



SRIP

SUMMER RESEARCH INTERNSHIP PROGRAMME



MEC
The machine is
parts:
Rotary Keyboard
switches.
Rotary are the
Keyboard has
representing 26
is connected to
copper wires,
conducting the
related charge
excitation and
LED lights are
switch is pressed
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press back the

SUMMER RESEARCH INTERNSHIP PROGRAMME

REPORT

2019

BACKGROUND

The Summer Research Internship Program (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 program was started in 2011 and was limited to the state of Gujarat in the first edition. The second edition of the program 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 program 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.

The SRIP 2019 is the ninth edition of the Summer Research Internship Program at IIT Gandhinagar. The SRIP Portal was generated for online applications submission and the students were invited from across the country, who make it to the program following a very competitive selection process. At IIT Gandhinagar, the interns are treated at par with the internal students. Institute provide them with a great research experience, and also encourage them to participate in other activities such as sports and cultural events. Many of them have had a significant impact on their career as a result of participation in this program

Students from prominent institutions across India have participated in SRIP since its inception. These include other IITs notably IIT Kanpur, Patna, BHU, Dhanbad, Bhubaneswar and Guwahati; NITs at Durgapur, Warangal, Agartala, Rourkela, Raipur, Nagpur, Kurukshetra, Tiruchirapalli, Surat, Patna, Meghalaya and Karnataka; IISER Bhopal and Thiruvananthapuram 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 program is expected to grow many folds in the coming years due to increase in faculty strength, publication of work originating from previous rounds of SRIP and wider knowledge of the program and the Institute's strengths. In this regard, the program is expected to be a crucial element in the Institute's efforts towards attracting strong researchers and scholars to its postgraduate program of study.

ACKNOWLEDGEMENTS

The organizers of Summer Research Internship Program (SRIP) 2019 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 Neeldhara Misra and Mr. Manish Jain. Special thanks are due to Mr. Sanjay Patel for help in dealing with the data and postal communications. All the SRIP events were photographed and/or videographed by the team of Mr. Devarsh Barbhaya and Ms. Chandni Vidhani. 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. Hatim Sham. The organizers are grateful for the efforts of Ms. Divyangi Choudhary and Mr. Dilip Kashyap for developing the SRIP Portal for online applications and projects submission under the guidance of Prof. Manish Kumar and also for 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 2019.

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SRIP2019: Statistics

A total of 17,958 internship applications were received for 73 projects offered by 39 IIT Gandhinagar faculty members, making an average of 240+ applications for a project. A total of 93 students were selected for the program (success rate of 1.2%). Out of 93 selected students, 24 undergraduate students were from IIT Gandhinagar, 8 undergraduates from other IITs, 2 from IISERs, 21 students from NITs, and remaining students from other prestigious colleges across India.

SRIP2019: Activities

2.1. Welcome Session

A welcome session was conducted in the Jasubhai memorial auditorium at IIT Gandhinagar on May 29, 2019. Our Director Professor Sudhir K Jain addressed the students and stressed on independent research by undergraduates. Professor Jain urged the students to become keen observer and also encouraged them to be the agents of change and try to do things in a better way. Some real life examples were shared with the interns with the emphasis on the SRIP opportunity, which helped the students in their future endeavors. The videos of the talk can be seen on the IIT Gandhinagar Youtube page.



Fig 1. SRIP Welcome Session, address by the Director.



Fig 2. SRIP Welcome session.



Fig 3. Welcome session address by the Dean, Academic Affairs.

2.2. SRIP Lecture Series

Two lecture sessions were conducted as part of SRIP Lecture Series. Professor Neeldhara Mishra delivered the inaugural lecture entitled “Evolution of Trust” using Game theory. She gave interesting examples from real life. She also discussed how the Game theory can be helpful to understand trust among humans. The second lecture was presented by Mr. Manish Jain, his team also demonstrated some scientific artifacts and their functions. The interns also learned how to make few scientific toys during the lecture. He coordinates the Creative Learning Institute (CLI) at IIT Gandhinagar. Mr. Jain spoke about the hands-on engineering education. The videos of these lectures are posted on the IIT Gandhinagar Youtube page.



Fig 4. SRIP Lecture Series, session with Mr. Manish Jain.



Fig 5. SRIP Lecture Series, interaction with interns.



Fig 6. SRIP Lecture Series, demonstration of a scientific object

2.3. SRIP Poster Session

A poster session was organized around the end of the SRIP on July 4, 2019. The students presented posters of their work done during the summer. More than 60 posters were presented by the summer interns of SRIP 2019. The posters were evaluated by a panel of judges comprising Professors Karla P. Mercado-Shekar, Sudipta Basu and Udit Bhatia. Six best posters were selected based on the recommendation of the panel.

1. "Rubik's cube solver" presented by Sourav Paul and Yash Dhake.
2. "A novel system for the treatment of human waste" presented by Ashutosh Bhattacharjee.

3. "Estimation of spatial gait parameters during human walking" presented by Naman Kaushik.
4. "Changes and anomalies in 20th century extreme precipitation over India" presented by Harsh Shah.
5. "Quantifying the effect of phonons on transverse correlations at the solid-liquid interface via molecular dynamics simulations" presented by Deep M. Patel.
6. "Spectroscopic studies of benzimidazole substituted alpha-cyanostilbenes compounds for explosive detection" presented by Monika.



Fig 7. SRIP Posters presentation.



Fig 8. SRIP Posters presentation.



Fig 9. SRIP Poster Session.



Fig 10. SRIP Poster Session.



Fig 11. SRIP Poster Session, group photograph.

2.4. Others

Research Proposal, Diary Writing and Bi-weekly Reports

Every participant was required to submit a research proposal within a week of joining the program. Students were also encouraged to maintain an online diary, namely: Tuesday-Friday (TF) Diary to keep track of their own progress. Additionally, they were encouraged to maintain a bi-weekly record online. At the end of the program, all the participants submitted a report based on the SRIP project work carried out at IIT Gandhinagar. The interns Ayush Pandey, Biswajeet Sahoo, Vibhor Kumar Srivastava, Varad Pimpalkhute and Satya Prakash Sahoo won awards for maintaining the diaries that includes research proposal, Tuesday-Friday diaries and bi-weekly reports.

Chalk The Talk

The “Chalk the Talk” activity was introduced in SRIP last year; each participant was asked to discuss his/her research using only the chalk and the board for 10 min duration. Chalk the Talk session was organized on June 17, and the participants made short presentations on their research projects in an open-to-all presentation session. This exercise provided a good opportunity for the students to share their work and research ideas with their peers and exchange thoughts with them.



Fig 12. SRIP Chalk the Talk activity.



Fig 13. SRIP Chalk the Talk activity.

Cultural Event

The SRIP 2019 Cultural Night was organized on June 29 for all the summer interns. The undergraduate students of IIT Gandhinagar and the interns came from various colleges gave song and group dance performance near Panchayat circle. Subsequently, a DJ night was organized where the SRIP interns danced to the tunes and enjoyed the show with IIT Gandhinagar students.



Fig 14. SRIP Cultural Night



Fig 15. SRIP Cultural Night

SRIP Intern's Achievements

- » The summer interns Utkarsh Gangwal and Samrat Chatterjee have worked under the guidance of Prof. Udit Bhatia and won Best Poster Award in the Annual meet of the Society of Risk Analysis (2019) held in the Washington DC.

- » S. Chatterjee, U. Gangwal, D. Kamboj, M. Singh, U. Bhatia “A network of network approach for cyber-based contingency analysis of interdependent infrastructure networks under uncertainty”, Washington DC, US, Dec., 2019. (Best Poster Award in Annual Meet of SRA).

- » The summer intern Deepika Gaat has worked under the supervision of Prof. Arnab Dutta and the project work has been published in the high impact journal of the American Chemical Society; ACS Catalysis 2019 as Front Cover.

- » D. Dolui, S. Khandelwal, A. Saikh, D. Gaat, V. Thiruvankatam, A. Dutta*, Enzyme-inspired synthetic proton relays generate fast and acid-stable Cobalt-based H₂ production electrocatalysts, ACS Catalysis, 2019, 9, 10115–10125. (Selected as front cover figure)

Students Speak

“SRIP 2019 was overall a very good experience. The campus is equipped with every necessity and has good reachability with the outside world. Facilities of IIT Gandhinagar is in accordance with students need, and the freedom provided to us was very impressive. During my internship, I worked in Tinkers Lab, Electrical Lab, ISTF, Mechanical Lab and worked for the network team and also with the on-campus electrician while working under a faculty from the CSE department. It was truly a diverse and enriching experience for me. This experience was one of a kind for me. The freedom given by my mentor helped to work freely and helped to put up in my best efforts. I learned how the standard of an IIT is maintained, by the way of working of people here and that has left a positive impact on me. Overall, this was truly an enriching experience for me.”

- Sajal Sirohi

“SRIP 2019 was a life-changing experience. It will definitely encourage me to pursue research as my career goal. The experience and knowledge that I have gained during these months are unquantifiable. My faculty advisor and fellow interns were very co-operative. We were always notified about the events in the college and hostel and got the same exposure despite being an intern. I had a great work-life balance, made some excellent friends and got a good exposure to the world of research.”

- Raktim Malakar

“It has been a very wonderful experience at IITGN. The SRIP had given a very great opportunity to carry on my research at IITGN. The srip lecture series and the extra curricular activities arranged for the students have made the program more effective. Overall it was an wonderful learning experience.”

- Konala Reshma Reddy

“My experience at IIT Gandhinagar was really good. Starting from the introductory session to the SRIP lectures, everything was very interactive. I liked that IIT Gandhinagar not only takes care of the research work of the students but also motivates the student to take part in extra-curricular and arranged various events like halla-bol, cultural night, poster etc. The experience to be at a new place, meeting new people, making new friends and learning something from all of them was really nice.”

- Shruti Sinha

“My SRIP experience at IIT Gandhinagar was great. I had gathered a huge amount of knowledge and research experience from this place. Not only knowledge related to my project, but learned some basic trending technology implementation also. The most important thing I learned here is the professional attitude. The faculty is very supportive and provides necessary guidance to the students. The students of IIT Gn are also friendly and helpful. Lab facilities are amazing with well-planned infrastructure. The institute provides all the resources to the students. Apart from that, the stay at the campus was amazing, with fully air-conditioned, spacious, semi-furnished rooms. The campus is very well maintained with the cleaning process going on all day. The campus is more lively at night, maybe because of the scorching heat in the daytime. Apart from that, the mess food is very good and affordable. There were interns from all over India, it was an amazing experience being with them. Overall these two months were very well spent. It was not just like we were only into work but also we visited some beautiful places in Ahmedabad and Gandhinagar. I like everything about this place. It has given me some beautiful memories. I feel really blessed for getting selected for this internship.”

- Manika kumari

“I can, without any hesitation say that this has been my most utilized summer vacation till date. The welcoming atmosphere of the campus helped me settle within no time and get started. The research facilities provided were of top-notch, beyond my expectations. On the whole, I thoroughly enjoyed and at the same time learnt a lot during my stay here.”

- G Pruthvi Trinadh

“Summer Research Internship Project 2019 was phenomenal. After working almost for two months I can clearly say that this was my best experience of interaction with students from different institutions and discussing their cultures. My roommate at IIT GN, my fellow teammates, the friends I made here they all were from different institutions. We used to discuss our research while having snacks and it was really fun explaining my research to interns from other engineering branches. This was my first research experience, and I believe it was a good start as it opened options for me to pursue research for my future. My research topic was very interesting and I really enjoyed the challenges that I had faced because it was a new field that most of the researchers had hardly explored. The SRIP lecture series is another feature that adds to this program’s value. I really appreciate the innovative idea of maintaining Tuesday-Friday diaries and biweekly report as one proceeds in the project which helped me evaluate myself while staying motivated for what’s ahead. Thank you IIT Gandhinagar, my faculty advisor and my fellow interns for this enriching and memorable experience.”

- Prem Sangam Mishra

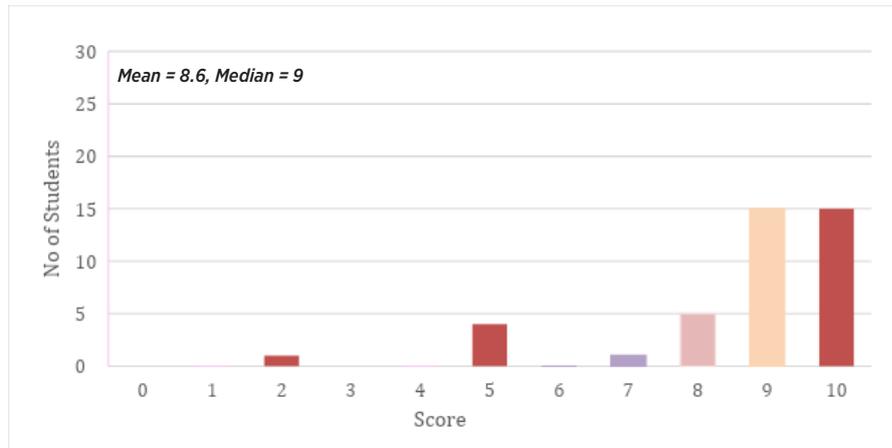
“First of all, It was a valuable opportunity to get this project in my 2nd-year undergraduate because it was almost like an industrial internship. This internship will help me in setting my future goals. For me, the essential part of this internship was my daily routine. It taught me the discipline that is vital when you work in a professional environment. I also liked the flexibility and diversity of the project because it helps me in exploring different areas of the project. The project involved working with civil engineers, and that interaction helps me know more about my discipline. Thank you IIT Gandhinagar for such an enriching experience.”

- Sumit kumar

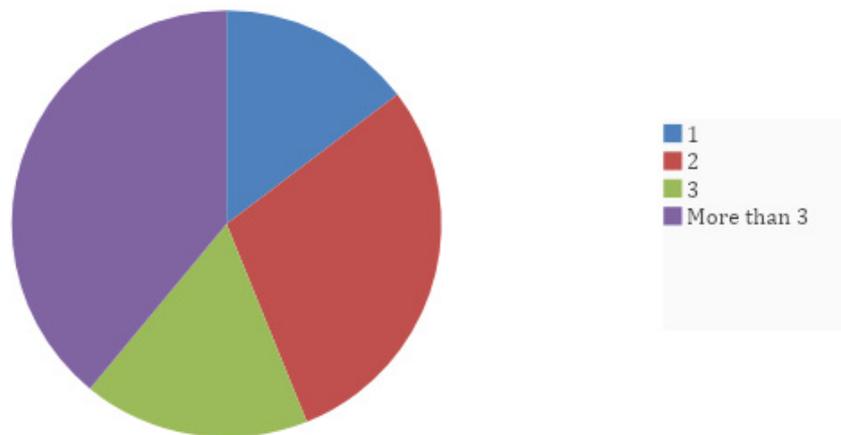
“I would like to convey my sincere gratitude to the director of IITGN for providing such an exceptional opportunity to work in advanced facility laboratory. The laboratory and all the other facilities are up-to the mark required for modern research. Even the liberal environment of IITGN makes it more comfortable for research Tyros like me to explore things without any constraint. There isn’t any barrier in the road of science in this institute. The facilities are even accessible during midnight and weekend under proper surveillance. Additionally I would like to sincerely thank Prof. Kaustubh Rane for guiding me throughout this journey. At last I would like to convey my heartily gratitude to the research group of “kaustubh_research” for always helping me to clear all my doubts during interpretation of the concepts. It was surely an experience worth gaining to. I hope this program keeps on providing such opportunities to young talents across the globe.”

- Deep M Patel

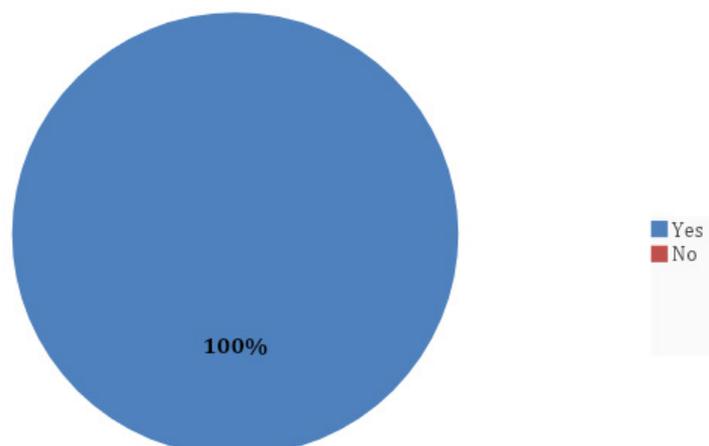
Student experience in numbers



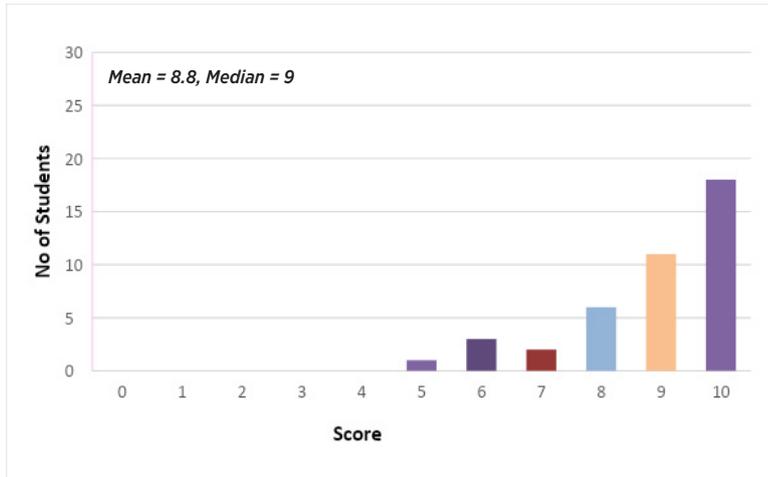
Was your research exciting? Rate on a scale of 0 to 10 (10 = very much so, 0 = not at all).



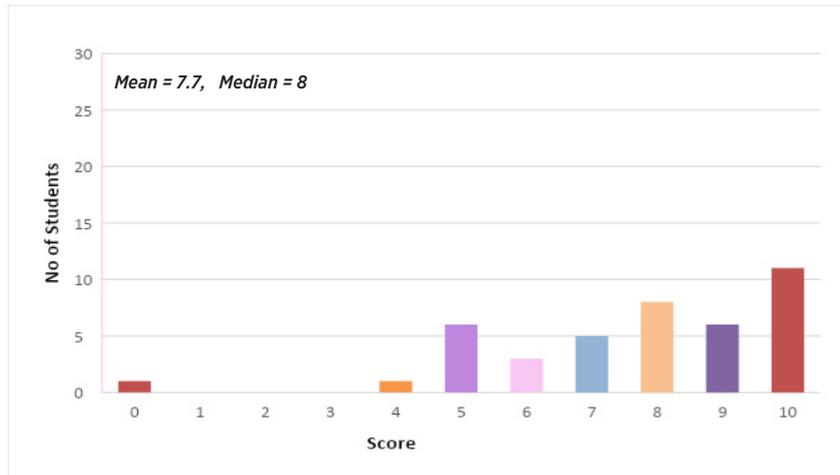
How many times did you meet your advisor every week on an average?



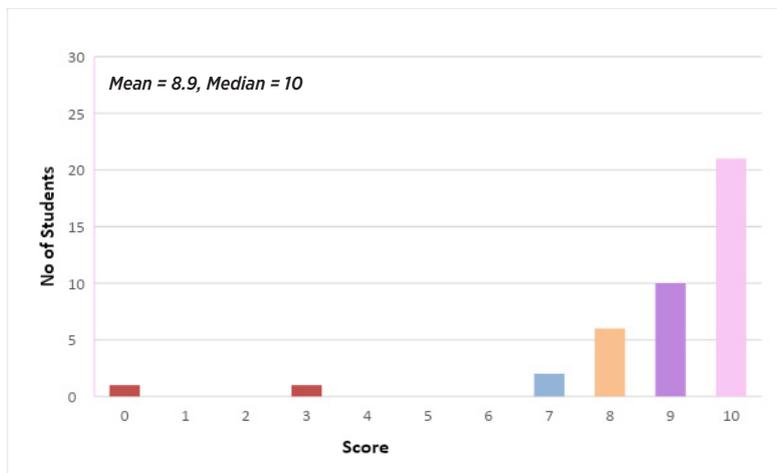
Did you receive sufficient guidance from your faculty advisor?



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

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 every year, 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 the best poster award in front of the community. The fourth edition of Undergraduate Research Conclave (UGRC) 2019 was organized on August 31, 2019. A total of 51 posters were presented by our undergraduate students. These posters were based on the work they had done during the preceding summer. A panel of judges comprising Professors Paresh Date, Himanshu Shekhar, Arnab Saha and Pradipta Ghosh evaluated the posters. Following posters were selected for Best Poster Awards and Special Mentions, based on the recommendations of the judges. These posters are also put on display on the designated walls in the academic area.

1. “High Strain Behaviour of 3D printed Al 6061” by Shreyas Sreeram (Best Poster Award).
2. “Algebraic Geometry Meets Artificial Intelligence: Predicting Fixed Points of Group Actions” by Pratik K. (Best Poster Award).
3. “Light curve classification with recurrent neural networks” by S. Vinu Sankar (Special Mention).
4. “JoyHolder: Tangible Back-of-Device Mobile Interactions” by Amit Kumar Singh Yadav (Special Mention).
5. “Retrofit of Reinforced Concrete Shear Walls Using Weakening and Self-Centering Approach” by Tejas Wani (Special Mention).
6. “Optimizing Autonomous Driving Systems” by Varun Gohil (Special Mention).



Fig 16. UGRC Poster Session.



Fig 17. UGRC Posters presentation.



Fig 18. UGRC Poster Session.



Fig 19. UGRC Poster Session, group photograph.

Past Publications (Updated till 2020)

The SRIP was started in 2011 at IIT Gandhinagar and along the years, the efforts of the students and faculty members involved in the variety of research projects manifested in terms of SRIP publications. Overall the SRIP list of publications includes about 30 conference papers in the leading international and national proceedings and/or symposia.

The summer research projects have been presented in the various international and national conferences of good repute such as: The IEEE International Conference on Computer Vision (ICCV); The IEEE 7th International Conference on Power Systems (ICPS 2017), Pune; The 10th Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP), Indian Institute of Technology Guwahati; The 6th National Conference on Computer Vision, Pattern Recognition, Image Processing and Graphics (NCVPRIPG), IIT Mandi; The ACM India Joint International Conference on Data Science & Management of Data (COMAD/CODS), Kolkata; International Colloquium on Automata, Languages, and Programming (ICALP), 2018; 10th International Symposium on Visual Computing (ISVC), Las Vegas.

In the year of 2017, the summer research project of a group of interns working under the supervision of Prof. Chelvakumar culminated into the book titled “Solar Power in India: Past Present and 2022”.

Furthermore, the ongoing work of summer research projects yielded ~11 research articles published in the high impact international journals namely: Nature Scientific Reports, Soft Matters, ACS Catalysis, Cell Reports Physical Sciences, Inorganica Chimica ACTA, Surface Science, IEEE Transactions on Signal Processing, Journal of Environmental Management, Powder Technology and Bulletin of Earthquake Engineering etc.

Year	Authors	Title	Journal/Conference/ Publisher
2020	V. Pandey, D. Jain, N. Pareek, I. Gupta	Pd(II) porphyrins: Synthesis, singlet oxygen generation and photoassisted oxidation of aldehydes to carboxylic acids	Inorganica Chimica Acta, 502, 119339.
2020	A. Roshan, M. Kumar	Water end-use estimation can support the urban water crisis management: A critical review	Journal of Environmental Management 268, 110663.
2020	M. Gupta, R. Jain, N. Modi,	Multiple Source Replacement Path Problem,	ACM Symposium on Principles of Distributed Computing (PODC)
2020	D. Agarwal, M. Kumari, B. Srinivasan, P. Rajappan, J. Chinnachamy,	Fault diagnosis and degradation analysis of pm dc motors using fea based models.	International Conference on Power Electronics, Smart Grid and Renewable Energy (PESGRE2020) (pp. 1-6) IEEE.

2020	D. Dolui, S. Das, J. Bharti, S. Kumar, P. Kumar, A. Dutta	Bio-inspired Cobalt Catalyst Enables Natural-Sunlight-Driven Hydrogen Production from Aerobic Neutral Aqueous Solution	Cell Reports Physical Science, 1, 1, 100007.
2019	N. Batra, R. Kukunuri, A. Pandey, R. Malakar, R. Kumar, O. Krystalakos, M. Zhong, P. Meira, O. Parson.	The 6th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation	BuildSys 2019, New York, USA.
2019	D. Dolui, S. Khandelwal, A. Saikh, D. Gaat, V. Thiruvencatam, A. Dutta	Enzyme-inspired synthetic proton relays generate fast and acid-stable Cobalt-based H ₂ production electrocatalysts	ACS Catalysis, 9, 10115–10125. (Selected as front cover figure)
2019	S. B. Mehta, A. Kumar, M. Radhakrishna	Role of confinement, molecular connectivity and flexibility in entropic driven surface segregation of polymer–colloid mixtures	Soft Matter, 15, 6495–6503.
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
2018	T. Mane, P. Bhat, V. Yang, D. S. Sundaram	Energy accommodation under non-equilibrium conditions for aluminum-inert gas systems	Surface Science, 677, 135 - 148
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 (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 CO ₂ 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. Thiruvengatam	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, Chandigarh, 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)
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1. Detection and Analysis of Pre-dicrotic and Dicrotic Notch in the Arterial Pulse Pressure Waveform using A Fiber Bragg Grating Sensor-based Wearable System

OINDRILA SINHA, Department of life sciences

Presidency College

Mentor: Arup Lal Chakraborty, Electrical Engineering

The dicrotic notch is a significant characteristic that marks the end of the ventricular ejection in the arterial pressure waveform. In investigating cardiovascular disorders, reliable detection of this notch in the pulse waveform is of concern. It also offers insight into critical patients' haemodynamic complexities. We demonstrate a sensor-based arterial pulse signal recording system using fiber Bragg grating (FBG) sensor, which accurately detects both the dicrotic notch and the pre-dicrotic notch. On the pulse waveform obtained from four different subjects, the notches were evidently noticeable. Even when connected up to 10 cm from the wrist joint, the sensor is delicate enough to pick up the pulse signals. The light weight and electromagnetic immune FBG sensors are ideally suited for use in hospital environments. The complete system can readily be made compact, battery-powered, and wearable.



2. Synthesis of strong acceptor and doner Flourocenec molecules based in gelation and biological application.

Vora Dipti B, Chemistry

Uka Tarsadia University

Mentor: Sriram Kanvah Gundimeda, Chemistry

We have developed the synthesis of pyrene aldehyde, tri-phenylphosphin, and also some synthesis



3. Impact of Social Influence on Elections

Kavel Baruah, Computer Science and Engineering

Tezpur University

Mentor: Neeldhara Misra, Computer Science

Election control using social influence considers the problem of an adversary who attempts to manipulate the results of an election by spreading fake news. With the onset of social networks, we have access to billions of people who can be manipulated and misled using false advertising or fake propaganda. We study the control of election using social influence in the constructive(making a target candidate win) as well as the destructive(making a target candidate lose) settings. We study approximation algorithms to the aforementioned problems and see that problem of maximising the probability of victory is inapproximable for any constant factor and we can have constant factor approximations for the margin of victory objective. These results suggest that it is surprisingly quite possible to formulate an optimal strategy through which an attacker can manipulate any given election provided he has the necessary information and a limited budget. Social influence is a major threat to election integrity.



4. Feedback Stabilisation of NOON State in Bosonic Double Well

Avani Vivrekar, Engineering physics

Indian Institute of Technology Guwahati

Mentor: B. Prasanna Venkatesh, Physics

The aim of this project is to understand if we can use quantum feedback to stabilize hard to prepare quantum mechanical states such as a `NOON' state (or

Schrodinger cat state) - which is a macroscopic superposition of a large number (N) of particles localised in distinct (single particle) quantum mechanical states (with labels L and R):

$$|>NOON = 1/\sqrt{2} (|NL, OR + |OL, NR)$$

where $|NL, OR$ denotes a “Fock” state with N atoms in the L state and O atoms in the R state. In our study we will consider the specific system of Bosonic atoms in a double well potential with the single particle states L(R) denoting state of the atom localized in the left (right) well. For the same we have considered theory of continuous measurement and given details about dynamics

Of bosons in double well potential system and analysed one of the methods to prepare NOON state as well as verified the failure of the same for large N.



5. Digital Photography with Flash and No-Flash Image pairs

Shriyesh Chandra, Electronics and Computers Engineering

Thapar Institute of engineering and Technology

Mentor: Shanmuganathan Raman, Computer Science

This Report summarizes the work that has been done by me at the college in these two months. This report is on the topic “Digital photography with flash and no flash image pairs”. As the title suggests we have taken 2 images in the same environment with the difference being that one utilizes Flash, thus producing Detailed, Noiseless, and an image with less preservation of colours and another Ambient or no flash image with the visual richness of natural colours, Higher amount of noise and lesser amount of details. In this report we have provided an efficient way to use these 2 images to produce a superior quality fusion image with the better qualities from both these images using multiple filtering techniques.



6. A fiber Bragg grating sensor-based system for recording the sound of an Indian flute

Srijeet Basu, Instrumentation & Electronics Engineering

Jadavpur University

Mentor: Arup Lal Chakraborty, Electrical Engineering

The Indian flute (bansuri) is a reed instrument that presents unique challenges in recording its sound using a conventional microphone setup. In an ensemble of various instruments, its sound often remains quite indistinct. The person playing the flute also has to restrict movement while recording. In this report, we demonstrate a fiber Bragg grating (FBG) sensor-based recording system that is able to record the sound of the flute. We are able to suggest the FBG as an alternative to a microphone and identify the position on the flute where the FBG is to be attached in order to obtain the best signal. The FBG- based recording system is also shown to identify the musical notes played while there is high-intensity noise in the background. Its functionality is also not affected when the flute moves while being played.



7. Spider Bot and Rubik's Cube Solver

Yash Dhake, Mechanical Engineering

IIT Gandhinagar

Mentor: Manish Jain, Creative Learning

Robots equipped with wheels and tracks are preferred on even terrain but on uneven terrain the advantages of wheels become minimal or obsolete. Instead the advantages of legs make walking more useful in an uneven terrain because of the versatility in its movements. This forms the basis of my minor project where I am assigned with the making of an spider bot using Klann Mechanism. The Klann linkage is a planar mechanism designed to simulate the gait of legged animal and function as a wheel replacement, a leg mechanism. Klann linkage works on the basis of kinematics where all links gives relative motion with each other. It converts the rotatory motion to linear motion, and looks like an animal walking. The Klann

mechanism uses six links and seven joints per leg with one degree of freedom.

My model will be made using MDF Sheet (Medium-density fibreboard) which will be designed in a CAD software of required dimensions for effective movement of the robot and then using the laser cutting machine to get the finished product. The movements of the robot will be controlled using one electric motor and gears.

The Rubik's cube has recently begun making a comeback. Invented in 1974, it is the world's best-selling toy. But solving them takes thought, effort, and skill, so why not let a robot do it. This is my major project, where I have to build an intelligent robot capable of solving a Rubik's Cube.

The model's structure will be made using LEGO bricks and pieces which includes a base to keep and rotate the cube, an arm to flip the cube and a color sensor to detect the color faces of the initial state of the unsolved cube. All these will be controlled using 3 stepper motors of LEGO Mindstorm EV3. The brain of the bot will be the Lego Mindstorm EV3 brick which will store the program code, process and generate a solution to solve the cube and control the stepper motors and color sensor.



8. Mechatronics: Programming Future Mechanisms

Sourav Paul, Electronics and Communication

National Institute of Technology Meghalaya

Yash Dhake, Mechanical Engineering

IIT Gandhinagar

Mentor: Manish Jain, Creative Learning

Robots equipped with wheels and tracks are preferred on even terrain but on uneven terrain the advantages of wheels become minimal or obsolete. Instead the advantages of legs make walking more useful in an uneven terrain because of the versatility in its movements. This forms the basis of my minor project where I am assigned with the making of an spider bot using Klann Mechanism.

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9. Morphological analysis of the lunar surface

Rajnish Kumar Ranjan, CSE

IIT(ISM) Dhanbad

Mentor: Vikrant Jain, Earth Science

Craters are the surface characteristics generated after the impact of an asteroid

falling over the planetary surface. Crater density on the lunar surface provides important information about the chronology of the lunar surface. Further, recent studies on crater morphology provided new insight into geomorphic processes in the absence of water and air. Crater detection is very crucial for the morphological study of the planetary system. Several automation algorithms have been introduced for crater detection. The main challenges, this area has faced:- (i) Generating a large number of training samples is non-trivial, which is essential for greater accuracy in the crater detection, and (ii) Detecting a large number of variant sized craters from large-size high-quality surface imagery is highly complex in nature. In this project, highlight shadow algorithm is used to generate possible sub-samples from the high-quality imagery, which are to be verified using a supervised algorithm such as CNN.



10. Flash and No Flash Image Fusion Pairs

Uttharapally Sai Chandra, Electrical Engineering

IIT Gandhinagar

Mentor: Shanmuganathan Raman, Computer Science

This report shows for the work that I have done for my Summer Research Intern Project, it has a detailed analysis of how one can use different techniques on pairs of Flash and Non flash images to create a superior quality resultant image

by fusing the two images.

We have seen that there is a problem when we click pictures in low light setting, we have created a procedure that can tackle this problem and make use of better qualities of both the images to create the final image.



11. Cardboard/Paperboard Furniture

Chekkala Sai srishal, Civil engineering

IIT GANDHINAGAR

Mentor: Manasi Kanetkar, Design

The Furniture needs of people are increasing day by day and the future design of furniture is much concerned about space saving, multi-utility and easily accessible. Due to the huge consumer need the demand for timber is rising simultaneously, which results in cutting of trees and shows other ecological imbalances. On the other hand, cardboard is one of the materials that is sturdy, versatile and light weight. Furniture made of cardboard is environmentally friendly, cheap, allow a construction of complex geometry in design and can be easily accessible by the user. Adding design details and development to the unique properties of the cardboard makes it a lot value in the perception of furniture. This project aims on developing the cardboard as furniture by studying its properties, behavior, joinery, design and applications.

This project involves prototyping of various furniture models with cardboard, making several design and focusing them to be portable, multi-utility and user-friendly.



12. Structural Dynamical Study of Additively Manufactured Plastic Structures

Abu Shagma Siddiqui, Mechanical Engineering

IIT(ISM), Dhanbad

Mentor: K R Jayaprakash, Mechanical Engineering

The objective of this SRIP Internship is to study the effect of 3D printing raster angle on the modal frequencies of the additively manufactured plastic structure.

We consider the experimental modal analysis of an additively manufactured cantilever beam structure by varying the raster angle. In this study, we have considered two specimens one with a raster angle of [0,900] and the other with [450,-450]. The experimental results are compared with the one-dimensional analytical model and the exact analytical solutions thereof. It can be conjectured that the raster angle has a definitive effect on the modal frequencies

and the study indicates that there is a variation of about 5% in the first and second modal frequencies. Further studies would be required to validate these results and to more specifically consider other raster angle layouts.



13. Mechatronics: Programming Future Mechanisms

Yash Gaur, Mechanical Engineering

IIT Gandhinagar

Mentor: Manish Jain, Creative Learning

The minor project is a mechanical device which produces desired patterns on a screen. This is a device with no electrical parts and is completely hand driven. The main components are the two cams or disks of variable radius which drive the laser into the required pattern. By simply feeding in the coordinates of the required pattern, various cams can be designed to produce the required shapes.

The major project is about designing a robot which can balance on its own. This works on the principle of inverted pendulum which is an inherently unstable system with a nonlinear behaviour. The equations are linearized about certain fixed points and then control techniques like full state feedback to stabilize the inverted pendulum. Simulation is done in MATLAB and SIMULINK with Lego Mindstorms kit used to build and run the simulation. Sensors like gyroscope to measure the body angle and encoders to record wheel angle are used along with Lego DC motors which serve as actuators.



14. 3D Modeling and Geometry Processing

Nayan Chaudhary, Electrical Engineering

IIT Gandhinagar

Mentor: Shanmuganathan Raman, Computer Science

Digital 3D geometric models are widely used in the arena of computer graphics, visual industries, architecture, computer games, animated movies and 3D digitization of objects and many other prominent fields. The methods and applications of 3D Digital geometry processing had been a hot research area across the globe in the recent times. Our research project aims to use digital geometry processing techniques for restoring and preserving 3D objects digitally for applications such as cultural heritage and archaeology. We aim to develop a pipeline from acquisition of point cloud from long range laser scanner, point cloud registration, mesh generation, surface generation and finally publishing them on the WebGL platform and 3D print it. Our research also aimed in going through the recent developments in the field of 3D digital geometry processing with a flavor of Deep learning and Convolutional Neural Networks (CNNs).



15. Effect of RRA process on mechanical & metallurgical properties of 7075 alloy

Nishkarsh Srivastava, Material Science & Engineering

IIT Gandhinagar

Mentor: Amit Arora, Materials Science & Engineering

7075 aluminium alloys are heat treatable and among the Al-Sn-Mg-Cu alloys provides the highest strength of all aluminium alloys. The most extensive applications of the 7075 have been in the transport industries such as automobiles, marines and aviation sectors. The 7075 alloys are prone to intergranular corrosion. Retrogression and Re-ageing (or RRA) also designated as T77 is a heat treatment process which is used to improve the stress corrosion resistance of the alloys while maintaining the strength of the alloy. The process involves applying a double stage thermal cycle to an alloy in the T6 temper: the first stage runs at a higher temperature (retrogression) followed by a stage similar to that used to obtain T6 temper (Re-ageing). RRA was performed on aluminium alloys at 180oC, 240oC and 320oC for 10 minutes, 30 minutes and 50 minutes followed by ageing at 120oC for 26 hours. The process resulted in decreasing hardness as the retrogression temperature and duration increases. Similarly, the electrical

conductivity increases with an increase in retrogression temperature and duration. These changes can be attributed to the dissolving of precipitates and then coarsening of the same, which facilitates the electron flow through the matrix. The further objective of the experiments includes putting the heat-treated alloys through immersion test for intergranular corrosion followed by observing and quantifying the corrosion.



16. Computational Social choice

Radhika Vyas, Computer Engineering

LJ Institute of Engineering and Technology

Mentor: Neeldhara Misra, Computer Science

My area of research was “Algorithms on Gerrymandering over graphs” under Computational social choice. I worked under Prof. Neeldhara Misra. Under her guidance, I studied the paper thoroughly and found the areas where more research and improvement can be done in terms of reducing the problem to FPT and also improving the time complexity of the algorithm on gerrymandering over graphs.



17. Synthesis of Tetradentate NiN4 complex for efficient H+ and CO2 reduction

SHIVAM KUMAR, Chemistry

IIT Gandhinagar

Mentor: ARNAB DUTTA, Chemistry

The electrochemical catalytic reduction of CO₂ to CO is attained with excellent selectivity in

acetonitrile in the presence of 2,2,2-trifluoroethanol with the 2-nitro tren nickel complex acting as a molecular catalyst. Upon performing cyclic voltammetry analysis in the presence of 2,2,2-trifluoroethanol, we observed the increase in the amount of current. On performing cyclic voltammetry in the presence of water, we saw improvement in current.



18. Synthesis and Characterization of Bio-inspired Cobalt based Catalysts for Proton Reduction reaction

SANDIPAN BHATTACHARYYA, APPLIED CHEMISTRY

RAMAKRISHNA MISSION VIDYAMANDIRA

Mentor: ARNAB DUTTA, Chemistry

VCobalt based molecular catalysts are already popular candidates in scientific community as a homogeneous catalyst of proton reduction reaction. But there is a scope of much improvement. It was observed that there is a prior role of the axial ligand in this cobalt based catalyst. In this we made an attempt to enhance that catalytic property by using biologically available molecules as an axial ligand.



19. Estimating error probabilities due to single event transient in combinational circuits based on electrical, temporal and logical masking

Shweta Pardeshi, Electrical Engineering

IIT Gandhinagar

Mentor: Joycee Mekie, Electrical Engineering

Electronic components have become an important part of space and military equipment. However, the environments in which these equipment are employed are very harsh as there are various kinds of radiations in space like heavy ions and lighter particles affecting circuits in different ways. When high-energy neutrons (present in terrestrial cosmic radiation) or alpha particles (which originate from impurities in the packaging materials) strike a sensitive region in a semiconductor device, the resulting single-event upset (SEU) can alter the state of the system resulting in a soft error. In this project, we have come up with a technique to obtain an optimized circuit with respect to area and power with a minimum possible probability of error. We

have implemented ISCAS'85 benchmark circuits using Gate sizing technique in umc 65 nm technology. Our aim is to automate the analysis for larger circuits.



20. CHARGE DRIVEN SELF ASSEMBLY OF POLYMER GRAFTED NANOPARTICLES

Vinod Kumar Prajapat, Chemical Engineering

IIT Gandhinagar

Mentor: Mithun Radhakrishna, Chemical Engineering

The main objective of this project is to study the self-assembly of a polymer grafted nanoparticles (NPs) by using Molecular Dynamics simulation. MD simulations were performed using LAMMPS and simulations were performed at room temperature using the NVT ensemble. Dispersion of nanoparticles and its role on properties was studied. It was found that nanoparticles dispersion and its three-dimensional arrangements could be controlled by varying the grafting density, grafted chain length N and matrix chain length P . By the addition of nanoparticles like nanospheres, tubes, or sheets, to a polymer melt can result in materials having significantly improved thermomechanical, optical, and electrical properties. For this, there has to be a specific nanoparticle dispersion state to improve or optimize these desired properties. The following tasks were done in this project: (1) By the use of electrostatics, supramolecular (having cluster) self-assembly of nanoparticles was built. (2) By grafting nanoparticles with charged block copolymers (which can provide a range of different morphologies and different properties) stimuli-responsive materials were developed. (3) Restraining of the block copolymer self-assembly was done by site-specific mutation or variations to optimize the specific properties. (4) A theory assisted with the simulations was developed to serve as a template for nanoparticle dispersion. The synthesis of nanoparticles could be done by Controlled radical polymerizations (CRP) technique. It consists of three methods (1) Atom transfer radical polymerization (ATRP), (2) Nitroxide-mediated polymerization (NMP), and (3) Reversible-addition-fragmentation chain transfer polymerization (RAFT). As well as there would be three types of assemblies (1) Quiescent Assembly, (2) Crystalline Assemblies, (3) Driven Assembly. Future research or direction of this project include (1) Relationship between Dynamics and T_g (glass transition temperature of composites), (2) Magnetic NPs, (3) Semicrystalline Polymers, (4) Block Copolymer Grafts, (5) Matrix with Different Chemistry than Brush.

The main research of this project was performed for a nanoparticle symmetrically grafted with 2 chains of monomers with chain length 5. There was a different kind of systems like one having zero rigidity constant and others having rigidity constant of 20, some having salt and some were without salt. These systems were forming rings (cycles) of different sizes as well as strings also. The system having high rigidity was forming more number of cycles as compared to the system having less rigidity. The result for strings was the opposite of the cycles. On increasing the salt concentration in the system the number of cycles of smaller size was increasing. Rings of size 4 were more favorable in case of rigid systems, whereas rings of size 4, 6, 8 and 10 are favorable for flexible systems.



21. Robotics and Control

Robin Badsara, Electronics and Communication Engineering

National Institute of Technology Kurukshetra

Mentor: Madhu Vadali, Mechanical Engineering

The developments done in the recent time are not only in the field of the microchips or microcomputers but also in highly integrated embedded systems. Modelling and designing small and intelligent devices such as autonomous mini mobile robot is also possible. As we, the human beings, communicate with each other then why the robots can't? The ease of use and high efficiency are driving the wireless communication technology in a new era. Communication between the multi robots or between the operator and a robot helps in delivering the information by which many important tasks can be done easily. In this research project, a novel mini robot with wireless control and wireless power supply is developed. A perfect wireless mini robot is designed using the Arduino Nano. A simple, modular and robust supervision hardware system has been developed for the mini robot. The mini robot is being controlled wirelessly

using Xbee signals. These types of the mini robots with wireless communication are very helpful to do useful tasks such as searching in narrow areas and many more.



22. Modelling Hydrological Processes using Physics-Guided Machine Learning

Anshuman Yadav, Computer Science and Engineering

Indian Institute of Technology, Gandhinagar

Mentor: Udit Bhatia, Civil Engineering

The rise of Deep Learning and Data Science in the past few years has had a tremendous impact on not only Computer Science, but also across other domains. The predictive ability has helped people tackle a lot of challenges but still, there are a lot of domains where there is a scope for improvement. To predict processes like Hydrological processes, there are two usual approaches, one is to use physics-based models and the second is to use general Data Science models. We'll Primarily focus on using different Machine Learning models to predict future processes. The next step would be to use the output of these physics-based models and add these outputs as a feature in our model. We'll also add a loss function such that it maintains the physical consistency of our model. This type of surrogate modeling is commonly known as Physics-Guided Machine Learning.



23. Accompany the engineer at a construction site

Sumit Kumar, Civil engineering

IIT Gandhinagar

Mentor: Gaurav Srivastava, Civil Engineering

Building a home is a pervasive work. It involves an enormous amount of money, requires project management skills, coordination with different stakeholders, and need skills to manage technical issues. Through the project "ACCOMPANY

THE ENGINEER AT A CONSTRUCTION SITE," I got a chance to work at a construction site and Observe these aspects of a construction project. This report is the detailing of the things that I have learned and observed through this project. I was visiting the staff housing construction site at IITGN, and all the technical aspects like construction method, lab tests, type of concrete mix, etc. are discussed considering the staff housing block of IITGN. I have also presented examples of some of the daily practices that are generally conducted at a construction site like calculating the quantities of material required from the ratio of concrete and plaster, calculating the cutting length of steel, making bar bending schedule, making working drawings, etc.

In the end, I have also discussed some of the technical and nontechnical challenges that the construction team faced during the construction and how they tackled those challenges. Some challenges were like the problem in fixing of shuttering, delay in development due to lintel band, separation of RC frame constructed part from confined masonry built part, etc.



24. Bio-Inspired H₂ production catalyst

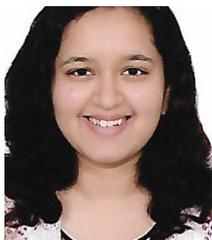
Nijeshree Kamleshbhai Nayak, Institute of Research and Development (IRD)

Gujarat Forensic Sciences University

Mentor: ARNAB DUTTA, Chemistry

Global energy consumption is projected to increase, even in the face of substantial declines in energy intensity, at least two fold by midcentury relative to the present because of population and economic growth this demand was fulfilled from fossil energy resources. However, cumulative nature of CO₂ level increases which required invention, development, and deployment of scheme for carbon neutral energy production. In the view of intermittency of insolation if solar energy is to be a major primary energy sources, it must be stored and dispatched on demand to the end user. An especially attractive approach is to store solar converted energy in the form of chemical bonds. The work is inspired by structural features of the hydrogenase enzymes and should of interest to researchers in the area of biomimetic chemistry as well as catalyst design and hydrogen utilization. Scientific challenges involved with this

process include scheme to capture and convert solar energy and then store the energy in form of chemical bonds, producing oxygen from water and reduced fuel such as hydrogen.



25. Deep Learning For HDR Imaging

Saumyaa Shah, Computer Engineering

Institute of Technology, Nirma University

Mentor: Shanmuganathan Raman, Computer Science

In this work, we propose a deep learning based system to generate high dynamic range (HDR) images, GIFs and videos from images captured using consumer cameras. We start by generating a single HDR image from multiple low dynamic range (LDR) images of varying exposures, captured consecutively at fixed time intervals using Debevec's algorithm. However, this method fails to produce ghost-free HDR images for dynamic scenes. To address this limitation, we use state-of-the-art deep learning methodologies, which generate HDR images free from artifacts. Then, we generate intermediate images between each pair of consecutive HDR images using both optical flow based and non-optical flow based approaches, which are then combined to form a GIF. Finally, the GIF is converted into an HDR video using SuperSloMo network. Experiments show that both approaches of frame interpolation fail to predict the accurate in-between frames for the input images, resulting in discontinuous motion of dynamic objects in the final video.



26. Single-Peaked Consistency and its Variants in Incomplete Elections

Dhruvesh Asnani, ICT

Dhirubhai Ambani Institute of Information and Communication Technology

Mentor: Neeldhara Misra, Computer Science

Incomplete preferences are likely to arise in real world preference aggregation. Here, we survey the results that deal with determining whether an incomplete preference profile is single-peaked. We also consider other variants of single-peakedness for some special types of incomplete preference profiles. Single-peakedness is an important domain restriction because many intractable voting problems become tractable for single-peaked profiles.



27. Synthesis of Donor-pi-Acceptor fluorescent dyes.

Alluri Sri Satya, Chemistry

Gitam UNIVERSITY

Mentor: Sriram Kanvah Gundimeda, Chemistry

A series of Donor - π -acceptor fluorescent dyes have been synthesized, characterized and examined their fluorescent properties in different solvents with different polarity. we synthesized these molecules as the scientific community throughout the ages, always venture for the best candidate molecules which have high photostability, larger Stokes' shift and target specific emission responsive properties. These molecules have their multifaceted applications across the field of Material Science and Biological sciences because of their unique light-emitting responses.



28. Adaption of Committee elections into a FisherMarket Instance and the analysis of proportional representation of the committee selected using Chamberlin-Courant Rule

Sarath Chandra Lavu, Economics

Indian Institute of Technology, Kanpur

Mentor: Neeldhara Misra, Computer Science

This work is about the study of adaption of private goods allocation and market economics to the public decision-making setting. A public decision-making instance is

one where people vote on different issues to achieve a single outcome for all. In public decisionmaking, case of committee elections is considered using the adaptation in the past literature. Since the general per-issue pricing result in a poor equilibrium, pairwise issue expansion model developed is used to construct a fisher market instance based on the committee elections in-stance. The outcome can be randomised sometimes, which might not be an ideal case for committee elections. Hence the outcome is approximated and is analysed using proportional representations scores like Chamberlin-Courant.



29. Preparing the nanoporous Calcium hydroxide using calcium oxide.

PRIYAVRAT VASHISTH, CHEMISTRY

IIT GANDHINAGAR

Mentor: Sudhanshu Sharma, Chemistry

The drastic use of fossil fuels to meet energy needs has led to increased carbon dioxide (CO₂) emissions into the atmosphere. It is widely accepted that the CO₂ concentration was about 280 ppmv before the industrial revolution now it has increased from 315 ppmv in 1950 to 355 ppm in 1990. Increasing CO₂ levels have been reported to account for half of the greenhouse effect that causes global warming. The anthropogenic CO₂ emissions are small compared to the amount of CO₂ exchanged in natural cycles, the difference between the long life of CO₂ in the atmosphere (50-200 years) and the slow rate of natural CO₂ sequestration processes leads to CO₂ accumulation in the atmosphere. It is, therefore, necessary to develop cost-effective CO₂ management schemes to limit its emission.

This project study focuses on the development of nanoporous calcium hydroxide having high surface area for adsorption and desorption of CO₂. Adsorption systems capture CO₂ on a bed of adsorbent materials such as molecular sieves or activated carbon. But in this project, we are using commercially available limestone (CaO). Calcium oxide (CaO), commonly known as quicklime or burnt lime, is a widely used chemical compound. It is a white, caustic, alkaline, crystalline solid at room temperature. Density 3.34 g/cm³, Melting point 2,613 °C Boiling point 2,850 °C. The primary aim would be to synthesize nanoporous calcium hydroxide from calcium oxide using the conventional hydration method using purer water only.

The next method would involve the use of alcohol and water as the solvent system for the alcohol assisted hydration of the calcium oxide. In this method, different concentrations of ethanol + water will be used as the solvent system, and a comparative study shall be done with the conventionally prepared calcium hydroxide in determining the best possible solvent system for the synthesis.

Other than this we'll be investigating a novel hydration method for the efficient conversion of calcium oxide to calcium hydroxide. The principle of this project is to retard the rate of hydration of calcium oxide which should decrease the contact of water with calcium oxide and thus increase the surface area.



30. Quantifying the effect of Phonon on transverse correlation at solid-liquid interface

Deep M Patel, Chemical Engineering

Institute of Technology, Nirma University

Mentor: Kaustubh Rane, Chemical Engineering

The process of designing the solid surfaces to achieve required results has been gaining attention since the advent of solid state physics. In this work, we are particularly focusing on relating the wetting properties of solid-liquid interface with the structure of solid. The properties we have focused upon are displacement correlations, density-density correlations, solid crystal structures/arrangements, phonon distribution and solid-fluid interaction energy correlations. After the determination of exact relation between all the properties, we might be able to exactly design the solid surface corresponding to the required wetting properties at solid-fluid interface. Previous works have determined solid-fluid inter-facial properties by keeping the solid crystals intact (neglecting the phonon distributions) which doesn't correspond to the actual

real-life scenario. Therefore we have tried to achieve the results that corresponds to the actual situation by taking solid vibrations into account. Additionally we have also worked upon comparative study to determine the best suitable method to determine the contact angle for these solid-fluid systems.



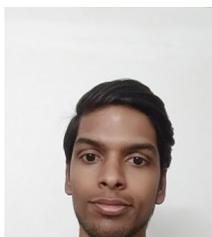
31. Synthesis and Characterization Quinoline Analogues as PIKKs Inhibitors

Vigram Muneeswaran M, Nanotechnology

Central University of Gujarat

Mentor: sivapriya kirubakaran, Biological Engineering

Cancer is a group of deadly diseases in which scientists still struggling for cure by inhibiting the protein kinases. Among them Phosphatidylinositol-3 kinase-related kinases (PIKKs) which ATR and ATM plays a vital role in cellular functions like metabolism control, transcription, cell division, programmed cell death functions. By synthesising quinoline analogues as kinase inhibitors like Torin1, torin2 . In which SPK98 a novel inhibitor that we tried to synthesize in internship.



32. Fall if it lifts your teammate

KAKUMANI PRUDHVI RAJ, computer science and engineering

Indian Institute of Technology Gandhinagar

Mentor: Neeldhara Misra, Computer Science

We focus on the problem of potential manipulation and issues of ties with a new event that is being added in the 2020 Olympics. Then we try to work on the complexity of finding a manipulation in a similar kind of problem related to multi-winner voting.



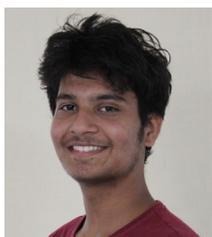
33. Spectroscopic studies of Benzimidazole Substituted -cyanostilbenes compound

Monika, Chemistry

IIT Gandhinagar

Mentor: Sriram Kanvah Gundimeda, Chemistry

Owing to the urgent mission against terrorist attack it is essential requirement for explosive detection. Especially picric acid detection which is one of the main sources of making explosive it exhibit highly acidic nature and show water solubility. Five compounds have been synthesized containing -cyanostilbene unit with amino donor group characterized through NMR spectroscopy. All the compounds are showing showed aggregation induced emission in the aqueous media. Photo physical properties of all the molecules were studied. Picric acid sensing method has been investigated in THF-water (f w = 90%) mixture where detection limit involved in micromolar range concentration. Mechanism of PA sensing also investigated through ¹H-NMR titration method.



34. Changes and Anomalies in 20th Century Precipitation Extremes over India

Harsh Shah, Civil Engineering

IIT Gandhinagar

Mentor: Udit Bhatia, Civil Engineering

The losses caused due to natural disasters is very high. We experience loss of human lives, infrastructure, and many other monetary losses. India lost approximately \$80bn USD in 20 years (1998 - 2017). Risk analysis helps us to stay prepared for these natural disasters in advance. Floods are a part of these natural disasters. Floods are caused due to frequent extreme precipitation events, research has been done to estimate the risk based on the trend in these extreme precipitation events, but a study shows that at the extreme events are more sensitive to the variability of climate than to its average. Thus it is important

to do the risk analysis based on the variability of these extreme precipitation events. We also need to look at the anomalies caused in the frequency of extreme precipitation over India.

Extreme precipitation events are caused by heavy rainfall. As stated by the Clausius–Clapeyron relation the water holding capacity of the atmosphere increases by about 7% for every 1 Degree rise in temperature. The greater moisture content of the atmosphere results in higher precipitation which in turn increase the number of extreme precipitation events. Thus, in a warming environment, it is necessary to study the change in extreme precipitation events.



35. Targeting mitochondria in cancer by chemical nanotechnology

Pranav kumar, chemistry

IISER Thiruvananthapuram

Mentor: Sudipta Basu, Chemistry

Cancer is the main cause of death in the industrialised nations around the globe. Conventional cancer treatments are losing their therapeutic uses due to drug resistance, lack of tumour selectivity and solubility and as such there is a need to develop new therapeutic agents. Targeted drug delivery systems are designed to transport the drug specifically to target organs, tissues, cells or organelles at therapeutic concentrations. Specifically targeting drugs, as opposed to non-targeted delivery, potentially provides a variety of advantages such as improved efficacy and increased therapeutic threshold. Mitochondrion also conducts various yet co-ordinated cellular functions including modulating calcium homeostasis, tricarboxylic acid/urea cycle, fatty acid oxidation, amino acid metabolism and redox signalling. As a result, mitochondrion has emerged as potentially important and promising therapeutic target for the detection, prevention and treatment of various human diseases such as malignant growth or cancer, neurodegenerative diseases, diabetes and obesity. Mitochondria are the powerhouse of the cell, however additionally their self-destructive weapon store. Classical approaches of targeting the mitochondria of cancer cells usually aim at inducing changing energy metabolism or directly affecting functions of mitochondrial anti-apoptotic proteins but most of such approaches miss the required specificity of action and carry important side effects. Several types of cancers causes somatic mitochondrial DNA mutations and specific immune response to mutated mitochondrial proteins has been observed. Cellular and mitochondrial barriers can be potentially overcome through the design of nanoparticles which are capable of transporting drug molecules selectively to mitochondria. These particulate carriers or nanovectors can be made from lipids (liposomes), biodegradable polymers, or metals, protecting the drug molecule from rapid elimination and degradation in vivo. Many formulations can be tailored to target mitochondria by the incorporation of nanovesicular agents onto the surface and can be manufactured to desired sizes and of suitable molecular charge. However, the transportation of drugs to mitochondria is extremely challenging in itself owing to the multiple cellular structures through which the drug must pass, such as the plasma membrane, the cytoplasm, and the outer and inner mitochondrial membranes. Some drug moieties are intrinsically capable of overcoming these barriers to access the mitochondria, while other drugs require conjugation to mitochondria-targeting molecules. There are some key challenges in mitochondrial chemical biology which needs to be addressed such as understanding the complex interconnected mitochondrial signalling cascade, targeting of mitochondrial signalling in cancerous cells, Understanding the communication of mitochondria with other organelles and signalling hubs and to integrate the targeting of mitochondria and related signalling hubs for the betterment of therapeutic systems.

Effective and specific targeting of mitochondria in cancer cells to overcome drug resistance is one of the major challenges in next generation cancer therapy. To address this, we hypothesize to develop novel multimodal chimeric Nano platform for simultaneous targeting of mitochondrial DNA (mtDNA), mitochondrial topoisomerase I (mtTopoI) and mitochondrial ribosomes (mt-Ribosomes) for shutting down the mitochondrial central dogma machinery. We envision that this novel nanoplatform would emerge as highly efficacious therapeutic strategy to overcome drug resistance and provide improved quality of life to the cancer patients.



36. Energy Efficient Architectures for Neural Networks

Busireddy Soumith Reddy, Electronics and Communication Engineering
National Institute of Technology, Tiruchirappalli.

Mentor: Joycee Mekie, Electrical Engineering

Deep Neural Networks (DNN) have achieved state-of-the-art results in a wide range of applications like Computer Vision, Natural Language Processing and Speech Recognition. In computer vision, a particular type of DNN, known as Convolutional Neural Networks (CNN), have demonstrated state-of-the-art results in object recognition and detection. The best results for these were obtained with large training sets and large models. Hence, CNN based recognition systems need large amounts of memory and computational power. While they perform well on expensive, GPU-based machines, they are often unsuitable for smaller and low-power devices such as mobile devices, cell phones and embedded electronics. As a result, there is much interest in research and development of dedicated hardware for Deep Learning (DL).

In this work, We have studied and worked on few efficient techniques for running neural networks on hardware that can be optimized to benefit in terms of power and delay yet not compromising on the accuracy of the networks. We introduce a method to train Binarized Neural Networks (BNNs) neural networks with binary weights i.e weights which are constrained to only two possible values (-1 and 1). This would bring great benefits to specialized DL hardware by replacing many multiply-accumulate operations by simple bit-wise operations, which is expected to substantially improve power-efficiency since multipliers are the most space and power hungry components of the digital implementation of neural networks. To validate the effectiveness of BNNs we conducted two sets of experiments on the Tensorflow and Theano frameworks. On both the frameworks, BNN's achieved nearly state-of-the-art results over the MNIST, CIFAR-10 datasets.

We have also studied the Neural Cache Architecture, which re-purposes cache structures to transform them into massively parallel compute units capable of running inferences for Deep Neural Networks. The Neural Cache architecture is capable of executing convolutional, fully connected, and pooling layers "in-cache" (i.e in SRAM). This in-SRAM computing technique is known as "Bitline Computing". Neural Cache architecture leverages bitline computing to perform arithmetic computation (add, multiply, and reduction) directly in the SRAM array by storing the data in transposed form and performing "Bit-serial computation". By avoiding data movement in and out of memory arrays, we naturally save vast amounts of energy that is typically spent in shuffling data between compute units and on-chip memory units in modern processors.



37. Solution Of A Nonlinear Ordinary Differential Equation

AASHIMA KAUSHAL, MATHEMATICS

IIT GANDHINAGAR

Mentor: Jagmohan Tyagi, Mathematics

We worked on finding the nonlinear ordinary differential equation whose solution is $y(x) = (u^2(x) - cv^2(x))^r$

, $r > 0$ where $u(x)$ and $v(x)$ are the

solution of the linear ordinary differential equation $y'' + a(x)y = 0$ for which $u(x_0) = q$, $u'(x_0) = p$ and $v(x_0) = 0$, $v'(x_0) = 1/q$. We reduced the nonlinear differential equation so formed into Pinney's equation by simple change of variables.

38. Systolic Architecture for Convolution

Rama Krishna Reddy, Electrical Engineering
IIT Gandhinagar



Mentor: Joycee Mekie, Electrical Engineering

Deep neural networks are widely used in the field of Artificial Intelligence (AI) but at the cost of high computational complexity. The complexity arises due to the need to process many filters and channels. Systolic architecture can be used to speed up the process. In this project, I have implemented a systolic array for convolution using row stationary dataflow. Systolic arrays (SAs) are highly parallel pipelined structures capable of executing various tasks such as matrix multiplication and convolution.



39. Photooxidation of aldehydes by Palladium Porphyrins working as a catalyst

Drishti Jain, Department of chemistry

Banasthali vidyapith

Nitesh Pareek, Department of Chemistry

Uka Tarsadia University

Mentor: Iti Gupta,

Porphyrins are found in nature and play a very significant role in nature as in Hemoglobin, Chlorophyll and Cytochromes, since one cannot completely copy nature but can try to mimic the structure. So the motive of this project is to synthesize the Photo Catalyst for the Photooxidation of Aldehydes to Acids. Metalloporphyrins with the substitution at meso position are used as the photo catalysts and the groups used for the substitution are electron donors and the moiety of porphyrin is electron acceptor. The basic idea is to form the donor-acceptor molecule which is used as photo catalyst. Mainly the groups for substitution are TPA; Triphenylamine, CBZ; Carbazole, PTZ; Phenothiazine and the photochemical reaction is done in the presence of O₂ (Oxygen), white Light and the solvent Acetonitrile



40. Synthesis of goldnanowires and their application in photocatalysis for water splitting reaction

Sweety, Chemistry

National Institute of Technology Warangal

Mentor: Saumyakanti Khatua, Chemistry

This study reports a systematic approach to synthesize ultralong gold nanowires using a seed-mediated growth in aqueous medium and in organic medium. The ability to make gold nanowires over this exceptionally wide and useful length range is exciting because applications and demonstrations using ultralong gold nanowires of most suitable lengths are now possible. Recently, Au@Co core-shell bimetallic nanostructures have attracted considerable interest for photocatalytic water splitting reaction due to some special properties of GNWs. There are two reasons for using GNWs in photocatalysis; one is that GNWs possess (111) facet which is catalytically active and the second is that it possesses 1-D anisotropy and abundant surface atoms. Regrettably, most of the research mainly focuses on the morphological and structural control whereas interfacial control is neglected. In this work, Au nanowires deposited over PAA coated ITO glass coverslip is used as catalyst in water splitting reaction. Here, GNWs are synthesized by using seed growth mediated method using ascorbic acid and sodium borohydride as reducing agent, using CTAB aqueous solution as surfactant and the pH was maintained acidic using HNO₃. But the organic synthesis of GNWs using 1-naphthol gives more yield and high aspect ratio of GNWs as compared to aqueous synthesis. Optimizing the shape, structure, and interface of noble metal bimetallic nanostructures significantly improves their catalytic properties.



41. Building a Campus Dashboard using IoT for sustainability

Avinash Gaur, Electronics and Communication

NIT Rourkela

Mentor: Nipun Batra, Computer Science

Measuring real-time data of various environmental parameters like air quality, temperature, particle concentration can help to find sustainable solutions to reduce the pollution in the environment. Sensor Deployment does the same by collecting data from the surrounding and sending it to a server which can further analyze it and provide best measures that should be taken. I worked on interfacing sensors with Microcontroller(MCU) and transmitting the data from MCU wirelessly to a central server over different protocols. On Interfacing sensors with MCU, I found that the sensors were responsive to the immediate surrounding, and their output values were reasonable. My work can be used to deploy the sensors further and transmit their data. It can be extended to deployment in Smart Cities and developing countries.



42. Phase Change Memory as a DRAM Alternative

Aditya Ranjan, Electrical Engineering

IIT Patna

Mentor: Joycee Mekie, Electrical Engineering

The most critical and exploring part of today's computers is a memory. A lot of research is going on in memory to make it denser, high storage, non-volatile and cost-efficient. From the years till now we are using SRAM for cache, DRAM for main memory and Flash for external hard drives. The improvement rate in microprocessor speed exponentially surpasses that of memory, making the gap between them a key system design concern. At this time, it has been seen that the conventional memory like DRAM can not be scaled below some limit (40nm) because DRAM uses a transistor and a capacitor to perform its read and write operations, but to store charge, the capacitor must be large enough, also the transistor must be sufficiently large to exert effective control over the channel. So some new memories are coming up that are trying to fill the gap between processor and memory, one of them being PCM (Phase change memory) or PCRAM (Phase Change Random Access Memory). PCM is an emerging non-volatile memory that is supposed to replace DRAM and Flash memory. Phase change memory (PCM) storage relies on scalable current and thermal mechanisms. Some of the advantages of PCM over DRAM is its high density, low leakage, multi-bit cell and no need of refreshing. This has made it a strong competitor against DRAM as a universal memory replacement in multi-core systems. It is also seen that PCM can be used in handheld devices with LPDDR variants as a hybrid memory. However, its overall efficiency is limited by the high energy and latency requirements of phase switching during writes and limited write endurance, which has impeded its widespread adoption in memories. To overcome these problems and to use PCM as the main memory we provide architectural level solutions like Buffer reorganization and Partial writes. Next, we have compared the IPCs (Instruction per Cycle) of PCM with LPDDR3 in an architectural simulator, Gem5.



43. Optimizing write operations in Spin Torque Transfer Random Access Memory(STT-RAM)

G PRUTHVI TRINADH, Electronics and communication

IIT BHUBANESWAR

Mentor: Joycee Mekie, Electrical Engineering

The most critical part dominating the design of computing systems nowadays is the memory. The improvement rate in microprocessor speed exponentially surpasses that of memory making the gap between them a key system design concern. Moreover, the shift towards data-centric computing these days for RMS (Recognition, Mining, Synthesis) enforce new hardware requirements with higher density, lower cost, and ultra-low power. Due to increasing Second-Order effects such as high leakage power in conventional memory technologies on scaling down the Mosfets below a particular limit, they are becoming limited in addressing the capacity and cost requirements. As CMOS scaling is moving towards an end, some of the unconventional non-volatile memories are coming into the light to meet the market requirements, one of them being STT-MRAM. (Spin Torque Transfer Magnetoresistive RAM) Spin-Transfer Torque RAM (STT-RAM) is an emerging non-volatile memory technology that is a potential universal memory that could replace SRAM in processor caches. High density, low leakage and non-volatility are the attractive features of Spin-Transfer-Torque-RAM (STT-RAM), which has made it a strong competitor against SRAM as a universal memory replacement in multi-core systems. However, its overall energy

efficiency is limited by the high energy and latency requirements of spin-transfer torque switching during writes, which has impeded its widespread adoption in memories. Trading-off STT-RAMs nonvolatility property (data-retention-time) to overcome the problems associated with write operations, leveraging the ability of many applications to produce acceptable outputs under approximations to computations and data, a combination of different approximation techniques at the circuit and architecture levels that yield significant energy benefits for small probabilities of errors in reads, writes, and retention was proposed earlier. We have simulated quadcore out of order processor designs using a combination of SRAM(6t and 8t) and STT-RAM-based caches. We found that a pure STT-RAM cache hierarchy provides the best energy efficiency, though a hybrid design of SRAM based L1 caches with STT-RAM L2 caches eliminates performance loss while still providing energy efficiency.



44. Factorization of Polynomials

Rohan Prashant Patil, Computer Science

Indian Institute of Technology Gandhinagar

Mentor: Bireswar Das, Computer Science

Factorization of Polynomials pops up at unexpected places like BCH Codes, Cryptography, modeling chemical compounds, etc. There are known algorithms for factorizing polynomials over finite fields but very little is known for

factorization of polynomials over rings. The known results are limited to very specific cases. Our focus was on finding out the hardness of such problems rather than focusing on algorithms.



45. Critical urban studies: marginality, mobility and aspirations

BELADIYA YASH HARESHBHAI, MECHANICAL ENGINEERING

NIRMA UNIVERSITY

Mentor: Mona Mehta, Humanity

The objective of this study is to understand and address the unique challenges pertaining to the paucity of skilled labour in peripheral spaces or 'peri-urban spaces' surrounding mega-cities and smart cities. There is a serious lack of

skilled labour networks in peri-urban sites despite the growing economic opportunities and demands for skilled labour in these spaces. Through the case study of peri-urban sites located between megacity Ahmedabad and India's first smart city—Gujarat International Finance Tec-City (GIFT) in Gujarat, this research will identify the factors that are necessary for developing exemplary 'live-work' networks to produce inclusive growth. This approach departs from conventional approaches to urbanization that emphasize building physical and info-tech connectivity of roads and internet without sufficiently strengthening the socio-economic infrastructure domain of skill-based networks. The insights gained from this research will directly help advance the developmental goals of inclusive growth and Skill India by enabling local communities to access the socio-economic opportunities offered by urbanization. The study will be primarily carried out in peri-urban sites surrounding India's first smart city—Gujarat International Finance Tec-City (GIFT) and the Indian Institute of Technology, Gandhinagar, located between megacity Ahmedabad and the capital city of Gandhinagar, in Gujarat. The innovation of the proposed research exists at three levels. One, at the conceptual level, it focuses on the unique challenges of peri-urban areas, which has been the site of much of the recent projects of urbanization such as the setting up of smart cities. The peri-urban offers the opportunity to consider. Two, Methodologically, it extensively uses qualitative methods of ethnography, in-depth interviews and participant observations, coupled with quantitative survey data to understand the crucial dimensions of the availability and dynamic labour force. Three, At the policy level, contrary to the policy thrust on the largely technical and physical capacity building of smart cities, this study gets at the root of complex socio-political factors.

Vocational training and skill development need to be studied beyond the lens of imparting technical knowledge by examining the broader educational, aspirations and socio-economic context of the predominantly young labour force. IITGN's NEEV program is an impressive initiative and it is imperative that these efforts at skill development be accompanied by an academically rigorous impact analysis that will provide much needed insights into the success and challenges of skill

development initiatives in India more generally today. The insights from the study can directly benefit NEEV to assess the socio-economic efficacy and community impact of its programs and if needed to consider adequate alterations wherever necessary. It will also produce overall crucial insights for skill development programs.



46. Ranking with fairness constraints'

Shivam Mishra, Information Technology
IIT-Lucknow

Mentor: Neeldhara Misra, Computer Science

As a SRIP project, we studied ranking algorithms with fairness constraints and got the solid understanding of computational complexity of this problem along with complementary hardness results. It is based on the paper 'Ranking with fairness constraints' (2018) by Celis, D Straszak and NK Vishnoi. In addition to theoretical analysis, we also attempted to carry out simpler and efficient implementation of these algorithms. Ranking algorithms are used widely to order a set of items in applications such as search engines, news feeds, and recommendation systems. The basic algorithmic problem that arises is as follows: There are m items (e.g., web pages, images, or documents), and the goal is to output a list of $n \ll m$ items in the order that is most valuable to a given user or company.

However, traditional ranking algorithms may produce rankings in the manner which can result in one type of content being over-represented at the expense of another. So to ensure the rankings are fair, ranking with fairness constraints are introduced to restrict allowable rankings to those in which no type of content dominates.



47. Gravity balancing and Analysis of Jansen Mechanism

Parth Shinde, Mechanical Engineering
IIT Gandhinagar

Mentor: Vineet Vashista, Mechanical Engineering

Exercise machines are important in rehabilitation and physical therapy. Gravity balancing makes these exercise machines accessible to patients with low muscle abilities. The joint torques in the hip, knee, and ankle are computed using the inverse dynamic model during standing up for a paraplegic patient. The joint torque comprises the dynamical torque due to the inertia forces, and a passive torque due to the muscles and gravitational torque. It has been observed that the contribution to the joint torques by the gravitational torque is dominant. On the basis of this result, a gravity balanced assistive device is proposed for the elderly and impaired people such as spinal cord injury and paraplegic patients.



48. Time Table Scheduling

Ankit Anand, CSE
NIT Patna

Mentor: Madhu Vadali, Mechanical Engineering

Time Table Scheduling aims at scheduling a set of tasks in such a way that there are no conflicts. Since we are taking only college/university activities into consideration, tasks that need to be scheduled are classes and exams. In any educational institution, the two most common academic scheduling problems are course timetabling and exam timetabling. Colleges have a number of different courses and each course has a number of students. Now, one student can be enrolled in more than one course at a time, so, in such a case, both classes, as well as exams of those courses, can not be held simultaneously. So now time table needs to schedule the classes/exams at provided time slots in such a way that their timings do not overlap and the time table schedule makes the best use of time slots. Here we have treated exam scheduling and course scheduling differently. For exam scheduling, a set-theoretical approach is proposed and for course scheduling, genetic algorithm has been used which is a heuristic optimization technique.



49. STABILITY ANALYSIS OF FRACTIONAL CIRCUITS

Aneek Jash, Electronics and Communication Engineering

National Institute of Technology, Durgapur

Mentor: Jagmohan Tyagi, Mathematics

In this short review paper, we discuss the existence and stability analysis of fractional circuits which are governed by fractional ordinary differential equations. Our main task is to review the existence and stability analysis of such fractional order differential equations.



50. A Novel System for the Treatment of Human Waste

Ashutosh Bhattacharjee, Chemical Engineering

Visvesvaraya National Institute of Technology Nagpur

Mentor: Pratyush Dayal, Chemical Engineering

Disposal of human waste at snowy terrains affects the environment as it leaks into the glacier, contaminates the snow and runs off, and ultimately causes airborne diseases. Using the principles of freeze-drying, we have developed a technique for environmentally friendly handling of human waste. Specifically, we developed a system for drying human waste at low pressures and temperatures that removes water through sublimation; the low-pressure conditions are maintained through a vacuum pump. Based on the principles of heat and mass transfer, we have developed a model for the freeze-drying of human waste under various scenarios; these scenarios replicate the conditions of snowy terrains found at the high-altitude areas. Using the modelling studies, we determined drying time, mass flux, rate of formation of the dried layer and pressure required for the effective drying of the human waste. Our calculations revealed that by utilizing the sensible heat from the surroundings, which results from the temperature difference of direct vaporization of ice, the minimum drying time is achieved. In other words, drying the human waste under ambient conditions allows efficient removal of water compared to other means of artificial heating. Our findings can be used to design a personalized waste management system that is capable of drying human waste without the use of any electrical power. We expect the dried waste, processed through our system, to contain high enough organic matter and low enough moisture content to be potentially used as an efficient fuel source.



51. Evaluation Strategies for Deep Learning Statistical Downscaling methods : the tale of 'Concept Drift'

Babin Dutta, Electronics and Telecommunication Engineering

National Institute of Technology Raipur

Mentor: Udit Bhatia, Civil Engineering

Global climate models (GCMs) are the primary tool for capturing global climate system model behaviour. However spatial resolutions of GCMs are usually quite coarse (ranging between 100 and 500km). This results in the loss of regional and local details of the climate mainly due to homogeneity of each grid size that does not show local features. Based on the assumption that local climate features are determined by a combination of global conditions together with local conditions, many downscaling approaches have been developed via dynamical and statistical methods. Downscaling is the process to infer high-resolution climate or climate change information from relatively coarse-resolution global climate models which are relevant for adaptation and policy. Statistical downscaling is one of the principal ways to get regional features from global climate projection. Various deep neural network models have used GCMs results to simulate regional features (like sea level rise, warming and drought events) with a fine resolution. One such model is based on using Super Resolution Convolutional Neural networks (SRCNN) which is good in capturing spatial relations.

Obtaining reliable precipitation data at relevant spatial and temporal scales is necessary for water resource management and timely warning of precipitation-related natural hazards such as floods and drought. So, it becomes imperative to evaluate the performance of such models for the extremes.

We have evaluated the performance of SRCNN for the extremes for the precipitation feature.



52. Tertiary overgrowth of gold nanoparticles and cobalt deposition.

Manashi Rudra Paul, Chemistry

NIT Agartala

Mentor: Saumyakanti Khatua, Chemistry

Gold nanostructures show interesting optical and electronic properties due to its Surface Plasmon Resonance (SPR). Application of gold nanorods depends on its plasmonic properties which can be tuned by changing the geometry of gold nanorods. Different gold nanostructures such as dog bone, arrow head, nanobar etc can be prepared via overgrowth of gold nanorods at different pH level. Herein we report the tertiary overgrowth of gold nanorod by varying the pH of the solution. The geometries of gold nanorods also vary in presence of AgNO_3 . Tertiary growth provides a way to tune the surface plasmon resonance.



53. Predicting Tipping points of Networked Systems against Sequential Attacks

Utkarsh Sandeep Gangwal, Civil Engineering

IIT Gandhinagar

Deepak Kamboj, Information Technology

Indian Institute of Engineering Science and Technology, Shibpur

Mentor: Udit Bhatia, Civil Engineering

Complex structures, inter-dependence and fragility are three important characteristics of a network. These characteristics determine the response of a network in case of a disruption. All these networked structures also exhibit a tipping point. It is not possible to study all possible disturbances that a real-world network may face because of a large number of possibilities. Huge losses are faced due to these failures as they cannot be predicted with certainty. Thus, understanding the responses by performing contingency analysis and predicting the tipping points will help us make the networks more robust. While significant progress is being made on network resilience, we lack contingency plans and methods that can help us secure these networks. The main idea is to understand and mathematically model the response of a network if 'n' nodes out of 'N' nodes are targeted simultaneously. The Erdos-Renyi network and Barabasi-Albert network are the two different synthetic networks that have been used to study the response of a network in case of simultaneous disruptions. This analysis has been done for the Indian Railways Network also, where we have considered moving attacks like a tsunami and targeted cyber-physical attack.



54. Approximate computing - Circuit and Architectural level analysis

Vibhor Kumar Srivastava, Computer Engineering

IIITDM Kurnool

Mentor: Joycee Mekie, Electrical Engineering

Approximate computing is a promising solution to design faster and more energy efficient systems. Division, in particular, the floating-point division is one of the most important operations in multimedia as well as machine learning applications which has been implemented less in hardware due to its significant cost and complexity. So, in this project, I have been analysing and implementing pre-existing approximate divider circuit design proposed by different researchers in recent years and based on the analysis I have been trying to find a new method for the approximate division which will have less energy consumption with maximum throughput.

55. Beauty and Function in Nature

Polaki Sunayana, Industrial Design



National Institute of Technology, Rourkela

Mentor: Manasi Kanetkar, Design

Nature has already found the best solution and has the experience of millions of years. It has evolved, enhanced, learnt and sustained life in the most efficient way. It has given each species, a speciality to survive on the earth. Each of the functions is achieved by extraordinary forms such as spirals, waves, fractals, etc. which are not just aesthetically appealing but also functionally sound. Hence, the aim is to find inspiration from nature, understand the function and mimic it

in products.



56. Lunar Craters: Morphology and Degradation

chintakayala Venu gopal, Civil engineering

IIT Gandhinagar

Mentor: Vikrant Jain, Earth Science

“Morphological analysis of the lunar surface”

Impact craters on the lunar surface provide important information about the chronology of the surface. Studies on crater morphology provide insights about the geomorphic processes in the absence of air and water on the lunar surface. Our study is mostly based on analysis of crater morphology with the help of DEM and Ortho-images of Chandrayaan -1 datasets. Degradation of lunar craters is mostly due to gravity, slope processes and solar wind weathering. There are parameters like depth to diameter (d/D) ratio, the slope of craters, maximum slope along the wall and topographic roughness index which are used to estimate the shape, properties and extent of degradation of craters. With the help of these, we are going to examine and classify the craters based on their shape i.e., flat-floored or round floored craters and the impact of shape on the degradation of craters. We are also going to classify the craters based on the extent of degradation that it has gone through these millions of years.



57. Bio-Inspired Design based on Chameleon's Ballistic Tongue

Prem Sangam Mishra, Mechanical Engineering

Vellore Institute of Technology, Vellore

Mentor: Manasi Kanetkar, Design

The ballistic projection of the chameleon tongue is an ultimate example of quick energy release in the animal kingdom. It relies on a complicated physiological structure and an elaborate balance between tissue elasticity, collagen fibre anisotropy, active muscular contraction, stress release, and geometry. A solid model is constructed which is inspired from the geometry of the intralingual sheaths arrangement which is almost exclusively made of collagen. In this report, I have tried to establish how the proposed intralingual sheaths geometrical spring model is better than the traditional helical coil spring considering the similar dimensions and volume for both the model and structural analysis under similar conditions. I have used SolidWorks 2016 software to model and ANSYS 16.0 software to simulate the proposed intralingual sheaths geometrical spring model and traditional helical coil spring under different loads. Later the applications of the proposed model are also discussed and the areas where it can be effectively used is also explored.



58. Quantification of antioxidants in organically grown foods using Briggs Rauscher reaction

Tarun Pundalik Raikar, Chemical engineering

Sardar Vallabhbhai National Institute of Technology Surat (SVNIT)

Mentor: Pratyush Dayal, Chemical Engineering

Antioxidants - are naturally produced in the body or are obtained from fruits and plants- play a vital role in the human body. These antioxidants prevent oxidation and hence protect the body cells from the damaging free radicals, which are produced due

to external agencies for example, continuous exposure to sunlight, and smoke as well as metabolic activities of the cell. In order to maintain a healthy lifestyle, it is essential to make a wise choice of the food we eat in terms of its nutritional value. In this study we have used the oscillatory Briggs Rauscher (BR) reaction to determine the amounts of antioxidants present in fruits and vegetables that have been grown using organic farming and conventional methods. The experimental studies were carried out with samples of organically and conventionally grown Beetroot, Tomato and Lemon. We developed a relation between induction time of the reaction and the antioxidant concentration to quantify the activity of the samples in terms of equivalents of ascorbic acid (ASC). Organically grown vegetable samples showed higher antioxidant concentration compared to its conventional counterparts. This low cost method does not need high end instruments. The colour changes occurring in the reaction vessel enables remote analysis of the reaction via image processing software.



59. CFD analysis of acoustics propagation in ducts

arun shakya, Chemical Engineering

IIT Gandhinagar

Mentor: Vinod, Mechanical Engineering

To achieve a better physical understanding of the nature of the propagating waves through the ducts, computational fluid dynamics simulations are performed. The major objective of this work is to develop an efficient simulation analysis procedure to simulate wave propagation in air-filled ducts accurately. The development of such a simulation technique is essential in the study of wave propagation in duct networks such as ducts used in spacecraft engines and urban water distribution networks. While numerical analysis using FEA seems superficially straight forward, this study demonstrates that the element type and refinement used for acoustic FEA have a significant effect on the accuracy of the result achieved and the efficiency of the computation. The results obtained shows that the ducts similar to the ducts used in simulations performed in this study are very effective in sound filtration and reduction.



60. Device Design of PIN diode for RF Applications

Debarshiya Chandra, School of Electronics Engineering

Vellore Institute of Technology, Chennai Campus

Mentor: Nihar Ranjan Mohapatra, Electrical Engineering

We have performed simulations for the purpose of designing a high voltage PIN diode which is capable of handling voltages greater than 50 Volts. A PIN diode is a semiconductor device that runs as a variable resistor in RF frequencies and microwave applications. Due to the presence of the intrinsic layer, PIN diodes have higher breakdown voltages; hence they are capable of controlling large RF signals. For this study, we have used Technology computer-aided design (TCAD) to design the PIN diode with the desired characteristics. TCAD is a simulation tool which is used for electronic design automation (EDA) which can model semiconductor fabrication and semiconductor device operation. Here, we have calculated the I-V characteristics, the Reverse Breakdown voltage, the Electric Field profile, the Electrostatic Potential etc. for different geometries of the PIN diode. We have varied the doping concentration, the intrinsic layer thickness etc. to characterize the PIN diode.

We have also calculated the PIN diode characteristics analytically by solving the Poisson equation to understand the simulation results. We have studied the characteristics of a PIN configuration with an N- layer by varying the thickness and doping concentration of N- and I layer. It has been observed that N- layer behaves like an intrinsic layer to some extent and also helps in increasing the reverse breakdown voltage. So, there is a possibility to replace some part of the intrinsic layer by the N- layer. This observation may be useful for the fabrication of cheaper PIN diode.



61. Sustainable water quality management in the urban environment: Importance of water end-use studies in water conservation and management

Ajmal Roshan, Earth and Environmental Science

Indian Institute of Science Education and Research, Bhopal

Mentor: Manish Kumar²¹, Earth Science

Water crisis is looming the planet with the urban population expecting to be worst-affected. With precipitation patterns changing due to climate change and diminished availability of freshwater in existing sources, the existing situation demands sustainable use of water resources on an immediate basis. The need of the hour lies in the proper management of existing water resources. The present study discusses how end-use studies are beneficial for researches related to water conservation in general and wastewater recycling in particular. Since the domain of water end-use studies are nascent in India, the primary aim of the internship was to conduct water end-use studies in areas in and around Gandhinagar. Based on the survey, (some conclusions were obtained on people's water usage). The conducted end-use study aims to find out the parameters that affect water consumption in individuals, water budget of a particular locality and to come up with targeted water conservation policies. During the study, attempts were also made to come up with a review paper on water end-use studies.

The highlights of my work as SRIP intern can be summarized as follows:

- Completed a review paper on “End-use of Water in the Urban Area: Future of Sustainable Water Management” or “Perspective, Pattern, Practice and Practical Applications of Water End-Use: A review” based on 80 journal papers.
- Learnt online survey handling of Survey Monkey
- Learnt the complexities of a questionnaire survey and carried out sampling in 10 villages and around 200 families.
- Learnt the data interpretation through effective use of excel and statistical tools.



62. Photoelectrochemical water splitting with gold nanostructures

Tannu, Chemistry

Indian Institute of Technology, Gandhinagar

Mentor: Saumyakanti Khatua, Chemistry

In order to deposit MnO_x on gold nanorods, different Manganese salts (namely MnSO₄, KMnO₄ & H₂MnCl₄) were used which were reduced to corresponding manganese oxides by different reducing agents such as Hydroquinone, Ascorbic acid, Sodium borohydride at room temperature or 40 °C. Initial characterization of nanorods was done by UV-Visible spectrophotometer, which clearly indicated the changes in aspect ratio of gold nanorods by a shift in Longitudinal Surface Plasmon Resonance (LSPR) wavelength & absorbance changes. For MnSO₄ and H₂MnCl₄ no significant changes in LSPR were observed but for KMnO₄ a significant blue shift upto 80 nm was observed. To confirm MnO_x deposition we further characterized the as-synthesized sample by Scanning Electron Microscope (SEM) in which we observed a change of structure from gold nanorods to truncated dog-bone kind of shape after addition of KMnO₄ and Hydroquinone. Further studies, such as performing control experiments are still in progress and other studies are yet to be performed in order to confirm whether the change in structure is due to MnO_x deposition or etching of gold nanorods.



63. Image-based crack classification in beams using convolutional neural network

Jaydeep Sonagra, Civil Engineering

Sardar Vallabhbhai National Institute of Technology

Mentor: Manish Kumar,

Cracks on the concrete beams are one of the earliest warnings of differential settlement. Cracks are also seen in the structures in the aftermath of extreme

events. (e.g., earthquakes, blasts). It is helpful sometimes to study those cracks and quantify the extent of damage the building has undergone. Several methods exist for the detection of cracks concrete structures, but there is no method for -classification of cracks in concrete beams to the knowledge of the author. This report presents an image-based crack classification method using a convolutional neural network (CNN) which is applied for analyzing visual imagery. The convolutional neural network is trained and validated using a database that included 1600 images. Many parameters whose values are set before the learning process known as hyperparameters are used in this model. During training the CNN the dataset is divided into two parts training set and validation set. The validation set is an image set that is used to estimate the correct hyperparameters after training the model with the training set through trial and error method. 0.00005 was set as the best value for the hyperparameter named learning-rate that result in the accuracy of a validation set to be 93.1%. The images used in training the CNN were having a resolution of 250X250 pixels. The results confirm that the proposed method can indeed classify cracks from images of real concrete beams.



64. Non-linearity in the self-oscillating Belousov-Zhabotinsky reaction

Siddhesh Borkar, Chemical Engineering

National Institute of Technology, Rourkela

Mentor: Pratyush Dayal, Chemical Engineering

The Belousov-Zhabotinsky reaction is one of the most prominent and widely studied chemical oscillators. Self-sustaining swelling-shrinking polymer gels excited by the periodic oxidation-reductions of the catalyst is one of its many applications. In this project, we have studied experimentally, the effect of various reaction conditions and initial parameters on the key macroscopic properties of the BZ reaction oscillations-frequency and amplitude. We have tweaked the recipe of the reaction and have found trends that allow for an easy control of the oscillation frequency by the variation of just the initial reactants' concentrations; all this while keeping the catalyst unchanged. Mathematically, our experimental findings agree with the established models and we have also identified theoretical characteristics of the reaction w.r.t. the input parameters. Further, we have treated each oscillation as an electrochemical cell and have calculated the extractable work from the system in sync with the initial conditions. With these findings and a tangible output energy associated with the reaction and a scope for chemo-mechanical transductions, we have presented a deeper understanding of the BZ reaction and a platform for the design of its applications.



65. Estimation of Spatial Gait Parameters during Human Walking

Naman Kaushik, Mechanical

IIT (BHU) Varanasi

Mentor: Vineet Vashista, Mechanical Engineering

The present gait treatment rehabilitation methods use a harness which motivates the patients to correct their gait. These rehabilitation methods work fine for short-term, but long term effects are rarely noticed among the patients who go under this rehabilitation the primary reason being inefficient diagnostic methods. There is a need for the diagnostic methods whose data will contribute to giving more accurate control parameters, which would be used in the rehabilitation. The current diagnostic methods use infrared cameras and markers to calculate these parameters. The proposed system is a portable system and is capable of performing the required task of diagnosing gait parameters. This system can be used outside a laboratory's controlled environment and is more versatile than the previous system. It uses off shelf sensors and controllers to achieve the objective.



66. Multiwinner Voting with Restricted Admissible Sets

Varad Pimpalkhute, Electronics and Communication Engineering

Indian Institute of Information Technology, Nagpur

Mentor: Neeldhara Misra, Computer Science

We will consider the problem of multiwinner voting, in which the task is to

identify a winning subset of candidates based on a collection of votes that express preferences over all available alternatives. Most literature on multiwinner voting focuses on restricting the size of the output committee. In recent work, consider the problem of finding winning subsets that satisfy additional desirable properties, which they formalize using the notion of admissible sets. In our work, we propose to continue this line of study: specifically, we will consider algorithmic questions along the lines of approximation and restricted domains given the existing hardness results in the literature.



67. Liquid Democracy

Rutvik Rahul Page, Computer Science and Engineering

Indian Institute of Information Technology, Nagpur

Mentor: Neeldhara Misra, Computer Science

This project will focus on problems in the setting of liquid democracy, wherein the voters can either choose to vote directly or delegate their vote further, leading typically to transitive chains among voters. The success of liquid democracy is often attributed to its potential to work as a reasonable and practical compromise between direct democracy and representative democracy. Direct democracy can be too demanding for the voters, who may not have complete information about all aspects of the issues on which they are voting. Representative democracy can also be relatively inflexible compared to liquid democracy. Therefore, in many ways, liquid democracy is considered to be a model which has the best of both worlds. The work of Khang et al. focuses on algorithmic aspects of liquid democracy in the context of binary issues. The main question they address is the following: are there delegation mechanisms that are guaranteed to yield more accurate decisions than direct voting? This should intuitively lead to collective decisions that are “better” than those made in a direct democracy. In another recent development, the notion of “pairwise” liquid democracy has been introduced by Brill et al., wherein the voters are allowed to specify their vote as a partial order, and allow for different delegates to extend different parts of the partial order. This work focuses on the problems (intransitivities) that pop up with the flexibility provided by the Liquid Democracy to the voter, and provides metrics to detect them i.e. through consistencies. The methods presented to circumvent these inconsistencies include restricting delegations, ignoring and delegations and consolidating delegations into weak rankings. Broadly, the theme of our investigation is to find workarounds for the intractabilities that have been encountered in the existing literature (for instance, the impossibility results in Khang et al. and the computational hardness for various natural questions raised in Brill et al.).



68. Contingency Analysis of Real World Networks

Deepak Kamboj, Information Technology

Indian Institute of Engineering Science and Technology, Shibpur

Mentor: Udit Bhatia, Civil Engineering

Complex structures, inter-dependence, and fragility are three important characteristics of a network. All these networks also exhibit a tipping point. These factors determine the response of a network in case of a disruption. It is not possible to study all possible disturbances that a real-world network may face because of a large number of possibilities. Huge losses are faced due to these failures as they cannot be predicted with certainty. Thus, understanding the responses by performing contingency analysis and predicting the tipping points will help us make the networks more robust. While significant progress is being made on network resilience, we lack contingency plans and methods that can help us secure these networks. The main idea is to understand and mathematically model the response of a network if ‘n’ nodes out of ‘N’ nodes are targeted simultaneously. The different networks that have been used to study this are Erdos-Renyi network and Barabasi-Albert network. This analysis has been done for the Indian Railways Network also, where we have considered moving attacks like a tsunami and targeted cyber-physical attack.

69. Creating Digital Institutional Archive using Open Source Archiving Software for IIT Gandhinagar

SHRUTI SINHA, Information Technology

National Institute Of Technology Raipur



Mentor: Kumbar T S, Library

Archiving different set of documents, both in print and digital form, covering various academic and non-academic activities of any Institute to serve as memory, and for future use, is a challenging task. This being an important work that needs to be undertaken and executed in a professional way, libraries seems to be best equipped to handle this work. IIT Gandhinagar, though it is only 10 year old, has many useful documents to preserve and make available for future use. Library at the Institute has been making a concerted effort to collect, organize, preserve and provide access to such useful documents. Keeping in view the importance of such an important task, me as Intern under the SRIP program was advised to undertake creating a prototype of the digital archive using an open source software. By understanding the objective of such an archive and the variety of documents collected by the Library, an open source software viz. Omeka Classic version was chosen to develop Digital Institutional Archive. Omeka is written in Php programming language and it uses MySQL database in backend. It also has range of plugins which added new features and facilities. Using Omeka, scattered documents of the Institute can be organized in systematic way. The archive can be used to preserve various types of material. An effort was made to create a prototype of archive and was successfully tested with different types of documents. As the generation of information and data accelerates at the Institute, there will be a need for preserving this information for future use and which has been successfully proven by creating a digital academic archive.



67. Stability Analysis in Humans

Annamalai L, Robotics & Automation Engineering
PSG College of Technology

Mentor: Vineet Vashista, Mechanical Engineering

The stability of human gait plays an important role in the health of a person. Notably, the main parameters important in this analysis include the center of pressure (COP) and center of mass (COM). The COM isn't sufficient in a dynamic state, consideration of velocity component should also be done. The extrapolated center of mass (XCOM) is required to understand dynamic stability. The gait cycle is split into different parts to determine BOS. In ideal cases, the COM should lie inside the BOS region. During locomotion, stability is challenged because the BOS and the COM are in motion with the BoS changing its size, and the XCOM keeps moving due to the body temporarily being in the unstable state. The COP data can be taken only for static trials, while the XCOM is calculated for dynamic trials. Some perturbations are provided virtually and the subject's response to them is identified. This data can be used for rehabilitation purposes.



68. Fault detection in electric motor using data mining approaches

Manika Kumari, Computer Science and Engineering
Birla Institute of Technology, Mesra

Mentor: Babji Srinivasan, Chemical Engineering

The electrical motors constitute an important part of the industries. For the growth of industry and generating good profit, it is important that the motors are running smoothly without degradation. The electrical devices have a lifetime, after which they degrade. Therefore it is important to detect faults in the electric motor and diagnose those faults. So here we have used data mining and data analysis approaches to detect faults. We used tools of signal processing like wavelet transform, discrete wavelet decomposition for extracting relevant features and adopted Machine learning approaches for fault classification. The artificial data generation techniques are also discussed in this project. The simulations were taking a lot of time to generate data so we need data which is the replication of the original data. The proposed methods and results create a framework for fault detection in the motor of battle tanks

69. Study on existence and stability of periodic solutions of second order differential equations

ANIRUDDHA VISHWAS DESHMUKH, Applied Mathematics and Humanities Department



Sardar Vallabhbhai National Institute of Technology

Mentor: Jagmohan Tyagi, Mathematics

The study involves the existence and stability of periodic solutions to second order nonlinear differential equations. This is motivated by several examples from real-world phenomena which give rise to such equations. The main interest lies in those second order equations which have singularities in the dependent variable for some finite value. In this study, we find establish the existence of positive periodic solutions to such equations and also comment on their stability.



70. Non-intrusive load monitoring toolkit (NILMTK) and Scalable Energy Breakdown

Raktim Malakar, Information Technology

IEST, Shibpur

Mentor: Nipun Batra, Computer Science

Non-intrusive load monitoring (NILM) or energy disaggregation is the task of separating the household energy measured at the aggregate level into constituent appliances. In 2014, the NILM toolkit (NILMTK) was introduced in an effort towards making NILM research reproducible. Despite serving as the reference library for data set parsers and reference benchmark algorithm implementations, few publications presenting algorithmic contributions within the field went on to contribute implementations back to the toolkit. Our work in SRIP focused on two significant contributions to the NILM community in an effort towards reproducible state-of-the-art research:

- 1) Rewrite of the disaggregation API and a new experiment API which lowers the barrier to entry for algorithm developers and simplifies the definition of algorithm comparison experiments,
- 2) The release of NILMTK-contrib; a new repository containing NILMTK-compatible implementations of 3 benchmarks and 9 recent disaggregation algorithms. We have performed an extensive empirical evaluation using a number of publicly available data sets across five important experiment scenarios to showcase the ease of performing reproducible research in NILMTK.
- 3) We figured out finding the solution of GitHub issues that NILMTK faced. NILMTK had many issues like algorithms, bugs, data set issues, documentation, feature requests, installation, questions and testing.



71. RECIPROCAL DOME AND RECIPROCAL BALL

Yash Mandwaria, civil engineering

Sardar Vallabhbhai National Institute of Technology

Mentor: Manish Jain, Creative Learning

The goal was to design and make a reciprocal dome using bamboos. Design is completed on SketchUp. Another aim was to design and make a 6v reciprocal ball. Design is completed on SketchUp and structure will be completed in the

next few days.



72. Single Crystal X-ray Crystallography

Priyadharshini N, Chemistry

Bishop Heber College

Mentor: Vijay Thiruvengatam, Biological Engineering

The title compound (E)-3-(pyridin-3-ylidiazonyl)-1-H-indole was crystallised and solved in centrosymmetric space group monoclinic, with $P21/n$ and consist of four molecule in the unit cell ($Z=4$) The molecular structure is in planar confirmation, where indole moiety and 3-pyridyl moiety positioned trans to each other. The torsional angle between indole and pyridyl moieties was found to be 178.80° (C2-N2-N4-C9). Further, a detailed structure analysis was presented here.



73. Developing a user friendly method for Formaldehyde detection

Kunj, Chemistry

Uka Tarsadia University

Mentor: ARNAB DUTTA, Chemistry

Formaldehyde is carcinogenic in some amount. There are so many methods available for

detection of Formaldehyde. But we try to make synthesis of Rhodamine-6G derivative organic molecules for detection of formaldehyde. After that, we will focus on the formation of User friendly based paper strip immobilized with Rhodamine-6G derivative organic molecules. In this method there is no need for costly instrument. This method is very cheap and easily made up.



74. Capacitive deionization of water and extraction of titanium dioxide

Shruti Singh, Department of earth science

Banasthali vidyapeeth

Mentor: Sudhanshu Sharma, Chemistry

Titanium dioxide has many uses. It is now the common white pigment in paints after the use of lead oxide was banned some years ago. It is also used as a pigment in printing inks, plastics, cosmetics, soap, toothpaste and food. Titanium dioxide is good choice as a pigment as it is chemically resistant and non-toxic. Even though titanium dioxide is fairly abundant, it is often found in low concentrations in ores. To make it worthwhile for mining, it needs to be found in purer form and higher concentration. The production of pure titanium dioxide involves several stages and is demanding in terms of chemical reagents and energy. Pure titanium dioxide exists in different forms and the forms anatase and rutile have photocatalytic properties. Titanium dioxide can be extracted from its ore by either chloride process or sulfate process. The sulfate process requires the use of very large quantities of sulfuric acid and produces copious amounts of acidic waste. This acidic waste could cause significant damage to the environment, if not disposed of responsibly. In chloride process titanium dioxide ore is reduced with carbon and then oxidised again with chlorine producing a pure titanium dioxide.

Capacitive deionization (CDI) is an emerging technology for water desalination, and is based on the phenomenon of ion electrosorption. Especially for low molar concentration streams, like brackish water, CDI is a promising alternative to established technologies such as reverse osmosis. CDI research and commercialization efforts have exponentially grown over the past five years. This enhanced growth has been motivated by novel CDI architectures (such as flow-through or flow electrode design) and a deepened understanding of ion electrosorption. The performance of a CDI system depends on many parameters. A basic parameter to consider is the choice of electrode material, and different carbon materials have been explored so far (such as activated carbon, carbon nanotubes, and graphene). Yet, equally important is the system architecture and the operational mode. New developments using flow electrodes can even enable continuous operation of a CDI system. In this project industrial waste (slag) has been used as ion adsorbing medium after being coated on Fluorine doped Tin oxide (FTO) electrode.



75. Synthesis and characterization of molecules to inhibit Helicobacter pylori IMPDH

SMRITEE REKHA HAZARIKA, Chemistry

VIT

Mentor: sivapriya kirubakaran, Biological Engineering

Helicobacter pylori (H. pylori) is a Gram-negative, facultative anaerobic bacterium that is usually seen in the stomach [1]. It is a normal flora that has immuno-modulating properties. The WHO has categorized H. pylori as a carcinogen as its infection can lead to: (i) MALT lymphoma (mucosa-associated lymphoid tissue) and (ii) gastric adenocarcinoma [2], although it will depend on the nature of the H. pylori and not all infected individuals will develop gastric cancer [3]. An analysis carried out in 2009 inferred that eradication of H. pylori decreases

the risk of gastric cancer in previously infected people, which suggested that its presence comprises of a 65% relative risk factor for gastric cancers [4]. The current treatment for *H. pylori* infection includes antibiotics that have been rendered ineffectual by the improvement of drug resistance [6]. Thus finding some other drug advancement programs for antibiotic discovery became necessary and the importance of Inosine 5'-monophosphate dehydrogenase (IMPDH) as a viable target came into play. The work done by Allison et al. 1977 has explained that lymphocytes are reliant on the de novo pathway of the nucleotide biosynthesis, causing IMPDH to be an encouraging target for various diseases as IMPDH catalyzes the transformation of IMP to XMP with the simultaneous reduction of NAD to NADH. The XMP is further turned to GMP when catalyzed by GMP synthase which after some operations by several enzymes gives rise to some of the building blocks of DNA (dGTP) and RNA (rGTP) [5]. The given reaction regulates the size of the guanine nucleotide pool, thus inhibition of IMPDH can obstruct the progression of this pool and hence the microbial proliferation. It is seen that species selective IMPDH inhibitors can also be produced as prokaryotic and eukaryotic IMPDHs differ in both architectural characteristics and kinetic properties [6]. Also, the accessible structural data makes IMPDH a very good target for structure-based drug design [5]. Thus our aim is to synthesize small benzimidazole- and indole-based small molecule which will show good inhibition against HpIMPDH.



76. Adsorptive Removal of Arsenic using Alginate beads impregnated Oleic acid coated Iron oxide Nanoparticle .

Satya Prakash Sahoo, civil engineering
National Institute of Technology, Rourkela
Mentor: Manish Kumar, Earth Science

Alginate (AB) and oleic acid-coated iron oxide impregnated alginate (FAB) beads were synthesized, characterized and compared as an adsorbent for the removal of Arsenic (As), a carcinogenic geogenic contaminant ubiquitously present in the groundwater. Initially to study the surface morphology of both the adsorbents the Scanning Electron Microscopic and Energy Dispersive Spectroscopic (SEM-EDS) analysis was performed and the obtained results revealed the homogenous and porous surface of AB before adsorption. On the surface of FAB, the impregnated nanoparticles can be easily observed. After the adsorption of As, the surface of both the adsorbents became smooth and even. The presence of As in the EDS spectra can confirm the adsorption of metalloid onto both the adsorbents. The batch study was conducted to evaluate the effects of system parameters (pH, adsorbate concentration, contact time, and dosage of adsorbents). Results confirmed that for increasing metal ion concentration and contact time the similar trend was observed for both the adsorbents whereas, with changing pH both beads showed a contrasting behavior. Two parameter isotherm models (Langmuir and Freundlich) were studied and the results confirmed the good agreement of experimental data with the Freundlich model. The dynamical data fit well with the pseudo-first-order kinetic model and suggested the physisorption mechanism. The results indicate that AB and FAB beads could be employed as a low-cost material for the adsorption of low concentration of As from drinking water.



77. Blockage Detection in Pipelines using Machine Learning Techniques

Gowri R, Electronics and Instrumentation
Madras Institute of Technology
Mentor: Babji Srinivasan, Civil Engineering

Blockages in pipelines are a very predominant problem as they reduce the efficiency of

transfer of liquids. Blockages are difficult to detect unlike leakages as they are present inside the pipeline. In this work, a method is proposed to classify the blockages according to their location and magnitude using pressure transients. A number of experiments were performed for three different block magnitudes along with a no-block condition in three different locations on a single pipe single block system. The blockages are introduced separately for each case using orifice plates. The transients are produced by the sudden closure of the valve at the end of the pipe.

The pressure is measured at only one location, near the downstream end. Stationary wavelet transform was applied on pressure signals for feature extraction. Shannon entropies of wavelet coefficients are calculated and passed through Support Vector Machines. The classifier so built, gives 100 % accuracy for binary classification between the block and no-block condition. The model will be further improved in order to localize the blockages and determining their magnitude in the water distribution network.



78. Molecular biology and structure determination of proteins involved in chronic diseases using X-ray crystallography

Sneha Ghosh, Biological Sciences

PD Patel Institute of Applied Sciences, CHARUSAT

Mentor: Vijay Thiruvengadam, Biological Engineering

Helicobacter pylori (*H. pylori*) is a type of gram negative bacteria, which is responsible for majority of gastric ulcers, chronic gastritis and in long terms leads to gastric cancer. Treatments against it usually involve a combination of antibiotics but, emergence of *H. pylori* in resistant strain forms remains unaffected. Thus, an alternative method has been developed to treat and target these infections. In de novo biosynthesis of the purine nucleotides, inosine 5'- monophosphate (IMP) is oxidized to xanthosine 5'- monophosphate (XMP) which is further converted to guanine 5'- monophosphate (GMP) by the enzyme Inosine-5 -monophosphate dehydrogenase (IMPDH). The importance of GMP production is that it enhances increase of guanine nucleotide pool. That leads to increase in proliferation of cells in *H. pylori*. IMPDH of other prokaryotic organisms has already been studied thus; IMPDH is a potential target for treating with respect to gastric cancer. The project aims on expression and purification of HpIMPDH and further crystallization of this protein for acquiring the knowledge of its structure.



79. TEMPERATURE BASED KINETICS OF BELOUSOV-ZHABOTINSKY REACTION CATALYZED BY GRAPHENE BASED NANOCOMPOSITES

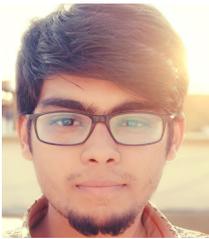
KONALA RESHMA REDDY, PETROLEUM ENGINEERING

INDIAN INSTITUTE OF PETROLEUM AND ENERGY

Mentor: Pratyush Dayal, Chemical Engineering

Belousov-Zhabotinsky (BZ) reaction is a classic example of a nonlinear chemical oscillator. These reactions are part of the systems far away from equilibrium and show sustained chemical oscillations for a considerable period of time. Typically, the BZ reaction is catalysed by a metal-ions (Ru, Ce, Mn and Fe metal complexes) that undergoes periodic oxidation and reduction cycles, and results in the emergence of colourful patterns in the reaction medium. One of the recently introduced catalyst for BZ reaction are the graphene based nanocomposites. This nano catalysts demonstrate the increase in oscillating frequency due to the synergy between the two effects. First, NP decorations provide enhanced access to catalytic sites and second, highly conductive graphene platform facilitates efficient shuttling of electrons for faster oxidation and reduction of the catalyst. Here we investigate the effect of temperature on the kinetics of BZ reaction catalysed by ceria NP decorated graphene nanosheets.

Precisely, the oscillatory nature of the BZ reaction is used to estimate the activation energies of key steps involved in the BZ reaction mechanism. In particular, the reaction is carried out at different temperatures i.e. 30°C, 40°C, 50°C and 60°C when catalysed by Ce-graphene, Ce-rGO and Ce-GO. Then the rate constant (k_5) are estimated by matching the experimental oscillations and the oscillations obtained by simulating the Oregonator model. Finally, by using the Arrhenius equation it was found that the activation energy of the BZ reaction catalysed by Ce-graphene, Ce-rGO and Ce-GO nano catalysts are 7425.8652 J/mol, 7926.1792 J/mol, 9281.4608 J/mol respectively. Therefore, the activation energy of the BZ reaction has been reduced by 10 times in the case of nano catalysts when compared with traditional catalysts. Our findings would help in better understanding of the kinetics of BZ reaction and can be used to design chemical oscillators that may be used for a variety of self-actuated devices based on chemo-mechanical transduction.



80. SYNTHESIZING HYDROGELS USING ADVANCED DNA NANOTECHNOLOGY

Naman Maniyar, Department of Cell and Molecular Biology

Maharaja Sayajirao University

Mentor: BHATIA DHIRAJ DEVIDAS, Biological Engineering

DNA Nanotechnology is a relatively recent and steadily rising field with application ranging over wide spectrum of industries. In this SRIP research project, we aim at using this DNA Nanotechnology to create DNA based Hydrogels. We try and develop DNA nanostructures and subsequently aim at synthesizing hydrogels with similar technology. We found the DNA Nanotechnology approach to produce highly viscous DNA solution indicating possible gel formation. DNA hydrogels have the potential to become the breakthrough we need in the world of biology and the nanotechnology approach is making it more tractable and viable.



81. SYNTHESIS AND CHARACTERIZATION OF ATM KINASE INHIBITORS FOR EVALUATING THEIR ANTI-CANCER ACTIVITY

C. Valarmathy, Chemistry

Ethiraj college for women

Mentor: sivapriya kirubakaran, Biological Engineering

Nowadays, DDR pathway is mainly targeted in order to increase the success rate of cancer treatments. It is done because the DNA double strand breaks (DSBs) caused during treatment of cancer has been repaired by the DNA Damage and Response (DDR) pathway in combination with the cancer therapy is a boon to patients. Ataxia-telangiectasia mutated (ATM) kinase is one of the key mediator of DDR pathway. Here, a series of 3-QuinolineCarboxamides has been synthesized as selective inhibitors of ATM kinase.



82. Development of virtual reality games for use in stroke rehabilitation

Sudipta Gyan Prakash Pradhan, Electronics and Communication Engineering

IIT Bhubaneswar

Mentor: Arup Lal Chakraborty, Electrical Engineering

Stroke has emerged as a leading cause of death globally. Stroke survivors are left with a prominent residual disability, which severely affects their quality of life. Most of the stroke survivors can regain control of their motor functionalities significantly. However, the conventional rehabilitation methods do not provide motivation to the patients to continue the rehabilitation exercises which leads to failure of the rehabilitation therapies. Virtual reality-based gaming systems are being incorporated in the therapies in recent times to make these sessions more enjoyable for the patients. The patients can mass practice different exercises while playing various games in the virtual world without losing motivation. Such games can also be useful in residential rehabilitation. The games for the stroke patients need to be designed carefully so that they are immersive, engaging, could motivate the subjects to perform a set of exercises, and the data collected during the gameplay could be used to analyze the progress of recovery. We, therefore, have developed a set of games that could be played using a fiber-optic glove developed in-house at IIT Gandhinagar. The developed games focus on improving the movement and control of the different finger joints, which will help them in carrying out day-to-day activities like holding a glass of water. These games are platform-independent and can be played on devices supporting Android, Linux, and Windows. We designed these games in such a way that they do not cause cognitive overload to stroke patients. Finally, we demonstrated and tested the games with an FBG-sensor-based glove.



83. Sensor Deployment for a Sustainable Campus

Sumit Kanu, Electronics and Communication Engineering

National Institute of Technology Karnataka

Mentor: Nipun Batra, Computer Science

Large scale campus deployments in the past have resulted in energy conservation measures, data validation, and software architectures. Proper implementation of such methods, will result in sustainable systems.

We did our work on deployment involving sensing various aspects of campus sustainability like water, electricity, air quality, and parking lot occupancy. We worked with EM6400NG smart meters, ELMAG200 flow sensors. Data from these sensors can be used to determine which type of meters are suitable for determining the water consumption. We also prepared weatherproof ultrasonic sensor modules and their circuitry for car parking system which updates about parking availability in real time. We conducted several experiments with LoRa RF communication module to determine the optimum conditions in which the module performs the best and using it for data communication where WiFi or LAN is not accessible.

To determine the condition of air in a room, we installed a sensor board, which is capable of measuring CO₂ and VOC level in the air, and send that data over WiFi. We also created a prototype of a wearable air quality monitoring system for individual use. This prototype is capable of measuring particulate matter (PM) of sizes 1-10 um and CO₂ concentration in ppm.



84. Non-intrusive load monitoring toolkit (NILMTK) and Scalable Energy Breakdown

Rajat Kumar, ICT

DA-IICT

Mentor: Nipun Batra, Computer Science

Non-intrusive load monitoring (NILM) or energy disaggregation is the task of separating the household energy measured at the aggregate level into constituent appliances. In 2014, the NILM toolkit (NILMTK) was introduced in an effort towards making NILM research reproducible. Despite serving as the reference library for data set parsers and reference benchmark algorithm implementations, few publications presenting algorithmic contributions within the field went on to contribute implementations back to the toolkit.

Our work in SRIP focused on two significant contributions to the NILM community in an effort towards reproducible state-of-the-art research:

- 1) Rewrite of the disaggregation API and a new experiment API which lowers the barrier to entry for algorithm developers and simplifies the definition of algorithm comparison experiments,
- 2) The release of NILMTK-contrib; a new repository containing NILMTK-compatible implementations of 3 benchmarks and 9 recent disaggregation algorithms. We have performed an extensive empirical evaluation using a number of publicly available data sets across five important experiment scenarios to showcase the ease of performing reproducible research in NILMTK.
- 3) We figured out finding the solution of GitHub issues that NILMTK faced. NILMTK had many issues like algorithms, bugs, data set issues, documentation, feature requests, installation, questions and testing.



85. Sensor deployment for a Sustainable Campus

Sajal Sirohi, ECE with specialization in IoT and Sensors

VIT, Vellore

Mentor: Nipun Batra, Computer Science

Large scale campus deployments in the past have resulted in energy conservation measures, data validation, and software architectures. Proper implementation of such methods, will result in sustainable systems. We did our work on deployment involving sensing various aspects of campus sustainability like water, electricity, air quality, and

parking lot occupancy. We worked with EM6400NG smart meters, ELMAG200 flow sensors. Data from these sensors can be used to determine which type of meters are suitable for determining the water consumption. We also prepared weatherproof ultrasonic sensor modules and their circuitry for car parking system which updates about parking availability in real time.

We conducted several experiments with LoRa RF communication module to determine the optimum conditions in which the module performs the best and using it for data communication where WiFi or LAN is not accessible.

To determine the condition of air in a room, we installed a sensor board, which is capable of measuring CO₂ and VOC level in the air, and send that data over WiFi. We also created a prototype of a wearable air quality monitoring system for individual use. This prototype is capable of measuring particulate matter (PM) of sizes 1-10 um and CO₂ concentration in ppm.



86. Non-intrusive load monitoring toolkit (NILMTK) and Scalable Energy Breakdown

Ayush Pandey, Computer Science

National Institute Of Technology Agartala

Raktim Malakar, Information Technology

IEST, Shibpur

Mentor: Nipun Batra, Computer Science

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87. High voltage devices for >50V applications

Biswajeet Sahoo, Electronics and Communication Engineering

National Institute of Technology, Rourkela

Mentor: Nihar Ranjan Mohapatra, Electrical Engineering

The development of VLSI technology is hugely focused towards the miniaturization of semiconductor devices, which in turn heavily depend on the advancement in the Metal-Oxide-Semiconductor Field Effect Transistor (MOSFET). The minimum dimension of a single device for present day technology is below 30 nm in channel length. So, with the advancement of the nanotechnology, it's very important to study the electrostatic and transport properties of the MOSFET. In this project, an interactive tool is made for the simulation of MOSFET Characteristics. The tool has been made for the simulation of MOS Cap (2 terminal), 3 terminal MOSFET and the 4 terminal MOSFET. The tool has options to simulate both

n-type as well as p-type MOSFETs. This tool is designed in such a way that it will be more user-friendly and easier to understand. It gives a proper visual representation of how a MOSFET would work under different scenarios as per the inputs given by the user and finally plotting the resulting graphs. It can prove very useful for understanding the MOSFET physics.



88. Sustainable water quality management in the urban environment

HUKMA RAM, Civil Engineering

college of engineering and technology bikaner

Mentor: Manish Kumar, Earth Science

The hydrophobic nature of magnetic iron oxide NPs Fe_3O_4 coated with oleic acid to obtain a high specific surface area were synthesized by an environment friendly co-precipitation method. The only used capped agent oleic acid which serves like a functionalized molecules from prepared certain the high stability of the oleic acid coated Fe_3O_4 in aqueous solution. The oleic acid Fe_3O_4 nanoparticles were used to as adsorbent to remove heavy metal like arsenic presence in ground water which is toxic contaminants for human health. Thus the adsorption isotherm could be described by the Langmuir model which suggests the adsorption of As onto the nanocomposite with homogenous surface. The adsorption kinetics graph by noted that higher doses of As could be removal by Fe_3O_4 nanoparticles.



89. Tabular Information Extraction from Scientific Articles

Shivam Hareshkumar Patel, Computer Science

SRM Institute of Science and Technology

Mentor: Mayank Singh, Computer Science and Engineering

In the past few years, there has been an exponential growth of intricate tables inserted with multi-modal information such as citations, images, plain text, and hyperlinks. Consequently, the task to detect and extract performance information embedded within tables present in PDF documents have come out to be yielding research. In this project, we currently aim to develop machine learning models for automatic detection and extraction of tabular data present within scientific articles in PDF format with high accuracy, efficiency, and in a scalable fashion. Later, we plan to build deep learning models for the problem.

Two performance information extraction frameworks were built by us. In the first, a generic mapping template was built to map the tokens of the LATEX file to those in the pdf2xml output of the scientific document based upon the surrounding context. Since, the mapping template offered a lot of challenge to generalize on the variety of ways the LATEX files are written in, we build a new information extraction framework. Using the second information extraction framework, we annotated the .tex files with two specific tokens to identify the tabular structures in the PDF documents.

We have annotated a large benchmark dataset to form the ground truth for our potential classification models - CRF++ (Conditional Random Fields++) and LSTM (Long Short Term Memory). We also plan to release this dataset for further research and development activities in scholarly performance extraction tasks.

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Organising Team

Undergraduate Research Committee at IIT Gandhinagar coordinated and organized the Summer Research Internship Program (SRIP) 2019. Drs. Manish Kumar and Iti Gupta 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 the 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.



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