



SURGE 2019



(STUDENTS-UNDERGRADUATE RESEARCH
GRADUATE EXCELLENCE)

ANNUAL REPORT



IIT KANPUR
Indian Institute of Technology, Kanpur



MESSAGE FROM DEAN, RESEARCH & DEVELOPMENT

Dear SURGE Friends,

Congratulations to all the 2019 SURGE fellows and their mentors on another successful summer!

The success of the program has been possible due to hard work of SURGE fellows, enthusiastic and dedicated faculty mentors, excellent support provided by staff members, and financial support by our illustrious alumni.

A record number of approximate 1400 applications were received from different colleges and 145 excellent students from different institutions and from IITK were welcomed to the IITK campus for SURGE.

I would like to congratulate all the members of SURGE family who made this summer so successful. Thanks to the SURGE Core Committee, for their invaluable leadership. Thanks to the all mentors who took time out of their busy summers to direct the boundless energy of SURGEians down the most illuminating path.

Finally, thanks to all of the friends and alumni whose donations help make SURGE financially possible. I applaud all of your tremendous generosity and look forward to your continued support.

Helping support the next generation of innovators is truly an investment in the future!

Thank you!

S. Ganesh

Dean of Research & Development

SURGE PROGRAM – AN OVERVIEW

IIT Kanpur launched an 8-week SURGE (Students-Undergraduate Research and Graduate Excellence) program in the summer of 2006. Under this program, a small number of selected undergraduate students from top engineering colleges from all over India are given an opportunity to explore research and to experience the academic atmosphere of IIT Kanpur. Students in second and third year of their academic program are selected from a large pool of applicants. The students get selected on the basis of their academic record, their research proposal & their technical achievements.

Under the SURGE program, students undertake short duration, but focused on research project and push their intellectual abilities beyond those driven by the classroom. The SURGE participants are required to give a mid-term presentation after four weeks, to a review committee consisting of a group of academic staff members. The review committee gives feedback and suggests possible improvements in the work. At the end of the program all the SURGE students make a poster presentation of the work carried out at IITK. The poster presentation is open to the public. It is also evaluated by faculty members.

This year, the scope of the SURGE Programme was extended to include candidates which were to be funded through projects of faculty members and also those who would not be receiving any funding at all. This desired expansion of the SURGE program was aimed at creating more impact of undergraduate internship through the established platform of SURGE.

As per current institute norms, SURGE can recently accept 60 students from Institute Funding, 120 students from Project Funding, 100 students under Self-Funded category and few students under Industry IITK tie-up. A maximum of 04 students from NEPAL + BHUTAN may be allowed to participate in the SURGE program. This year (in 2019), Two SAARC students (from Nepal) were selected under SURGE program

Few selected students are given stipend, all students are given a commendation certificate and those who produce exceptional quality research are given an award in addition to the certificate.

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FUNDING SURGE

The Dean of Resources and Alumni Office raises funds to support SURGE students from a variety of sources including gifts from individuals, foundations, and corporations. SURGE depends upon the generosity of its many friends for annual gifts or for contributions to the SURGE endowment to build a robust financial base. We thank the donors who have supported SURGE 2019 and beyond! Endowments help to ensure the future of the SURGE program and provide students with unparalleled research opportunities.

Special Thanks to: Batch 1977 and 1980, Shri N R Narayana Murthy

Institute Funded

This year 49 students received full support (stipend of Rs 12,500 for the eight-week summer program) while 11 students received partial support and two students from Nepal received full support from the funds raised from external sources.

Project Funded

This year 27 student's received stipend from institute projects (The suggested stipend for 8 weeks' duration is between Rs. 8000 to Rs. 12500).

Self-Funded

This year 56 students were selected in SURGE Program under the self-funded category.

Opportunities still available for new endowments

Individuals or batches may support in several ways to establish endowments—they may be paid in full at creation, given in instalments over a period. The contributors can be proud of the investment they have made in the future of bright and talented students, and the donors gain the personal satisfaction from playing an important part in the formation of young people, many of whom will make significant contributions to the nation and the world.

PARTICIPANTS OF SURGE 2019 FROM IITK

S.N.	Name	Mentor	Project Title
1	Abha Tamrakar	Dr. Y. M. Joshi	Linear and Non-linear Rheological Investigation of Thermoreversible Gel
2	Abhay Pratap Singh	Dr. Anurag Gupta	Mechanobiology of Plant Growth
3	Abhishek Agrawal	Dr. Raj Ganesh S. Pala	A study on Electropolishing of Copper and Kanthal (Alloy) using the Electroactive Surface Area (ESA) & Roughness Factor (RF) via potentiostatic techniques and modeling of Electropolishing on MATLAB
4	Ali Faraz	Dr. Ketan Rajawat	Energy optimal Path Planning for marine surface vehicles considering heading angle.
5	Aman Sethia	Dr. Durgesh C. Rai	Force on Arch Bridge
6	Amrit Kumar Arya	Dr. Animesh Mandal	Delineation of shallow crustal configuration based on inverse modeling of land gravity data in MATLAB
7	Anubhav Satpathy	Dr. K. S. VENKATESH	Disturbance detection in a static video using temporal median filtering
8	Arpit Bansal	Dr. Dibakar Ghosal	Bayesian Inversion For Porosity And Water Saturation
9	Arzoo	Dr. Sohini Sahu	Does internet search data enhance forecast of macroeconomic variables in India
10	Ashutosh Ranjan	Dr. Chinmoy Kolay	Experimental investigation of physical and mechanical properties of bamboo for the purpose of being used in Laminated Veneer Bamboo
11	Ayan Banerjee	Dr. Aditya K Jagannatham	Hybrid Precoding and Combining for Millimetre Wave Massive MIMO Wireless Communication Systems

12	Ayush Mishra	Dr. Sohini Sahu	Inflation Expectations using Twitter
13	Bashirul Islam Sheikh	Dr. Jonaki Sen	Expression analysis of NeuroD downstream targets in the developing forebrain of chick and mouse.
14	Deeksha Yadav	Dr. Sri Sivakumar	Development of Nanocatalysts for Hydrodesulfurization Reaction
15	Diprasom Das	Dr. Amitabha Bandyopadhyay	Identification of Down-Regulated genes due to BMP signalling in Bone
16	Harshit Verma	Dr. Santanu De	Developing Drag Models For Two Flow Model Simulation Of Gas-Solid Bubbling Fluidized Bed With Geldart B Particles
17	Japneet Singh	Dr. Vipul Arora	Generative Modelling for XY lattice model
18	Jay Gupta	Dr. Swaprava Nath	Skillcheck: A Blockchain based Evolution System
19	Jayant Ranwka	Dr. Sachin Shinde	CFD of a Pitching Plate
20	Jinang Rupeshbhai Shah	Dr. Preeti Malakar	Machine Learning-based Performance Prediction of Parallel Applications using Hardware Counters
21	Kanishka	Dr. Vishal Agarwal	Rare Event Simulations Based Study of Methane Decomposition on Liquid Tellurium
22	Kuldeep Singh	Dr. Raju Kumar Gupta	Enhancing Conductivity of the glass substrate through Polyaniline coating
23	Mataria Pence Jagatkumar	Dr. Indranil Saha	Precision Agriculture using MAVs
24	Mohit Yadav	Dr. Vipul Arora	Electroencephalography controlled wheelchair
25	Naveen Balaji	Dr. Mangal Kothari	Decentralized Swarming of Unmanned Aerial Vehicles with Minimum Computation
26	Navodit Chandra	Dr. Kamal K Kar	Study of water management in PEM fuel cell gas flow channels using lattice Boltzmann method

27	Neelesh Kumar Vij	Dr. Shilpi Gupta	Controlling Solid State environment of Quantum Dots
28	Nitish Vikas Deshpande	Dr. Vipul Arora	Score Following-Audio to Score Alignment
29	Nupur Mehra	Dr. Naveen Tiwari	Impact of nonionic surfactant and surfactant-SiO ₂ nanoparticle interaction on the wettability of surfaces: An experimental approach
30	Piyush Patel	Dr. Salil Goel	SLAM for UAVs
31	Pragya Patel	Dr. Sanjay Kumar	Visualization of shocks due to granular flow around a circular cylinder
32	Prajwal Samal	Dr. Anand Kumar Jha	Measurement of Orbital Angular Momentum spectrum of Pure State Paraxial Fields
33	Priyanshu Saxena	Dr. Pankaj Wahi	Prosthetic Hand
34	Pulkit Nijhawan	Dr. Bikramaditya Datta	Economics of Market for Personal Information
35	Rakshit Paurwal	Dr. Ashu Jain	Statistical Downscaling of Rainfall Using Artificial Neural Network
36	Rakshit Verma	Dr. Nishchal Kumar Verma	Low Light Image Enhancement using Adaptive Log Transformation
37	Ratnangshu Das	Dr. Arun Kumar Saha	Stability analysis of the wake past a square cylinder
38	Rudraraju Sai Vishnu Varma	Dr. Malay K Das	Phase Field Lattice Boltzmann Simulations of Water Transport in PEM Fuel Cell Gas Channel
39	Sabhay Jain	Dr. Aditya K Jagannatham	MIMO
40	Sagnik Bhattacharya	Dr. Raghunath Tewari	Minimum Path Isolation in non-planar 3D grid graphs
41	Sagnik Mukherjee	Dr. Raghunath Tewari	Minimum Path Isolation in non-planar 3D grid graphs
42	Saket Arora	Dr. Raju Kumar Gupta	Wet spinning of GO fibers
43	Saksham Katiyar	Dr. Ashoke De	Fire simulation using FDS
44	Saksham Mittal	Dr. Anurag Tripathi	High Speed Granular Chute Flow Simulations
45	Samarthya Sahu	Dr. Salil Goel	Unmanned Aerial Vehicle Traffic Management System (UTMS)

46	Sandeep Kumar Routray	Dr. Vinay P Namboodiri	Height Invariant Object Detection of Aerial Images Using Domain Adaptation
47	Sanket Anand	Dr. Anand Kumar Jha	Probing the near field distribution of signal beam in SPDC
48	Sarasij Banerjee	Dr. Indranil Saha Dalal	Computational aspects of phase transitions at the molecular level
49	Sathvik Bhagavan	Dr. Bishakh Bhattacharya	Design and Analysis of Transmission Line Inspection Robot
50	Saurabh Sharma	Dr. Sohini Sahu	Predicting the stock market and developing a profitable trading strategy with the help of google trends.
51	Shashank Kumar Buchasia	Dr. Bishakh Bhattacharya	Design and development of Power Substation Monitoring Robot
52	Shashi Ranjan	Dr. Bishakh Bhattacharya	Theoretical Modeling of Piezoelectric Energy harvesting from vortex induced vibration
53	Shibalik Lahiri	Dr. Debrata Goswami	Quantum Information processing through light-matter interaction
54	Shreyash Raj	Dr. Nitin Gupta	Positive Thinking through Games
55	Siddiqui Mohd Osama	Dr. Somnath Bhowmick	Phase Transformations in Fe using Classical Molecular Dynamics
56	Sunamya Gupta	Dr. Rahul Mangal	Active Emulsions
57	Suyash Singh	Dr. Mohit Law	Characterisation of an Electro-Hydraulic Exciter for Active-damping of Structural Vibrations
58	Tayade Akhilesh Kishor	Dr. Jonaki Sen	The role of Wnt - PCP Signalling in the forebrain development
59	Ujjwal Pratap Singh	Dr. Kaustubh Kulkarni	Interdiffusion in Cu-Si and Cu-Mn system
60	Vaibhav Jindal	Dr. Vinay P Namboodiri	Height Invariant Object Detection in Aerial Images Using Unsupervised Domain Adaptation

61	Varun Rajesh Gadre	Dr. Sachin Shinde	Comparison of ALE and IBM methods
62	Vivek Agrawal	Dr. Indranil Saha	Shared Autonomy via Deep Reinforcement Learning and Formal Methods
63	Yash Raj Singh	Dr. Abhishek	Design and Optimization of Multirotor UAVs
64	Yash Verma	Dr. Arun Kumar Saha	Kinetic Energy Budget Of Fluid Flow Under Partial Suppression Of Vortex Shedding Due To Square Control Cylinder
65	Yatin Azad	Dr. Nitin Gupta	The GMT Project, Games to treat mental illness

PARTICIPANTS OF SURGE 2019 AT IITK FROM OTHER UNIVERSITIES

S.N.	Name	Institute Name	Mentor	Project Title
1	Aditya Ramnarayan	MIT Manipal	Dr. Pranav Joshi	On the velocity and frequency variation in the vertical Y direction in the wake of a circular cylinder.
2	Aditya Singh Chauhan	Vellore Institute Of Technology	Dr. Shashank Shekhar	Modelling and optimization of Johnson-Cook parameters for SS 316L deformed under high strain rate machining
3	Aditya Uday Manolkar	College Of Engineering Pune (COEP)	Dr. Chandraprakash	Volumetric ultrasound imaging technique using one dimensional transducer array.
4	Ahmad Faiz Khan	Jamia Millia Islamia	Dr. Richa	Modelling of Flow of Water through soil using Unsaturated Soil Parameters
5	Anchal Gupta	Amity University Noida Campus	Dr. Santosh Kumar Misra	Optimization of a Protocol for Preparing an Efficient Biosensing Surface Using Carbon-Nanomaterial Composites by Post-mixing Method
6	Angira Katyayan	SRM Institute Of Science & Technology	Dr. Amey Karkare	Prutor - online tutoring system
7	Anjali Singh	Madan Mohan Malaviya University Of Technology, Gorakhpur	Dr. Anubha Goel	Study Of Technologies That Can Be Used As Interventions To Improve Indoor Air Quality
8	Ankit Behera	National Institute Of Technology, Rourkela	Dr. P K Panigrahi	Design and optimization of miniature Compact Heat Exchanger for cooling computer circuits using CFD
9	Annanya	Miranda House, University Of Delhi	Dr. R. Vijaya	Understanding the role of Reflection and Interference in Optical Devices
10	Anubhav Dasgupta	Indian Institute Of Engineering Science And Technology, Shibpur	Dr. Tapan Sengupta	Flow Instabilities and Receptivity Analysis for Falkner-Skan similarity profiles

11	Anurag Purbey	Vellore Institute Of Technology, Vellore	Dr. Ishan Sharma	Pulsatile flow in rigid tube
12	Anwasha Barik	National Institute Of Technology, Rourkela	Dr. Dibyendu Das	Role of Hemagglutinin in Bat Influenza Virus Entry
13	Anwasha Dash	Veer Surendra Sai University Of Technology	Dr. Mohit Law	Chatter mitigation in boring bars with Tuned Mass Dampers
14	Arnab Nandy	Indian Institute Of Engineering Science And Technology, Shibpur	Dr. Utpal Das	Design of Barriers for Reduction of Dark Current in T2SL Mid-IR Photodetectors
15	Arunima Khunteta	National Institute Of Technology, Hamirpur	Dr. Aditya K Jagannatham	Performance Analysis of Different Sparse Signal Recovery Algorithms
16	Asmita Samanta	Manipal Institute Of Technology	Dr. Anoop Singh	Impact Analysis of Rooftop Solar PV Systems on DISCOMs and Consumers
17	Bidipta Ghosh	NIT Durgapur	Dr. Raju Kumar Gupta	Synthesis Of Boc/Bv Heterojunction Photocatalyst Towards Degradation Of Pharmaceutical Pollutants
18	Bishan Debnath	Indian Institute Of Engineering Science And Technology, Shibpur	Dr. Ashish Dutta	Human Robot Interaction (HRI) between a mobile manipulator and a human carrying an object together
19	Ch Prabhanjan Patro	IIT(ISM), Dhanbad	Dr. Arvind Kumar	Numerical Simulation of Droplet Impact onto a solid substrate
20	Chandraprakash Tiwari	Harcourt Butler Technical University , Kanpur	Dr. R. Gurunath	Data mining for the analysis of Iron containing Metalloproteins
21	Chetan Vashishtha	Vellore Institute Of Technology	Dr. Bishakh Bhattacharya	Energy harvesting by Vortex Induced Vibration (VIV)

22	D. Sharda Devi	NIT Raipur	Dr. Y N Singh	Event-driven Simulation for Optical Networks
23	Debankana Bhattacharjee	Indian Institute Of Engineering Science And Technology, Shibpur	Dr. G. Pahar	A Zero Inertia Model for Coastal Flood Inundation
24	Debjit Kundu	JADAVPUR UNIVERSITY	Dr. Ashoke De	Numerical prediction of liquid atomization using Hybrid Eulerian-Lagrangian approach
25	Deepanshu Singla	VIT	Dr. Saravanan Matheshwaran	Role of Alkyl transferase like proteins in Mycobacterium tuberculosis
26	Devanshi Handa	DIT University	Dr. Prabhat Munshi	Thermal Hydraulic analysis of a Nuclear Fuel Rod Subassembly
27	Devanshu Mishra	R V College Of Engineering	Dr. Sandeep K. Shukla	Dynamic Anomaly Detection on Apache Logs
28	Devendra Singh Parihar	Madhav Institute Of Technology & Science, Gwalior	Dr. Yogesh S Chauhan	Analog Circuit Design using BJT
29	Dheeraj Bhogisetty	Visvesvaraya National Institute Of Technology, Nagpur	Dr. Ashish Dutta	Impedance control for mobile manipulator and Human carrying an object together.
30	Diyanko Bhowmik	Jadavpur University	Dr. Pankaj Wahi	Design and Development of a Contactless Electromagnetic Actuator
31	Gaurav Kesari	Harcourt Butler Technical University, Kanpur	Dr. Pankaj Wahi	Passive mechanism for foot motion coordinated with a passive knee mechanism for gait replication
32	Harsh Sharma	NIT Kurukshetra	Dr. Vaibhav Arghode	Estimation of Surface Tension of aluminium and nickel nanoparticle by adiabatic coalescence using Molecular Dynamics

33	Harshit Kumar	NIT Hamirpur	Dr. Satyadev Nandakumar	A Linear Lower Bound in the Bit-Probe Model
34	Hassan Yazdani	IISER PUNE	Dr. R. Vijaya	Sub-micron-thick metasurfaces and their effect on incident light.
35	Himanshu Sahu	IIT (BHU) Varanasi	Dr. Chandraprakash	Design And Development Of Robust, Low-Cost Mechanism For The Removal Of Water Hyacinth.
36	Hrithik Das	Motilal Nehru National Institute Of Technology, Allahabad	Dr. J. Ramkumar	3D Micro/Nano Structures: Characterization, Fabrication and Automation using Two Photon Polymerization
37	Jayanta Ghosh	NIT Durgapur	Dr. Ketan Rajawat	Design of a Communication Architecture for Unmanned Aerial Vehicle (UAV) Swarm Networks
38	Joydeep Mukherjee	Techno India ,Saltlake	Dr. Sudib Kumar Mishra	Vibration Control Of Ten Storey Building By Tune Mass Damper
39	Kajal Gupta	Indian Institute Of Engineering, Science And Technology, Shibpur	Dr. A. Kushari	To develop a single stage axial flow turbine test rig
40	Kaustuv Ghosh	IISER - Mohali	Dr. Jonaki Sen	Understanding the function of the metabolism related genes CNKSR2 and PHACTR1 in the developing chick forebrain
41	Krishna Kant Gupta	Dr. Akhilesh Das Gupta Institute Of Technology And Management	Dr. Anubha Goel	Monitoring parameters of IAQ of offices inside IIT Kanpur to assess likely influence on health and wellbeing of employees
42	Krishnam Bhavika	Mahindra Ecole Centrale	Dr. A R Harish	Real time location tracking system using BLE
43	Logesh M	Sri Krishna College Of Technology	Dr. J. Ramkumar	Computational biomechanics techniques used in occupational safety and ergonomics

44	Manisha	Banasthali Vidyapith	Dr. Chandraprakash	Estimation of Properties of Material from Video
45	Manisha Jogi	Mahindra Ecole Centrale	Dr. A R Harish	Real Time Location System using BLEs
46	Meghna Hooda	SRM University, Delhi NCR, Sonapat	Dr. Swarnendu Biswas	Exception Checking Removal To Increase The Speed of Pypy Interpreter
47	Mohammad Shahid Habib Khan	VIT, Chennai Campus	Dr. Sanjay Mittal	Numerical Simulation of Flow Past Two Circular Cylinders with Attached Splitter Plates
48	Mullai	SCSVMV	Dr. Satyadev Nandakumar	Active Noise Cancellation using Markov Chain Monte Carlo
49	Nayonika Rahut	Heritage Institute Of Technology	Dr. Amitabha Bandyopadhyay	Construction of microRNAs to validate downregulation phenomenon of the genes downstream of BMP signaling pathway
50	Nehal Ansh Srivastava	Manipal Institute Of Technology	Dr. Samit Ray Chaudhuri	Retrofitting of Unreinforced Masonry
51	Nikhil Malviya	Motilal Nehru National Institute Of Technology, Allahabad	Dr. Sameer Khandekar	Exploring spray cooling for thermal management of high power electronic devices
52	Nishant Gupta	NIT, Hamirpur	Dr. Nitin Kaistha	design and control of extractive distillation column for separation of homogeneous binary azeotrope using a heavy entrainer
53	Omkar Mohapatra	NISER, Bhubaneswar	Dr. A.K. Patra	Copper complexes of saccharin and terpyridine derivatives, Synthesis, Structure, Biological interactions and DNA binding affinity
54	Palak Tripathi	UCER Allahabad	Dr. Biswabandan Panda	Instruction Prefetching for Servers

55	Paroma Roy Chowdhury	Ashoka University	Dr. Praveen Kulshreshtha	Net Neutrality and Zero-Rating Services
56	Prashant Sharma	National Institute Of Technology, Rourkela	Dr. A.K. Singh	Study of Chromium partition in the Synthetic Slag during Steelmaking process using FactSage software
57	Praveen Kumar Upadhyay	NIT Kurukshetra	Dr. Niraj Sinha	Evaluation of Compressive Strength of Borate Based Bioactive Glass Scaffold During In Vitro Immersion Test
58	Priya Katiyar	DY. Patil Biotechnology	Dr. Nitin Mohan	Microtubule-PTMs, Motors, MAPs, their interactions, regulations, implications in neurodegeneration- A Literature Survey
59	Priyamvada Singh	Sri Venkateswara College,DU	Dr. Dibyendu Das	Study of the Structure and Function of the EBOLA Virus glycoprotein for its entry into the host cell
60	Pujika Kumar	BITS PILANI	Dr. Laxmidhar Behera	Designing an efficient manipulator using RNN and object detection using CNN
61	Rahul Vishnu Narkhede	Sardar Vallabhbhai National Institute Of Technology, Surat	Dr. Niraj Sinha	Robocasting of Borate Based Bioactive Glass Scaffolds for Bone Tissue Engineering
62	Rajesh Layek	NIT Jamshedpur	Dr. Sudhanshu Shekhar Singh	Effect of Machining on the Microstructure and Corrosion Behaviour of Al7075 Aluminium Alloy
63	Rohit Misra	National Institute Of Technology Warangal	Dr. Naren Naik	Focused Phased Array Design and Analysis for Volumetric Ultrasound Probes
64	Saikat Mishra	Bankura Unnayani Inst Of Engg	Dr. Sudib Kumar Mishra	Vibration Control of buildings under Seismic Excitations
65	Sanjay Pal	Jadavpur University	Dr. P. Ghosh	VERTICAL VIBRATION OF SQUARE FOOTING ON LAYERED MEDIA

66	Sarthak Banerjee	Jadavpur University	Dr. Sameer Khandekar	Ferrofluid plug based valve for microfluidic applications
67	Satyam Srivastava	U.I.E.T. C.S.J.M. UNIVERSITY	Dr. Jayant K Singh	Experimental investigation of the effect of different salts on the surface and interfacial tension of n-hexadecane/water system with or without non-ionic surfactant and silicon dioxide nanoparticles
68	Shivam Sharma	National Institute Of Technology, Hamirpur	Dr. Nitin Gupta	Tag Suggestion and Post Recommendation System.
69	Shiwani Sharma	NIT Durgapur	Dr. Santanu De	Numerical study of particle laden flow in a fast fluidized bed
70	Shruti Srivastava	Central Institute Of Plastics Engineering And Technology Lucnow	Dr. Anish Upadhyaya	Sintering Studies on Particulate Copper Compacts
71	Stuti Gupta	Motilal Nehru National Institute Of Technology (MNNIT) Allahabad	Dr. Amitabha Bandyopadhyay	To identify novel downstream targets of Wnt signalling during articular cartilage differentiation
72	Subhrasmita Sahu	National Institute Of Technology, Rourkela	Dr. P. Sen	Site Specific Study of Red Edge Excitation Shift of a Multidomain Protein
73	Tanay Pratik	R.V.College Of Engineering	Dr. Anshu Gaur	Solution Processed High-k Gate Dielectrics for Emerging Large Area and Flexible Electronics
74	Taral Patel	NIT Patna	Dr. Pranav Joshi	Study and Analysis of formation of boundary layer over a flat plate for time varying free stream velocity
75	Uday Raj Singh	Amity Institute Of Aerospace Engineering, Noida	Dr. P. Mohitey	Mechanical characterization of prepreg based composite
76	Utkarsh Ahuja	Indian Institute Of Information Technology, Pune	Dr. Vipul Arora	Smart Tutor

77	Vakulabharanam Mounika	Mahindra Ecole Centrale	Dr. A R Harish	Real time location system using BLE gateways
78	Vandita Verma	Amity Institute Of Biotechnology	Dr. S Ganesh	Understanding the effect of dual stresses on cell survivability and mitochondrial dynamics
79	Vedashree Vijay Mankar	VNIT	Dr. Balaji Devaraju	Relationship between GRACE water storage change and NDVI values
80	Vidiyala Varun	SVNIT, SURAT	Dr. Vaibhav Arghode	Simplified Model For Directional Air Delivery Through Louvers

ABSTRACTS: SURGE 2019 RESEARCH PROJECTS DONE AT IIT KANPUR

Linear and Non-linear Rheological Investigation of Thermoreversible Gel

Abha Tamrakar, Mentor: Dr. Y. M. Joshi

An important characteristic of pluronic solutions is their temperature dependent self-assembling and thermo-gelling behaviour. Concentrated aqueous solutions of pluronic are liquid at a low temperature and form a gel at a higher temperature in a reversible process. The thermoresponsive sol-gel transition of aqueous Pluronic F-127 solution is under study by rheometry for various concentrations.

Mechanobiology of Plant Growth

Abhay Pratap Singh, Mentor: Dr. Anurag Gupta

This model of elastic rod is obtained by assuming that the rod is unshearable and inextensible with a diagonal constitutive relationship. Morphoelastic rods are thin bodies which can grow and can change their intrinsic curvature and torsion. Theory of elastic rods is extended to combine all aspects of growth and remodelling by considering the evolution of the reference configuration separately from the mechanical response of the rod.

A study on Electropolishing of Copper and Kanthal (Alloy) using the Electroactive Surface Area (ESA) & Roughness Factor (RF) via potentiostatic techniques and modeling of Electropolishing on MATLAB

Abhishek Agrawal, Mentor: Dr. Raj Ganesh S. Pala

Electropolishing is a process used for cleaning and polishing surfaces of metals. The project includes the study of electropolishing on ECSA via potentiostatic techniques and EIS, to find out the factors affecting it. Simulations for the same are being worked upon.

On the velocity and frequency variation in the vertical Y direction in the wake of a circular cylinder.

Aditya Ramnarayan, Mentor: Dr. Pranav Joshi

The velocity and frequency variations of the wake behind a circular cylinder has been studied in detail by Prasad & Williamson, Cantwell & Coles, T Karasudani & M. Funakoshi and many other researchers.

The velocity and frequency variations at various points in the downstream of the wake has been studied in detail by making use of parameters such as Strouhal number etc. However, the variation of velocity and frequency in the vertical y direction hasn't been investigated in detail. This literature aims to answer many of the unanswered questions regarding these discrepancies with regard to the vortex dynamics at the downstream of a bluff body.

The measurement technique used for the experiment is hot wire anemometry in the wind tunnel present at IIT Kanpur. Smoke-wire method is used for the visualization of the flow past the circular cylinder.

Modelling and optimization of Johnson-Cook parameters for SS 316L deformed under high strain rate machining

Aditya Singh Chauhan, Mentor: Dr. Shashank Shekhar

The aim of the project is to determine the Johnson Cook constitutive equation parameters for 316L stainless steel using optimization algorithm with data available for strain, strain rates and temperature rise. We will be considering linear regression in MATLAB for parameter determination.

Volumetric ultrasound imaging technique using one dimensional transducer array.

Aditya Uday Manolkar, Mentor: Dr. Chandraprakash

Volumetric images can be obtained using 2D phased array transducers. However, this technique is cumbersome and such probes are expensive. We are trying to investigate whether it is possible to add volumetric imaging capability to existing 1 dimensional ultrasound systems at minimal cost.

Modelling of Flow of Water through soil using Unsaturated Soil Parameters

Ahmad Faiz Khan, Mentor: Dr. Richa

We are trying to find the flow pattern of water in soil. We can do this by 3 D modelling of water. It will tell us how the water is infiltrating into the soil during the season of Kharif crop.

Energy optimal Path Planning for marinesurface vehicles considering heading angle

Ali Faraz, Mentor: Dr. Ketan Rajawat

Motion planning is a term used in robotics to find a sequence of valid states in the allowed configurations of the robot that moves the robot from the source to destination. In my quest of understanding motion planning, I have gone through various terms related to the field and also implemented some of the algorithms of this field. I have gone through a course on coursera.com on computational motion planning in order to improve my understanding. In this course, I became familiar to and implemented some of the graph based planning methods like Grassfire, Dijkstra's and A* algorithms. I also came to know about the concept of configuration space and methods like trapezoidal decomposition and implemented them. Then I also implemented Probabilistic Road Maps and RRT(Rapidly-exploring Random Trees) algorithm. Lastly, I became familiar with the concept of Artificial Potential Fields and implemented it through a programming assignment. Having these as the basics, I am currently looking forward to implementing two research papers on the topics: 1) Streamlines for motion planning in Underwater Currents & 2) Energy-Optimal Kinodynamic Planning for Underwater Gliders in Flow Fields.

Force on Arch Bridge

Aman Sethia, Mentor: Dr. Durgesh C. Rai

My project is about simulation of how the force is transferred to primary member of bridge and how the situation differ in actual as compared to simulation in software like SAP2000.

Delineation of shallow crustal configuration based on inverse modeling of land gravity data in MATLAB

Amrit Kumar Arya, Mentor: Dr. Animesh Mandal

Subsurface density modeling based on observed gravity anomaly can help us to decipher crustal configuration of a region thereby provides important information related to natural resources and/or structural features of the region. Present study aimed at 3D modeling of gravity anomaly data using Fast Proximal Objective Function (FPOF) optimization technique - an advancement of conjugate gradient method. Modeling is carried out by gridding the subsurface into n different cuboidal prism bodies of equal dimension. The FPOF optimization is applied over the gridded surface to calculate each unknown element of the model space independently at each iteration.

Optimization of a Protocol for Preparing an Efficient Biosensing Surface Using Carbon-Nanomaterial Composites by Post-mixing Method

Anchal Gupta, Mentor: Dr. Santosh Kumar Misra

Early detection of biological events, especially in diseased conditions, give immense chance for better treatments and therapy. Biosensors have been developed in recent past to provide these advantages in efficient way. One of the most important components of biosensors is biosensing surface. It generally regulates the sensitivity and efficiency of sensing process by controlling responsiveness.

Prutor - online tutoring system

Angira Katyayan, Mentor: Dr. Amey Karkare

Prutor is a tutoring system platform that utilizes a project-based approach to conduct introductory programming courses. It is a cloud-based web application that allows the user to remain unbothered by external dependencies like compilers and compiler options.

Study Of Technologies That Can Be Used As Interventions To Improve Indoor Air Quality

Anjali Singh, Mentor: Dr. Anubha Goel

Indoor air is contaminated by smoke, chemicals, gasses and particles and indoor air Pollution puts our life in danger. Although source control is the universally preferred approach to reduce contaminants from air, this is becoming increasingly insufficient, technically unfeasible or economically unviable. To control indoor pollution, we generally provide enough ventilation, but it is also not much effective due to poor outdoor air quality. This is leading to seal off indoor spaces (buildings), which can increase exposure to endogens like tissues, micro-organism in indoor air, which increases health risks and decrease concentration in learning and productivity. My work is to search indoor air purification technologies being used as interventions in key indoor microenvironments. Preliminary examination suggests that air filtration produces clear reductions in indoor pollution concentrations.

Design and optimization of miniature Compact Heat Exchanger for cooling computer circuits using CFD

Ankit Behera, Mentor: Dr. P K Panigrahi

The project is about designing a small size heat exchanger. The heat exchanger should be compact and as small as possible. After setting the dimensions the simulations are done by CFD. The design is optimised for efficiency based on the results obtained.

Understanding the role of Reflection and Interference in Optical Devices

Annanya, Mentor: Dr. R. Vijaya

Reflection is a source of loss in optical devices, such as solar panels and reduces their efficiency. Anti-reflection coatings are studied and can be used in order to increase their efficiency. Other than that, the effect of coherence on interference of light is being analyzed.

Flow Instabilities and Receptivity Analysis for Falkner-Skan similarity profiles

Anubhav Dasgupta, Mentor: Dr. Tapan Sengupta

Instabilities of flow in Blasius and Falkner-Skan profiles occur due to disturbances in the flow field. The Orr-Sommerfeld equation, which incorporates the assumption that if the shear layer grows very slowly, the flow can be considered parallel, is the governing equation for investigation of flow instabilities. Instability and transition are not synonymous; the onset of instabilities.

Disturbance detection in a static video using temporal median filtering

Anubhav Satpathy, Mentor: Dr. K. S. Venkatesh

Given a video which is almost static in the temporal domain with minuscule but detectable disturbance in between, the project aims to detect such disturbances and the time instants at which they occur. The algorithm uses temporal median filtering which is also a common background extraction method. This project can be applied in various fields such facial behavior analysis, video surveillance etc.

Pulsatile flow in rigid tube

Anurag Purbey, Mentor: Dr. Ishan Sharma

We are trying to simulate the Nadi pariksha technique by modeling the apparatus. We are using an acrylic pipe and we are creating a hole in the pipe. Then on the end of the pipe, we will attach a pulsatile pump which will pump water at around 60-200 BPM. We are attaching a rubber diaphragm on the hole and measure the displacement using a laser triangulation sensor.

Role of Hemagglutinin in Bat Influenza Virus Entry

Anwasha Barik, Mentor: Dr. Dibyendu Das

In this project, we were made to understand the entry of bat influenza viruses into human cells. The major bat influenza A virus haemagglutinin does not bind the canonical influenza A virus receptor, sialic acid despite its high sequence and structural homology with conventional haemagglutinins. Using transcriptomic profiling of susceptible versus non-susceptible cells.

Chatter mitigation in boring bars with Tuned Mass Dampers

Anwesha Dash, Mentor: Dr. Mohit Law

My project is about suppressing chatter in machining processes, specifically boring. The boring bars are cantilever structures. Chatter is a form of unstable vibration which reduces productivity. Tuned mass dampers are used to mitigate chatter in this project.

Design of Barriers for Reduction of Dark Current in T2SL Mid-IR Photodetectors

Arnab Nandy, Mentor: Dr. Utpal Das

The T2SL photodetector dark-current density is a hindrance in its practical implementation, especially in the MWIR range. Some of the important bulk dark current components are thermally generated carriers in the absorbing region and the minority diffusion current from the contact regions to the absorbing region. Our objective is to create efficient barriers and structures in these devices.

Bayesian Inversion For Porosity And Water Saturation

Arpit Bansal, Mentor: Dr. Dibakar Ghosal

Rocks saturated with gas often show high attenuation and frequency dependence of seismic properties. We develop a Bayesian inversion scheme which allows probability distributions for porosity and saturation to be derived from pre-seismic data.

Seismic amplitudes contain important information about rock saturation. Seismic amplitude can be studied by amplitude vs offset analysis of seism.

Implementation of Sparse Signal Recovery in Python

Arunima Khunteta, Mentor: Dr. Aditya K Jagannatham

The project is based on the implementation of various algorithms used in Sparse Signal Recovery. Sparse Signal Recovery is the process where we recover the signal that we have sent from fewer sensors on the receiver side, with an assumption that the signal is sparse (that is having more number of zeros than values). We do so by a number of algorithms namely, Orthogonal Pursuit Matching (OMP), SOMP (Simultaneous Orthogonal Pursuit Matching), SBL (Sparse Bayesian Learning), LASSO, etc. The aim of this project is to implement these projects in python and compare the results and efficiency of these algorithms.

Does internet search data enhance forecast of macroeconomic variables in India

Arzoo, Mentor: Dr. Sohini Sahu

Macroeconomic data are typically published with a time lag. This has led to a growing body of research on nowcasting. Nowcasting uses currently available data to provide timely estimates of macroeconomic variables weeks or even months before their initial estimates are produced. The availability of internet search data has provided a new resource for researchers interested in nowcasts or short-term forecasts of macroeconomic variables.

Experimental investigation of physical and mechanical properties of bamboo for the purpose of being used in Laminated Veneer Bamboo

Ashutosh Ranjan, Mentor: Dr. Chinmoy Kolay

This project basically emphasizes on the experimental study of bamboo by performing tests of both physical and mechanical properties of bamboo. In order for the bamboo

to be used in Laminated Veneer Bamboo, it should pose certain desirable properties like it should have low moisture content, high density, low shrinkage, high bending, compressive, tensile and shear stress.

Impact Analysis of Rooftop Solar PV Systems on DISCOMs and Consumers

Asmita Samanta, Mentor: Dr. Anoop Singh

This project aims to analyze the commercial impact of Rooftop Solar PV Systems on DISCOMs and consumers based on the solar PV system capacity and tariff of the region.

Hybrid Precoding and Combining for Millimetre Wave Massive MIMO Wireless Communication Systems

Ayan Banerjee, Mentor: Dr. Aditya K Jagannatham

Hybrid precoding/combining appears to be an effective way to reduce hardware implementation complexity, especially for mmWave massive MIMO networks. In this project, we have considered a hybrid model in which analog processing leverages antenna array response vectors to obtain power gains. Subsequently, digital processes such as maximal ratio combining (MRC) or zero forcing (ZF) are performed.

Inflation Expectations using Twitter

Ayush Mishra, Mentor: Dr. Sohini Sahu

Social media in recent years have become an important source of public expression in every field, we try to harness this technological advance for calculation of an important practical quantity like Inflation expectation. The advantage with social media approach, if it is a success, are numerous.

Expression analysis of NeuroD downstream targets in the developing forebrain of chick and mouse.

Bashirul Islam Sheikh, Mentor: Dr. Jonaki Sen

The cerebral cortex is the anteriormost and largest part of the brain in mammals and is involved in many processes such as perception, learning, decision-making, etc. NeuroD is an important factor in the development of the cerebral cortex. In my project, I am investigating the downstream targets of NeuroD in the developing forebrain of chick and mouse.

Synthesis Of Boc/Bv Heterojunction Photocatalyst Towards Degradation Of Pharmaceutical Pollutants

Bidipta Ghosh, Mentor: Dr. Raju Kumar Gupta

In this project work, our main objective is to degrade recalcitrant pharmaceuticals present in waste water using heterojunction photocatalyst. we have developed Bi₂O₂CO₃/BiVO₄, a binary heterojunction photocatalyst for this purpose. Some catalyst characterizations are made to study the morphology, structure, optical behaviour and surface charge of the developed photocatalyst .

Human Robot Interaction (HRI) between a mobile manipulator and a human carrying an object together

Bishan Debnath, Mentor: Dr. Ashish Dutta

Human-Robotic Interaction has significant advantages over generic robotic applications. The problem statement of the project is to design and build a robot for a collaborative task with a human operator. To achieve the goal that is, an interaction of the robot and the human, an Impedance controller is being developed.

Numerical Simulation of Droplet Impact onto a solid substrate

Ch Prabhanjan Patro, Mentor: Dr. Arvind Kumar

Numerical models are prepared using ANSYS Fluent to observe the spreading, splat formation and air entrapment for 2 sequential molten molybdenum droplets impact and for another case of a water droplet impacting a substrate.

Data mining for the analysis of Iron containing Metalloproteins

Chandraprakash Tiwari, Mentor: Dr. R. Gurunath

Metalloproteins have a great untested potential in applications as metalloenzymes for pollutants degradation, one such enzyme is novel dimethylformamidase (DMFase), an amidohydrolase produced by Paracoccus species strain DMF, isolated in IIT Kanpur, typical thing with this DMFase is that it utilizes iron atom for its activity that is coordinated by two phenolic groups like tyrosine side chain n, in its natural form. Iron (Fe) atoms are found in many metalloproteins naturally and are known to perform a variety of chemical and structural functions. Data Mining helps analysts to recognize significant facts, relationships, trends, patterns and anomalies that might go unnoticed otherwise, along with collecting useful data of interest. Thus, data mining of Cambridge Structural Database (CSD) and Protein Data Bank (PDB) database will help in gathering useful information related to various iron atom containing metalloproteins, that will help in understanding metal-ligand interactions and structural-functional possibilities.

Energy harvesting by Vortex Induced Vibration (VIV)

Chetan Vashishtha, Mentor: Dr. Bishakh Bhattacharya

With the increase in demand of energy day by day the conventional sources of energy are failing us. Non-conventional methods are the alternates on which we are solely dependent. This research project focuses on building a low-cost alternative to harvest electrical energy from water flow. An in-house experimental apparatus is developed which calculate the power generated during the water flow. In accordance with the theory of flow, Von Karman vortices are shed around bluff body when a body is placed in a flowing water. A cantilever beam with a piezo strip is mounted at one end. The forces generated by vortices make the cantilever beam to vibrate periodically.

Event-driven Simulation for Optical Networks

D. Sharda Devi, Mentor: Dr. Y N Singh

This project is about designing a simulation for Optical Networks. We are using an event-driven simulation because it is very efficient than time-driven simulation. Here we are using Poisson arrival and exponential service of a connection. In this simulation, we will be finding paths between source and destination to set-up a connection request.

A Zero Inertia Model for Coastal Flood Inundation

Debankana Bhattacharjee , Mentor: Dr. G. Pahar

The depth-averaged governing equations (Shallow Water Equations) are often computationally expensive for a large region. The local and convective acceleration of flood-progression is often very small from a larger perspective, which may be utilized to derive Zero-Inertia equation. The 2D zero-inertia equation has been solved using the finite-difference method.

Numerical prediction of liquid atomization using Hybrid Eulerian-Lagrangian approach

Debjit Kundu, Mentor: Dr. Ashoke De

Multi-phase flows are encountered in several technical applications. Spray is an important phenomena under that category. Modeling of spray is complicated as well as important. In the present work, numerical simulations of spray are carried out, using OpenFOAM.

Development of Nanocatalysts for Hydrodesulfurization Reaction Deeksha Yadav, Mentor: Dr. Sri Sivakumar

The project is aimed at developing nanocatalysts which give higher conversion rate in the Hydrodesulfurization reaction. This reaction is used for desulfurizing the sulfur containing fuels using Hydrogen. From the environmental point of view, this is very important since the sulfur present in fuel converts to Sulfur Dioxide causing Acid rain. Thus, this project is an aim towards obtaining cleaner

Role of Alkyl transferase like proteins in Mycobacterium tuberculosis ***Deepanshu Singla, Mentor: Dr. Saravanan Matheshwaran***

Tuberculosis is among the major global health problem, which claims millions of lives annually. Mycobacterium tuberculosis the causal organism is a persistent bacteria that has the ability to persist in human macrophages for a long time. The genomic integrity of the organism is threatened by the harsh conditions put forth by the immune system and antibiotic treatment in the host macrophages. The DNA repair mechanism plays crucial role in genome maintenance and in vivo survival. Mycobacterial repair system is highly evolved and has multiple redundant pathways and enzymes to form a backup in repair. Modified alkylated guanine is both genotoxic and cytotoxic to the cell.

Thermal Hydraulic analysis of a Nuclear Fuel Rod Subassembly

Devanshi Handa, Mentor: Dr. Prabhat Munshi

Thermal hydraulic analysis using RELAP5/MOD3.4 has been carried out in an attempt to compare two different fuel cladding concepts of a Pressurized Water Reactor.

Dynamic Anomaly Detection on Apache Logs

Devanshu Mishra, Mentor: Dr. Sandeep K. Shukla

Dynamic Log based Intrusion Detection is developed using Apache server access log. The anomaly detection method is applied on log files is based on completely unsupervised technique. I have used unsupervised learning, which involved cluster

formation, followed by cluster mapping between the cluster of the previous time stamp and the succeeding cluster of the next time window, finding the overlapping score and accordingly designed algorithm to get all the valid cluster transitions (sizes) having overlapping score greater than certain threshold, in a list.

Analog Circuit Design using BJT

Devendra Singh Parihar, Mentor: Dr. Yogesh S Chauhan

Solid state device evolution started from diode, BJT and MOSFET. Presently, transistors are driving the integrated circuit (IC) technology. These devices are specifically used as switches for digital circuit design and as amplifiers for analog circuit design. In today's scenario, transistor is the best possible choice for analog design, due to its high speed feature.

Impedance control for mobile manipulator and Human carrying an object together.

Dheeraj Bhogisetty, Mentor: Dr. Ashish Dutta

The aim was to build a robotic system that works in collaboration with a human to carry an object. A basic mobile manipulator with a differential-drive and a 4-DOF arm on it was chosen. First, the kinematics of the mobile manipulator was studied and a control scheme was developed for the motion of the wheeled base and the manipulator expending minimum energy during its motion.

Identification of Down-Regulated genes due to BMP signalling in Bone

Diprasom Das, Mentor: Dr. Amitabha Bandyopadhyay

BMP is a group of growth factors which has the ability to induce bone formation in vertebrates. Mesenchyma cells are differentiated into osteoblasts due to dynamic gene expression. So during this process of bone development, BMP causes few genes to upregulate where few get down-regulated in this process of Bone development. My aim is to identify those down-regulated genes due to BMP signalling.

Design and Development of a Contactless Electromagnetic Actuator

Diyanko Bhowmik, Mentor: Dr. Pankaj Wahi

The project is based on designing a contactless electromagnetic actuator to apply a force on rotating or moving bodies. Applications for such actuators are immense as they can be used as an exciter of any ferromagnetic body without any contact, can be used in the high precision medical application, as a damper, etc. The project can be divided into roughly 3 parts, i.e. Design, Simulation, and Test.

Passive mechanism for foot motion coordinated with a passive knee mechanism for gait replication

Gaurav Kesari, Mentor: Dr. Pankaj Wahi

Kinematic synthesis of optimal four bar and six bar knee (Watt and Stephenson) mechanisms for gait replication and trans-femoral prosthesis is performed earlier without consideration of motion of the foot. A new four bar mechanism is synthesized using an optimization-based approach which will coordinate the motion of the foot with different optimized knee mechanism.

Estimation of Surface Tension of aluminium and nickel nanoparticle by adiabatic coalescence using Molecular Dynamics

Harsh Sharma, Mentor: Dr. Vaibhav Arghode

Surface properties of nanoparticle are the main characteristic that differentiates nanoparticles from bulk. The project focuses on the estimation of surface tension of aluminium and nickel nanoparticle using temperature rise due to the decrease in surface energy in coalescing nanoparticle. The nanoparticles that are to coalesce in their liquid state, specific heat and density are considered constant.

A Linear Lower Bound in the Bit-Probe Model

Harshit Kumar, Mentor: Dr. Satyadev

Nandakumar We find the lower bound of an algorithm in the bit-probe model using sunflower lemma and decision assignment tree. We use an efficient data structure for the algorithm. We also use the concept of space-optimal for representing an integer.

Developing Drag Models For Two Flow Model Simulation Of Gas-Solid Bubbling Fluidized Bed With Geldart B Particles

Harshit Verma, Mentor: Dr. Santanu De

Fluidized Beds are widely used in chemical and physical process in large scale operations such as manufacturing of polyethylene and polypropylene, the synthesis of the fuels and chemicals, and especially in heat exchangers, and in petroleum industry in process of Catalytic Cracking. Some of the advantages of gas-solid bubbling fluidized bed reactors are controllable handling of solid, isothermal condition due to good solid mixing, large thermal inertia of solid, and advantageous reaction rate because of large interfacial area between solid and gas.

Sub-micron-thick metasurfaces and their effect on incident light.

Hassan Yazdani, Mentor: Dr. R. Vijaya

The work is broadly divided into two parts namely study of Antireflection coatings and study of imaging properties of the structured fresnel lens. Studies of AR properties are mainly done for solar cell applications. For the study of AR surfaces, uniform layer coatings with varying thickness and materials of different refractive indices are analyzed to achieve the optimal result in terms of low reflectance over broad wavelength ranges. Calculations are mainly done with DiffractMod package of commercial software Rsoft which follows the theory based on rigorous coupled wave analysis. Some calculations are also done with transfer matrix method using MATLAB code to compare these two simulation results.

Design And Development Of Robust, Low-Cost Mechanism For The Removal Of Water Hyacinth.

Himanshu Sahu, Mentor: Dr. Chandraprakash

A mechanism is to be developed for the removal of water hyacinth which is robust, requires low maintenance, easily portable, and can be operated in both ways i.e. going inside as well outside of water. The mechanism (complete setup of the water hyacinth remover) can be fixed in an automobile when cleaning the small canals without going inside the water and the same setup can be fixed to a motorboat.

3D Micro/Nano Structures: Characterization, Fabrication and Automation using Two Photon Polymerization

Mrithik Das, Mentor: Dr. J. Ramkumar

Two Photon Polymerisation is a technology to fabricate true 3D micro/nanostructures of various materials with sub-diffraction limit resolution. This has wide applications in microoptics, electronics, communications, biomedicine, microfluidic devices, MEMS and metamaterials. The present study focuses on the fabrication of simple as well as complex features using this technique as well as offline au

Generative Modelling for XY lattice model

Japneet Singh, Mentor: Dr. Vipul Arora

We explore the potential of generative techniques to generate configurations for a 2d XY lattice model of statistical mechanics. Operatively, we adopt the Variational Auto Encoders (VAE) and Generative Adversarial networks (GAN) for our study. We use these techniques to model the intractable distribution of configurations. Hence we have an approximate inference and learning problem.

Skillcheck: A Blockchain based Evolution System

Jay Gupta, Mentor: Dr. Swaprava Nath

To create a platform which can be used for easy verification of skills, projects, courses of students which can be used by the professors, alumni or seniors to select students for various positions. This platform can be used by professors to allot courses, project and other work without spending time to verify their skill. This platform can be to a combination of decentralised claims, but with "verified" claims. An employer can use this portal to bypass the process of verification of their skills.

CFD of a Pitching Plate

Jayant Ranwka, Mentor: Dr. Sachin Shinde

This project is all about computer simulation of fluid-structure interaction using the immersed boundary (IB) method. It aims at simulating a flexible airfoil pitching in an incompressible fluid with a single degree of freedom using the IB method. It also compares it with other methods to analyze its strengths and weaknesses.

Design of a Communication Architecture for Unmanned Aerial Vehicle (UAV) Swarm Networks

Jayanta Ghosh, Mentor: Dr. Ketan Rajawat

Nowadays this UAV application ranging from simple search and rescue mission to combat mission like a talented hit. Communication is an important component in UAV systems. Our main aim is to design an integrated communication system which can itself decide when it has to use Long Range communication System or when it needs to use Short Range Communication System on the basis of favourable conditions

Machine Learning-based Performance Prediction of Parallel Applications using Hardware Counters

Jinang Rupeshbhai Shah, Mentor: Dr. Preeti Malakar

We present multiple models to predict the performance on based of the data collected from the built in hardware counters for parallel applications. And further there is analysis and research involved to establish a productive way to the performance prediction.

Vibration Control Of Ten Storey Building By Tune Mass Damper

Joydeep Mukherjee, Mentor: Dr. Sudib Kumar Mishra

Structures suffers excessive load of vibration under the action of wind and earthquake load leading to structural failure. To ensure proper functioning of structure, vibration control device are used. Tune mass damper (TMD) is one such device, considered effective to control undesirable response of structures. the effectiveness of TMD is governed by proper tuning of its mass, damping and frequency. A tune mass damper consists of a mass mounted on a structure via a spring system and a damper, preferably in a location where the structures deflections are the greatest in order to reduce the amplitude of the vibration.

To develop a single stage axial flow turbine test rig

Kajal Gupta, Mentor: Dr. A. Kushari

The main objective of doing this experiment is to to develop a single stage axial flow turbine test rig, operating with air. This is done for the demonstration of turbine operation and associated measurements and also can be used as a teaching aid.

Rare Event Simulations Based Study of Methane Decomposition on Liquid Tellurium

Kanishka, Mentor: Dr. Vishal Agarwal

Hydrogen is an important fuel for the future because of environmental considerations of using fossil fuels as energy sources. It is therefore necessary to develop environment friendly hydrogen production techniques for mitigating the greenhouse gas emission problem. One of the cost-efficient and ecofriendly ways to produce hydrogen is by pyrolysis of methane.

Understanding the function of the metabolism related genes CNKSR2 and PHACTR1 in the developing chick forebrain

Kaustuv Ghosh, Mentor: Dr. Jonaki Sen

Metabolism related genes (MRGs) are supposed to come in to play much after organogenesis has taken place and play a role in metabolism. We have observed that MRGs express in a tissue-restricted manner in contrary to metabolism, which takes place ubiquitously through-out the organism. Tissue-restricted expression of genes often hints toward a role in differentiation and development.

Monitoring parameters of IAQ of offices inside IIT Kanpur to assess likely influence on health and wellbeing of employees

Krishna Kant Gupta, Mentor: Dr. Anubha Goel

The health and wellbeing of the employees in the office are of great concern. Good health directly impacts the work efficiency of the employees. Due to indoor air pollution, every year 1.3 million deaths occur in India and 2.6 million deaths occur in

the world. Air sampling is done on various floors of faculty building for a period of two to three weeks.

Real time location tracking system using BLE

Krishnam Bhavika, Mentor: Dr. A R Harish

This project includes working on a couple of BLE (Bluetooth low energy) devices and RFID tags to track the location of a person indoors or to find a missing object. This application can be used in the busiest areas like airports and hospitals. G1 is a (BLE) to Wi-Fi connectivity gateway without the uses of smartphones or apps. The G1 gateway collects the data from iBeacon, Eddystone, BLE sensor and other BLE devices, and then sends to the local server or remote cloud server by HTTP / MQTT protocol over Wi-Fi / Ethernet.

Enhancing Conductivity of the glass substrate through Polyaniline coating

Kuldeep Singh, Mentor: Dr. Raju Kumar Gupta

The task is to increase conductivity of glass substrate by coating it with different conducting polymers at the same time maintaining the transparency of it.

Computational biomechanics techniques used in occupational safety and ergonomics

Logesh M, Mentor: Dr. J. Ramkumar

Biomechanics of the body is similar to the mechanics of any physical entity where finite element can be used to determine mechanical/electrical outputs for a given response. These results can be compared with actual mechanical responses either directly by taking a specimen from the cadaver and applying standard mechanical tests or by using the electrical response of muscles such as electromyogram.

Estimation of Properties of Material from Video

Manisha, Mentor: Dr. Chandraprakash

Scene Understanding has now applications in various field. The estimation of material properties paves the way for the same. This project work demonstrates the approach with fabric materials.

Real Time Location System using BLEs

Manisha Jogi, Mentor: Dr. A R Harish

Various experiments were conducted using BLE gateways and beacons to check the working of the gateway to understand it better. A lot of data has been generated which has to be analysed now to build an algorithm to find the location of these tags. K-nearest neighbourhood algorithm has been used to estimate the location coordinates.

Precision Agriculture using MAVs

Mataria Pence Jagatkumar, Mentor: Dr. Indranil Saha

The motive is to tackle the agricultural problems using the power and agility of an autonomous swarm of Micro Aerial Vehicle.

The project includes the development of a swarm MAV system capable of achieving tasks such as crop surveillance, disease identification among the crops, harvest and

irrigation analysis, measures against the animal and the overall growth monitoring with a fleet of MAVs.

Exception Checking Removal To Increase The Speed of Pypy Interpreter
Meghna Hooda, Mentor: Dr. Swarnendu Biswas

Our project focuses on analysing the increase in speed of Pypy interpreter by modifying its source code. Considering our program don't have any errors or exceptions we are creating annotation to switch off some basic exception checks, so the interpreter don't waste its time in checking. It has been noticed that not many projects has been down in this area. We are working on understanding the source code thereby modifying it for the mentioned purpose. We are testing the modification by building the binary from modified source code that can be implemented. We are expecting a sufficient amount of increase in speed that can tested on Python modules like pytorch, pandas, etc.

Numerical Simulation of Flow Past Two Circular Cylinders with Attached Splitter Plates

Mohammad Shahid Habib Khan, Mentor: Dr. Sanjay Mittal

The project deals with the study of flow past two circular cylinders with attached splitter plates. 2-D finite element approach is used to simulate the fluid-structure interaction. Flexibility of splitter plates is varied and vibration response of plates is studied. It was found that at lower flexibility, plates vibrate in-phase while at higher flexibility they vibrate out-of-phase to each other.

Electroencephalography controlled wheelchair

Mohit Yadav, Mentor: Dr. Vipul Arora

Brain-computer interfaces translate measured brain signals into tangible actions for a specific application. The functionality of such a system requires at least 3 components: a signal acquisition component that measures brain activity, a signal processing component that deciphers the measured signal, and an application interface where the deciphered brain activity is used as a command.

Active Noise Cancellation using Markov Chain Monte Carlo

Mullai, Mentor: Dr. Satyadev Nandakumar

The aim of our project is to actively cancel out noise in an environment. We are using Markov Chain Monte Carlo to sample our noise data and then generate a sound which negates the noise.

Decentralized Swarming of Unmanned Aerial Vehicles with Minimum Computation

Naveen Balaji , Mentor: Dr. Mangal Kothari

To implement Aerial Swarm. We surveyed the current method and technologies for implementing. We propose the technique of using UWB (UltraWideBand)sensors for localization of drones. Explored different Gaussian filters for State Estimation using UWB sensors. Then according to experiment results, proposed navigational algorithms for the aerial vehicles.

Study of water management in PEM fuel cell gas flow channels using lattice Boltzmann method

Navodit Chandra, Mentor: Dr. Kamal K Kar

PEM fuel cells are an attractive choice to be used as clean sources of energy. They are renewable sources of energy, have high efficiency and do not cause pollution. Water is produced as a by-product of the electrochemical reaction taking place in the cell. The mechanism of water transport needs to be studied in detail for effective water removal from them in order to ensure optimum performance.

Construction of microRNAs to validate downregulation phenomenon of the genes downstream of BMP signalling pathway

Nayonika Rahut, Mentor: Dr. Amitabha Bandyopadhyay

Bone Morphogenetic Proteins (BMP), are a group of growth factors, originally discovered by their ability to induce ectopic bone, presumed to be involved in bone-cartilage formation. Ectopic activation of BMP leads to ectopic bone formation in tissues like muscle, tendons but not in other tissues like kidney. Hence it is critical to identify the genes that are regulated downstream of the BMP signal.

Controlling Solid State environment of Quantum Dots

Neelesh Kumar Vij, Mentor: Dr. Shilpi Gupta

Phonons are the quasiparticles which give the quantum mechanical description of vibrational motion. Removal of phonons from the system reduces the vibrational which leads to a decrease in temperature. The project involves developing models based on quantum optics framework to study and engineer the phononic environment of quantum dots to control their optical and thermal properties.

Retrofitting of Unreinforced Masonry

Nehal Ansh Srivastava, Mentor: Dr. Samit Ray Chaudhuri

This project emphasizes the importance of retrofitting of unreinforced masonry buildings to improve their performance during an earthquake. To evaluate the strength of unreinforced and retrofitted masonry, diagonal tension tests have been performed on the wall specimens. Similar walls have been modeled and analysed to understand experimental behaviour. Sensitivity analysis has been conducted.

Exploring spray cooling for thermal management of high power electronic devices

Nikhil Malviya, Mentor: Dr. Sameer Khandekar

This project provide solution to thermal management of miniaturized electronic components. Following are my major aim in this project; Spray visualization and spray characterization (like spray cone angle and droplet diameter); Study heat transfer mechanisms in spray cooling; To find the effect of various operating parameter on surface temperature; Finally to optimize all parameters.

Design and control of extractive distillation column for separation of homogeneous binary azeotrope using a heavy entrainer

Nishant Gupta, Mentor: Dr. Nitin Kaistha

Formation of azeotropic mixtures is not very uncommon in chemical industries. Ethanol-water system is the most common example. Adding to it a third component such as glycol, can help break this azeotrope altering the relative volatility of the mixture. This has been done using a two column extraction-recovery system. Selection of suitable component is crucial.

Score Following-Audio to Score Alignment

Nitish Vikas Deshpande, Mentor: Dr. Vipul Arora

Audio-to-score alignment (also known as score following) is the process of temporally fitting music performance audio to its score. There are two main components in audio-to-score alignment task: features used in comparing audio to score and alignment algorithms. Our implementation is a combination of the state-of-the-art algorithms which involves using transposition invariant audio features.

Impact of nonionic surfactant and surfactant-SiO₂ nanoparticle interaction on the wettability of surfaces: An experimental approach

Nupur Mehra, Mentor: Dr. Naveen Tiwari

This work attempts to investigate the impact of nonionic surfactant (Triton X -100) on glass surface, interaction between Triton X -100 and SiO₂ nanoparticle (NPs) on wettability alteration, adhesion and spreading on glass and aluminium surface and separating the polar and dispersive components of the surface free energy of the Triton X -100 and SiO₂ solution by inverse protocol to the Owens-Wend.

Copper complexes of saccharin and terpyridine derivatives, Synthesis, Structure, Biological interactions and DNA binding affinity

Omkar Mohapatra, Mentor: Dr. A.K. Patra

Copper complexes of saccharin and terpyridine were synthesized by standard procedures. They were characterized by various spectral techniques. Then their DNA binding and protein binding experiments were done.

Instruction Prefetching for Servers

Palak Tripathi, Mentor: Dr. Biswabandan Panda

Through this project, we are investigating state-of-the-art instruction prefetchers and quantifying their effects on cloud based workloads so as to provide faster L1 accesses.

Net Neutrality and Zero-Rating Services

Paroma Roy Chowdhury, Mentor: Dr. Praveen Kulshreshtha

Since the commercialization of the internet in the late 20th century, control over its various aspects have continued to remain points of contention globally and the net neutrality debate is one of many. Net neutrality simply means that Internet Service Providers (ISP) should treat all data equally, and in essence have no control over the data they carry which is consumed by the end users. There are three principle ideas to ensure network neutrality- blocking, throttling and paid prioritization, each of which must be banned to ensure a neutral net. Zero-rating or sponsoring data by ISPs and

content providers (CP) involves that particular content being exempted from a consumer's subscription data cap, and is, therefore, a violation of net neutrality.

SLAM for UAVs

Piyush Patel, Mentor: Dr. Salil Goel

With recent technology, it is possible for UAVs to be completely autonomous. For a vehicle to be autonomous, the following tasks must be performed automatically; Localisation and Mapping.

Visualization of shocks due to granular flow around a circular cylinder

Pragya Patel, Mentor: Dr. Sanjay Kumar

This work compares the shock front resulting from granular flow of two different grain sizes over circular cylinders. Four cylinders of different radii were used in our experiments. The inclination angles were varied in order to change the flow velocity. The visualizations were done using the shadowgraph technique.

Measurement of Diagonal Elements of Mixed Photon Ensemble Density Matrix in OAM Basis

Prajwal Samal, Mentor: Dr. Anand Kumar Jha

The project is on experimentally determining diagonal elements of a mixed photon ensemble density matrix in orbital angular momentum (OAM) basis. To achieve this, measurements of angular coherence of input light is to be performed and its connection to the diagonal elements of the density matrix will be exploited. A specialized Mark Zehnder interferometer is currently being set up for the angular coherence measurement. A dove prism is to be attached to one of the arms of the interferometer to allow for rotation of laser beam phasefront. Further, OAM ensembles will be prepared using a SLM (spatial light modulator) and measurements will be performed on them.

Study of Chromium partition in the Synthetic Slag during Steelmaking process using FactSage software

Prashant Sharma, Mentor: Dr. A.K. Singh

The objective of the present project is to get an understanding of the impact of viscosity, basicity, pressure, temperature, and Al₂O₃ addition on the phase relationships in the CaO-MgO-SiO₂-Cr₂O₃ synthetic slag with a view to controlling the precipitation of Cr-Spinel in the slag.

Evaluation of Compressive Strength of Borate Based Bioactive Glass Scaffold During In Vitro Immersion Test

Praveen Kumar Upadhyay, Mentor: Dr. Niraj Sinha

This project deals with the evaluation of the compressive strength of borate-based bioactive glass BG-30 by the fabrication of a scaffold. Initially, bioactive borate-based BG-30 is synthesized by the sol-gel method. Then, the scaffold is synthesized using a polymer foam replication technique of specified porosity. Then the variation in compressive strength of the BG-30 scaffold is recorded.

Microtubule-PTMs, Motors, MAPs, their interactions, regulations, implications in neurodegeneration- A Literature Survey

Priya Katiyar, Mentor: Dr. Nitin Mohan

Various interactions between specific Post translational modification and microtubule associated proteins (MAPs) using super resolution microscopy (STORM). STORM imaging is being applied in the field of biology for proper understanding of localisation, structural arrangement and interaction of the different molecules present in the cell.

Study of the Structure and Function of the EBOLA Virus glycoprotein for its entry into the host cell

Priyamvada Singh, Mentor: Dr. Dibyendu Das

Ebola is a deadly disease that has no vaccine to this date. The project will be a key step to study the glycoprotein of EBOLA and thus study how membrane fusion (a key step in infection) occurs in Ebola virus and thus generate vaccines that might prevent its future occurrences

Prosthetic Hand

Priyanshu Saxena, Mentor: Dr. Pankaj Wahi

My project includes development of single actuator multi finger prosthetic hand with adaptive grasp. It will be a tendon-based hand which will be actuated with a whiffletree mechanism of links. The mechanism to actuate the hand would include a whiffletree mechanism linked with a single motor. My part would be to study the existing prosthetics in this field such as Southampton hand and TBM hand and design a optimum linkage structure with accurate link length for the whiffletree mechanism as well as for the phalanges and minimize the vibrations and friction forces involved with the tendon based linkage.

Designing an efficient manipulator using RNN and object detection using CNN

Pujika Kumar, Mentor: Dr. Laxmidhar Behera

My project involves designing an efficient manipulator using RNN and object detection using CNN to build a robot using for building a wall having a specified pattern. I have been trying to implement a model-free dual neural network and see the effects of injecting an additive noise into the control channel since recent studies have shown that the learning error is guaranteed for convergence to zero despite the existence of additive noise for simulation.

Economics of Market for Personal Information

Pulkit Nijhawan, Mentor: Dr. Bikramaditya Datta

The recent news reports regarding selling of personal data by data brokers has once again highlighted that personal data is continuously been sold and traded among firms. The use of personal information as economic goods, by firms to gain an advantage over consumers and competitors, is increasing in recent times. There are theoretical and empirical scenarios where sharing of personal data can increase or decrease individual and societal welfare due to externalities. Information asymmetries regarding usage of shared information restrict individuals' abilities as consumers to optimally navigate privacy tradeoffs.

Robocasting of Borate Based Bioactive Glass Scaffolds for Bone Tissue Engineering

Rahul Vishnu Narkhede, Mentor: Dr. Niraj Sinha

Bioactive glass scaffolds act as a supporting structure and template for bone regeneration. Here we use a novel composition of borate based bioactive glass, named BG-30. It has been reported that the strut size affects the mechanical properties of scaffolds. Therefore, we have fabricated scaffolds of BG-30 having three different strut sizes and evaluated their compressive strength.

Effect of Machining on the Microstructure and Corrosion Behaviour of Al7075 Aluminium Alloy

Rajesh Layek, Mentor: Dr. Sudhanshu Shekhar Singh

Al7075 alloy is generally subjected to machining operations before using them commercially. Thus the variation of machining parameters like feed rate (mm/min) and cutting speed (rpm) on aged Al7075 alloy and their influence on the surface roughness corrosion behavior is studied.

Statistical Downscaling of Rainfall Using Artificial Neural Network

Rakshit Paurwal, Mentor: Dr. Ashu Jain

The prime objective of this project is to develop an ANN model for the downscaling of rainfall. Downscaling means taking input from systems operating at a coarse resolution like GCM to make predictions of a phenomenon at the local level. Here the phenomenon is rainfall which operates at a local level.

Low Light Image Enhancement using Adaptive Log Transformation

Rakshit Verma , Mentor: Dr. Nishchal Kumar Verma

Proposed a new adaptive log transformation for enhancing low light and non-uniformly illuminated images. Experimental results show that the proposed algorithm can adaptively enhance the images and works on both low light images, and non uniformly illuminated images. We also compare it with other state of the art methods and it can achieve comparable, if not better results both subjectively and objectively.

Stability analysis of the wake past a square cylinder

Ratnangshu Das, Mentor: Dr. Arun Kumar Saha

The present study aims at the stability analysis of the wake past a square cylinder. The distributions of convective and absolute instabilities will be determined for different Reynolds numbers and different locations.

Focused Phased Array Design and Analysis for Volumetric Ultrasound Probes

Rohit Misra, Mentor: Dr. Naren Naik

Volumetric ultrasound imaging is usually done using 2D planar phased arrays by steering the ultrasound beam to all the Regions of Interest (ROI). We present a method to design phased array probes with better focusing capability. We have proposed the design of 2D concave curvilinear phased arrays as well as 3D concave spherical cap arrays. The effect of various design parameters on the radiation pa

Phase Field Lattice Boltzmann Simulations of Water Transport in PEM Fuel Cell Gas Channel

Rudraraju Sai Vishnu Varma, Mentor: Dr. Malay K Das

Parametric study on how different parameters like inlet velocity of the gas, operating current, surface wettability and capillary number effect the water transport in the gas flow channel is done.

MIMO

Sabhay Jain, Mentor: Dr. Aditya K Jagannatham

The primary goal of this project is to develop more efficient and effective reception algorithms, from the computational point of view and in terms of signal reception quality.

Minimum Path Isolation in non-planar 3D grid graphs

Sagnik Bhattacharya, Mentor: Dr. Raghunath Tewari

The problem statement was tough and involved high level of theoretical aptitude. While visualizing 3D graphs which are non-planar was a problem, so was to formulate the general characteristics of the weight function. We have already proven the statement for weight functions which are polynomials on the coordinates of the starting coordinates of the edges, and aim to proceed for a generalized function.

Minimum Path Isolation in non-planar 3D grid graphs

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Vibration Control of buildings under Seismic Excitations

Saikat Mishra, Mentor: Dr. Sudib Kumar Mishra

This Study has been conducted with the aim of reducing the dynamic response of a building with a Tuned Mass Damper(TMD). It is a passive vibration control methodology for tall buildings. This is especially important as tall buildings are being increasingly constructed for space constrains. Tall buildings are susceptible to dynamic excitations such as wind and earthquakes. TMD control the vibration by moving the TMD mass in out of phase to the motion of the buildings. In this study, efficiency of TMD is assessed for controlling vibration of structure of a 10 storey framed building modeled in SAP, a commercial structural analysis program. The building with and without TMD is modeled using SAP 2000. While modeling, the mass and restoring stiffness of the TMD are estimated using well established tuning criteria i.e. the frequency of vibration will be mostly identical to the frequency of structure itself.

Wet spinning of GO fibers

Saket Arora, Mentor: Dr. Raju Kumar Gupta

The aim of the project is to design a setup for the formation of graphene oxide fiber. So far the time has been spent in synthesizing graphene oxide.

Fire simulation using FDS

Saksham Katiyar, Mentor: Dr. Ashoke De

The study contributes in reducing the risks of fires by early prediction of the expected scenarios of fires and associated smoke movement. My objective is to demonstrate that Fire Dynamics Simulator (FDS) is ideally suited to build realistic models of process geometries in which large scale explosion and fire failure risks can be evaluated. Also, in the process, try to evaluate how well these models perform against some of the standard models often employed for numerical simulations of fire scenarios. The results of simulations will be compared to experimental data and good agreement between the models and data will be demonstrated.

High Speed Granular Chute Flow Simulations

Saksham Mittal, Mentor: Dr. Anurag Tripathi

My project focuses on DEM simulations of chute flows and achieving the steady state rheological properties. The event-driven approach is expected to highly reduce the computational time in steep chute flow simulations. Comparison of the above approach with soft particle model in the dilute regime.

Unmanned Aerial Vehicle Traffic Management System (UTMS)

Samarthya Sahu, Mentor: Dr. Salil Goel

The Unmanned Aerial Vehicles (UAVs) are finding their application in each and every sector ranging from military, e-commerce to agriculture, surveillance. With the increasing use of UAVs, the pressure on the airspace is gradually increasing, resulting in interference and collision. Hence, there is a need for a safe and reliable system for evading conflicts and to route the drone operations. The basic functions of UTM system are pilot and UAV registration, flight path planning, real time monitoring of UAVs, collision avoidance, create and manage restricted areas.

Height Invariant Object Detection of Aerial Images Using Domain Adaptation

Sandeep Kumar Routray, Mentor: Dr. Vinay P Namboodiri

We are trying to build an object detection model that would learn representations to bridge the domain gap among images captured at various heights by using unsupervised single source multi-domain adaptation technique.

Vertical Vibration of Square Footing On Layered Media

Sanjay Pal, Mentor: Dr. P. Ghosh

The primary goal in the design of the machine foundation is to limit the response amplitude of the structure within the specified tolerance. This is achieved by ensuring that the machine operating frequency is different from the natural frequencies of the foundation-soil system. Excessive vibration can cause unsatisfactory performance of machine foundations.

Probing the near field distribution of signal beam in SPDC

Sanket Anand, Mentor: Dr. Anand Kumar Jha

The aim is to find a theoretical approach consistent with the laboratory findings in the near-field intensity distribution of signal beam in SPDC phenomena.

Computational Aspects of Phase Transitions At The Molecular Level

Sarasij Banerjee, Mentor: Dr. Indranil Saha Dalal

We propose the investigation of a nano-confined Lennard-Jones fluid. As a part of initial work, we shall reproduce a paper based on the cooling rate dependence of crystallization for liquid copper. CNA is to be employed to achieve the distribution of polyhedra. This shall be followed by study of the system under various shear rates.

Ferrofluid Plug Based Valve For Microfluidic Applications

Sarthak Banerjee, Mentor: Dr. Sameer Khandekar

Study of the pressure characteristics of a ferrofluid plug based magnetic field actuated valve which can be used in the microfluidic applications.

Design and Analysis of Transmission Line Inspection Robot

Sathvik Bhagavan, Mentor: Dr. Bishakh Bhattacharya

Designing a Transmission Line Inspection Robot using SOLIDWORKS and analyzing its dynamics using ADAMS for further modifications.

Experimental investigation of the effect of different salts on the surface and interfacial tension of n-hexadecane/water system with or without non-ionic surfactant and silicon dioxide nanoparticles

Satyam Srivastava, Mentor: Dr. Jayant K Singh

How salts of different ionic strength have effect on interfacial behaviour in presence nanoparticle and surfactant, the application of this project is present in oil industry as well for cosmetic industry.

Predicting the stock market and developing a profitable trading strategy with the help of google trends.

Saurabh Sharma, Mentor: Dr. Sohini Sahu

This research work tries to find whether queries made on google has any relationship with the Contemporaneous or near future individual Prices, Trading Volume and Returns of the stocks in NIFTY 50. Further, it tries to find if these relationships can be used to predict stock variables of those individual stocks. This research work also attempts to devise a profitable trading strategy of stocks bas.

Design and development of Power Substation Monitoring Robot

Shashank Kumar Buchasia, Mentor: Dr. Bishakh Bhattacharya

Semi-autonomous inspection of Power substation using a three-wheeled robot. Sensor-fusion to obtain real-time data of the substation equipment. Safe and error-free inspection of the critical components.

Theoretical Modeling of Piezoelectric Energy harvesting from vortex induced vibration

Shashi Ranjan, Mentor: Dr. Bishakh Bhattacharya

The purpose of my research work is to design and solve a mathematical model of piezoelectric energy harvesting from vortex induced vibrations to validate it with experimental results.

Quantum Information processing through light-matter interaction

Shibalik Lahiri, Mentor: Dr. Debrata Goswami

The Varying the Parameters Rabi Frequency, Detuning, Frequency sweep determining the pulse shape ultimately the determine the state of the system after a laser(Light) has been shined at the system(matter). This system used here is an two level system which represent the traditional qubit and Laser here act as the logic which is enacted upon the qubit. By controlling the pulse shape of pulse various gates can be applied. In this Project Light matter interaction is theoretically modeled via MATLAB. in which simulation are performed by first considering Resonance between light and system, then by varying Rabi frequency, Then detuning, then both and ultimately looking at chirped cases.

Tag Suggestion and Post Recommendation System.

Shivam Sharma, Mentor: Dr. Nitin Gupta

The goal of my project is to assist the users of TreadWill and increase their engagement on the platform. I aim to do this by building a tag suggestion system for user posts and a post recommendation system.

Numerical study of particle laden flow in a fast fluidized bed

Shiwani Sharma, Mentor: Dr. Santanu De

The gas-solid flow in the circulating fluidized bed is a typical heterogeneous reaction with formation and dislocation of clusters. In the result, the nature of solid volume fraction and pressure with bed height was studied and compared with the Wu et al.[2018] The inert bed material is ash and is filled upto a height of 400mm.

Positive Thinking through Games

Shreyash Raj, Mentor: Dr. Nitin Gupta

Sadness and grief are normal human emotions. We all have those feelings from time to time but they usually go away within a few days. Depression however, is something more. It's a diagnosable condition that's classified as a mood disorder and can bring about long-lasting symptoms such as overwhelming sadness, low energy and low appetite. You distance yourself from the pleasures of life and all your loved ones. Statistics highlight mental illness as a serious issue in India affecting millions of people. Utilising the principles of Cognitive Behavioural Therapy me and my batchmate is creating a game that people who suffer from this disorder can play which would induce positive thoughts in them and encourage them to imagine situations whose outcomes are favourable to them.

Sintering Studies on Particulate Copper Compacts

Shruti Srivastava , Mentor: Dr. Anish Upadhyaya

The aim of this project is to see the behaviour of copper powder at different sintering temperature and compaction pressure. It is important to find the optimum pressure and temperature range on which the copper powder can be compacted and sintered to get good properties like density, conductivity etc. The motive is to reduce the conventional compaction pressure and sintering temperature being us.

Phase Transformations in Fe using Classical Molecular Dynamics

Siddiqui Mohd Osama, Mentor: Dr. Somnath Bhowmick

We started by learning the basics of Molecular Dynamics and Lammmps script and calculated Bulk Modulus for Fe by plotting Energy vs Volume graph. we also got the elastic constants along with that we worked on finding a relation between lattice constant and temperature. We are working on creating simulation boxes of the various orientation relationships present in martensite like Bain, KS, NW, Pit.

To identify novel downstream targets of Wnt signalling during articular cartilage differentiation

Stuti Gupta, Mentor: Dr. Amitabha Bandyopadhyay

Articular cartilage is very crucial to ensure proper movement at synovial joint. But as the tissue is non- regenerative in nature; any damage or injury might cause severe locomotive immobility. Wnt signalling is known to be sufficient for inducing articular cartilage differentiation during the developmental stages but little is known about its downstream targets. The project aims to identify the possible downstream targets of Wnt signalling involved in articular cartilage differentiation, by shortlisting specifically upregulated transcription factors from the microarray results and validating their expression pattern through in vivo studies on mouse embryos, using in situ hybridization technique (ISH).

Site Specific Study of Red Edge Excitation Shift of a Multidomain Protein

Subhrasmita Sahu, Mentor: Dr. P. Sen

Red Edge Excitation Shift (REES) has been previously used to study the heterogeneity and dynamics of a protein core. Site specific heterogeneity and dynamics of a multidomain protein, HSA is investigated along its unfolding pathway by two chemical denaturants, urea and guanidine hydrochloride. Domain I, domain II, domain III are studied from the fluorescence of CPM tagged cys 34, trp 214 and NPCE.

Active Emulsions

Sunamya Gupta, Mentor: Dr. Rahul Mangal

The main aim of this project is to study the effect of change in viscosity on the motion of a 5CB liquid crystal droplet dispersed in TTAB surfactant aqueous solution. The viscosity is varied by using glycerol in the surfactant solution. The trajectories of the droplet are captured and then used to calculate rotational diffusion time of the droplet.

Characterisation of an Electro-Hydraulic Exciter for Active-damping of Structural Vibrations

Suyash Singh, Mentor: Dr. Mohit Law

The idea is that once the EHE is able to damp the excitations of any structure-under-test, it can be further adapted to be used as an active damping device to damp the machine tool vibrations as well. The software interface controlling the EHE includes the LabVIEW code compiled on FPGA and RT modules. The LabVIEW code of the EHE is to be first understood using back-tracking the data flow and further re-engineered.

Solution Processed High-k Gate Dielectrics for Emerging Large Area and Flexible Electronics

Tanay Pratik, Mentor: Dr. Anshu Gaur

There is a need for cheap accessible low temperature processed high k dielectric ink which can be used for TFTs. Solution processes advantage of low cost and ease of large area deposition which has also reported good results for leakage current and film uniformity and high k lets us operate devices at lower voltages.

Study and Analysis of formation of boundary layer over a flat plate for time varying free stream velocity

Taral Patel, Mentor: Dr. Pranav Joshi

When fluid flows over a surface, fluid layer adjacent to the surface stick to it causes no slip condition. The fluid layer above the surface slows down due to viscous effects. The effect of viscosity is only observed up to certain thickness above the surface. The region up to where the presence of the surface is felt due to viscosity is called the Boundary layer.

The role of Wnt - PCP Signalling in the forebrain development

Tayade Akhilesh Kishor, Mentor: Dr. Jonaki Sen

Wnt signalling has been extensively studied in the context of developmental role it plays in vertebrates and non-vertebrates. In my project, I have focused on one of the non-canonical Wnt signalling pathways i.e. Wnt - PCP pathway. I am using the RNA in situ hybridization technique to elucidate the role of Wnt - PCP genes in the forebrain development of chicken (*Gallus gallus*).

Mechanical characterization of pre-preg based composite

Uday Raj Singh, Mentor: Dr. P. Mohitey

This project work aims to develop a pre-impregnated composite with significant mechanical properties. Pre-pregs are scarcely or not even manufactured in India. Hence the project aims to achieve manufacturing of the pre-pregs, firstly in this country. Such that these may replace the mostly imported pre-pregs, applied in the various industries.

Interdiffusion in Cu-Si and Cu-Mn system

Ujjwal Pratap Singh, Mentor: Dr. Kaustubh Kulkarni

The research project aims at finding the Interdiffusion coefficient as a function of composition in Cu-Si and CU-Mn systems by preparing diffusion couples Cu/Cu-10at%Si and Cu/Cu-10at%Mn.

Smart Tutor

Utkarsh Ahuja, Mentor: Dr. Vipul Arora

Evaluation of answers and resolving general queries of the student are the two most time-consuming tasks in the field of teaching. To reduce the time in these tasks, an Intelligent Tutoring System (ITS) or Smart Tutor has been designed. Additionally, it can also recommend the student to study the material again.

Height Invariant Object Detection in Aerial Images Using Unsupervised Domain Adaptation

Vaibhav Jindal, Mentor: Dr. Vinay P Namboodiri

We try to build deep neural networks to bridge the inter-domain gap between aerial images captured at different heights and train object detection networks for single source multi domain unsupervised domain adaptation.

Real time location system using BLE gateways

Vakulabharanam Mounika, Mentor: Dr. A R Harish

Using BLE to track the location of an object or person especially in indoor. BLE is used over other communications for their low power consumption. By reading the RSSI values of the reference RFID tags the location of the object or person is tracked by using the data of the reference tags.

Understanding the effect of dual stresses on cell survivability and mitochondrial dynamics

Vandita Verma, Mentor: Dr. S Ganesh

Mild heat shock activates heat shock response which is a highly conserved cellular response mechanism. It enables the cells to survive against various stresses including Heat Shock. Since Heat Shock response is an energy demanding process, glycolysis is the main process providing ATP. Hence, a link was established between the role of glycolysis on the Heat Shock Response pathway.

Comparison of ALE and IBM methods

Varun Rajesh Gadre, Mentor: Dr. Sachin Shinde

There are various methods available to simulate flow past a pitching plate. We have selected two of those solvers for our project- PimpleDymFoam which is an ALE(Arbitrary Lagrangian Eulerian Method) method and Immersed Boundary Method. We have simulated flow past a plate which is pitching about the endpoint with a specified frequency and amplitude.

Relationship between GRACE water storage change and NDVI values

Vedashree Vijay Mankar, Mentor: Dr. Balaji Devaraju

This project focuses on comparing two very different sets of data and try to find out if there exists any causal relationship. The two quantities, Vegetation and total water storage are physically related but an effort is made to find such a dependency of these two factors on each other in the data. This will help to in simplifying further studies and research.

Simplified Model For Directional Air Delivery Through Louvers

Vidiyala Varun, Mentor: Dr. Vaibhav Arghode

Louvers are important components of air conditioning systems, which are for directional air flow delivery. Hence, it is keen to determine the downstream flow field of air passing through the louvers for analyzing air conditioning effectiveness. An effort to reduce the computational effort using simplified body force model through CFD is the pivotal aim of this project.

Shared Autonomy via Deep Reinforcement Learning and Formal Methods

Vivek Agrawal, Mentor: Dr. Indranil Saha

Autonomy is the field in AI which is helping humans for the tasks which are difficult for them to do or are risk-taking. By autonomous systems, these tasks are performed more conveniently. In this project, we try to make an Autonomous navigation robot by concepts of reinforcement learning and formal methods which can navigate in an unknown environment. We use reinforcement learning algorithms to train our model also we would also use some formal methods techniques for some predefined situations and use them as a reward function for our model. And also human is always there in the loop to take over the control from the autonomous system and in some critical tasks final decision is always taken by a human.

Design and Optimization of Multirotor UAVs

Yash Raj Singh, Mentor: Dr. Abhishek

My project work is focussed on design optimization of Multirotor UAVs. The task is to design a UAV that can fulfill a given mission requirement efficiently. Currently, I am in the learning phase, where I am learning and implementing various optimization techniques.

Kinetic Energy Budget Of Fluid Flow Under Partial Suppression Of Vortex Shedding Due To Square Control Cylinder

Yash Verma, Mentor: Dr. Arun Kumar Saha

This project has taught me to study fluid flow and its importance in the practical world. It requires application of Navier Stokes equations and stability criterion in the wake region to stabilise the flow. I learned to use tecplot to model the flow and plot graphs using data from the modelling. I also learned to use mathematical methods to apply NS equations using MAC method and Finite Element.

The GMT Project, Games to treat mental illness

YATIN AZAD, Mentor: Dr. Nitin Gupta

Depressed patients tend to think about situations in an apathetic and distorted manner. We aimed to induce positive thoughts in them. We created a game where they were asked to imagine a situation and choose a response that best reflected their initial reaction to it. When patients were able to identify their automatic negative thoughts, their depression significantly improved.

SURGE 2019 POPULAR LECTURES

PROF. AVINASH KUMAR AGARWAL

Prof. Avinash Kumar Agarwal is currently Professor in the Department of Mechanical Engineering at Indian Institute of Technology, Kanpur.

TITLE: Global Energy Scenario, and Future Prospects of Green and Environmental Friendly Methanol Economy.

ABSTRACT: In this talk, I will discuss about the global energy scenario and emerging fuels. Sometime will be spent on two emerging scenarios involving EVs and Methanol economy. This will be followed by brief open ended discussion on "Research" and "Ethics in Research".



PROF. NITIN MOHAN

Prof. Nitin Mohan is currently Professor in the Department of Biological Sciences and Bioengineering at Indian Institute of Technology, Kanpur.

TITLE: Tracks, Maps and Motors: Deciphering the molecular cues of intracellular transport with advanced fluorescence microscopy.

ABSTRACT: Intracellular transport mediated by cytoskeletal network is important for cell functioning and survival. Microtubules and Actin filaments serve as tracks on which motor proteins can translocate large protein complexes and organelles over long distances within the cell. Microtubules are filamentous structure built from heterodimers of α - and β -tubulin monomers.



Motor proteins interact with tubulin to generate movement along the microtubule utilising the chemical energy from ATP hydrolysis. The Dynein and Kinesin motors transport cargo to and from the Microtubule-Organizing Centre of the cell, respectively.

PROF. GAURAV RAHEJA

Prof. Gaurav Raheja is currently Professor in the Department of Architecture & Planning at Indian Institute of Technology, Roorkee.

TITLE: *from **Empathy by Engineering **to* *Inclusion by Design*.



PROF. NISHCHAL VERMA

Prof. Nishchal Verma is currently Professor in the Department of Electrical Engineering at Indian Institute of Technology, Kanpur.

TITLE: Deep Fuzzy Networks.



MR. RAVI PANDEY

Mr. Ravi Pandey is currently Research Establishment Officer in the Department of Start-up Incubation & Innovation Centre at Indian Institute of Technology, Kanpur.

ABSTRACT: Idea protection is an important aspect to prevent others from using, selling and reproducing the invention. This could be achieved through filing Intellectual Property Rights i.e. Patents, Design, Copyright and Trademark, these rights are important in getting the benefit to the inventors, either through licensing the Patent to an entity or following the route of entrepreneurship through Start-up,

having an IPR doesn't only gives weightage to the CV of a student, but also enhances the valuation of a start-up company. The talk will elaborate different prospects of IPR and how to file & secure them, the ultimate objective of the talk is to give an overview to students for the transition from Idea to Prototype and leading to a Start-up. The talk will include one workshop of Patent claim drafting and another workshop of Preparing the Patent search report, the objective behind organizing this talk is to provide complete information to SURGE Participants, about managing innovations and think about entrepreneurship as an alternative to campus Job placements.



SURGE 2019 AWARDS

“Dr. Elizabeth and Dr. Verkey Cherian Award” for Best Project and an “Outstanding Poster Award” for Best Poster who produce exceptional quality research during the SURGE program. Award of Rs. 5000 plus a commendation certificate will be given to SURGE students for best project and an Award of Rs. 5,000 plus a commendation certificate for Outstanding Poster will be given to SURGE students. This year SURGE Evaluation committee has been shortlisted the following SURGE participants for SURGE 2019 Awards.

S. N.	Name of the Participant	Department	Award Name
1	Chandra Prakash Tiwari	Chemistry	Best Project Award
2	Saksham Mittal	Chemical Engineering	Best Project Award
3	Arunima Khuneta	Computer Science & Engineering	Best Poster Award
4	Praveen Kumar Upadhyay	Mechanical Engineering	Best Poster Award
5	Rakshit Verma	Electrical Engineering	Best Poster Award

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4. Department faculty coordinator and the Project Evaluation Committee.
5. Mr. Abhishek Singh and Ms. Shobhi Srivastava of SURGE office for coordinating the SURGE program.

SURGE 2019 BATCH



For more information about SURGE programme, please contact:

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