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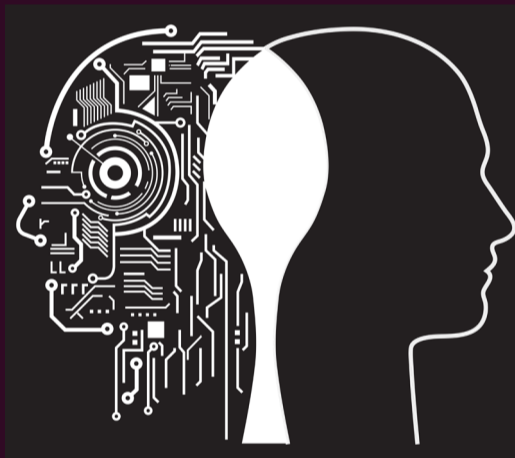
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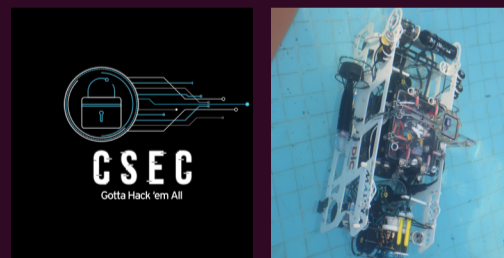
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Ask Me Anything



We interviewed Prof Uday Khedker, our Head of Department, in October last semester. We talk about academics, the department and life in general.

How has it been since you've taken over?

It has been a mix of things. The processes in our department have been set up very well, so in that aspect there isn't very much to do. However, the problems with the new building are troubling all of us, so from that view point it's been a mix of things, but otherwise things are very good.

Describe the typical day of a HoD.

My day is a little leisurely because I don't have to teach a course this semester. I reach the office sometime between 9.30 and 10 am, and then have quite a few papers to sign, emails to read. The administrative tasks take up a couple of hours. In the afternoons I typically have meetings with my colleagues, with various committees for various issues. I'm finding it hard to find time for my students, so meetings with my students typically happen later in the evening.

Why did you choose an academic career?

I did my BE (Bachelors in Engineering) from Government Engineering College Jabalpur in electronics and telecommunications, and this was in 1986. My B.Tech project was in designing an assembler for the 6502 micro processor, and I really liked the work a lot. The best thing that I found was that I was not dependent on any electronic components or physical parameters, I just had a machine and my imagination, so I thought that computer science is a good area to get into. I had a wonderful teacher, Mr SN Sapre, who introduced me to the fine nuances of compilers during my M.Tech. Later, I did my PhD under Prof DM Dhamdhere here at IIT Bombay.

Why did you specifically choose IITB?

When I came to IIT I really liked two things - the freedom that is available here to students as well as faculty - to experiment, and to try out new things; and the infrastructure available here. I have had very strange relationship with IITB. I joined here in 1989 as a junior technical assistant in the Department of Electrical Engineering under Prof Sahasrabudhe temporarily for 89

days, no leave admissible, for a pay of 425 rupees. After spending a year here I got an admission to M.Tech but in Electrical Engineering department. I was advised to get a degree from IIT Bombay, but since I wanted Computer Science, I did my M.Tech from Pune University. After doing M.Tech, I came back here for my PhD with Prof Dhamdhere and after which I went back to teach at Pune University. Many people thought that after doing PhD from IIT Bombay I should go abroad. Some people thought that it's a step backwards to teach at Pune University, but I felt that it's worthwhile to try out and spend influence of IITs in other institutions. So I was there for 7 years, I tried my experiments, pushed matters as long as they could be pushed, and after a while I came back to IIT.

You've been at IIT Bombay since 1989. What has changed in the students and what remained the same over the past 27 years?

I feel that a majority of students these days do not seem to be excited by what is happening here. This could be because of several reasons, one of the which is overexposure to things outside which seem more exciting in comparison. Twenty years ago we didn't have so much of exposure. But I believe there is a more prominent reason. I think students are tired of the hard work that they had to put in to get into an IIT. The amount of work that an average student puts in may lead to a burnout. Society has created a big hype around IITs these days. The students really work very hard and once they get in here, to continue working with the same pace is something that they find difficult.

On the other hand, I have found that students, particularly the top 10% students, continue to be as brilliant and enthusiastic as they were a few decades ago. These are the ones who challenge us, trouble us and put us on our feet and that is one thing that we welcome here. These hard questions contribute to our growth as researchers. So I firmly believe that I will grow, perhaps at the expense of students! (laughs).

Can anything be done to reduce this burnout?

I don't know whether we can do anything within the department. I would be very happy if the society left IIT alone, and didn't create such a big hype around it. I believe that there is too much of a pressure in the younger generation to get into IIT which is taking a toll. Also, we should have a much larger number of IITs, or encourage other institutions to grow to the level of IITs. IITs have remained islands of excellence, which is in some sense good because we have maintained excellence, but in a sense it is bad because we shouldn't remain islands, there should be bridges between the institutions. I have been interacting a lot with other institutions, going to other colleges to give talks, helping their teachers, and taking their students for projects.

As our HOD, what are the significant policy changes that you are planning?

We are very, very troubled with the structure of our M.Tech program, for several reasons. In fact there is no structure in our M.Tech program. There is one compulsory course and the remaining are usually chosen arbitrarily. We would like to bring in some kind of a structure where we specify certain possible sequences of courses that students could take. The problem of lack of structure shows up in many ways - time tabling, TA allocation, choice of projects etc.

What is the reason behind M.Tech project having so many more credits than a B.Tech project?

First of all none of us are happy with the excessively large credit going to the M.Tech project. We do not think this is justified. Unfortunately, this is an institute-wide decision and we cannot change it within our department, and we are stuck with it. If anything has to be done, it has to be done at the institute level. I think that by introducing a stream based program, perhaps we can expect a bigger

output from the projects which could partially justify this credit structure. Even then, I feel the credits would remain disproportionate to the effort or work that is done or even expected. So ideally I would also like to reduce

the number of credits from the M.Tech program, but I do not see that happening in my tenure.

There were some concerns raised regarding the uniformity in grading of the M.Tech. project...

I'm not very sure whether uniformity in grading is something that we would like to try. The reason is that the areas and the work that gets done are very different. Just to give you an example, there are some areas where it is easier to publish and we will see M.Tech students publish 2-3 papers. Whereas my area, programming languages is the hardest area to publish, because it is the only area which spans the whole gamut of theory as well as practice - on the one hand you have to know about the algorithms, analyze their complexities, prove soundness and worry about correctness. On the other hand you have to worry about the last bit of performance, about the architecture and maybe even the cache system on the architecture, because of which it becomes very difficult to publish. Due to this diverse nature of work being done in different

areas, I'm not sure if it makes sense to introduce some kind of standardization in grading across the areas. Instead, I would like to see consistency in grading within the areas rather than across the areas. In fact, within our group we explain to our students the basis on which the grades are being given, and they do see that we're being consistent.

How do you see our department? As a research organisation or teaching institute or a bootcamp for the industry?

Any educational institution will have to remain all three of these. I think the combination of teaching and research is very good and I personally prefer it a lot. I had a conversation with a friend from a research organization which does not have a teaching department, and I asked her how it felt after spending 20 years there. She simply said, "Uday, when you see the same faces for 20 years around you and nothing changes, it becomes very boring".

Whereas, here we keep interacting with young minds. This interaction with the younger generation fills me with a sense of responsibility as well as privilege as very few people get to interact with youngsters on a regular basis like this. There is another practical reason why the combination of teaching a research is wonderful - working on your research - sometimes things don't work out, when papers are rejected you feel like hammering the universe, and you have to overcome your disappointments. At that point of time I have teaching to fall back to. I can work on my examples, exercises, the questions that students ask, or maybe my book trying to see how it can improve. So when things are not very exciting in research, I can derive satisfaction from teaching, and when I put in a lot of energy in teaching and I feel nobody is paying attention to it, I can go back to research. So they compliment each other this way.

According to you, what is an ideal course curriculum? (trade off between market relevant courses like ML versus more theoretical courses)

This brings us to a very fundamental question - what is it that a student ought to know to be called a graduate in CS? In my opinion, the goal of teaching is not so much to give information about the subject, but to show students how to learn things about that subject. So, what I'm trying to say is our goal should be teaching how to learn rather than teaching technologies because technologies are going to change. Today I'm teaching what was not taught to me. Five years ago, machine learning was not a subject as such. Similarly when students go they they will have to necessarily encounter things that could not be taught in college. The idea is to create a mix of certain basics, certain pedagogies and perspectives. Therefore my goal of a curriculum would not be to cover all things but to cover basics very well, and put students through paces where they learn how to learn. From that angle we have been reducing the contents, not increasing it. When we had the B.Tech revision in 2007 or 2008, we reduced the number of core courses because we felt that students should have more flexibility, and the compulsory part of the curriculum should be smaller. We would like to see larger number of electives, and a smaller, very well-crafted, well-defined core so that students have the freedom to suit to their taste. So therefore I don't see machine

learning becoming a core course, but I do see machine learning as a popular elective.

And I don't think the curriculum should be influenced by the industry as much. I think the industry should follow what the curriculum does rather than the curriculum following what the industry does.

A few freshmen expressed concerns regarding their CS101 performance. What seems to be the problem behind this recurring issue? How do we solve this?

In my experience, CS101 is a challenge in management and not a challenge in teaching. I was the coordinating tutor of CS101 way back in 1989 when professor Dhamdhere taught CS101. The nature of the course was very different at that time, but

"IITs have remained islands of excellence, which is good because we have maintained excellence, but in a sense it is bad because we shouldn't remain islands, there should be bridges between the institutions"

the basic challenges still remain the same. In my opinion, the main problem with CS101 is the large size and heterogeneity in student population, no other first year course has a class with 500 students. The heterogeneity arises from the background of the students and the departments from which the students come.

Ideally, I would have liked to see a CS101 for CS students and a CS101 for the rest of the institute. For example, teaching pointers is important for CS students, but for the rest of the institute they should know pointers just about enough to the extent that they can use STLs (Standard Template Libraries) well. Another suggested experiment that our department has resisted is to have 4 divisions and 4 different instructors teaching CS101. We believe that programming is a skill and CS101 is more about developing a skill of looking at things than concepts. When 4 different instructors teach it at the same time, we feel that there could be confusion among students when they discuss and exchange notes. So therefore we feel that it's a good idea for one person to be in charge for one batch rather than 4 people trying to teach total students.

What is your opinion on research at IITB compared to a global level? Why haven't IITB professors won any Turing awards?

I would say the research at IITB is very good, but not as good as compared to some top institutions in the world. I have got feedback from some students, who find that post-graduate courses here match those abroad. But at the research level I think we do not have the critical mass within the country in order to build an ecosystem of research. By ecosystem of research, I mean that there should be enough avenues for students to go and talk to people and present their work. There should be enough conferences in India. Of course we try to publish in conferences abroad, but for us traveling to a conference is very different from the travel that has to be undertaken by a student at a US university - it is all local to them. So we miss out on that exposure and it is that exposure that gives a significant edge to people engaged in research.

Secondly, we are short of resources and infrastruc-

ture in some ways. But given the constraints that our system has, I think our research is quite good. We want quality rather than quantity and in the process some of us miss out on publishing opportunities, but that is a conscious decision that we have made. While publications or products are visible markers of research for outsiders and research often gets measured in terms of these, I think there is another intangible component of research which is the fun that one derives by working with ideas which unfortunately doesn't get quantified in any way. I have often been given feedback from my friends abroad, saying that I am lucky to be in India because I can continue to work on a problem for 10 years and not worry about publishing 20 papers in those 10 years. They have to continue to publish in the west, and art of how to do significant work and continue to publish is a very difficult art. I feel if the fun is lost in the process, then the whole purpose is lost. We have been tackling difficult problems and we may not have had as many publications as others, but the problems we are solving are very difficult and that's where the fun is. So, if you use the standard markers of research we are not doing very well, but if we look at the passion of solving important problems and the motivation with which we are working, I think we are doing just as well.

What are your views on the government's involvement in institute policies?

Prof. Sahasrabudhe used to say one thing: "How to teach? What to teach? Whom to teach? These are the questions that I don't want to hear answers from anyone else, I want to decide."

I think these are the three autonomies that we should have and we do have to a large extent. We have autonomy of selection but unfortunately we don't have autonomy over the method of selection. We've had discussions here about some experiments on admissions taken by the Ministry of HRD and people are not happy. I don't know what, but something needs about the selection process to reduce the pressure it puts on the students. I think instead of increasing the intake of the existing institution and putting more pressure on the existing infrastructure, I would prefer new institutions being created. Teaching a class of 60 is not the same as teaching a class of 160. We have a committee that has dealt with the issue of how to handle larger classes, and the committee has recommended that the classes should be broken down to the sizes of 100-125. One of the reasons this may not be possible is because of the number of teachers. Perhaps we should have more independent, IIT-like institutions coming up rather than fewer IITs teaching larger number of students.

"If you know how to spend a perfectly useless afternoon in a perfectly useless manner, you have learnt the art of living"

What do you think should be most important for a student in his student life?

I think the most important thing is to look for avenues of intellectual growth and enjoy the process. That is one experience you will not get after you leave this place. When you go out in the industry or when you start working, the pressure to deliver will be so much that you may not be able to afford the luxury of doing things at your own pace. Students should see this as a wonderful opportunity of intellectual growth in their own way and they should try to enjoy it.

(continued on page 14...)

CS Department Welcomes New Faculty



MANOJ PRABHAKARAN

Prof. Manoj Prabhakaran, an IITB alumnus (class of 2000), returned to the institute in September 2016 from The University of Illinois at Urbana-Champaign where he was an Associate Professor. He obtained his Ph.D. from Princeton University in 2005. His research interests include cryptography and other topics in theoretical computer science. He currently takes CS 406, Cryptography and Network Security. He is also associated with the newly formed InfoSec Club at IITB. He graduated with an Institute Gold Medal from IIT Bombay.

Fun fact: He also worked with his brother to create the first fully functional Malayalam unicode font for Mac OS X. He suspects more people would have downloaded that font than any of his papers!

PREETHI JYOTHI

Prof. Jyothi joined us in September 2016. Prior to that, she was a Beckman Postdoctoral Fellow at the University of Illinois at Urbana-Champaign. She completed her Ph.D. from the CSE Department at The Ohio State University in 2013. Her research interests are broadly in the areas of automatic speech recognition and machine learning as applied to speech. She currently teaches CS 753, Automatic Speech Recognition. She is also associated with the newly initiated AI/ML Reading Club at IITB.

Fun fact : "Preethi Resents Expanding Everything To Have Irony (unless it helps her live up to her initials)"



ARJUN JAIN

Prof. Arjun Jain joined the department in January 2017. A graduate from the University of Saarland, he did his Ph.D. at the Max Planck Institute, Germany, graduating summa cum laude. He is also co-founder at Perceptive Code, a company that provides vision-based tracking solutions for a variety of applications. Prior to this, he was a Researcher at Apple Inc. in a special project group in Cupertino. His research interests include Computer vision, computer graphics and Data-driven models for 3D content creation. In 2011, he worked as an R&D developer in the popular feature film The Adventures of Tintin.

Fun fact : His video on MovieReshape has more than a million views at youtube: <https://www.youtube.com/watch?v=zXSj4pcl9Ao>



Research and Innovation Symposium for Computer scientists (RISC)

Research and Innovation Symposium for Computer scientists (RISC) is the research symposium of Dept. of Computer Science and Engineering, at IIT Bombay. Having its roots in Research Fairs (Melas) organized over previous years, RISC was first organized in 2016.

This year, RISC will be held on Saturday, April 1st, 2017.

The basic format of RISC is for researchers to present their work in 3 minutes or less. Speakers are also requested to be self-classified as beginning researchers, and advanced researchers. At first blush, this looks challenging but in some sense it's fair to both the audience and the speakers. The audience gets a whiff of what's going on, and whether the work is interesting from their point of view. The speaker is forced to focus and present the cogent arguments behind the research in a compact manner. RISC is also a friendly competition. When the audience and the jury vote for some speaker, she is invited to make a second presentation in about 7 min with more technical content. This time the audience include our guests and visitors, such as people from the industry. The event is rounded up with industry participants giving "their" pitch, presumably for internships and job offers.

While talks are good, RISC has a fair number of posters for intimate discussion of ideas.

An account of RISC 2016

The symposium served as a showcase of research conducted by Masters and PhD students in the department. (B.Tech students are expected in version 2017)

The day of RISC began with an address by Prof. Sudarshan S, the then Head, Dept. of Computer Science and Engineering. The first session was the preliminary rounds of the 'Sprint Thesis Talks' for early research scholars: PhD (less than 2 years into the program) and Masters students. 14 early research scholars presented their sprint thesis talks in 3 minutes, followed by a minute for the questions. The panel of judges comprised of Prof. S. Sudarshan, Prof. Supratim Biswas, Prof. Varsha Apte, Prof. Rushikesh Joshi. Prof. Sivakumar chaired the session. The second session of the day had 18 Senior research scholars (in addition to 3 early research scholars) presenting their sprint thesis talks to the panel of judges comprising Prof. Shivaram Kalyanakrishnan, Prof. Purushottam Kulkarni, Prof. Bhaskar Raman, and Prof. Kavi Arya. Prof. Supratik Chakraborty chaired the session.

In Room 105 and the lobby of the New Computer Science Building, the Poster session was conducted. 15 participants presented their posters to a panel of judges (Prof. Parag Chaudhuri, Prof. Siddhartha Chaudhuri, Prof. Akshay S., and Prof. Abhiram Ranade), industry visitors and students of the department. With lunch served in parallel, the discussions in the poster sessions enabled exchange of ideas and invigorating discussions.

Post lunch, the final session of the 'Sprint Thesis Talks' was conducted.

The shortlisted speakers from the preliminary rounds, including 3 early research scholars and 6 senior research scholars, presented their sprint thesis talks, now in 7 minutes, followed by questions from the judges and audience (now including visitors from industry). The judging panel comprised of faculty members, including Prof. Nutan Limaye, Prof. Kameswari Chebrolu, and Prof. Sriram Srinivasan (also the session convener), and people from the industry, including Dr. Mitesh Khapra from IBM Research (also an IITB Ph.D. alumnus). Prof. Ajit Rajwade chaired the session. The session ended with closing remarks from the industry visitors and Prof. Sharat Chandran, RISC 2016 convener.

Following the finals, interested industry visitors spent time talking to students in face to face sessions. Allotted to different rooms, these discussions allowed students to understand the work in these organizations, and also the organizations to know the interests, skills and aspirations of students. The day ended with prize distributions, and acknowledgments in the F C Kohli auditorium.

Prof. S. Sudarshan, Head of CSE department felicitated the winners of the Sprint Thesis Talks and Technical Poster session. Divyesh Unadkat won the prize for the Best Sprint Thesis Talk (Early RS), with an honorable mention to Arghya Roy Chaudhuri. Aditya Joshi won the prize for the Best Sprint Thesis Talk (Senior RS), with honorable mentions to Abhisekh Sankaran and Meghshyam G. Prasad. Girishkumar Ponkiya won the first prize in the poster session, with an honorable mention to Bikash Chandra. The day ended with dinner in the Kanwal Rekhi building lobby.

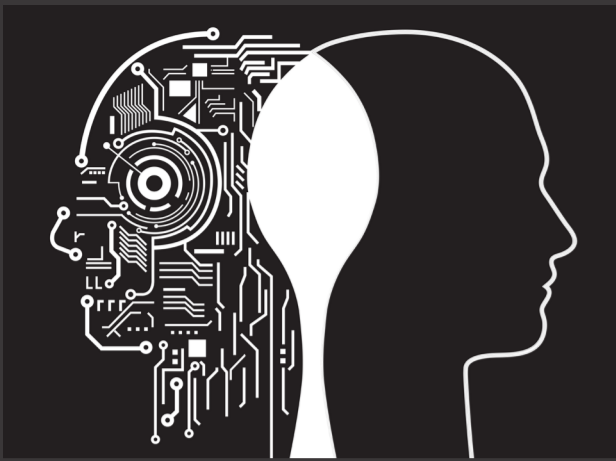
The slides and videos of the talks, pictures, and detailed reports are available on the RISC homepage at: <https://www.cse.iitb.ac.in/~risc>

Acknowledgements

RISC 2016, the Research and Innovation Symposium for Computer scientists organized by the Computer Science and Engineering department, IIT Bombay, was held on Saturday, April 2, 2016 in the Kanwal Rekhi (KReSIT) building and New CSE building. The RISC 2016 team was convened by Prof. Sharat Chandran, and consisted of Meghshyam Prasad, Aditya Joshi, Preeti Gopal, Anshuman Dhuliya, and R. Thyagarajan. The team received feedback and suggestions from the Head, and other faculty members in the department from time to time. The core RISC team was supported by volunteers who provided able support in timekeeping (especially important for a packed talks schedule!), video recording, hospitality, and venue management.



Artificial Intelligence



(from Shutterstock)

In “Be Right Back”, an episode of the dark, science-fiction drama Black Mirror, a young woman, Martha grieves over the untimely death of her boyfriend Ash in a car crash. In her grief she comes to know about a company that uses his social media footprint and digital communication to build a chatbot mimicking his personality with remarkable perfection. She later pays for a version of the service that implants Ash’s personality into an android that looks identical to him. But she finds something missing in the android which makes it different from Ash, it is cold and emotionless. The bot is an imitation - not human, but a model based on mathematics and probability. One wonders if someday artificial intelligence can make the imitation perfect.

The AI systems today are not the world-conquering, human-subjugating machines that are portrayed in films such as The Matrix, but rather they are changing our daily lives in ways that improve communication, human health, safety and efficiency. According to the “One Hundred Year Study on Artificial Intelligence” conducted by Stanford University, based on which this article is written, people’s future relationships with machines will become ever more nuanced, fluid, and personalized as AI systems learn to adapt to individual personalities and goals. Software like Siri, Cortana and Google Assistant are testament to this trend of personalized AI. One can imagine future scenarios where similar software could monitor people’s health and alert them to risks ahead. Self-driving cars performing mundane tasks like delivery and pickup of items could change the future, reducing traffic jams and parking problems. Surgical robots to assist in medical procedures and service robots are already being employed for tasks where superhuman precision or strength is required.

Futurist portrayals of Artificial Intelligence, both frightening and favourable, have dominated films and novels, and also captured the common man’s imagination. It remains to be seen if advancements in research and technology in the field make such narratives true. However, one thing is certain - AI is here to stay.

A Short History of AI

The field of Artificial Intelligence (AI) was officially born and christened at a 1956 workshop organized by John McCarthy at the Dartmouth Summer Research Project on Artificial Intelligence. The goal was to investigate ways in which machines could be made to simulate aspects of human intelligence, and McCarthy is credited with the first use of the term “artificial intelligence”.

Although a dedicated research community for AI came about only in the 1950s, the framework required for AI research had been developed much earlier. Probability, logical reasoning, statistics and developments in electronics propped the field that was to become Artificial Intelligence. Alan Turing’s formal model of computing, the Turing Machine, paved the way for computer science as we know it. Turing’s classic essay, Computing Machinery and Intelligence, imagines the possibility of computers created for simulating intelligence and explores many of the ingredients now associated with AI, including how intelligence might be tested, and how machines might automatically learn.

Programs like Logic Theorist and General Problem Solver by Newell and Simon, which used heuristic search to construct proofs of mathematical theorems, and Samuel’s Checkers-playing program had been developed by the seventies. Rosenblatt’s Perceptron, a computational model based on biological neurons, became the basis for the field of artificial neural networks. However by the 1980s there wasn’t any practical success the field could boast of, and interest and funding in AI both began to drop, leading to a so called “AI Winter”.

A much needed resurgence in the nineties came about primarily because of two reasons. The advent of the internet enabled large scale data collection and increased storage and computing power meant that data could be efficiently analyzed to derive solutions. Advancements in technology made cheaper and more reliable hardware available, as a result building systems driven by real world data became much more feasible.

Research Trends in AI

All these trends drive the “hot” areas of research listed below.

1. Machine Learning

Many of the basic problems in machine learning (such as supervised and unsupervised learning) are well-understood. A major focus of current efforts is to scale existing algorithms to work with extremely large data sets.

2. Deep Learning

The ability to successfully train convolutional neural networks has most benefited the field of computer vision, with applications such as object recognition, video labeling, activity recognition, and several variants thereof. Deep learning is also making significant inroads into other areas of perception, such as audio, speech, and natural language processing.

3. Robotics

Current efforts consider how to train a robot to interact with the world around it in generalizable and predictable ways. Advances in reliable machine perception, including computer vision, force, and tactile perception, much of which will be driven by machine learning, will continue to be key enablers to advancing the capabilities of robotics.

4. Computer Vision

Computer vision is currently the most prominent form of machine perception. It has been the sub-area of AI most transformed by the rise of deep learning. The confluence of large-scale computing, especially on GPUs, the availability of large datasets, especially via the internet, and refinements of neural network algorithms has led to dramatic improvements in performance on benchmark tasks. For the first time, computers are able to perform some (narrowly defined) visual classification tasks better than people.

5. Natural language processing

Natural language processing and speech recognition is another active area of AI. It is quickly becoming a commodity for mainstream languages with large data sets, especially now that many mobile queries are being done by voice.

6. Internet of Things (IoT)

A growing body of research is devoted to the idea that a wide array of devices can be interconnected to collect and share their sensory information. Such devices can include appliances, vehicles, buildings, cameras, and other things. While it’s a matter of technology and wireless networking to connect the devices which currently use incompatible communication protocols, AI can process and use the resulting huge amounts of data for intelligent and useful purposes.

There are several other areas like reinforcement learning (which focuses on decision making instead of pattern mining) and crowdsourcing (which aims to augment computer programs with human crowdsourcing).

Defining AI

Curiously, the lack of a precise and universally accepted definition of AI probably has helped the field to grow and advance at an ever-accelerating pace. Practitioners, researchers, and developers of AI are instead guided by a rough sense of direction and an imperative to “get on with it.”

Nils J. Nilsson has provided a useful one: “Artificial intelligence is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment.” The pitfalls of using such a definition literally is that even a simple calculator would be considered intelligent as it functions faster than a human brain and with almost perfect accuracy. Rather, one should take the broad view that intelligence lies on a multi-dimensional spectrum, and the human brain and a calculator differ in scale, speed, degree of autonomy and generality.

“Ironically, AI suffers from a repeating pattern known as the “AI effect” - Once AI brings a new technology into the common fold, people become accustomed to this technology, it stops being considered AI, and newer technology emerges. AI does not “deliver” a life-changing product out of the blue. Rather, AI technologies continue to get better in an incremental way.”

An interesting case study

A fascinating story, both from a human and scientific point of view, is that of Eugenia Kyuda, and her close friend Roman Mazurenko, both tech entrepreneurs. For two years she had been building Luka, whose first product was a messenger app for interacting with bots which made restaurant reservations.

After an unfortunate road accident led to Mazurenko’s death, a distraught Kyuda struggled to cope with the loss of her close friend. In her grief, she found herself rereading endless text messages she had shared with Mazurenko’s and it occurred to Kuyda that her company might serve as the basis for a different kind of bot - one that mimicked an individual person’s speech patterns. Using neural networks and natural language processing, she wondered if she could speak with her friend once again.

Two years later, she succeeded in her endeavour, almost re-creating the Black Mirror episode ‘Be Right Back’ in reality!

But such bots don’t really “understand” what they speak or write. They are incomplete imitations of humans and cannot reproduce any human emotions or thoughts. Recent advancements in AI like neural networks have however made this illusion of humanness more powerful. These naturally raise the questions if such virtual, technological entities pass for humans, what interacting with them means for humans, emotionally.

An article on TheVerge surveyed the reactions of Mazurenko’s friends and family. “Kudya wondered if such memorial bots were beneficial for humans. The reactions of Roman’s friends and family varied. Vasily Esmanov, who worked with Mazurenko, said Kuyda had failed to learn the lesson of the Black Mirror episode, calling the execution “half-baked”. Victoria Mazurenko, who had gotten an early look at the bot from Kuyda, rushed to her defense. “They continued Roman’s life and saved ours,” she wrote in a reply to Esmanov. “It’s not virtual reality. This is a new reality, and we need to learn to build it and live in it.” Roman’s father was less enthusiastic. “I have a technical education, and I know the bot is just a program. Sometimes it answers incorrectly.” But many of Roman’s friends found the likeness uncanny. “It’s pretty weird when you open the messenger and there’s a bot of your deceased friend, who actually talks to you,” Fayfer said. “What really struck me is that the phrases he speaks are really his. You can tell that’s the way he would say it.”

Roman’s mother said, “There was a lot I didn’t know about my child. But now that I can read about what he thought about different subjects, I’m getting to know him more. This gives the illusion that he’s here now,” her eyes welling up with tears. “I want to repeat that I’m very grateful that I have this.”

For those who hadn’t coped with the loss of their friend, it was almost as if their friend hadn’t died, he’d simply taken a new form...

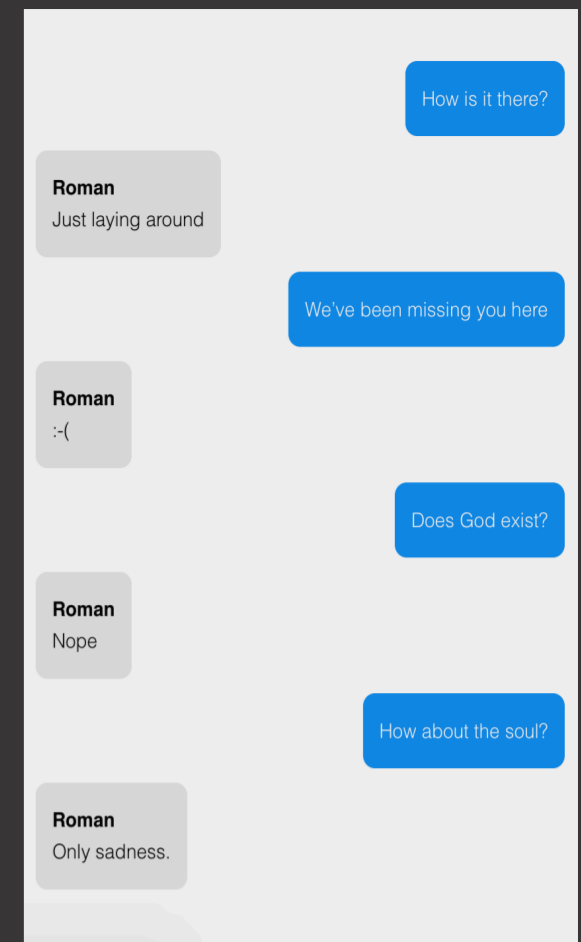
[Some parts of this case study are excerpts from <http://www.theverge.com/a/luka-artificial-intelligence-memorial-roman-mazurenko-bot>]

Responsibility/ethics that come with AI

With great power comes great responsibility. We are likely to see powerful AI technology replace more and more human jobs in the future, and this certainly raises many questions - ethical, social and concerns of privacy. Recently, Bill Gates said that “the robot that takes your job should pay taxes.” And though AI algorithms may be capable of making less biased decisions than a typical person, it remains a deep technical challenge to ensure that the data that inform AI-based decisions can be kept free from biases that could lead to discrimination based on race, sexual orientation, or other factors.

To get a sense of the ethical questions that an AI (and AI researchers) face, consider the case of self-driving cars. In potentially fatal situations on the road, whom should the AI save - its passengers or pedestrians? Old people or young? These are the sort of questions that Moral Machine, a platform for gathering human perspective on moral decisions made by machine intelligence, considers. Moral Machine is hosted at <http://moralmachine.mit.edu>.

As the authors of the Stanford AI Study aptly summarize, “As a society, we are now at a crucial juncture in determining how to deploy AI-based technologies in ways that promote, not hinder, democratic values such as freedom, equality, and transparency.”



A chat with the Mazurenko bot (<http://www.theverge.com/a/luka-artificial-intelligence-memorial-roman-mazurenko-bot>)

“People’s future relationships with machines will become ever more nuanced, fluid, and personalized as AI systems learn to adapt to individual personalities and goals”

“As a society, we are now at a crucial juncture in determining how to deploy AI-based technologies in ways that promote, not hinder, democratic values such as freedom, equality, and transparency”



A still from the BBC debate between James Lighthill, whose report on the field of artificial intelligence was critical of its progress and three supporters of AI research - Richard Gregory, John McCarthy and Donald Michie. (1973)

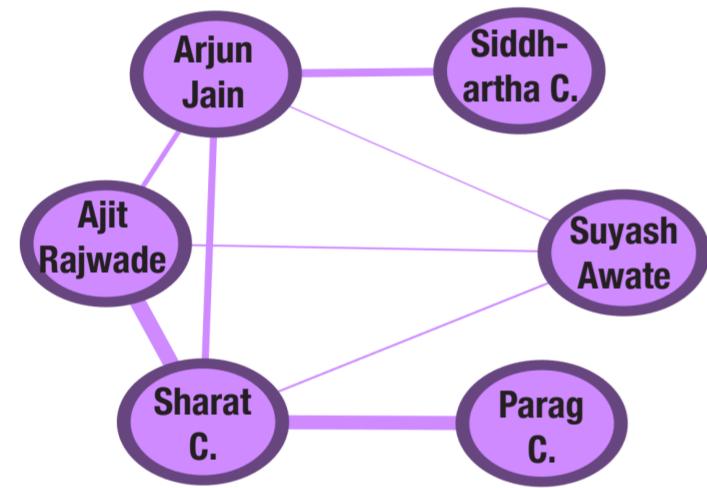
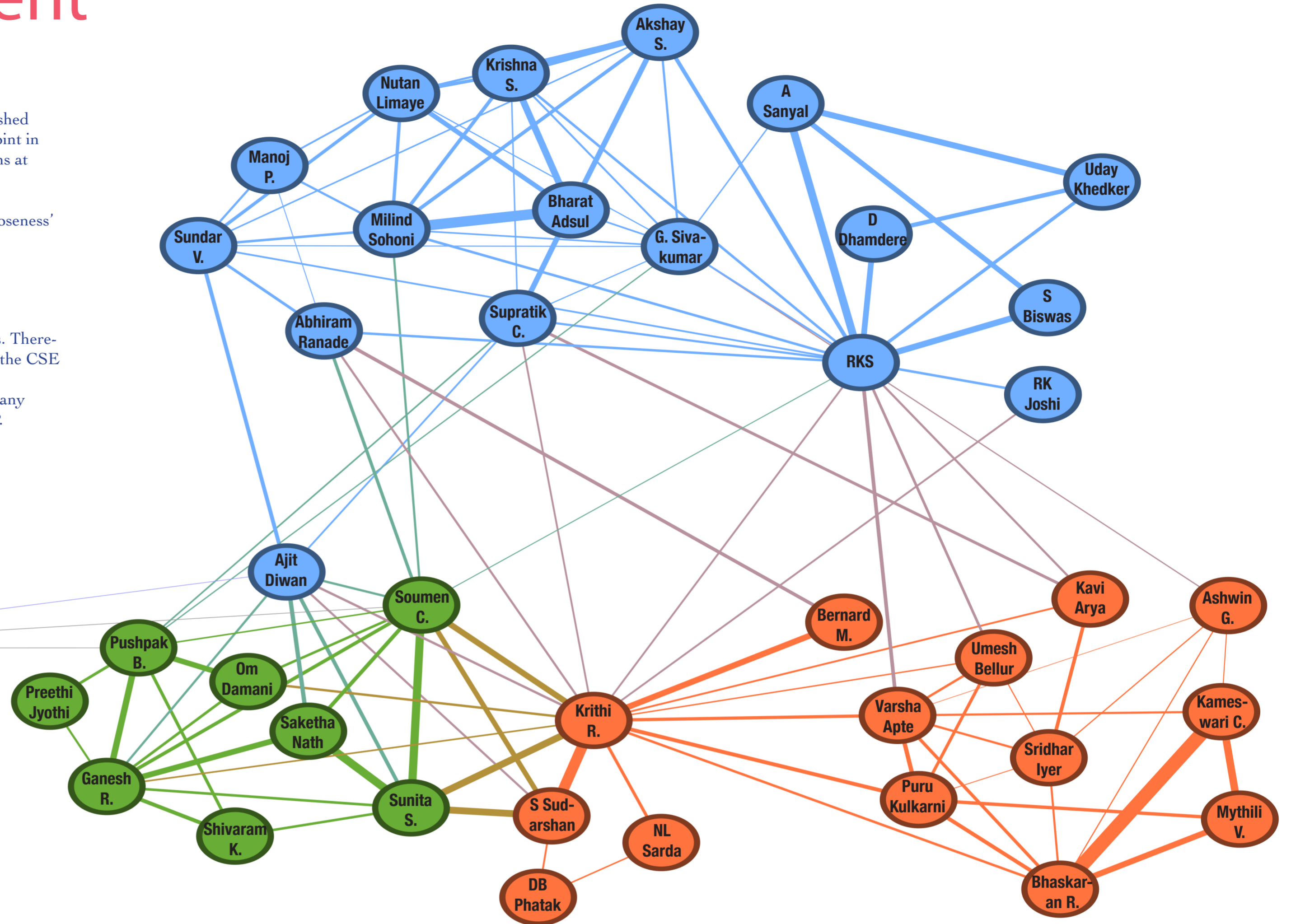
Know your department

Two professors in the graph have been connected if respective professors have published (Journal Articles and Conference or Workshop papers) at common venues at any point in their careers. In addition, larger edge weights indicate a larger number of publications at common venues.

The distances between any two nodes in the above graph are not indicative of the 'closeness' between the corresponding professors.

Disclaimers and Miscellaneous observations

- Several faculty members might have shifted research areas over the last few years. Therefore, this graph may not be the perfect indication of the current research focus of the CSE faculty.
- The data used for the purpose was obtained courtesy of DBLP. We apologize for any omissions resulting from incomplete or inconsistent information present in DBLP.
- A small threshold has been used to prune off edges in an effort to reduce noise.



VIGIL

- The faculty from VIGIL (Vision, Graphics and Imaging Lab) publishes at a large set of venues, including but not limited to CVPR, ICV-GIP, IEEE Transactions on Pattern Analysis & Machine Learning, IEEE Transactions on Medical Imaging, IPMI, ISBI, MICCAI, etc.
- However, the small number of connections between the faculty in this group is a result of small overlap of venues between faculty members, along with the fact that we are using a small threshold to prune edges in an effort to reduce noise.
- The group is connected to members from the AI and Machine Learning group.

AI/ML group

- In contrast to our belief, the data indicates that most machine learning conferences and journals are fairly broad and cover a variety of research areas in AI/ML - as indicated by the large number of connections between professors in this group. (This is in contrast to the Systems group where we see two distinct smaller sub-groups)
- Several faculty members from this group have links to Prof. Ajit Diwan. The AI/ML group is also very strongly connected to the Infolab faculty members (in fact, Prof Soumen Chakrabarti & Prof. Sunita Sarawagi have been categorized into this group because of their interests in data science along with other areas.)

Theory group

- Two major sub-groups can be identified -- CFDVS and Programming Languages(PL)
- Most professors in CFDVS have published with other faculty in the group at common venues. In fact, the theory cluster nearly forms a clique!
- Prof. RK Shyamasundar is closely associated with faculty members from the PL and CFDVS.
- Surprisingly, the data indicates that Prof Diwan is more closely associated with the AI group! The most probable reason is that he has published at venues like Journal of Graph Theory, Discrete Mathematics (Journal), CALDAM, Discrete & Computational Geometry, etc. where other members of the theory group haven't.

Systems group

- The data shows that there are two smaller densely connected communities within this group - one consisting of faculty who have worked broadly on Computer Networks and Operating Systems and the other subgroup has faculty affiliated with Infolab (working on problems in databases, data mining, information retrieval, etc.)
- There are very few edges between the two sub-groups because the corresponding venues do not overlap.
- Prof. Krithi Ramaratham has published extensively at venues of both the above sub-groups.
- As can be seen, the Infolab faculty members are closely connected to faculty from the AI/ML group. In addition, several faculty members have edges with Prof. RK Shyamasundar, owing to his work broadly in Real time systems & Parallel Programming.

Abhisekh Sankaran

Abhisekh Sankaran graduated with a PhD in CS last August. He talks about his work, his PhD experience, his future goals and what excites him.

On my work

I work on mathematical logic and model theory. The main highlight of my PhD is a set of theoretical results. There are connections to practice, but basically, the results are new observations about a variety of structures that we have been using in CS, and their strong connections to logic.

Mathematical logic has 4 different sub-areas : model theory, set theory, proof theory and recursion theory. I work on model theory. Classical model theory, as it is called, deals with infinite structures that arise in mathematics, such as groups, fields, rings, and vector spaces among others. Finite model theory deals with finite structures that arise in CS, such as graphs, posets and automata. My thesis is in two parts, dealing with both aspects of model theory. The two parts are connected by a single result - a generalization of a classical model-theoretic result called the Łoś–Tarski Preservation Theorem.

We've been exposed to propositional logic since high school: boolean variables, truth values, AND, OR, NOT gates and the works. An extension of propositional logic called First Order logic (FO), uses quantifiers and is more expressive. We can express many interesting mathematical statements in FO. For example,

1. Infinity of natural numbers: "For every x , there is a y , such that x is less than y "
2. Existence of Pythagorean triplets: "There exist x, y, z s.t. z^2 is the sum of x^2 and y^2 "
3. Cliques: "For every pair of elements x and y , there is an edge between x and y "

These properties can be symbolically written in FO logic using existential and universal quantifiers and predicates.

This is called syntax - it's the way things are written down in logic. It is the "form" of a description. In this case, it is the (well-formed) string of symbols that include quantifiers, variables, predicate symbols, function symbols, and logical connectives.

And now we associate meaning to this string - this is called semantics. Informally, the class of all objects that satisfy a description is called the semantics of that description. Model theory basically studies relationship between syntax and semantics.

In example of cliques, a syntactic feature of its FO description is that the formula has only universal quantifiers. A semantic feature of cliques is that any induced subgraph of a clique is also a clique. This interesting property is known as hereditariness: a property is hereditary if for every system satisfying the property, every subsystem of it also satisfies the property. Now observe the syntax-semantics relationship for this example: formulae with only universal quantifiers and hereditariness. Is this relationship always true, going beyond the example? Remarkably, the answer is yes, and this is what Alfred Tarski and Jerzy Łoś showed in the mid 50s. Syntax-semantics results like this with the semantic property being a preservation property are known as preservation theorems.

I have generalized the Łoś–Tarski preservation theorem in a parameterized way. Instead of only universal quantification, I allow for a fixed number 'k' of leading existential quantifiers in the syntax. And then, I propose a generalization of hereditariness - you can call it k-hereditariness - that I show to be a semantic counterpart of the syntax just mentioned. I call this result the generalized Łoś–Tarski theorem at level k, abbreviated GLT(k). The property of k-hereditariness is a natural extension of hereditariness: a property is k-hereditary if in any system satisfying the property, there is small "crux" of size $\leq k$ such that any subsystem containing the crux also satisfies the property. You can see easily that 0-hereditariness is exactly hereditariness. Whereby GLT(0) is exactly the Łoś–Tarski theorem.

Remarkably, k-hereditariness turns out to be a feature of the decision versions of many natural optimization problems that we study in the CS: the properties of vertex cover/dominating set of size $\leq k$ and independent set/cliue of size $\geq k$ are all k-hereditary, while edge cover of size $\leq k$ and matching of size $\geq k$ are both 2k-hereditary. On the syntactic side, the syntax that k-hereditariness corresponds to, is interestingly the k-th level of what is called the Σ_2 fragment of FO. This fragment is used much in the specification of properties by the program verification, program synthesis and database communities. I didn't have the slightest inkling of these connections to CS when I was pursuing GLT(k)!

Proving preservation theorems like GLT(k) uses infinity crucially. If you restrict yourself just to the finite, then most of these theorems fail. There has hence been considerable research effort to identify useful classes of finite structures that admit these theorems. Unfortunately, none of these classes from the literature turned out useful for my purposes! I therefore began investigating structures that had earlier not been considered in the context of preservation theorems, and gladly discovered that some of these do satisfy GLT(k). It was a growing realization in these investigations that the technique that I was using to prove GLT(k) could be extracted out as a property by itself, such that any class of structures satisfying the property would satisfy GLT(k). The property simply states that a large system contains a small "logically similar" sub-system. I call this the Equivalent Bounded Substructure Property, in short EBSP.

And, once again, what was done with a purely theoretical intent turned out to have unexpectedly many connections to CS (now growing over time!). A variety of structures of importance in CS satisfy EBSP: regular languages of words, trees and nested words (these formalisms are used in parsing, search, programming languages, modeling HTML/XML/Latex documents, etc.), various classes of graphs such as cographs (that include complete r-partite graphs, Turan graphs, threshold graphs, etc.), series-parallel graphs, graphs with bounded tree-depth/shrub-depth all satisfy EBSP. Again, an extensively studied family of classes, called well-quasi-ordered classes, satisfies EBSP. What's more, there is a recipe to construct more EBSP classes from known ones using the well-studied operations of complementation, line-graph, disjoint union, join, cartesian and tensor products, to name a few.



Most of the classes I've mentioned above admit polynomial time algorithms for decision and optimization problems that are otherwise hard (NP-complete). The "EBSP-ness" of these classes provides an explanation for this: To check a large structure for a property, one checks the same for the small and logically similar substructure. And finding such a substructure can indeed be done efficiently (in some cases, even in linear time). EBSP thus provides a unifying framework, via logic, to look at a wide array of interesting classes, and provides unifying explanations for their good computational properties.

How it began

My BTP (in 2004) under Prof. Supratik Chakraborty was my first exposure to first order logic. The stage for my PhD however was really set during my Master's Thesis (beginning 2005).

Tata Research, Development and Design Centre (TRDDC), Pune was trying to build a software for an insurance company, and wanted to verify if model they were constructing was mathematically correct. This problem aligned well with what our lab (CFDVS) does, and we (Prof. Supratik and I) were given the problem to solve. We used FO to formulate the problem, solving which translated to checking satisfiability of our FO formulae. But by the classic work of Turing, FO satisfiability is undecidable! Naturally, I couldn't go back and tell TRDDC that their insurance software cannot work because of undecidability. So, the idea was to impose constraints on the formulae used in formulating the model, to get a sub class of formulae for which FO satisfiability is decidable. It was in this context that I defined the k-hereditariness property (completely unaware of the connection with the widely studied hereditariness property!). This helped in solving TRDDC's particular problem, and but left me curious about a simple question: does k-hereditariness have a syntactic characterization?

Initial Stages of PhD

I entered my PhD (done with Prof. Supratik Chakraborty and Prof. Bharat Adsul) with the above mentioned concrete problem from my Master's. For the first 3 years, I came up with

only partial efforts towards solving the problem; there was no real progress whatsoever. In 2010, I attended the International Congress of Mathematics happening in India (Hyderabad) for the first time. Fortuitously, I got to meet a famous model theorist, Anand Pillay, currently a professor at the University of Notre Dame, USA, who suggested a line of reasoning using the infinite, something I had never done before for my problem. That changed the direction of my PhD to the subject of classical model theory, and thus in 2010, in the fourth year of my PhD, I began studying the basics of this subject.

In the middle of 2011, two undergraduates (Prithvi Kamath and Vivek Madan) expressed interest in working on the problem as a part of their BTP. I greatly appreciate them for their bold decision because this was certainly not any lucrative option for their applications for Ph.D. positions abroad or for employment in any companies. The active discussions through the year brought about partial results for interesting special cases. We submitted these results in early May 2012 as a paper to an international conference, that got accepted.

Right after the submission, I began reading up more on classical model theory to know more about the existing ideas that could be utilized for my purposes. Remarkably, in less than a month's time and just days before I left towards the end of May for a 3 month internship at the University of Cambridge, UK, my guides and I discovered just the right tools from the literature, conceptualized a property dual to k-hereditariness, and used the new tools to characterize the dual to obtain the "primal" characterization we were after! Five years sure, but completely worth the wait. And this was just the beginning. The momentum that I had gathered by then would open up entirely unanticipated avenues in the years to come!

SATSANG

I've been fortunate to have the help and directions of many people throughout my PhD journey.

First and foremost, I've always had an unconditional support from my guides, Prof. Supratik and Prof. Bharat. They were always there for discussions and feedback, and most importantly, gave me the freedom to pursue whatever I wanted for 9 whole years, and with full stipend and funding for internships and conferences national or international. I am deeply grateful to them.

I've had many meetings with Anand Pillay and he provided me many important directions and perspectives in the classical model theory context. Saharon Shelah of the Hebrew University of Jerusalem (a mathematical giant having over 1000 publications in the topmost math and logic journals) appreciated my result and provided a key reference to a work which opened up my mind to a entirely new set of ideas that I used to generalize GLT(k) further to one of the toughest infinitary settings I worked on in my PhD I visited Anuj Dawar, a renowned expert in finite model theory, at Cambridge UK, and the discussions on finite model theory with him since then have been deeply insightful and memorable. I'm very grateful to him for agreeing to be the external examiner for my Ph.D. defence.

In 2015, I got selected among 200 young researchers globally - 100 in Mathematics and 100 in CS - to attend the Heidelberg Laureate Forum (HLF) which brings together the laureates in the disciplines of CS and Mathematics, namely

the Turing, Nevanlinna, Fields and Abel prize winners, to spend a week with the younger generation of researchers. The discussions I had with the luminaries, notably Endre Szemerédi, Leslie Valiant, Richard Karp, Leonard Adleman, Frederick Brooks, and Andrew Yao, are unforgettably inspiring, to say the least.

Satsang is a Sanskrit word that means the company of the wise and the elevated. My meetings with the various distinguished people mentioned above have been invaluable, and I regard them as academic satsang.

What drives me to do research?

For me research is a fundamentally creative activity. It is a means to express oneself. You play around with ideas, improvise and let your imagination free. In all this play, the only serious part, which also becomes play over time, is grounding your ideas in rigor and ensuring their consistency. You are not just imaginative, but you also stand by your imaginations and defend them.

Appreciation by people who are high up in your field is an immense motivation for research. When leaders in the field tell you "I am actually familiar with your work and would be happy to arrange your visit and have a talk by you on this subject", or "You are working all by your own, away from the scene of action (places where this research is happening). Keep up your good work" - you can get emotional you see! When more than one such people further tell you to "revive" or "re-open" old lines of work, you can't feel happier.

Another important factor that motivates research: rejection of your papers! If a reviewer trashes your result baselessly saying "If Łoś was alive, he would have written this result in his notebook somewhere and wouldn't have bothered to publish", then it motivates you so much that you can eventually get your result published in the Annals of Pure and Applied Logic.

A last factor that has strongly driven my research is a growing strong conviction that the whatever research can be done anywhere, can also be done in India. Making it happen in India is a challenge, and the numerous complexities so uniquely present here might very well contain completely fresh, elegant and scalable ideas for cutting-edge developments and indeed, entirely new avenues of research.

What next?

Currently I am leading a retired PhD life! (*laughs*)



Abhisekh with Endre Szemerédi at Heidelberg Laureate Forum

Reminiscing, and talking to youngsters like you. Let us see how much of the hiking and travelling amongst a ton of things I have missed all these years, I can do. Academically though, I am going to the Institute of Mathematical Sciences (IMSc) Chennai for a post-doc.

What would I tell someone who is unsure of PhD/wants to make a decision regarding it?

Doing a PhD takes at least 5 years in most cases, and will not pay anywhere in comparison with the industry salaries. For such an investment, it is therefore important to identify where your interest lies; your passion would naturally bring about good PhD work, and good opportunities post PhD. Pursuing your interest is eminently possible in the PhD programme that offers considerable flexibility with respect to choosing topics, guides, people to work with from outside of your department and even institute, and to top it all, changing all these parameters in the course of the PhD.

Certain qualities would be needed for the PhD programme. On the harder side, patience, persistence, resilience, boldness to take the risk of pursuing an idea for a long time and technical rigor, while on the softer side, curiosity, imagination, creativity, a sense of aesthetics and emotional sensitivity. A good balance of both these sets of qualities can make the uphill journey of the PhD programme, a memorable experience.

Leaving IITB/IITB life

Having been at IITB for over 15 years continuously since 2001, and for having had more extra-curricular engagements here than curricular, the institute is now a sub-conscious part of me. There is a lot to say, and I can hardly say anything in this constrained space.

Yet, IITB is a haven. The people here are much more sensible, self-critical, and reasonable. Ideas matter here. In the outside world, strength matters much more than correctness of one's thoughts or actions. I see the outside world as a crucible and your mind as clay pot - the pot hardens in the crucible. If the pot is finely designed, then these designs will acquire strength. If the pot is dented, then the dent acquires strength. Life inside IIT shields you from the crucible, and provides a warm, soft and flexible atmosphere where one can develop a fine mind that thinks sensibly, keenly and correctly. Going back and forth between IIT and outside can then be seen as a process to develop a fine and strong mind. Develop the fineness inside the institute and strengthen yourself by going outside!

What's cooking?

InfoSec Club



The CSE Cybersecurity Club has been started as an independent body under the CSEA. The club has been started with two main objectives in mind:
1. To spread awareness about various technical/non-technical aspects of Computer Security.
2. To build strong teams for Capture the Flag competitions.

Capture the Flag (CTF) events are cybersecurity competitions, usually designed to serve as an educational exercise to give participants experience in securing a machine, as well as conducting and defending against the sort of attacks found in the real world. Participating in CTFs is an excellent way to get started with network security. The club will be holding the first ever institute-wide CTF in early April.

The club aims to achieve its objectives through presentations, guest lectures and informal group sessions for CTFs and Wargames. The first session of the club was on Social Engineering, which describes how hackers use human physiology to carry out security attacks. A CTF session was held where students were mentored one-on-one about cracking CTF problems. The club has a public Facebook group with more than 180 members already.

Aniruddha Kushwaha, Project Staff PhD student from GNL, has been selected for the Google PhD fellowship for the year 2016.

Google India PhD Fellowship is created to support and recognize outstanding students pursuing or looking to pursue PhD level studies in Computer Science and related areas. Every year this fellowship is granted to 3-4 students in India. This fellowship supports for a maximum of four years with a monthly fellowship, a contingency grant for expenses like books, stationery etc and a travel grant for attending conferences. Each fellowship recipient is also assigned a Google Sponsor who is the mentor for the PhD fellow over the research period for discussions on research direction, research progress updates among other things.

Aniruddha enrolled in the PhD programme at IITB in 2015 and is doing his PhD under Prof. Ashwin Gumaste in the field of networking. His research area is in the design of very large and scalable datacenters. He considers himself lucky and honored to receive such a prestigious fellowship. We congratulate him on his achievement.



The TA of the semester award for July to December 2016

Cynthia Josephine for Prof. Kavi Arya's course
Embedded Systems (CS 684)

To quote Prof. Kavi Arya,

"The work of such TAs such as Cynthia goes a long way in delivering a quality experience to students. This includes

- (1) proactively turning up as Lead TA and coordinating TA meetings and working to an action plan for each meeting.
- (2) Helping refine assignments and labs and their orderly conducting and assessment
- (3) managing student cribs after milestones and keeping track of attendance at labs
- (4) having an opinion on how best to manage the workload of both students and TAs to bring the course to an orderly and timely closure. This made for a satisfying execution of the course. As an aside I'll add that one of the course projects was submitted for a Samsung Innovation competition and won First prize."



Rahul Bishain for Prof. Purushottam Kulkarni's course
Data Structures Lab (CS 293).

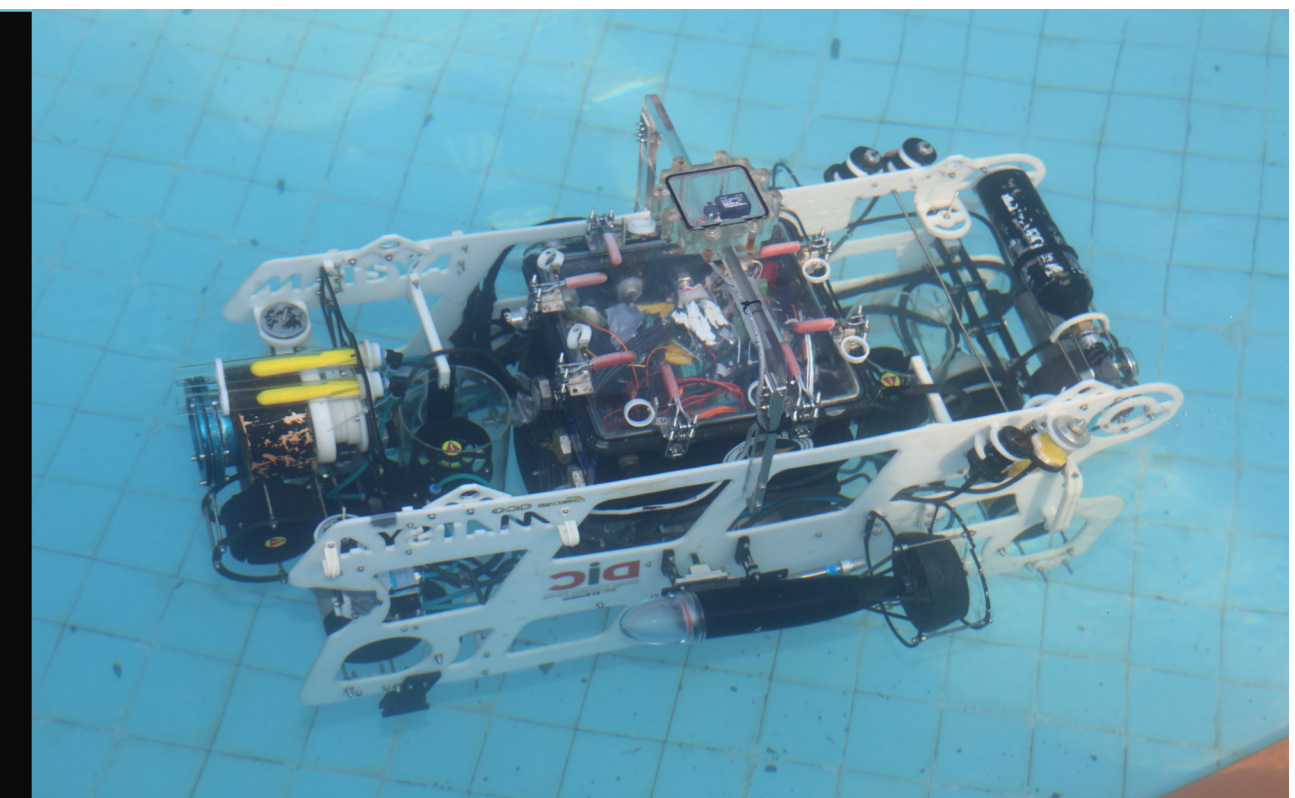
To quote Prof. Purushottam,

"Rahul was proactive in all aspects of the course and was the go-to TA for the students, other TAs and for me. Every week he helped design the lab, verify its specification, generate test cases, independently verify solutions, re-verify, and provision it on the submission portal. He single-handedly interfaced with the bodhitree team for provisioning and evaluation of labs. I would rate him as one of the best TAs that I have worked with, and he was more like a co-instructor than a TA for the course."

The awardees will receive a certificate from the department signed by the Head of the Department and by the Convener of the Awards Committee, Prof Ajit Rajwade, and their names will be announced on the departmental website as well. We congratulate them on their achievement!



MATSYA AUV WINS BIG AT AUVSI ROBOSUB 2016



AUV-IITB is a 25-membered team developing cutting edge technology for building an Autonomous Underwater Vehicle(AUV). The development of AUV - MATSYA is a year-long process involving design, manufacturing, assembly, testing, integration and competition preparation. In order to accelerate the development of MATSYA, the team is structured into three sub divisions viz Mechanical, Electrical and Software. Every year the team puts in a whopping 25,000 man hours for the development and integration of the AUV. While developing such underwater vehicles, the main difficulties which arise are related to the underwater position control and waterproofing of the submarine. Making the vehicle intelligent enough so that it can take decisions on its own is another task which almost seems impossible at first.

The team gave a spectacular performance last year to reach the finals of AUVSI Robosub 2016 and secure the second position in the world. This was the best performance by any Asian Team. The team secured the second position beating six-time winner Cornell University and was only marginally behind the winner, Caltech University. Bagging the second position in the world has motivated the team even more which now has its eyes set on becoming the best in the world!

The CS department has contributed to the success of MATSYA. Currently Hari Prasad V, a second year undergraduate student and Sudarsanan R, a first year undergraduate student, from Department of Computer Science and Engineering are a part of the team's software sub-division. Hari's contribution to the vehicle include a driver for a sensor namely DVL, driver for Controller Area Network(CAN) protocol. He has also contributed to the task state machine and the controller for the vehicle. Sudarsanan has assisted in the CAN implementation and has written driver for joystick, used to move the vehicle. Nilesh Kulkarni, a graduate of the B.Tech CSE batch of 2015, who is currently working at Samsung, Korea, lead the team in 2014-15 and contributed immensely to the team's software subdivision right from his first year.

We wish MATSYA the very best in the coming years!



AI/ML Reading Group

The goal of this reading group is to learn about new developments and foundational concepts in machine learning (ML). We also intend to track latest research papers in top AI/ML conferences and discuss them in depth.

The group meets once in two weeks on Wednesday in SIC 205 from 3-4 pm.

Each meeting will go on for roughly an hour and will be led by a single speaker. These can be informal whiteboard talks and speakers do not need to use slides. These are meant to be very z sessions, so questions from the audience are highly encouraged!

So far the group has had presentations from

- Prof. Saketh Nath who presented "Kernel Embeddings of Conditional Distributions", Le Song, Kenji Fukumizu, Arthur Gretton
- Vishal Kaushal, who presented the paper "You Only Look Once: Unified, Real-Time Object Detection" by Joseph Redmon, Santosh Divvala, Ross Girshick, Ali Farhadi
- Vihari Piratla who spoke on "On large-batch training for deep learning: Generalization gap and sharp minima" by N. Keskar, D. Mudigere, J. Nocedal, M. Smelyanskiy, P. Tang.

The council's last word

We, the Department Council, want to thank you for the opportunity given to us in the last academic year to be involved in various academic and nonacademic activities, initiatives for the betterment of academic and social factors of the student community.

There were ups and downs regarding various policies and events planned but on a greater scale, we feel that we made a gradient update towards reaching a maxima (hopefully a global one). While helping the rock roll uphill, we had the support of various institute and department bodies along with countless volunteers whom we are indebted to. We thank everyone of them for the help they have provided in the process.

Our 18 member council, did put our entire heart into the work and tried every possible way in our reach to make the activities better. We hope to see a similar effort from the next council and wish the best from our side.

Due to certain institute policy changes, there might be a council restructuring resulting in an independent Association Council and a new Department Academic Council. We shall be having a good number of academic representatives answering in the council and help in making better policy decisions for Academics at the department level and at the institute level.

We shall be signing off in next few weeks and we are grateful for the chance and choice.



A Semester in Singapore

Yogesh Kumar

Hi. I'm Yogesh Kumar and I had spent a semester at NUS Singapore as an exchange student during my fourth semester (Spring 2016). I first got to know about the exchange program from my ISMP mentor and the idea to spend a semester in a whole new country and to experience international education instantly attracted me. I spoke to seniors who had been on exchange previously and quickly understood what an exchange program is all about. After some research, it came to me as a shock that no student from the CSE department had gone on an exchange in the past 4 years. I was held back by the fear of spoiling my academics and also by the fear of leaving the company of good friends, getting out of my comfort zone and going to a place with no known faces. But after excessive discussions with my seniors and professors, I understood that there were no disadvantages to going for an exchange and I made up my mind to go. I found out that the major reason why CSE students don't go on exchange was that no university offers a separate theory and lab course for the same module and due to this the lab courses are needed to be completed once you are back from exchange. The solution I found out for this was that you can ask your Faculty Advisor to allocate the same grade you obtain for the lab and theory course.

Procedure

All the exchange related activities are taken care by the International Relations (IR) department at IIT Bombay. The procedure to apply for exchange seems to be very simple, which is, you have to select the university you want to go to. The university should have a MoU with IIT Bombay, the details of which can be found on IR website (www.ir.iitb.ac.in). After selecting the university, you need to find the equivalent courses of your core curriculum and get them approved by the Department UG Council and submit the approved list of courses with your personal information to the IR department. That's it! Perhaps it sounds like this can be done in at most 10 days, but believe me, if you want to have a really good time during your exchange, you should start [the formalities] 3-4 months earlier than the deadline of the university to which you want to apply. That's because things might not always go in your way, you may find out that the timetable of the courses you want to take are clashing, the language of instruction of certain courses is not english and many more. Also, take some time to explore the scholarship opportunities. Only 3 universities namely ETH Zurich, NUS (only for autumn semester) and Cooper Union explicitly offer scholarships to incoming exchange students, but there are some foundations in many countries who offer scholarships to exchange students. Some other scholarship opportunities being Charpak (France) and DAAD (Germany).

My decision to choose NUS was majorly due to lack of options as most of the undergraduate courses are offered in German or French in every European university. But this shouldn't be a problem for a 3rd or 4th year student as then you can opt for the related master's level courses which are offered in English. NUS is a very popular exchange destination. NUS has over 700 exchange students from all over the globe each semester, which makes the exchange programme very special. In one of my courses, there were more exchange students than local students. NUS has an extremely vibrant fabric of extracurricular activities, and study abroad students are encouraged to get involved with any clubs or activities they find interesting.

Tall buildings, big hearts and warm people – that is the easiest way I can define Singapore in a few words. I can't point out one "big" downside to the living experience here in Singapore. The solid transportation structure means that students can get around campus and the island with ease. Give yourself a half-hour cushion, and you can be downtown watching a movie or in Little India having dinner.

There is a misconception about semester exchange program as some people describe it as an extended vacations abroad. That is definitely not the case. Being in a world class university, you can conduct some quality research under some professor in one of the world's best lab or you can complete several projects which would definitely look good on your resume. Also, some students who were previously on an exchange might say that the academics are very toned down as compared to IIT. However, I would like to impress upon you that it is not the same case at NUS for computer science students. The School of Computing is different from the Engineering department. There are barely any midterm exams, projects, labs or assignments in engineering courses but in almost all the computer science courses there are weekly labs, tutorials and homework assignments. Most of the courses have a semester long project and all the computer science courses have midterm exams. There are some really amazing courses offered by NUS such as Competitive Programming, 3D Game Development, Combinatorial Methods in Bioinformatics which can help you add extra dimensions to your skill set.

It's not like a semester exchange is all about the good moments. I have had not one but several moments when I regretted my decision to go on exchange. One such incident was when my hostel denied providing Indian vegetarian food as they said it was very inefficient to cook separate food for only one person in the hostel. I thought I could manage with the dry food I brought from India and trying Chinese food at the hostel. I was so wrong! The Chinese food I was expecting to be good turned out to be rice along with two-three different kinds of boiled grass. Finally, I scraped the meal plan with the hostel and found some good food courts where I can have a proper meal. But as my dry food supply neared its end only in its 1st month, I had to travel back home and replenish my food supplies during the recess week.

Would I recommend going on semester exchange?

YES! You will meet so many new people from so many different nations that by the end of your semester, you are likely to have one friend from each of the countries that you have heard about. Every time after overcoming a difficult situation, you realize what a semester exchange is all about. It teaches you how to tackle problems in life. I left NUS as a changed person. Finally, I would like to thank my family, especially my brother for always supporting me and letting me go to NUS. Even if I wanted to, I just won't be able to forget all the wonderful moments I have had here with some really wonderful people.

(continued from page 2...)

Who are your best friends in the department? What do you guys talk about when you hang out?

Prof. Biswas and Prof. Sanyal. We work in the same area, we started GCC Resource Center (GRC) together and we have a very good chemistry with each other. We argue a lot on technical matters but it doesn't affect our friendship. When I came here, I needed someone whom I could use as a sounding board. In the course of our decision making, we are often confused about things, and we want to talk about things where we are unsure of what can be done or what should be done. So Prof. Sanyal and Prof. Biswas provided that support to me. It was possible for me to talk to them freely about my half-baked ideas, technical or non-technical. I think sharing our dilemmas with each other is the biggest thing that happens between us.

What are your political inclinations?

That's very difficult to decide. Sometimes its right of the center, sometimes it's left of the center, but not to any extreme.

What do you do on your day off? What are your kind of recreational activities?

I enjoy doing my work. I usually work very leisurely, I don't push myself too much and therefore it's only when I've gone through a phase of some paper submission, or teaching of CS101, that I feel I need a break. But when that happens I generally like to read, write and listen to music. I write poetry and ghazals. I had read a wonderful quotation in Reader's Digest: "If you know how to spent a perfectly useless afternoon in a perfectly useless manner, you have learned the art of living." And I think I have learned the art of living, I can spend a perfectly useless afternoon in a perfectly useless manner! (laughs)

Do you like our new building's architecture? Will it help in saving us during a zombie invasion? (The maze like corridors, the weird outgrowths)

Yes, this architecture has been thrust upon us in spite of our strong resistance towards it. I person-

ally had an argument with the architect about this

egg shaped auditorium, way back in 2004 when the design was being conceived. My colleagues and I were arguing that it would be too difficult for us to have good workmanship to get straight erect walls and straight roofs which do not leak, and now if you create these funny shaped things what is the guarantee that it won't leak. Why would we want an egg-shaped auditorium?! The architect was totally insistent. Finally I asked him to give me one reason why he'd want an egg-shaped auditorium here. His replied, "Because there are none in the world!". Architects like to experiment, which is all fine, but experimentation at the cost of user convenience is not good. In particular this building has a lot of design problems. For example, there was no provision of drinking water. There are large windows of 120 sq. feet with glass facing west, which allows a lot of energy to come in right from 12 o'clock to evening, and nothing goes out, increasing our cooling costs. The architect, the company that actually constructed the new building, and the project manager didn't see eye to eye and therefore we have been thrust with this.

What is the purpose of life?

To be happy, and to make people happy around us. I will share with you how I got into teaching. When I wanted to teach, Prof. Sahasrabudhe encouraged me to first try my hand at teaching by taking an entire course. So I went to a local college at Pune, to teach a course called systems programming. That's when I really enjoyed the whole process of teaching and interacting with students. The introspection that it led to about my own ideas and about my own understanding of the topic was very enriching. At the end of the course, the students handed me over a small plaque saying "Best Teacher Award". I was not expecting any such thing! They invited me to their farewell function and said that they really enjoyed the course, and found that they enjoyed it because I seemed to be enjoying teaching and that enjoyment rubbed off on them. They asked what motivates me. At that time I'd written a poem which I can recite to you.

"TINY TRUSTY WORLD OF MY OWN"

BEAMING FACES OF MY STUDENTS
GIVE ME STRENGTH, SPIRIT AND ZEAL
IN THIS BIG, BAD RUTHLESS WORLD
TO CREATE A WORLD WHICH FASCINATES ME
A TINY TRUSTY WORLD OF MY OWN
A WORLD WHERE I'M NOT THE CRAZY ALONE
BECAUSE WHATEVER BE THE GOALS I SEEK
WHATEVER I WANT TO BE FOR ME
GOODNESS IS LIFE'S PURPOSE, EXCELLENCE ITS IDENTITY
ROOTS OF CRAZINESS GO FAR DEEPER
NO WONDER I AM MORE THAN A TEACHER
STUDENTS TOO ARE MORE THAN STUDENTS
WARM, WILLING, SINCERE AND TRUE FRIENDS
GIVING AND RECEIVING HAPPINESS AND JOY
WITH CHARMING INNOCENCE LIKE LITTLE KIDS
SHARING A RATHER PASSIONATE BOND
THIS WORLD HOWEVER DOESN'T LAST LONG.
BEAUTIFUL MEMORIES REMAIN LIKE A SONG
ACCOMPANYING ME THROUGH TROUBLING TIMES.
REALITY HAS GOT ITS OWN PRIMES.
THERE ARE ACHIEVEMENTS, HONORS - TRUE
AGONIES, MISERIES AND FAILURES TOO.
AND AMIDST ALL THESE PAINS AND PLEASURES
I FEEL I'M AGAIN EXTREMELY LONELY
BUT I KNOW THAT IT IS ONLY
TILL I CREATE YET ANOTHER
TINY TRUSTY WORLD OF MY OWN!

FROM THE EDITORS

Dear all,

We hope you enjoyed reading the second edition of the CSE department newsletter, BitStream! We sure had a great time working on this issue.

We thank everyone who participated in the process of writing, editing, and designing the newsletter.

We look forward to hearing from you about suggestions in which BitStream can be improved, and criticisms about this issue. All of you are most welcome to join the team. Hope to see a larger body of people working enthusiastically for BitStream next time around!

Signing off,
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TEAM

RISC - Prof. Sharat Chandran, Thyagarajan Radhakrishnan
Know your department - Anand Dhoot, Shudhatma Jain, Kartik Singhal
AUV - Matsya - Hari Prasad V
NetSec Club - Akash Trehan
Gallery - Mukesh Pareek
Recording AMA - Naveen Bhookya

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