IIT
Gandhinagar

SRIP

SUMMER RESEARCH INTERNSHIP PROGRAMME

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REPORT

2018

BACKGROUND

The Summer Research Internship Programme (SRIP) started as an initiative aimed at increasing the visibility of the Institute and presenting its attractive environment to a large audience. As part of SRIP during the summer months the Institute offers specific research projects for students from all over India to participate in. The Institute supports the students by providing a stipend and hostel accommodation. The programme was started in 2011 and was limited to the state of Gujarat in the first edition. The second edition of the programme in 2012 attracted nearly 700 applications from all over the country for 12 research projects. Thirty five students were selected from among the applicants and spent between two to three months at IIT Gandhinagar working on their research projects of interest. An online application system was used in the third edition of the programme in 2013 and an unprecedented number of nearly 5000 applications were received for 35 research projects. Eventually 45 students were selected for these projects based on several parameters such as academic background, profile and area of research interest.

Students from prominent institutions across India have participated in SRIP since its inception. These include other IITs notably IIT Roorkee, Delhi, Kharagpur, Kanpur, Madras, BHU and Guwahati; NITs at Durgapur, Hamirpur, Warangal, Rourkela, Surat, Allahabad, Bhopal, Sikkim, Meghalaya and Nagaland as well as other prominent colleges of engineering, sciences and humanities and social sciences. A notable feature of SRIP in keeping with the Institute ethos is of students participating in research projects from across different disciplines. While at IIT Gandhinagar, the SRIP participants are treated no differently than the regular students of the Institute and are engaged in all academic and extracurricular activities of their interest. The programme is expected to grow many fold in the coming years due to increase in faculty strength, publication of work originating from previous rounds of SRIP and wider knowledge of the programme and the Institute's strengths. In this regard, the programme is expected to be a crucial element in the Institute's efforts towards attracting strong researchers and scholars to its postgraduate programmes of study.

ACKNOWLEDGEMENTS

The organizers of Summer Research Internship Program (SRIP) 2018 thank IIT Gandhinagar for providing all necessary financial, personnel, and infrastructure support. Regular guidance of Director Professor Sudhir K. Jain is gratefully acknowledged. The support from the academic office under the leadership of Professor Pratik Mutha is put on record. The organizers are thankful to the speakers of the SRIP Lecture Series: Professor Bhaskar Datta, Professor Kabeer Jasuja and Mr. Manish Jain. Special thanks are due to Mr. N. Ravi for help in dealing with the data and postal communications. The team comprising Mr. Gaurav Shukla, Mr. Devarsh Barbhaya and Ms. Khushbu Shah photographed and/or videographed all events. These pictures are used in this report. The videos of the welcome session and the SRIP Lecture Series are available on the IIT Gandhinagar Youtube page. The support provided by the communication team led by Dr. Neeldhara Misra is appreciated. This document was given the final shape by Mr. Gaurav Shukla & Mr. Hatim Sham. SRIP team is also thankful to Mr. Franklin Kristi for his contributions. The organizers are grateful for the efforts of Ms. Divyangi Choudhary and Mr. Dilip Kashyap in coordinating the preparation of the report. The organizers thank all participating faculty members and interns for the successful completion of the program. The student body of IIT Gandhinagar organized the sports and cultural events, which added color to the experience of the interns. Their efforts are deeply appreciated. The organizers are thankful for the help and support of all those who directly or indirectly contributed towards SRIP 2018.

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1 SRIP2018: Statistics

Addressing the need for expansion of the Indian Institutes of Technology system, the Government of India has established a number of completely new IITs. This includes the Indian Institute of Technology Gandhinagar (IITGN), which became part of the system in the 2008-09 academic year. The Institute was initially housed on the premises of Vishwakarma Government Engineering College in Chandkheda, Ahmedabad, Gujarat. In July 2012, the Government of Gujarat provided a piece of land on the banks of the Sabarmati River at Palaj village, Gandhinagar District, measuring about 161 hectares (399 acres) for the IITGN permanent campus.

The 399 acre site has a difficult terrain and only about 55% of the site is available for development. The site is in two parcels with the village of Palaj separating them. A new highway forms the boundary on the eastern side of campus and the western side of campus is bounded by the Sabarmati River. Of the total site area, the southern parcel consists of 305.1 acres; 93.9 acres are in the northern parcel. The northern parcel is dominated by ravines while the southern parcel has a large contiguous area suitable for the main campus.

2 SRIP2018: Activities

2.1. Welcome Session

A welcome session was conducted in the 300-capacity auditorium at IIT Gandhinagar on the 24th of May 2018. Our Director Professor Sudhir K Jain addressed the students and emphasized on independent research by undergraduates. Professor Jain also shared some real life stories with the interns about SRIP opportunity and how it can help in shaping the future of the students. The videos of the talk can be seen on the IIT Gandhinagar Youtube page.

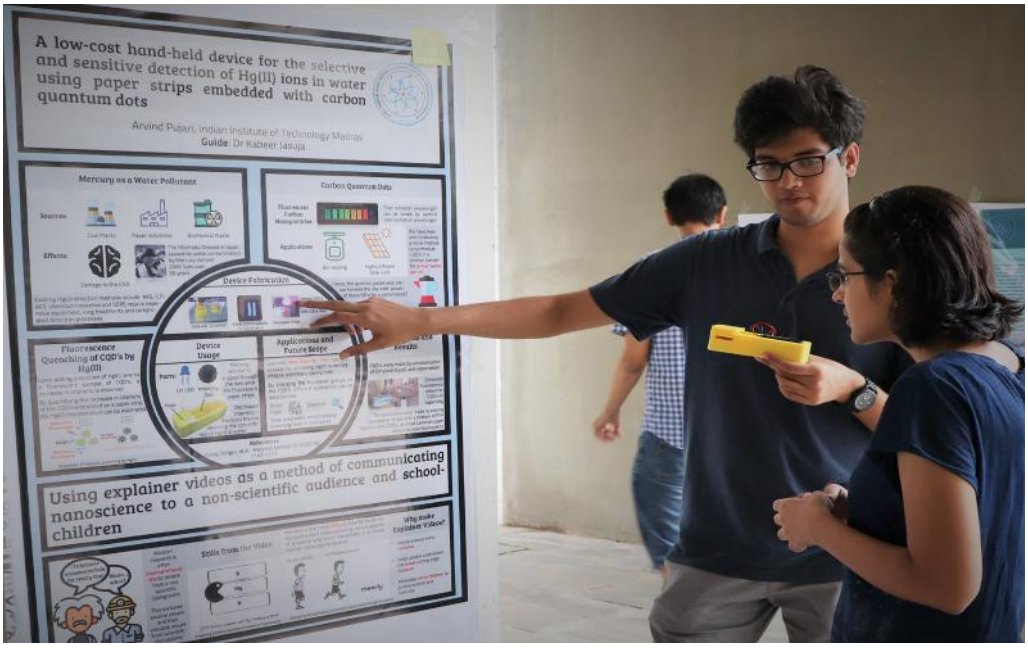
2.2. SRIP Lecture Series

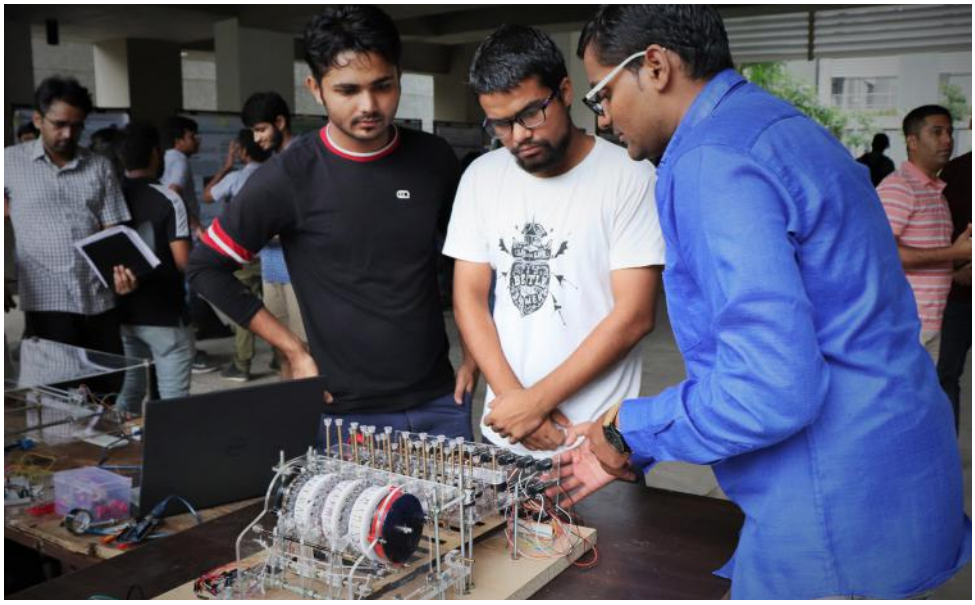
Three lecture sessions were conducted as part of SRIP Lecture Series. Professor Bhaskar Datta delivered the inaugural lecture entitled “Two Mysteries”. Professor Datta is an Associate Professor at IIT Gandhinagar. The second SRIP lecture was delivered by Professor Kabeer Jasuja, wherein he discussed the fascinating properties of boron-based nanosturctures. Professor Jasuja is an Assistant Professor at IIT Gandhinagar. The third talk was given by Mr. Manish Jain on toys and the science behind them. He coordinates the Creative Learning Institute (CLI) at IIT Gandhinagar. Mr. Jain spoke about the hands-on engineering education. The videos of the three sessions are posted on the IIT Gandhinagar Youtube page.

2.3. Poster Session

A poster session was organized around the end of the SRIP on July 4, 2018. The students presented their work done during the summer. The posters were evaluated by a panel of judges comprising Professors Jayaprakash KR, Uddipta Ghosh and Dhiraj Bhatia. Five best posters were selected based on the recommendation of the panel.

1) "Klann Mechanism Walker" presented by Shubham Chakraborty.
2) "Cleavage of his tag using TEV Protease in IMPDH protein" presented by Arvind Singh Bhati.
3) "A Low-Cost Hand-Hold Device for the Selective and Sensitive Detection of the Hg(II) in water using paper strips embedded with carbon quantum dots" presented by Arvind Pujari.
4) "Architectural Exploration tool for Handheld Devices" presented by Nisarg Parikh and Varun Gohil.
5) "Synthesis of High Surface Area Porous Hydrated Lime" presented by Lakhan Agrawal and Mayank Kamle.



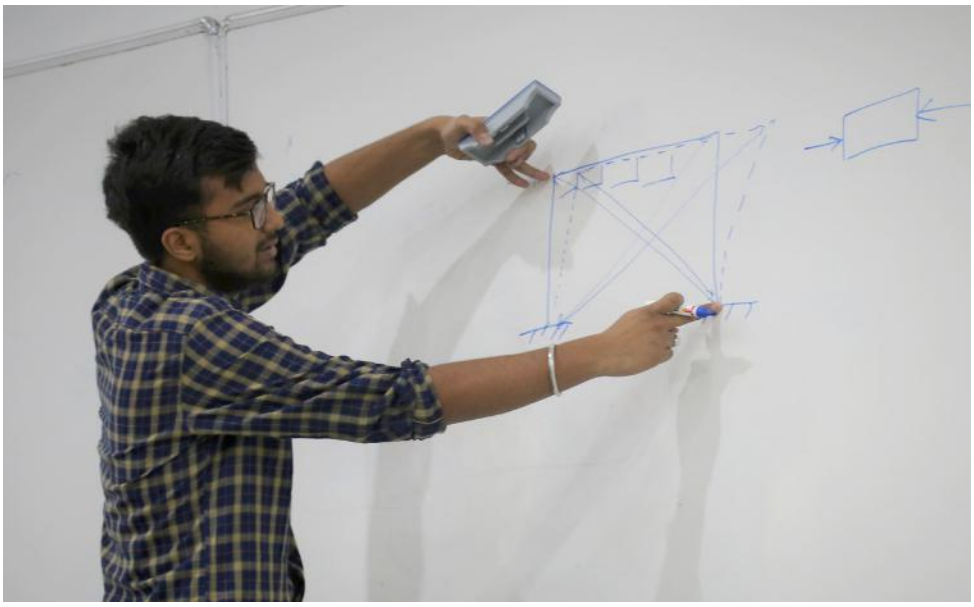


2.4. Research Proposal, Diary Writing and Bi-weekly Reports

Every participant is required to submit a research proposal within a week of joining the program. Students are encouraged to maintain an online diary, namely, Tuesday-Friday (TF) Diary to keep track of their own progress. In addition, they also are encouraged to maintain a bi-weekly record online. At the end of the program every participant submits a report comprising the work done over the summer.

2.5. Chalk The Talk

A new activity was introduced in SRIP this year called “Chalk the Talk”. Students made short presentations on their research projects in an open-to-all presentation session. Each participant was given about 10 mins to talk about his/her research using only the chalk and the board.This exercise provided a nice opportunity to the students to share their work and research ideas with their peers and exchange thoughts with them.



2.6. Viva-voce

Each student gets to briefly interact one-on-one with a member of the Undergraduate Research Committee, which helps the committee understand and address concerns related to the stay of the students at the campus, availability of resources, or other factors that keep the student from realizing their best.

2.7. Cultural Events

The SRIP 2018 Cultural Night was organized on June 16, 2018 for summer interns; where undergraduate students of IIT Gandhinagar delivered a band performance. It was followed by song and group dance performance by the students of IIT Gandhinagar and the interns came from various colleges. Subsequently, a DJ night was organized where the SRIP interns danced to the tunes, and bonded among themselves and with the IIT Gandhinagar students

3 Participants Speak

"The internship opportunity I had with IIT was a great chance for my learning and professional development. The experience I got in completing this project was tremendous. I consider myself very lucky as I was provided with an opportunity to be a part of it and to get exposed to the real scientific world and the field of research. I am also grateful for having a chance to meet so many wonderful people and professionals who supported me throughout this internship period. But all things were possible only because of Indian Institute of Technology (IIT) as without the opportunity provided by them I will never be able to avail such facilities for the completion of Project. I am grateful to them."

- Swasti Shree

"Through the project, I not only got to learn new technical skills but also had a great chance to sharpen and expand my soft-skills in team-work, ability to work under pressure, adaptability and time-management. It was only through giving presentations and talks at various events, and discussing with the advisor time-to-time that I got a wide exposure to communication skills.

It was my first ever research internship and till then I wasn't sure which path to pursue in future. In turn through the course of this internship I developed my passion towards research. This was solely due to the fact that it taught me to stay determined and focused whatever the situation might turn out to be. I learnt to be agile and resilient particularly when the problem at stake turned out to be very challenging, which on pursuing - in turn made me a better person. My experience at SRIP 2018 was truly one of its kind!

I am very much grateful to my advisor Prof. Saumyakanti Khatua and the SRIP team for giving me such a wonderful experience in pursuing a cutting-edge research project, as well as in developing values that matter the most in life."

-Rochis Manda

"The two months of research gave me the much needed exposure of looking at things from a different perspective. It developed within me patience ,problem solving abilities and most importantly the spirit of not giving up. It instilled within me a very positive inclination towards pursuing the field of research. Amidst of all these it was quite fun and enjoyable working with all the people out there in the lab and my guide."

-Biswajit Kumar Prusty

"The experience of SRIP'18 has been a pretty challenging as well as enriching one. I had very little prior knowledge of what I was going to work on and everything had to be learnt and tried out from scratch. Nevertheless, it was interesting, and I gained a lot of insight into my topic and as to how research is performed. The work culture of IIT Gn is also something worth mentioning, with people working tirelessly, till late hours into the night. Comprising mostly of young faculty members, the atmosphere is very friendly and flexible. I wish to see IIT Gn at great heights in the years to come."

-Arka Mallik

"My experience at IIT Gandhinagar was absolutely amazing. The studying environment that I got here working with MTech and PhD students was incredible. I got to learn so many things here, not only related to my project but also life improving skills. It was great working under my supervisor Dr. Umashankar Singh. He is a great personality and it was wonderful to meet him and learn so many things. He motivated me at every point of time whenever needed and I was provided with everything required to complete this project. I never felt that I am an intern, I always felt that I have been here since long. I never felt that I don't have to work on Sundays. I was always ready to learn new things and I feel happy that I came here and met so many amazing people. This internship gave me an exposure of research field and it is a start to my career journey. I have got an emotional connect with this place and I would love to come here again when time permits."

-Swati Jain

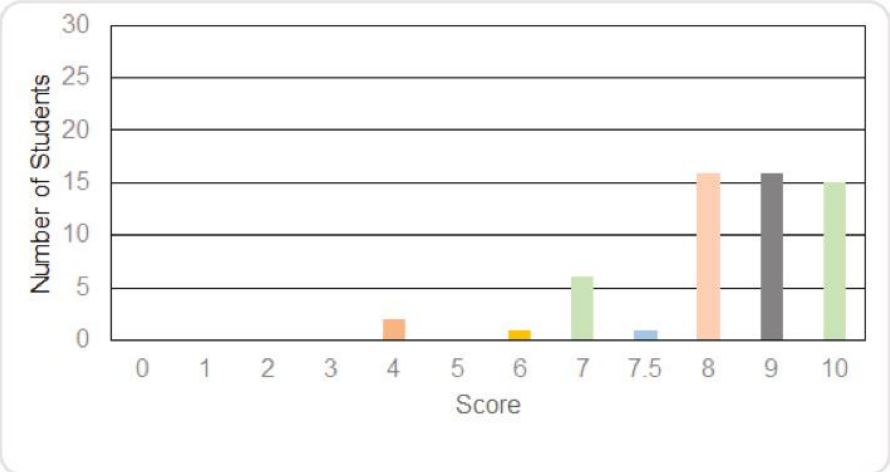
"The Summer Research Internship Program 2018 at IIT- Gandhinagar provided an excellent exposure to research work and helped me learn crucial lessons on how to conduct a research project. My advisor and guide supported me through out the process and I was able to learn a lot from them during the time I spent at the campus. The research environment promoted in the computing lab and the campus in general motivated me through out the internship. Regular lectures conducted by the SRIP and initiatives like Chalk the Talk proved to promote interaction with the other interns and were very helpful. I had a lot of positives to take from this program and I would suggest my juniors to apply for the coming SRIPs as the program proves to teach a lot not only in the field of interest but also in different fields. "

-Aaryan S. Shah

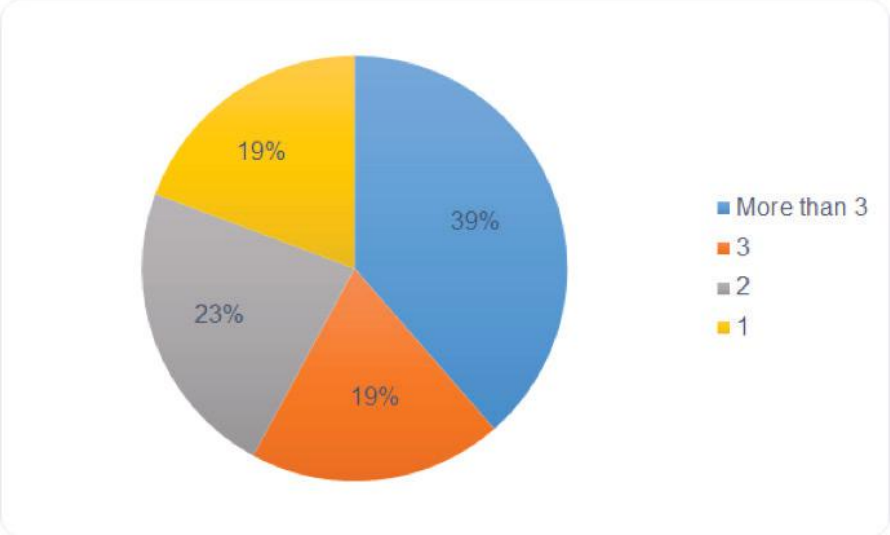
"IIT Gandhinagar instantly catches a student's imagination of what an ideal institution should be like. The open and inclusive culture, the ability to go beyond the norm to mingle with multiple disciplines and the freedom of making and breaking truly puts it on the road to become one of the best in the world.Be it the accessible infrastructure or the variety of mess food based on socio-religious factors, IITGN has paid attention to the minute yet intimate sensitivities of everyone. SRIP truly embodies the very essence of IITGN's philosophy by allowing students across the world to work on the institute's projects treating them as regular students.The projects have been well designed to challenge the interns to explore uncharted territories.It is probably the only institute in India which identified the need of recreation for its interns to do better at their works.

I interned at the Photonics Lab to develop a 3-dimensional Arduino-based movable platform for industrial gas sensing applications under the mentorship of Dr Arup Lal Chakraborty. The mentor as well as the research scholars in the lab were extremely supportive.They ensured that I got to understand the bigger picture of the project as well as complete the project in a goal-oriented manner."

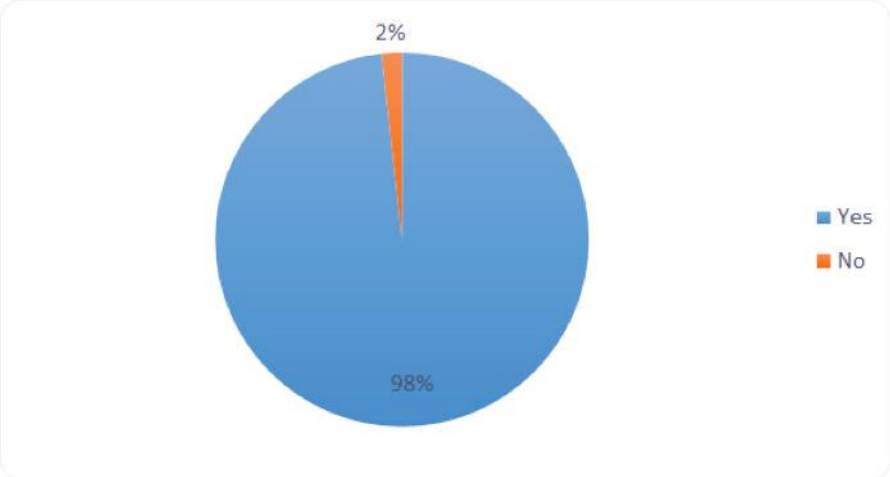
4 Student experience in numbers



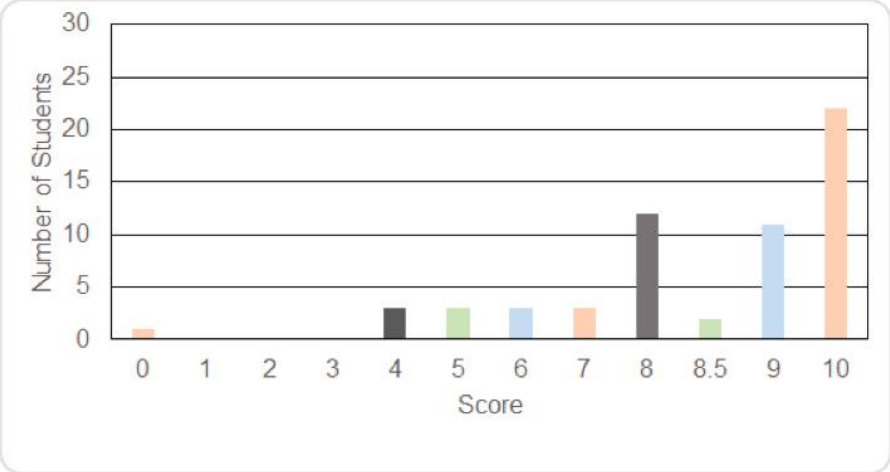
Was your research exciting? Rate on a scale of 0 to 10 (10 = very much so, 0 = not at all).



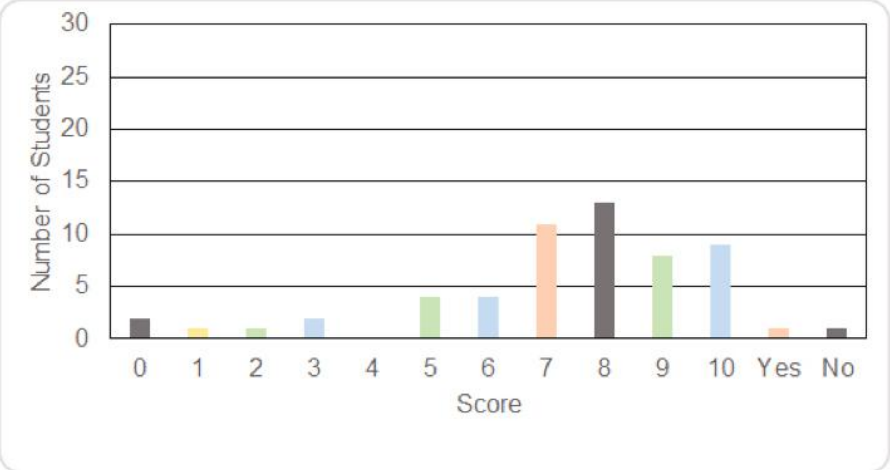
How many times did you meet your advisor every week on an average?



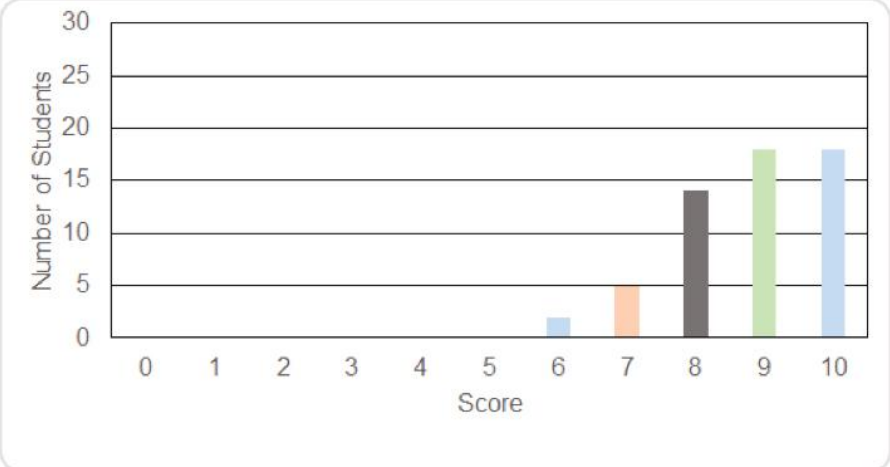
Did you receive sufficient guidance from your faculty advisor?



How was the infrastructure necessary for your functioning? Rate on a scale of 0 to 10 (10 = excellent, 0 = highly inadequate).



Did you participate in activities other than your project (e.g., SRIP lecture series, games, diaries). Rate on a scale of 0 to 10 (10 = most, 0 = none).



How was your overall experience? Rate on a scale of 0 to 10 (10 = excellent, 0 = very poor).(10 = most, 0 = none).

5 Post SRIP@IITGN

A significant number of SRIP participants are from IIT Gandhinagar itself. The Institute also sends a good number of students on an internship abroad during the summer. Undergraduate Research Conclave (UGRC) is organized in the beginning of the Fall semester, wherein the students who interned as a part of the SRIP or went to the academic and research institutions within or outside India present their work in the form of a poster. Select posters presented in the UGRC are considered for an award and/or recommended for a powerpoint presentation in front of the community. These posters are also put on display on the designated walls in the academic area. Following posters were recommended for an award in the UGRC 2018.

- "Scaling up an Aerosol Chemical Vapour Deposition Model" by Anusha Kamath M.
- "Developing a capacitive pressure sensor to measure the center of pressure" design by Alrick D'souza

In addition, the posters by Priyanshu Ranjan Gupta, Prateek Varma, and Khili Khamesra were recommended for a powerpoint presentation in front of the community.

6 SRIP Publications

Publication from SRIP 2011-18

Year	Authors	Title	Journal/Conference/Publisher
2019	S. Nath, D. Mukhopadhyay, K. Miyapuram	Emotive Stimuli-triggered Participant-based Clustering Using a Novel Split-and-Merge Algorithm	The ACM India Joint International Conference on Data Science & Management of Data (COMAD/CODS), Kolkata, India, 2019
2018	A. Singh, M. Gupta	Generic Single Edge Fault Tolerant Exact Distance Oracle	International Colloquium on Automata, Languages, and Programming (ICALP), 2018
2017	K. Chelvakumar (editor), P. Badve, N. Panpalia, P. Patel, P. Priyadarshi, S. Singal, P. Swami, VVS Akhil, D. Wichramaarachchi	Solar power in India: past, present and 2022	Indian Institute of Technology Gandhinagar, Gandhinagar
2017	A. Dixit, K. Banerjee	New representations for $\sigma(q)$ via reciprocity theorems	Analytic Number Theory, Modular Forms and q-Hypergeometric Series, Springer Proceedings in Mathematics and Statistics
2017	V. Mavani, S. Raman, K. P. Miyapuram	Facial Expression Recognition Using Visual Saliency and Deep Learning	The IEEE International Conference on Computer Vision (ICCV)
2017	S. Dahale, A. Das, N. Pindoriya, S. Rajendran	An Overview of DC-DC Converter Topologies and Controls in DC Microgrid	2017 IEEE 7th International Conference on Power Systems (ICPS 2017), Pune, India.
2017	S. Ramakrishnan, S. Pachori, A. Gangopadhyay, S. Raman	Deep Generative Filter for Motion Deblurring	The IEEE International Conference on Computer Vision (ICCV)
2017	M. Verma, R. Ghosh, S. Raman	Saliency Driven Video Motion Magnification	The 6th National Conference on Computer Vision, Pattern Recognition, Image Processing and Graphics (NCVPRIPG), IIT Mandi
2017	V. Patel, P. Shah, S. Raman	A Generative Adversarial Network for Tone mapping HDR images	The 6th National Conference on Computer Vision, Pattern Recognition, Image Processing and Graphics (NCVPRIPG), IIT Mandi
2016	G. K. Singh, R. Chavan, V. V. Shah, A. P. Dahale, H. Madapusi	Backward-in-time input reconstruction	American Control Conference (ACC)
2016	B. Sonane, S. Ramakrishnan, S. Raman	Automatic Video Matting through Scribble Propagation	The 10th Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP), Indian Institute of Technology Guwahati

2016	H. K. Verma, A. Saikia, N. Khanna	A Hybrid Model for CFA Interpolation Detection	IEEE 3rd International Conference on Identity, Security and Behavior Analysis, IIIT Delhi
2016	H. Jain, J. Das, H. K. Verma, N. Khanna	An Enhanced Statistical Approach for Median Filtering Detection using Difference Image	IEEE 3rd International Conference on Identity, Security and Behavior Analysis, IIIT Delhi
2015	S. K. Das, A. Bedar, A. Kannan, K. Jasuja	Aqueous dispersions of few-layer-thick chemically modified magnesium diboride nanosheets by ultrasonication assisted exfoliation	Scientific Reports (Nature)
2015	V. Karde, S. Panda, C. Ghoroi	Surface modification to improve powder bulk behavior under humid conditions	Powder Technology (Elsevier)
2015	D. Basu, S. Giri	Accidental eccentricity in multistory buildings due to torsional ground motion	Bulletin of Earthquake Engineering (Springer)
2015	V. Gandhi, S. Heda, R. Anand, A. S. Zarin, A. Upadhyay, A. L. Chakraborty	Rapid detection of CO2 using a Raspberry Pi-based field-deployable tunable diode laser spectroscopy system	International Conference on Microwave and Photonics ICMAP 2015
2015	U. Dwivedi, A. Dasgupta	Enabling Compliance of Environmental Conditions	International Conference on Information and Communication Technologies in Development (ICTD 2015)
2015	A. A. Kanoria, K. Panchal, R. Dongre, M. Damodaran	Computational Modelling of Aerodynamic Characteristics of Airships in Arbitrary Motion	AIAA Lighter-Than-Air Systems Conference at AIAA Aviation and Aeronautics Forum and Exposition (AVIATION 2015), Dallas, USA
2015	V. Palkar, G. Srivastava, O. Kuksenok, A. C. Balazs, P. Dayal	Using stability analyses to predict dynamic behaviour of self-oscillating polymer gels	American Physical Society March meeting, San Antonio, TX, USA
2015	M. Jalaj, M. Damodaran	Computational Modeling of Small Energy Harvester Subjected to Aeroelastic Instabilities	2nd Indian Conference on Applied Mechanics, IIT Delhi, India.
2015	M. Chawla, M. Mesa, K. P. Miyapuram	Graph Clustering for Large-Scale Text-Mining of Brain Imaging Studies	WCI 2015
2014	S. Pandey, R. Patidar, N. V. George	Design of a krill herd algorithm based adaptive channel equalizer	22nd IEEE International Symposium on Intelligent Signal Processing and Communication Systems (ISPACS 2014), Malaysia
2014	T. Samanta, C. Wargo	Recasting "active aging" in India: Implications for theory and policy	Gerontological Society of America Annual Scientific Meeting, Washington DC

2014	R. Mallik, A. Gupta, A. Joshi, A. L. Chakraborty	Using tunable laser diodes to classify cold drinks brands and interrogate an FBG-based temperature sensor	12th International Conference on Fiber Optics and Photonics (Optical Society of America, 2014)
2014	P. Modi, R. Shah, V. Mishra	Projections of extreme precipitation events in India from regional and global climate models	American Geophysical Union (AGU) Fall Assembly 2014, San Francisco, USA
2014	G. Kanojia, S. R. Malireddi, S. C. Gullapally, S. Raman	Who Shot the Picture and When?	10th International Symposium on Visual Computing, Las Vegas, USA
2014	S. S. Pamulapati, S. Kirubakaran, V. Thiruvenkatam	In Search Of Drugs For Helicobacter Pylori Infection	Research Scholars & Alumni Symposium 2014 (RSAS 2014), IIT Bombay
2014	S. Jolad, A. Roman, M. Shastry, M. Gadgil, A. Basu	A family bounded divergence measures based on Bhattacharyya coefficient	IEEE Transactions on signal processing
2014	A. Bapat, A. Ravi, S. Raman	An Iterative, Non-local Approach for Restoring Depth Maps in RGB-D Images	21st National Conference on Communications (NCC), IIT Bombay
2014	A. Chatterjee, V. Karde, S. Saroj, C. Ghoroi	Partial least squares analysis for property prediction of binary blends	CHEMCON 2014, Chandigrah, India.
2014	P. Gupta, N. V. George	An improved face recognition scheme using transform domain features	IEEE International Conference on Signal Processing & Integrated Networks (SPIN 2014), Noida, India.
2014	K. Sirisha, N. V. George	Improving convergence of nonlinear active noise control systems	2014 IEEE Students' Technology Symposium (TechSym 2014), IIT Kharagpur, India.
2013	N. V. George, G. Panda, V. Kumar	On the development of a partial update multichannel nonlinear active noise control system	7th International Conference on Signal Processing and Communication Systems (ICSPCS 2013), Gold Coast, Australia.
2013	G. K. Singh, V. V. Shah, H. J. Palanthandalam Madapusi	Diagnosis of Parkinson's disease: A limit cycle approach	International Conference on Control Applications (CCA)

7 Abstracts from SRIP 2018

1. Cloning and expression of kinesin domain fragment in E.coli

Swasti Shree, Department of Bioscience and Biotechnology
Banasthali University
Mentor: Virupakshi Soppina, Department of Biological Engineering

Eukaryotic cell requires a network of microtubules to serve for cytoskeletal and intracellular transport via motor proteins. Kinesin is a member of motor family proteins which utilizes ATP hydrolysis to power its movement. Kinesins are organized into 14 families out of which Kinesin-3 is largest. Kinesin-3 has five different sub-families (KIF1, KIF13, KIF14, KIF16, and KIF28). KIF13b is involved in the reorganization of the cortical cytoskeleton. It also regulates axon formation by promoting the formation of extra axons. Any impairment in transport leads to various diseases like Alzheimer, Huntington, and cancer, etc. In the current proposal, we aim to understand the autoregulation of Kinesin 3. In this respect, different KIF 13b domain fragments have been cloned and expressed in a suitable host for further purification and single molecule motility analysis.

2. Dynamic Graph Algorithms for Single Fault Problem

Nitiksha, Computer Science and Engineering
Indian Institute of Technology Gandhinagar
Mentor: Manoj Gupta, Computer Science and Engineering

Given a graph G = (V, E) and a set S of source vertices where |S| = σ, we want to efficiently compute all the shortest distances from a source vertex s in S to any other vertex t in V avoiding some edge e in E. The shortest paths avoiding an edge or vertex are called replacement paths. When only a single edge or vertex is to be avoided, it is called single fault problem. For the case when σ = n, this problem has been solved by Bernstein and Karger. The above result works for directed weighted graphs as well. Our focus is to solve it for undirected and unweighted graphs for the case when $1 \leq \sigma < n$. This problem naturally models any network subject to node or edge failure such as a road failure in a road transportation network.

3. Depth Map Estimation using Convolutional Neural Networks

Manish Ranjan Karna, Computer Science & Engineering
Indian Institute of Technology (ISM) Dhanbad
Mentor: Ravi Hegde, Electrical Engineering

Depth estimation is an important task in Computer Vision. It helps in robotic vision, medical imaging, 3D image construction, etc.. Estimating depth is relatively easy if we have more than one image but the task becomes difficult when we have a single 2D image. Estimating depth from a single image relies on assumptions about geometric scenes which we call monocular cues such as relative size, texture gradient, position of objects etc. Out of many approaches for depth prediction, I used convolutional neural network for regressing the depth of single RGB image.

An alternate approach is to use synthetic images generated from freely available 3D models. In my case, it is possible to generate high resolution images both RGB and its respective depth maps using a software called 'Blender' and its python API. To increase the training data size, I flipped all the images and their corresponding depths. Thus, the training dataset was doubled. The absolute depth map (upto 10 meter distance) is generated.

The architecture model I used to predict depth maps was based on AlexNet. Thus, all the convolutional layers had kernels size same as that of the original AlexNet network. This was done just to use the pretrained weights which were trained on AlexNet. The model consists of 3 CNNs namely global context, gradient network and refining network. The first stage contains the global context model and the gradient model which outputs the rough depth estimate and the gradient estimate, respectively. The output of the first stage is given as input to the second stage (refining network), in order to improve the rough depth estimate. The normalized loss function is used for optimization, which results in better estimates of the depth map. To compare how much similar two given images are, I used Structural Similarity Index (SSIM). It gives a score between 0 and 1. Scores closer to 1 implies more similarity. The results of the depth estimation network shows the improvement in the performance after fine tuning the model.

The results were just compared by visualising through the eyes. We found a considerable improvement in the depth maps when the variation in the training dataset was introduced. These variations included the contrast difference, varying angle of cameras and the position of lamps. This task can also be tried in future by incorporating other models such as GoogleNet, VGG, etc. Also, to compare the results by just visualising using human eyes isn't an efficient method to do this. So, we can also work on how to compare two images and use it to compare the results on different architectures.

4. Synthesis and characterization of Mesoporous Silica Nanoparticles and Silica Dye Nanoparticles

Raghuram Gaddam, Metallurgy and Material Science
JNTU Hyderabad
Mentor: Sudhanshu Sharma, Material Science and Engineering

The primary objective of this research programme was to synthesize Mesoporous silica nanoparticles and subsequently mesoporous silica dye particles for their targeted applications in the fields of biomedicine. And eventually carry out various characterization tests to analyze the nanoparticles. For the synthesis, I initially opted for the Sol-gel method of synthesis. I conducted 3 experiments. First without using any surfactant, then using a cationic surfactant - CTAB (Cetyltrimethylammonium Bromide) and finally using a neutral surfactant - PEG (Polyethylene Glycol). Then I also conduct 2 experiments via coprecipitation method. One experiment to synthesise silica nanoparticles using an anionic surfactant - SDS (Sodium Dodecyl Sulphate) and the other experiment to synthesise silica dye nanoparticles using FITC - APTS dye and CTAB as surfactant. As for the characterization, I conducted 5 tests. TGA and DSC to identify the amount of moisture content and the temperature at which the sample becomes completely moisture free. FTIR to analyze the various kinds of bonds present in the sample. BET to study the nature of pores and find pore size, pore volume and specific surface area and lastly SEM to study the surface morphology.

5. Determination of Monosaccharides using Belousov Zhabotinsky reactions

Ankita Srivastava, Chemical Engineering
National Institute of Technology Calicut
Mentor: Pratyush Dayal, Chemical Engineering

Diabetes, a major source of morbidity and mortality is caused by imbalance of glucose, a monosaccharide in human body. Mannose is another monosaccharide, used for the prevention of Urinary Tract Infections. Quantification of these monosaccharides can help reduce the health risks such as alzheimer, tumour, heart problems, etc. caused due to their imbalance. Inexpensive chemicals and simplistic analysis is a motivation for using Belousov Zhabotinsky (BZ) reactions over common quantification techniques such as enzymatic method, chemical method and

chromatography. BZ reaction is an oscillating reaction in which oscillations are observed in terms of colour change of solution due to alternate oxidation and reduction of catalyst. These colour changes are recorded and image processing technique is used to determine the oscillation parameters. The oscillation parameters of BZ reaction are affected upon addition of monosaccharides in the system. Monitoring the change in parameters of BZ system, glucose and mannose are determined with high precision and calibration chart is prepared. Use of this simple analytical technique with prepared calibration chart can help in easy monitoring of glucose and mannose in human body which can further help in the prevention of diabetes, UTI and other related problems.

6. Decoration of Porphyrin with Tetraphenulethene

Aman Kumar Sharma, Applied Chemistry

Sardar Vallabhbhai National Institute of Technology Surat

Mentor: Iti Gupta, Chemistry

Porphyrins have been extensively used in fluorescence detection of tumors and image-guided surgery because it can exhibit fluorescence properties. However, in concentrated solutions, the fluorescence properties of porphyrins are quenched because of tend to form ϖ-ϖ stacking aggregates via driving forces such as hydrogen bonding, van der Waals interactions, electrostatic interactions and hydrophobic effects due to this porphyrins show aggregation caused quenching (ACQ). This ACQ limits the applications of porphyrins in bio-imaging and photodynamic therapy. We can reduce this aggregation caused quenching by adding dendritic arms to the porphyrin. Therefore, attaching TPE moieties to the porphyrins is a viable approach to enhance the fluorescence properties of porphyrins in aggregated state or in concentrated solutions.

I have synthesized core modified porphyrins attached with TPE moiety, where two meso positions will contain TPE substituents. In the present context core modified porphyrin indicates one of the four pyrrole moieties of regular porphyrins is substituted by a thiophene moiety. The presence of thiophene would cause the absorption spectra shifted to a longer wavelength, indicating lower energy absorption. Synthesis of such porphyrins will be achieved by multiple steps and finally the photophysical properties of the porphyrins will be studied by UV-Vis, fluorescence and lifetime studies.

7. Microbial Mobilization of arsenic and Antibiotic Resistance Bacteria in Groundwater and surface water

Subhash Kumar Sharma, Environmental Engineering

National Institute of Technology Tiruchirappalli

Mentor: Manish Kumar, Earth Science

Contamination of groundwater and surface water due Arsenic and other heavy metal and various types of antibiotics. Which are being dumped in the dump yard as our waste are heavily polluting the water bodies. Once they reach the water bodies through the rain and other natural phenomenon they are polluting the water bodies. The increasing pollution in the water bodies is the major concern today because of its high toxicity. This study is an effort to understand the role of Aspergillus niger and Penicillium Chrysogenum to degradation of arsenic and occurrence of antibiotic resistance Total coliform and E. coli in wastewater and surface water in Ahmedabad. The study focuses on the level of arsenic tolerance in Aspergillus niger and Penicillium Chrysogenum and the level of resistivity of antibiotic resistance Total coliform and E. coli. Fifteen different samples were collected from different location of Ahmedabad from lakes, river, sewage treatment plant (STP), water treatment plants (WTP) and canals. Total coliform and E. coli was cultured and colonies were isolated for the antibiotic resistance test was done by disk diffusion method for six different

antibiotics. The result suggests that Aspergillus niger and Penicillium Chrysogenum has got high tolerance for arsenic and able to consume arsenic and help in the removal of arsenic from water in presence of organic matter. The STP has got highest number antibiotic resistance E. coli compared to the WTP, river, lakes and canal.

8. Designing virtual reality games and interfacing with inertial motion sensors (IMU)

Gargi Yadav, Electrical Engineering

Indian Institute of Technology Roorkee

Mentor: Arup Lal Chakraborty, Electrical Engineering

Existing evidences shows that virtual reality games and 3D games can be very helpful for stroke patients in their recovery. In stroke there is less blood flow to the brain and it causes disability and hemiparesis. This project aims to make a glove using IMU sensors and interfacing it with a 3D game. This will be used as a therapy for rehabilitation of patients. We aim at developing a glove that along with virtual reality games could be used for rehabilitation of such patients hands. Several such gloves exist commercially, but they are very expensive and limited in performance. Inertial measurement unit (IMU) sensors are inexpensive, small in size and readily available in market . The IMU based hand glove uses a combination of six degree of freedom inertial sensors in addition to filtering techniques to detect finger joint movement. This project is mainly divided in two parts. First, Making a glove with IMU sensors attached on fingers to measure the bending angle of fingers and Second, game development in Unity and connecting it to the glove for the input. IMU sensors are used because the bend angle can be measured accurately and faster as it contains both accelerometer and gyroscope.

9. Extraction, purification and crystallization of Glucose 6 Phosphate Isomerase

Swarupa Bashyam, Marine Biotechnology

Goa University

Mentor: Vijay Thiruvenkatam, Biological Engineering

Glucose 6 phosphate isomerase from the organism Pseudomonas aeruginosa is an enzyme that participates in the conversion of glucose 6 phosphate to fructose 6 phosphate and vice-versa in glycolysis and gluconeogenesis. P.aeruginosa is a pathogen that causes nosocomial infections like cystic fibrosis in humans. It follows the glycolytic pathway uniquely. Targeting this protein might give an insight on the organism's metabolic pathway with respect to cystic fibrosis. Based on this analysis, elucidating the enzyme's structure would help determine the secondary structure where one can understand the mechanism and its function.

Crystallization can be a good way to elucidate the protein structure. The protein has to be obtained in its native form with high purity to facilitate the process of structure elucidation. A suitable buffer and right incubation temperature along with desirable time are equally important parameters to optimize the crystallization to occur.

Once the crystals are obtained, further structural analysis using X-ray crystallography will highlight the secondary structure of the protein to further explore on structure based drug design.

10. Understanding growth mechanism of gold nanorods

Rochish Manda, Metallurgical and Materials Engineering

Indian Institute of Technology Kharagpur

Mentor: Saumyakanti Khatua, Chemistry

Lately, gold nanorods have become the center of interest for scientific research due to their immense shape-dependent optical and plasmonic properties leading to revolutionary applications in cancer therapeutics, bio-marking, heat sensing and photovoltaics - which may have a significant impact in the way we live in the near future. Due to these various applications of gold nanorods, it is imperative to ensure their reliable and efficient synthesis with a wide range of dimensions, and to understand the impact of changing the dimensions of gold nanorods on their optical and plasmonic properties. This dimensional or morphological change in gold nanorods can be brought about by varying the parameters involved in the growth process that are responsible for constraining the growth of gold nanorods in the growth solution such as – the reducing agent employed in the growth solution and its concentration, pH of the growth solution, silver ion concentration in the growth solution and additives used in the growth solution.

The objective of this project was to build a schematic model illustrating the growth mechanism of gold nanorods at different pH, and then build an empirical relationship between the aspect ratio of gold nanorods and the pH of the growth solution.

Using this empirical relationship, the aspect ratio can be tuned and hence the optical and electronic properties of gold nanorods can be fine-tuned as per requirement of the application.

11. Synthesis of N,N-Dimethylamino Benzaldehyde N,N-Dialkylamino Benzaldehyde and Julolidine composed of Trifluoromethyl Cyanostyrenes

Jillan. S, M.Sc., Applied Chemistry

Anna university, College of engineering, Guindy

Mentor: Sriram Kanvah Gundimeda, Chemistry

Learned NMR,UV-Vis,Fluorescence spectroscopic techniques and column chromatography.

12. Analysis of statistical image properties of Indian visual art

Rashmita Chatterjee, Electrical Engineering

National Institute of Technology Rourkela

Mentor: Leslee Lazar, Cognitive Science

In recent years, there have been efforts in defining the statistical properties of aesthetic photographs and artworks using computer vision techniques, giving rise to the field of computational aesthetics. Statistical image properties such as self-similarity, complexity, anisotropy and Birkhoff-like measure have been linked to aesthetic perception. A self-similar object is exactly or approximately similar to a part of itself (i.e. the whole has the same shape as one or more of the parts). Complexity is conventionally defined as the level of detail or intricacy contained within an image. Anisotropy is the property of being directionally dependent. We compared the above values for Indian paintings across different styles and other subjective factors of the paintings. We made a database of Indian artwork which covered a wide time span, representing 4 broad categories of artwork: Tribal, Pahari, Rajput and Modern Figurative art. It consists of 287 paintings. These images were analyzed using the PHOG (Pyramid Histogram of Oriented Gradients) algorithm, which computes values for the four mentioned properties. We compared them with western artwork (JenAesthetics dataset), photographs of simple objects, natural scenes and patterns.

13. CFD analysis of vortex-induced aeroacoustics

Aby Jose, Mechanical Engineering

Indian Institute of Technology Roorkee

Mentor: Vinod Narayanan, Mechanical Engineering

Despite various innovations, present day helicopters are noisy and suffer from vibration issues. Excessive noise levels near community heliports are among the main impediments to increasing civilian use of helicopters. Noise reduction is also important from a militaristic point of view, especially for stealth ops. One of the most persistent sources of noise in a helicopter is the Blade-Vortex Interaction (BVI) noise. This is the interaction between the trailing tip vortices of a rotor blade with the oncoming rotor blade. Because of these interactions, loud noise is emitted which is undesirable. Studies on vortex interactions are sparse and the physics behind it are still not properly understood. Even more, experimental studies are expensive and difficult to perform. Recent developments in mathematics and computer technology have made it possible to have fast and accurate results of such physics problems using Finite Volume Method and employment of several mathematical models to simulate the flow.

In this project, I have tried to get a deeper insight of the vortex induced aeroacoustics by modelling the turbulent flow across two NACA 2412 airfoils in tandem. I performed the simulation using the software ANSYS 18.0. I captured the acoustic signatures produced by each airfoil individually. The second airfoil encounters the wake of the first airfoil and hence produces a different self-noise compared to the first, which encounters the free stream. I also carried out simulations by varying the angles of attack of both the airfoils by 10 degrees and observed the accompanying acoustic phenomena. In an attempt to design a wake control mechanism and to see the effects on the noise emitted, I introduced a thin sheet between the two airfoils and simulated the flow using the same boundary conditions. The resultant acoustic behaviour was recorded and comparisons made with the original set up.

14. Application of controls in autonomous race car

Amit Jangid, Mechanical Engineering

Indian Institute of Technology Gandhinagar

Biswajit Kumar Prusty, Electrical Engineering

National Institute of Technology Rourkela

Mentor: Harish PM, Mechanical Engineering

The robustness of the control systems varies as we move up the speed. Autonomous Cars are no longer a dream but reality, however the incorporations of the autonomous principles in the race car model sets up the challenge of developing a fast and effective control system that gives autonomy to the vehicle at high speed. The project aims to build the challenge of developing a fast and effective control system that gives autonomy to the vehicle at high speed. The project aims to build an autonomous scaled down version of a race car. It include various approaches starting with image processing which aimed at finding the centroid of the masked image to find the steering input of the car. However environmental disturbances such as infrared light from the sun caused an error in the calculation of centroid. Moving to the other methods, machine learning and preview control techniques were studied parallelly to compare the robustness of the two. The connections required for video streaming and processing in machine learning was done successfully and collection of the data for neural network training was carried out. The vehicle dynamics modelling was done with simulations in MATLAB that provided us with a picture of the track that the car was supposed to follow under the given inputs and vehicle properties. The objective of the project is to explore and

analyze tracking and preview control that may find its utility in several other applications including robotic manipulators and autonomous vehicles.

15. A study on developing higher efficiency lower cost solar Photovoltaic (PV) technologies

Mohd Shadab, Electrical Engineering

Sardar Vallabhbhai National Institute of Technology Surat

Mentor: K. Chelvakumar, Mechanical Engineering

With increasing demand for electric power and rapidly depleting conventional energy sources, it is becoming more important to use renewable, clean production of energy at the highest levels of efficiency. Solar energy is most abundant clean source of energy that is capable of being harnessed with minimum detrimental impact on environment. Presently, the solar PV technologies that are being used extensively are monocrystalline Silicon (cSi), polycrystalline Si (pSi) and thin film cadmium telluride (CdTe). Improvement of efficiency and cost reduction of these technologies has been slow. Multi-junction, Organic and perovskite are the most promising emerging technologies with advantages such as higher efficiency, lower cost and ease of manufacturing. Yet these technologies still need research and development to be viable for terrestrial installations. This study focuses on Multi-junction, and perovskite solar cells, and summarizes their state of art limitations and challenges. And The cost of these solar cell and its comparison with conventional Silicon and thin film PV is also discussed.

16. Single image super resolution

Manas Satish Bedmutha, Electrical Engineering

Indian Institute of Technology Gandhinagar

Mentor: Ravi S. Hegde, Electrical Engineering

Super Resolution of Images, here, refers to enhancing the image in terms of size at no compromise to the quality of the image. Basically it is a class of techniques that enhances the resolution of the given image or upscales the image (given a low resolution image suppose 100*100 pixels, the superresolution techniques convert this image into a high resolution image, for example 400*400 pixels).

For real time vision applications, cameras have lesser quality as a tradeoff over processing time. Hence the need to create methods to enhance their resolution.

Various image processing techniques have been applied with hardly any further scope for improvement. With deep learning, multiple networks like SRCNN, Laplacian Pyramids, SRGAN, etc. have given a new way of thought.

The basic aim is to improve the networks in terms of computational time and making them suitable to incorporate in security devices (especially in the fields of image and video forensics.)

We propose two different architectures, one better in terms of quality but having larger number of parameters, the other, a faster one.

17. Study of aerosol generated from solid phase reaction and its characterization

Sanu Kumar, Chemical Engineering

National Institute of Technology Tiruchirappalli

Mentor: Chinmay Ghoroi, Chemical Engineering

Ultra fine particulate solids in the form of aerosol is important in many applications including its application in fire extinguisher. In this project, aerosol particle is generated from solid phase reaction and its complete characterization such as particle shape and size distribution, composition, temperature and density is done.

Experiments are conducted to confirm mechanism of fire suppression and to quantity mass of the aerosol produced from solid phase reaction.

Based on the literature study, the aerosol of desired properties will be generated by changing the experimental conditions.

18. Wave propagation in three dimensional granular media

Saptarshi Saha, Civil Engineering

Indian Institute of Technology Kharagpur

Mentor: K. R. Jayaprakash, Mechanical Engineering

In this report we present a computational study of energy dispersion due to various modes of excitation on spherical granules in a three-dimensional arrangement. We commence by verifying our simulations for one-dimensional cases of homogeneous granules and periodic arrangement comprising of 'heavy' and 'light' granules (i.e. a dimer), in a chain. We consider the force transmission to a fixed last bead as a measure of the dispersion characteristics of the granular dimer chain. We simulate a cylindrical tube containing particles in a regular arrangement to mimic a 1D chain. Given an impulsive excitation, we observe how the parameters of the dimer and of the tube affect the characteristics of the travelling pulse.

An interesting behavior observed irrespective of the mass ratio is the higher magnitude secondary pulse in comparison to the primary pulse. This behaviour is attributed to the reflected pulse from the cylindrical boundary and their constructive interference at the center. In a continued study we will look at the same/similar three-dimensional arrangement under harmonic excitation and with dissipative forces within the system, amongst various modifications.

19. Solar photovoltaic power generation: water conservation in canal top installations and effect of temperature on efficiency

Athula Kumara Karunarathne, Mechanical and Process Engineering

Faculty of Engineering, University of Jaffna

Mentor: K. Chelvakumar, Mechanical Engineering

This paper focus on assessment of annual water conservation from evaporation in a canal top solar installation and analysis of temperature impact on solar panel efficiency. Water conservation assessment has done for Gandhinagar weather data and 1MW plant specific

data (Canal length, canal bed width, annual water flow rate).Canal top solar installation (1MW) can conserve 8.5 million litres annually and it is 88.5% from the open evaporation. The aspect of Temperature impact on panel efficiency analysis is to expose the correlation of panel efficiency on ambient temperature. If consider about a data a single day, There is not that much correlation of Efficiency on Temperature as expected. But in morning (9.00am -12.00pm) has clear dependence (0.19%/0C). But when consider in economically it is not feasible to recover

20. Probabilistic seismic hazard analysis of northeast India

Arka Mallik, Exploration Geophysics

Indian Institute of Technology Kharagpur

Mentor: Dhiman Basu, Civil Engineering

Seismic ground motion caused by earthquakes can affect the constructions and structures around its area of influence. In this context, Seismic Hazard Assessment is a key tool for planning the safety and design of structures.

Probabilistic Seismic Hazard Assessment (PSHA) provides a framework in which the uncertainties of earthquake size, location, recurrence rate and variation of ground motion parameters can be identified and quantified to provide a complete picture of the seismic hazard. The PSHA of Northeast India has been carried out in this project. The study area has been classified into 6 seismic source zones. The a and b values of the Gutenberg-Richter recurrence

relation are calculated separately for each zone taking into consideration the completeness of the available earthquake data. 5 different Ground Motion Prediction Equations (GMPEs) have been used, with suitable weighing factors assigned to each. Ground motion intensity has been measured as Spectral Acceleration (SA) for the return periods 475 and 2475 years and time periods 0.01s, 0.1s, 1s. The spatial variation of the same has been shown through hazard maps. Seismic hazard curves have been estimated for 10 major cities lying within the study region.

21. Salient object detection: improving the universal framework

Meghna Ravishankar, Electronics and Communication Engineering

PES University, Bangalore

Samyuktha Sridhar, Computer Science and Engineering

SRM Institute of Technology, Kattankulathur, Chennai

Mentor: Shanmuganathan Raman, Electrical Engineering

The aim of our research is to propose a methodology which improves the universal framework for salient object detection. A prior saliency map of the input image is first taken from any existing saliency detection models. This is then used to extract the rough salient region by applying distance weighting, adaptive binarization and morphological closing. The RGB image is converted to CEILab color space. For each channel, non-overlapping 8x8 blocks are formed and the DCT function is applied on them. The DC value of each block is retrieved and used as a unique feature of the pixels in that block. The Bayesian decision model is then applied to find the probability of a pixel belonging to the salient region. As in the universal framework, an iterative approach is used to refine the accuracy of the saliency map. Alternate methods, such as LBP in place of dct and use of histograms to count the number of pixels are also being looked upon.

22. Flow over a vertical cylinder

Dhairya R. Solanki, Civil Engineering

Indian Institute of technology Kharagpur

Mentor: Pranab K. Mohapatra, Civil Engineering

In the past few decades, numerous studies have been done on reducing the scouring depth around a bridge pier. Scouring reduction technique mainly are of three types 1) Flow altering 2) Structural 3) Armorcing the scouring depth around a bridge pier. Scouring reduction technique mainly are of three types 1) Flow altering 2) Structural 3) Armoring. The following report consists the use of flow altering counter-measure(suction) to foresee its effects

on flow and scouring.Usage of suction inside the pier is the main focus of this report. Firstly, a literature review of the previous work done on the scouring problem is reported. A CFD approach is used in the following work for validation of the boundary conditions as well for incorporation of suction. The following approach can be used further in many practical situations as well as for research purposes.

23. Smart materials

Rohit Dash, Chemical Engineering

National Institute of Technology Rourkela

Mentors: Pratyush Dayal, Chemical Engineering

Advances in living conditions and medical research has resulted in a global increase in the average lifespan of humans,while at the same time-Metropolitan life style and living habits have made sure that diseases such as diabetes creep into and affect lives widely. According to Wild et al1, the prevalence of diabetes is predicted to double globally from 171 million in 2000 to 366 million in 2030 with a maximum increase in India. It is predicted that by 2030 diabetes mellitus may afflict up to 79.4 million individuals in India. The above statistic gives a clear indication of the epidemic that is diabetes and thus the continuous effort within the scientific community to discover a faster and versatile diagnosis methodology for early detection of the same. Diabetes and cancer diagnosis can be performed by determining the blood glucose/mannose concentration -as a diabetic patient has inflated glucose content than a healthy human counterpart(same is applicable in case of mannose for cancer).This work provides a non-traditional yet simplistic approach to analyze the glucose/mannose concentration in blood, urine, sweat, and saliva using Belousov Zhabotinskii reaction and a real-time image processing script.Belousov Zhabotinsky (BZ) reaction is an oscillatory reaction which accomplishes the oxidation and bromination of an organic substrate with the aid of a catalyst in an acidic medium. The reaction proceeds with oscillation in color of the system caused by alternating oxidation-reduction of the catalyst changing its oxidation state. Addition of monosaccharides (glucose/mannose) results in changes in the reaction parameters such as frequency of oscillations and induction period,as the organic substrate and the added monosaccharide compete for Br- ions for bromination, thus the rate of consumption of Br- ions outpower its replenishment and thus the induction period of the reaction reduces noticeably.. This oscillation in color is quantified with the help of the autonomous script, which maps with the concentration of intermediates in real time. Subsequently, the number of oscillation obtained is inserted as a parameter into the equation obtained from the calibration chart prepared after summarising the results of a series of BZ reactions to reverse engineer the glucose/mannose concentration in the BZ system.The non-traditional approach of determining monosaccharide concentration proves to be cost-effective :by doing away with expensive machinery and high maintenance cost, accurate and more accessible than the traditional approach currently in popular practice. Moreover, this method of analysis is remotely accessible, thus reducing the time delay between treatment and diagnosis. Diseases such as diabetes, cancer etc affect the monosaccharide level in the human body and with this approach, the vital biomolecules of the body can be tracked easily thus reducing the diagnostics and treatment delays.

24. Simulating facade behavior under real fire scenarios

Tejas Wani, Civil Engineering

Indian Institute of Technology Gandhinagar

Mentor: Gaurav Srivastava, Civil Engineering

Glass façade are used very commonly in modern construction due to their role

in energy conservation in addition to improving the aesthetics. However, they can easily become vehicles for movement of fire along the building. Thus, assessment of façade systems in real fire scenarios is important.

IIT Gandhinagar in collaboration with UL constructed a G+2 storey façade fire testing facility under real fire scenarios.

The test facility has been modelled with all construction details in Autodesk Inventor and real fire scenarios are modelled using Pyrosim. Sensitivity analysis using various grid sizes has been performed.

25. Techno-economic analysis of battery energy storage system (BESS)

Warnakulasuriya Mahakumarage Wathmini Sharika Jayalath, Electrical and Electronic Engineering

Faculty of Engineering, University of Jaffna, Sri Lanka

Mentors: Naran M. Pindoriya, Electrical Engineering

K. Chelvakumar, Mechanical Engineering

This research is based on a method of calculating the profitable of storage system using time of using (TOU) tariff system through calculating net present cost of the system without storage and with storage. BESS can have used to control the electricity bill in the point of view of consumer by charging it during the off-peak hours (at low electricity price) and discharging it in a peak hour (at high electricity price). The methodology used here, is valid for any kind of storage technologies, but it has been used for lead-acid batteries which contains low acquisition cost and low efficiency in present market. Case study was done for one of buses in distribution power network of IITGN. The result shows that the BESS is not economically profitable at present cost of the battery bank.

26. Nonlinear dynamics of a circular disk oscillating on a rigid concave surface

Omkar Devidas Kadam, Mechanical Engineering

Indian Institute of Technology Gandhinagar

Mentors: K R Jayaprakash, Mechanical Engineering

There are some materials called as seismic metamaterials which are capable of withstanding seismic waves. Hence, artificial structures can be protected using such materials. This study deals with the understanding behind the dynamics of such seismic meta-materials. So, this study might be useful in designing more efficient seismic meta-material.

27. Power electronic drive for permanent magnet motor

Rakesh Nagwan, Electrical and Electronics Engineering

National Institute of Technology Hamirpur

Mentor: S Rajendran, Electrical Engineering

Permanent-magnet-AC-motors drives have been increasingly applied in a variety of industrial applications which require fast dynamic response and accurate control over wide speed ranges. However, there still exist challenges to design position-sensorless vector control of PMAC motor operating in a wide speed range. Thus, A control technique is proposed in this dissertation for PMAC motor drives, namely sliding mode observer with feedback of equivalent control. The research objectives are to extend the operating speed range of the PMAC motor drive system and improve its control robustness and adaptability to variations of operating conditions as well as dynamic performance.

A sliding mode observer is developed for estimating rotor position of PMSM without saliency, by means of which position-sensorless vector control can be achieved. A concept of feedback of equivalent control is applied to extend the operating range of sliding mode observer and improve its angle-estimation performance.

The feasibility and effectiveness of the control technique addressed in this dissertation is verified by Matlab simulation.

28. Video defocusing techniques

Shubhranshu Singh, Electrical Engineering

Indian Institute of Technology Gandhinagar

Ajit Deshpande, Electrical Engineering

Indian Institute of Technology Gandhinagar

Mentor: Shanmuganathan Raman, Electrical Engineering

Video processing has recently become an important area of application for machine learning concepts. This is mainly because it leads to the reduction of the computation cost of processing videos which is greater than images in general. Various video processing applications include object detection, refocusing,defocusing and many more. Video defocusing is a technique used to shift the focus of the video frames to a particular object/depth. This technique is widely used in photography and visual effects in movies. In our project, we tried to achieve video defocusing using neural network architectures by creating target frames using algorithms to defocus a video with all-in-focus frames.

29. Power electronic drive for permanent magnet motor

Shrihari Mani Tripathi, Electrical Engineering

National Institute of Technology Arunachal Pradesh

Mentor: S Rajendran, Electrical Engineering

In the 21st century the petroleum and natural gases are at the verge of extinction so the use of electric vehicles is preferred. Although other conventional DC motors could be used in the electric vehicle, but the use of BLDC is preferred because it has high power to weight ratio , high speed and the ease of electronic control.

Hence , we require more compact and lightweight BLDC motors with better durability and reliability. But the use of Hall Sensors in the sensored control of BLDC motors leads to an increase in cost and reduced reliability. So, here is a detailed study about the working and control of BLDC motor. Both the control strategies .i.e., sensored and sensorless control including the open - loop and closed - loop operation have been discussed. Implementation of both the control strategies along with their open - loop and closed - loop operation has been done in the SIMULINK environment, MATLAB domain.

The outcomes / results of this project will provide the reader with a brief and accurate idea about the functioning and controlling (sensored and sensorless) of Brushless Direct - Current (BLDC) motor.

30. Significance of predicted and experimentally established transcription factor binding site motifs and their genome-wide co-occurrence

Swati Jain, Biotechnology Engineering

National Institute of Technology Rourkela

Mentor: Umashankar Singh, Biological Engineering

Transcription factors have DNA binding sites throughout the genome. This work analyzes the significance of predicted transcription factor binding sites through an in silico analysis of publicly available experimental data. Our approach relied on studying the co-occurrence of predicted transcription factor binding sites with the experimentally determined transcription factor binding sites. As transcription factor binding sites are not randomly distributed, there must be some unique pattern throughout the genome where these binding sites occur. So through this in silico approach, we have analyzed the correlation between experimentally determined and predicted transcription factor binding sites.

31. Analysis of phase behaviour of polymer blends

Harshita Singh, Chemical Engineering

Sardar Vallabhbhai National Institute of Technology Surat

Mentor: Pratyush Dayal, Chemical Engineering

The process of modification of polymers based on simple mixing of two or more polymers originated a new class of materials called polymer blends. The development of polymer blends offers opportunity for many interesting polymer mixtures for commercial exploitation. Among the reasons for the popularity of polymer blends are versatility in tailoring end products, optimization of properties, improved biodegradability by recycling of plastics as polymer blend comprises of 30-40 percent of plastic products. Most commercial blends consist of two polymers combined with small amount of third polymer which enhances miscibility of other two polymers. But the performance of polymer blends depends on properties of each polymer in blend, miscibility of the components, nature of phase separation as in photovoltaics and its morphology so this provides motivation to analyse phase behaviour of polymer blends. Thus to study the phase behaviour of binary and ternary polymer blends, simulation work has been done by MATLAB using the theory of thermodynamics of mixing and phase separation in polymer mixtures, i.e., Flory-Huggins lattice theory in conjunction with mass balance equations. To further understand the effect of changing only one parameter for any particular binary polymer blend parametric study is done. All this analysis which has been performed on binary mixtures is further being extended for a multicomponent system like ternary polymer mixtures in which many attempts are being done to analyse phase behaviour of such systems but still the results are not satisfactory.

32. Morphological analysis of lunar surface using Chandrayan-1 data

Jitesh Mittal, Civil Engineering

Indian Institute of Technology Gandhinagar

Rishabh Jain, Civil Engineering

Indian Institute of Technology Gandhinagar

Mentor: Vikrant Jain, Earth Science

The surface of the moon is covered by craters of various sizes and lifespan. As there is no atmosphere and water on the moon, the only force which affects the shape of these craters is the gravity. The degradation process of craters on the moon surface is prolonged in comparison to Earth, because of the absence of atmosphere and low gravity force (1/6th) compared to Earth. These craters are the primary source to study the morphological processes and chronology of lunar surface.

For analyzing the craters, we will use the Chandrayaan 1 data and will work on it using ArcGIS software. To examine these craters we used various parameters such as the slope of the crater, depth of crater, circularity index of the rim of crater among many are considered. We created various profiles in the ArcGIS software based on these parameters and tried to find the correlation between them which can help us decide the chronology of the crater.

We all took one strip of the moon and analyzed crater morphology in that area. The data on crater morphology compared with morphological features from other strips. Crater morphology used to interpret the surface processes on the moon and chronology of different craters will be assessed.

33. Morphological analysis of lunar surface using Chandrayan-1 data

Shivam, Civil Engineering

Indian Institute of Technology, BHU

Mentor: Vikrant Jain, Earth Science

The surface of the moon is covered by craters of various sizes and lifespan. As there is no atmosphere and water on the moon, the only force which affects the shape of these craters is the gravity. The degradation process of craters on the moon surface is prolonged in comparison to Earth, because of the absence of atmosphere and low gravity force (1/6th) compared to Earth. These craters are the primary source to study the morphological processes and chronology of lunar surface.

For analyzing the craters, we will use the Chandrayaan 1 data and will work on it using ArcGIS software. To examine these craters we used various parameters such as the slope of the crater, depth of crater, circularity index of the rim of crater among many are considered. We created various profiles in the ArcGIS software based on these parameters and tried to find the correlation between them which can help us decide the chronology of the crater.

We all took one strip of the moon and analyzed crater morphology in that area. The data on crater morphology compared with morphological features from other strips. Crater morphology used to interpret the surface processes on the moon and chronology of different craters will be assessed.

34. Fault Tolerant Distance Preservers

Debanuj Nayak, Computer Science and Engineering

Indian Institute of Technology Gandhinagar

Mentor: Manoj Gupta, Computer Science and Engineering

Preservers are subgraphs that preserve the distance between a given pair of vertices in a graph or network. Real world networks however are prone to failures, thus it is important to study fault tolerant versions of these subgraphs. Fault Tolerant Distance Preservers can preserve distance even after a set of edge failures in the graph. These have been studied before, but the construction has been very complex. The problem is that given a graph G , we have to construct a k - Fault Tolerant Distance preserver , in other words a subgraph of G which preserves distances after k edge failures.

In this paper we present a simple and elegant way of constructing k Fault Tolerant Distance preservers for k=1 and k=2.

35. Development of bio-inspired H2 production catalyst

Priyanka, M.Sc. Chemistry

Indian Institute of Technology Gandhinagar

Mentor: Arnab Dutta, Chemistry

Our objective in this project is to synthesize biologically inspired metal complexes that catalyse the hydrogen production reaction. This project focuses on molecular complexes containing acenaphthoquinone based ligands. The challenge in this project is development of highly active electrocatalysts with low overpotentials. The catalyst for H2 production which we

developed in this project is based on inexpensive abundant metal cobalt.

36. Simulation of phase separation in polymer blends using the Cahn-Hilliard equation

Anmol Agarwal, Chemical Engineering

Indian Institute of Technology (BHU) Varanasi

Mentor: Pratyush Dayal, Chemical Engineering

When at least two polymers are blended together a new class of materials is originated called the polymer blends which have an entirely different set of properties as compared to its predecessors. Polymer blends can either form homogeneous mixtures or they can undergo phase separation. The degree of separation in blends will greatly affect the resulting morphology, which can have adverse effects on the mechanical and electrical properties of the resulting film. Conversely, a phase separated film could exhibit more desirable characteristics, and being able to tune the resulting morphology with a tailored preparation technique could prove beneficial. Therefore, understanding the mechanisms that affect demixing morphology and to what degree the kinetics and dynamics are influenced are issues of considerable commercial interest.From a basic science perspective, systematic investigations of these processes as well as a full understanding of blend separation processes such as nucleation and growth, spinodal decomposition and Ostwald ripening is important. For better understanding, we start with modelling the very basic reaction diffusion equation for one and two spatial dimensions. To model the phase separation in binary polymer blends the Cahn-Hilliard model was derived and simulation was carried out in MATLAB. A further investigation of the role of different parameters like temperature, Flory-Huggins interaction parameter, polymer size etc., in the process of phase separation, was carried out. Several interesting results came out like the variation of degree of mixing with temperature, variation with the initial volume fraction and changes observed when open boundary condition is taken into consideration.

37. Saturated Pool Boiling on wettability pattern surface

Harshita Malav, Chemical Engineering

Sardar Vallabhbhai National Institute of Technology Surat

Mentor: Atul Bhargav, Mechanical Engineering

Pool boiling is a mechanism by which heat is removed through nucleation of bubbles at the heated surface. With the continuous miniaturization of electronic devices, thermal management is an important issue associated with it. In this work, we argue that surface with patterned wettability leads to an enhancement in the heat transfer coefficient as compared to surfaces with homogeneous wettability. Patterned wettability surface was obtained by coating hydrophobic dots on hydrophilic region with masking technique to form less-wetting islands and more-wetting network. Hydrophobic dots were made of commercially available RTV silicone sealant having a thickness of 100 μm. Further, the effect of the diameter of the hydrophobic patterns on the boiling was also investigated. The wall superheats of all the heterogeneous wettable surfaces were less than the plain copper (homogeneous wettability) surface. The highest heat transfer coefficient was obtained from the hydrophobic pattern with 2 mm size and 6 mm pitch. The results shows that the heat transfer can be significantly enhanced by wettability patterns in comparison with a hydrophilic surface under pool boiling heat transfer performance. This research work contributes to the various methods and techniques used to fabricate reliable and robust patterned wettability

surfaces for the enhancement of HTC.

38. Modelling and simulation of Aluminium dust explosion in a spherical vessel

Rahil Sanwla, Mechanical Engineering

Indian Institute of Technology Gandhinagar

Mentor: Dilip S Sundaram, Mechanical Engineering

A numerical multiphase approach has been carried out to understand the effect of change in initial dust concentration and particle size over the explosion severity parameters, i.e., Maximum pressure(Pmax) attained in the explosion sphere and Maximum rate of pressure rise(dp/dtmax) achieved during the explosion/burnout time. The simulations are carried out in the software named COMSOL Multiphysics 5.3. The models used are Mixture model(Laminar flow) and heat transfer in fluids. The initial concentration of Aluminium dust is varied in the range of 100-3000 gm/m3. The dust particle sizes studied are 7 µm, 11µm, 27 µm and 42 µm. The simulations were in accordance with the experiments carried out by O. Dufaud, M. Traoré, L. Perrin, S. Chazelet, D. Thomas [1] in the 20L explosion sphere. The study is done for a greater insight over the results that the above researchers obtained though the results were not explicitly the same, especially in high concentration zone. The primary aim of the study was to make a graph that incorporates the effect of both parameters over the explosion severity parameters. The study has given an equal attention over the visualisation of changes in the explosion severity parameters while changing one of the system parameter and keeping the other one constant.

39. Development of an Arduino-based robotic platform for automated 3-axis alignment of a laser beam for industrial sensing applications

Alhamd Khan, Computer Science and Engineering

SRM Institute of Science and Technology, Chennai

Aditya Das Choudhury, Electrical Engineering

Veer Surendra Sai University of Technology, Burla

Mentor: Arup Lal Chakraborty, Electrical Engineering

Lasers have a wide range of applications-fiber optics communication, weapon guiding, measurement of gas concentration, surgery, spectroscopy, metal cutting, and printers and so on.

Gas sensing by optical methods can achieve higher sensitivity, selectivity, and stability than non-optical methods. Therefore we have introduced an advanced version of gas detection using Tunable Diode Laser Absorption Spectroscopy (TDLS). Spectroscopy analysis mainly involves techniques based on absorption and emission spectroscopy. The earlier models for performing the Tunable Diode Laser Absorption Spectroscopy (TDLS) were based on a manually operated stage. The position of the laser was static in nature and the detection of gases was constrained in only one direction only within a stipulated area. This model was not appropriate to detect gases in real-time in all the three dimensions. This method was hence not preferable for gas detection in industries.

The main objective of this project is to develop an Arduino based robotic platform for automated 3-axis alignment of a laser beam for industrial sensing applications. The stage to be developed should be free to move in polar angle direction as well as azimuthally. The laser should be aligned to the stage in such a manner that the light should be incident on the detectors one by one, in a continuous manner.

A general laser-based device, as in the case of the setup required to measure carbon dioxide gas concentration, works on the principle of absorption of light. . The photo-detector is kept just behind

the laser diode on the stage. Retro-reflectors are present in the environment where the setup is required to do the measurement. The methodology suggested, involves the development of a 3-Dimensional Rotatory stage which has two stepper motors- to control the azimuthal as well as the polar rotation of the laser beam. Both the stepper motors are interfaced with the stage using appropriate metal work. 12V supply is used to drive the motors, controlled by an Arduino board. While orienting the laser towards a particular detector, the polar as well as azimuthal coordinates of both are matched one by one. Pololu 8825 drivers are used to drive the stepper motors as they offer a wide range of micro-stepping options, from full-step to 1/64th step which allows accuracy of around a tenth of a degree.

40. Unsupervised object localisation

H L Praveen Raj, Computer Science and Engineering

National Institute of Technology Karnataka

Mentor: Shanmuganathan Raman, Electrical Engineering

Object localization is an important problem in Computer Vision. It deals with the localization of an object in a 2D image, i.e. it involves the task of drawing precise bonding boxes for each object present in the image. Here we address the problem of unsupervised single class object localization. The major disadvantage of the supervised and weakly supervised approaches to this problem, is the inevitable inclusion of external error, since both these approaches involve human annotations. Hence we propose an efficient yet simple algorithm for object localization, which uses saliency map and spatial pyramid matching. Here we use an off-the-shelf object proposal algorithm to provide a set of candidate region boxes for objects, from which the most salient proposals are selected using saliency contrast. The selected proposals (i.e.those having higher saliency contrast) are then grouped into several clusters and each group is scored for similarity using spatial pyramid matching. The best scoring clusters are used to estimate the final bounding box. We tested our algorithm on two of the most used object discovery datasets namely, PASCAL VOC 2007 and PASCAL VOC 2012. The results show that our approach achieves an average CorLoc of 65.63\%. The experiments show that our algorithm performs significantly better than other unsupervised approaches, and performs comparably to the state of the art weakly-supervised approach (which achieves an average CorLoc of 64.60\%).

41. Cryptography using real Enigma Machine

Nishant Nakum, Instrumentation and Control Engineering

Vishwakarma Government Engineering College

Mentors: Manish Jain, Creative Learning Initiative

The aim of this project is to give a brief overview on Enigma cipher machine and its crypto analysis before and during the Second World War.How Enigma machine worked? Its cryptography and its design modification. Also Its wiring and its commercial application in today's day to day life.

42. Simulation of non-homogeneous Belousov-Zhabotinsky(BZ) reaction

Aditi Tibrewal, Chemical Engineering

Banasthali University

Mentor: Pratyush Dayal, Chemical Engineering

We see various natural patterns in our day to day life such as the zebra strip,

tiger strip, sand waves, etc., which relate to the target patterns observed in the Belousov-Zhabotinsky (BZ) reaction. Inspired by those patterns, we have simulated a three-variable model of non-homogenous BZ reaction. BZ reaction serve as a classical example for the oscillating reaction which results in concentric and spiral patterns. The oscillations occur due to the change in concentration of various species such as cerium, bromous acid, etc. It consists of three processes which include the formation of bromomalonic acid, reduction and oxidation of catalyst as well as change in concentration. Various models have been proposed for this reaction such as Oregonator model, GTF model, Epstein model, etc. Models were necessary because if we want to see the variation we can simply change the values of concentration and other parameters thereby saving time, money and efforts. We chose the Epstein model to simulate those target patterns as it quite consistent with the experimental results. Also, this model uses the whole concentration of the catalyst whereas other models such as the Oregonator model uses only the oxidized part of the catalyst. So, there were sixteen sets of reaction given in the paper which they reduced it by writing their rate equations. We derived those equations both dimensional as well as non-dimensional. Subsequently, we solved the reaction part using the software which gave me oscillations. Various parameters such as concentration, rate constants, etc. were incorporated, and variation were seen by varying the parameters. My next task was to add the diffusion term to obtain the concentric patterns which is still in process. So, future work is to obtain the patterns and incorporate polymer in the BZ system so that we can study the dynamics of self-oscillating polymer gels. This is how our work is inspired by patterns and it has big scope in future.

43. PLAYPAL - Auto Chess Board

Hari Pithadia, Instrumentation & Control

Vishwakarma Government Engineering College

Mentors: Manish Jain, Creative Learning Initiative

It includes 2 axis arrangement (X-Y),which can be controlled by stepper motors connected with screw on both axis. X axis controls horizontal area for y axis and y axis controls vertical area for servo motor and resulting servo motor attached with Y axis can move in whole working area . on the upper portion pieces base is mounted . Sensor like reed switch is used to detect position of pieces. Sensors data will be acquised by shift register and fed to Arduino.

44. Cognitive evaluation of design creativity

Pavithra Ashok Kumar, Cognitive Science

Indian Institute of Technology Gandhinagar

Mentor: Leslee Lazar, Cognitive Science

Design creativity is a combination of practicality, problem-solving and aesthetic appeal (Nagai, 2016). Visual design creativity is an area of creativity with many questions unanswered. It requires more comprehensive studies of the design process as well as relevant cognitive skills.

We aimed to develop a battery of appropriate tests to evaluate creativity in visual design and test cognitive skills related to this form of creativity. A complete task booklet, along with an instruction manual for administration and assessment guidelines for the tasks was compiled. This includes a task to assess drawing abilities, tests of visual creativity, tests of visual mental imagery abilities, and mental rotation. A pilot study with 2 participants supported the suitability of these tests for the study, however, the tests have to be made in a digital medium.

The battery is a tool which can be used on individuals with varying levels of experience with visual design. The evaluation of existing visual design creativity will enable us to understand the cognitive aspect underlying the tasks, and can lead to development of better design thinking.

45. Single image refocusing

Chennuri Prateek, Electrical Engineering

Indian Institute of Technology Gandhinagar

Mentor: Shanmuganathan Raman, Electrical Engineering

A digital camera requires/demands the photographer to select many range of parameters while capturing a scene. Though the light field photography have enabled for post capture focus control, they have faced several limitations and have experienced low spatial resolution.

In recent years, several types of photography(Ex. Focal stack photography, epsilon photography, multi aperture photography, focal sweep, HDR imaging etc). were proposed for complete post capture control. Though they were successful, they had to take in 8-16 images as an input which is quite large. The project mainly focuses on getting post capture control on the focal plane using only one image and its corresponding depth map.

46. Robotic arm

Ishita Shah

Vishwakarma Government Engineering College

Mentor: Manish Jain, Creative Learning Initiative

The simplest experiment we do, the deepest knowledge we get. Nowadays, the world is of automation and robotics. The main aim of this project is making the robotics fun loving and interesting with minimum making cost. The basic of robotics starts with the robotic arm. In robotics arm we can learn many fundamental of mathematics, mechanics and electronics. Design of robotic arm is such that it has the ability to move in 3 axis. Thus by coding it we can perform many tasks like picking and placing an object. Writing a letter or doing signature and many more things.

47. Study of different filters and their applications in Image Processing

Raman Dutt, Computer Science and Engineering

Shiv Nadar University

Amisha Goyal, Electrical and Electronics Engineering

National Institute of Technology Silchar

Mentor: Shanmuganathan Raman, Electrical Engineering

In digital image processing, filtering is a technique for modifying or enhancing an image. We can filter an image to emphasize certain features or remove other features. Image processing operations implemented with filtering include smoothing, sharpening, and edge enhancement and many others. Filtering is a neighborhood operation in which the value of any given pixel in the output image is determined by applying some algorithm to the values of the pixels in the neighborhood of the corresponding input pixel. A pixel's neighborhood is some set of pixels, defined by their locations relative to that pixel. The project aims at studying different types of filters from basic to more advanced, study their advantages and disadvantages, their applications and finally implementing each filter from scratch. Each different filter has a different way of functioning. Hence, they have different advantages and disadvantages which further leads to a different set of applications. Some filters are developed as an improvement of an already existing filter so as to cover its areas of weakness. On the other hand, some filters are developed to be used for a particular application. Regardless of the source of origin, more and more new filters are being developed in the present time. As a result, the field of digital image processing is seen as a very developing field, advancing at

a very fast pace. In this project, apart from studying and implementing different filters, we will also try to use one of the recently developed filter for any particular application for which it has not been used before and we will test if we get an improvement over the previous results obtained from existing filter(s).

48. Design of fire resistant shopping centre

Ankur Sharma, Civil Engineering

National Institute of Technology Arunachal Pradesh

Mentor: Gaurav Srivastava, Civil Engineering

This report provides detailed study of design of fire resistant low rise shopping centres. The fire safety is the major concern in the case of shopping centres because fires within shopping centre may result into huge property loss and loss of lives. The shopping centres have different type of occupancy in its different components. So it cannot be designed like normal buildings. It comes under assembly building and special design is done for it. Shopping centre has some particular attribute that contributes to its fire safety, it includes layout of the shopping centre with wide malls leading to large exits to the outside, large access routes between levels of shopper movement, occupants who are generally alert and mobile and a level of management control.

The special features of fire safety and their requirements has been described in the report. This includes heat and smoke detectors, sprinklers, smoke removal system, smoke reservoirs, fire exits fire separating wall and fire rated door etc.

The design fires of shopping centre are classified into 3 groups-

C-1 fires are those fire which are controlled without sprinklers and cause almost no loss or negligible loss. These are either of self-extinguishing type or controlled during initiation period.

C-2 fires are those fires which are controlled after activation of the sprinklers, these fires cause significant property loss and life loss.

C-3 fires are those fires which are uncontrolled even after the presence of sprinklers. Mostly, these fires cause complete property loss and considerable loss of lives.

Also, this report includes the detailed study about the surface finish in a building. The different types of floor finish and wall finish and their fire characteristics (flammability, FSI, SDI, ignition temperature) have been described in detail.

Also, the properties of the floor finish and wall finish, their advantages and disadvantages, health issues related to them have been tabulated

49. Approximate computing in CORDIC & its applications

Aaryan S Shah, Electrical and Electronics Engineering

National Institute of Technology Tiruchirappalli

Mentor: Joycee Mekie, Electrical Engineering

The Coordinate Rotation Digital Computer (CORDIC) algorithm is based on the principle of geometry. It is an algorithm par excellence comprising of an iterative formula which can be implemented in hardware design by eliminating the use of multipliers and can be used for complex calculations involving sine, cosine, hyperbolic, exponential and logarithmic functions and expressions. The main focus of this project was to primarily implement CORDIC in MATLAB to find trigonometric functions using the rotation mode and study its use in a wide range of applications like image compression, numerical methods, approximation of functions and signal processing.

50. Configurable approximate arithmetic circuits

Sumit Walia, Electrical Engineering

Indian Institute of Technology Gandhinagar

Mentor: Joycee Mekie, Electrical Engineering

Approximate computing has turned out to be one of the promising approach for energy efficient design in the digital world. Approximate Computing(AC) is a trade off between quality and energy and sometimes latency. The assumption in Approximate Computing does not include stochastic (random pattern) nature of any underlying processes. However, it often uses the statistical properties of data and algorithms for good results rather than the best result to save energy. AC depend on the capability of the system to tolerate error and quality loss. Relaxation in the computed Results that are Precise requires highly energy consuming operations, approximate computing techniques allow great improvement in energy efficiency. Multipliers are generally made up of large numbers of full adders. A 16×16 multiplier has 16 array of full adders, 16 full adders in each array. Hence,multipliers turned out to be one of the most energy hungry unit. Since, it is a basic arithmetic so, it used in most of the systems. Introducing approximate multiplier unit saves lots of energy and even decreases the latency too. These days, Approximation is done in different ways from device level to architecture level. Sometimes, approximation is done using software like loop performance, the lesser the number of loops, the lesser will be the amount of energy used by the system. It will generate some amount of error but depending upon the error tolerance capability of the system or the application, the loops are reduced.

51. Development and synthesis of catalyst for bio-inspired hydrogen production electrocatalysts Lhingneichong

Touthang, Chemistry

Indian Institute of Technology Gandhinagar

Mentor: Arnab Dutta, Chemistry

One of the most important issues in the present day world is energy because of decreasing fossil fuel reserves and environmental problems. The increasing consumption of energy has also led to the tension of the situation of our present energy supply. Thus, understanding of sustainable development to promote the development of low carbon emission and environmental friendly concept has been enriched. Therefore, production of hydrogen with the help of efficient catalyst is greatly focussed as small amount of hydrogen can store large amount of energy.

52. Synthesis of novel hydrogen bond donor organocatalysts and their application

Dhanraj Kumawat, Chemistry

Indian Institute of Technology Gandhinagar

Mentor: Chandrakumar Appayee, Chemistry

In organic chemistry, many reactions require catalysts to proceed, including their asymmetric variants. Changing the structure of the catalyst can have a drastic effect on the enantioselectivity. Hydrogen-bond donor catalysis relies on the use of hydrogen bonding interactions to accelerate and control organic reactions. In biological systems (enzymatic reactions) hydrogen bonding plays a key role both in lowering barriers to reaction and orienting the substrate molecules. Organocatalysis, (small organic molecules to catalyze Organic transformations), is most successful concepts in asymmetric catalysis, and from decades it has been used for the enantioselective construction of C–C, C–P, C–S, C–O ,C–N, and C–halide bonds. Organocatalyst exhibit desirable

properties such as easy handling, low toxicity and stability compared to metal catalyst and can efficiently synthesize valuable chiral molecule under very mild reaction condition. They are applicable for variety of different functional groups and provide high and predictable chemo, region and Stereoselectivity for a substrate. The cyclopropenium ion is the example of smallest aromatic cation. Their stability depends on the steric and inductive effects of the substituents. The first derivative of cyclopropenyl cation system, triphenyl-cyclopropenyl cation, was prepared in 1957 by R. breslow. Recently, lambert developed effective brønsted base catalyst based on cyclopropenimine for highly selective reactions 8-11. Highly selective synthesis has great significance in organic chemistry because distinct molecules as well as isomers of same molecule often shows different biological activities a key example in this regard is the guanidinium ion, where the low acidity, high hydrogen-bond donating capacity, and stable cationic nature make It difficult to replicate. For cell transport a deltic guanidinium dendrimer is demonstrated.

53. Self-balancing robot

Vasvani Ashish Maheshbhai, Mechanical Engineering

National Institute of Technology Jamshedpur

Mentor: Manish Jain, Creative Learning Initiative

Self-balancing robot is based on the principle of Inverted pendulum, which is a two wheel vehicle balances itself up in the vertical position with reference to the ground. It consist both hardware and software implementation. Mechanical model based on the state space design of the cart, pendulum system. To find its stable inverted position, I used a generic feedback controller (i.e. PID controller). According to the situation we have to control both angel of pendulum and position of cart. Mechanical design consist of two dc gear motor with encoder, one arduino microcontroller, IMU (inertial mass unit) sensor and motor river as a basic need. IMU sensor which consists of accelerometer and gyroscope gives the reference acceleration and angle with respect to ground (vertical), when encoder which is attached with the motor gives the speed of the motor. These parameters are taken as the system parameter and determine the external force needed to balance the robot up.

It will be prevented from falling by giving acceleration to the wheels according to its inclination from the vertical. If the bot gets tilts by an angle, than in the frame of the wheels; the center of mass of the bot will experience a pseudo force which will apply a torque opposite to the direction of tilt.

54. Mechanical walking mechanisms

Shubham Chakraborty, Mechanical Engineering

Vellore Institute of Technology

Mentor: Manish Jain, Creative Learning Initiative

My project was to make a working model of walking mechanisms. I could successfully complete the model of a mechanism that worked on the principle of Klann linkage. The mechanism consists of a body having two vertical plane sides which is made up of acrylic and contains holes for the shafts and fixed pivot points. Each vertical side contains two sets of legs. Each set consists of a crank, two rocker arms, one connecting rod and a leg shaped link which gives the final output. Power transmission is done with the help of an electric motor to a set of gears which give the final rotation to the crank.

55. Art and science of nano sheets

Simran Raheja, Chemical Engineering

Sardar Vallabhbhai National Institute of Technology Surat

Mentor: Kabeer Jasuja, Chemical Engineering

In this constantly evolving world, a lot of discoveries come up daily. But, are we really successful in sharing all the ideas that come up so frequently? The answer is a blatant NO. Required funds for carrying out the research come from public's pocket. So, it becomes the responsibility of researchers to share their discoveries and make people aware of what they are doing and how is it a boon for a common man. It has always been an arduous task for the scientists to convey their ideas to someone who does not come from a scientific background. People get bored if something has a lot of technicalities involved in it. To hold on people's attention, an interesting narrative is required. In this project we have tried to make a video abstract which can convey the research by creating a narrative which holds on the attention of viewers. We tried to focus only on certain concepts of the research which we felt were important for the public to know. We have tried to explain the scientific concepts by relating it to real life objects so that it connects with the viewers' mind. An online software Animatron was used to create the video. People understand better if something is conveyed in form of a story. Hence, we have tried to use animation wherever it was possible. The video starts by giving basic knowledge about graphene nanosheets and then focuses on the techniques involved in the synthesis of boron based nanosheets.

56. Image processing using Python Opencv

Anisha Jain, Computer Science

Jaypee Institute of Information Technology Noida

Mentor: Shanmuganathan Raman, Electrical Engineering

We enhance photographs shot in dark environments by combining a picture taken with the available light and one taken with the flash. The image without the flash will have the lighting and colour characteristics you want, but it will be noisy. The image with the flash will have the incorrect lighting, but it will be much less noisy. We preserve the ambiance of the original lighting and insert the sharpness from the flash image. We use the bilateral filter to decompose the images into detail and large scale. We reconstruct the image using the large scale of the available lighting and the detail of the flash. We detect and correct flash shadows. This combines the advantages of available illumination and flash photography.

57. Synthesis and characterization of gold nanodroplets

Kakali Debnath, Physics

National Institute of Technology Agartala

Mentor: Saumyakanti Khatua, Chemistry

In last two decades, tremendous works have been done in the field to synthesize and modified the various shape of gold nanoparticles. Gold nanostructures have shown unique optical and electronic properties, due to the collective oscillation of the conduction free electrons upon the irradiation of the light, known as surface plasmon resonance(SPR). The SPR is very sensitive to the size, shape, surrounding refractive index of the nanostructures. Due to its unique SPR properties, gold nanostructures have been utilized in sensing, photocatalysis, SERS, photothermal therapy etc. It has been found that the anisotropic gold nanostructures have displayed the better sensitivity compare to isotropic spherical particles. The synthesis of anisotropic gold nanostructures have been coveted due to their high field enhancement at their sharp tips and sharp

edges. The shape dependent anisotropic properties of the gold nanostructures are also desired. Different shape morphology of gold nanoparticles shows a different degree of enhancement in its sensitivity and hence, its application. A large group of the researchers is involved in the development of gold nanoparticles with different shape morphology,such as rods, bipyramids, dog-bone, rice, cubes, prisms, and many more.

In this project we have developed a chemical synthetic method to synthesize a novel anisotropic gold nanostructure, which we have termed as a “nanodroplet”. To the best of our knowledge, this is the first instance of the wet chemical synthesis approach of such nanostructure. The gold nanodroplet (GND) can be synthesized by a similar approach as for gold bipyramidal structure with slight modification with high yield. These GNDs are described as the following - one end is highly tapered, while the other is rounded. It can be conceived as the amalgamation of half of the bipyramid and half of a nanosphere. The interesting factor is the sharp nature of the sharp edge of the GNDs. From the microscopy image analysis, the tapering angle is seen to be very low, implying a potential further enhancement of the electric field. The yield of the GNDs is also seen to be substantial - about 50%, with the other components being either nanospheres or bipyramids. The synthesis protocol was tuned with a variety of the synthesis parameters, such as the seed aging time, solution pH, reaction time and AgNO3 concentration in order to improve the GNDs yield. Also, the shape of the gold nanostructure we synthesized here has not been reported before, therefore, in order to confirm our experimental findings about the optical properties of this nanostructure we also done some theoretical calculations on this unique GNDs. This report includes the both experimental synthesis method and its’ characterization as well as simulation of chemically synthesized GNDs.

58. Design of IMU based hand glove for virtual reality rehabilitation

G V N D Maruthi, Electronics and Communication Engineering

Lakireddy Bali Reddy College of Engineering

Mentor: Arup Lal Chakraborty, Electrical Engineering

Patients with stroke and Parkinson’s disease suffer from muscle spasticity leading to partially or completely inactive hand. The objective aims at developing a sensorized glove that along with virtual reality games could be used for rehabilitation of such patients’ hands. Several such gloves exist commercially, but they are very expensive and limited in performance. Inertial measurement unit (IMU) sensors are inexpensive, small in size and readily available in market. Besides, they offer good accuracy (less than 1°). Therefore, these sensors were chosen to make the glove. The IMU based hand glove uses a combination of six degree of freedom inertial sensors in addition to filtering techniques to detect finger joint movement. The inertial signals obtained from the IMUs are integrated over time to obtain position and orientation information of the fingers. Due to this integration over time, the measurement tends to drift, not returning to zero when the finger is extended back to its initial position. This issue of measurement drift is handled by fusing the measurements from the accelerometer and gyroscope with data fusion algorithms like Kalman and Complementary filters. Kalman filter is an algorithm that uses the data observed over time to estimate unknown variables with better accuracy. Complementary filters use accelerometer data in long term measurements as it doesn’t drift and gyroscope for short term measurements, as it is precise. My work also involves choosing the most appropriate microcontroller, designing the interfacing technique and the algorithms. Finally, the glove will be paired with virtual reality games being developed in the lab.

59. Scour due to interference of bridge piers

Rachna Gupta, Civil Engineering

National Institute of Technology Silchar

Mentor: Pranab Kumar Mohapatra, Civil Engineering

Local scour at single pier has been extensively studied by several investigator,

but scanty work is available on the scouring around piers placed at closed proximity. The present study is concerned with experimental studies of formation and characteristics of local equilibrium scour around a single pier , a set of identical cylindrical pier in tandem arrangement and also a set of piers aligned to each other. The objective is to see the nature of scour evolved due to effect of mutual interference of one pier on another by varying the space between the piers as 2D, 3D and 4D and also by varying alignment angle as 45 degree and 60 degree followed by comparison of observed scour depth with scour depth of single pier. Analysis of result shows the variation of individual non- dimensional equilibrium scour depth with diameter of the pier and increasing longitudinal spacing between the piers.

60. Utilization of Solar Energy as Additional Power Source in Automobiles

Sathish M, Automobile Engineering

Anna University

Mentor: K Chelvakumar, Mechanical Engineering

Steady depletion of non-renewable energy sources has made it critical to gradually switch over to renewable sources so we do not run out of energy. Furthermore, renewable sources also provide opportunities to be more cost efficient than the fossil fuels. More importantly, these sources cause less or no pollution to the environment thereby being less hazardous to other living creatures.

One application of these renewable resources is additional power to hybrid vehicles, use of which is steadily increasing as a result of recent innovations. Tesla has been a leader in the research, development and application of full-fledged electric cars powered by solar chargers. It has declared to successfully implement solar powered charging stations [1]. Other researchers and manufacturers [2] have installed panels on cars. Akarawat Siriwattanapong and Chantharasenawong [3] are using solar energy as a primary energy resource in charging stations for the electric vehicles to renew its power backup.

This paper focuses on utilizing solar energy for powering major automobile accessories such as air conditioners thus increasing the fuel efficiency of such automobiles while at the same time reducing pollution. Calculators have been developed to determine and quantitative analysis are provided.

61. Screening the inhibitory effects of natural and synthetic compound on protein aggregation by using THT and THS dyes

Shaista Nouseen, Applied Chemistry

Jabalpur Engineering College, Jabalpur

Mentor: Bhaskar Datta, Biological Engineering

Protein aggregation gives rise to many biological complication and diseases in human beings. Insulin is a type of peptide hormone that easily gets aggregated when they are not kept at specific conditions and temperature. Insulin is used as an anti-diabetic drug. Insulin aggregation was commonly found at a site repeated insulin injections given to diabetic patients and has become a major solution for diabetic patients. It has enormous importance in pharmaceutical industry for which protein aggregation inhibition is our major goal for this particular research. Previously, various natural compounds polyphenols like quercetin, curcumin, gallic acid were reported as a protein aggregate inhibitors. Here, we try to investigate these results and verify them by doing our experiments. Our research group also synthesized some sulphonyltriurets compounds [T1,T2,T3,T4,and T5] derivatives widely used in medicine as hyperglycemic drugs and as a herbicide in agriculture. We had investigated the effects of sulphonyl triuret compound in insulin and BSA with dyes THT and THS. Protein aggregates later been formed into beta-sheet fibrillar structure that binds

very well with the thioflavin T and thioflavin S dyes. Different combination of samples are prepared with proteins [Insulin and BSA], natural, synthetic compounds, dyes and their fluorescence behaviour are studied by the plate reader. The results obtained from our experiments are quite different as one of the sulfonyl triuret derivative [T2] enhancing the fluorescence intensity by many folds. Gallic acid and curcumin also shows some unusual behaviour from the reported results. These results need to be verified by DLS, AFM and SEM.

62. Existence and uniqueness of solution of ordinary differential equation

Himanshi Chanana, MSc Mathematics

Indian Institute of Technology Ropar

Rahul Mahla, MSc Mathematics

Indian Institute of Technology Gandhinagar

Mentor: Jagmohan Tyagi, Mathematics

The study of existence and uniqueness of solutions of Ordinary Differential Equation became important due to the lack of general formula for solving nonlinear ordinary differential equations and also it will prove to be very important even when we consider applications of differential equations. Compact form of existence and uniqueness theory appeared nearly 200 years after the development of the theory of differential equation.In first chapter we've explained Existence and Uniqueness theorems for first order IVP. One of the most important theorems in Ordinary Differential Equations is Picard's Existence and Uniqueness Theorem for first-order ordinary differential equations. One reason is it can be generalized to establish existence and uniqueness results for higher-order ordinary differential equations and for systems of differential equations. Another is that it is a good introduction to the broad class of existence and uniqueness theorems that are based on fixed points. After that we've studied Delay differential equation and it's existence and uniqueness of solution. It has various application in the field of science and engineering, for example, in Laser Dynamics,population dynamics and bioscience problems. And some other useful criterion for proving uniqueness of the solution.In the next chapter, firstly we've analysed existence and uniqueness of second order differential equation and then the nth order for that we've studied existence and uniqueness of solution of the system of first order differential equation. It has many applications to physics, engineering and economics some of them are the dynamics of a linear electrical circuit is governed by a system of linear equations with constant coefficients,multiple spring-mass systems and parallel circuits.In the last chapter, we've inspected existence theorems for nonlinear differential equation but there is loss of uniqueness of solution i.e. there might have more than one solution, maximal and minimal solutions of an IVP and established some of there properties, upper and lower solutions of differential equations, which plays an important role in study of existence and uniqueness of solution.

63. Screeing the natural inhibitor for insulin and BSA aggregation by using Tht and Ths Dye

Simpi Verma, Chemistry

Indian Institute of Technology Gandhinagar

Mentor: Bhaskar Datta, Chemistry

Insulin and BSA is the most important pharmaceutical peptide for diabetes treatment , assisting to regulate carbohydrate and fat metabolism in patient. Under environmental condition and evaluated temperature insulin and BSA have nature to partially unfold and aggregates into highly structured amyloid fibrils. Inhibition of BSA and Insulin aggregation is extremely important in order to prevent and control the occurrence of neurodegenerative diseases. Growing interest and research efforts have recently been focused on elucidating the screening of effective

inhibitor like as Querectin, Curcumin and Gallic acid to interrupt amyloid structures of insulin and BSA by using THT and THS dye.

64. Development of computer programs for the modelling of molecular motor

Parakhee Choudhury Brahma, Electronics and Communication Engineering

National Institute of Technology Meghalaya

Mentor: Kaustubh Rane, Chemical Engineering

Kinesin is a protein belonging to a class of motor proteins found in eukaryotic cells.

Kinesin motor proteins acts as a vehicle that works on the microtubule that helps in carrying vesicles consisting of cargo protein from one part of cell to another. They consume chemical energy by from the hydrolysis of ATP(Adenosine Triphosphate) and converts it to mechanical energy for movement in cell.These movement supports different functions like mitosis,meiosis, cargo transport within the cell. The modelling of kinesin motors requires solving of set of Fokker Planck equations which are stochastic partial differential equations which includes various parameters involved in the movement of these motors. Our project work aims at developing a generic code for solving Fokker Planck equation that models the movement of these kinesin motors. The code is highly reusable,efficient and general enough that can be tested with varied kinds of input parameters and can be easily accessed online .It can play a crucial role in studying the effect of mutation on the speed of kinesin motors and the relation between their free energy and average velocity.

65. Protein-protein interaction in a living cell

Satadeep Nath

National Institute of Technology Agartala

Mentor: Umashankar Singh, Biology

My project under my advisor Dr. Umashankar Singh was on Protein-Protein interaction in a living cell and how does one protein affect or regulate the function of another protein that it interacts with.

A protein in a living system almost all the time needs to interact with another protein to perform its function. In other words function of a protein needs to be regulated by another protein that is in physical contact with it.

We tried to find out by several experiments that if 2 very specific proteins, namely CGGBP1 and CTCF interact with one another inside a cell and what effect does this interaction have on the function of both the proteins.

So by finding out that if two proteins interact or not we can control the functions of one protein by modifying the other protein interacting with it.

Results of our experiments proved that indeed there is physical interaction between CGGBP1 and CTCF proteins. And inactivation of one of these proteins leads to the disruption of the function of the other protein

66. Theoretical modelling of pulsed laser surface structuring via remelting

Gogineni Venkata Jagadeesh, Mechanical Engineering

National Institute of Technology Raipur

Mentor: Madhu Vadali, Mechanical Engineering

Pulsed laser beam of certain fluence and beam radius incident on a surface assumed to be flat. Laser irradiates the sample surface at a fluence that causes surface melting with minimal or no ablation. This results in formation of a melt pool. The heat produced by a single pulsed laser will be transferred in lateral and axial directions. The temperature of melt pool is maximum at the center and equivalent to melting temperature at the boundary. Due to this, thermocapillary flow occurs because of surface tension gradient induced by a temperature gradient. For most liquid metals, surface tension increases as temperature decreases. As the temperature decreases from the center to the outer perimeter of a melt pool, the liquid metals tend to flow outward since surface tension is greater in the cooler regions, thus creating a crater at the center and a rim at the outer perimeter of the melt pool. The physics of the process is not completely understood yet and very few analytical models to describe the process and optimize the process parameters. The current work tries to establish a reliable physical model that can significantly assist in understanding the fluid flow and melt pool dynamics in thermocapillary regime. Inevitably, this model can provide the cut-off pulse duration between capillary and thermocapillary regimes.

67. Industry- oriented synthesis of 2- amino 4- tert butylphenol

Saranya Krishnan, Chemistry

Uka Tarsadia University

Mentor: Arnab Dutta, Chemistry

Industrial pollution has been a problem lately, due to the overuse of toxic reagents, methods involving injudicious use of solvents and metals leading to excess waste generation. In order to avoid pollution, there is a need for the use of green methods in the industrial synthesis by using methods which involve less toxic reagents, atom-economic processes and minimal metal and acid wastes. The present project is an effort to involve greener methods in the synthesis of 2- amino 4-tert butylphenol, which is an important precursor of benzoxazoles with wide applications in material and medicinal chemistry. A two-step synthesis was envisaged involving nitration and reduction starting from 4-tert butyl phenol. Nitration was optimized using dilute nitric acid which gave the nitro compound in good yields. Subsequent reduction with known methods was attempted with mixed results, calling for further studies for the synthesis to be industrially feasible.

68. Mechanical Computing

Shireesh Shelke, Mechanical Engineering

Indian Institute of Technology Gandhinagar

Gargi Datta Choudhury, Production Engineering

National Institute of Technology Agartala

Mentor: Manish Jain, Creative Learning Initiative

The aim of this project is to give brief overview on Arithmometer and Curta.

Creating parts of each mechanical calculator after understanding their mechanism. Also we should get familiar with 3D printer and laser cutting machine. We can use mechanism used in these machines to design and invent new devices. Example, subtraction mechanism used in both of these calculators is used in present electronic calculator.

69. Architectural exploration tool for handheld devices and benchmarking of mobile applications

Nisarg Parikh, Computer Engineering

L.D. College of Engineering

Varun Gohil, Computer Science and Engineering

Indian Institute of Technology Gandhinagar

Mentor: Manu Awasthi, Computer Science and Engineering

Mobile computing has grown substantially over the past decade with more than 2 billion mobile devices being used today. Despite the rapid pace of advancements, hand-held device understanding, benchmarking, and evaluation are still in their infancy, both in industry and academia. Today, only 1 percent of all architecture research papers published each year in the top computer architecture conferences focus on mobile computing.[1]We believe that this dearth of research is due to unavailability of tools supporting latest operating system platforms and slowly evolving benchmarks for the architectural studies of mobiles. To tackle these two problems we present an architectural exploration tool and a benchmark suite to keep the mobile computing ecosystem evolving and in pace with people's expectations. Here we present the design of a tool currently under development for architectural study of handheld devices.We propose to make a tool compatible and independent of the changing Android OS versions. The tool also supports multiple ISAs like ARM and MIPS. The tool is also proposed to run on various platforms like Windows and Linux thus making it platform independent. We have developed a new benchmark suite of 10 real-world applications using a systematic approach rather than selecting solely based on popularity. These applications can be further used for micro-architecture analysis using the tool.

70. De-noising gravitational waves using machine learning

Atishay Jain, Computer Science and Engineering

Indian Institute of Technology Gandhinagar

Mentor: Anand Sengupta, Physics

Gravitational wave astronomy is a rapidly growing field of modern astrophysics, with observations being made frequently by the LIGO detectors. Gravitational wave signals are often extremely weak and their amplitude is usually comparable to that of noise. The signals are corrupted by non-Gaussian and non-stationary noise, often containing transient disturbances which can obscure the required signals. Furthermore, a method which can detect such waves without delay will have many useful applications. We have tried to design a deep learning neural network based on auto-encoders to solve this problem.

71. Highly selective α-Functionalization of α,α- unsaturated aldehydes via Morita-Baylis-Hillman Reaction pathway

Ashish Parihar, Chemistry

Indian Institute of Technology Kanpur

Mentor: Chandrakumar Appayee, Chemistry

There have been various attempts for the introduction of asymmetry in the Morita-Baylis-Hillman reaction and people have been successful as well, μ, μ-unsaturated aldehydes have been used before as well in the Morita-Baylis-Hillman reaction but here we are using phenyl glyoxal electrophile which have never been used before, for the highly selective μ-functionalization of μ,μ-unsaturated aldehydes, proline based catalyst are used here for the asymmetry in the reaction, the product formed in this reaction can be used further for synthesis of biologically active compound

having anti-tumour properties.

72. Unreinforced masonry infilled reinforced concrete framed structure for lateral loads as per Indian standards

Shwetabh Sinha, Civil Engineering

National Institute Of Technology Meghalaya

Mentor: Manish Kumar, Civil Engineering

Infill masonry (IM) is frequently used as exterior or interior partition in Reinforced Concrete (RC) frames. They serve the purpose of architectural perspective, and even though they are considered as a Non-Structural Elements (NSE's), they may interact with the bounding frame, when the structure is subjected to strong lateral forces such as earthquake loads. It has been discovered by past earthquake experiences that despite of not being designed for earthquake forces they have shown good performance. After many experiments and studies it is proposed in the Indian Standards (IS Part-1- 2016) that we can model an IM characteristics and effects using a single-strut using defined parameters in the same. Strut definition is being used in OpenSees computer simulation software to model and analyze different cases in IM with RC frame.

73. Identification of disease relevant long non-coding RNAs with potential to fold in G-quadruplex

Lisa Ghosh, Biotechnology

National Institute of Technology Arunachal Pradesh

Mentor: Bhaskar Datta, Chemistry

Long non coding RNA (lncRNA) refers to those transcripts of DNA which are not translated into protein. Interestingly these molecules are suspected to participate in several physiological functions. The list of lncRNAs, which are functionally defined as transcripts of more than 200 nucleotides in length with no protein coding potential, number in the tens of thousands, many of which are uniquely expressed in differentiated tissues or specific cancer types. In fact, the number of lncRNA genes outnumbers protein-coding genes. It is now recognized that lncRNAs are exquisitely regulated and are restricted to specific cell types to a greater degree than mRNA and have frequently exhibited evolutionarily conserved function and secondary structure despite minimal overall sequence similarity. However, the function of the vast majority of these transcripts remains to be identified. DNA G-quadruplexes are known as modulators of transcription. More recently G-quadruplexes, located in the untranslated regions of the mRNA of protein coding genes, have been described to negatively regulate gene expression at the post transcriptional/ translational levels. In this work, we try to predict the possibility of the existence of G-quadruplexes in lncRNA and discuss their potential biological roles in cancer formation. Using the prediction tool QGRS Mapper, we observe a significant occurrence and distribution of G-quadruplexes in lncRNA of various sizes in pancreatic cancer and breast cancer cell lines. Subsequent in vitro analyses of a subset of these sequences are to be performed which support our predictions. The complexity of handling and integrating different types of genomics data poses significant challenges to experimental laboratories that lack extensive genomics expertise. LncRNA-screen is a comprehensive pipeline for computationally screening putative lncRNA transcripts over large multimodal datasets. The main objective of this work is to facilitate the computational discovery of lncRNA candidates to be further examined by wet-lab experiments.

74. Entropy driven surface segregation in polymer-colloid Mixture-Role of confinement and chain flexibility

Spand Mehta, Chemical Engineering

Indian Institute of Technology Gandhinagar

Mentor: Mithun Radhakrishna, Chemical Engineering

The surface segregation properties are useful in industrial applications such as colloidal stability, surface coating, surface filtration and lubrication. Monte Carlo simulations are performed for binary mixture of hard-spheres and polymers with variations in chain flexibility, number density and confinement effects. The chain flexibility is tuned using a stiffness parameter. The ratio of density of hard-sphere chains to that of hard-spheres in the vicinity of the surface is given by μ. Calculated results for a binary mixture of hard-sphere chains and hard-spheres indicate that for flexible chains, the hard-spheres are always preferred over the chains on the surface. However, for chains with higher bending energy at liquid-like state, this trend is reversed. These simulations were also carried for a spherical confinement with similar trends observed. However, the trend gets reversed even at lower densities, which we believe is due to confinement effects. These results have been primarily explained through configurational entropy and excluded volume effects.

75. Creating research data repository

Rashid Aziz, Computer Engineering

Jamia Millia Islamia

Mentor: T S Kumbar, Library

In this era of information, the amount of data generated of all types is increasing rapidly. It is becoming difficult for organizations to handle this huge amount of data. The collection, organization, preservation and providing access to research data on a long term basis is a challenge for research community. Handling large amount of both structured, unstructured as well as research metadata was never an easy task for traditional data storage method. Since past 10 years, the requirements of researchers have changed and similarly the definition of large data has changed. Keeping this in mind Researchers all over the world have developed many framework/ ready to use application along with set of standards, guidelines, processes for handling the research data. These applications are complex and not so easy to install, customize, populate and work with required data and make available for end users.

Understanding this area of data repository, array of applications, set of standards, tools and technologies and identifying the one suits for IIT Gandhinagar needs itself is an area of my research. My Aim in this internship program was to identify the best open source

software for IIT Gandhinagar Library and then customizing the software as per the needs and requirement. For this i had selected to work on Ckan because of wide popularity and large support base. I had it customized as per the requirement specification and then installed it on

local system for live hosting. Though, this research work may not involve a hard core software development, but understanding the entire area of Data Repository which is an emerging area now and creating a repository that suits IIT Gandhinagar needs now and in future and

making it go live will itself will be a professional developer-client experience in itself.

76. Orerry

Nishi Walia, Production and Industrial Engineering

Punjab Engineering College

Mentors: Manish Jain, Creative Learning Initiative

The aim of this project is to illustrate or predict the relative positions and motions of the earth and moons, usually according to the helio centric model. Orrery is a product for school going students to make them understand the concepts behind the origin of day & night, seasons & months, lunar and nuclear eclipse by using multiple gear trains for controlling the rotations of earth and moon.

77. A low cost hand-held device for the selective and sensitive detection of Hg(II) ions in water using paper and plastic strips embedded with carbon quantum dots/Using explainer videos as an effective Using explainer videos as a method of communicating nanoscience to a non-scientific audience

Arvind Pujari, Metallurgical and Materials Engineering

Indian Institute of Technology Madras

Mentor: Kabeer Jasuja, Chemical Engineering

The development of paper based screening devices in recent years have been a source of great interest, particularly due to their low cost, rapid screening capabilities, easy disposability and reusability. In this report, we illustrate the use of paper and plastic strips, coupled with a low cost hand-held device, which uses photo-luminescent carbon quantum dots (CQD's) to selectively determine the presence and concentration of mercury (Hg(II)) ions in water, where resonance energy transfer phenomenon may be the sensing mechanism. The relation between the decrease in intensity of the paper strips due to quenching by Hg(II) and the concentration of Hg(II) is expected to be linear. We have synthesized two sets of quantum dots, from the ultrasonication of ethylene glycol and, from the ultrasonication of a 1:1 solution of NMP and DMSO to obtain carbon quantum dots. These CQD's were embedded in newspaper and PVA films, and both exhibited cyan-blue fluorescence under excitation at 365 nm. A low cost device was fabricated using 3-D printing methods, to provide a quantitative method of fluorescence detection, without any electronic sensing mechanism, which has not been done before, to the best of our knowledge. This device, consisting of only LED's and a battery, manufactured at a cost of less that Rs. 100, has potential screening applications, especially in the most rural parts of India.

Nanoscience is one of the fastest developing fields in science and technology today. Recent developments such as the discovery of new materials such as graphene, carbon nanotubes and quantum dots have the potential to revolutionize the modern world. However, given the breakneck speed of progress in this field and the scientific complexities associated with them, the field of nanoscience is only accessible to people with advanced scientific backgrounds, and is at risk at leaving the non-scientific community behind. Public understanding of nanoscience is crucial, as it helps policy makers understand the need for funding scientific research, encourages more children to pursue careers in science and helps invite suggestions and views from people from a non-technical background. In this dissertation, we focus on a comparatively new method of communicating nanoscience, namely, explainer videos, and present an example of an explainer video about boron based nanosheets.

78. Deep learning and feature matching

Ayush Garg, Computer Science and Engineering

Indian Institute of Technology Gandhinagar

Mentor: Shanmuganathan Raman, Electrical Engineering

Machine learning -

It includes optimization algorithms which learn features and parameters on training data to minimize certain loss function. These features and parameters are then used for predicting the test data.

Neural network -

It is an interconnection of nodes distributed in layers. In this each layer is an output of the previous layer and input for the next one. Each node can be understood as a function learning parameters for future prediction. As we go from input to output the features learned at each layer becomes more and more complex and high level. This way the network can learn higher order and more complex features and parameters than normal machine learning algorithms without explicitly having to identify them. Also it helps as the algorithm can automatically figure which is the best feature for it to learn.

Gradient Descent -

It is the basic optimization algorithm used to converge the algorithm. In this we try to find the direction of greatest descent and take small steps in the direction until we reach a global minimum or converge. There are certain variations of the algorithm like GD with momentum, RMSprop and Adam.

Vectorization -

It is a technique to use vectorized implementation wherever possible as it can save a lot of useless or repetitive computation. Also there are fast algorithms for vectorized computation using parallelism which can further cut down the computation.

Parameters vs Hyperparameters -

Parameter are those which are learned by the algorithm during training and hyperparameters are those which govern the learning of the algorithm.

Bias vs Variance -

Bias is when the algorithm is completely ignoring the training data while training and hence not even fits training data well. Variance is when algorithm overfits data and fails to generalize and hence has high training data accuracy but low test accuracy. These can be corrected by tuning the hyperparameters.

Convolutional layer -

This layer in neural network are used when dealing with images. It is kernel of fixed size which is learned during training. This layer takes an image as input and generates output image by dot product with input. It gets max. activation or the output value is max. when the image patch is similar to the convolutional filter (due to dot product).

Transfer learning -

It is a technique to use pre-trained parameters and features of an architecture till a layer and then introduce few new layers to create a new architecture that might have some other similar function as that of original architecture. This saves a lot of training time as most of the parameters don't need training and hence computation is greatly reduced.

Recurrent neural networks -

In many of the applications it is important to take into account the events that have occured to

predict. These neural networks keep into account of few recent outputs and weight them based on their order of occurrence and use them to predict the next output which is then stored to be used as one of the input for next output.

Generative Adversarial Network -

It is a combination of 2 networks - the generator and the descriptor in which the generator generates the candidate images or a potential outcome and the discriminator evaluates them. As the algorithm goes on the generator becomes more and more proficient in candidate images which give good results with discriminator.

Cross-domain feature matching -

The main objective here is to take 2 images of different object classes like one of airplane and other of a bird which are structurally similar and find reliable correspondences between the 2 images.

79. Collar as scour countermeasure for bridge piers

Ishank Singh, Civil Engineering

Indian Institute of Technology Gandhinagar

Mentor: Pranab Mohapatra, Civil Engineering

The present study examines the use of collars in reducing the maximum local scour depth around the circular bridge pier, for clear water conditions. An attempt has been made to optimize the shape of collar using the literature and study of scour around the pier without a collar. The efficiency of collars is studied through experiments. The result of the experiment on the pier without a collar is tested with the result obtained by scour equation given in HEC-18. The data obtained showed that if the regular circular collar is extended elliptically in front by 4D distance then its efficiency is increased by 34%. Other cases tested also showed an increase in efficiency, but the trade off between the size of the collar and an increase in efficiency is not much appreciable. Experiments with new shapes also showed the increase in the rate of scouring in the initial phase of the test run. However increase in efficiency is observed, a study of the effect of angle of attack of flow on the new shape is critical, as all the experiments are done by keeping the collars aligned with the flow.

80. Memory hierarchy in non-volatile memory devices

Pranjali Jain, Computer Science and Engineering

Indian Institute of Technology Gandhinagar

Kunal Verma , Computer Science and Engineering

Indian Institute of Technology Gandhinagar

Mentor: Manu Awasthi, Computer Science and Engineering

The performance and energy consumption of a computer system primarily depends on its memory system. DRAM technology which is presently used with these systems is facing several challenges with scaling, energy efficiency and capacity. This has motivated the use of other Non-Volatile Memory systems as a replacement for DRAM technology. As a part of the project we test the reliability of the non volatile memory systems against DRAM in terms of performance and cost for which we employ ZSim+NVmain memory simulators. Our focus is to configure and run the simulator and create a portable version of it. Also, we analyze the performance of DRAM and STT-

RAM against PARSEC benchmarks and find the most critical timing parameters.

81. Characterization of friction stir welding of Al6082

Indira Kar, Mechanical Engineering

ICFAI University

Mentor: Amit Arora, Material Science and Engineering

In this research, the effect of increasing rotational speed and traverse speed for friction stir butt welded AA6082 are studied. The temperature at Advancing side and Retreating side of the weld is measured by using K-type thermocouple at four different locations. Also optical, hardness and tensile test are carried out at different tool rotation speeds (540,720,900 rpm) and traverse speeds (30, 60mm/min).Cracks were formed on the surface of welded sample at 900 rpm, and 60mm/min tool traverse speed during the welding.

82. Smart materials

Abhishek Dubey, Chemical Engineering

Indian Institute of Technology Gandhinagar

Mentor: Pratyush Dayal, Chemical Engineering

The lattice Boltzmann method(LBM) is increasingly attracting researchers in many areas from turbulence to multi-phase flow in porous media. The lattice Boltzmann equations are derived from the continuous Boltzmann equation with appropriate approximations suitable for incompressible flow.

In this project LBM is used for isothermal incompressible flow in porous media. The generalized two-dimensional Poiseuille flow, and Couette flow are simulated using similar model. It is found the numerical results agree well with the analytical solutions. We investigated capillary rise by using the two-phase LBM. The Shan-Chen single-component multi-phase model was applied to simulate capillary rise in straight cylindrical capillaries. The interfacial dynamics, such as phase segregation and surface tension, are modeled by incorporating molecular interactions.

We have successfully simulated the results of these cases. We will use these results to verify Darcy's law and simulate more complex models. We can also use the models developed in this project to simulate a system where pressure gradient across the ends of the foam results in compressing or expanding (imbibition) the geometry and fluid flow across it.

83. Friction stir welding of AA2219 alloys

Anjali Kumari, Material Science and Engineering

Indian Institute of Technology Gandhinagar

Mentor: Amit Arora, Material Science and Engineering

AA2219 alloys are widely used in aerospace industries. It is an alloy in the Aluminium-Copper family consisting of 91-93% Aluminium and 5.8-6.8% Copper. These are used in making aircraft skin and other structural members. AA2219 alloys are strong yet lightweight. Friction Stir Welding is a solid-state joining process which can give better joints than most fusion based welding techniques. FSW has been done on AA2219 alloys in 4 different configurations and parameters. The configurations are as follows: One plate in rolling direction and other in transverse direction with 900 rpm; One plate in rolling direction and other in transverse direction with 1020 rpm; Both plates in rolling direction with 960 rpm; Both plates in transverse direction with 840 rpm. The welding speed as 30 mm/min and plunge speed as 3 mm/min are same

for all these configurations. Analysis and tests done on these 4 different configurations are microstructural characterization, Scanning Electron Microscope, X-Ray Diffraction, Tensile strength and microhardness. Based upon these analysis and tests, the microstructural characterization is achieved. The XRD curves confirms the precipitate formation. The precipitation is better for precipitation hardening. The SEM pictures shows the secondary phases orientations in weld zone and base metal. Hardness test shows a trend for different rpms and the hardness is maximum in 960 rpm. The tensile strength is highest in the 1020 rpm weld.

84. Garlic coated iron oxide magnetic nanoparticles for Targeted Drug Delivery

Riya Ghosh, Pharmacy

Birla Institute of Technology Mesra

Mentor: Chinmay Ghoroi, Chemical Engineering

Most of the anti-cancer drugs used in chemotherapy exhibit narrow therapeutic window as these drugs fail to differentiate between normal and tumour cells. The targeted drug delivery addresses this major concern by judiciously targeting the cancer cells minimising the undesired effects. The aim of the project is to design a smart drug delivery system having minimal side effects and maximum therapeutic efficiency in case of cancer treatment using nanoparticles. Being in size range of “nanometres” increases the solubility, enhanced surface area and ability to target at specific site. They selectively target the drugs to the cancer cells by using the unique pathophysiology of tumours, such as their enhanced permeability, retention effect and the tumours microenvironment. The shape, size and multi-functionality of nanoparticles can be manipulated by using biopolymer. These biopolymers are capable to release entrapped drugs at predetermined rate, at appropriate time and site of action in response to specific physiological trigger.

In this work we have developed a Magnetic nanoparticle (MNP) (iron oxide) coated with natural extract garlic (GE) which aids pH responsive behaviour and targeted drug delivery. The GE having antioxidant behaviour can efficiently counteract the ROS effects of Doxorubicin. The presence of iron oxide was confirmed using FE-SEM using EDS and P-XRD indicates the presence of oxides, while the interaction studies are demonstrated by FTIR. The release of garlic was studied for 48 h using UV Spectrophotometer. The maximum release was observed in alkaline pH (7.4) as compared to that of acidic pH (1.2 and 5.4).

85. Brain computer interface

Surabhi S Nath, Computer Science and Engineering

Indian Institute of Information Technology

Mentor: K P Miyapuram, Cognitive Science

PROJECT 1 - P300 Speller

This project is based on the P300 ERP potential that arises due to an oddball stimulus. The speller is developed using this concept and it serves as a vital communication tool for ALS or paralytic patients. We collected the 8 channel EEG data from an online source (http://bnci-horizon-2020.eu/database/data-sets). The formats were understood through calculations and plots. We then pre-processed this data to remove noise following which we applied machine learning classifiers (Linear discriminant Analysis worked best for us) to classify the data into target or non target. Using this, we found the mode row and mode column, intersection of those gave us our letter. We were able to achieve nearly 75% accuracy in correctly predicting the character.

PROJECT 2 - Person/Emotion Detection In this project, we aimed to group people and their emotions in groups using unsupervised Kmedoids clustering. The data is collected on campus using high density EEG equipment for 20 subjects for 9 emotions through movie clips as stimulus. This is followed by dimensionality reduction after which the data is divided into frequency bands - theta, alpha and beta. Following this, we applied our very own recursive clustering strategy similar to Hierarchical Kmeans algorithm. We studies the groups formed to realize the exceeding similarities in subject-wise emotions. All emotions of a particular subject were clustered together. Also, in some cases, most emotions of multiple participants were together indicating similar emotions experienced by a few subjects.

86. Development of portable earthquake shake table

Chinmay Kulkarni, Civil Engineering

Indian Institute of Technology Gandhinagar

Akshay Mittal, Civil Engineering

Indian Institute of Technology Gandhinagar

Mentor: Manish Kumar, Civil Engineering

We had started working on the development of a portable earthquake shake table last semester which was further extended as SRIP project. Our aim was to develop a portable shake table that can be easily transported to a classroom for the purpose of demonstration. Over the course of our SRIP, we were able to systematically identify different source of errors and were also successful in removing a few of them. After lot of iterations, we were able to identify correct combination of different components of the table which will lead to minimum error levels. We will be working on the table in future as well to make the table as accurate as possible.

87. Data encoding in DRAM

Riddhi R. Thakker, Information and Communication Technology

Dhirubhai Ambani Institute of Information and Communication Technology

Mentor: Joycee Mekie, Electrical Engineering

Various Data encoding schemes have been suggested earlier to reduce communication energy in chip designs. In a recent work, Bit-wise Difference Encoding method is proposed as an Energy Efficient Data Encoding method for DRAM channels. This method exploits data value and performs a similarity check on the data. Communication energy is saved by transferring a similarity index rather than the actual data if it is very similar to the previous data. This scheme is heavily dependent on the actual data values read from or written into the actual data if it is very similar to the previous data. This scheme is heavily dependent on the actual data values read from or written into DRAM. On similar lines, we propose that in error-resilient applications, communication between processor and memory can be reduced using such a similarity index. In this project, we have set up a tool - GEM5 - which allows us to view these data values when an application is run on a processor. We have tested the tool using different benchmark applications and tested the working of the entire tool setup. In future, we will use the results of this study to apply approximate computing for error-resilient applications.

88. Prediction of crater degradation degree

Nitesh Kumar Shaw, Electronics and Communication Engineering

National Institute of Technology Jamshedpur

Sai Praneeth Maddi, Electrical Engineering

Indian Institute of Technology Gandhinagar

Mentors: Nitin Khanna, Electrical Engineering

The aim of this project is to classify the impact craters on planetary according to their degradation status. This project is done on Martian crater images captured in High Resolution Imaging Science Experiment(HiRISE) and Chandrayaan data containing lunar craters. We mainly divided craters by ternary classification. They are pristine craters, moderately degraded craters and highly degraded craters. These classes are either color coded as green, yellow, red respectively or ternary coded as 0,1,2. We have extracted visual features of the crater along the rim to classify it. The project was developed in python using modules like ArcPy, NumPy, OpenCV, etc. ArcGIS platform was used to find the centres and radii of the craters extracted. This project can be divided into two parts namely delineation of the crater contour and classification of the crater based on degradation.

89. System dynamics and stability analysis of rehabilitation robotics

Mayank Gupta, Mechanical Engineering

National Institute of Technology Meghalaya

Mentor: Madhu Vadali, Mechanical Engineering

To develop a robotic device so as to measure the dynamic parameters of the motion of human leg. Mobility aids are the devices which helps in alleviating limitations imposed on the motion of body. The simplest form of walking aid is Walking stick, which helps in improving Stability by acting as a straight leg and also provide base support. By 60 years of age most of the person start using walking stick so to assist them in motion, measurement of motion parameters are essential. Since we have to measure the dynamic parameters of motion, mathematical approach to calculate these parameters for validation is difficult. The method for measurement is described in the report. We are considering two parameters for this project-relative orientation and acceleration. By measuring these parameters we can have some basic dynamic analysis of the system and can understand its motion better and this will help in rehabilitating the person.

90. Synthesis of substituted α-cyano stilbenes

Abhishek Saini, M.Sc. Chemistry

Indian Institute of Technology Gandhinagar

Mentor: Sriram Kanvah, Chemistry

A series of μ-cyanostilbenes substituted with pyridine and hydroxyphenyl was synthesized and their optical spectroscopic properties in homogeneous solvents, the dioxane–water binary mixture are to be observe. Generally, Stilbenes exhibit weak emission behaviour in homogeneous solvents but show remarkable red-shifted emission along with enhanced intensity in water. This phenomenon is due to the aggregation induced enhanced emission effect. Other stilbenes also exhibit significant solvatochromic emission behaviour and have similar enhanced emission characteristics in water and the solid-state.

91. Science and art of Nanosheets

Sourabh Saini, Chemical Engineering

Indian Institute of Technology Gandhinagar

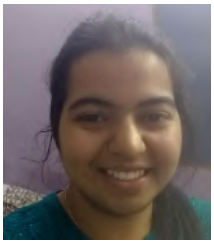
Mentor: Kabeer Jasuja, Chemical Engineering

The first 2D structure was Graphene and it was discovered in 2004. Graphene is single-atom-thick layer of carbon atoms arranged in hexagonal honeycomb lattice. It is the building block of graphite, which is commonly used as pencil lead. It is a remarkable material with multitude of amazing properties that repeatedly earn it the title of “wonder material”.

It is the thinnest material and is also incredibly strong - about 200 times stronger than steel.

Graphene's discovery has increased the demand for 2-dimensional forms of many elements and inorganic compounds. Boron is Carbon's neighbour; it presents a curious case in its ability to be structured as Graphene. Although it cannot independently constitute a honeycomb planar structure, it creates a graphitic system in collaboration with electron donor elements. Magnesium diboride (MgB2); an inorganic layered material consists of boron honeycomb planes, which are sandwiched between layers of Mg atoms. MgB2 has been primarily researched for its superconducting properties. However, our research group earlier showed that the ultrasonication of MgB2 in water results in its exfoliation to yield few-layer-thick, Mg-deficient, hydroxyl- functionalized nanosheets. Our project aims to explain our research to a wider audience, who may or may not have a scientific background. This is extremely crucial because we want our research work to be more extremely crucial because we want our research work to be more accessible for people from diverse backgrounds. This challenge exists for several research areas, which are either extremely new or too deep to understand.

In this work, we have shown how to make thin layer of MgB2 using ultrasonication in water, and with Chelation assisted exfoliation with a physical tool, which can help to explain our research (or certain elements of our research) to a general scientific audience as well audience with no formal scientific background.



92. Aluminium Based TiC Reinforced In-Situ Composite Fabrication by Friction Stir Processin

Sunidhi, Material Science and Engineering

Indian Institute of Technology Roorkee

Mentor: Amit Arora, Material Science and Engineering

Friction Stir Processing can be used to fabricate composites. In this study, pure Aluminium 1050 plate was used for fabrication of the composite by friction stir processing. A groove of dimensions 150x2x0.5 mm was drilled and filled with powder mixture of Titanium and carbon, followed by friction stir processing at 900 rpm and 20 mm/sec transverse speed. Al3Ti are formed which act as reinforcement of the composite. The SEM, XRD and EDS analysis were conducted to confirm the presence of reinforcement particles. The Vickers Hardness test resulted in an increase in hardness of the processed region.

93. Approximate Computing

Bishal Banerjee, Electronics and Communication Engineering

National Institute of Technology Nagaland

Mentor: Joycee Mekie, Electrical Engineering

This project presents the procedure of configurable approximation in a full adder circuit in an FPGA. Approximation could be used as a procedure to reduce power, area and delay in circuit designs apart form gate-level reduction. Reduction in area and power make a device subject to being portable. In this project we present different levels of approximation in a full adder implemented on an FPGA using specific LUTs(Look Up Tables) including fully accurate mode.

94. Antibiotic Resistance of isolated E.coli in surface water of Ahmedabad and Assessing Microplastic abundance in river sediment of Guwahati

Thinles Dolkar, MSc Chemistry

Indian Institute of Technology Kanpur

Mentor: Manish Kumar, Earth Sciences

Today, the antibiotics are widely used in the treatment and prevention of bacterial infections. However their effectiveness and widespread use have led to their overuse, prompting bacteria to develop resistance. The aim of this study is to evaluate the level of resistivity of E.coli to the antibiotics being used in this experiment such as Kanamycin Monosulphate (KM), Tetracycline (TC), Norfloxacin (NFX), Ciprofloxacin (CIP), Levofloxacin (LVX), Sulfamethoxazole (ST) in the collected water samples . The samples were collected from the various sites of Sabarmati River and Lakes of Ahmedabad. The E. coli and Coliform tests were performed by membrane filtration method that resulted in the formation of colony units of E.coli ranging from 1947 CFU/ml to 7660 CFU/ml and Coliform ranging from 307 CFU/ml to 667 CFU/ml , this significant number must be due to the stagnation of water in the riverfront. Similarly in lakes such as Chandola and Kankaria the E.coli ranged from 347 CFU/ml to 1533 CFU/ml and for Coliform, it ranged from 0 CFU/ml to 7 CFU/ml . The level of resistivity was also evaluated, where it ranged from 0-60% in the Sabarmati river, Fatehwadi canal and lakes samples for all antibiotics used. The results shows that the samples from Kankaria Lake was 0% resistant due to the lake being a major tourist spot hence the quality is highly maintained.

95. Batch to Continuous production of Reactive Black 5 (RB5)

Badwaik Prashil Rajesh, Chemical Engineering

Visvesvaraya National Institute of Technology Nagpur

Mentor: Chinmay Ghoroi, Chemical Engineering

Reactive Black 5 (RB5) is a vital dye for the textile industry, from which other dyes can be prepared. The primary production of RB5 in the industry is by a batch process, which is time-consuming, with limited production and, the efficiency of heat and mass transfer is less, which results in the low reaction yield. Therefore, for the improvement in the traditional way of production, we need to design an appropriate process for the continuous manufacturing of RB5, which will be cost-effective and deployable in industry. In this project, we have prepared RB5 by batch as well as the continuous process on a lab scale. In the batch process, we have successfully prepared RB5. However, in the continuous process using PFR, precipitation of the Vinyl Sulfone para base (VS) took place due to very less solubility in water. Therefore, we tried continuous production using CSTR, where we have obtained the RB5 as the final product. The characterization of the final product is done qualitatively and quantitatively using Thin Layer Chromatography (TLC), UV-Vis Spectrometry, and Total Suspended Solid (TSS).

96. Inter-limb transfer of newly learned Motor skills

Rachna B, Industrial biotechnology

AC Tech, Anna University

Mentor: Pratik Mutha, Cognitive sciences

Generalisation of motor learning across hands i.e., inter-manual transfer is a well accepted phenomenon of motor learning. Yet, the characteristics of this transfer are still ambiguous. Previous findings in our laboratory have shown that there is an immediate transfer of motor skill from one limb to the other and also that it is symmetric i.e., a transfer is seen from the dominant to the non-dominant hand and vice-versa. In this study, we investigated the influence of a 24-h consolidation period on the inter-manual transfer in a motor skill learning task. We recruited healthy participants who learned a skill motor task with one of their limbs and tested the other limb 24hrs later on the same task. From the initial data and preliminary analysis, it is evident that there is an inter-manual transfer even after a consolidation period of 24 hrs. These findings support the hypothesis that each arm controller has access to information learned during opposite arm training even after the memory consolidates. Hence, we also speculate that both the transfer and consolidation

of a learned motor skill have underlying similar mechanisms. Though further statistical analysis to test for the significance and more extensive data collection is required to corroborate this finding.

97. Enhancing the solubility and dissolution of a drug by solid dispersion technique using the co-milling method

Romesh Agarwal, Chemical Engineering

Thapar Institute of Engineering & Technology

Mentor: Chinmay Ghoroi, Chemical Engineering

The solubilization and dissolution of a BCS class II drug Aceclofenac having low solubility and high permeability in nature by solid dispersion technique using the co-milling method. In this work, we have taken Aceclofenac and Ibuprofen as a drug and k-carrageenan (commercial as well as extract form) as an excipient, have made in the ratio of 1:1 while performing the co-milling process for 10 and 20 min at 100 rpm. In this study, we are comparing the results between the Aceclofenac and Ibuprofen regarding solubility and dissolution test. We used to perform proposed characterization tools for improving the dissolution rate such as Powder X-Ray Diffraction (PXRD) used to measure the crystallinity of an Active Pharmaceutical Ingredient (API). If more will be the reduction in crystals greater the amorphicity, i.e., better will be the dissolution. The Heat flow of fusion during phase transitions used to measure from Differential Scanning Calorimetry (DSC). The morphology, thickness of the coating, and the contamination are analyzed by the Field Emission Scanning Electron Microscopy (FESEM). The interaction between the molecules and the functional group present in the structure were studied by the Fourier Transform Infrared Spectroscopy (FTIR). Reduction in the size of particles greater the wettability surface area of particle that was analyzed by the Particle Size Analyzer (PSA).

98. Synthesis of high surface area porous hydrated lime

Lakhan Agrawal, Chemical Engineering

Indian Institute of Technology Gandhinagar

Mayank Kamle, Chemical Engineering

Indian Institute of Technology Gandhinagar

Mentors: Sudhanshu Sharma, Chemistry

Chinmay Ghoroi, Chemical Engineering

Toxic gases like Carbon Dioxide, Sulphur Dioxide and many more are exhausted into the environment through the chimneys of chemical industries. These gases pollute the environment which causes hazard to the environment and human health. Techniques like wet scrubbing, flue gas desulphurisation, etc have been introduced for adsorbing the toxic gas fumes. An active adsorbent is prepared when CaO is given a hydrothermal treatment from a distillation column setup to form high surface area porous Ca(OH)2. A layer of powdered CaO in the dish of distillation column setup, was given hydrothermal treatment for 3 hours. After the hydrothermal treatment, the dish was boiled at 100oC for forming the porous Ca(OH)2 . Another desulphurisation sample was prepared by kneading 33 gm of CaO with 17 gm of Coal fly ash with 30 wt % of water forming dough at 70oC for 5 min. Then 13 gm of coal fly ash and 17.5 gm of Calcium Sulphate was added to the dough. The dough was given hydrothermal treatment like that of CaO and the resulting dish was boiled at 100oC. Similarly, two more samples of each CaO and the desulphurisation sample was prepared using water+ethanol and ethanol. So, total of 6 samples were prepared. For checking the crystallinity of the samples, P-XRD test of these samples were performed. The XRD graph of Ca(OH)2 and the XRD graph of the samples prepared from CaO were almost identical. The BET data also been observed and it was found that

the pore volume and the surface area of hydrolysis done with ethanol+water is most effective comparison to others.

99. Human Arm Kinematics and sensor subsystem

Sanjana Dhiran, Electronics Engineering

Sardar Vallabhbhai National Institute of Technology Surat

Mentor: Vineet Vashista, Mechanical Engineering

The main motivation behind this project was to conduct an experiment to study Human Arm kinematics and to do so an experiment was conducted wherein subjects were asked to perform certain tasks involving drawing figures. From these experiments, we hypothesized the significant difference between the motions of an expert sketcher and a novice both temporally and spatially. We were also able to hypothesize that irrespective of their different levels of expertise in sketching, there will be an improvement in drawing those figures after enough number of trials. Through this experiment, we are going to study joint angles, task space, end effector motion and the rate at which joints move.

Also to make the setup portable and to get a hand on experience on the study, we made use of IMU sensors to obtain yaw, pitch, and roll of the two planes of the human arm, they were upper arm and forearm and hence find the Euler angles and study relative motion between them.

100. Selective Synthesis of Sulfonyltriurets over other oligomeric compounds

Rudra Prasad, Chemistry

Indian Institute of Technology Gandhinagar

Mentor: Bhaskar Datta, Chemistry

Various derivatives of sulfonylurea and sulfonyltriuret have been designed and synthesized from commercially available starting materials like amines, sulfonamide, pyridine, acetonitrile and sodium cyanate in a single step method. Desired product is depending on the nucleophilicity of amines and reactivity of sulfonyl chloride. Isocyanate proceeded single step reaction for synthesis of sulfonylureas and also provide a specific method for synthesis of sulfonyltriuret. electronic effects decide to modulate the nature of major product between sulfonylureas and sulfonyltriurets

101. Wearable device for Wrist Rehabilitation

Sushrut Surve, Mechanical Engineering

Indian Institute of Technology Gandhinagar

Menor: Vineet Vashista, Mechanical Engineering

Currently stroke is one of the major reasons for disability in low-income and middle income countries like India. The existing devices for rehabilitation are expensive and hence do not have far reaching effects in places like these. Moreover robotic advances in this field have led to evolution of clinical devices to help patients in training and rehabilitation. But the usage of these devices is restricted to a clinical setting due to the weight of the device or the complexity of operation.

There has been extensive research done on leg rehabilitation while on the other hand, it has been observed that many patients have fast recovery of the limbs as compared to the distal muscles(wrist). Hence the aim of this project is to design a low weight, low cost wearable device for wrist rehabilitation.

We have been working on developing a 2 degree of freedom device for actuating flexion-extension and abduction-adduction. The device will help the patient perform daily activities. The device mainly aims at enhancing motor activity by training and not replacing it. Using surface electromyography (SEMG) and sensors like rotary potentiometers for feedback, we intend to develop a control strategy to help the patient whenever assistance in a certain motion is needed.

102. Multiple Model Fitting

Balani Mohit, Electrical Engineering

Indian Institute Of Technology, Gandhinagar

Mentor: Shanmuganathan Raman, Electrical Engineering(Jointly With Computer Science and Engineering)

This project deals with the extraction of multiple models from noisy or outlier-contaminated data Finding a model that fits data corrupted by noise and outliers is an omnipresent problem in empirical sciences, including Computer Vision .We try to solve the multi-model fitting problem in terms of training an already available Convolutional Neural Network named PointNet and modifying for our purposes ,which deals with intersecting structures and outliers in a straightforward and principled manner avoiding the typical shortcomings of sequential algorithms and those of clustering algorithms.The method performs on par against the state-of-the-art .

103. Prediction of Emotions Evoked in a human by Authentic Indian Artefacts

Ayush Prakash, Electronics and Communication Engineering

National Institute of Technology Silchar

Mentors: Shanmugnathan Raman, Electrical Engineering

Leslee Lazar, Humanities

The beauty of an artworks lies in explicitly evoking a strong emotional response in a human. Throughout the history of mankind, we have witnessed several art movements which employed different techniques to express different emotional expressions through the medium of artworks. Human minds were always consistently able to read the emotional messages even from the most abstract paintings. This behaviour of the human mind has always tempted the cognitive science researchers. Thus we are integrating the cognitive science principles with the machine learning concepts to see can a machine learning model identify what makes a human mind perceive different emotions through different artefacts. In this work, we consider a set of ancient Indian paintings collected from different sources. Each painting was labelled as carrying a positive or negative response. We will be using state-of-the-art ML system to learn which statistical patterns are associated with positive and negative emotions. We will also be tracking what specific portions of the image contributes to the overall response. This will help us understand the different dynamics of the emotional side of human mind as to how it classifies a certain element to be positive or negative. This also will be helpful in understanding how a human mind observes different artefacts.

104. Yield Stress Measurement of Coal Ash Slurry

S.V.Kashyap, Chemical Engineering

University of Petroleum and Energy Studies(UPES), Dehradun

Mentor: Prachi Thareja, Chemical Engineering

During the recent times, the process of handling, storage, processing and

transportation of residue, has been a huge concern all over the world, especially in chemical industries. So, there is a need for designing a waste disposal strategy of the residue. To account for this, we need to know the rheology and its rheological parameters affecting the fluid and, slurries being Non-Newtonian fluids, the concept of yield stress will be considered as the most important parameter, as it plays a very essential role in presuming with how much velocity these slurries will have to be pumped in a pipeline with minimum power consumption and operating costs.

At a particular yield stress, suspensions or slurries transit from solid-like behaviour to liquid-like behaviour and vice versa. It is fundamental to measure the yield stress as accurately as possible. Different methods have been proposed for measuring the yield stress by assuming non-linear equations proposed by Bingham, Herschel–Bulkley, and Casson, then fitting and extrapolating the data obtained from the rheometer, stress relaxation method, constant shear stress technique, and many other methods. These turned out to be accurate at a limited scale and very expensive.

So, in the need of the hour, new methods have to be developed for measuring the yield stress in economical methods. In this project, we have taken up Slump method and verified the results using Vane Shear Apparatus.

The data will be obtained by conducting both the experiments and compared

105. A study on Improving Efficiency of Solar Photovoltaic Power System

Swapnil Sen, Electrical Engineering

National Institute of Technology Arunachal Pradesh

Mentor: K. Chelvakumar, Mechanical Engineering

As Indian Solar Power Industry moves forward steadily towards its ambitious 100GW target, one of the most important aspects that still lags behind is panel efficiency. With more than 40% efficiency, thermal power plant is way past solar plant which has a mere efficiency of 20-25%.

Higher efficiency is needed so as to maximize the energy output of a solar panel per amount of light energy incident on the cell which will, in turn, take up less surface area to meet our energy requirements. Presently, 3rd generation solar cells are making their impact in the solar market. Researchers are also working on 4th generation cells and Solar Trackers which are believed to increase the solar efficiency to a high extent.

This report discusses different scopes ranging from the evolution of Solar cells to Solar Tracking devices to Grid- Integrated Photovoltaic Inverter System.

The end results will make some specific observations regarding the current efficiencies, advantages, limitations and cost/W of all the mentioned solar cells based on previous studies and research papers.

106. Application of control systems in human movement disorders

Bhawana Sharma, Electrical Engineering

National Institute of Technology Silchar

Mentor: Harish P.M., Mechanical Engineering

According to studies, PD patients exhibit less fluctuating CoP as a consequence of increased stiffness . Contradicting to that, reports of increased amplitude of spontaneous CoP sway are also found in literature . The aim of present study is to gain better insight into the control strategy in stance balance of healthy subjects.

The stabilizing effect of intermittent control on quiet stand posture is presented in terms of various CoP measures like mean of CoP sway, average CoP sway area, total sway path length, mean and maximum sway range. the posture must be robust to variation in noise magnitude, average CoP sway

area, total sway path length, mean and maximum sway range. the posture must be robust to variation in noise magnitude, stiffness, delay or any other parameter and the posture model incorporating continuous feedback controller model fails to achieve this robustness. Intermittent Control has the ability to renounce this asymptotic stability to a bounded one more efficiently. human body dynamics with both the active and passive controllers and 0:2s delay can be represented by a transfer

function G(s) =(0:011149(s 10))=(s3 + 11:47s2 + 12:86062s 18:3938)

107. Economics of Off-Grid Rooftop Solar PV Installations and its Market in India

Rahul Yadav, Electrical Engineering

Indian Institute of Technology Gandhinagar

Mentor: K. Chelvakumar, Mechanical Engineering

India with 50% of its rural population (about 80 million households) having little or no access to grid based electricity, can benefit greatly through off-grid solar systems and micro-grids. In order for this to work, the economics has to work. The off-grid sector comprises of different ranges of installation which include independent rooftop installation, solar pumps, solar street lights, solar cold storage, etc. Some common economic studies undertaken in solar energy sector involve feasibility analysis of hybrid solar PV system, estimation of profits using annual cash-flow, location specific studies, etc. Various industries in India now look to establish solar based captive power plants. The following work will mark the financial factors that influence the economics of the installation. It will quantitatively analyze the feasibility of a rooftop installation by calculating unit cost of electricity and making a payback analysis of the solar installation. The outcome will highlight the major factors that play a role in the economics of a rooftop solar photovoltaic installation.

108. Expression and purification of Human Tousled-like Kinase 1B (hTLK1B) in Escherichia coli

Piyush Kashyap, Biotechnology

National Institute of Technology Sikkim

Mentor: Sivapriya Kirubakaran, Chemistry

Cancer is a disease characterized by the abnormal growth of cells which have a potential to invade and metastasize to the other parts of the body. Deregulation of genes and alterations of the enzymes cascade reactions leads to the occurrence of cancer. One of the kinases that are altered in the disease is Tousled Like Kinases (1 and 2) which belong to the family of serine-threonine kinases that are highly conserved in human. They are known to act in chromatin assembly, including replication, transcription, DNA repair, and chromosome segregation. TLK1 interact specifically and phosphorylates the chromatin assembly factor (CAF) Asf1a which disrupts the nucleosome to remodel the chromatin in damaged DNA to repair the double-strand break (DSB) ends. In this project, I plan to express and purify the full-length

hTLK1B from E. coli.

For expression studies, the plasmid construct with our target gene will be transformed into E. coli cells and grown in Luria-Bertani (LB) broth supplemented with chloramphenicol and ampicillin at 25 °C for 9 hrs. with 0.5 mM isopropyl-μ-D-1-thiogalactopyranoside (IPTG) concentrations. The harvested cells will be resuspended in a lysis buffer containing 50 mM Tris-Cl (pH- 8.8), 500 mM NaCl, 1% Triton-X l00, 10% Glycerol (v/v), 0.3 mM TCEP, 20 mM Imidazole (pH-8.8), and Complete™ EDTA-Free Protease Inhibitor tablets, and lysed by the ultra-sonication method. The obtained cell suspension will be centrifuged to remove the unlysed cells and debris. The supernatant will be loaded onto a Ni-NTA column, the unbound material will be collected for analysis by SDS-PAGE, and bound protein

will be eluted using an elution buffer containing 50 mM Tris-Cl (pH-8.8), 450 mM NaCl, 200 mM imidazole (pH-8.8), 0.3 mM TCEP and 5% glycerol. The purified protein will be further subjected to buffer exchange by size-exclusion chromatography (SEC). The final protein preparation will be used for functional studies and other downstream applications.

109. Traces of Audio Compression Detection using CNN and SVM

Abhay Garg, Electrical Engineering

National Institute of Technology Silchar

Mentor: Nitin Khanna, Electrical Engineering

Digital audios have become ubiquitous with the popularity of the internet and portable digital devices such as personal music players and smartphones. In the meanwhile, rapid developments of low-cost and sophisticated editing software make the modification of audio file much easier for untrained users. Concern regarding how to authenticate multimedia data has led to research in forgery detection. Audio forgery techniques could be used to conduct piracy over the Internet, falsify court evidence, or modify security device recordings of events taking place in different parts of the world. Audio files may be presented as evidence in WAV format which is an uncompressed format. To perform the Traces of Audio Compression Detection operations and proper analysis the compression scheme and bitrate should be known. This project aims to extract and exploit frequency features to estimate the compression scheme among MP3, WMA, AAC and the corresponding bitrate used. The experimental results have been evaluated on GTZAN dataset. The model used is CNN with the generally used softmax layer removed and the outputs of the final layer feed into SVM classifier for better detection accuracy.

110. Cleavage of his tag using TEV Protease in IMPDH protein

Arvind Singh Bhati, Life Science

ISERC, VISVA BHARATI

Mentor: Vijay Thiruvenkatam, Biological Engineering

Helicobacter pylori is a Gram-negative, microaerophilic bacterium and one of the most common human bacterial pathogens, chronically infecting the gastric mucosa of approximately half of the world's population. While infection can be asymptomatic, H. pylori can cause chronic inflammation, duodenal and gastric ulcers, gastric mucosa-associated lymphoid tissue (MALT) lymphoma, and gastric cancer. The aim of the project is to express and purify the TEV IMPDH , DµG IMPDH and TEV Protease protein. We have cleaved the His tag located at the N-terminal of TEV IMPDH protein to get pure protein so that while crystallization there should not be any impurities in the protein. The protein assay is done to check the concentration of the purified proteins using plate reader.

111. Neural Correlates of motor learning

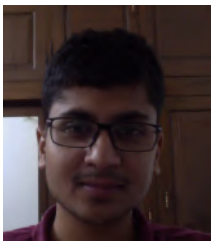
Luke Nihal Dasari, Cognitive Science

Indian Institute of Technology Gandhinagar

Mentor: Pratik Mutha, Cognitive Science

Motor adaptation is the process of adjusting movements to the perturbations imposed on the system either internally or externally. It is a vital motor behavior which is usually seen in patients with motor disabilities by which they overcome their limitations and perform Activities of Daily living with more ease. Studying motor adaptation will help in designing and improving rehabilitation programs for the benefit of these patients. Motor adaptation is known

to occur in two phases. One is a fast process where learning occurs quickly but with poor retention and the other is a slow process where learning occurs slow but retains for a longer period. The cerebellum is known to play a significant role in the fast process of motor adaptation, but the neural correlates for the slow process are not clearly known. A previous study in our lab has shown that inactivation of the left posterior parietal cortex using tDCS has resulted in lowering of learning in slow component of motor adaptation. In the present study, we impose a gradual perturbation to a visuomotor adaptation task and look at the behavior over trials. We also inhibit the PPC using tDCS over P3, P4 regions of the International 10-20 EEG montage system, to study its effects on the task performance. The present study will help us in better understanding the role of the Left posterior parietal cortex in the slow component of motor adaptation.



112. Parallel and Space Efficient Algorithms

Kaushal Modi, Mechanical Engineering

Indian Institute of Technology Gandhinagar

Nisarg Ujjainkar, Mechanical Engineering

Indian Institute of Technology Gandhinagar

Mentor: Bireswar Das, Computer Science

Computer algebra is ubiquitous to all elds of science and engineering rings and elds are fundamental to it. Calculation of gcd is a basic problem associated with rings and elds. It is also a part of various algorithms and programmes like \Maple", \Magma", etc. Earliest algorithm known for gcd calculations was one given by Euclid which is a sequential algorithm which had linear time complexity in number of bits. Then later rst sub-linear algorithm was devised in 1984. Algorithms used for algebraic calculations are typically sequential algorithms, i.e. they use only one processor unit for calculations. In a sequential algorithm, a calculation process starts only after the previous calculation operation in nished. In parallel Algorithms a set of operations are carried out simultaneously in parallel using multiple processor units, thus reducing the time required for a set of calculations as compared to sequential algorithms, at the cost of using more space.

113. Development of Bioinformatic tools for the identification of Quadraplex structure of Protein

Prachi Agnihotri, Biotechnology

National Institute of Technology Sikkim

Mentor: Bhaskar Datta, Chemistry

The main objective of this project is the development of bioinformatics tools which may be used in the identification of quadraplex structure of proteins. The four stranded helical structures called G-Quadraplex or G4 are being recognized as a possible nucleic acid based mechanism for regulating multiple biological processes. G-Quadraplex structures can arise from both intra or inter molecular folding of G-rich strands. The kinetics of folding and unfolding is an essential consideration to be kept in mind. 50% of human genes contain G-4 sequence near the promoter region which tells us about the role of G-4 quadraplex in gene regulations. G-Quadraplex formation can serve both beneficial and regulatory roles in cells such as forming the structure of telomeres. Nuclear Magnetic Resonance (NMR) is a powerful method in determining the structure of G-Quadraplex in relevant conditions. Our main interest was in investigating the prevalence of such sequences and structures with respect to their ability to participate in DNA-RNA hybrid quadraplex structures.

114. Design and Analysis of Different SRAM Cell

Sanghmitra Maurya, Electronics and Communication Engineering

National Institute of Technology Sikkim

Mentor: Joycee Mekie, Electrical Engineering

SRAM Memory is a major component in VLSI chip due to their small access time. It is widely used embedded memory in modern digital systems, and their role is preferentially increasing. For all local storing purposes (registers, cache memory etc.) .SRAM has become the topic of substantial research due to the rapid development for low power, low voltage memory design during recent years due to increase demand for notebooks, laptops, IC memory cards and hand held communication devices .SRAMs are widely used for mobile applications as on chip memories, because of their ease of use and low standby leakage. The main objective of this project is evaluating performance in terms of power consumption, delay and SNM (Static Noise Margin) of various SRAM cell like: 6T SRAM, 8T SRAM, DICE, 4x4 memory arrays. I designed schematic structure and comparison was made between various SRAM cell on the basis of power and delay at different process corner : tt-18 (Typical – Typical) , ss-18 (Slow –Slow) , ff-18 (Fast – Fast) , sf-18 (Slow – Fast) , fs-18(Fast – Slow) .I have performed Monte Carlo Simulation by taking 100 number of bins using cadence tools at Scl-180nm technology also learns OCEAN Scripting. OCEAN that stands for Open Command Environment for analysis is a powerful programming language that can automate simulation within cadence. I used OCEAN Scripting for Power calculation at different supply voltage. I have read paper which is based on concept of leakage power. In 6T SRAM Cell Leakage power for write (0) and write (1) is different. But in Proposed 8T SRAM Cell leakage power is same for both write(0) and write(1). After read the paper I have verified its result.

115. Monitoring in Tinker's Lab

Sabbi Pavan kumar Chakri, Mechanical Engineering

Indian Institute of Technology Gandhinagar

Mentor: Vineet Vashista, Mechanical Engineering

This project is basically an iot application of monitoring tl lab using some cameras to take photos and stitch them together and display on the monitor. It is basically a surveillance system to monitor the tl facility and also to create a good environment so that people can actively use

the TInker's Lab for projects

116. Active Noise Cancellation in a plane

Vikash Kumar, Mechanical Engineering

National Institute of Technology Sikkim

Mentor: Vinod Narayanan, Mechanical Engineering

Active Noise Control (ANC) is a technique for reducing noise using a secondary source of sound which produces "antinoise" that destructively interferes with the primary noise. ANC is more efficient in low frequency range (less than 600Hz) where passive noise control devices like mufflers and silencers become bulky and ineffective. This project is mainly based on the practical aspect of Active noise cancellation in a like mufflers and silencers become bulky and ineffective. This project is mainly based on the practical aspect of Active noise cancellation in a plane for low frequency noise. The active control is being implemented in the software level through FIR filters which updates the weights using an LMS algorithm. A brief understanding of the LMS algorithm is made with MATLAB software. An experimental setup with two speakers for studying

the propagation of sound in a closed 3D space is developed. A simulation for the same setup is run on COMSOL software. A comparison study between the experimental setup and the simulation results is also made. As an extension to the double speaker experiment, a new setup with multiple speaker arrangement is developed for further studying noise propagation in a 3D space.

117. Slope Stability of Expansive Soil Using Geosynthetics

Alok Kumar, Civil Engineering

National Institute of Technology Sikkim

Mentor: Amit Prashant, Civil Engineering

The main objectives of this research study are to investigate the effect of expansive soils on retaining wall, to predict swell pressure acting on retaining wall and to provide an efficient and effective design solution to be used for retaining wall design in expansive soils. Retaining wall are structures designed to restrain soil to a slope that it would not naturally keep to. It has been seen in many cases that the expansive soil with a high shrink-swell capacity is problematic for many structures as it leads to change in volume causing damage to existing civil engineering structures such as cracks in foundations, retaining walls, pavements, airports, sidewalk, canal beds and linings. Additional stresses applied to the structures due to the swell pressures are important in explaining some of the damages to the structures in expansive soils. Therefore, the prediction of the swell pressure and taking them in to consideration in the design of retaining structures is needed. Stability of the structure will be reduced if these pressures are not included in the design. Retaining walls are also subjected to swell pressure tending to cause additional deformations and bending. In this project, the emphasis was to understand the methods of stabilizing the slopes using geosynthetics.

118. Mathematical Modelling of Photovoltaic Module in MATLAB/Simulink

Chinna Vishwanath Bhusaraddi, Electronics and Communication Engineering

B M S College of Engineering Bengaluru

Mentor: K. Chelvakumar, Mechanical Engineering

The oil crisis of 1970s banged the wind out of the global economy and helped set off a stock market crash, skyrocketing inflation and high unemployment - eventually leading to the fall of a UK government. Energy Security plays a major role in achieving sustainable development goals and economic policy goals. The Global reliance on crude oil is destined to keep going for the best part of this century. Furthermore, we have undesirable effects such as global warming caused to a great degree by greenhouse gases emitted from fossil fuel energy generating systems which as well is a vital concern. That being so, doubtlessly we should naturally and visibly be in want of alternate non-conventional, renewable sources of energy and unquestionably we go for that radiant energy by the sun! Photovoltaic solar energy is evidently a clean, renewable energy with a long service life and high reliability. In order to account for an efficient study of photovoltaic systems, it is essential to acquire precise knowledge of the Current, Voltage and Power characteristic curves of photovoltaic modules. The performance of a PV array system depends on the operating conditions as well as the solar cell and array design quality. The output characteristics of PV cell depend on many conditions like temperature, irradiation level, series resistance and shunt resistance. Many researchers used circuit based approach to characterize the PV module of which the simplest model is the current source in parallel to a diode. This paper presents the mathematical model of solar cell in MATLAB/Simulink environment. Voltage, current and power characteristics of photovoltaic system under varied conditions of temperature and irradiation are plotted and analysed.

119. Soiling Effect of Dust on Solar Photovoltaic Electricity Generation and Surface Designing of Solar Panel

Richa Sharma, Chemical Engineering

Birsa Institute of Technology, Sindri Dhanbad

Mentor: Chinmay Ghoroi, Chemical Engineering

Solar Energy is the most abundant, inexhaustible and clean of all the renewable energy resources. Photovoltaic technology is one of the finest ways to harness the solar power. So, of these technologies the Solar Photovoltaic (PV) Panels are used to convert the short wave radiation to electricity. In India, the aspiration is of 100 GW solar power but there is lot of particulate solids in recent times due to the intense air pollution. Soiling of panels leads to reduce the efficiency of PV electricity generation. These are due to deposition of atmospheric aerosols (the solid and liquid particles suspended in the atmosphere, the main constituents of which are inorganic species such as sulfate, nitrate, ammonium, sea salt, organic carbon, black carbon,and mineral dust) which causes the accumulation of dust and dirt on the PV surface. So, the aim of this project is to advance the understanding of the atmospheric aerosol radiation interaction and its impact on Solar PV electricity generation and to come with such surface design of the solar panel having self cleaning effect to achieve minimum impact of dust accumulation and give maximum possible power generation. The soiling study is done using small plant of 5W PV panel and for surface designing, different hydrophobic solutions are coated on the glass slides. The characterization of dust and coatings are done by Particle Size Analyzer (PSA), Scanning Electron Microscope (SEM), Electron Dispersion X-ray (EDS), X-ray Diffraction (XRD) Analyzer and Drop Shape Analyzer (DSA).

120. Exergetic Model of Textile Industry

Sana Farheen, Chemical Engineering

Birsa Institute of Technology Sindri

Mentor: Babji Srinivasan, Chemical Engineering

The work deals with the Exergetic Analysis of a Batch Dying Plant. The prospective of the work is to analyze the key components and then pinpoint the areas where the maximum amount of exergy destruction is taking place. In this study both the first law and the second law is being

utilized. Two types of loops were taken namely the Steam loop and the Thermic Fluid loop into which we have performed the exergy balance in each component. In addition for the steam loop, it has been found that the overall exergy efficiency was 60.7226%. And for the Thermic

Fluid loop, the calculated exergetic efficiency was 86.61%. The Boiler and the Heater are the major sources of irreversibility in the Steam loop and the Thermic Fluid Loop respectively. The total exergy destruction rate of the whole system was found to be 2638.6683 kJ/s and 2417.87594 kJ/s respectively.

121. Deep Learning for image resolution enhancement

Rajat Kanti Bhattacharjee, Computer Science and Engineering

Assam Engineering College

Mentor: Ravi S. Hegde, Electrical Engineering

Single image super-resolution , problem refers to taking a single image of dimension ‘M μ N’ and upscaling the image by a factor of ‘f’ to obtain an image of dimension (f.M) μ (f.N) without compromising the perceptual quality of image. The SISR problem is a classical problem in Computer Vision. The problem itself is inherently ill posed because of its multiplicity of its solution i.e it’s an undetermined inverse problem. In other words there exists

multiple High Resolution solution to a given Low Resolution image. With this project we give an overview of the work done in this field using Deep Learning as a solution framework for the problem along with the key ideas of what the different Deep Learning Architectural flavour brings in. And following this also propose a Cascaded GAN for progressive upscaling of an image that uses the ideas of using deep dense networks with adversarial losses but upscaling very low res images in a stage wise manner to achieve results on very low resolution image where there is extreme loss of information.

122. Development of mass communication resources for Alumni Relations Office

Deepak Dhariwal, Materials Science and Engineering

Indian Institute of Technology Gandhinagar

Mentor: Amit Arora, Materials Science and Engineering

Facebook is the largest social media site and is very mobile-friendly. The inherent shareability of Facebook lends itself to stronger alumni relationships. We'll be able to grow your network, raise money, and strengthen the existing connections we have with graduates. Almost all of your alumni are using social media as a way to stay in touch with each other after they leave the campus and go out into the real world.

8 SRIP 2018: Participants List

Interns Name	Institute	Faculty Advisor
B Rachna	AC College of Technology Anna University	Pratik Mutha
Rajat Kanti Bhattacharjee	Assam Engg. College	Ravi Hegde
Riya Ghosh	BIT Mesra	Chinmay Ghoroi
Richa Sharma	BIT Sindri	
Sana Farheen	BIT Sindri	Babji Srinivasan
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Kunal Verma	IIT Gandhinagar	
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Alok Kumar	NIT Sikkim	Amit Prashant
Abhay Garg	NIT Silchar	Nithin George
Bhawana sharma	NIT Silchar	Harish P M
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Ayush Prakash	NIT Silchar	
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Prashil Badwaik	VNIT Nagpur	Chinmay Ghoroi
Aditya Das Choudhury	VSSUT Burla Odisha	Arup Lal Chakraborty

9 Organising Team

Undergraduate Research Committee at IIT Gandhinagar coordinated and organized the SRIP 2018. Drs. Vineet Vashista, Manish Kumar, Iti Gupta and Krishna Kanti Dey were the members of the committee

Dr. Manish Kumar is an Assistant Professor in the Civil Engineering discipline. He completed his PhD from State University of New York at Buffalo in 2015. He works in the area of earthquake engineering and blast engineering.

Dr. Iti Gupta is an Associate Professor in Chemistry discipline. She was working with BITS Pilani prior to joining IIT Gandhinagar in 2009. She works on the development of “synthetic pigments” based on organic molecules

Dr. Vineet Vashista is an Assistant Professor in the Mechanical Engineering discipline. His research focuses on design and control of mechanical system, and robotics. Dr. Vashista completed his PhD from Columbia University in 2015 before joining IIT Gandhinagar

Dr. Krishna Kanti Dey is an Assistant Professor in Physics discipline. He completed his PhD in 2011 from IIT Guwahati. Prior to joining IIT Gandhinagar in 2016, he was a postdoctoral researcher at Pennsylvania State University. He specializes in nanotechnology.

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