

Abhikshnata

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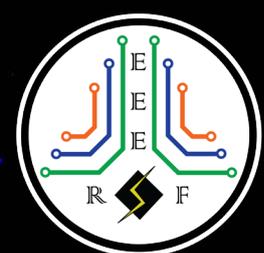
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Miscellaneous



अभिकक्ष्णता

One of the most commonly used term by any electrical or electronics researcher is 'frequency'. The title chosen for this newsletter, 'Abhikshnata' (अभिकक्ष्णता), is a Sanskrit tatsama word that comes close to describing this term and more. Abhikshnata literally means 'ability to rotate in cyclical nature'. This word is seldom used and, in terms of pronunciation, it is certainly not an easy one. Nevertheless, the editorial team finalized it because of its possible larger philosophical implications. It is, of course, not our intention here to delve too deep into Indian philosophy. Simply put, Abhikshnata reflects the eternal cyclical aspect of material creation. Unfortunately, there is no single English word to justify its true meaning and this can be seen from a few simple examples: One complete cycle of the minute hand in a clock would mean an hour, one complete rotation of the earth on its axis would mean a day, one complete rotation of the moon around the earth is a month, a full circle of the earth around the sun is a year, and so on. All these just mean cycles of time, albeit of different lengths. Clearly, Abhikshnata is much more!

Essentially, we experience our life based on different events which depend on time and competence, and both of these are based on the cycle of cosmos. For the technology-driven modern world to move forward, more creative engineers are required as, often, technology could be destructive in nature. The most important aspect is to understand that every artificial creation should be in unison with nature and all its creation. This central idea should be seeded in our mind and in our consciousness. To be the force of universal well-being, our technology should be in sync with the cyclical nature of this vast cosmic creation. As engineers and researchers, we should strive to be on the side of greater good, and take the responsibility to ensure that technology should not be exploitative and should be of benefit to all the creation. This would mean that our body, mind, intelligence, and emotions should all be in sync with the cosmic Abhikshnata of the creation. In short, we should all work for the betterment of the society in complete unison with our mother nature.

The Research Scholar Forum has added another feather in the cap of EEE Department by taking initiative to publish a magazine entitled as “Abhikshnata”. It is really my proud privilege to write the foreword for this edition. It is very heartening to note that this magazine has been launched in the year when both the Institute and the Department are celebrating Silver Jubilee of their inception. Starting from a humble beginning, both the Department and the Institute have made good progress and are now ranked among the top within the country. In these years, the EEE Department has achieved a number of milestones and one of them is attracting a critical mass of dedicated faculty and bright research scholars across the nation. With the award of the first PhD in 2004, there are 128 PhDs graduated from the department so far. This is a good beginning, but there are many more challenges lying ahead. In the coming decades, India is projected to become the top 3 economies in the world. Certainly, it sounds very pleasing to our ears, but also demands greater responsibility on the part of all institutions of the nation, in particular, the technical institutes. The role of the technical institutions is going to be very crucial. Apart from imparting the technical knowledge, they need to actively participate in the development of technologies along with the industry. The research on problems concerning the immediate needs of the nation should be given due priority and incentivized more. At the same time, appropriate checks and balances need to be established so that minimum delivery can be ensured. Without such radical transformations, it would be very difficult to sustain the economic dominance for long enough so that its benefits percolate down to the grassroots.

The future is going to be challenging as well as exciting for the younger generation and my humble advice to them would be to set high goals but lead a simple and sustainable life. In this regard, I quote Ratan Tata, a famous industrialist, philanthropist and Padma awardee-

“
Life is not only good educational qualification or good career. Your goal should be to have a balanced and successful life. Balanced life means your health, good relations with people and peace of mind. Everything should be good.
 ”

I am really impressed by the choice of the name of the magazine. I take this opportunity to extend my heartiest congratulations to all the contributors and the editorial team for their excellent work in bringing out this edition. I eagerly look forward to future editions.

With best wishes,

Prof. Rohit Sinha
 Head, Department of EEE



“
No resistance can drop our potential
 ”
 – *Anonymous*

In this lightning era of technology, the electronics and electrical engineers have had a huge contribution. Today's medical advancements and high-speed communications are flag-bearers of the same. With the vision of pursuing their research in cutting-edge technologies, the research scholars of the Department of Electronics and Electrical Engineering (EEE), IIT Guwahati have been marching ahead to do their bit. The supervision and guidance from the esteemed faculty members help them realize their dreams into reality.

The Research Scholar Forum (RSF)-EEE, a body formed to establish co-ordination among the research scholars (both past and present) and showcase research activities of the department, takes pride in releasing their newsletter for the academic year 2018-19 in an effort to pen down every possible information about research-related activities of the department. It aims at keeping the research scholars and faculty members on the same page by letting them know about various research works being undertaken in the department, publications achieved, recognitions and awards received by our faculty members, hearing from our alumni and experiences of our research scholars while attending various conferences abroad. Also, it provides inspiration and guiding light for the newcomers in their research-path as they get to know about the state-of-the-art inventions and discoveries across the diverse areas of electronics and electrical engineering being worked upon in the department.

Last but not least, we would like to thank the HoD of our department, Prof. Rohit Sinha, who has been cooperating with us in all of our events in every manner and sharing his message through this newsletter. A big thank you to our faculty advisor, Dr. Arun Tej M, for his valuable suggestions whenever the team seemed clueless about how to proceed with things. Our heartfelt gratitude to Mr. Bikram Paul, Marketing Head, RSF-EEE, for coming up with such an apt name for our newsletter. A huge shout-out to our team for such a wonderful coordination enabling us to organise our events in a very efficient manner and motivating us to compile this newsletter. We acknowledge the contribution of the research scholars who have contributed in their own way, either by sharing their articles or by providing information sought from them.

We look forward to the readers having a good time while going through our newsletter and get an insight about the various research horizons of our department. We would also be happy to hear from them regarding any feedback and suggestion which can be taken care of in the forum's future editions of the newsletter.



Thockchom Birjit Singha
 Editor-in-Chief



Arunima Dutta
 Editor-in-Chief



Manoranjan Minz
 Creative Head



Nayan Moni Baishya
 Marketing Head

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MISCELLANEOUS

SCIENCE meets TECHNOLOGY at "NANO"

The famous physicist Richard Feynman quoted, "There is plenty of room at the bottom", in his lecture at the annual meeting of American Physical Society (APS) at Caltech on December 29, 1959. He is the winner of 1965 Nobel Prize in Physics for his work in the field of quantum electrodynamics. Actually, many scientists consider this day as the birth of NANOTECHNOLOGY. It was the true genius of R. Feynman who envisioned the manipulation of larger amount of matter on an atomic scale. He also visualized the making of "nanoscale machines" capable of arranging the atoms the way we want. At that point in time, it was hard to believe in the manifestation of such nanoscale machines and devices, but nowadays, these are a part of reality. Nanotechnology is one of the leading research areas which has resulted in encouraging outcomes in the field of micro-nano electronics, biomedical engineering, drug delivery, biosensors, etc. Therefore, in this context, it will be apt to discuss the state-of-the-art facilities that are currently available in the Centre for Nanotechnology (CNT), IIT Guwahati, where major research is going on for the development of theranostic devices, biosensors and nanoelectronics. The CNT primarily has three labs, known as fabrication lab (room no. 3001), characterization lab (room no. 3002) and oxidation diffusion furnace (ODF) lab (room no. 3004).



Field Emission Scanning Electron Microscope (FESEM, Make: JEOL)

The fabrication lab is equipped with basic instruments required for fabrication of silicon, organic and inorganic material based devices. Field Emission Scanning Electron Microscope (FESEM, Make: JEOL, Model: JSM-7610F) is the mainstay of this lab providing an image resolution up to 10 nm. FESEM is integrated with Electron Beam Lithography (EBL), which provides sub-200 nm patterning resolution. To achieve such fine resolution, proper optimization of several parameters, associated with EBL, such as dose quantity, dose energy, etc. is required. Once micro-to-nano channels are fabricated using EBL, microelectrodes with a resolution (or channel gap) of sub-500 nm can be fabricated by depositing aluminium with the help of thermal evaporation. Metal film deposited using thermal evaporator have thickness of 150-200 nm.

However, for successful fabrication of microelectrodes, the lift-off process needs to be optimized by dipping the metal-deposited sample in acetone for 5-10 seconds. Organic evaporator is also available which enables deposition of organic materials, such as polymers. An RF sputtering system deposits metals and metal-oxides. Initial deposition trials have been tried with silver metal target, whereas, deposition of metal-oxides, such as barium oxide is under optimization process.

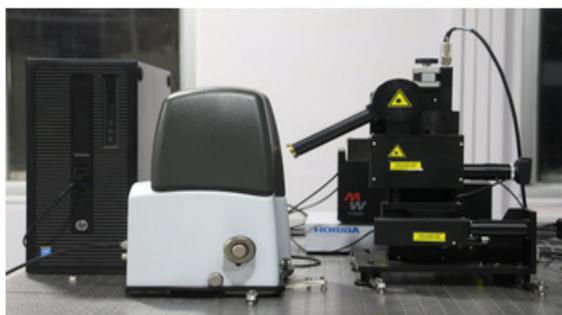
Masks are one of the most vital and expensive tools used for device fabrication. In this regard, the fabrication lab is resourced with a mask writer, capable of developing patterns with a resolution of sub-10 μm . The mask writer has been optimized for a pattern resolution of 3 μm . It can also fabricate hundreds of mask designs on a chrome coated soda-lime glass within few minutes, merely by a photo exposure mechanism (i.e., UV photolithography). The masks thus fabricated can also be aligned with other masks on a different silicon wafer using double sided mask-aligner (DSMA).



DC Probe System from LakeShore Cryotronics (Model:CPX)

For electrical characterization of fabricated devices, there is an RF probe station from CasCade and two DC Probe Stations (DCPS)- one from LakeShore Cryotronics (Model:CPX) and the other from EverBeing Int'l Corp (Model: BD6). The CasCade RF Probe Station is attached with PNA (Make- KeySight Technologies) and is used to measure s-parameters and gain of frequency-based devices. The operating frequency range is over 20 GHz. The DCPS from LakeShore Cryotronics can perform I-V measurements of devices for temperatures varying from 77 K to 600 K in vacuum. For low temperature I-V measurements, pressurized liquid nitrogen (near 60 litres) is required which can be used for 3 days of continuous experimentation. Standard Operating Procedures (SOP) for low temperature I-V measurements have been developed till 77 K using liquid nitrogen. I-V measurements can be performed for temperature as low as 4 K using liquid Helium. The DCPS from EverBeing is operated at room temperature without having any vacuum chamber for samples. It is easy to operate and provides quick I-V measurements. Apart from that, C-V, pulsed C-V and pulsed

I-V measurements can be performed upon connecting it with Keithley 4200A (Semiconductor Characterization System) SCS-Parametric Analyzer. The fabrication lab also has Controlled Environment Chamber (CEC), which has been fully developed by an Indian company. It is used for gas sensing experiments and is under optimization with test gases, such as CO₂, CO, NO₂, hydrogen, etc. In order to measure the sensing parameters of the device, CEC is interfaced with Parametric and Network Analyzer. The lab is also equipped with Laser Micro-Machine (LMM), optical microscope, spin coater, impedance analyser, hot-plate and an Electron Spinning Device (ESD), which is developed by an IIT Kanpur start-up.



Atomic Force Microscope (Make: Bruker)

The second major lab in CNT is the characterization lab with the most prominent facility of Atomic Force Microscope (AFM) from Bruker, which is used to study surface roughness, surface uniformity and thickness of the samples. The lab also has facilities for Raman spectroscopy and Tip Enhanced Raman Spectroscopy (TERS) for characterization of various kind of samples. A Material Printing System (MPS) is also installed which is basically a micro-cantilever based printing and deposition system. It has a capability to print structures with size ranging from 0.5 μm to 1000 μm on diverse substrates based on quality, chemical and physical composition of ink used for printing. A UV-ozone cleaner is stationed for substrate cleaning and a confocal microscope captures images of biological samples, such as cancerous cells based on the phenomena of fluorescence. The lab also has UV-Vis Spectrophotometer for optical characterization. Glove-Box, used to deal with hygroscopic samples has been recently installed with mini-sputtering system and is under optimization. The lab also has cyclic voltammetry system for electrical characterization of electrolytic or liquid based samples. A

Transmission Electron Microscope (TEM) for high-end resolution imaging in sub-1 nm regime is also stationed in the lab, in collaboration with Central Instrument Facility (CIF), IIT Guwahati.



RF Sputtering System

Finally, the ODF lab has the provision of oxidation process that enables the growth of silicon oxide layers of varied thickness. Typical oxide thickness achieved through ODF ranges from 20 to 200 nm. Doping of both p-type and n-type can also be performed using ODF based on diffusion processes. Apart from ODF, basic facilities required for various fabrication processes, such as wet-bench system for cleaning of substrates, de-ionized (DI) water production plant and ultra-sonicator are also available in this lab. It also has a facility of wire-bonder (with aluminium, gold and copper wires) to connect micro-to-nano level devices to outer electrodes for further testing and experimentation. This was a brief summary regarding current facilities available for fabrication and characterization of various kinds of nanotechnology based devices. Many other facilities, such as Reactive Ion Etching (RIE), Chemical Vapour Deposition (CVD) system, etc. are under procurement which will be installed in CNT in future. It can be concluded from this article that IIT Guwahati is graced with state-of-the-art fabrication and characterization facilities in the area of nanotechnology. We hope towards the development of exciting and efficient devices in CNT, IIT Guwahati which has certainly a great research potential ahead where research is going to be interdisciplinary in nature and where SCIENCE meets TECHNOLOGY.

P.S. Please visit the following link to see and uncover the details of various instruments mentioned above:

http://172.16.57.6/CENTD/New_CENTD/index.html#project

Vimal K S Yadav

Ph.D. Research Scholar,
EEE Department, IIT Guwahati

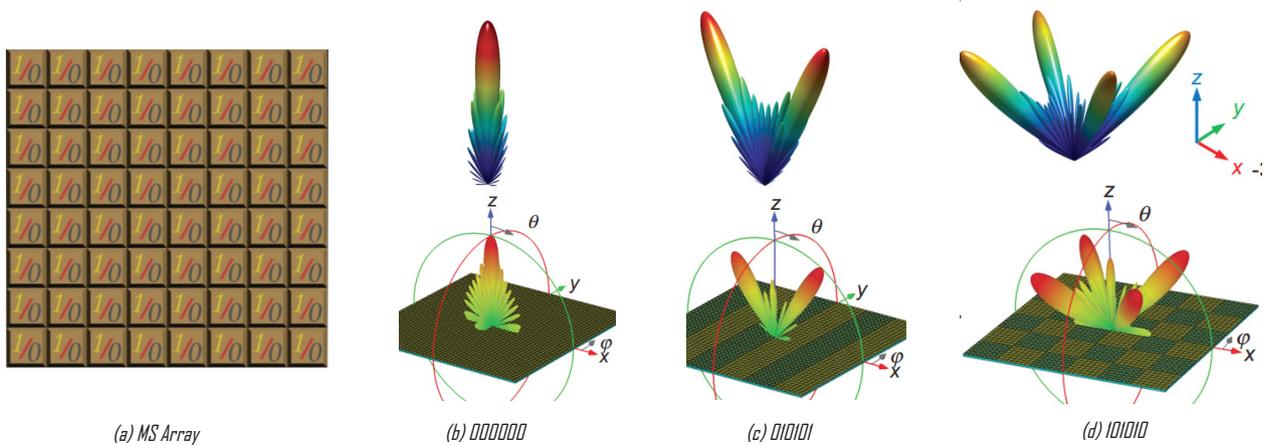


Vimal Kumar Singh Yadav is pursuing his Ph.D. under the supervision of Prof. Roy P. Paily in the field of printed electronics for electronic device fabrication at micro-to-nano level for sensing applications at the Department of Electronic and Electrical Engineering, Indian Institute of Technology, Guwahati. He has completed his M.Tech in Electronics, Design and Technology from Tezpur University, Assam in 2014 and B.Tech (HONS.) in Electronics and Communication Engineering from Faculty of Engineering and Technology, RBS College, Agra (affiliated to Uttar Pradesh Technical University, Lucknow) in 2011.

The world of metasurface

Metamaterials (MM) are artificial materials which have negative refractive index, thus forming the image of the source after refraction, in the line of sight. Discovered by Dr. J. B. Pendry and Dr. D. R. Smith, MM are used as focusing lens, cloaking device, filters and in miniaturizing antennas having higher gain and better radiation pattern. The 2D version of MM, i.e. metasurface (MS) has many exciting properties with thickness of dielectric substrate of the order of $\lambda/10$, where λ is the operating wavelength. With very thin MS, various studies in realising polarizer converters and filters in microwave and terahertz frequency have caught the attention of researchers and scientists. Recent works show the use of MS in tuning it and giving them binary code according to their reflection and transmission phase or amplitude of the respective coefficients. This discovery enabled the array of MS to be used for steering the beam more easily

using phased arrays, which are bulky and cumbersome. A high resolution imaging can be done using MS and its light weight enables its integration with the antennas and radars easily without increasing the overall size and weight. Each unit cell in the digital MS is given a binary code, i.e. either “0” or “1” according to the phase or amplitude of the transmission and reflection coefficients. The overall array, which may consist of 30×30 unit cell, creates a binary code pattern which helps the incident beam to be tuned, reflected and transmitted in a specific direction. For example, Fig. 1(a) shows the array of the digital MS which can be tuned to either “0” or “1” by applying a bias voltage to varactor or PIN diode. Fig. 1(b) shows the reflected beam in the direction of $\theta = 0^\circ$, and, for coding sequence 010101..., the beam is reflected in the direction of $\theta = 30^\circ$ as observed in Fig. 1(c). For reflection in $\theta = 60^\circ$ direction, the coding sequence is changed to 10101... as observed in Fig. 1(d). Hence, by varying the digital coding sequence of the metasurface unit cell, the beam can be tilted to the required direction.



(Source: Tie Jun Cui, Mei Qing Qi, Xiang Wan, Jie Zhao & Qiang Cheng, "Coding metamaterials, digital metamaterials and programmable metamaterials", Light: Science & Applications volume 3, page e218 (2014))

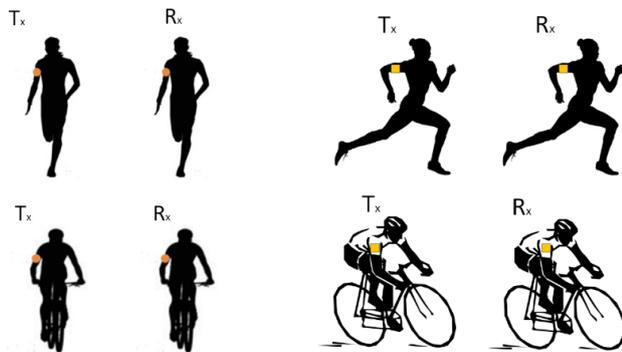
Amit Kumar Baghel
Ph.D. Research Scholar,
EEE Department, IIT Guwahati

Amit Kumar Baghel joined Indian Institute of Technology Guwahati to pursue his Ph.D. degree under the supervision of Dr. S. K. Nayak in the Department of Electronics and Electrical Engineering in 2014. His research area includes wireless power transfer using metamaterials, GRIN lens, and antenna design. He also works in high power rectenna design. He did his Bachelor of Technology from NIT Surat, Gujarat in the year 2014.



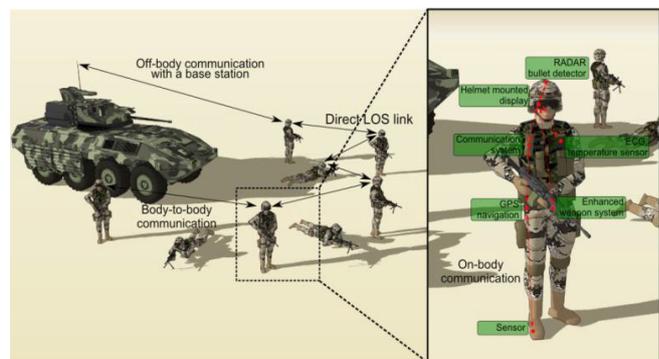
Next generation communication – Body to body (B2B) communication

Body-to-body communication has its potential in various fields like sports, health, entertainment, military, and other applications. It is an amalgamation of various fields like signal processing, communication, and antenna design. Data transmission takes place from a wearable device located on the body of a person to another device located on the body of another person either nearby or geographically separated by some distance. Wearable antennas are designed and integrated on a chip to serve this purpose. The received signal power and fluctuations need to be studied by various signal processing techniques. In such communication, data transmission at both ends would be affected by shadowing effects resulting in movement of bodies. So, scatterers would be present at both transmitting and receiving ends, thereby impacting the communication links. Both the bodies are in relative motion, thereby, resulting in time varying shadowing effects. Hence, the channel model needs to be suitably designed to take all these factors into account. Depending on the nature of application, the communication scenario may vary. B2B communication can be of line-of-sight (LOS) or non-line of sight (NLOS) type.



B2B communication can be used for health monitoring purposes like monitoring patients remotely, cardiovascular disease detection, sleep monitoring, etc. Moreover, it can be used in military domain to monitor the status of a soldier in battlefield and to exchange critical information among soldiers. Exact location and fatigue details can be tracked through such devices resulting in the better management of soldiers on warfront. This technology can be deployed in sporting domain to get live updates about the status of an athlete during events. The performance can be monitored and any abnormalities can be immediately tracked. In some sports, some fatalities occur due to abnormal performance of various body organs during sports events. This type of communication can be useful in stopping various mishaps like heart attacks, strokes etc. Currently, research in this field is at a nascent stage, but in future it is expected to help mankind to avoid many adversities. Presently, it is operating in the radio frequency band of 2.45 GHz and its potentiality is unexplored in many domains.

Some images are shown below which depict the application of B2B communication for running and cycling activities under two different scenarios: one where the subjects are 'beside' each other and the other situation where the subjects are 'behind' each other.



Anirban Bhowal

Ph.D. Research Scholar,
EEE Department, IIT Guwahati

Anirban Bhowal is currently pursuing Ph.D. in Communication Engineering under the supervision of Prof. Kshetrimayum Rakesh Singh. His research area includes optical wireless communication and body to body communication. He completed his Bachelor of Technology in 2012 from Heritage Institute of Technology, and Master of Technology in 2015 from Indian institute of Information Technology Allahabad.



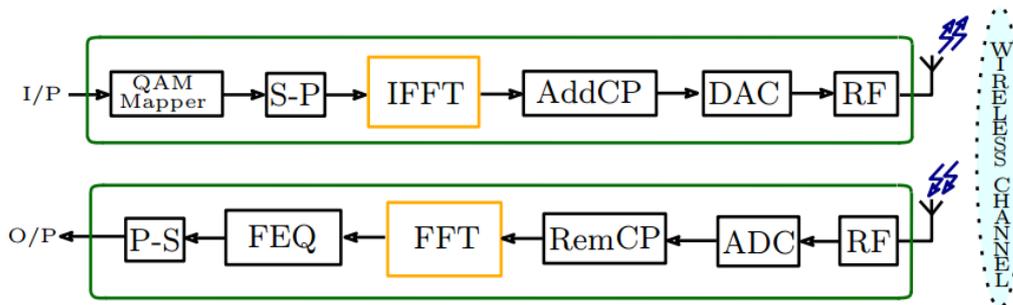
Forthcoming Wireless Communication Systems

Wireless communication is taking a rapid pace in the advancement of communication systems, with data rate operating in the order of gigabits per second (Gbps). The success of current fourth generation (4G) wireless networks has led to the development of fifth generation (5G), which is expected to bring more capacity and energy efficiency to the system. The recent works on research and development of 5G is expected to go beyond the current mobile experience, with thousand times the present amount of traffic for hundred times the present number of connected devices and machines to pave its way in the era of Internet of Things (IoT). By 2020, the number of connected devices are expected to be over 50 billion. As a result, 5G networks must be more adaptable, intelligent, and diverse to meet the upcoming requirements. In brief, the requirements of 5G networks include flexible, standards-based solution that combines software programmability, hardware optimization and versatile connectivity along with safety and security. The maximum achievable data rate with 5G is expected to be around 1 to 10 Gigabit per second (Gbps).

These data rates can be achieved with multi-carrier modulation technique, such as orthogonal frequency division multiplexing (OFDM). OFDM-based architectures are strong candidates for the physical layer implementation in 5G systems which will permit packet based high data-rate communication preferable for applications, such as

video transmission and mobile internet. Since throughput required for 5G lies in the range of 1 Gbps to 10 Gbps data-rate, therefore, high-speed architecture is of prior concern. Apart from the high speed of operation, the system demands low power consumption since it is primarily aimed at portable and mobile applications.

A typical OFDM system comprises of many operational blocks, such as quadrature amplitude modulation (QAM) mapper, serial-to-parallel (S-P) converter, inverse fast Fourier transform (IFFT), cyclic prefix adder (AddCP), digital-to-analog converter (DAC), radio frequency (RF), analog-to-digital converter (ADC), cyclic prefix remover (RemCP), fast Fourier transform (FFT), frequency domain equalizer (FEQ) and parallel-to-serial (P-S) converter. FFT and IFFT are the most fundamental building blocks in the system. The FFT is being extensively researched at both algorithmic and architectural levels. Although its algorithm is quite easily understood, the variants of the architectures and specifications are significant and are a time consuming task for hardware engineers. By adjusting the operation according to the system requirements, the efficiency of resource usage can be improved. Over the years, researchers have made continuous efforts for improving the performance of FFT processors in terms of throughput, area and power consumption. In particular, low-area and low-power FFT architectures are in demand since most of the portable devices have a limited power supply and are expected to consume as less area as possible. Thus, the design of an FFT processor is an important contribution in the context of hardware infrastructures for the next generation of wireless devices.



Jinti Hazarika
Ph.D. Research Scholar,
EEE Department, IIT Guwahati



Jinti Hazarika joined as a Ph.D. student at IIT Guwahati in 2016 under the supervision of Prof. Shaik Rafi Ahamed and Prof. Harshal B. Nemade. Her research area includes VLSI DSP algorithms and architectures. She received her Bachelor of Engineering degree from Jorhat Engineering College in 2012 and completed her Master of Technology from IIT Roorkee in 2015.

- Prof. Praveen Kumar organized a conclave on electric mobility, with the theme titled "Building a Nationwide EV Ecosystem: Opportunities in the Northeast," which was funded by Ashok Leyland, ANSYS, Lohia Auto, NonFerrous Materials Technology Development Centre (NFTDC) and Hero Electric.
- Prof. Ratnajit Bhattacharjee and Mr. T. Tiwari (SAMEER) organized a National symposium on Vacuum Electronic Devices and Applications (VEDA) 2018, jointly with SAMEER, which was funded by DRDO, SAMEER, CSIR, CST, IPR, ANSYS, CEERI, THERELEK ENGINEERS and attended by 100 participants.
- Dr. R. K. Sonkar and Dr. Chandan Kumar have been awarded Young Faculty Research Fellowship (YFRF) of Visvesvaraya PhD Programme of Ministry of Electronics & Information Technology, MeitY, Govt. of India for a period of 5 years.
- Dr. Prithwijit Guha has developed a new course titled "Video Analytics" which is awaiting final approval from the senate.
- Prof. Ratnajit Bhattacharjee delivered an invited lecture titled "Microwave power dividers and multiband impedance transformers: some recent trends" in IEEE MTT-S International Microwave and RF Conference (IMaRC 2018).
- The paper entitled "Dense 3D Reconstruction of Endoscopic Polyp", authored by Prof. M. K. Bhuyan has been selected for the BIOIMAGING 2018 (PORTUGAL) Best Poster Award.
- Prof. Ratnajit Bhattacharjee visited Technical University Denmark as Ph.D. thesis examiner in April 2018.
- Mr. Amit Kumar Baghel (Research Scholar) and Mr. Shashak S. Kulkarni (Project Staff) have been awarded the Gandhian Young Technological Innovation (GYTI) 2018 award for the project titled "Feasibility Study of Wireless Power Transfer using Metamaterial," from Honorable President of India in Rashtrapati Bhawan, New Delhi. The project work was carried out under the supervision of Dr. Sisir Kumar Nayak (Dept of EEE) and Mr. D. Senthil Kumar (MTRDC, Bangalore).
- Niharika Baruah, Mrutyunjay Maharana, Dr. S. K. Nayak, and N. Sahoo received Best Poster Paper Award for "Comparative study of mechanical and electrical strength of kraft paper in nanofluid based transformer oil and mineral oil," 7th International Symposium on Electrical Insulating Materials (ISEIM), Toyohashi, Japan.
- The paper titled "Low-Complexity Continuous Flow Memory-Based FFT Architectures for Real-Valued Signals", authored by Jinti Hazarika, Mohd Tasleem Khan, and Prof. Shaik Rafi Ahamed won the best student paper award in the 32nd International Conference on VLSI Design and 18th International Conference on Embedded Systems, 2019 (VLSID, New Delhi).
- Dr. Jiss J. Nallikuzhy, Prof. Samarendra Dandapat and Dr. Md. Khayrul Bashar have been awarded Best Paper Award for the paper title "Spatially Enhanced ECG using Patient-Specific Dictionary Learning" at the IECBES 2018, Borneo Convention Centre Kuching, Malaysia.
- Mr. P. Anoop, research scholar, received the best paper award in IEEE-INAE WORKSHOP ON ELECTROMAGNETICS (IIWE 2018) for the research paper entitled "Expression for Quality Factor of TM₀₁ Delta Mode in Equilateral Triangular DRA," co-authored with Prof. Ratnajit Bhattacharjee.

PATENT

- ◆ G. Rituraj and P. Kumar, “Unipolar coil arrangement method for improving the coupling factor and reducing the electromagnetic emissions in wireless power transfer systems and a coil thereof,” Indian Patent 201931003386, filed on Jan 28, 2019.

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- ◆ D. Sarma and M. K. Bhuyan, “Hand Gesture Recognition Using Deep Network Through Trajectory-to-Contour Based Images,” IEEE India Council International Conference (INDICON), Dec 16-18, 2018.
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- ◆ Himangshu Jyoti Gogoi, Ankur Solanki, Arun Tej Mallajosyula, “Effect of Antisolvent Method on the Performance of HOIP based Memristive Devices,” 4th International Conference on Emerging Electronics (ICEE 2018), IISc Bangalore, 16-19 December 2019.
- ◆ I. Das and N. Nallam, “Systematic Generation of Flicker and Thermal Noise Canceling Circuits,” IEEE International Symposium on Circuits and Systems (ISCAS), Sapporo, May 2019. (Accepted)
- ◆ Jinti Hazarika, Mohd Tasleem Khan, and Shaik Rafi Ahamed, “Low-Complexity Continuous Flow Memory-Based FFT Architectures for Real-Valued Signals,” Proceedings of the IEEE on 32nd International Conference on VLSI Design and 18th International Conference on Embedded Systems, 2019 (VLSID, New Delhi). [Best Student Paper Award]
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“

Words are things, and a small drop of ink...

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That make thousands, perhaps millions think.

– Lord Byron

- ♣ The 10th Conference on Speech Technology and Human-Computer Dialogue (SpeD), 10-12 October, 2019, Timisoara, Romania.
- ♣ IEEE Biomedical Circuits and Systems Conference (BioCAS), October 17-19, 2019, Nara, Japan.
- ♣ IEEE Conference on Electrical Insulation and Dielectric Phenomena (CEIDP), October 20-23, 2019, Richland, Washington, USA.
- ♣ Asia Communications and Photonics Conference (ACP), November 2-5, 2019, Chengdu, China.
- ♣ IEEE Avionics and Vehicle Fiber-Optics and Photonics Conference (AVFOP), 5-6 November, 2019, Arlington, Virginia.
- ♣ International Conference on Power Energy, Environment and Intelligent Control (PEEIC), 18-19 November, 2019, Noida, India.
- ♣ International Conference on Condition Assessment Techniques in Electrical Systems (CATCON), 21-23 November, 2019, Chennai, India.
- ♣ International Conference on Intelligent Informatics and Biomedical Sciences (ICIIBMS), November 21-24, 2019, Shanghai, China.
- ♣ IEEE Asia Pacific Conference on Circuits and Systems (APCCAS), November 25-28, 2019, Bangkok, Thailand.
- ♣ IEEE Asia-Pacific Power and Energy Engineering Conference (APPEEC), 1-4 December, 2019, Macao, China.
- ♣ International Conference on Power and Energy Systems, 10-12 December, 2019, Perth, Australia.
- ♣ IEEE Automatic Speech Recognition and Understanding (ASRU) Workshop, 14-18 December 2019, Sentosa, Singapore.
- ♣ IEEE International Conference on Advanced Networks and Telecommunication Systems (ANTS), 16-19 December, 2019, Goa, India.
- ♣ 8th International Conference on Pattern Recognition and Machine Intelligence (PReMI), December 17-20, 2019, Tezpur, India.
- ♣ International Conference on Power Systems (ICPS), 20-22 December, 2019, Jaipur, India.
- ♣ International Conference on COMMunication Systems & NETworkS (COMSNETS), January 7-11, 2020, Bengaluru, India.
- ♣ SPIE Photonics West, 1-6 February, 2020, San Francisco, United States.
- ♣ SPIE Photonics Europe, 29 March-2 April, 2020, Strasbourg, France.
- ♣ IEEE International Conference on Communications (ICC), 7-11 June, 2020, Dublin, Ireland.

S. No.	Name of the student	Supervisor (s)	Thesis title
1	Vinay Kr. Pandey	Dr. Indrani Kar Prof. C. Mahanta	Adaptive Controller Design for Nonlinear Uncertain Systems using Multiple Model Based Two Level Adaptation Technique
2	Bhoopal Rao Gangadari	Prof. S. R. Ahamed	Low Power VLSI Architectures for Cryptographic Algorithms
3	Jiss J Nallikuzhy	Prof. S. Dandapat	Spatial Enhancement of ECG Using Transform Domain Models
4	Gaurav Kr. Yadav	Dr. Amit Sethi Dr. S. Krishnaswamy	Human Action Recognition using Differential Motion
5	Jitendra Prajapati	Prof. R. Bhattacharjee Dr. Amitabh Chatterjee	Analytical and Simulation Modeling of the Terahertz Photoconductive Antennas
6	Sameer Pawanekar	Dr. Gaurav Trivedi	Large Scale Circuit Placement and Partitioning using Nonlinear Analytical Optimization Methods
7	Satyabrata Dash	Dr. Gaurav Trivedi	Novel Metaheuristics for the Performance Analysis and the Design Optimization of VLSI Circuits
8	Arghya Chakravarty	Prof. C. Mahanta	Adaptive Compensation Based Actuator Fault Tolerant Control of Nonlinear Uncertain Systems with Emphasis on Transient Performance Improvement
9	Venkata Ramana Kasi	Prof. S. Majhi Prof. A.K. Gogoi	Identification of Process Models Using Relay Feedback Response
10	Deepak Joshi	Dr. Gaurav Trivedi	Analog/RF Circuit Optimization using Adjoint Network Sensitivity Analysis and Metaheuristics
11	Ripudaman Singh	Dr. B. K. Rai Prof. S. K. Bose	Low Delay and Low Energy Contention Based Synchronous Mac Protocols for Event-Driven Wireless Sensor Networks
12	Karam Singh	Prof. S. R. Ahamed	Power Efficient Motion Estimation Algorithms and Architectures for HEVC/H.265
13	Om Prakash Singh	Prof. Rohit Sinha	Exploration of Coarse Representation Techniques in Language Recognition
14	Harikrishna Veldandi	Prof. S. R. Ahamed	Performance Enhancement Techniques for Low-Voltage Bulk-Driven Circuits
15	Sonali Biswas	Prof. A. K. Gogoi	Design and Analysis of A Wearable Piezoresistive MEMS Accelerometer with Low Cross-Axis Sensitivity For Neurological Disease Diagnosis
16	Babita Jajodia	Prof. S. R. Ahamed Prof. Anil Mahanta	Design of IR-UWB Transmitter and Receiver for IEEE 802.15.16 Wireless Body Area Network System
17	Sunil Dutt	Dr. Gaurav Trivedi	Analysis, Design and Modeling of Approximate Adders for Error-resilient Applications
18	Pawan Kumar	Dr. Kalpana Dhaka	Performance Analysis of Conventional and Wireless Powered Decode-and-Forward Relay Systems
19	Pavan Kumar Manchi	Prof. Roy Paily Prof. A. K. Gogoi	Design and implementation of low power digital baseband transceivers for wireless body area networks
20	Vivek Venugopal	Dr. Suresh Sundaram	Exploration of novel descriptors for online writer identification

Dr. Rohan Kumar Das

Postdoctoral Research Fellow,
National University Singapore



What were your experiences during your stay in IITG?

It is a life-long experience to grow as an individual in one of the premier institutes of India. There is a great difference in the personality of an individual, from the day one enters IIT to the day he leaves. I do believe that the experiences during my stay not only helped me to develop a research mindset, but also introduced several other perspectives of life. Pages after pages can be written to share these experiences. However, to cut short, the experiences during my stay in IITG showed the path to be independent, yet work in collaboration to achieve some target. Further, I came to know the differences between confidence and over-confidence; being ethical and non-ethical; tolerance and intolerance; success and failure; amiable and dreadful, and many such aspects in a practical sense. Overall, the experience at IITG made me ready to face the real-life challenges ahead apart from igniting zeal towards research.

Something about maintaining work-life balance during PhD period.

Work-life balance is always necessary to stay healthy physically as well as mentally. During PhD, one is always occupied with a bunch of deadlines apart from TA duties and many other responsibilities. There are instances when one has to work whole day and night to meet a particular deadline. It is found that our efficiency is inversely proportional to the time left for a milestone. However, if someone has a proper timeline in mind and the roadmap is clear, then, such rush towards the end is unlikely. Therefore, it is advisable to always maintain a proper time schedule of work in order to balance the other side of life. Additionally, there should be flexibility in the work plan as everything always does not follow our expectations. As we call work-life "balance", a disciplined way is the key to maintain that.

Is there anything related to IIT Guwahati that makes you nostalgic?

Well, this question shows me a flashback of my entire journey at IIT Guwahati. I have to agree, almost everything is nostalgic! Whether it is the initial struggles in research, some good time with friends, laboratory group discussions, happiness with some publication acceptance or tough time during manuscript rejections, and many more. All these would always remain with everyone in some corner of the memory lane. To be honest, we spend a quality time of our life in such a vibrant environment, which most of us may not have experienced before entering to IIT. The moments spent in the campus are always cherished and close to the heart that echoes in mind from time to time.

Is there anything that you wish to suggest the current research scholars of the department to follow during their time in IIT Guwahati?

Every day is accountable; a little effort in each day in proper direction can lead to achieve milestones of research. Try to set own targets, even if you do not have some deadlines from mentors or manuscript submissions. It is good to follow the recent works belonging to one's area of research and then to carry out the works that are trending internationally. Never feel disappointed during research if something is not converging on your way, the light may be just a step away! The research will soon become your passion once you are completely devoted to it. I am sure the recent entrants to the department will be much more enthusiastic to raise the legacy of IIT Guwahati.

How did your research work help you to land at your current position?

I used to read the latest available research articles in my domain and, then, continuously followed some of those from leading research groups. Apart from attempting top tier conferences and journals, I participated in global challenges and competitions related to my domain during Ph.D. The participation in such competitions not only provides information of trending topics, but also a researcher's visibility in the international platform. Further, whenever I got chance to present works in renowned international conferences, I took them as an opportunity to connect and learn from the peers. I tried to work according to my planned schedule to meet the milestones throughout my thesis work. These are the few things that worked for me. However, every individual is different and one should find the best that works according to their final objectives.

Dr. Nabanita Adhikary

Assistant Professor,
Electrical Engineering Department, NIT Silchar



What were your experiences during your stay in IITG?

Studying in IITG has been so far the best experience for me in terms of academia. I came from a state engineering college knowing next to nothing about research and, here, I not only learnt things, but also found my passion in research. I must say that the college offered me a very good environment starting from the faculty, fellow researchers and the institution as a whole to actually thrive in my field.

Something about maintaining work-life balance during PhD period.

This is the most important thing during not only Ph.D. period, but throughout the whole life. Doing research can be exhausting and at times frustrating, even if we are passionate about it. But, it should not be the only thing in your life. Researching on a topic, trying to find answers should not leave your near and dear ones feeling abandoned. And, most importantly a work life balance is actually helpful in this time as sometimes even the most mundane things in life like going home and having a cup of tea with your loved one can actually refresh your brain enough to again start your quest the next day.

Is there anything related to IIT Guwahati that makes you nostalgic?

Apart from the academic life, IITG offered us with an abundance of excellent memories to keep with us forever. I will always miss my hostel mates, my labmates..all of these were different groups of people who were always there one way or another. And, the beautiful campus itself was like a companion. For me, especially, I miss the campus life there, it is updated, beautiful and a walk along the lakes is often enough to make you happy on a rainy day. And, of course, the core stalls and the tea breaks that offered us a bit of an escape whenever studies stuffed our head. As it seems, the list of nostalgia is endless when IITG is concerned.

Is there anything that you wish to suggest the current research scholars of the department to follow during their time in IIT Guwahati?

During research, there comes a point when we tend to lose heart. But, the point of research is to keep searching. I have seen people getting depressed when their colleagues publish and they somehow feel stuck in a rut. However, research is not competition. Yes, you need to publish, but in order to rush for publications, do not lower the quality of research. There are so many people around you, you have the back of the faculties of the entire institute. If you feel like you are stuck, discuss with people even outside your area. Sometimes another person's perspective can open new doors for you. Do not be an island, and do not be needlessly hard on yourself.

How did your research work help you to land you at your current position?

My current job requirement involves a Ph.D. degree. So, I think the contribution of the research was 100%.

Reminiscence of Jeju days !!



Sandeep Kumar Pandey
MS + Ph.D. Research Scholar

First foreign trips always hold a dear place in your heart and for me, it happened when my paper "Speaker Identification Using Tensor Decomposition of Acoustic Models" got selected in IEEE TENCON 2018, which was held in the beautiful island of Jeju, South Korea.

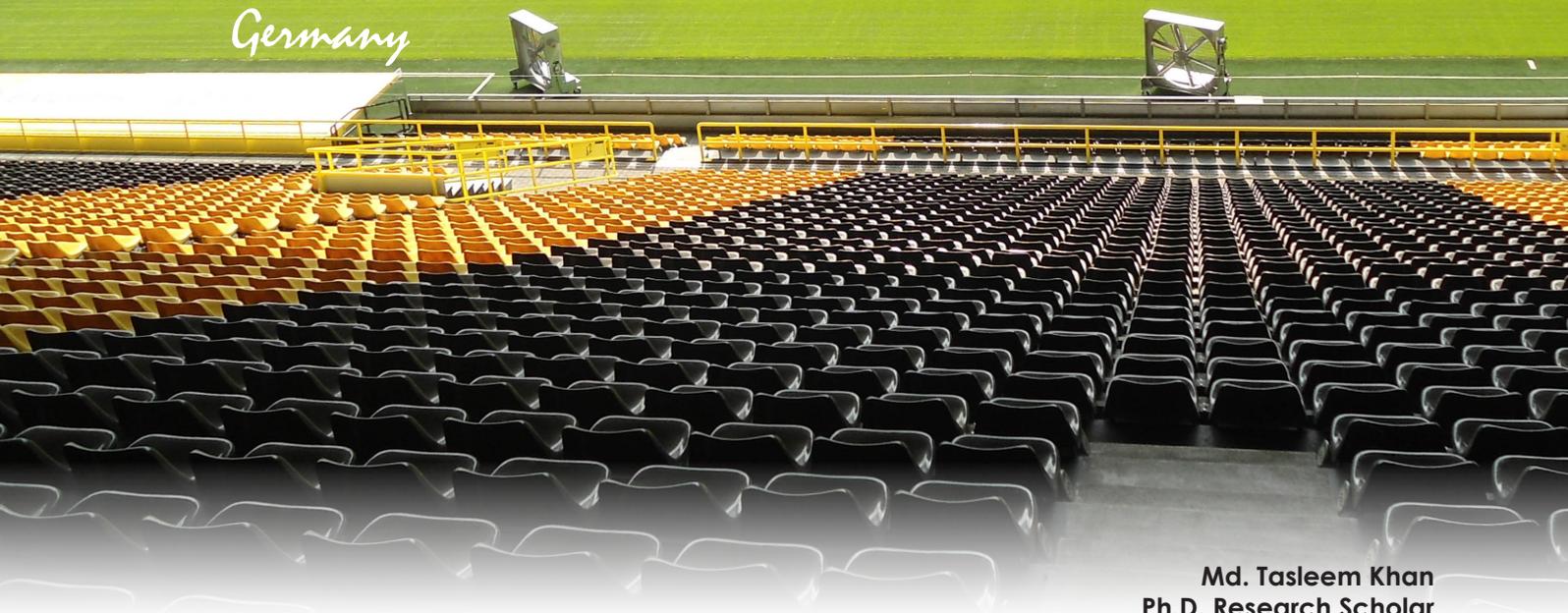
TENCON was the congregation of researchers, academicians, and industry people of varied research discipline. It gave me an opportunity to interact with global leaders of the research arena, such as IEEE President & CEO Prof. James Jefferis, Mr. Kyungwhoon Cheong, Head of R&D, Samsung Electronics etc. There was a huge participation from India, China, and Japan. I was glad to meet researchers from

neighbouring countries like Pakistan, Bangladesh, Sri Lanka, and Nepal. The Koreans are very hospitable. Language being a barrier there, Google Translate came to my rescue. Korea is a food heaven for non-vegetarian people, but sadly not for vegetarian people. The island is full of natural beauty among which the ones I visited were- Mt. Hallasan, the dormant volcano and also the highest peak of Korea, Seongsan Ilchulbong (sunrise peak), a UNESCO world natural heritage site, Jeongbang waterfall, the only one in Asia which directly falls into the sea and many more.

Altogether, it was a memorable trip as I made new friends and carried home lots of memories.



Conference Trip to Germany



Md. Tasleem Khan
Ph.D. Research Scholar

My first foreign trip was to Germany during 3rd-5th July, 2017, for presenting a paper in IEEE Computer Society Annual Symposium on VLSI (ISVLSI-2017). The conference center was located at Ruhr University, Bochum, Germany. I had booked a hotel at a nearby station called 'Accura' to reduce the traveling time from the conference center. I was excited as it was my first foreign visit, but also a bit nervous. During the conference days, I met many renowned professors in my research area, viz., Prof. Michael Huebner (Brandenburg University, Germany), Prof. Saraju Mohanty (University of Florida, USA) and many more. I briefly discussed my research work with these professors and they asked me to contact

them after completion of Ph.D. for Post-doc positions. In my opinion, this is one of the best conferences of VLSI which would help researchers to meet with renowned people and see the current trends in VLSI ranging from semiconductor devices to computer algorithms. Apart from technical presentations, the conference hosted social events in last two days. One such example was to explore the most beautiful places in the Ruhr Region, the Dortmund-Ems Canal, where we sailed in a boat through Henrichenburg. I travelled along this canal and enjoyed the beautiful landscape in a ship called 'Santa Monika'. Overall, It was a great conference for me and I enjoyed the trip to the fullest.



**“A journey of a
thousand miles
begins with a
single step”
- Lao Tzu**

Conference Trip to Malaysia



Niharika Baruah

MS + Ph.D. Research Scholar

The opportunity to visit Malaysia came my way in the form of a conference, where I was thinking of submitting my work. The conference was the 10th IEEE PES Asia-Pacific Power and Energy Engineering Conference 2018 (APPEEC) held at Kota Kinabalu, Sabah, Malaysia from 7th-10th October 2018. The writing and submission of paper started long back since April 2018, and finally got accepted in July 2018. Luckily, I got an offer for a student travel grant from the conference organizers which helped me a lot. So, I had quite a lot of time to plan and visit this beautiful country.

I myself am a travel freak, so this opportunity was a great way to share my research and also experience the rich culture of this beautiful country of Malaysia. First, I had to understand the geographical location of Sabah because it's not a usual place that people visit when they travel to Malaysia. I read quite a lot of blogs and googled a lot to finally plan out my itinerary to combine a few places along with Sabah because it's not always that I will get a chance again to visit this place. On researching about the place, I was pleasantly surprised to know that Sabah (a state of Malaysia) forms a part of the Malaysian Borneo Island. It borders with Sarawak (another

state of Malaysia) and Kalimantan (a state of Indonesia).

Some quick facts:

- The capital of Sabah is Kota Kinabalu.
- Sabah is home to the world's largest flower Rafflesia.
- Mount Kinabalu is a part of the Kinabalu National park in Sabah, which is the highest peak in the Malay Archipelago. It is a UNESCO world heritage site.
- Sabah has a rich collection of wildlife, like the orang-utans.



At the conference venue in Kota Kinabalu

Now, considering the geographical location of Sabah, it meant my conference location was quite far from peninsular Malaysia. So, I had to plan accordingly. First, I had to book my tickets and accommodation. Then, I applied for my Visa. There are two types of Visa for Indians to

enter Malaysia: (i) eNTRI, (ii) eVISA. I applied for the 30-days single entry eVISA as my purpose was attending a conference and got it via e-mail within a day. My journey started on the 6th of October 2018 from Guwahati, and I finally reached Kota Kinabalu on the 7th of October after changing three flights. The journey was a bit hectic, but the excitement of travelling to a new place overpowered my tiredness. I missed half a day of the conference, but planned to attend rest of the interactive sessions which were lined up till the 10th of October.

After delivering my talk, I interacted with a few students and professors working in my area. An advantage of attending conferences is that you get to share your views and meet people working in similar areas and see their work too. It was really an enriching experience for me. I also



Interactive session in progress

visited the University of Malaysia at Sabah during my stay.



University of Malaysia, Sabah

So, all work done, I had plans to do some sightseeing in and around Kota Kinabalu. I headed towards two of the islands of Tunku Abdul Rahman National Park: Sapi and Manukan. It consumes half a day to visit these two small islands surrounded by clear turquoise water. Swimming and snorkelling options are also available for those interested.



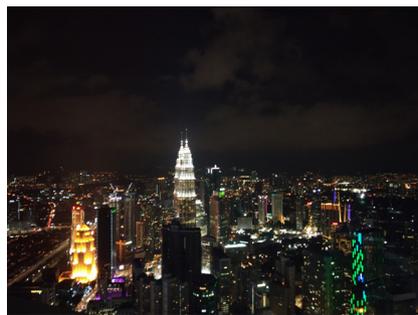
Manukan Island



Menara Tun Mustapha

Now, just look at that structure behind me. It's the Menara Tun Mustapha, located around 5 km away from the city centre. The building is structured as a 72-sided polygon with walls made of 2,160 special reflective glass panels that can withstand wind speed up to 272 km/hour. Suspended from the central core of the building are steel radial brackets where some 96 high-tensile steel rods are hung and hold the 30 floors of the building. This building is known to be the fourth of such high-rise "hanging" office building in the world and has been a famous landmark and tourist attraction ever since its construction in 1975. I found it really amazing. Sabah is a great place to visit because it has a lot to offer, both for beach addicts and seafood lovers. Unfortunately, due to lack of time, I could not visit the Kinabalu National Park, so, it remains in my bucket list.

After completing my conference tour, I extended my leave to explore a bit of Kuala Lumpur and Penang within 3 days. I knew the time at hand was insufficient, but I had to manage. Kuala Lumpur is the perfect example of a city, with high rise buildings, markets, hotels and numerous places to eat.



City Skyline from top of KL tower

The mandatory visit in store for me was the Petronas twin towers which still holds the record of being the tallest twin towers in the world. The best way to view the towers along with the city's panoramic view is to go to the top of KL tower during sunset and spend some time there. It is just majestic. Another iconic attraction of Malaysia is the Batu Caves, which is a limestone hill and houses cave temples of different Hindu Gods. I went there to offer my

prayers, too.



Batu Caves

Having visited the sights of KL city, I headed for a one-day tour of Penang as the street art and old world charm of that place always fascinated me.



At the Kek Lok Si temple in Penang

Overall, my work trip turned out to be quite a wonderful experience, as I got to interact with many people from different universities and also had a chance to taste the culture of beautiful Malaysia.

**“Not all those
who wander are
lost”
- J. R. R. Tolkien**

A conference visit to Niagara Falls, USA – The elaborate process behind how I made it possible



Vivek Venugopal
Ph.D. Research Scholar

Fortunately, one of my papers got accepted for the International Conference on Frontiers in Handwriting Recognition (ICFHR), held in Niagara Falls, USA during August 5-8 2018. The acceptance came to me around the last week of May. There were two questions that came to my mind at that point in time:

1. From where can I get the funding for attending the conference?
2. What is the procedure for obtaining a conference visa for US?

The answer to the first question came from one of my seniors in Signal Processing – Dr. Rohan Das. He had previously visited the US for a conference and got funding from agencies, such as Science and Engineering Research Board (SERB) (a statutory body under the Department of Science and Technology (DST)). He advised me about the different avenues for conference funding. Primarily, from the government's side, there are two main funding agencies that we can approach- SERB and Council of Scientific & Industrial Research (CSIR). I availed the funding from SERB and in the following paragraphs, the different aspects pertaining to the application process in the SERB travel support scheme are provided in detail.

SERB provides young scientists under the age of 35, a travel support program for attending conferences under the International Travel Support (ITS) scheme. The funding agency reimburses the registration fee, airfare and visa application charges. Applications should be submitted 60-90 days before the starting date of the conference. The

financial assistance through this scheme can be availed only once in three years.

The application is done online through the website [1]. The first step involves creating your profile wherein your basic personal details and institution-related information are required. Once that is completed, the next step is to submit a proposal. In the portal, select 'Form Submission' under the 'Proposal Submission' tab and it leads to a page where they provide the different options one can avail. Select ITS scheme from the drop down. After that, you have to click the 'Start Submission' button. But, before going forward do ensure that the following documents are with you:

- An endorsement letter duly signed and stamped by Dean of Academic Affairs
- A copy of letter of acceptance of the presenting paper (oral/poster) by the organizers
- Date of birth certificate

- Bio-data (sample template is provided in the portal)
- Certificate from applicant (sample template is provided in the portal)
- Abstract of the submitted paper
- A document mentioning benefits that you may get by attending this conference
- Financial support from other sources (if any)

These documents are required during form submission. Once you click on 'Start Submission', the application process begins. There are 8 phases in the application process:

- Profile detail– Requires your personal details including Passport, Aadhaar number and institution-related information.
- Event details– Here, we fill the conference details, such as location, start and end date of conference, name of organiser, and conference website.
- Qualification details– All information



pertaining to the different qualifications that you have (starting from Bachelor's degree).

- **Publication details**– Details of the papers related to the event published by you during last 5 years. It is desired to have any journal publications for increasing your chances of obtaining travel support.

- **Budget details**– Here, we enter the anticipated airfare, visa charges and registration fee in INR. While computing airfare, only look for Air India flights as SERB only approves air travel via Air India. Wherever Air India flights do not exist, flights run by carriers which come under Star Alliance should be considered while providing budget details.

- **Budget from other sources**– If you have got any approval for financial support from any other sources, do mention them and the amount they are going to provide.

- **International events attended**– Details of international events that were attended by you during the past three years is required here.

- **Upload documents**– The 8 documents that were mentioned before are uploaded into the portal at this stage.

Subsequent to filling the data in these 8 stages, a provision is provided to preview the form (to check for any erroneous data) and then, submit the form using the 'Submit' button. Generally, a confirmation mail regarding the submitted form and a File number are sent to your registered email id. The final confirmation regarding whether SERB will fund you or not came to me 3 weeks before the conference began. So, it is advised to carry out the travel-related process regardless of SERB funding. In case you have a sector which requires a non-Air India flight, it is suggested to book the air tickets by going directly to the Air India office at Ganeshguri.

The reimbursement process needs to be completed within 90 days from the end date of the conference. In the portal, there is an 'RTGS submission' link wherein we have to upload details of the expenses incurred in each overhead (travel, registration and visa) and also provide the bank details of the institute registrar. The bank account details of the registrar are available in the Finance and Accounts section. A small write-up regarding the Academic highlights and new developments presented at the event as well as the contribution at the event also needs to be provided. Once all the files are uploaded, the hard copy of the same along with the completed reimbursement form has to be sent by post to the SERB office

at Delhi. The aforementioned files are then cross-examined and sanctioned if everything is fine. A mail containing the sanction order along with a reference number (UTR number) will be sent once the money has been transferred to the registrar's account. To obtain the money in your account, there is a form under the Finance and Accounts section (Form 11 e in [2]). The filled form along with the sign of Head of the department has to be submitted at the Finance section for further processing.

Apart from the government funding agencies, there are a few companies, such as Google and Microsoft which provide funding for attending conferences. But, the conferences that are eligible for funding from these companies are limited and the applicant has to satisfy some additional criteria as well. If you satisfy all their criteria, it is worthwhile to apply for these channels as well.

As for the conference visa for US, we have to apply for the B1 category of US visa. If you plan to visit some other places as a part of tourism, then it is desired to apply for the B1-B2 visa. The details regarding the application process are elaborated in the website [3].

The first step is completing the DS-160 form wherein all your personal details, educational background and travel information is asked. The next step is in the payment of the visa fees. The particulars regarding the visa fee for each category is provided in the link [4]. The different payment options are presented in [5]. Once the payment is completed, you get an MRV number as a reference in the visa application portal. The generation of the MRV number may take time, so, please be patient. The visa fee is non-refundable, so, if you encounter an error while paying for the first time, do not pay again as the amount will not be refunded.

As soon as you obtain the MRV number, the next step is to book a slot for the visa interview, which takes 2 days. Your biometric information is collected on the first day and on the second day, you undergo a personal interview at the consulate. While going for the interview, one should take the following documents along:

- Current passport (and old ones if any)
- All your original degree certificates starting from Bachelor's degree
- Filled DS-160 form
- Bank statement of the past six months
- Acceptance mail from the conference organiser
- Invitation letter from the conference organiser
- Proof of accommodation in the USA
- A No Objection Certificate from the Dean of Academic Affairs
- A cover letter to the consulate general stating your purpose of visit, tentative itinerary and accommodation details
- Appointment confirmation of the visa interview
- Approval of funding for conference from funding agency (if any)
- A Bonafide certificate from Student Affairs section for proof of studentship



Once the visa is approved, the passport is submitted at the consulate where they will print the visa and send via post. It takes about 4-5 working days to get the approved visa. The period for which visa is issued can vary from a few months to 10 years.

I was lucky to get a 10-year multiple visits B1-B2 visa right in time for the conference. All in all, I had a great experience at the conference as I got to meet some of the pioneers and contemporaries in my area. At the same time, I also took the opportunity to visit Niagara Falls and New York.

References:

- [1] <https://www.serbonline.in/SERB/HomePage.do>
- [2] <http://intranet.iitg.ernet.in/acc/forms>
- [3] <https://www.ustraveldocs.com/in/index.html>
- [4] <https://www.ustraveldocs.com/in/in-niv-visafeeinfo.asp>
- [5] <https://www.ustraveldocs.com/in/in-niv-paymentinfo.asp>

The department, in order to mark the Silver Jubilee year of the institute, organized an event which was named SangoshthEEE. The event was a 2-day lecture series during 16th – 17th February, 2019, in which five eminent educationists were invited for a talk.



Prof. S. C. Dutta Roy
Former Professor & Head, Electrical Engineering, IIT Delhi

Title of the talk: Two outstanding paradoxes in electromagnetics



Prof. S. C. Sahasrabudhe
Former Professor & Head, Electrical Engineering, IIT Bombay

Title of the talk: Telecom- A story



Prof. M. R. N. Murthy
*Distinguished Professor, Institute of Bioinformatics and Applied Biotechnology
Former Professor, IISC Bangalore*

Title of the talk: The recent explosive growth of structural biology



Prof. A. K. Chaturvedi
Director, IIT Roorkee

Title of the talk: Science of Nyquist waveforms



Prof. A. K. Ray
Former Professor, IIT Kharagpur

Title of the talk: Convergence of technologies: A gateway to the future

NOTE: The abstracts of the talk and the details of the event can be found at: http://www.iitg.ac.in/eee/silver_jubilee.html



Ph.D. farewell ceremony on 24th June, 2018

A get-together was organised for the graduating Ph.D. scholars in order to bid them farewell and wish them success for their upcoming career and future endeavours. They shared invaluable experiences of their PhD career and gave suggestions and advices for a successful research.



Freshers welcome on 1st Aug, 2018 (July Session)

A freshers' party was held in order to welcome the new Ph.D. students of July session. The meet was an ice-breaking session for the newcomers in order to make them feel at home in the new environment and make them aware of the departmental rules and regulations.



LaTeX workshop on 25-26th Aug, 2018

A workshop was very successfully conducted on Latex, which was attended by nearly 200 students, from our own institute as well as other universities/colleges, like IIIT Guwahati, NIT Meghalaya, Assam Engineering College, Guwahati University, Royal Global University, Assam Don Bosco University, and GIMT.



Teachers' Day celebration on 5th Sep, 2018 at Seminar room, Dept. of EEE

Teachers' day was celebrated with great enthusiasm in the department which included motivational speeches from the faculties, cultural programs like singing from the students' end and gift distribution for the faculty members.



Intra Departmental Table Tennis Tournament on 29th Sept, 2018

A table tennis tournament was conducted as a part of the sports events where Miss Aditi emerged as the winner in singles beating Mr. Aditya in the finals, and Mr. Aditya and Mr. Akshay bagged the winners' trophy in doubles going past Mr. Basit and Mr. Ram.



A session on Communication Etiquette by Ar. Pragati Goyal on 1st Nov, 2018

A non-technical session on communication etiquettes was held in which Ar. Pragati Goyal, a soft skills trainer, talked about how the research scholars could develop better presentation and verbal abilities for better and influential communication.



RSF-EEE Badminton Tournament on 19 & 20th Jan, 2019

The 2nd sports event was held in the form of a badminton tournament amongst the scholars and faculties. The tournament involved singles, doubles and mixed doubles, which was won by Mr. Sreeram's team beating Mr. Samarjeet's team in the finals.



Freshers welcome function on 7th Feb, 2019 (December Session)

Another fresher's welcome function was held in order to welcome the new PhD students of December session. A healthy interaction was made between the existing and new PhD students discussing how to kick-start their PhD and letting them know the departmental rules and regulations.



Departmental Cricket Tournament on 24th Feb, 2019

The last sports event was held in the form of a cricket tournament which again saw an active participation from the faculties, staff and the PG students. The tournament was won by team CRPF, led by Mr. Vimal beating team BSF, led by Mr. Birjit in the finals.



Matlab Workshop on 9th and 10th March, 2019

The last and final event was conducted in the form of a MATLAB workshop wherein nearly 60-odd students from our institute as well as IIIT Guwahati, Assam Engineering College, Guwahati University, Royal Global University, Manipur University and Kaziranga University took part to learn the basics of MATLAB, speech processing, image processing, and fixed point toolbox. The speakers were our own research scholars, viz., Mr. Tilendra Choudhary, Mr. Aniruddha Mazumdar, Mr. Sarfaraz Jelil and Mr. Sumit Agarwal.



**“ Coming together is a beginning,
staying together is progress, and
working together is success ”**

– Henry Ford

Runners-up in the PhD Premier League (PPL) 2019, inter-departmental cricket competition

An inter-departmental cricket competition comprising of 12 teams is held every year in the month of February. Like every year, this year too, our departmental cricket team vied for the cup. However, the team ended up as runners-up going down to the Chemical Engineering team in the finals. The EEE contingent was led by Mr. Prateek Rathore, who himself gave good performances on the field and managed the team very efficiently.



Departmental picnic at Marngar lake, Nongpoh, Meghalaya

The year 2019 began with a departmental picnic at Marngar Lake in Nongpoh, Meghalaya, situated at a distance of 70 kms from IIT Guwahati. The spot was mesmerizingly beautiful with lakes and greenery all around. The picnic was attended by nearly 80 people comprising of faculties, staffs, research scholars and some of their family members. People enjoyed themselves by indulging in sight-seeing, boating, photography and games. The picnic concluded with a delicious lunch and a group-photo session.



Advisory Committee



Dr. Arun Tej Mallajosyula
Faculty Advisor



Dr. Tony Jacob
Community Advisor



Anirban Bhowal
Student Advisor

Executive Committee



Atanu Purkayastha
Chief Executive of Forum



Darpan Mishra
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