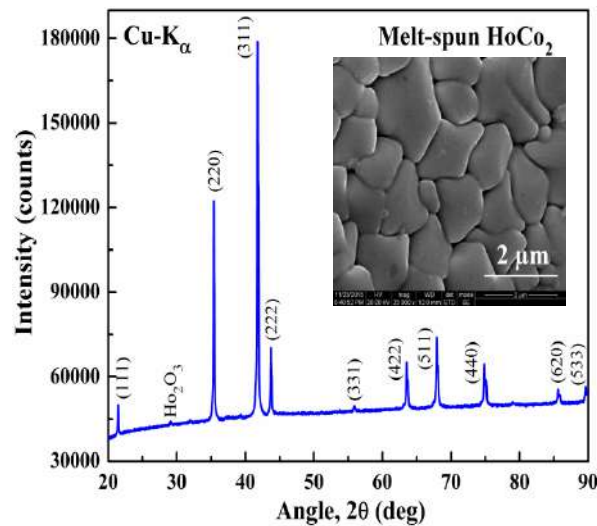
Impurity Dynamics in the ABC Map



R Nirmala

Physics

Magnetism of Rare earth intermetallics and Strongly correlated electron systems



- Structure-Property relationships in Rare earth intermetallic compounds, alloys and oxides
- Magnetic entropy changes near magneto-structural transitions - materials for Magnetic cooling/heating applications
- Microstructure and Particle size dependence of magnetic properties



Dr. Panchanana Khuntia

Assistant Professor, Physics

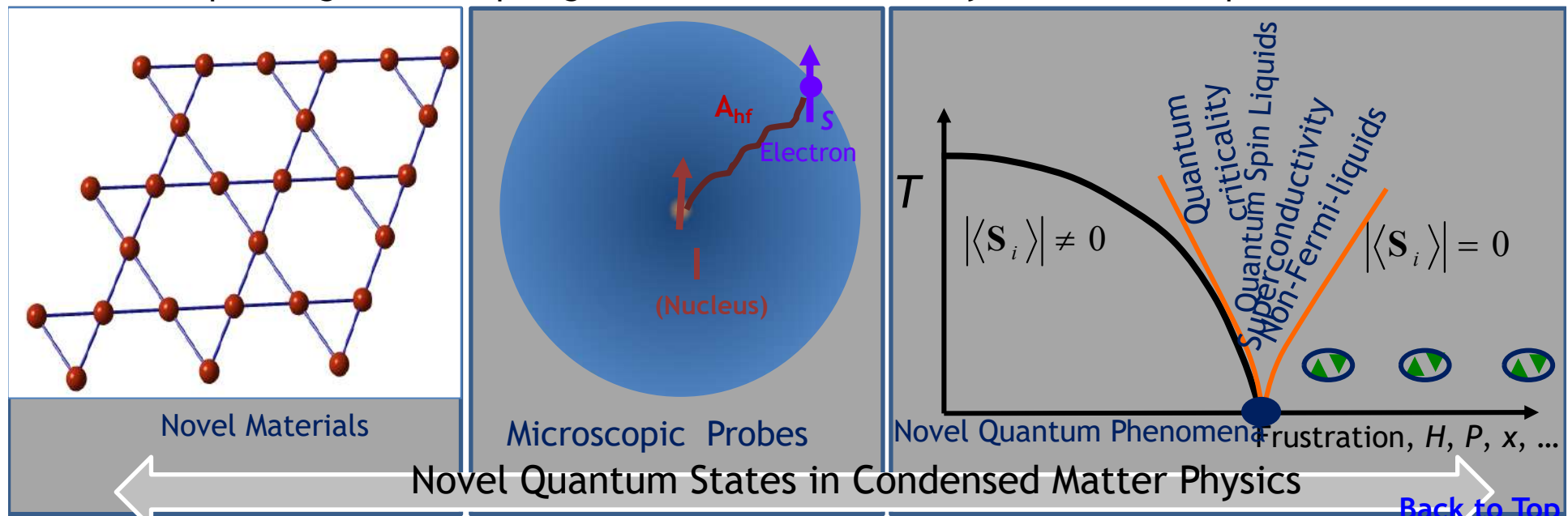
044-2257-4847; pkhuntia@iitm.ac.in

<https://physics.iitm.ac.in/pkhuntia>



Major Areas of Research

- Design, growth, characterization, and investigation of novel quantum materials
- Exploring dynamic properties of correlated electron systems by NMR, μ SR and Neutron Scattering encompassing a wide range of energy scales and sensitive to spin, charge and orbital degrees of freedom
- Microscopic insights into topological order and elementary excitations in quantum materials





Dr. M Pattabiraman

PhD, IIT, Madras, India

Associate Professor, Physics

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<http://www.iitm.ac.in/component/faculty/81/pattu/>



Research Area: Experimental Atomic Physics and Quantum Optics

- We study the coherent interaction of light with atoms in order to control and manipulate their optical properties

Applications:

- Measurement of ultra-low magnetic fields
- Low-noise frequency standards for atomic clocks



Dr. Prabha Mandayam

PhD, California Institute of Technology

Assistant Professor, Physics

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<http://www.physics.iitm.ac.in/~prabhamd>



Major Areas of Research

- **Quantum Error Correction** : Modelling decoherence in physical systems and evolving schemes to tackle such decoherence efficiently
- **Quantum Cryptography & Foundations** : Understanding the interplay between complementarity and incompatibility

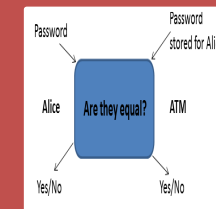


A general framework for
**Approximate Quantum
Error Correction**

Quantifying **incompatibility**

&

Identifying **measurement
bases** which are most
incompatible



Two-party protocols in
**noisy-storage quantum
cryptography**

Quantum Information and Quantum Computing

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Dr. Prabhat Ranjan Pujahari

PhD, Indian Institute of Technology Bombay

Assistant Professor, Physics

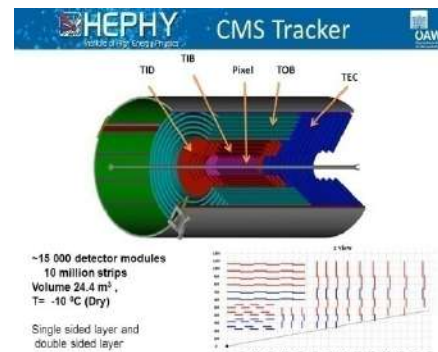
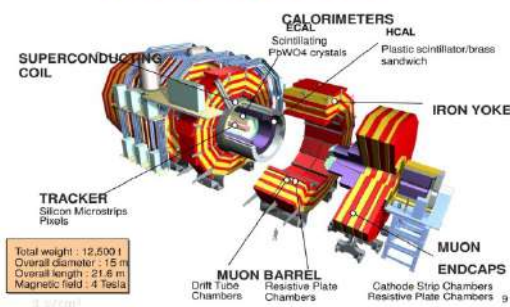
044-2257-4844; p.pujahari@iitm.ac.in

<https://physics.iitm.ac.in/p.pujahari>

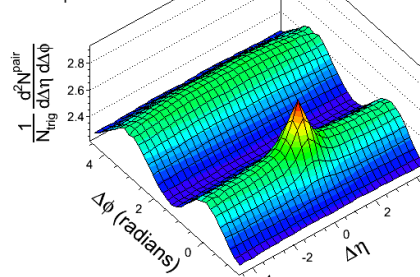


- Experimental High Energy Heavy-Ion Physics in CMS at the Large Hadron Collider, CERN, Geneva
- Study the properties of a new form of matter at extreme conditions of temperature and energy density known as Quark Gluon Plasma (QGP)
- The physics of ‘Origin of Mass’ and the different phases of the early Universe
- Two-particle correlation, azimuthal anisotropy, charge balance function
- CMS silicon tracker detector up gradation program at LHC

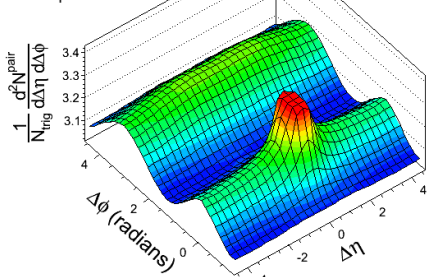
The CMS Detector



(a) CMS PbPb $\sqrt{s_{NN}} = 2.76$ TeV, $220 \leq N_{trk}^{offline} < 260$
 $1 < p_T^{trig} < 3$ GeV/c
 $1 < p_T^{assoc} < 3$ GeV/c



(b) CMS pPb $\sqrt{s_{NN}} = 5.02$ TeV, $220 \leq N_{trk}^{offline} < 260$
 $1 < p_T^{trig} < 3$ GeV/c
 $1 < p_T^{assoc} < 3$ GeV/c



Ridge and collective flow

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Dr. Prafulla Kumar Behera

PHD, KEK supported, Japan

Associate Professor, Physics

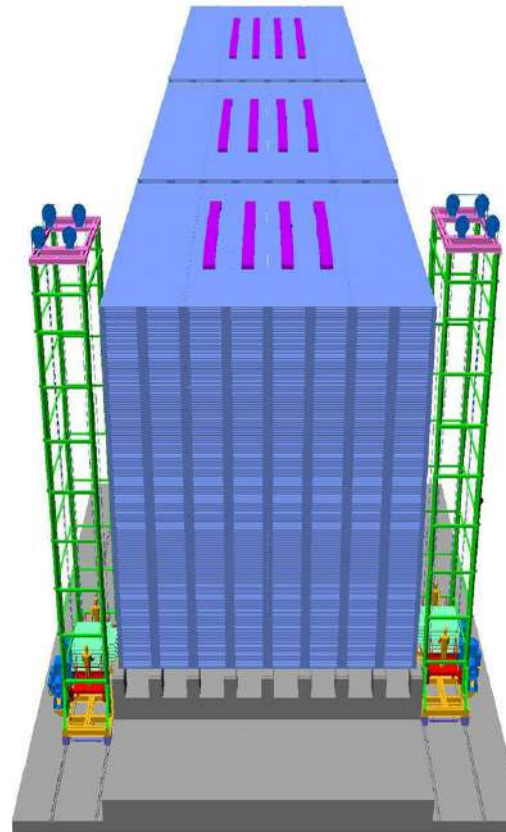
044-2257-4898; behera@iitm.ac.in

<http://www.physics.iitm.ac.in/~behera>



- Focus: Measuring properties of neutrinos using experimental tools. A member of India-based Neutrino Observatroy (INO). Actively involved in ICAL Detector development and detector simulation.

Proposed ICAL Detector, India



BELLE Detector, Japan



- Understand the matter and antimatter assymetry in the Universe and the origin of mass as part of the BELLE, KEK, Japan and ATLAS experiment, CERN, Switzerland.

Experimental High Energy Physics: Atmospheric Neutrino, e^+e^- and pp collider physics.

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Dr. Prahallad Padhan

PhD, IIT Madras, India

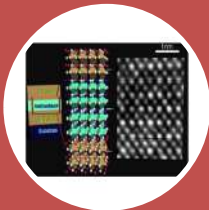
Associate Professor, Physics

044-2257-4884; padhan@iitm.ac.in

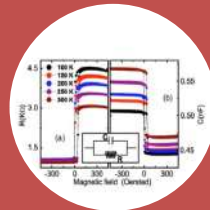
https://www.physics.iitm.ac.in/people_files/faculty/padhan.html



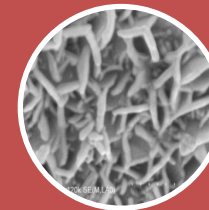
- Research Area/Focus 1 : Transition metal oxide Multilayers/Superlattices
- Research Area/Focus 2 : Thin film devices
- Research Area/Focus 3 : Transition metal oxide nanostructures



APPLICATION 1 :
Magnetic sensing and
storage technology



APPLICATION 2 :
Magnetic random access
memory



APPLICATION 3 :
Anode of lithium-ion
battery



Dr. Prasanta Kumar Tripathy

PhD, Utkal University, India

Associate Professor, Physics

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<http://www.physics.iitm.ac.in/~prasanta>



- Calabi-Yau Compactification
- Black Holes, Super gravity
- Attractor Mechanism

Moduli Stabilization String
Theory, Flux
Compactifications

Calabi-Yau
compactifications

Macroscopic Black Hole
Entropy

And Attractor Mechanism for
Stringy Black Holes

Non-Supersymmetric
Attractors and Their
Stability

Bianchi Attractors in Gauged
Supergravity theory

String Theory and Supergravity, Quantum Field Theory, High Energy Physics

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Dr. Prem B Bisht
PhD, Kumaun University, India
Professor, Physics
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<https://www.physics.iitm.ac.in/~prem/>

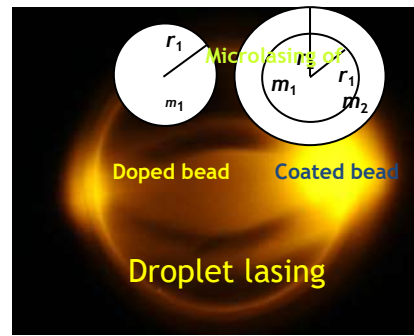
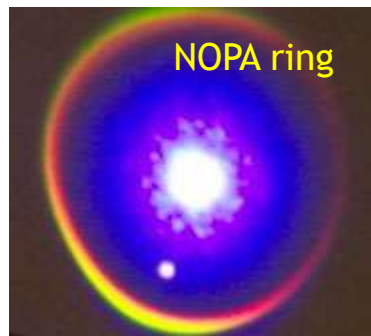


- Optical parametric amplifiers for : fabrication & characterization
- Whispering gallery modes of single microcavity; fluorescence microscopy
- Materials probed with ultrafast laser pulses for photonic applications

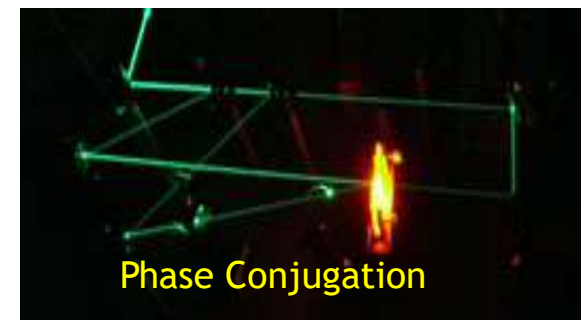
I. White light continuum and Optical parametric amplification: Ultrafast lasers



II. Whispering Gallery Modes (WGM) of a micro-cavity: Sensing applications



III. Laser Induced transient gratings: Nonlinear optics and photonic applications of nanomaterials



Ultrafast Lasers and Optical Amplifiers Lab

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Dr. Rajesh Narayanan
PhD, University of Oregon, USA
Professor, Physics

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<https://physics.iitm.ac.in/rnarayanan>





Dr. M S Ramachandra Rao

Professor, Physics

Nano Functional Materials Technology Centre and MSRC

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<http://www.physics.iitm.ac.in/~msrrao>



Research Theme: "Oxide electronics, Thin Film Nanostructures and Energy Harvesting"

Research Areas: Physics and applications of oxide electronics; ZnO nanostructures for light emission; Physics of doping in ZnO; Physics of diffusion in oxide nanoparticles; Magnetic nanoparticles; Spintronics and Tunnel junctions; Nanocrystalline diamond for mechanical applications; CIGS/CZTS nano-ink for photovoltaic applications; Topological insulators; Physics of strongly correlated systems; Quantum effects in nanosystems; Materials for energy harvesting.

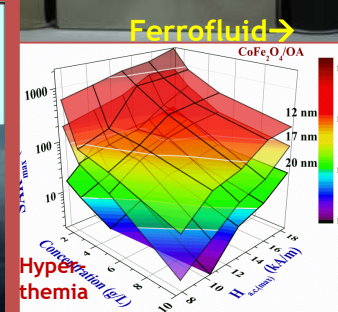
Physics and Applications of Nanostructured Thin Films and Nanomaterials



← Coated WC tools for improved mechanical applications.

Nanocrystalline diamond (NCD) coatings are known for their tribological characteristics ($\mu < 0.1$) and wear resistance. They are potential coatings for mechanical and space applications.

Magnetic Nanoparticles



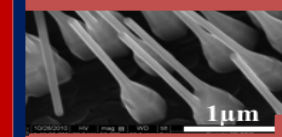
Hyperthermia



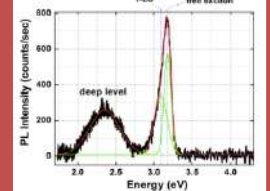
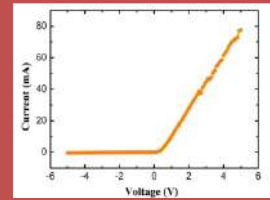
Ferrofluid

p-ZnO/n-Si Heterojunction diode

1D ZnO nanorods and thin films can be used in UV/blue LEDs and as UV detectors.



ZnO nanorods



PL spectrum of nanorods



Dr. S Ramaprabhu

PhD, IIT Madras, India

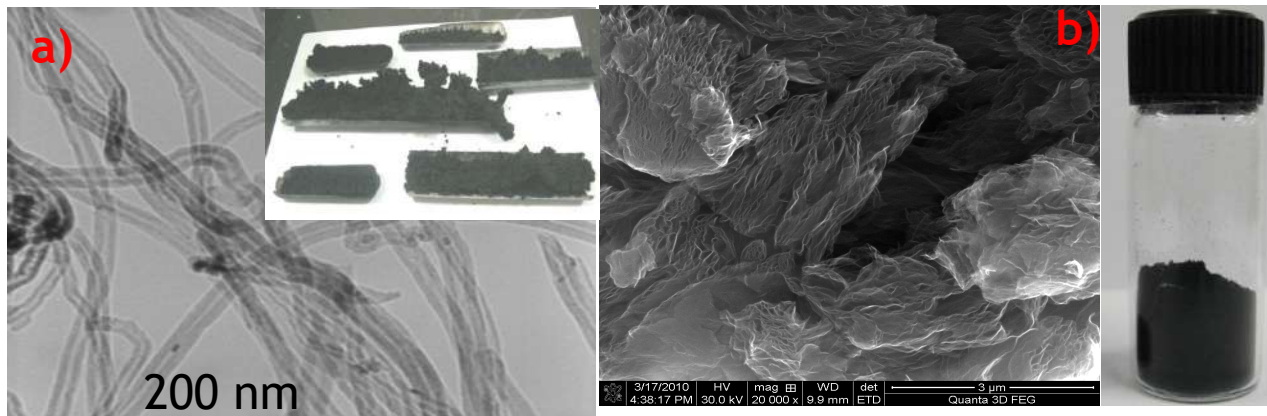
Emeritus Professor, Physics

044-22574862; ramp@iitm.ac.in

<http://www.physics.iitm.ac.in/~ramp>



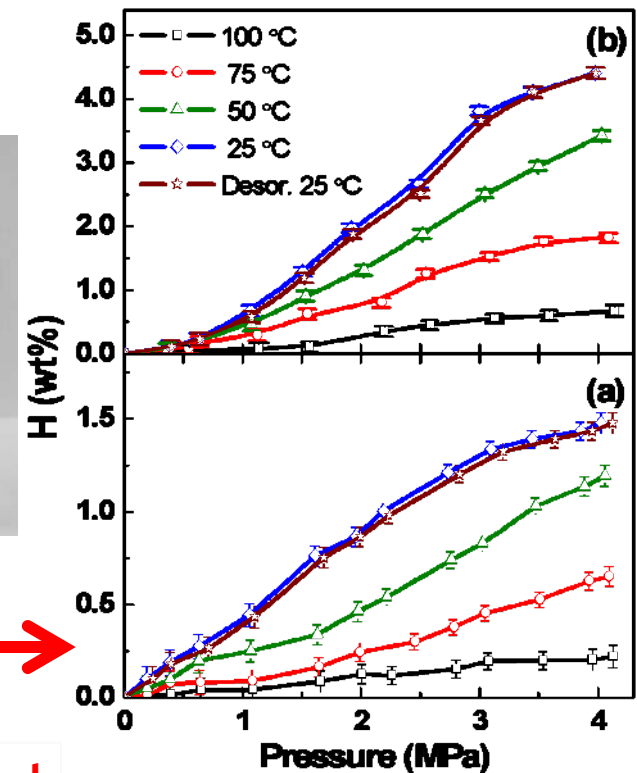
- **Nanomaterials/Synthesis of Carbon NanoTubes and graphene; application to Fuel cell; PV; water purification; CO₂ capture; supercapacitor; biosensors**
- **Hydrogen Storage in Nanomaterials**
- **Nanofluids/synthesis; coolant applications**



a) Carbon Nanotubes synthesized by CCVD technique

b) Graphene synthesized by hydrogen exfoliation method

Hydrogen adsorption isotherms of (a) Nitrogen doped Graphene (N-G) and (b) Pd-N-G in the ranges 25-100°C and 0.1-4 MPa.



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Dr. Santhosh P N

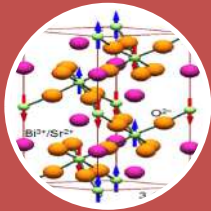
PhD, University of Pune , India
Professor, Physics

044-2257- 4882

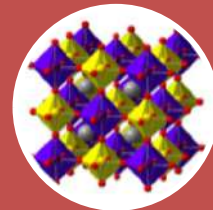
http://www.iitm.ac.in//people_files/faculty/santosh.html



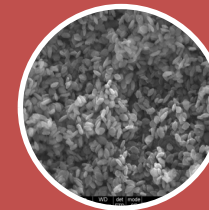
- Experimental Condensed Matter Physics:/Multiferroics
- Structure-property correlations, DFT calculations of Advanced Oxide Materials
- Magnetic and semiconducting nano particles



$\text{Bi}_{0.5}\text{Sr}_{0.5}\text{FeO}_3$ multiferroic
Double perovskite multiferroics



Order-disorder in perovskites
New double layered brownmillerites



Ni/NiO core-shell structure
CuO, FeSe_2 , Fe_3Se_4 nano particles
Gold nano particles for bio applications

← Experimental Condensed Matter Physics/ Multifunctional materials →



Dr. M V Satyanarayana

PhD, Institute of Mathematical Sciences, Madras University
India

Professor, Physics

044-2257-4874; mvs@iitm.ac.in



- Quantum Optics/ Optical Coherence, Non-classical states of radiation
- Quantum Mechanics/ Entanglement - role of squeezing and anti-bunching, atom-radiation interaction
- Fresnel Optics/ connection between squeezing and Fresnel propagation

I am interested in non-classical states of radiation like squeezed and anti-bunched states - its generation and applications to novel sources of radiation. I am also interested in interaction of such states of radiation with atoms and molecules for the purposes of lasing. In this process I also study the role of entanglement in quantum optics. Recently, I am looking into the connection between Fresnel optics and squeezing. Essentially, my interests are in the dynamics of atom(s)-radiation interaction(s) with applications to novel sources of light.



Dr. K Sethupathi

PhD, Moscow State University, Russia

Professor, Physics

044-2257-4875; ksethu@iitm.ac.in

<http://www.iitm.ac.in/>



- Magnetism and Transport properties of Colossal Magnetoresistance Oxides at low temperatures
- Novel materials in the bulk, thin film and nanocrystalline forms
- High Temperature Superconductors and
- Cryogenic Insulation

Novel materials that exhibit large magnetoresistance for magnetoresistive sensors and spintronic device applications

Magnetic refrigeration materials for cooling applications

New materials for electronic cooling



Dr. Shantanu Mukherjee
PhD, University of Wisconsin-Milwaukee, USA
Assistant Professor, Physics
044-2257-4845; shantanu@iitm.ac.in
<https://physics.iitm.ac.in/shantanu>

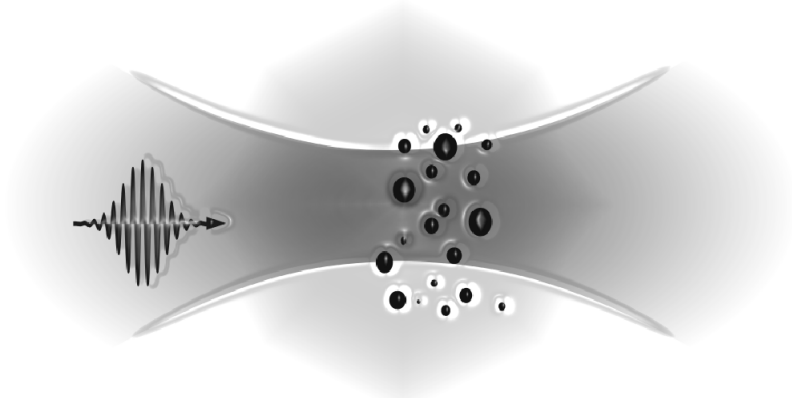




Dr. Sivarama Krishnan, PhD,

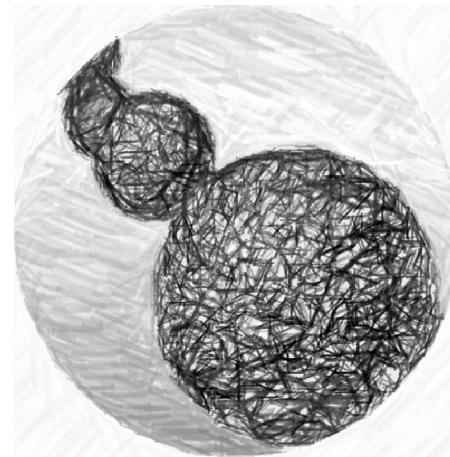
Assistant Professor, Physics

044-2257-4857; srkrishnan@iitm.ac.in

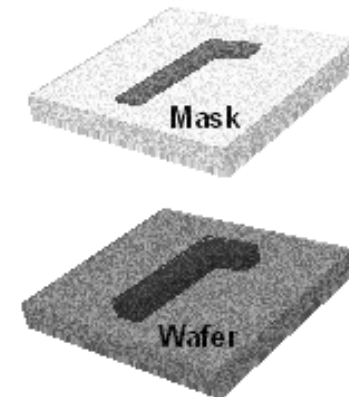


**Femto- and atto-second physics
of nanoscale atomic & molecular
systems**

**Synchrotron physics
of nanoscale systems**



**Dynamics in
Nanoscale superfluids**



**Nanolithography
next generation technologies**

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Dr. Somnath Chanda Roy

PhD, IIT Delhi, India

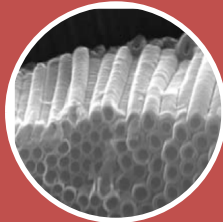
Associate Professor, Physics

044-2257-4886; somnath@iitm.ac.in

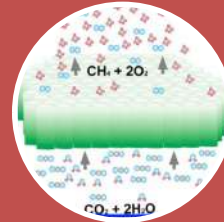
<http://www.physics.iitm.ac.in/~somnath>



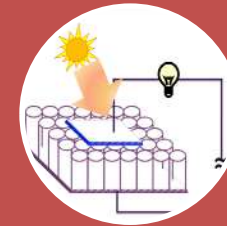
- Synthesis and characterization of metal-oxide nanostructures and thin films
- Study of Electronic conduction and Photo-catalytic properties
- Use of nano-materials for clean Energy and Environment



Metal oxide Nanotubes Sensors for Green-house Gases



Generation of Hydrogen/Hydrocarbons from water/ CO_2 using solar energy



Solid state, Hybrid Solar Cells based on nanomaterials

The Environmental Nanotechnology Lab : Novel Nanostructures for (i) Detection of pollutants (ii) Recycling of CO_2 through Photo-catalysis (iii) High efficiency Solar cells



Dr. V Srinivas

PhD, IIT Bombay, India

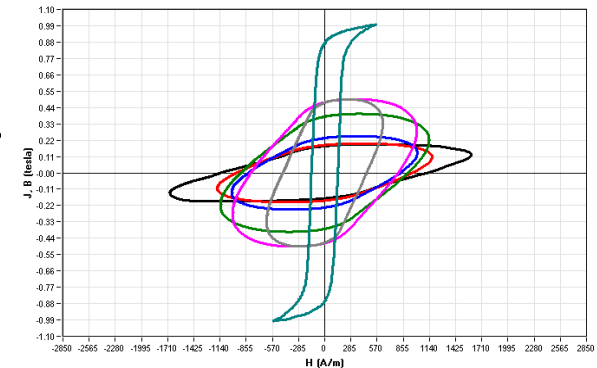
Professor, Physics

044-2257-4896; veeturi@iitm.ac.in

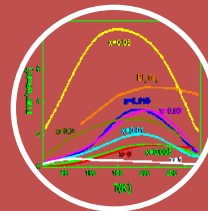
http://www.physics.iitm.ac.in/people_files/faculty/veeturi.html



- Low temperature magnetic and electrical properties
- Electronic properties of complex band structure materials
- Development of soft magnetic composites for applications



Synthesis & study of
Crystalline alloys & compounds
Disordered & nanomaterials



Magnetic & electrical transport
Metal-Insulator transitions,
Magnetic effects GMR, GMI



SFM composites ac applications
Thermoelectrics/Pseudogap
engineering

Investigation of Physical properties of materials for device applications



Dr. L Sriramkumar

PhD, IUCAA, Pune

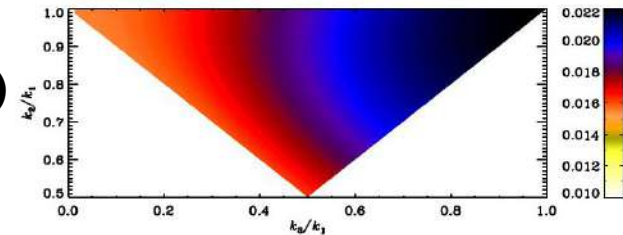
Professor, Physics

044-2257-4854; sriram@iitm.ac.in

<http://www.physics.iitm.ac.in/~sriram/>



- Origin of perturbations during inflation
- Signatures on the Cosmic Microwave Background (CMB)
- Semi-classical gravity and the physics of black holes



Origin of perturbations during inflation

- Deviations from slow roll and features in the primordial power spectrum
- Generation of primordial non-Gaussianities
- Evolution of power and bispectra post inflation

Signatures on the CMB

- Comparison of inflationary models with the recent WMAP and Planck data
- Efficient numerical computation of inflationary bispectra (figure above)
- Imprints of primordial bispectra on the CMB

Semi-classical gravity and the physics of black holes

- Issues related to the origin of Hawking radiation and black hole entropy
- Possible quantum gravitational corrections
- Phenomenological models of quantum gravity



Dr. V Subramanian

PhD, IIT Madras, India

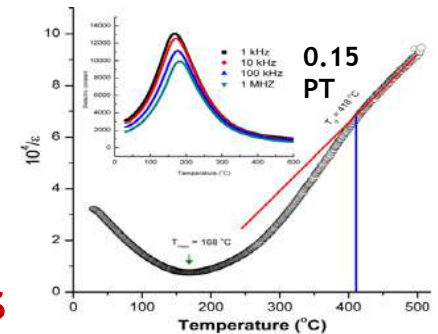
Professor, Microwave Laboratory, Physics

044-2257-4883; manianvs@iitm.ac.in

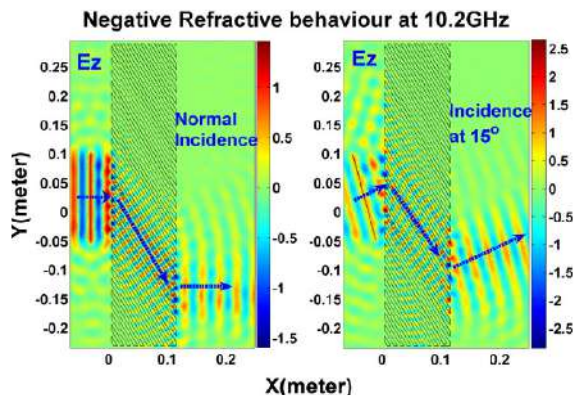
<http://www.physics.iitm.ac.in/~manianvs/index.html>



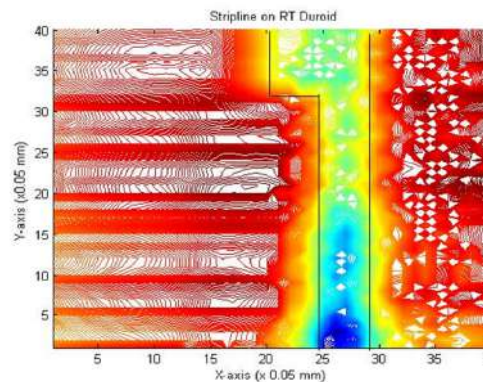
- Dielectrics, Relaxors and Multiferroics
- Photonic Crystals and Metamaterials
- Non-Destructive Evaluation at Microwave Frequencies
- Microwave Imaging
- Magneto-impedance studies at microwave frequencies



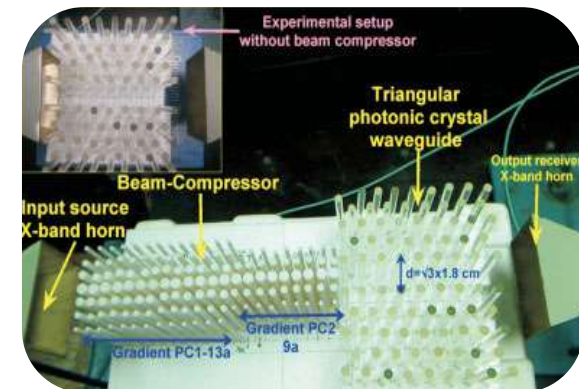
0.15 PT - 0.85 PIN Relaxor



Negative Refraction - Slabs Oriented at 60°



Microwave Near-Field Imaging of a Stripline on RT Duroid Substrate



Spatial Beam Compressor - Based on Photonic Crystal

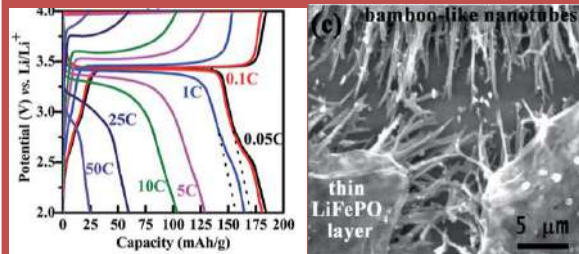


Dr. Sudakar Chandran
PhD, IISc Bangalore, India
Associate Professor, Physics
044-2257-4895; csudakar@iitm.ac.in
<https://home.iitm.ac.in/csudakar/>



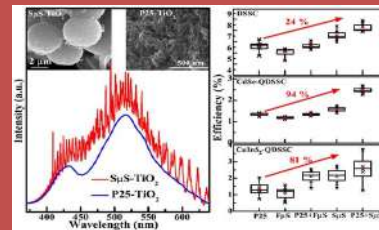
- Materials for energy generation (solar cells) and storage (Li-ion batteries) applications
- High power density cathode and anode materials for quick charge Li-ion batteries
- Novel multifunctional materials with interesting properties for advanced applications
- Defect structure property correlations on composition/microstructure tailored materials
- Nanomaterials for solar cell and LED applications

High-rate capability materials for Li-ion Battery applications



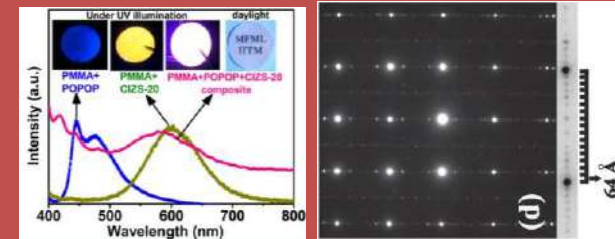
Nanostructured metal oxides for Li ion battery cathode and anode materials; controlling the crystal defect structures and the microstructure to tune the specific capacity and the power density

High performance photoanodes and sensitizers for solar cell applications



Functional materials for DSSC, QDSSC, Perovskite solar cell applications, bandgap engineering in sensitizers, fabricating high performance photoanodes for enhancing efficiency

Multifunctional materials and Defect-structure property correlations



Role of oxygen/nitrogen defects and surface/interface effects on the physical properties of semiconducting oxides and nitrides and multiferroics; electrical, optical and magnetic properties studies

MULTIFUNCTIONAL MATERIALS LABORATORY (MFML)

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Dr. Sunethra Ramanan

PhD, The Ohio State University, USA

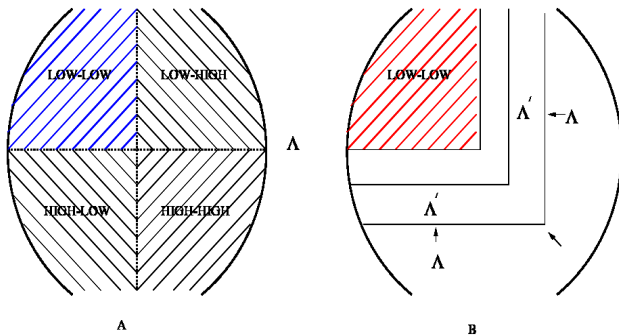
Assistant Professor, Physics

044-2257-4871; suna@iitm.ac.in; suna@physics.iitm.ac.in

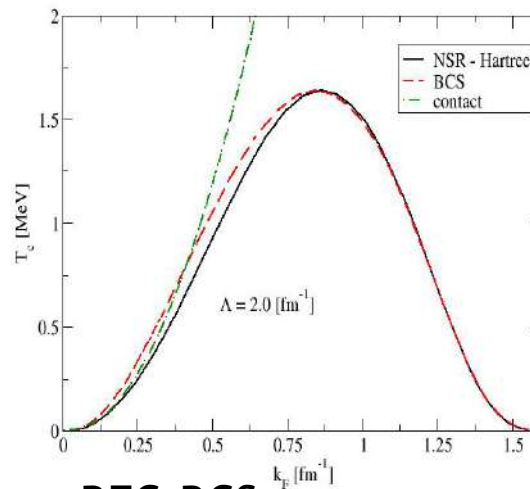
<http://www.physics.iitm.ac.in/~suna>



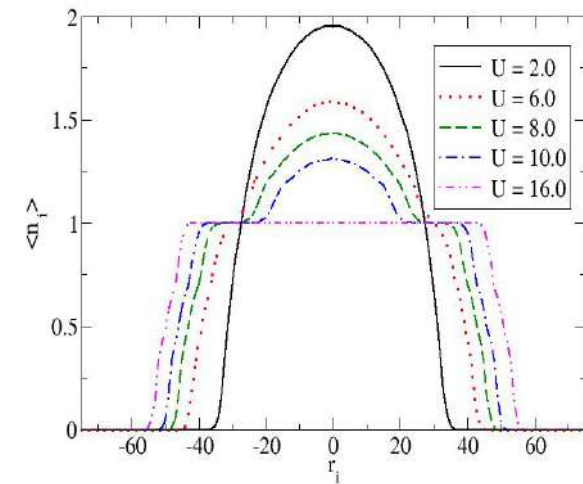
- Effective Field theories and Renormalization Groups
- Nuclear Structure
- Cold Atomic Systems



RG approach to Effective Nucleon-nucleon interactions



BEC-BCS crossover in neutron stars



Cold bosons in optical Lattices



Dr. P B Sunil Kumar

PhD, 1995 Raman Research Institute, India

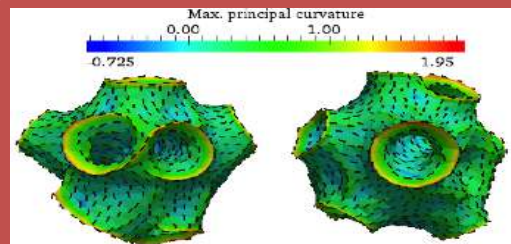
Professor, Physics

044-2257-4876; sunil@iitm.ac.in

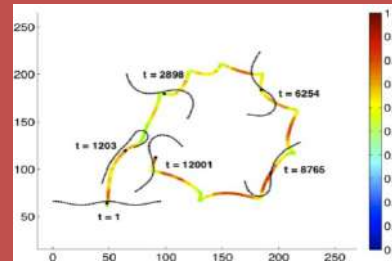
<http://www.physics.iitm.ac.in/~sunil>



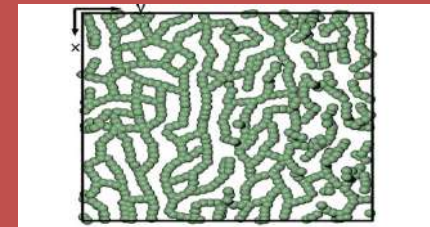
- Soft Condensed Matter Physics
- Biological Physics
- Computational Physics



Lipid membranes: modeling equilibrium and dynamical properties of lipid membranes and membrane-protein complexes. Response of membranes to external forces.



Active soft matter: Dynamics of molecular assemblies, that convert chemical energy to mechanical work internally.



Dynamics of polymers.: Rheology and shear induced transitions in polyelectrolytes and living polymer suspensions. Developing coarse grained models for polymers.



Dr. Suresh Govindarajan
PhD, University of Pennsylvania, USA
Professor, Physics
044-2257-4867; suresh@iitm.ac.in
<http://www.physics.iitm.ac.in/~suresh>



- String Theory and Conformal Field Theory
- Black Holes and Counting of BPS states
- Mathematical Physics (Partitions, Mathieu Moonshine, Modular Forms)

Counting of BPS states
in string theory

Moonshine for the
Mathieu Groups

Higher Dimensional
Partitions
 $p_3(72) = 3464274974065172792$

← THEORETICAL HIGH ENERGY PHYSICS & MATHEMATICAL PHYSICS →



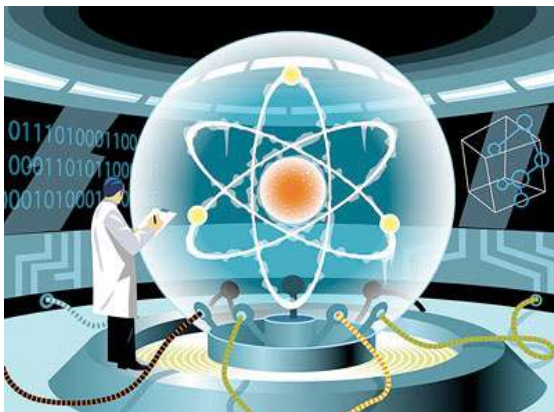
Dr. Vaibhav Madhok
Assistant Professor, Physics
044-2257-4846; madhok@iitm.ac.in



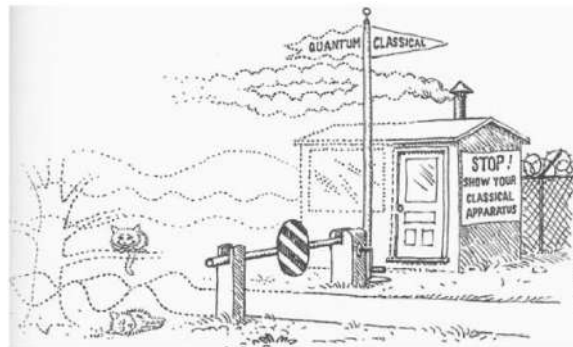
Major Areas of Research

- Physics of Information, Quantum Information Theory
- Chaos: Quantum and Classical Chaos
- Mathematical Biology and Complex Systems

Quantum Computation

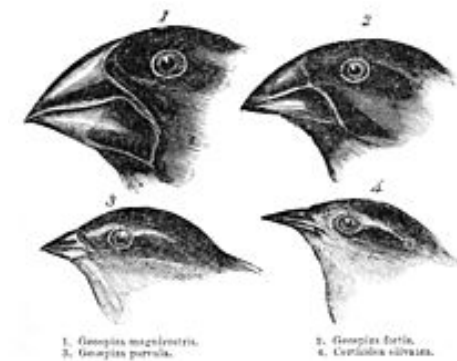


Quantum-Classical Transition



Drawing by Michael Ramus, 1991.
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How do species arise?



1. *Geopelia striata*,
2. *Geopelia striata*,
3. *Geopelia striata*,
4. *Certhia sibylla*.

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Dr. Vidya Praveen Bhallamudi

PhD, Ohio State University, USA

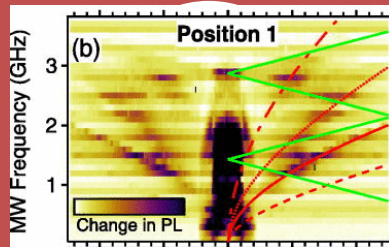
Professor, Physics and EE

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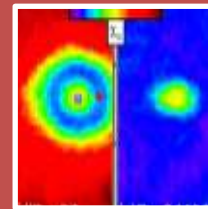
<https://physics.iitm.ac.in/praveen.bhallamudi>



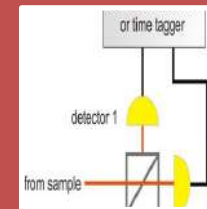
- Condensed Matter experimental
- Microscopy: Fluorescence and Scanned probe microscopy
- Magnetism and Magnetic Resonance



Nanoscale Magnetic spectroscopy



Magnetic imaging



Quantum photon sources

BROAD DESCRIPTION OF THE BANDWIDTH/AREA OF RESEARCH



Dr. C Vijayan

Professor, Physics

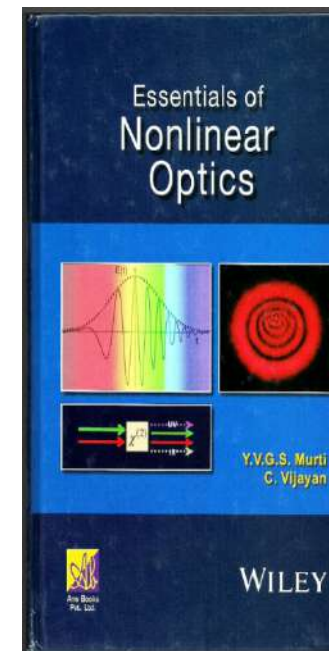
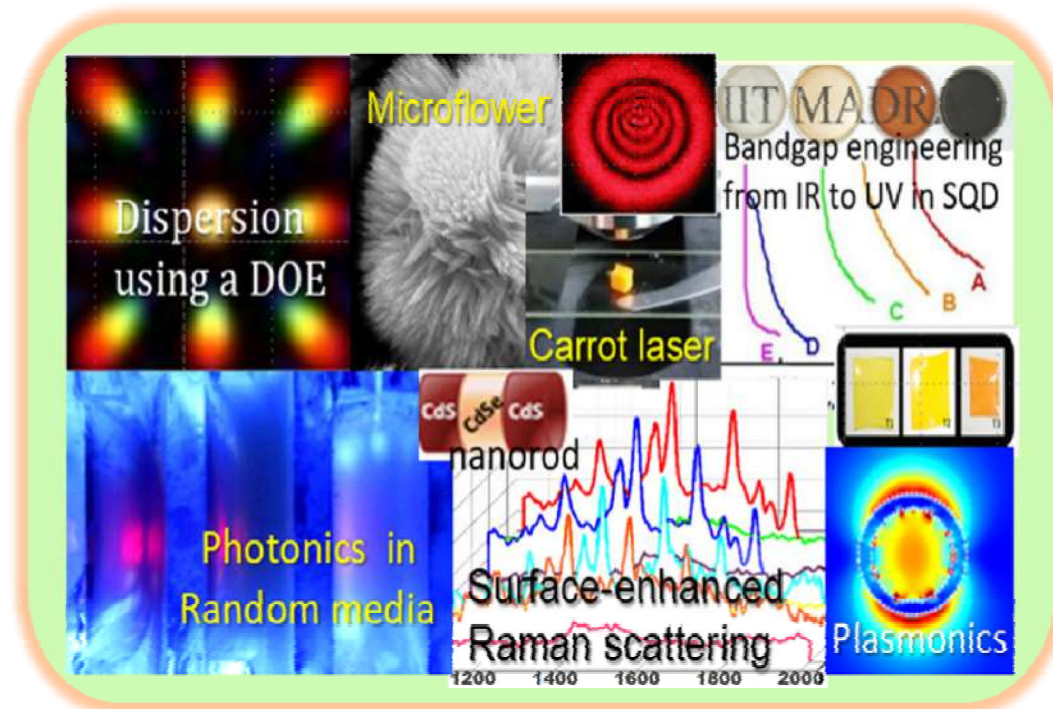
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Major Areas of Research

- Light-Matter Interaction in Novel Nano Composites and Random Media, Nanophotonics and Plasmonics



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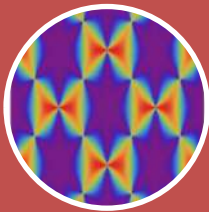
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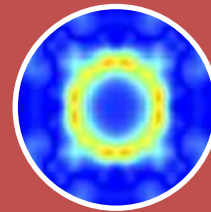
<https://physics.iitm.ac.in/yiqbal>



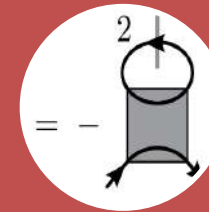
- Frustrated Magnets
- Quantum Spin Liquids
- Numerical Quantum Many-Body Techniques



Novel States of Quantum
Matter



3D Quantum Spin Liquids



Functional RG

← Search for exotic states of matter and developing their theoretical understanding →