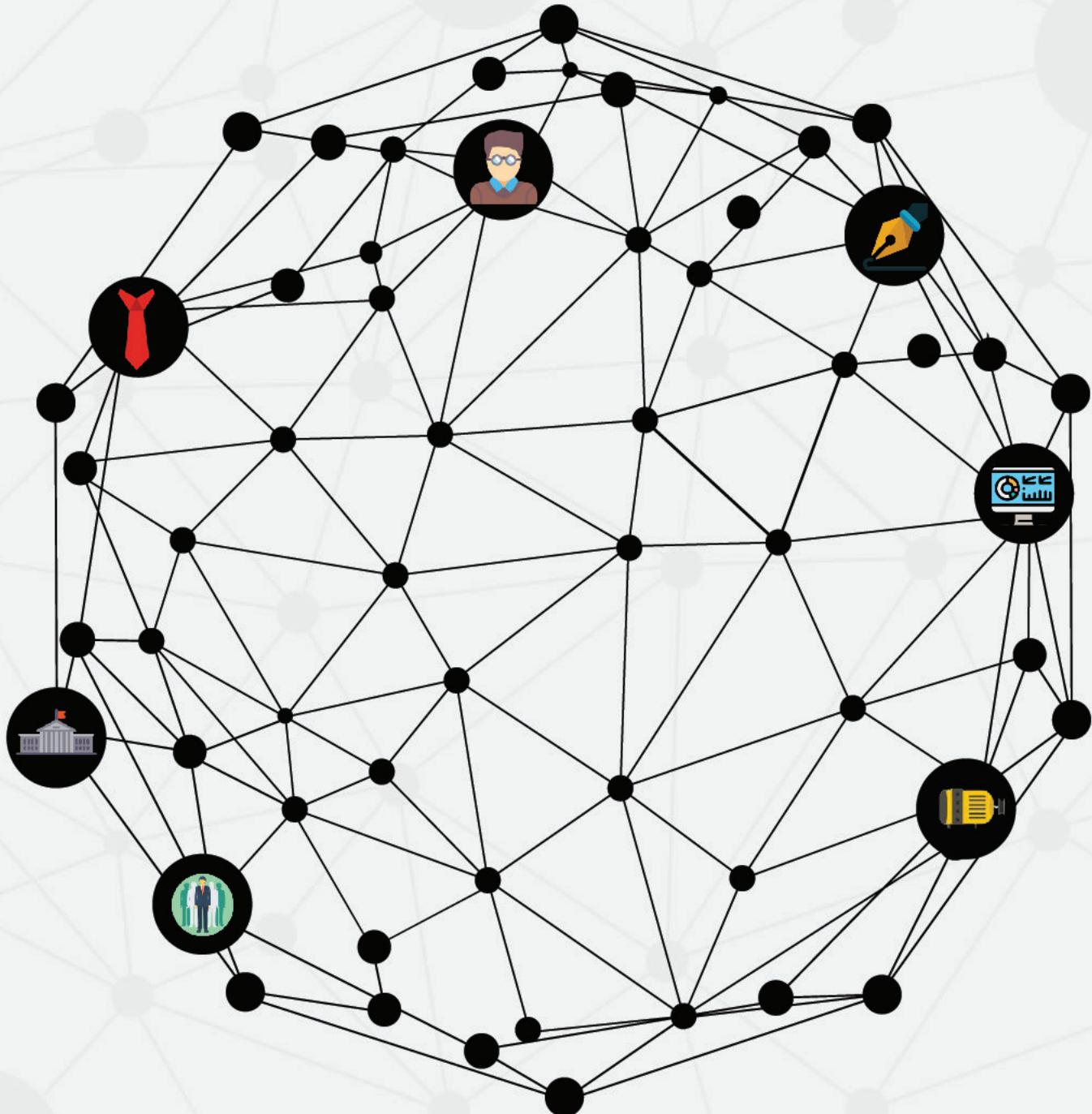


# InPhase

>>> December 2017 | 15th Edition >



a proud **cepstrum** presentation

# EDITORIAL

DIWANSHU JAIN  
ON BEHALF OF  
TEAM INPHASE

Greetings from Team InPhase.

Cepstrum has always been ardent in lending a helping hand to the EEE fraternity and is undoubtedly the major efficacious link between students and the authorities. With the aim of bringing the EEE family closer, we present to you the 15th Edition of InPhase magazine.

The resurrection of Jesus is the central tenet of Christian theology. As the Nicene Creed says: "On the third day he rose again in accordance with the Scriptures". Likewise, after the 14th edition in 2015, our departmental magazine gets resurrected here after 2 years in 2017 and it gives us immense joy and satisfaction to finally re-introduce "InPhase".

The articles we received for the magazine reflects the diversity in our EEE society. The department is invigorated with cutting edge research ideas. In addition to it, our technical minds are no less when it comes to creative writing or coherently expressing their philosophical views. Through this magazine, one fact is clearly proven - The EEE fraternity believes in doing whatever inter-

ests them with utmost dedication and sincerity. It's enthralling to see students as well as faculties chasing their dreams to make a difference in the future. The magazine will take you on an exciting ride where you'd find different people sharing their own set of experiences. Also, as the internship and placement season is approaching fast, we present to you the past experiences of our students which would definitely help you ace the interviews. This edition is an effort to bring you closer to your family. Through this, we strive to create an environment where everyone follows their passion and chases their dreams with honesty. The entire collection of articles is an effort from our side to make the magazine an informative as well as interesting read for our readers.

We would like to thank all the authors for their contribution and hope you will enjoy reading the magazine. Do remember to give us a feedback, as it would help in fine tuning our efforts with the expectations of the department. Stay tuned for the 16th edition of magazine in 2018.

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## WORD FROM HEAD OF DEPARTMENT



**With best wishes,**  
**Prof. Rohit Sinha**

Among many things which attract bright young students to join technical institutes is the desire to become creative. But by the time they graduate, many of them would testify that their creativity is either diminished or lost completely. Such feelings, though genuine, are often triggered by lack of patience with oneself or undue comparison with others. According to Teresa M. Amabile, "Creativity depends on a number of things: experience, including knowledge and technical skills; talent; an ability to think in new ways; and the capacity to push through uncreative dry spells."

For key to success in life, I quote Robert H. Schuller, "Never cut a tree down in the wintertime. Never make a negative decision in the low time. Never make your most impor-

tant decisions when you are in your worst moods. Wait. Be patient. The storm will pass. The spring will come."

Over the years, the InPhase magazine has well chronicled the achievements, innovation and unique experiences of young talents who were part of the EEE department. I too nostalgically recall my contribution made to the first edition of InPhase. The current edition contains some interesting articles and memoirs. I am really impressed by the overall quality. I take this opportunity to extend my heartiest congratulations to all the contributors and the editorial team for their concerted efforts in bringing out this edition after long hiatus. I eagerly look forward to future editions.

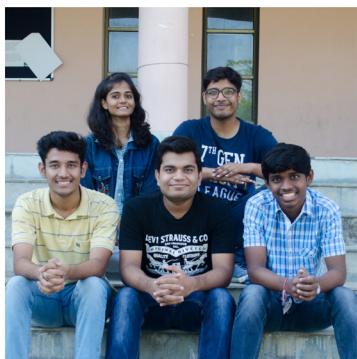
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**THE DEPARTMENT IS INVIGORATED WITH CUTTING EDGE RESEARCH IDEAS. IN ADDITION TO IT, OUR TECHNICAL MINDS ARE NO LESS WHEN IT COMES TO CREATIVE WRITING OR COHERENTLY EXPRESSING THEIR PHILOSOPHICAL VIEWS.**

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This small space is dedicated to the people who worked tirelessly into converting this edition of the magazine into reality. **These are the people responsible for capturing all the waves and signals from the department and bringing them InPhase. :)**



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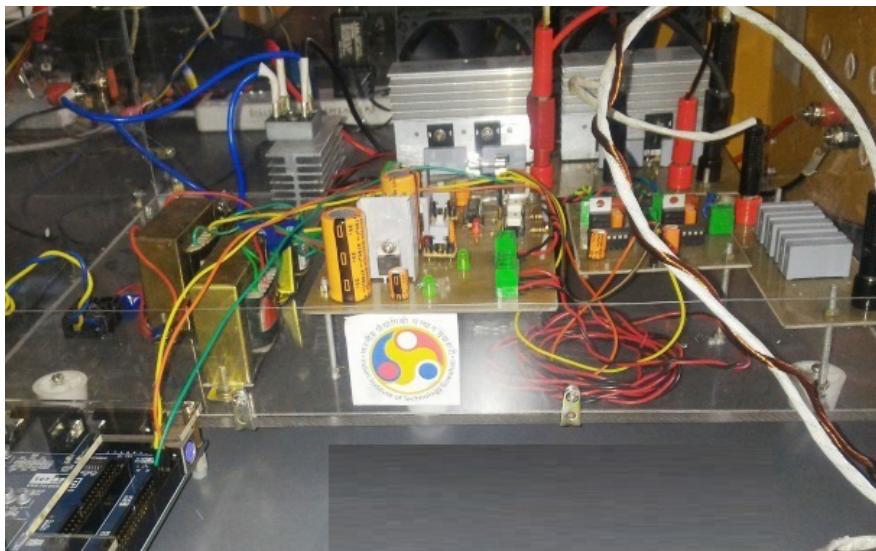
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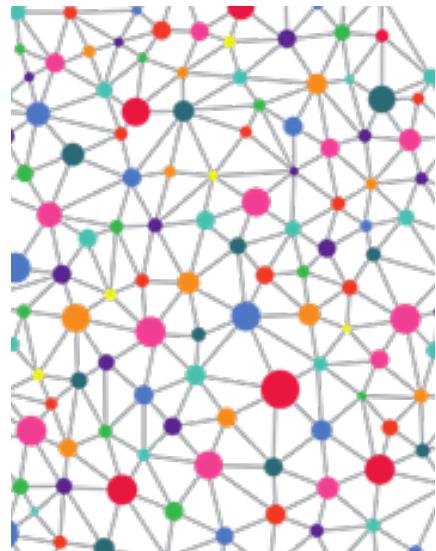


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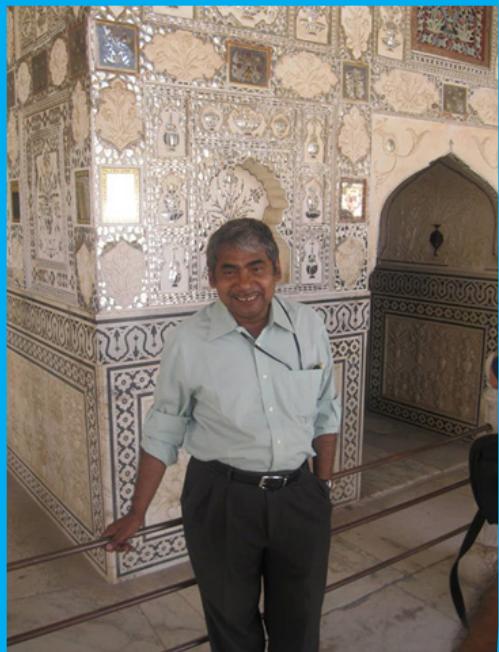
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Sai Dileep Munugoti talks about his internship experiences over the years in the field of Deep Learning. He also gives a guideline for students pursuing research and helps them plan their years. He then moves on to detailing his research experiences, projects and how they have shaped his future.



# PRACTICALLY SPEAKING - MY TRYST WITH MY NEMESIS





## My adventures (mishaps really!) with the practical side of engineering haunted me through all the five years of my BTech in IITK.



My daughter claims that when she expressed a desire to study journalism, sometime during her middle school years, my response was "That sounds good but what will you do to put bread on the family dinner table?" I honestly do not remember this episode but I had no such problem when I had to make my career choice. Even though I came from a long line of chemists, Chemistry was too messy for me to get into as a profession for life. Physics was out of the question as all the physicists I knew were absent minded people who dealt with things too abstract for my tastes. Engineering seemed like a good fallback option for somebody who was reasonably comfortable with mathematics but was not good enough at it to study Mathematics as a subject; and if engineering was going to be my career choice, then Electronics seemed like the best thing to do as it was nice and neat (nothing messy, usually!) and was bound to be something that would impress people enough, to land me a job somewhere! My family was also overwhelmingly in favor of this. Since I had already blown the house fuses a few times and nearly electrocuted myself once playing with live wires, my father opined that if I really did learn some proper Electrical Engineering, Casa Bose will be a lot safer place to live in. The good people running JEE those days seemed to agree with that assessment and wanted to make an Electrical Engineer out of me in IIT Kanpur. Little did they, or I, realize that engineering was not just some watered down physics and mathematics

but that there was a practical angle to it which I also required to hack.

The fact that I was not really cut out for the more practical aspects of engineering was evident even before I started at IIT/K. Even though I had passed JEE, I still had to pass the Class XI exams in BNSD College to get there and I failed miserably in the Chemistry Practical exam. My phobia of Chemistry might have had something to do with it but it was more likely that the lab attendant (who was not overly fond of me) managed to pass on a very difficult Calcium salt for me to detect. I eventually passed with the minimum pass marks because the Chemistry teacher took pity on me and realized that it would be cruel to fail one of the two guys in class who did manage to do reasonably well in JEE. (My friend is now a famous theoretical physicist as he had no taste for engineering at all!!)

My adventures (mishaps really!) with the practical side of engineering haunted me through all the five years of my BTech in IIT/K. Here are some examples! It was a miracle of sorts that my professors would still talk to me even though they kept a close watch on my hands while doing so to see that they were not wandering off to play with some lab equipment or experiment in progress, as mayhem would inevitably follow!

A standard experiment in our surveying class was to measure the height of the faculty building in IIT/K – at six stories, which was the tallest building on campus and a relatively easy one to measure. When I turned in my lab report, the instructor called me and patiently explained that though the faculty building was really tall, it really wasn't a competitor to the Empire State Building! It seemed I had goofed up the units and managed to put one of the world's tallest building inside our own campus. This and similar episodes probably explain why, even though my classmates were more than happy to copy my home assignments, nobody really ever wanted to copy my lab reports.

My misadventures with the practical aspects of engineering continued in the departmental labs as well. When asked to make an amplifier, I would end up making a really good oscillator and when the time came to build an oscillator, my circuit would insist on behaving as a merely high-gain amplifier. I reversed the polarity of the power capacitor in the electrical circuits lab – that year, Diwali came early as the resulting fireworks were partly to blame for my getting unceremoniously banished from the lab for a week. My assigned lab partner put in a plea for a “divorce” after that episode, which was fortunately not granted as I could not have passed the lab without him. I was the only guy who managed to short out the very sturdy Tektronix oscilloscopes that we had in our labs – to this day, I do not know how I managed to do that but I did! In the digital labs, my counters would never count properly when I had to show them to the instructor even though they would happily count up and down for me when we were testing them. My partner still complains that it was my obsession to make the wires look neat, had something to do with that. In the Communications Lab, my FM modulator never worked and when the time came to show it to the instructor for grading, we had to “steal” the signal from my neighbor to show him. (That was done very innovatively though by passing the signal through the neutral of the lab table wiring. I now realize that this was a very unsafe thing to do and we

survived only because the lab tables had a floating DC power supply and the neutral was not being used! (Don't try it, ever!)

The fact that I eventually wandered into networks was a stroke of good luck. Here was an area where almost everybody would do simulation experiments without touching any hardware at all. After all, leaving a whole lot of costly equipment at the mercy of a person with two left hands is not something that anybody really wants!

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**I was the only guy who managed to short out the very sturdy Tektronix oscilloscopes that we had in our labs.**

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# CAMPUS PLACEMENTS

**Brace yourself for this crazy season of adventures**

As you start climbing up the ladder of your engineering degree, placement concerns will begin to hover into your mind. No doubt, your first step towards your long-term career depends on how you carry yourself for the big days to follow during your campus placement. In an effort to help you with the same, we floated a survey doc to the passing out batch of students who went through this exhaustive process of placement a few months back. Following are some words of wisdom as shared by them, which would surely give you a heads-up in your preparation.

The profiles that have been a popular choice for the students from the department includes Data Scientist, Research and Development Engineer, Software Development, Analyst, Business Operations, and Consultants. There were multiple recruiters for each profile this season, most of them open to the two branches that the department caters to. Some of the popular recruiters for the department included Samsung and Citi Corp based on the number of offers made.

The following academic courses proved out to be a great asset for the students during the tests and interviews:

Pattern Recognition and Machine Learning, Probability and Random Processes, Advanced Machine Learning, Data structures and Algorithm and not to forget the introductory CS101. Most of the survey respondents were of the view that CS minor courses helped them significantly in the process. Apart from this, online courses on Coursera, Department Projects and Bachelor Thesis were brought to use by the students while cracking the interviews.

Coding is one of the essential tools to make oneself well qualified while sitting for the campus placements, especially when one is interested in software development, data science and analyst positions. One of the questions in the survey asked the students to mention the best place to practice coding. While the basic CS101 and CS minor courses were a start, books like Karumanchi and websites like Interview bit and Geeks for geeks helped the students, leaps and bounds with competitive coding.

And to take this first step is the hardest. Though most of the students take up with placement preparation right after their pre-final year, "RIGHT NOW" and "SOONER THE BETTER" is what many said when asked, when is

## **Here is a sample algorithm to coding as responded by one of the students:**

- The important thing is TO START, just take the first leap.
- Choose a language of your liking. Go through syntax and basic programming details of the language from any language tutorials.
- Dive into writing programs from geeksforgeeks.org.
- After 2-3 days of geeksforgeeks coding, get into competitive programming on interview bit. Their leader board proves motivating to code a lot (though the program should be the focus, not the score). Geeksforgeeks problems are the most important thing here.
- Eat, code, sleep, Repeat.

the best time to start preparing for placements. Another respondent added that one should be sincere in those academic courses at least which are in sync with their career interests. Along with this, a little work can always be done on your communication skills especially if you are to sit for consulting and management profiles.

Another segment in the survey enquired students about the importance of internships during their second and third year. While few of the students responded in negation, for most of them, internships and projects provided a huge help in getting them their job offers.

Here is what one of them had to say - "Yes, It does matter but till an extent. If you have done any internships whether regarding to profile or not, you have to be thorough with concepts involved in a way such that you can explain your work to the person who does not have any experience in that field."

Another student responded - "2nd year intern doesn't matter much but the 3rd year intern should be a decent one. Because I feel that this and the BTP are the two key selling points on which you can justify your selection. PORs are also important (have at least one but not too many) but try to get a good 3rd year intern. Please revise what you have done and be prepared for cross questioning."

Internships, thesis and projects provide an excellent ground for talking. They also allow one to manoeuvre the interview towards their strengths.

To conclude, here is another excerpt from the survey response- "Don't get depressed seeing your friends get placed and you not getting anything. Believe me there are ample companies for EEE/ECE guys. No matter how much you curse this branch in the 4 years of engineering, you will feel its worth during the placements!!! Good Luck!!"

## **By others faults, the wise correct their own.**

“Don’t utter any key words during the interview if you don’t know it very well.”

“Never lie on your CV.”

“Have a plan.”

“Do not give up mid-way.”

“Don’t try to remember codes (it won’t help in exam and interview).”

“You should not underrate the importance of Quantitative Aptitude.”

“Do not run behind every job profile, pick the job profiles in which you are interested and prepare for the same.”

“Do not sell yourself short.”

“Don’t be too modest.”

“Do well in Intern.”

“Don’t get stuck on any topic.”

“Practice writing codes on paper.”

“Please keep your CPI above 7 at least. That’s a popular company cut-off.”



Nikhil Nagaraj



Nikhil Nagaraj

# AN INTERN ABROAD

## My internship experience at Ghent University

23rd March 2016, these were the headlines in some of the major newspapers: 'Terrorists strike the heart of Europe.' 'Bloodbath in Brussels.' 'ISIS strikes Belgium.' Little did I know that within 2 months of this unfortunate incident, I would be there, right at the heart of it, for my summer internship. This is a story about my sophomore internship experience.

A little background about myself. I am a student in Elec-

tronics and Communication Engineering (ECE) branch of our department. As you might have guessed, I am a part of the 2014-18 batch. During my third semester, by a chance of fate I came across some articles on the web about how many of these IT giants like Microsoft, Google, Amazon, and others are working on the democratization of AI. This got me hooked to the idea of Machine Learning, Artificial Intelligence and how they are going to shape the future during my lifetime. I soon took up the

'Hello World!' course on Machine Learning by Andrew N.G. From then on, I took up online courses whenever the grueling semester schedule permitted me. Some I did complete, some I did not. But I learnt enough to know that although this field was relatively new and I knew nothing, but this was where my future lay.

I had a few chance conversations with a couple of seniors regarding the process of getting an internship during my sophomore year. They encouraged me to approach professors who I felt were interested for an internship. So, I mailed a few of them and in this process, I came across the professor under whom I was going to intern at Ghent University. After a couple of mails going back and forth, there was a Skype interview which was very pleasant. I was soon told that I could join their group for the summer and then I got down to completing the other formalities.

I set off to Brussels on the 14th of May from Bengaluru. The journey was quite comfortable. I had a brief layover at Dubai before getting on my final flight to Brussels. The total journey duration (including the layover) was 10 hours. I had decidedly gone a couple of days early so that I could explore the city of Brussels before I went to Ghent for my internship. Belgium is basically divided into three regions - the Dutch speaking region of Flanders in the north and the French speaking region of Wallonia in the south being the bigger ones. The third is the Brussels capital region, which is the capital of the country and thereby something like our NCR, Delhi.

After a couple of days of sightseeing in Brussels, I set off to Ghent. Ghent is a town about 50 – 60 km from Brussels. The journey by train took 30 minutes and as expected, the trains were punctual to about 5 minutes to the estimated departure and arrival times. Ghent is a student city, of which Ghent University forms a huge part. Being a 200-year-old university, it has its buildings scattered throughout the city. It is said that the city wears a partially deserted look during the vacation times.

After completing my registration and other formalities I was given my dorm room in a hostel called 'Canterbury'. Single accommodation, fully furnished with an attached bathroom was more than I could ask for. It had a fridge and a heater which helped keep me warm during the chilly nights. After settling into my dorm room, I set off to meet my professor.

My professor's lab is in a newly built technology (rather 'technologie', if you are Dutch) park near the outskirts of Ghent. The public transport in Ghent is very good. With a combination of trams and buses, you never have to look for any other means of transport. Like the trains, the buses FOLLOW A TIMETABLE! That evening, I was introduced to all the PhDs and Postdocs in the lab. Just to add a villain to the story, I could tell you that some of them did not like me (like Dangal) but that would be doing grave injustice to all of them who did their utmost, to ensure that my stay at Ghent and my time in the lab was as comfortable and productive as possible.

There were no fixed timings to come to or leave the lab. You could work as per your timings. Working from home was another option. During my stay, I also got a chance to visit a conference in the University of Antwerp by Pieter Abeel a professor at UC Berkley on Deep Reinforcement Learning in Robotics which was quite fun and interesting.

During the first couple of weekends, I stayed in my hostel and moved around Ghent. Ghent is a very beautiful city. It has a couple of canals running right through it which just adds to its rustic charm. The presence of a multiplex about 500 meters from the hostel also added to my entertainment. I used to go down there at around 6 in the evening to catch a movie or two. After the first two weeks, I decided to start travelling and explore Belgium and other parts of Europe. Starting off with Luxemburg, I then went to Amsterdam, Bruges and on the last weekend (which luckily was a long weekend) I went to Paris. I had never travelled alone before and my first experience

was surely a 10/10. I was in Paris on the day of the EURO final. I hoped to catch the match at the public screening at the Eiffel Tower, but I was late in getting there and the arena was full so I had to be content with coming back to the place I was staying at and watching it with some other people who were also staying there.

Food during my internship was not a problem. Ghent being a student city, and by student city I mean a city with many students, had a lad number of eateries, grocery stores all around town.

Adding to the fact that I was staying in an area called 'Overpoort', which was predominantly inhabited by students, there was no dearth of food, both in variety and price points. Due to this as well as my own inherent lack of culinary skills, I did not cook much. Any food related story about Belgium would be incomplete without mentioning three of its specialties: 'Waffles', 'Fries' and 'Chocolates'. As a famous person puts it: "When you walk into a chocolate store, suddenly the most difficult decision you will ever have to make in your life, is which chocolates to pick! It is pure torture! Especially when you are in Belgium surrounded by Belgian chocolates!" Belgian waffles and Fries were heavenly and were quite a treat to have.

My internship ended with an ice cream treat at the house of one of the other professors in the lab, who happened to be celebrating his birthday. Then I returned to Brussels where I stayed for a day and packed my bags to return home to Bengaluru. In the aftermath of the terror attacks, the security at Brussels airport was so heavy that

it took me about 3 hours to just clear various security checks and reach my boarding gate. Luckily, I had been warned about this earlier and it was not a problem. Once again, I had a layover at Dubai, whose airport I must say is beautiful and has its own life to it.

I gained a lot during this internship both personally and academically but most of all I cherish the memories I created through this wonderful experience. Although thousands of miles from home, I never felt homesick due to the wonderful ambience provided by the people and the country in general.

**Ghent is a student city, of which Ghent University forms a huge part. Being a 200-year-old university, it has its buildings scattered throughout the city. It is said that the city wears a partially deserted look during the vacation times.**

I would like to thank everyone who helped me in any capacity throughout this internship both before and after. I would also like to thank InPhase for asking me to share my experiences and putting up with my inordinate delays.



Pritam Patra  
 Pritam Patra

# A magician in engineers' world

**“A flame was ignited in my very core burning in my heart, magic became my life.”**

When I was young, I was very self-conscious and always kept to myself. My world felt empty, until one day I saw a man take a coin and he just made it vanish right before my eyes. For many this was just a trick or an illusion, but for me, it became my escape, my awakening. Shapes and colors took new meanings as I felt the seed of my potential growing from within. A flame was ignited in my very core burning in my heart, magic became my life. I trained everyday forgetting to eat or sleep; coins, cards, Rubik's cube, rubber band became my only food. I was oblivious to the world around me, like living in a dream that I could understand. Times were changing, my hands grew, things took on new shapes, before I could even know it, seconds became years in a single moment. But there was one thing inside me that never changed "PASSION".



**“ PASSION  
NEVER  
CHANGES,  
IT  
GROWS  
WITH  
YOU ”**

I truly began to understand how powerful magic can be, every second, every syllable, every second of it.

I may perform the same piece of magic thousands of time yet I still have to remind myself that in the eyes of the audience; in their heart, it is their very first time. I never stopped to wonder where magic would lead me to. It led me to those faces, different people, different places, different cultures magic brings them back to their childhood, just like technology connecting people from two ends of the world just in seconds.

I finally understood my purpose was greater than myself, to give a feeling of joy and to make the sparkle of wonder that lives within all of us, come alive. I don't destroy forks just to show I can bend metal, I don't light paper on fire to demonstrate pyro kinesis, I don't float objects just to prove I can manipulate the laws of gravity and I don't move objects from my mind just because I can, I believe that meaning of magic is greater than all of this, it has never been about me, magic is about people, about motion, creating an image, a snapshot, a memory, something we will all remember for years to come.





## Exploring the core



Sagnik Middya

Greetings to all of you, hope you are gearing up for the new semester. It is really nice to share with you my experience about the placement process. I have received a job offer from MathWorks (India), the "MATLAB and Simulink Company" (that is how they prefer to call themselves). I need not elaborate about the company, their product MATLAB and Simulink explains everything in itself. It must be a dream for many of us to work for MATLAB. We have known it since we have known engineering. However, before starting off as a developer, it takes some training in the software and in-depth knowledge about how it works. The job profile is precisely meant for that pur-

pose. As an Application Support Engineer at their Engineering Development Group, you undergo training on various products and modules, solve technical problems and difficulties faced by the customers. Alongside, you take up projects from several development groups according to your interest and background. This role lasts for one year and then you move into any of the development teams depending on your and the team's mutual consent. In this job, you can learn many new things, meet new people and share novel ideas.

Regarding the hiring procedure, they have two

**I need not elaborate about the company, their product MATLAB and Simulink explains everything in itself.**

avenues, one is the computer science track and the other is engineering track. As you can guess, the former requires strong programming knowledge in C++ and/or Python. The engineering track (almost custom designed for Electrical Engineering) demands basic knowledge of signal processing, embedded systems and control systems and basic programming in C. Some elementary understanding and practice in MATLAB is helpful but considering the degree of association we have with it, I need not mention it separately.

The recruitment process unfolds as an online exam. Questions include basic quants, subject questions (subjects that I mentioned earlier), and 2 simple coding exercise in C. My personal experience says that they attach importance to the CGPA in shortlisting for the interviews. Now, coming to the tech interview part, they asked me questions from Control Systems like block diagram reduction, use of root locus, needs and types of compensator, etc. In Digital Signal Processing they asked about FIR and IIR filters and their implementations (direct forms 1 and 2). I faced some trouble with the programming part as I hadn't practiced for it. However, I can say that CS101 is sufficient as they mainly look for proper understanding of pointers, functions and elementary data structures (linked lists, queues, stacks). The HR was a very nice guy, it was more of a discussion with him rather than being a formal interview. I was asked about my interests, future plans etc (quite mainstream). He stressed on whether I was clear with the job role and spent a lot of time explaining it in great detail. Finally, I came out of the room after a pleasant chat with him that lasted for 50 mins! He never bored me for a single minute. Overall, the experience was very friendly and nice. The interviewers were modest and casual and made me feel completely relaxed even at midnight.

First weeks of December are very crucial for any final year student; after all it is the time when your hard work for the last 6 years starts paying off. It is a tough time too, with scores of interviews lined up one after another,



**You will always have your friends by your side. Whenever you walk into or out of the room, they will be there to cheer you up even in the most awkward situation.**

“ ”

you lose count of date and time (it practically happens) and often get frustrated by your failures. But you will always have your friends by your side. Whenever you walk in or out of the room, they will be there to cheer you up even in the most awkward situation. So, prepare well and have faith in yourself.

Hail EEE!



# DAAD WISE INTERNSHIP EXPERIENCE

**“For last year’s words belong to last year’s language  
And next year’s words, await another voice.”**

With these words by poet T.S Eliot in mind , I remember making the customary New Year resolutions in January 2016 with absolutely no idea that in a week or so a mail with the subject ‘WISE Result: Congratulations!’ would land in my inbox and give me a chance to listen to the next year’s words in a foreign language altogether!

With the application process made extremely smooth by the DAAD India Office, the next few months flew by in the blur of excitement for my first international journey. Equipped with only a few phrases in German, I landed in the gorgeous city of Dresden, in the state of Saxony. I soon witnessed the German engineering and excellence that is world-famous in the Deutsche Bahn (train) travelling at a heart throbbing speed of 300km/h. Dresden is a beautiful city , which had once been bombed during World War II but complete restoration meant its architecture was kept intact, making it a beautiful blend of modernity and quaintness.

I set out to meet my professor at the Computer Vision



Aparna Balagopalan



Aparna Balagopalan



Before going to Germany, my knowledge about Germany was initially limited to the fact that it is the land of ideas, engineering and cars. But it is so much more - a hub of cultures, discipline and punctuality.

Lab, Dresden from my accommodation at the International Students Hostel. The people at the lab were extremely friendly, with the professor himself telling stories about how he recently tried out a few cooking experiments with turmeric, hearing about its medicinal properties, only to have his hands turn yellow in the process! I found my colleagues at the lab to be passionate and hard working in what they did, all of them allowing no distractions while they worked, yet maintaining a healthy work-life balance by going on treks and relaxing with friends and family during the weekends. My lab had a fun setting with a pool table and a frequently-used coffee machine. I worked on an extremely interesting project in the field of Machine Learning. I have a deep interest in the field of deep learning and the project allowed me to study various facets of it, making me truly enthralled. With stalwarts such as Sundar Pichai of Google talking about its applications in his recent talk at IIT Kharagpur, I think further charm has been added to the field.

I also got the opportunity to explore the food and culture of Germany at various occasions. Though Germany is famous for various drinks, I think an underrated yet tasty one is coffee, which is available in huge quantities and at a very reasonable price. Various chocolates such as gummy bears, rittersport etc. are also quite delicious. There are quaint little restaurants and places selling doner, kebabs and other traditional dishes scattered around in every city in Germany.

Another thing anyone travelling in Europe would be absolutely enchanted by, is the transport network. Be it the local transport, which was extremely well-laid out in Dresden with its tram and bus routes, or the glamorous Euro rail connecting all countries of the European Union. This meant you could have a Gondola ride in Venice in the morning and be sipping a tasty drink in France in the evening. I, along with a group of friends, travelled a lot more than I had imagined I would during the weekends.

Fuelled by my impulse to travel and the great hostel network in Europe, I was able to visit various cities in various

countries like Prague, Amsterdam, Paris etc. and witness various sights such as the Eiffel Tower shimmering in lights in the color of flags of various countries during the FIFA 2016 matches. I was also pickpocketed for the first time in the subway network of Prague on one trip, got stuck in the rain on the top of the Elbe sandstone mountains in Saxony Switzerland on another, such experiences made me a seasoned traveler.

Before going to Germany, my knowledge about Germany was initially limited to the fact that it is the land of ideas, engineering and cars. But it is so much more - a hub of cultures, discipline and punctuality. I also met people from different parts of the world such as Italy, Romania and Malaysia. People are polite and Danke Schon's and Hallo's resound everywhere.

Though my stay in Germany was for about three months, I experienced a new culture, got to work on an engaging topic and met people from around the globe. Germany is ideal for education, research as well as travel. I would encourage anyone with an inquisitive mind to look into the amazing opportunities that Germany offers.



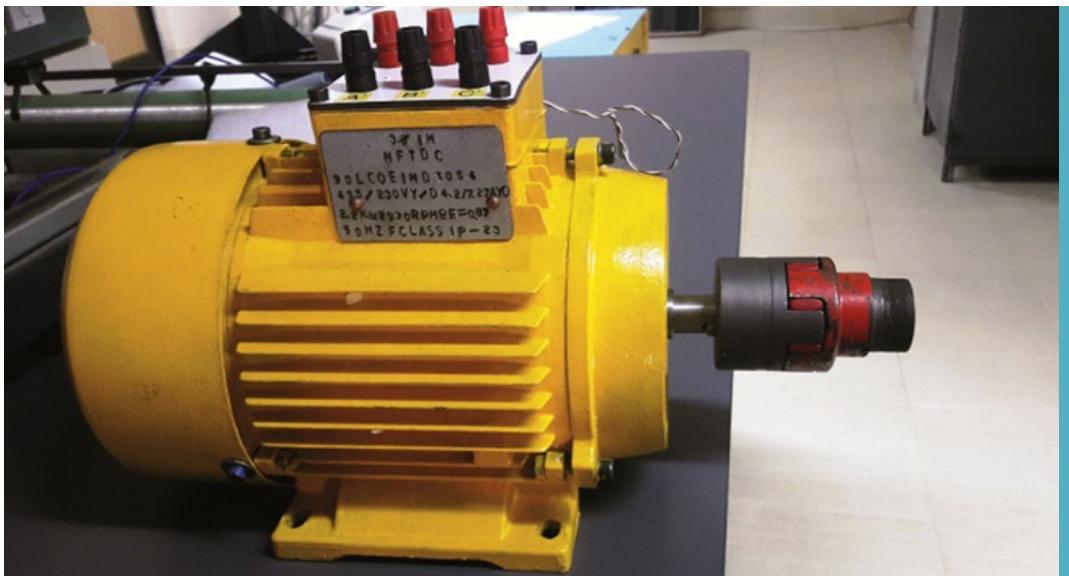
# Quest for developing indigenous e-mobility solutions

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**The electric vehicle (EV) industry in India hasn't reached the critical scale yet, but researchers in a laboratory in one corner of the country are working on projects that could help give a leg up to some EV makers as well as to the Make-In-India drive.**





## The first prototype of a copper cast induction motor.

A few hours before our meeting, Dr. Praveen Kumar, Associate Professor at IIT Guwahati, receives an update from a team of researchers who are working under his supervision, that they have managed to reach a weight level of 15.8 kilograms in a motor.

When the project started in September this year, the weight was 26kg. This motor is part of a family of motors, a key component of an electric 'powertrain' that the team in IIT Guwahati is working on. More importantly, the team wants to offer a powertrain with magnet-less motors. The main objective behind it is to avoid the dependence on rare earth materials which are usually imported. "We want to show that the induction motor or the synchronous reluctance motor can do the work as good as the permanent magnet motor," Dr. Kumar told an Autocar Professional.

Other members of the motor family that Dr. Kumar and his team of five research scholars at the Electronics and Electrical Engineering (EEE) department of the institute are working on, are a copper cast induction motor and a permanent magnet motor. Each type of motor will be available in all the power categories that the team is working on. The various power categories are – 1kW (for two-wheelers), 3.5 to 5kW (for three-wheelers), 8kW

(three-wheeled passenger carriers), 12 to 14kW (for minivans), 20kW (for midsize sedans), 60kW (mini buses) and 120kW (city buses).

IIT Guwahati's focus on building capabilities in motors is a part of the larger goal of being able to design an entire EV powertrain. "The entire powertrain, which includes the machines, controllers and the convertors. Of course, we are not focusing on making batteries because that's more of chemical engineering thing so we can't handle that. For that we will have to rely on other sources," says Dr Kumar.

The team has consulted industry players for inputs, in addition to tracking the developments in the global EV industry. Its plan is to complete all designs by December 2017 and "to a large extent" put them in test vehicles. The team isn't working for any OEM yet, but it plans to invite some of them to showcase the indigenous capabilities in the EV space. "We want to show that there's no need to import the machines and the controllers. Everything can be done in-house," says Dr. Kumar.

But why would an OEM pick up the EV solution from the IIT lab, instead of sourcing it from Tier 1 suppliers, backed by decades of experience?

**L-R:**

Binita Nanda, Tepera K Tolosa, Bikash Sah and Rajendra Kumar are part of the team developing the new solutions.



Dr. Kumar admits that he has a disadvantage in this regard, but he also says that IIT Guwahati can offer more value to OEMs when compared to conventional suppliers. "The disadvantage we have now, compared to very well established Tier 1 suppliers, is that we don't have years of knowhow. They can, maybe, design the component or the sub-system. Maybe they can design the motor in a month. But if the OEMs reach us, maybe we will take three months instead of one, but we would need three months for the first time only. After that we will cut down the time with every successive design. The difference, when it comes to us, is that we will give a complete design philosophy transfer, not just the design transfer," says Dr. Kumar, who believes that building the know-why is equally, if not more, important as offering know-how to clients. The 42-year-old Associate Professor may know a thing or two about offering value to automotive clients as he has had a stint in an AVL Group company in Germany before joining IIT Guwahati in 2009.

The current project, aimed at EV applications, was preceded by a project for application in city-buses that uses supercapacitors with contactless charging system. Dr. Kumar says it will now require the partnership of city transport authorities to be put in real-world application.

Before that happens, there is now an effort to develop a contactless charging system for a scooter.

Dr. Kumar and his team earlier developed a system for intra-city buses called Purta (Sanskrit for complete). It is a concept of an electric bus with capacitors, instead of batteries, which get charged every time the bus halts at a bus-stop. Supercapacitors were chosen over lithium-ion batteries, as such vehicles do not have to travel long distances without refueling opportunities. "We recently got a big pack of lithium ion batteries and will be testing in the actual system. And we are also taking care of the angles at which the scooter or the motorbike stands, so that will be the best efficiency we can achieve, because the distance between the two are not always the same," says Dr. Kumar.

## Kaizen at work

The works at just one laboratory at IIT Guwahati, reflects how researchers and innovators in the academia space are constantly at work to develop new solutions. Not all projects may succeed, but with increasing pace of evolution and competition in the automotive world, such efforts merit to be a part of industry-academia collaborations, not only for mutual benefits but also for the growth of India. Incidentally, we witnessed the opening of the package containing the first prototype of a motor designed by the IIT Guwahati research scholars and made by the Nonferrous Materials Technology Development Centre.

# **INTERVIEW: Dr P. Kumar, Associate Professor, IIT Guwahati**

## **Will the development time shrink after the first motor, as it will only be a matter of different sizes then?**

More than the sizes, the important thing is to inculcate the design philosophy among people. Once that comes in, then every engineer can do an independent job because they know what the right questions to ask are. The horizon widens. For the 12.5kW motor, it took us four months. For the next one, which may be a 20kW or a 60kW, the design time will come down to a couple of months. The idea is that if in a month they can design a system, it will be very good.

## **Is this work done independently, or through some alliance?**

We have some alliances with the governmental agencies for prototyping because we can't make it here. Conceptualizing, development and designing have been done in-house.

## **How about supercapacitor-powered two-wheelers?**

That's an idea which came up in one of our discussions about why have just a battery, why not have a hybrid (battery and supercapacitors) source? All the acceleration demands will be met by the supercapacitor, normal driving demands will be met by the battery. That will put less stress on the battery. It will extend the life of the battery and the performance of the vehicle would be better. So, hybridization of the power sources is a serious thing we are looking into. Plus, we are now seriously thinking of developing indigenous supercapacitors. The current ones are imported. Our role here in IIT Guwahati will be to balance the individual cells because you need to connect many cells together. The supercapacitor material, all the electrolytes and so on would

be developed by another partner agency. As soon as the funding comes, the work will begin.

## **What should the government do to ensure that the incubation is done properly, the derivation of the advantages is done properly and the country benefits? Where are the missing links?**

I think the missing links start from pre-school. How many times did you feel that questioning was encouraged? How many times did you feel that independent thinking was encouraged? No, not very often. The teacher writes something on the blackboard and the students copy it. The teacher asks similar thing in the examination, the student is supposed to reproduce. If you go off the track, or if you try to be creative, most of the times you are penalized. So, "fall in line" is the motto as of now. It's in research, education, everywhere. If you look at the Indian philosophy, this was not the case. It's asking a question. The other person gives a hint to what might be the solution or answer, and then leaves it to the listener to choose his/her own way.

## **What are the key steps that should be taken immediately in industry-academia collaboration?**

First of all, the academia should invite industry in curriculum formulation. Take the industry's opinion. The industry and academia should keep their egos aside and have a frank discussion. Industry should also be willing to take a risk. If they fund 10 projects, maybe eight would fail. Two would succeed. Let's try it. A bad solution is clearly an indication that we should not walk down that path. There's nothing called an absolute failure. Industry should increase its appetite for risk. Here the risks are not very high stake risks. Maybe, if an industry gives a project of Rs. 20-30 lakh, even if it fails I don't think that it is a serious drain on their balance sheets.



*Dr Praveen Kumar: "Electric mobility is not a luxury but a necessity for India, which is witnessing severe deterioration of air quality."*

“

**Why have just a battery, why not have a hybrid source? All the acceleration demand will be met by the super capacitor.**

”

# JOB OF A BUDDING SCIENTIST



**Rishabh Singh**



**Rishabh Singh**

Placement season is undoubtedly the toughest phase of a student life. Almost everyone must have dreamt of getting a high paid job after completing B.Tech. The thought is so instilled in the mind, that it sometimes creates an unnecessary stress in one's life. This could lead to lose your dream job. To get away from it, here's an article which explains the process of placement in one of the most sought companies - Xerox. Go through the article to know how the procedure goes and be more confident while facing the interviewers! All the best!!

**Greetings to everyone,** it is a privilege for me to share my placement experience with you all. I received an offer from Xerox Research. The fact that my position is named 'Budding Scientist' echoes itself how research intensive the profile is. It is a wonderful opportunity as it caters to the two most sought-after aspirations of every engineer - a role where you apply what you have learnt for the last 6 semesters and a job with encouraging remuneration. Apart from that, you get an exposure to industrial research, a view of how R&D sector is proliferating from a perspective which is different from what we gather in college years as well as strengthen your profile if you wish to go for higher studies.

Xerox has a simple yet complicated process of CV short-listing. And you will get to know whether you are through this stage only a couple of days before the actual interview. As you are asked to upload two different resumes,



make one as generic and another dedicated to R&D/core profiles. The internships, projects, academic achievements, technical skills and key courses should be properly focused in the latter type. It is no harm to mention your publications if the job profile suits it. The interview process is quite involving. There were three rounds; each being a stepping stone to next. The first interview was purely based on testing your application skills. Some questions were given and a solution from Machine Learning perspective was expected. The scope of questions is quite wide, as real life objectives are given to solve, still it is safe to prepare Convolutional Neural Networks, Recurrent Neural Nets, LSTMs, Probabilistic Graphical Models, Digital Image Processing, Machine Learning and Pattern Recognition. This one went for about an hour. The next round focused more on the resume. The internships, course projects and BTP were discussed thoroughly. I tried to explain those parts in detail which were my contribution to the mentioned works. Also, many small questions and derivations were asked which can be tackled easily if you have sound theoretical knowledge. This again went for about an hour. In the final round, one design question from Data structures and Algorithms and a mathematical puzzle were asked, which were to be solved within half an hour. The questions were tough but the interviewer was friendly enough to guide you to solution, if your approach is correct. The overall interview experience was exhilarating.

Placements are definitely a valuable aspiration, hence should be dealt with plan and patience. Research and Development profile, which is becoming popular these days in other companies as well, demands strong theoretical knowledge of its field. Also, it is an added benefit to prepare Data Structures, Algorithms and puzzles to increase your chance of selection.

**Coding and aptitude (both quant and verbal) is the key to many screening tests. Being confident and vigilant does half of your work in interviews.**

Being the placement coordinator, I would suggest everyone to jot down the job profiles they are interested in and prepare accordingly. Be the master of one but have a decent idea of other profiles too. Coding and aptitude (both quant and verbal) is the key to many screening tests. Being confident and vigilant does half of your work in interviews. With a series of screening tests, failure is bound to happen in some of them. What matters is the idea of keep going; an incessant effort to give your best. And lastly, work as a department or a group of friends instead of struggling alone to cover stuff in a limited time because your competition is with no one else, but with yourself.

With this, I wish you all the very best for the coming season and future endeavors of the life ahead.



Chandra Kiran Anem



Chandra Kiran Anem

# PASSION FOR VLSI

## ABOUT THE ARTICLE

**"Develop a passion for learning. If you do, you will never cease to grow."**

The following article is the best example of the above saying. It describes a student's passion and determination in following his interest. VLSI is the process of creating an integrated circuit by combining thousands of transistors into a single chip. VLSI began in the 1970s when complex semiconductor and communication technologies were being developed and the progress has been phenomenal. One cannot imagine a life without a computer which has a microprocessor- a VLSI device! Intrigued about the field? Dive into this article and find out how you can proceed!

The roots of my interest in the field of Analog and RF Electronics date back to my 4th semester. In the fourth semester, we had a course on Analog Integrated Circuits. Back then, Prof. Paily had taught us. I always felt that something vital was missing from the class lectures. In other words, I was unable to connect the dots to form a pattern. Nevertheless, this field had interested me the most so far. The curiosity had made me to freelance the areas on Analog Electronics. I very soon realized that Analog Electronics would not be a cakewalk. By this sheer freelancing, I landed at the lectures of Prof. Narendra Krishnapura of IIT Madras, who could be revered as "God for Analog Electronics".

Needless to say, his lectures and his methodologies are a

complete package for a bright career in this field. I spent nearly a semester and a half understanding the basics of Analog Electronics to the point of concretely reasoning any circuit I would encounter. Meanwhile I had approached Dr. Nagarjuna Nallam so that I could gain some hands-on experience. Even Dr. Nagarjuna had told me to stick to his lectures to get all the basics intact and a couple of times provided me with some Problem sheets. After all the groundwork discussed above, I had designed a 2 stage high gain Miller Compensated Op-Amp and tested it for various feedback configurations. During this process, I got hands-on experience with advanced simulator Cadence Virtuoso, which is an Industrial standard. I thought of extending my knowledge to Digital VLSI as well. So during my third year vacation, I interned with Mentor Graphics where I had learnt to build Verification environment for ASIC's in System Verilog. During my internship, I could see how any IC design company works and realized the importance of Verification of Designs, which is otherwise considered as a very boring and monotonous job. Currently I am working on my thesis in the area of Analog and RF IC design titled, Design, Modelling and Characterization of N-Path filters.

Analog Electronics finds its use in any Communication system. I believe Analog Electronics is a kind of license to do something big. The field of RF wireless systems attracted me the most. RF IC design is an area with a lot to offer to a skilled Analog Design Engineer. Most of the subsystems that are used in a wireless system, be it GSM, Bluetooth, WiFi, WiMax, ZigBee etc are analog in nature, which requires nothing but a skilled Analog Engineer. Now it is needless to elaborate the scope for a skilled Analog/RF engineer. Adding to this, is the fact that you can hardly find any skilled Analog/RF engineer. Edison Fong, former Senior Analog Designer and Director at National Semiconductor said in one of his interviews that Analog IC firms are in shortage of Analog Engineers and added that only 1 in 45 Analog Engineers of National Semiconductors is actually fit to perform his/her role and the search for a skilled Analog Engineer is like a hunt

**My second year internship was under Prof. Nagendra Krishnapura of IITM, widely regarded as Analog God in India**



is like a hunt for an oasis in the Sahara. Having quoted this, one can realize the shortage and importance of an Analog/RF engineer in any IC design firm.

For any prospective student who is willing to work in this area should make sure that their Electrical Networks is nothing but absolutely perfect. After all, we engineers would love to bring everything into a nice linear network. Then comes Analog Electronics. The approach to learn Analog Electronics is to understand the topology of the design. One can refer to the lectures of Prof. Krishnapura of IITM for Analog Electronics. It is a done deal if one masters Analog Electronics to be a good Analog/RF engineer, just which you have to bring your entire arsenal together. Dr. Nagarjuna Nallam can be a good mentor for anyone interested in this field.

# TRANSITION

## JOURNEY FROM BEING A FRESHER TO SOPHOMORE

### -ABSTRACT-

Edited by Diwanshu Jain

Needless to say, it's a dream of every engineering aspiring students of the country to be in an 'IIT' and be referred to as an 'IITian'. And when you achieve your goal and join the elite of finest minds of the country after coming out of the gruesome process thinking that it's over, you actually realise that what you thought as an end, is in fact, a start of a scintillating journey of your life. A journey which is full of surprises, a journey which builds you as an individual & a journey from being an impulsive adolescent to a responsible adult.

On this journey, you meet several people, coming from diverse backgrounds, having different culture/traditions yet sharing a common thirst of knowledge and a passion to achieve 'success'. Each one of us has a different story to tell, and have our own expectations. Sometimes, our expectations and goals change with time. Have you ever wondered what transition takes place when one goes from the first year to second year?

Let's go through the experiences of two of our branch mates, Mayank (fresher) and Sai Karthikey (sophomore) and try to explore the "transition", where they share their contrasting definitions of 'success', ponder upon their actual passion, and when they start enjoying the new life, realization hits hard. In the end they realized that the race has just begun!



**There were moments of bliss, there were experiences of sorrow, but one thing was sure, all of them had a message hidden- Life is beautiful, all you need is a little perspective.**

**-Mayank**



## *Desire and Destiny*

**-Mayank**

Still remember those days of restlessness and anxiety which was experienced when I landed on the place of my dreams, the destiny I set out out to, the milestone that would potentially shape my life for the better.

New faces greeting each other, all of them having new goals and beliefs, some vowing to never let their parents' head stoop low, some trying to grasp it all in one go, be it the beauty of the campus or the vastness and greatness the institution offers.

We were officially a part of a whopping twenty two year old legacy and individually yet simultaneously took an oath to bring glory to the name and fame the college offered.

Was it my dream, or was it shown to me by the society, did I really want to be called an IITian or was it the people who wanted me to think as such? Well, this remains the topic of debate and maybe a question I will not be able to find an answer to.

25 July, 2016 was the day I officially became a student of IIT Guwahati in Electronics and Electrical Engineering department. Days went by, time was flowing, I was wondering if it was this fast always. Many people changed

from mere acquaintances to best of friends. Discussions ranged from pre-IIT struggles to politics to girls in college to future dreams. One thing was apparent though, each one had a story to tell, some of tough life, some funny, others sad, all they needed was an ear to listen to but who has time in such a busy world where everyone was running in a race, a race to finish the earliest and the best of the lot. Little did we know that the system was designed to metamorphose simple and innocent students into lifeless adults, a world where monetary gains was the driving force and small talks were a waste of time.

Evening play and midnight chatter soon disappeared, we were engrossed in the never ending vicious circle of getting good grades. To the outside world we are the geniuses who did life changing work inside those four walls. Sorry to disappoint the society but we are the same children who didn't know how to tie the laces of our shoes, the same "chotu" who used to spill his glass of milk all over the majestic carpet meant to be shown to guests with a suppressed pride. We are trying hard to survive and prove to the world the faith they have in us isn't misplaced.

The four months taught us something we would always cherish in our lives. A part of us really matured. The other part blossomed like a bud resisting for too long. A lonely child got his confidant, the prudent ones were shown their place and above all, the curious ones got some-

thing to cling on to, a hope that the future is secured, the present is in right hands and the past bore sweet fruits.

Coming back home from home after the semester, I felt a void in my life. The late night chatter, the morning whines, the evening strolls, the empathy for each other's struggles and the food, we did miss the moments of togetherness IIT Guwahati had to offer. For the first time in my life, I was genuinely happy and strived to be better by each day. Never ever did I look forward to what I would do during the day before IIT happened.

There were moments of bliss, there were experiences of sorrow, but one thing was sure, all of them had a message hidden- Life is beautiful, all you need is a little perspective. Well, some complain roses have thorns while others complain thorns have roses. We belong to the latter ones.

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## A walk down the Memory Lane...

-Sai Pentapati Karthikey

18th June, 2015 was a day that defined the next chapter of my life and also of many other young engineering aspirants like myself. On that morning, I was a bit nervous. At noon, I was sitting in front of a computer constantly reloading a webpage, positively sweating with anticipation. For I believed that the next few moments would reveal to me, whether I was ensured of success in my career.

After a few nervy moments which seemed to stretch forever, there it was, in front of me. Clearly mentioned in a bold red color was 2086. It was my rank in JEE Advanced 2015! This was way better than what anyone had expected, including myself. One may expect that I would jump and whoop in celebration, but I remained seated, eyes



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**Real pleasure is not just in taking, but in sharing. It is not happiness you gain when you outperform others by not sharing what you have learned. It is merely fulfilling greedy ambitions.**

**-Sai Pentapati Karthikey**

”

glued to the screen. As I just sat on, I was suddenly surprised by the lack of my impulsive celebration. Was I not happy? Was that not what I had dreamed of for the past two years? Does it not mean I will be successful?

As soon as the question had hit me, the answer came from within the depths of my mind. I had realized that it was not a happy ending, but a glorious new beginning! I could see a road full of forks and bends leading into the unexplored plethora of opportunities. And hence without further ado, I embarked on my journey down the

path through time...

As I had never learned enough about various branches to develop any particular interest towards a particular one, I merely formed an opinion based on advices of others and ended up deciding that pursuing Mechanical Engineering at IIT Guwahati would be just perfect for me. Now that I had to journey forth, I had to travel on with memories of friends and family embedded in my soul. And the flight took off...

After spending a couple of days at the campus, I realized that the place, though it looks green, serene and quiet from the outside, was instead a metropolis. A Metropolis treasuring a wealth of knowledge and infinite opportunities. Finding myself with no idea about what I might enjoy, I seek advice of those who had walked this path before - the seniors. It would be unfair of me if I don't mention here, all the help and guidance passed on to me by them. One word I remember every senior telling me was "explore"!

So I decided to take the ring road around the Metropolis, 'window shopping' all possibilities along my way round. For almost all of my 'fachpan', I tried all sorts of activities like dancing, athletics, drumming, MUNing, gym, debating, robotics, anchoring and many more that I can't even remember now! I was miserable at a few but I still liked them, and was really good at some but didn't enjoy doing all of them.

With somewhat more defined interests, I started feeling a bit off track and waylaid in pursuing my branch. Though it was a bit late to aim for a branch change, I nevertheless tried with sincerity towards academics. And fortunately, my road to learn electronics did open up! I once again exceeded my expectation by getting a branch change.

With clearer plans and more defined targets, I wanted to dig deeper into the Metropolis and seek the treasure trove of knowledge. A significant difference was the joining of freshers. I could clearly see my old curiosity and enthusiasm reflected on their faces. Determined to be as helpful as my seniors were to me, I did my best to guide the freshers, trying to impart the knowledge I gained from my experiences here.

Along this winding journey through time, I have realized three important things. One, we must never be completely satisfied with what we have. Every end is a new beginning. Two, you might not always like what you are good at. Sometimes you might fail at something but still, don't feel disheartened and enjoy trying over and over, getting better as the days move on. Third, real pleasure is not just in taking, but in sharing. It is not happiness you gain when you outperform others by not sharing what you have learned. It is merely fulfilling greedy ambitions. Now I just let my interests lead me to wherever my heart yearns and just try to live each moment of my life to the fullest, trying forever to dig deeper yet....

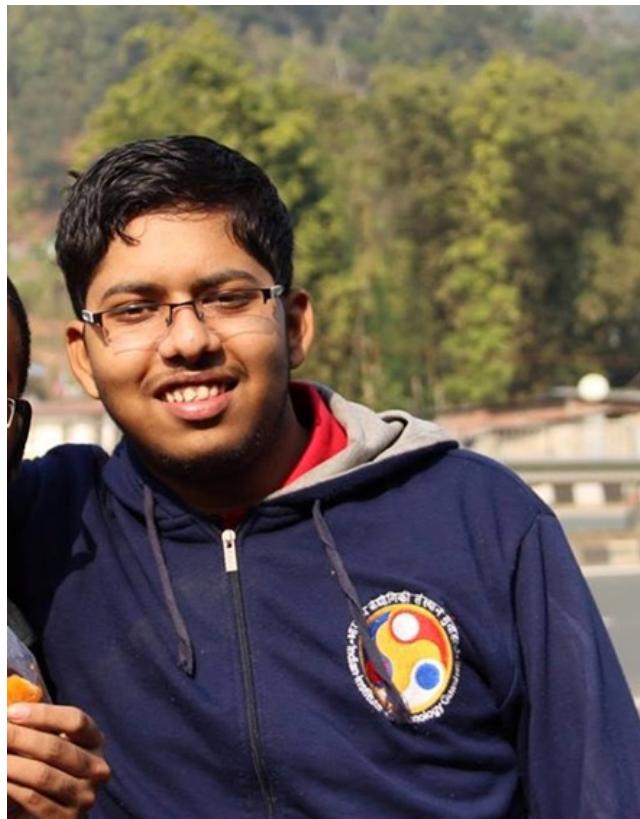
# Diving Deep Inside Deep Learning



SAI DILEEP MUNUGOTI



SAI DILEEP MUNUGOTI



Hi guys,

I am sure that most of you are facing difficulties in finding the right path to go about pursuing your research career. Hence, I would like to share my experience so that you may get some ideas on how to proceed. I started my research on Neural Networks during my second year internship with Prof. Garimella Rama Murthy at IIIT-H. The work culture at IIIT-H was more involving than at IITG. I would usually meet and discuss with the professor for more than an hour every day. This varies from place to place, but I believe this is usually the case for theoretical research. During the summer, my primary focus was on providing mathematical proofs for different types of modified Hopfield Networks we proposed. As you can observe, one of the core requirements for research area of my choice was the need for proficiency in mathematics, specifically in the areas of linear algebra, real analysis and optimization theory. Hence, it is essential to have a firm grasp of all the basics as you would not find your domain of interest until a later stage.

The next step is to gain domain specific knowledge. Once, you have decided on your domain of research, it is necessary to obtain the required knowledge to further your interest by picking up the necessary subjects in college and by perusing other internet content such as

blogs. For neural networks, I would suggest taking up pattern recognition and machine learning and specifically advanced machine learning courses by Prof Amit Sethi, as it covers all the recent developments related to neural networks and for further learning, I suggest people to follow Andrej Karpathy's blog.

Last, but not the least always look out for opportunities to further your knowledge in your domain through part-time research projects under professors or through participation in competitions. These will go a long way to strengthen your understanding of the topics. In my case, I continued collaborating with the professor during the semesters and also did a winter internship with the same professor.

For those interested to know more about my work, I have published at IJCNN 2016 and ICONIP 2015. In the ICONIP publication, we proposed a modified Hopfield Network with the state of each neuron as a vector and each synapse modelled as an FIR filter. I proved that such a network indeed works as an Associative

memory with more storage capacity than a simple Hopfield network. In the IJCNN publication, the main contribution was in proving that complex Hopfield Networks, when operated in parallel mode with the synaptic weight matrix as Skew-Hermitian, would always lead to a cycle of length 4. I also did a pet project, which involved hand coding a simple single hidden layered neural net in MATLAB. Later during my 3rd year summer, I participated in the HER2 scoring contest conducted by BIA lab of University of Warwick. For this contest, I worked under the guidance of Prof. Amit Sethi from IITG. Our team obtained the highest accuracy and was ranked first. For this contest, we developed a deep convolutional neural network to score HER2+ breast cancer on IHC stained slides. Scipy and a few other packages in python were used for data pre-processing whereas Keras was used for training and testing the CNN. Since at the time of competition I had not taken any courses which involved CNN's, I learnt the relevant concepts from video lectures of CS 231 course by Stanford University. The methodology we used is going to be published in Cytometry Part A.

I hope you found this helpful. Thank You.

# Battle of Wits

A detailed report on day - 1 of placements



**Mohit Gupta**



**Mohit Gupta**

"I know of no higher fortitude than stubbornness in the face of overwhelming odds. And sometimes, against all odds, against all logic, we still hope".

Placement session is not for the weak-hearted. Company after company, interview after interview, rejection after rejection, the only thing that remains constant is hope, but that too dipping, as the time passes. After a while, you lose the sense of time and your patience too. But all this struggle makes the success much sweeter. My hard work finally paid off as I bagged a job in Paytm. I am sharing my detailed experience to prepare you for the future placement battle. Hope you learn from my experience and mistakes.

## Day 0

There were 6-8 companies in the first slot. Goldman

Sachs, American Express, Tower Research, Oracle (US and Indian Profile), Microsoft, Nutanix (startup), Worksap and maybe 1 or 2 more.

I was not shortlisted among these but was on the extended list for Worksap and Nutanix.

In the 2nd slot, I was having 6 companies shortlisted so I decided not to wait for the shortlist to get extended and go to sleep in order to do well on day 1.

## Day 1 Test of Patience

**Companies** - Directi, Amazon, Walmart, Headout, Texas Instrument, DE Shaw, Rivigo (SDE), Rivigo (Business Analyst), Credit Suisse

I started with Amazon (25-30 people were shortlisted out of which some were already placed)

## Amazon interview

8 am to 10:25 am

### 1st Question - So what do you know about Amazon?

I wasn't prepared to start my interview with this question. But I had read months earlier how Amazon was established and was able to satisfy him with answer.

### 2nd Question - Tell me about summer intern at Wipro.

It took around 20 min. Deep discussion on project, all in and out.

### 3rd Question - How does the program gets compiled internally?

I told him I have not studied this part as my branch is ECE. He then asked me what have you studied- I told him Data Structures and Algorithms, OS, Networks and convinced him that ECE is strongly related to CS in terms of Algorithm.

### 4th Question - He asked me to tell a question which I have solved (as I mentioned Competitive Coding.)

I told him- Find the K-most frequent occurring word till now in a running stream of words by using TRIE(modified) and Heap concept. He asked why am I using min heap and not max heap and I told him the reason.

### 5th Question - Everything about Min Heap. Insertion -deletion modification.

Basic Question. Answered.

### 6th Question - Given data, how will you sort them?

I told him quick sort and merge sort are two possible ways. He asked me which one I will prefer. I told him quick sort. Why not merge sort, was the next question. I told him because of external memory use but then he asked that can't we do it 'in place'. Later, I was able to do in place merge sort and he again asked which algorithm you will prefer. I said quicksort, because it is more cache friendly and he was satisfied.

### 7th Question - You are given 100 GB data and you need to sort it. How will you proceed?

I said external sorting and he told me that he didn't want merge sort. Then I tried to twist the situation by asking what type of data is available. He was in doubt why am I asking that. So I told him that if all the data is in limited range, then I can simply apply counting sort. He was impressed and forgot about the actual question.

### 8th Question - He was done with the interview and asked if I had any question.

I enquired about the role I will be playing in the team, if selected.

**Verdict** - In 2 minutes, they told me that I have cleared round 1. News came in that I have been shortlisted (extended) for Headout and Rivigo too.

10:30 AM-11:20 am

I went for the 2nd round without wasting time as Spot On offers were to be given. The interviewer was slightly weird and straight on went for the questions.

### 1st Question - There is data available for different vehicles and all vehicles have 'n' parameters which distinguish them from other vehicles. So, given huge data you need to separate them in a different list based on some parameters matching. How will you proceed? Then he said that there are three parameters and if all the three parameters match, they belong to the same list.

I told him that let's sort the data according to the first parameter, then sort according to the second parameter and so on (something like Radix sort). He asked me to use Hash-Map and model the whole idea, building the structure for each vehicle and then use key to do hash mapping. I implemented it but due to overwriting, he was not looking impressed but he said that it's correct.

**Verdict** - After this round, I was rejected.

## Directi Interview

11:30 AM -12:10 AM

### 1st Round

Interviewer of Directi was completely different from that of other companies. He asked me to relax first and started talking in Hindi about the college (completely irrelevant) and then he gave me a question.

**1st Question - Given 2 integer arrays of size m and n, where m>n. You need to maximize the dot product by inserting zeros in the second array but we cannot disturb the order of original arrays.**

Simple. Dynamic Programming is the solution.

**Verdict** – 1st Round Cleared

### 2nd Round

Another cool person but questions get tougher.

**1st Question – ‘n’ cities and m roads (m>n), number of ways you can visit (n-1) cities one by one (each time we start from the origin city and reach to destination through minimum path and we have to output the number of different combinations possible for all the visits (for each city) with given constraint.**

Deep discussion on modified Dijkstra's algorithm, using heap sort and discussion on time complexity as it will also vary according to methodology. Then he gave me a hint on applying DP and I solved the question using the same. He was satisfied and asked me to proceed to the final round.

**Verdict** – 2nd Round Cleared

### 3rd Round

(HR+ Technical round)

This was the worst round as it was a skype interview and

the network was weak. The interview began with a discussion on my last summer intern and I was required to draw some diagrams to explain my project. It was really difficult due to the poor communication but I was somehow able to give the basic idea about my project.

**1st Question- There are 2 types of transactions in bank - Credit and Debit. How will you model the total amount of money available at bank?**

This was a "Threading" question based on synchronization. He asked me to build it in C++. He didn't seem to be fully satisfied though he said it's alright.

**2nd Question – We have a huge data of points in 2-D and they may be floating points. The query is that, given a rectangle, you need to output all the points inside that rectangle from a given set of points.**

I proceeded by making buckets in x-axis and then for each bucket along x axis. I further bucketed along the y-axis. He also helped me a bit in that.

**Verdict** - I thought that I did fine but maybe the CV and my branch were my weak points. As Directi is very selective, they selected only 2 students. But it is a really good company to work in. Rejected.

It was almost 3:00 pm. I was dead tired and were the last person to be interviewed at Walmart. This was a big mistake and I should have proceeded to Walmart, earlier than Directi.

## Walmart Interview

**1st Question – In paint software, several rectangular black blocks are given and you have to tell how many regions the whole area is divided into.**

It was a simple DFS problem and the interviewer was not even interested to take the interview. I started with the wrong procedure and then, later on, was able to do DFS but it was just a formality and the interview ended in half an hour.

Verdict - Rejected

## DE Shaw Interview

Again as the luck would have it, I was the last person to get interviewed there. I knew that it was just a formality. There were two interviewers and they were the most knowledgeable interviewers I have ever seen. Aged around 55, they knew everything and were easily able to understand my project work. Too many questions were asked about my summer intern work.

**1st Question - Given a doubly linked list, how can you modify it so that the deletion takes place only from backend? Also, the user can insert the node only from frontend and cannot delete from the frontend.**

I tried various possible solutions using encapsulation but in the end both were smiling as they knew it was not the correct answer.

**2nd Question - Difference between Data Hiding and Data Abstraction.**

Every definition I gave for data abstraction, he told me that it's for data hiding. And again both ended this question with a laugh.

**3rd Question - Next he asked me about the courses I like (this question was asked in many interviews.)**

Answered.

**4th Question - What do you know about TCP? How is the connection established?**

I answered.

**5th Question - Why threeway handshake instead of fourway?**

I told him three is necessary and after that you can even do 100 times it doesn't matter. He cross-questioned- Why not two? I replied and he was satisfied.

**6th Question - Why UDP exist and some other questions?**

Some answered. Some not.

Although I knew in 10 min that I don't deserve this company still they stretched the interview to 90 minutes. Actually, I was relaxed and even cracked some jokes here and there.

Verdict - DE Shaw selected none from IITG.

**ADVICE** - Do not give preference to companies which select very few candidates.

It was already 4:15 pm. I left interviews of Headout, Texas Instruments, Rivigo despite getting shortlisted. I thought let's go to sleep and crack the third round.

**6 PM - 1 AM**

Companies- Infosys, Paytm, Nvidia, Samsung Delhi, Samsung Bangalore, Ola

## Infosys Interview

First Company- Infosys gives a decent package - 15lakh base. So I proceeded for it. We were first given a pen paper question.

**1st Round**

**1st Question - Given 3 Gb data, sort it using 1 GB RAM.**

I knew the idea but my paper code writing skills are not good.

**2nd Round**

**1st Question - Tell me about yourself (interviewer was staring at me as if he was going to eat me). He also asked me to explain my BTP.**

Answered

## **2nd Question - Explain the 3 GB question (mentioned above).**

I told him about External merge sort. He criticized me as I didn't know K merge sort and said that I only knew two-way merge, because the internet provides only that. I tried to explain that the question doesn't demand k-way merge.

## **3rd Question - Given a directory address, change it to 6 letter shortened address.**

I told him to use Hash map but he was not convinced, and again started complaining that the students don't know anything.

## **4th Question - Design the snake ladder problem with multiplayer.**

(Unanswered)

## **5th Question - Given a hash map, whether key is mutable or not.**

I tried to confirm the meaning of mutable with this reference (later on found that it's a JAVA term) but I still answered, and I was correct. Again the interviewer told me that he doubted if I had ever done coding.

## **Paytm Interview**

I had 5th rank in Paytm written test and the Paytm people badly wanted to interview me.

### **1st Question - Have you worked on Database?**

I said no, giving him a proper reason that at college level there are a very few projects which are based on database, specifically in my department, though I know how to write the basic queries.

### **2nd Question - You have five minutes to tell anything you want with details of one project.**

I was speaking at 150% mode.

### **3rd Question - Building rain problem. You need to find**

### **the maximum water pond formed between buildings.**

I solved it. The interviewer went out after this. At that time, I wasn't sure if I was selected. There were a few questions. Now, the interviewer got changed and he randomly selected one project from my CV and asked me to explain it.

## **4th Question - I was given a puzzle. You have to place n robots on Mars and they are connected via GPS. You need to move each robot such that the whole planet is traversed and each robot travels minimum area (meaning no overlapping of area).**

I handled the question perfectly but he suggested an easy solution. I defended my solution.

## **5th Question - Design a dictionary using TRIE, having operations of inserting a word, updating and deleting (needed to write a full running code).**

Answered. After this, he asked me to leave.

I thought that I was rejected and was going for Samsung Bangalore next, but on the way I found that I was offered the job after the first round. It was one hell of a roller coaster ride. I sincerely hope that my experience would be useful to my juniors.

Now "gyaan" time – This is for those who plan to take on a Coding Job!

- 1) Start preparing from 6th semester and practice coding during summers.
- 2) GeeksforGeeks experience, Practice Part (at least do 80-100 questions here)
- 3) Interview Bit Website - Try to complete it.
- 4) Hackerearth - Do the hiring challenges. Many companies conduct their test on Hackerearth
- 5) Projects and Communication matter a lot. I was slightly weak here. Puzzles don't matter much. Please prepare Hash Maps, it is an important but often overlooked topic,

All the best for your future!



**Hey there!**

**So you have reached the end of the magazine which is super great! Thank you! We hope you enjoyed reading it.**

**We want to ask you for one favour. Can you tell us how you felt about the magazine? Any sort of feedback is most welcome, be brutally honest or tell us something funny. You can get in touch with us on:**

**cepstrumeee@iitg.ac.in**

**It's always been a pleasure hearing from our readers.  
Thank you so much!**

**With ❤,  
Team InPhase**

