



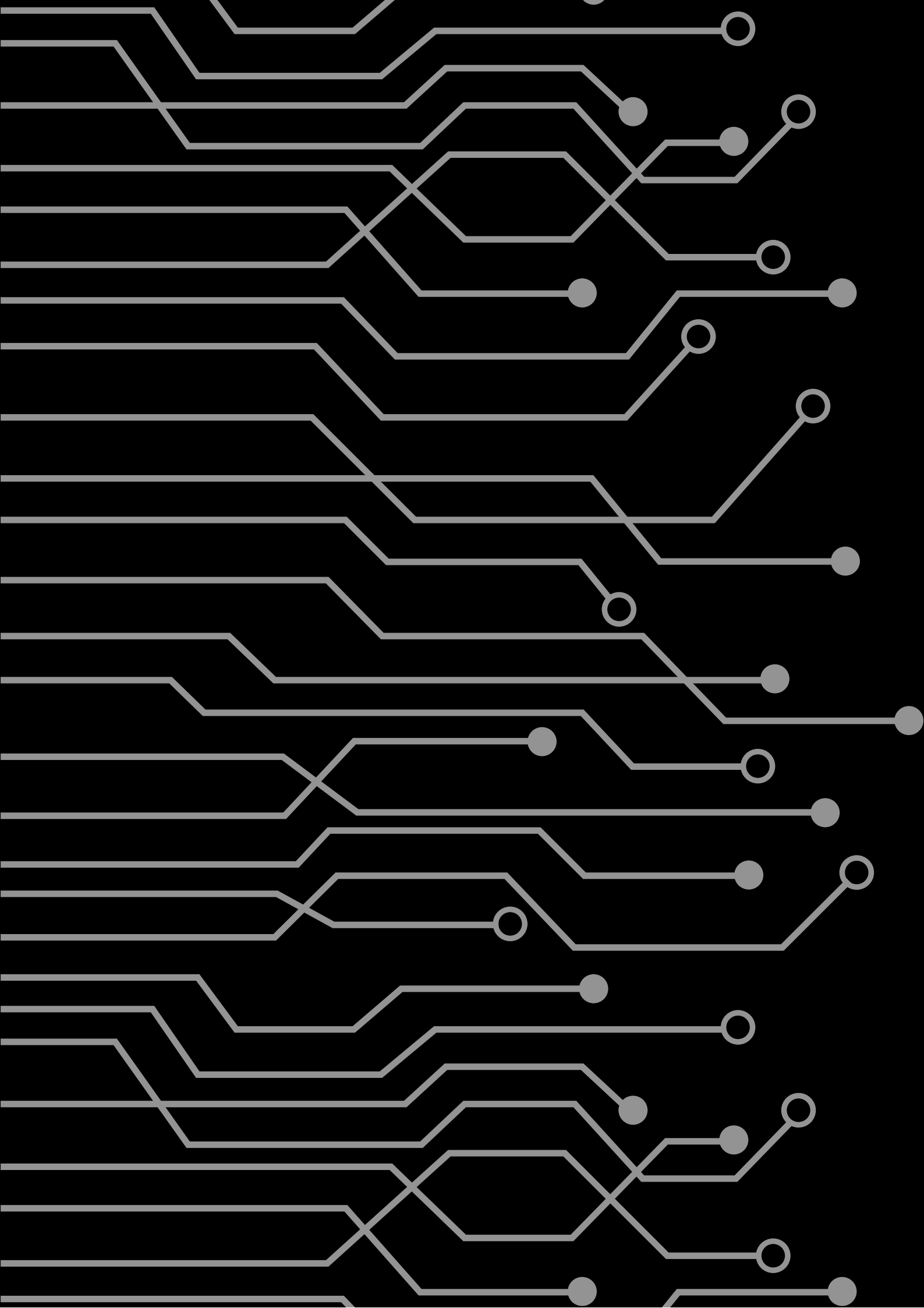
DEPARTMENT OF ELECTRONICS &
COMMUNICATIONS ENGINEERING

ELECTROBUZZ

April 2022



ECE DEPARTMENTAL
MAGAZINE



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HOD's Message



Dear All,

I am glad to share the latest edition of the ECE Newsletter with you. With vaccinations in full swing and most of the students back on the campus, it seems that we are getting back to normal. The department has already seen a considerable increase in the buzz of activity since beginning of this year.

As the 2018 UG batch and 2020 PG batch are about to graduate, I am happy to share that 92.31 % of UG and 86.36% of PG students have been placed in highly reputed organizations.

I am elated to share the department's achievements from a research perspective. Dr. Sanat has been selected as a member of the Technical Committee on Space Communications and Navigation (SCAN) of the International Astronautical Federation, and our Ph.D. student Ms. Himani Joshi has been conferred with the Best Ph.D. Thesis Award by COMSNETS, our UG students Shragvi Sidharth Jha (ECE B.Tech Student) and Aakanksha Tewari (Ph.D. Student) has won the VLSID Design Contest, and our Ph.D. student Prashasti is one of the 100 research scholars to receive the prestigious CII-SERB 'Prime Minister's Fellowship for Doctoral Research. Further details are available in this Newsletter.

The ECE department also came up with the concept of "Industry Day," held on 15th Dec 2022. Industrial experts from well-known organizations were invited to deliver talks and interact with the students and faculty of the institute. This also resulted in an insightful perspective on the industry's state-of-the-art research activity and an opportunity to interact with the expert speakers from this organization.

I hope that by the next edition of this Newsletter, all students will be on campus, and we will have more student-related activities, more research contributions, and interactive sessions. I hope that the readers enjoy this edition of the Newsletter.

Best Wishes
Dr. Vivek Bohara

Editors's Message

Dear Reader,

I am honored to welcome you to the 5th Edition of 'Electrobuzz', the student-run ECE Magazine of IIITD

With the onset of Spring, the institute started welcoming students back to the campus. Activities, both academic and non-academic, will commence offline after a gap of two years. Many people around the globe ended the chapter called 'Covid-19'. The losses have been humongous; however, they have brought us all together. The last two online years have instilled such degrees of compassion, understanding, perseverance, and awareness about mental health that have never been witnessed before.

The advent of AI and its conjunction with ML, DL, and various prevalent and upcoming technologies pose a very pressing dilemma to humanity. There is a saying that history repeats itself. However, it is incomplete. History repeats itself when we fail to learn our lessons from what has transpired and amend our actions. Humanity finds itself at the crossroads again and we must have the ability to intelligently discriminate and set ourselves on the right course of action. The next five years have the potential to decide the future of the next five decades. I can't comment on what will happen, for what are we if not some fragments of the matrix.

Questions must be asked to develop the ability to answer them. With this motto in our hearts, undying spirits and unquenching thirst for knowledge, we all march forward.

Lastly, I thank Dr Vivek A. Bohara and Mrs. Sanjana Khosla for their belief in the entire editorial team and me, and for the support they have provided in the last 3 months. I have no words to express for my team, they are as good as they come.

I hope you have a great experience reading and exploring the magazine just as much as we enjoyed making it.

Warm regards

Abhishek Goyal
3rd Year Undergraduate

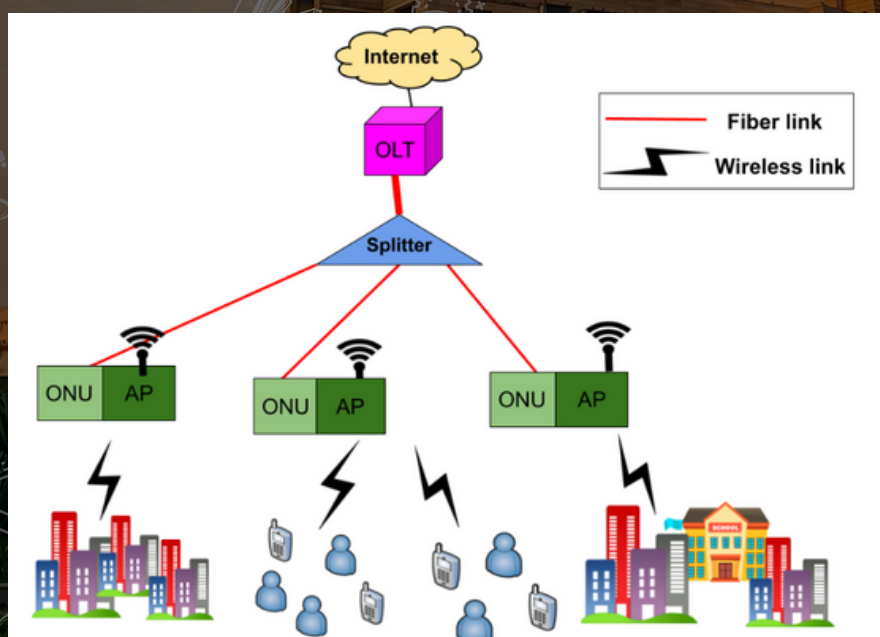


The ECE Department's mission at IIIT Delhi is to facilitate advanced research in various domains of Electronics and Communication Engineering to build a better tomorrow. To achieve so, there are multiple collaborations with sister academic varsities and industry partners to inculcate a culture of RnD in the students that they can take forward with them and excel in their particular fields. Some of the standout research done in various domains are as follows:-

1. Wireless and Optical Networks

"Quality-of-Service Aware Energy Resource Allocation for FiWi Network."

Globally, there is a significant rise in the number of connected devices. The increasing demand for ubiquitous coverage with seamless connectivity has created many new opportunities to develop an access network. Fiber-Wireless (FiWi) network has recently attracted considerable attention to alleviate some of the issues of conventional access networks. FiWi network consists of an optical fiber network as a back-end network connected with a wireless network at the front-end. In our work, along with improving the quality-of-service requirements of the end-user, and energy conservation mechanism to promote a sustainable environment by employing renewable sources of energy instead of traditional grid power supply is explored.



HIGHLIGHTS

To achieve this, we propose a joint energy resource allocation framework to minimize the number of photovoltaic (PV) panels and batteries required to power optical network unit (ONU) and access point (AP), collectively known as ONU-AP based on its location as well as throughput requirement of the users. We assume an off-grid FiWi network where the network component, namely, ONU-AP, is powered using renewable sources of energy such as PV panels and wind turbines along with batteries. Additionally, we utilize a random forest regression-based ensemble learning to predict the solar power available to ONU-APs effectively. After that, a dynamic resource allocation to allocate the energy resources based on the solar power availability is proposed and compared with non-ML-based approaches, such as maximum, minimum, median, and outage threshold-based energy resource allocation.

In addition to the above, we also explored the survivability and reliability of the FiWi network in the case of failure of ONU-APs. The position of backup ONU-AP is optimized in the FiWi network using a stochastic optimization algorithm and compared for different antenna configurations at backup ONU-AP.

List of Publications:

1. A. Gupta, A. Srivastava, and V. A. Bohara, "Resource Allocation in Solar-Powered FiWi Networks," in IEEE Access, vol. 8, pp. 198691-198705, 2020, DOI: 10.1109/ACCESS.2020.3034685.
2. A. Gupta, V. A. Bohara and A. Srivastava, "Techno-Socio-Economic Impact of Joint Energy Resource Allocation Scheme in FiWi Network," in IEEE Transactions on Network and Service Management, DOI: 10.1109/TNSM.2022.3144996.
3. P. Singh, A. Gupta, V. A. Bohara and A. Srivastava, "QoS-Aware Reliable Architecture for Broadband Fiber-Wireless Access Networks," in IEEE Systems Journal, DOI: 10.1109/JSYST.2022.3149854.
4. A. Gupta, H. Goel, V. A. Bohara and A. Srivastava, "Performance Evaluation of Integrated XG-PON and IEEE 802.11ac based EDCA Networks," 2020 IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS), 2020, pp. 1-6, DOI: 10.1109/ANTS50601.2020.9342752.



2) VLSI and Embedded Systems

Title:- Efficient Post-Silicon Debug Platforms for Future Many-Core Systems

The contemporary System-on-Chips (SoC) are becoming incredibly complex. Evaluating and maintaining the functional correctness of these systems is a real challenge. As a result, multiple functional bugs might escape through the pre-silicon verification stage. Therefore, post-silicon debug is performed on the first few silicon prototypes to capture the slipped functional errors.

The traditional store and forward trace-based debug methods encounter the problems of large trace buffer requirements and limited availability of trace communication bandwidth. A high volume of the trace can enhance the system's internal visibility but demands a large size on-chip trace buffer and increases the implementation cost of the debug infrastructure. Moreover, the duration of the debug phase largely depends on the trace transfer speed. This necessitates efficient Design for Debug (DfD) structures that can ensure trace reduction without degrading the system's internal observability and high-speed trace communication. As a result, the available trace buffer can be optimally used during trace collection, and additionally, a faster debug process can be achieved. Furthermore, most DfD modules are left idle after the debug phase. Reuse of such structures can compensate for the area overhead introduced by them. In the above context, we have proposed a wireless-enabled debug structure for faster trace communication, a redundant trace elimination mechanism for efficient trace reduction, and the reuse of trace buffer as routers' virtual channel (VC) for system performance improvement. All our proposals provide efficient debug solutions for NoC-based multicore SoCs.

This research work is carried out in Advanced Multicore Systems Lab (AMS Lab) under the supervision of Prof. Sujay Deb. Here are a few research domains on which we in AMS Lab work on

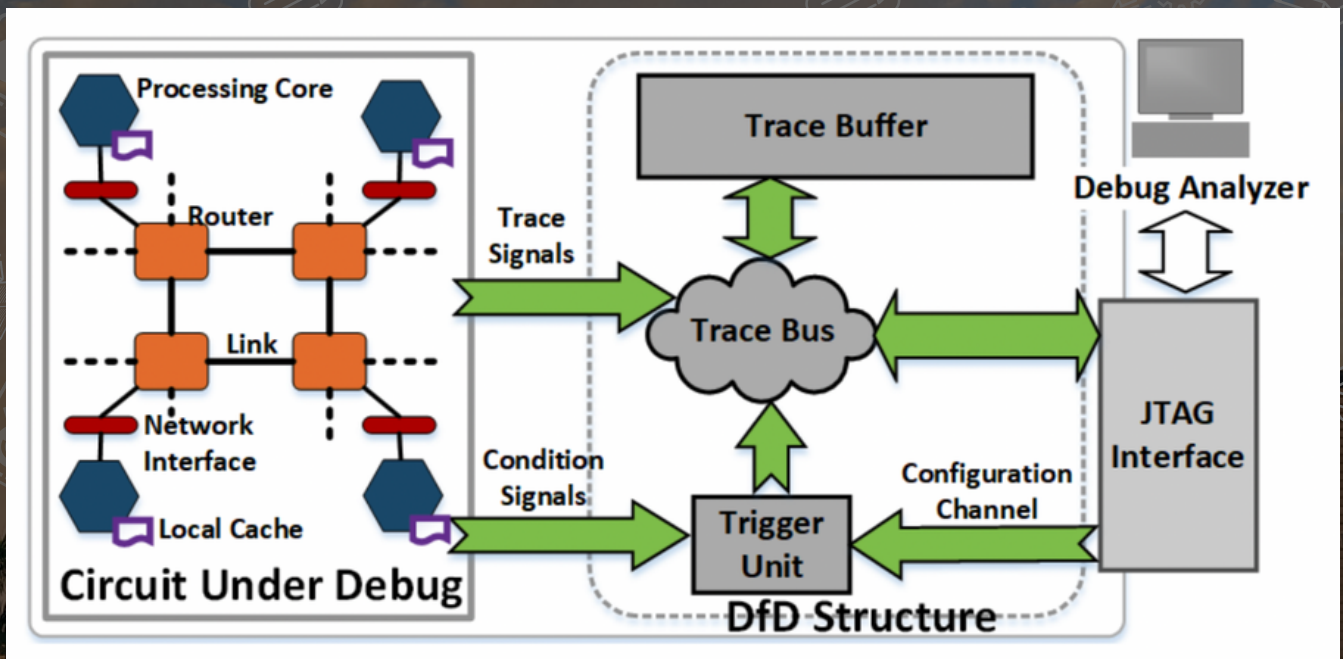
1. Design for Debug
2. Design of accelerator-rich systems
3. Hardware security
4. Design of efficient interconnects
5. Approximate Computing
6. Open-source multicore SoC Design and other



AMS Lab @IIITD

Publications:

1. Rout SS, Deb S, Basu K. WiND: An Efficient Post-Silicon Debug Strategy for Network on Chip. IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD). 2020 Dec 15;40(11):2372-85.
2. Rout SS, Badri M, Deb S. Reutilization of trace buffers for performance enhancement of NoC based MPSoCs. In 2020 25th Asia and South Pacific Design Automation Conference (ASP-DAC) 2020 Jan 13 (pp. 97-102). IEEE.
3. Rout SS, Patil SB, Chaudhari VI, Deb S. Efficient router architecture for trace reduction during NoC post-silicon validation. In 2019 32nd IEEE International System-on-Chip Conference (SOCC) 2019 Sep 3 (pp. 230-235). IEEE.
4. Rout SS, Basu K, Deb S. Efficient post-silicon validation of network-on-chip using wireless links. In 2019 32nd International Conference on VLSI Design and 2019 18th International Conference on Embedded Systems (VLSID) 2019 Jan 5 (pp. 371-376). IEEE.



Accelerated Reconstruction of Diffusion MRI (HARDI)

Health care facilities have improved significantly with the advent of reliable and convenient medical imaging techniques. However, there is tremendous scope for improvement in brain imaging. Imaging techniques such as Magnetic Resonance Imaging (MRI) gives accurate structural information but provides little information about the brain nerve connections and pathways. This is critical considering that some neurological disorders can only be diagnosed if the fine details of nerve fiber bundles are provided, which the MRI cannot capture. High Angular Resolution Diffusion Imaging (HARDI) is a variant of MRI that allows accurate white matter fiber tracking but requires a very long scanning time, which is not just inconvenient to patients but also makes scanning error-prone. At SBILab, we proposed methods, namely MSR-HARDI [1] and TL-HARDI [2], to accelerate the acquisition of the HARDI signal by sensing fewer samples from the scanner. The MSR-HARDI method uses multiple fixed sparsity regularizers to recover the signal undersampled in the joint $(k-q)$ -space using only 1 percent of samples acquired from the scanner, significantly reducing the acquisition time. The figure below shows a comparable depiction for the alignment of local fiber tracts generated from the original HARDI image and the one reconstructed with only 1 percent samples.

In comparison, the TL-HARDI method uses adaptively learned transform to reconstruct HARDI data. The transform is learned on the fly from the compressive measurements and captures the local image structure effectively. This method provides a high fidelity signal recovery compared to the MSR-HARDI and other state-of-the-art methods with as low as 8-10 percent samples.

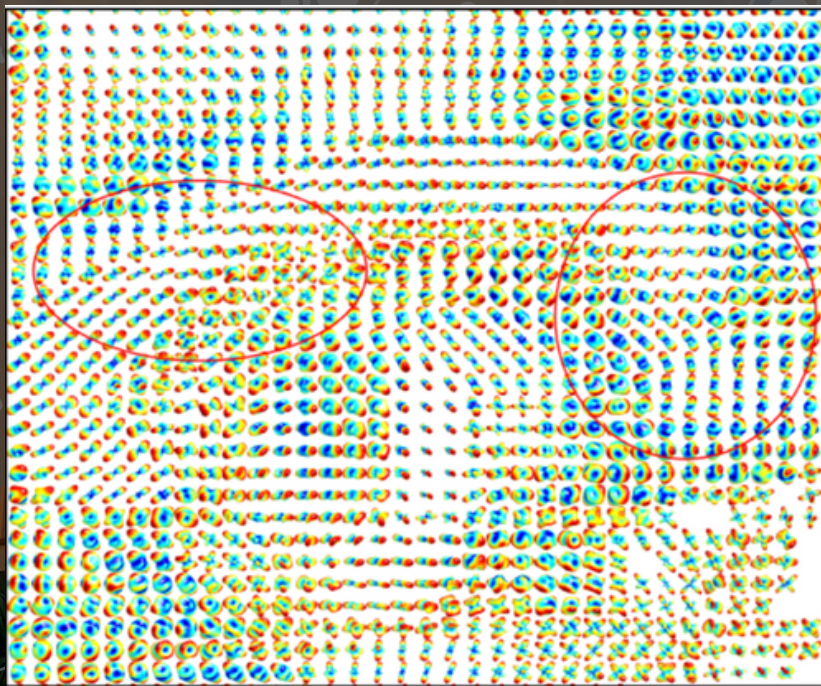


Figure 1

Figure- ODFs generated using the Original HARDI Image ((left) and generated from the image recovered using MSR-HARDI using 1% samples (right). We can observe a comparable depiction for the alignment of local fiber tracts in the corpus callosum region connecting the brain's left hemisphere with the right hemisphere.

[1] Vaish, Ashutosh, Anubha Gupta, and Ajit Rajwade. "MSR-HARDI: Accelerated Reconstruction of HARDI Data Using Multiple Sparsity Regularizers." 2020 IEEE International Conference on Image Processing (ICIP). IEEE, 2020.

[2] Vaish, Ashutosh, Ajit Rajwade, and Anubha Gupta. "TL-HARDI: Transform learning-based accelerated reconstruction of HARDI data." Computers in Biology and Medicine (2022): 105212.

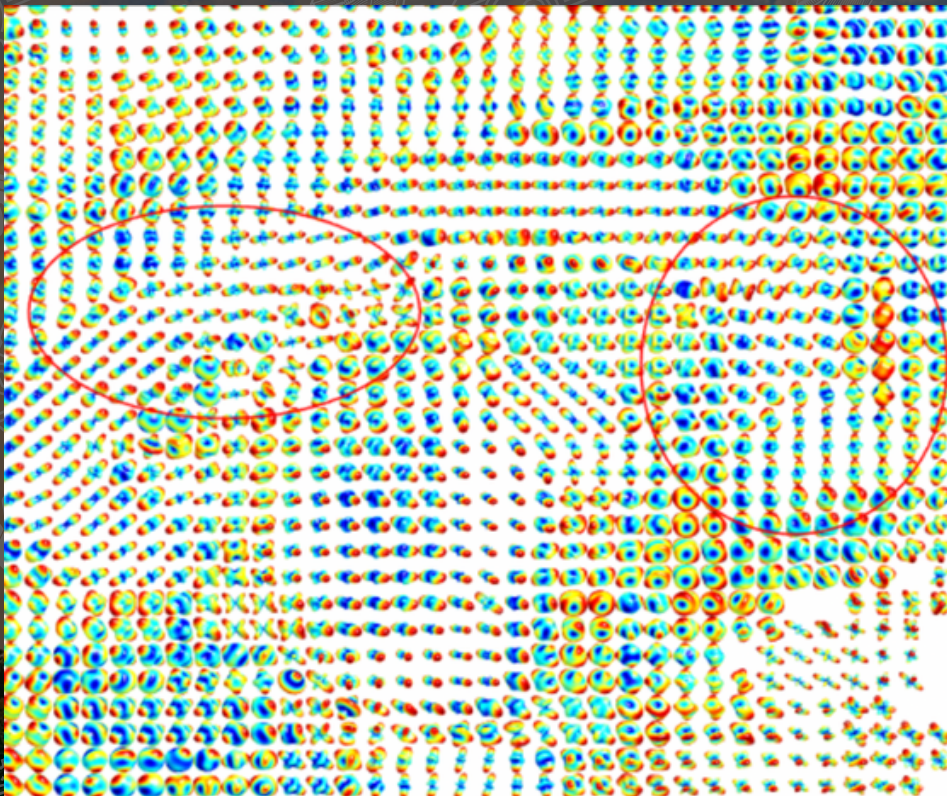
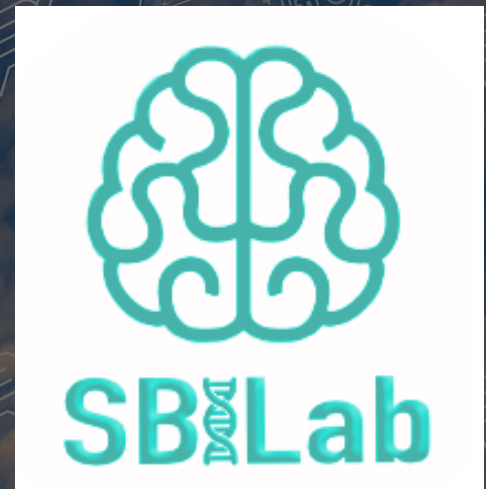


Figure 2

Circuits and

The Electronics and Communication Engineering department of IIITD runs several labs to support numerous research and teaching activities carried out by the faculty members, research scholars, and students. One such state-of-the-art lab is the Circuits and Innovation lab, which aims to produce trained professionals for the industry and achieve excellence in research.

The Circuits and Innovation Lab, located in the lecture hall complex on campus, primarily serves as one of the teaching labs which helps students grasp theoretical concepts taught in the course of study and their practical application. The lab also facilitates teaching and research projects, including experimental and innovative research ideas and projects in analog and digital circuits, microcontrollers, and their applications.



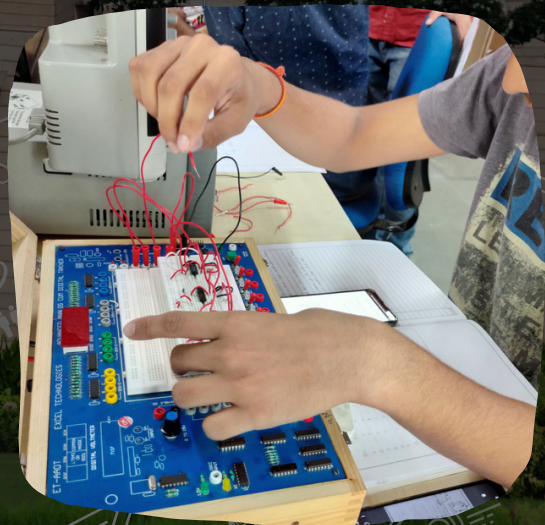
VLSI Lab

The lab is supported by the latest technologies and equipment essential for carrying out quality research. It includes all major research facilities such as:

- Microcontroller Boards
- DC Trainer Kits
- Sensors and Actuators
- Digital Storage Oscilloscope
- Arbitrary Function Generator
- Multimeters, LCR Meters
- MATLAB, LTSpice
- Power Supply
- Xilinx ISE Design Suite
- Tiva-C Launchpads with Booster packs

Some of the ongoing and completed research projects of the lab include:

- Gesture Controlled Bot
- Automatic Dispenser
- Fog Display
- Smart Door-Bell
- Unmanned Surveillance Bot
- Arduino Chess Board
- Auditory Navigation
- Braille Printer
- GPS AATV
- Lie Detector





ECE Seminar Talks

- A talk by Dr. Prabhat Kumar Sharma (Assistant Professor at VNIT Nagpur), titled 'Molecular Communication over Diffusive Channels,' was organized on 6th Oct 2021, Wednesday in an online mode.
- A talk by Dr. Shubha Sharma (Ph.D. student at NTU Singapore & M-tech. alumni of IIITD), titled 'Hybrid Free Space Optical (FSO)/Radio Frequency (RF) Communication for Future Wireless Networks' was organized on 18th Aug 2021, Wednesday in an online mode.
- A talk by Dr. Manjesh K. Hanawal (Associate Professor at IIT-Bombay), titled 'Stochastic Multi-Armed Bandits with Control Variates' was organized on 25th Nov 2021, Thursday in an online mode.
- A talk by Dr. Sanket S. Kalamkar (Systems Staff Engineer with Qualcomm, San Diego), titled 'Beam Management in 5G: A Stochastic Geometry Analysis' was organized on 20th Oct 2021, Wednesday in an online mode.
- A talk by Prof. Anubha Gupta (Professor at IIIT Delhi), titled 'MEG brain fingerprinting: Evaluation, pitfalls, and interpretations' was organized on 9th Feb 2022, Wednesday in online mode.
- A talk by Dr. Prabhu Baby (Associate Professor at IIT Delhi), titled 'Maximum likelihood estimation of Toeplitz Structured Covariance Matrices for RADAR Applications,' was organized on 23rd Feb 2022 Wednesday in online mode.





ECE Seminar Talks

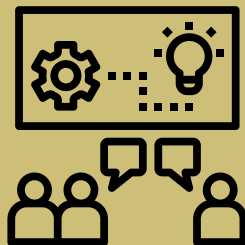
- A talk by Prof. Amlan Chakrabarti (IEEE Distinguished Speaker), titled 'IoT and Edge Computing,' was organized on 23rd Feb 2022, Wednesday in hybrid mode.
- A talk by Dr. Hari B. Hablani (Faculty at Department of Astronomy, Astrophysics and Space Engineering, IIT Indore), titled 'Meteorological Satellites and Payloads Attitude Dynamics and Control: Motion Compensation, Image Navigation and Registration,' was presented on 25th March 2022 in online mode.
- A talk by Dr. Radhakant Padhi (Professor, Dept. of Aerospace Engineering, Indian Institute of Science, Bangalore), titled 'Air Traffic Model over Airspace (ATMA) of India' was organized on 29th March 2022 in offline mode.
- A talk by Mr. Philippe Valéry (VP, Thales), titled 'Thales and Open Hardware Technologies' was organized on 1st April 2022 in offline mode.
- A talk by Dr. Sanat K Biswas (Assistant Professor IIITD), titled 'Unsupervised Learning-based Satellite Selection Algorithm for GPS-NavIC multi-constellation receivers' was presented on 6th April 2022 in offline mode.
- A talk by Dr. Ashutosh Gore (Principal Engineer/Manager, Qualcomm), titled 'WLAN Physical Layer' was organized on 17th April 2022 in online mode.





INDUSTRY DAY

INDUSTRY DAY was observed on 15th Dec 2021 with participation from faculty, and UG, PG, and Ph.D. students in hybrid mode. Dr. Ranjitha Prasad organized the event. There were twenty-one informative sessions spread across the various sub-domains of Signal Processing & ML, and CPS and Microelectronics, with speakers from more than 15 renowned firms such as Adobe Research, TCS, Swiggy, NXP, Qualcomm, Target Samsung Research, 00NXP, etc.



V2X Workshop



A 2-day workshop on "Vehicular Communication Technology Evolution towards 6G" was organized on 17th and 18th December 2021, organized by Dr. Vivek Ashok Bohara and Dr. Anand Srivastva and coordinated by Ms. Sana Al Naqvi and Mr. Khagendra Joshi. Sponsored by the SPARC Project under the Ministry of Education, GOI, the workshop was technically supported by IEEE ComSoc Delhi Chapter, co-hosted by CoE-LiFi and Wirocomm Research Group.





FDP on Aerospace

The ECE department at IIIT Delhi, in collaboration with the Astronautical Society of India, is, organized an AICTE sponsored workshop on "Aerospace and Electronic System and Signal Processing" as a part of the celebration of the 75th year of Independence. The workshop was convened by Dr. Shobha Sundar Ram & Dr. Sanat K Biswas from 14th to 18th Dec 2021.



FDP on AI on Soc

A 5-day workshop on "Artificial Intelligence (AI) on System-on-Chip (SoC)" was organized from January 10 to January 14, 2022, sponsored by AICTE, ATAL, and ECE Dept. at IIITD and headed by Dr. Sumit J Darak, Associate professor at IIITD. The workshop focussed on AI/ML and AI/ML algorithms on Systems of Chips(SoC) and microcontrollers.

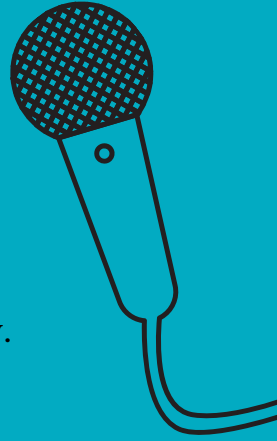


INTERVIEW WITH

Dr. Sumit
and
Dr. Himani

DR. SUMIT J DARAK

Dr. Sumit has been working in IIIT-Delhi since 2015 as an associate professor in the ECE Department. Dr. Sumit did his B.Tech in Electronics and Telecommunication Engineering from Savitribai Phule Pune University. He completed his post-graduation from Nanyang Technological University, Singapore, in Computer Engineering. Dr. Sumit's area of research is on the reconfigurable and intelligent architectures for wireless and signal processing algorithms. He is also actively involved in various administrative activities and serves as the chair for UG affairs.



DR. HIMANI JOSHI

Dr. Himani Joshi did her Btech from IP University and then joined IIITD for her master's and Ph.D. She was guided and supervised by Dr. Sumit in her academic journey at IIIT-D. During her Ph.D., she did two distinguished internships at the University of Luxembourg, where she worked in the 5G area. She is currently working as a senior manager at HFCL Ltd.



(To Dr. Himani) How did you feel about your achievement, and what are your plans with regard to your grant?

I felt great and jubilant after receiving the award from COMSNETS. It was a pleasant surprise for me. I would like to thank Dr. Sumit for it and his constant guidance and support. I have still not decided where to use it, but I am looking forward to constructively utilizing the grant.

(To Dr. Sumit) What was your reaction when you got to know of the award won by Dr. Himani?

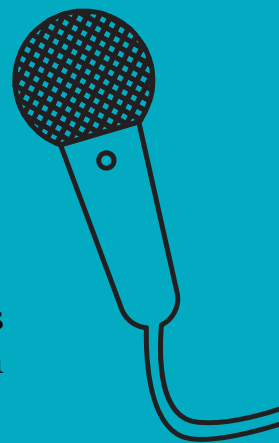
Getting such a prestigious award is always a tremendous achievement. Additionally, the national recognition gained by winning the award serves as a big motivation for other students. In this award, the nomination goes from the thesis advisor, and then a panel of judges decides, so it is a very long process. Also, luck plays an important factor here, however, it feels great to get the award after 4-5 years of intense hard work.

(To Dr. Himani) Could you tell us about your journey?

I did my Btech from IP University and did my master's from IIITD, where I got interested in the research domain and decided to pursue a Ph.D. here at IIITD. During my Ph.D., I wished to gain hands-on experience with hardware. Apart from that, I also wished to have industrial experience and got an internship from Sumit sir's collaboration.

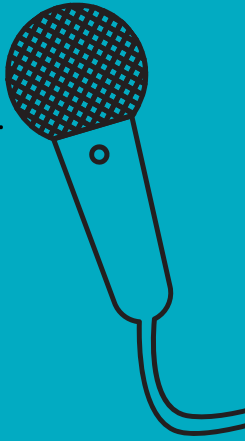
(To Dr. Sumit) Are there are any memories that you would like to share?

Himani was one of the first Mtech students, and she joined around six months after I joined IIITD. When you have your first student, you always make sure that both work hard and put in the required efforts to make the thesis a success. Also, Himani came with her fellowship, which is great in itself. It was really good to have a student like Himani. She was very cooperative and went with a solid technical background so it was a learning process for both of us.



Could you tell us more about Communication and Signal Processing?

I worked in the area of Wireless Communication, and there are relatively more minor people working in this domain. However, there are a large number of opportunities in it. With the coming of technologies like 5G, radar communication, and communication in medical fields, the opportunities are rapidly expanding. In TCS as well, 5G research is going on. I would also like to suggest a platform where students can have an overview of the upcoming opportunities in communication. This will motivate students to take up wireless communication and take it up as a research area.



(To Dr. Himani) Could you tell us more about the process of thesis writing?

Writing a Ph.D. thesis is a long journey, and it comes with its own set of challenges. There were setbacks and challenges: doing the work, putting in the required effort, and not getting the expected results. The papers not getting published were also demotivating at times. Also, testing and working on hardware was another challenge during my Ph.D. However, constant guidance from Dr. Sumit and multiple collaborations helped a lot.

Can you take us briefly through your research thesis? What were the challenges you faced during your research?

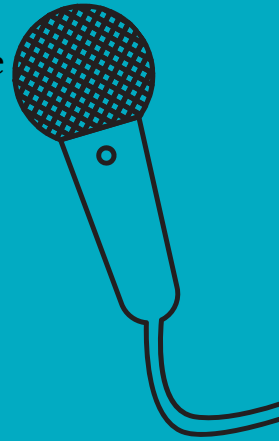


My thesis topic was on Intelligent and reconfigurable wideband spectrum characterization at the sub-Nyquist state. So, talking about the spectrum part first, its characteristics change geographically in the time horizon, so we want a system that can adapt to the system and channel. So, my research tries to tell which band we should focus on. Some areas/ bands are more occupied, and some are less occupied, so we need a reconfigurable system. In the wideband spectrum part, we need to determine various spectrum parameters. This is very important in 5G transmission.



(To Dr. Sumit) What were your responsibilities as her mentor and supervisor?

In Himani's case, it was a very smooth and convenient process, and the only aim was to ensure that she worked hard throughout her Ph.D. However, as a mentor in general, it is a very challenging process. Since most faculties here are very young, that is a challenge that we are constantly trying to overcome. Doing a Ph.D. is not very tough. However, the main challenge is to stand out from the rest, for which you constantly have to improve yourself. Also, the most crucial role of a supervisor is to manage the students well and motivate them, and then the technical or academic part can be looked after easily.



(To both) A significant part of being a Ph.D. student at IIIT Delhi is taking up Teaching Assistant/Fellow duties? How do these experiences help you grow as a person and an academic?

Being a teaching fellow is a very good experience since teaching helps you go into more depth in a subject. Also, you learn a lot while clarifying the questions and doubts of other students. It allows you to grow and expand your technical knowledge. I have been the TF/TA for courses like Digital Circuits, Opticals, Signals and systems, and other FPG courses. On a personal level, it helps you interact with many people, and you gain a lot of interpersonal skills.



(To Dr. Himani) In 2017, you also won NI (National Instruments) Academic Research Grant (\$2000) for your research proposal "Sub-Nyquist Sampling and Machine Learning based Automatic Modulation Classifier Testbed for Multi-Carrier Waveform". What does it mean to win a significant grant like this at the initial phase of your Ph.D. journey, and how did it help you?

Winning the grant at the initial stage of my Ph.D. gave me a massive boost in my confidence. It felt very motivating to win the award as it was an international award and many people recognized and acknowledged my work.



(To Dr. Himani) As a visiting research student, you attended the University of Luxembourg and SnT Interdisciplinary center for security reliability and trust. How did you come across this opportunity, and what are your major takeaways from your experience?

I came across this opportunity from one of Sumit sir's collaborations at Luxembourg University. We decided on the kind of work I wanted to do based on mutual interests. Also, I was able to get the desired results there, and it was a big boost. Also, with the help of the experience gained from this internship, I was able to deal with many practical issues that we were facing.

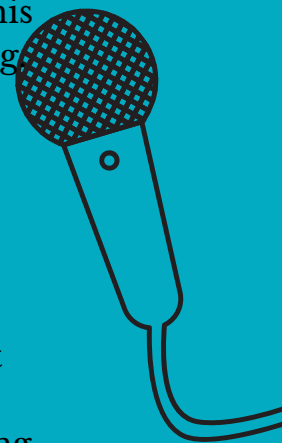
What will be your advice to students who want to build a career in the ECE domain?

Firstly, I wouldn't want to restrict the students to the ECE domain only but explore other allied fields. Students need to identify a few areas based on their interests and select a few inter-disciplinary areas. Then, while pursuing the research, the right balance between theory and practical applications in the form of experiments is necessary. Also, I advise students to take up BTPs as it allows them to interact well with the professors; working for one to one and a half years allows exploring many options and produces exceptional results. Students must also keep a regular habit of programming.

It is essential to pause between work and research. What do you like to do to relax and take your mind off work?

Dr. Sumit: As a faculty here, you have a lot of things going on here, first is the research work, then the teaching responsibilities, and finally, the administrative duties. So, an advantage of faculty life is that you are involved in many other activities. I also have a few other interests such as Cricket, following the stock market.

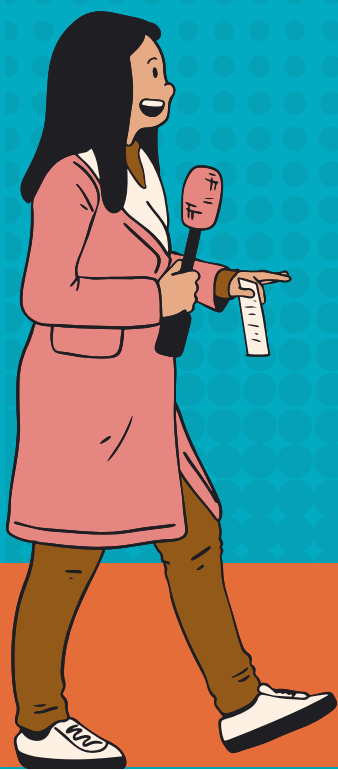
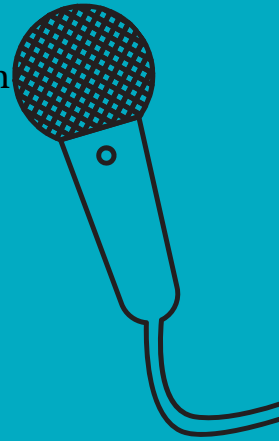
Dr. Himani: During my free time, I really like to travel, so I often visit and explore new places. I am also a foodie. I love trying new dishes and cuisines. Apart from that, sleep is vital for me as it helps me rejuvenate after a long day's work.



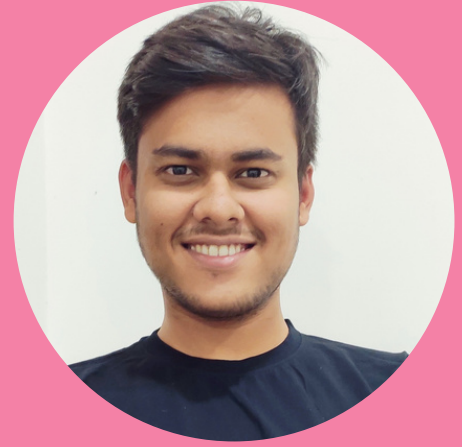
What projects are you two currently working on, and what are your plans for the future?

Dr. Sumit: We have a few sponsored research projects going on, such as the 'joint radar communication receiver' project, with Dr. Shobha and the DST-sponsored project on 'reconfigurable intelligence and physical layer'. Another exciting project is on the remote hardware labs since it was challenging to conduct embedded courses in a remote environment. This is one project which I would like to take further, and in the near future, to ensure that such hardware ECE courses can be done from anywhere through remote access.

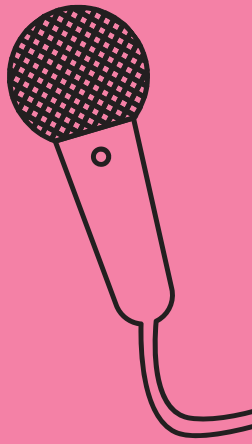
Dr. Himani: I started working on a new project with HFCL Ltd. after completing my Ph.D. So, here I am, working on the small indoor cell where we are looking to create a base station in the indoor environment. My principal role in this project is in the RF Chain and other research and development work.



INTERVIEW WITH



Prakhar Shukla (STA Design Engineer at NXP) ~ PrO Insights in Higher Studies



What are the differences between offline and online college education after having experienced both?

Prakhar: I would say the online mode of study is not an option. Sitting every day in front of a laptop makes studying feel cumbersome and reduces the focus on studies. This highly impacts productivity. Offline BTech was about the surroundings, extra co-curricular activities, new thoughts, and mischiefs. These extra activities added productivity and broadened the thinking area. But online, we were mainly confined to classes, assignments, and repeat! Since there is a significant need for hardware in VLSI, the online mode presents huge challenges.



What motivated you to pursue VLSI and Embedded Systems, and why did you choose it over other fields?

Prakhar: My first motivation was from the interest developed in terms like Processor, RAM, Architecture, OS, etc., during my high school, when there was a boom of keypad mobile phones. I chose VLSI over other fields due to its diversified nature of profiles, better job opportunities, and my passion which fueled my interest, was further amplified by my professors, the ECE Labs, and the knowledge I have gained at NIT Raipur and IIIT Delhi.

Can you share any recent projects or research you are working on?

Prakhar: Currently, I am working on a General Purpose SoC at NXP. I am responsible for timing closure of a block and performing several other timing and leakage signoffs, ECOs for full-chip.

I am also working on an extension of my M.Tech thesis (In-Memory Compute in GPUs) with Dr. Anuj Grover. This research aims at bringing down the memory bottleneck experienced in Von-Neumann architecture-based machines by performing data-centric, recent operations inside the memory.

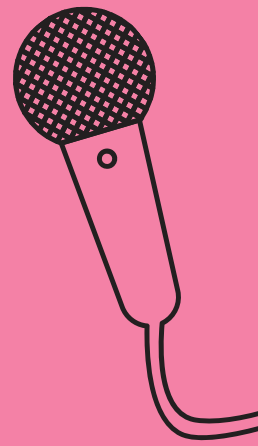
Looking at your experience at NXP Semiconductors, do you think you have grown as an individual?

Prakhar: Definitely. My short journey with NXP till now has helped me grow in a lot of horizons. Being the first job helped me acclimate with the corporate setup, prioritize things, and interact with people more efficiently. Also, this past year has been in work from home (WFH) mode, which is tough for a fresher like me as to adapt to the challenge of understanding new concepts.

I also learned how to reduce the turn-around time for something that I am trying for the first time. So, yes, my experience at NXP till now has taught me to emphasize and focus on the goals in tough times and strive for better performance with a work-life balance.

Looking at your experience at NXP Semiconductors, do you think you have grown as an individual?

Prakhar: My advice would be to spend more time strengthening basics first and then going for advanced domains. If the basics are clear, the advanced topics will be very easy to understand and implement. Else, it will become a never-ending loop of switching between advanced and basic concepts. And for VLSI specifically, focus on the tools used because they can help a lot in understanding and verifying the concepts learnt in the courses. Also, try learning some basic scripting languages which makes life much easier in VLSI.



INTERVIEW WITH



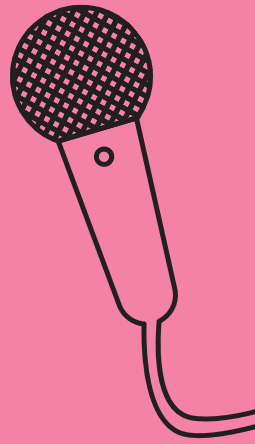
Shubhi Singhal In Focus – ECE Jobs and Life at IIITD

While many people talk of time management and being selective about your commitments, how do students practice it?

I feel it's really important to first know what all things you want to do simultaneously and also to have realistic expectations. For proper time management, one should plan their day/week. One way that has proven effective for me is to start with 168 hours of the week, and I start deducting time for various activities and then use the time I am left with to plan whatever work I need to do. And it's crucial to remove time for everything from sleep hours, eating to having a fun time.

How did you gain fluency across both CSE and ECE?

I chose ECE to be able to explore both ECE as well as CSE domains because just after school, I was not sure of the area of my interest. I started CP in my 1st year, and it seemed very interesting and fun to me, along which I tried to learn ECE concepts. I feel the first two years' courses give a good enough introduction to the domain. I recommend exploring development if someone wishes to explore both domains.



As a hardware intern at Qualcomm, what were your responsibilities, and how did you convert your internship into a PPO?

I worked in the synthesis team, and my work mainly included writing scripts for various purposes. I was assigned a mentor who guided me whenever I faced any technical issues and cleared my doubts regarding the company and the internship. I was fortunate enough to be able to convert it into a PPO.

How have you maintained such levels of consistency throughout your stay at B.Tech?

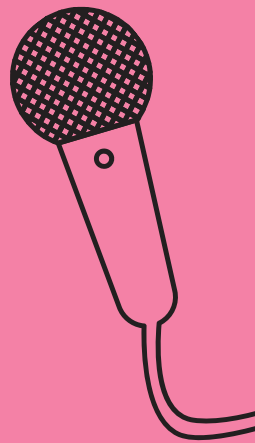
Well, I feel that I have not been that consistent as well. There were times when I dropped a course/BTP or scored low marks. But, it's just a journey of life. Everyone has both ups and downs in their journey. However, it's vital to believe in your potential and not lose hope and self-confidence even when you are at your low. My mantra is to set priorities for each semester and try to maintain an excellent work-life balance.

What are the internship/placement opportunities ECE students should know about? Which courses are significant for preparation?

For finding ECE internships/jobs, some of the ways apart from on-campus include:

1. Since very few ECE companies visit on-campus, a good enough way to go about is to contact professors and ask if they are aware of any opportunities in the industry or can put you in touch with their contacts.
2. Keep a proper check on your emails, as a professor or the college department often shares an opportunity to email with everyone.
3. Try professionally contacting people on LinkedIn who are working in your preferred company and inquire about available opportunities and tips for your preferred roles. You may also get your alums for referral/opportunity information.

I think the essential courses for Qualcomm internship interview preparation include Digital Circuits, Integrated Electronics, and Embedded Logic Design.





CONTROL SYSTEMS & ROBOTICS

A field of limitless Opportunities



Control Systems and Robotics are one of the crucial verticals of the ECE department. Multiple faculty members and scholars are involved in cutting-edge research broadly in the domains of state estimation algorithms for space applications, distributed and adaptive control theory, co-design of systems and controllers, autonomous systems, etc. The advanced courses that the faculty members teach in this vertical can make the students industry-ready for several emerging sectors including self-driving cars, unmanned aerial vehicles, factory automation, cyber-physical systems, and internet-of-things. The vision of this vertical is perfectly aligned with recent initiatives of the Government, like the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS) by the Department of Science and Technology (DST) or the emphasis on Kisan Drone in the latest Union Budget, to name a few. Of late, there has been a decent increase in the number of robotics start-ups. The Controls and Robotics group has a major role to play in terms of efficient manpower generation for the existing robotics industries and the creation of future entrepreneurs in this domain. In addition to the industry relevance, there is significant scope for higher studies. In the past, students after doing controls and robotics courses have acquired graduate admission in top universities in India and abroad (including the prestigious master's program in Robotics at Carnegie Mellon University). The analytical rigor of the offered courses facilitates the students to have a smooth transition to these graduate programs of top schools. Interested students can engage with the faculty members' research group and contribute to the research activities. Often, such collaboration provides top-tier publications and technology transfers. In a nutshell, the Controls and Robotics vertical is full of opportunities in terms of research and development and converting the research outcomes to societal upliftment. Come join us in this exciting journey!

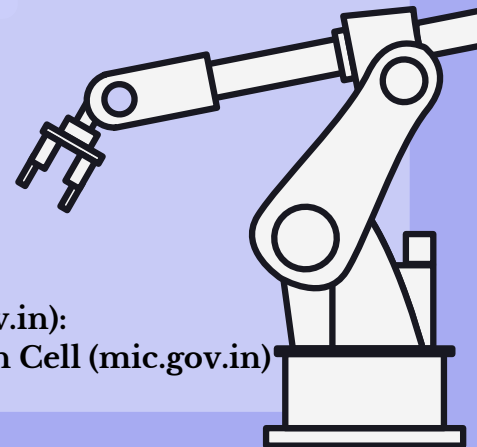
Few reputed journals for Control Systems and Robotics:

- IEEE Transactions on Systems, Man, and Cybernetics: Systems
- IEEE Transactions on Automatic Control
- Automatica
- IEEE Transactions on Cybernetics
- IEEE Transactions on Robotics
- International Journal of Robotics Research

Hackathons for students to implement their knowledge:-

1. RoboHack - RobotHack 2021 Online Hackathon
2. Smart India Hackathon - Smart India Hackathon 2022 (sih.gov.in):

This has international hackathons as well - MoE | MoE Innovation Cell (mic.gov.in)



Chanakya Fellowship

The CHANIHub Anubhuti IIITD announced the CHANAKYA Fellowship for UG and PG students. Comprehensive and Holistic Advancement of National Knowledge Yield and Analytics (CHANAKYA) UG fellowships presented students with a golden opportunity to enhance their knowledge, skills and learning by providing a platform for students to solve real problems of the industry. The students were asked to work on their innovative ideas, develop potential solutions and submit their proposals.

The first batch of students awarded with the CHANAKYA Fellowship was announced in January, UG students awarded with the prestigious fellowship received a fellowship grant of Rs.10000/- per month and the PG students received Rs.12400/- per month.

Huge congratulations to the following students from ECE department who were selected for the fellowship:

- 1.Md. Adil Arif
- 2.Chandan Gupta
- 3.Aditya Saini
- 4.Rohith Rajesh
- 5.Shragvi Sidharth Jha
- 6.Ajay Kumar
- 7.Mohammad Siraj Ansari
- 8.Moksh Aggarwal
- 9.Harsh Verma
- 10.Ayush Bhardwaj
- 11.Somya Sharma
- 12.Zuber Khan
- 13.Tanisha Jain
- 14.Tanay Singhal



Achievements

- Piyush Rajan Sahoo(ECE Batch of 2021), Ramesh Rajoria(ECE Batch of 2021), S.J. Darak(Associate Professor, ECE Dept.), S. Chandhok D. Pau, and HD. Dabral has won the best paper award for “Outstanding Application-oriented research” for their paper “Resource-Constrained Neural Networks for Direction-of-Arrival Estimation on Micro-controllers” at the AIMLSystems conference, 2021
- Dr. Sanat K Biswas has been selected as a member of the Technical Committee on Space Communications and Navigation (SCAN) of the International Astronautical Federation.
- Sanjit Kaul, Angshul Majumdar, and Ranjan Bose have been featured in the list of World’s Top 2% scientists database 2021, which Elsevier recently released based on a study conducted by researchers from Stanford University, USA, from over 100,000 top scientists of the world based on standardized citation indicators such as information on citations, H-index, co-authorship adjusted hm-index, citations to papers in different authorship positions, and a composite indicator.



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University



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- Dr. Himani Joshi (Ph.D. Alumni, ECE Dept.), under Dr. Sumit J Darak (Associate Professor, ECE Dept.), has been conferred with the Best Ph.D. Thesis Award by COMSNETS for her thesis titled "Intelligent and Reconfigurable Ultra-Wideband Spectrum Characterization at Sub-Nyquist Rate." COMSNETS is a high-quality annual conference that showcases some of the best research from India and worldwide.
- Shragvi Sidharth Jha (ECE B.Tech Student) and Aakanksha Tewari (Ph.D. Student) has won the VLSID Design Contest for their project "Design and Performance Analysis of Radar Receiver for Joint Radar Communication Systems on RFSoc" under the guidance of Aakanksha Sneh (Ph.D. student), Dr. Sumit J Darak (Associate Professor, ECE Dept.) and Dr. Shobha Sundar Ram (Associate Professor, ECE Dept.).
- Prashasti (Ph.D. Student) is one of the 100 research scholars to receive the prestigious scholarship CII-SERB 'Prime Minister's Fellowship for Doctoral Research in its 15h round, a scholarship by Science & Engineering Research Board, Department of Science and Technology, Government of India, and Confederation of Indian Industry.



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Club Highlights

IEEE

- X-GRID: The Inaugural Crossword

IEEE IIIT-Delhi organized the inaugural edition of X-Grid, IEEE's crossword event, on 12th November 2021.

The event's theme was 'The World of Internet and Technology, with anything from memes to companies to entrepreneurs being asked in the crossword in the form of cryptic and funny clues. The event saw enthusiastic participation among the students and the distribution of fantastic prizes.

- Tech Talks Debate

IEEE IIIT-Delhi organized 'Tech Talks', a one-of-a-kind group discussion cum debate event, on 19th November 2021. The event involved three rounds of amazing prattle, with the best participants from each group qualifying for the next rounds. The participants argued on various topics, including some of the most challenging decisions faced by people in prominent positions, and got a chance to win prizes worth 2500.

- Slash – The Cryptic Hunt

IEEE IIIT-Delhi organized its flagship event, Slash, IIITD's one and only cryptic hunt. The event was held on 21-22nd January 2022 where the participants had a period of 24 hours to prove their mettle. The hunt involved solving clues which tested the participants deciphering skills and logical abilities. The event offered prizes worth 10000 to the winners.



IEEE
IIIT Delhi
Student Branch

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CYBOG

- Introduction to Arduino

In the month of December, Cyborg in collaboration with Electroholics, gave an informative and helpful introduction to Arduino circuits that not only covered all the basics, but also delved into the know-hows of simulating these circuits. Alongside this, they also explored and taught the participants how to create circuit prototype on TinkerCad software.



- Introduction to Robotics

Cyborg conducted its first sessions on Introduction to Robotics on the 26'th of January 2022. The session covered basic concepts and broad elements of how problems are framed in robotics and the club plans to expand and approach it in more detail in subsequent sessions. The program ended with doubt clearing sessions as well as a general discussion about the participants' interests and ideas on the topic.

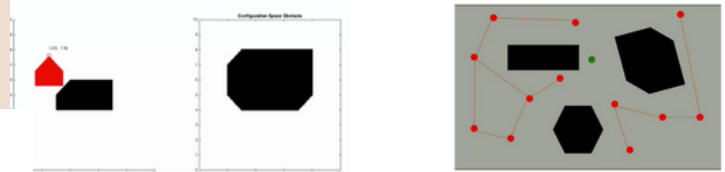
What is the height of the man in the image?



Configuration Spaces

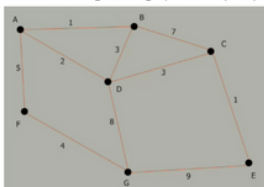
In simple terms, the configuration space is the set of all points(configurations) that our given robot can attain without colliding with an obstacle. There are a lot of ways one can plan a path using this tool such as

- Visibility Graphs
- Trapezoidal Decomposition
- Probabilistic Road Maps



Path Planning Algorithms

We use something called graphs to help us plan out these trajectories



Dijkstra's Algorithm



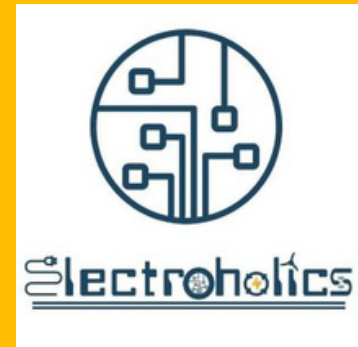
Grassfire Algorithm

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ELECTROHOLICS

- Electroholics is the hardware and electronics club of IIITD. We work on exciting hardware projects, organize hackathons and host interactive technical sessions with guest speakers from the industry. Our teams also participate in inter-college contests. We believe in the spirit of creativity and open knowledge, and using these to make awesome things!



Events from Oct 2021 to Feb 2022

- Circuit Debugging, Design and Analysis challenge

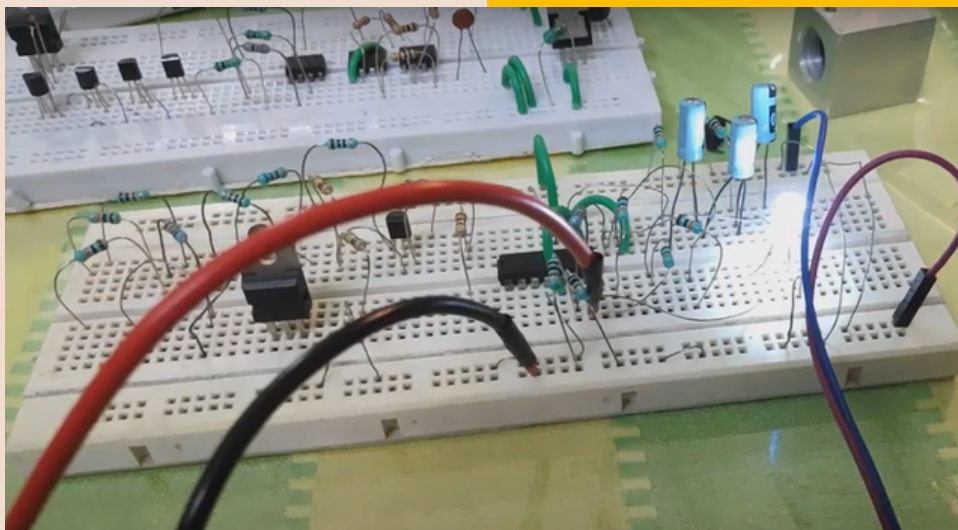
3-Part Challenge that tested the ability of participants to design circuits based on a given description, as well as debug and figure out the functionality of circuits provided their schematics.

- Space Race 2.0 (collab with Astronuts)

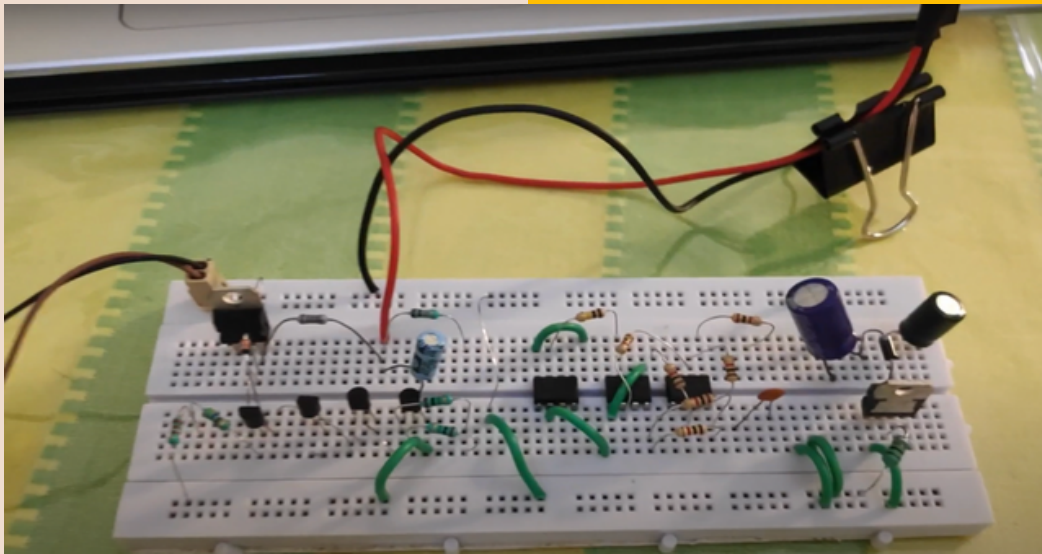
Workshop on the Basics of Orbital Mechanics followed by a simulation task on the app Space Flight Simulator.

PROJECTS COMPLETED

OpAmp RC Phase Shift Oscillator: AC Oscillator Circuit which outputs a sine wave with adjustable frequency. Implemented using an OpAmp and a feedback network of resistors and capacitors.



Audio Amplifier: Self Explanatory



ONGOING PROJECTS

Recreating Ben Eater's Version of an 8-bit Turing complete Simple-as-Possible computer. <https://eater.net/8bit/>

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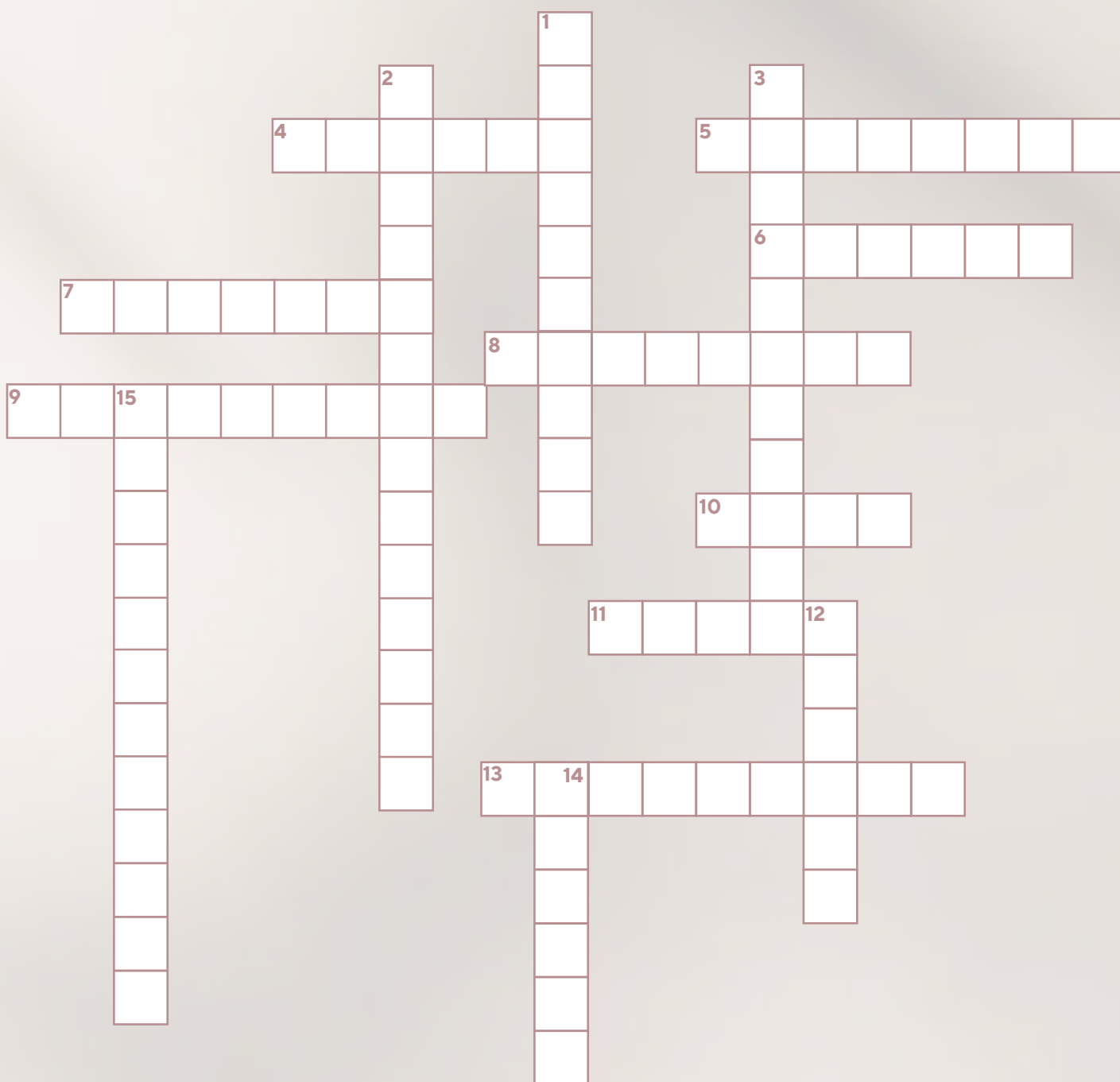
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Crossword



Crossword Across Clues

4. Physical property of matter that causes it to experience force in an EM field.
5. Transcending the boundaries of 0s and 1s to bring them together.
6. A clock or a watch with hands.
7. Munna bhai's best friend and sidekick.
8. "Sophia," a social humanoid, was created as a result of this branch of engineering.
9. A subset of Optics, this could be the force behind a real lightsaber.
10. Like terms are high, unlike are low.
11. Theorem for conditional probability
13. This is used to manage the flow of electricity in a circuit.



Crossword Down Clues

1. Before its invention, engineers actually used polished wood made for slicing a staple food item, to fix electrical components.
2. A branch of science involving the manipulation of atoms or molecules, famously depicted in the movie Terminator 2.
3. Used in camera flashes to produce a bright flash of light in a short time.
12. Function carrying information in the physical world typically by means of a gesture/action/sound.
14. MATLAB: Programming language developed by a mathematics professor, which was simply a MATrix calculator initially.
15. Oscilloscope: Device displaying continuous crests and troughs.

Across Answers

4. Charge 5. Karnaugh 6. Analog 7. Circuit 8. Robotics 9. Photonics 10. XOR 11. Bayes 13. Impedance

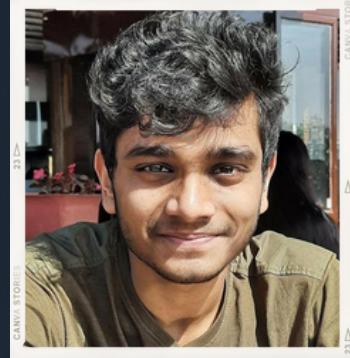
Down Answers

1. Breadboard 2. Nanotechnology 3. Capacitance 12. Signal 14. MATLAB 15. Oscilloscope

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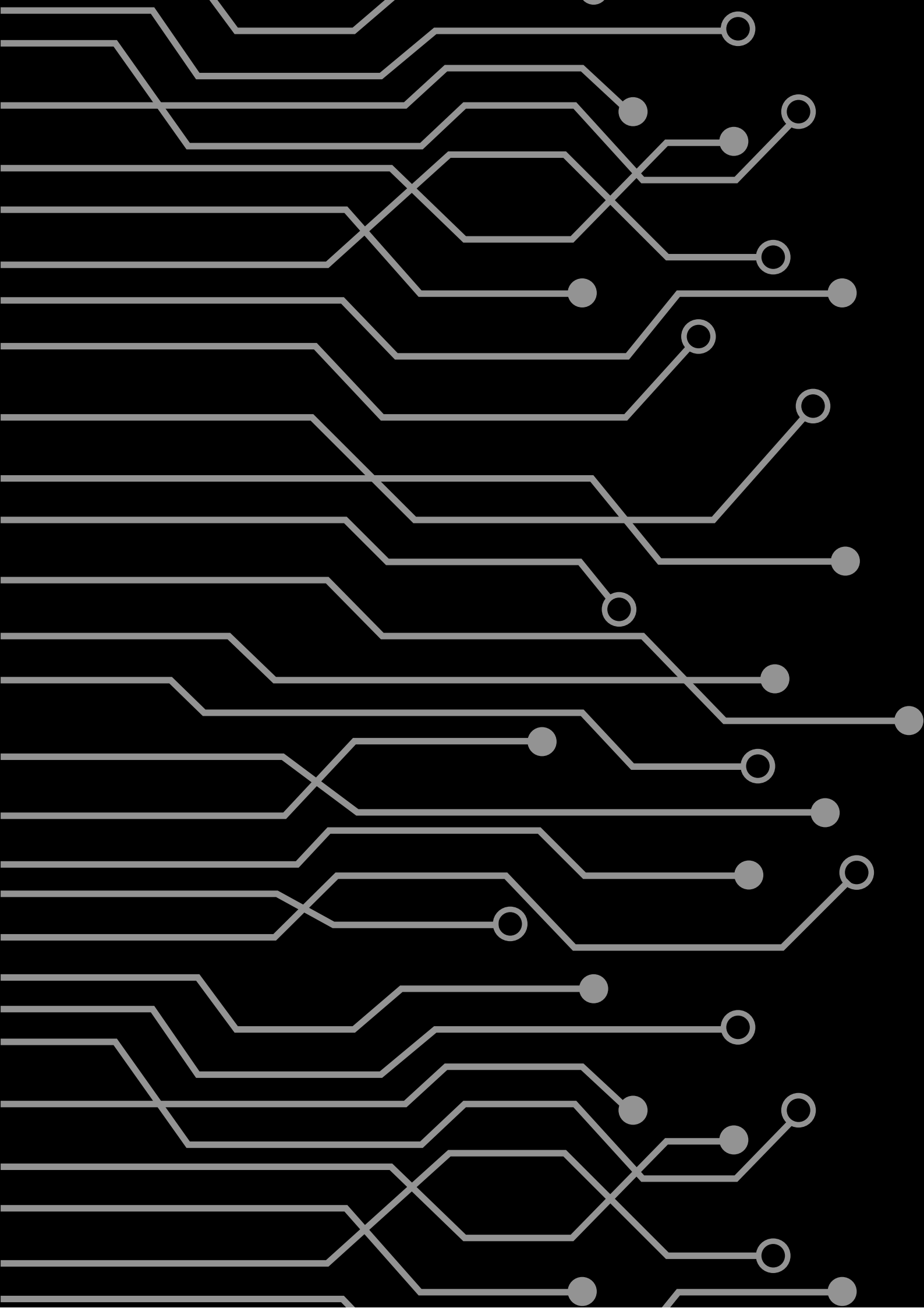


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