

From the Issue Editor's Desk

The Department of Computational and Data Science (CDS) presents the third issue of the first volume of its Newsletter series! We hope this gives you a glimpse into our intellectual enclave: what drives us, where our passions lie and what we aspire to accomplish. This is a "freshers" issue, welcoming the students who have joined our department this academic year. It features interviews with new students, our staff and recent alumni, highlights of systems research at CDS, recent activities and a vignette on Alan Turing.

Ours is an interdisciplinary department, spanning computational science, data science, and scalable systems. This offers us a diverse perspective on research methods and problem solving. Such diversity of ideas is seen among our students and faculty too, and we hope it reflects in this News Letter.

Yogesh Simmhan

From the Chair's Desk



It is our pleasure to share the activities of the department through this newsletter. The goal of this publication is to highlight our research activities, achievements of faculty, students and project staff and new initiatives.

The main motive of this news digest is to reach out to the world outside the campus including student, faculty, corporate and any individual who is interested in computational and data sciences. Ultimately, we hope to build a highly connected, a truly inter-disciplinary society and, of course, help us to network.

Our journey began in 1970, as the central Computer Centre for the institute. In 1990, it expanded to the Supercomputer Education and Research Centre (SERC), providing high performance computing facility to the Institute. A Master's degree programme in Computational Science, a first of its kind in India, was started in 1999 along with a PhD programme. CDS in its current form evolved from the academic wing of SERC in December 2015, incorporating data science as a key dimension.

Sashikumaar Ganesan



Faculty Interview

-with Dr. Anirban Chakraborty

Q1. Could you share your background with us?

I grew up in Kolkata and graduated from Jadavpur University in 2007 with a BE in Electrical Engineering. I briefly worked in TCS for 10 months and went to the University of California, Riverside to pursue my PhD. After graduating from there, I went to the National University of Singapore (NUS) for a Post Doc and also worked at Robert Bosch before joining the CDS department at IISc. I have worked on *Computer Vision* in different flavors at different places, ranging from medical imaging to video surveillance.

Q2. Tell us about the Visual Computing Lab (VCL)

Visual Computing Lab as the name suggests does research on video analytics, computing and vision in general. Our core research area is on video surveillance. Some areas of interest in surveillance person re-identification, tracking, human are activity detection and so on. Recently, we have had success in data efficiency in deep learning. We have a subgroup of students interested in knowledge distillation, which is about transferring knowledge from one neural network to another. We are working on performing this process without access to the data itself. We also work on several data association problems across text, image, and time series data. Currently, the lab is big and we are looking for good research assistants who are motivated to do research and contribute to the lab.

Q3. How do you address seemingly insurmountable, never-ending research problems?

As a researcher, we always face difficulties. Even now, we keep facing road blocks at various times and I consider that as a good sign. The definition of too-long is subjective and greatly varies depending on the stage of PhD or academic career. When I went to UC Riverside, we started on a collaborative problem on developing a software pipeline for high throughput analysis of confocal laser scanning microscopy images. These are taken from live plants and are actual time lapse images which are captured every three hours.



Each image is a 3D volume. In the hindsight, I think I spent a lot of time of on this problem -- roughly 3 years of my PhD. After I moved on to other vision problems, suddenly a lot of papers came out of them and things clicked for me. Then my adviser and I felt we should not have pushed this earlier problem when faced with diminishing returns. So, I think it is good to face roadblocks and bottlenecks in research as it helps you learn and be successful as a researcher in my opinion.

Q4. What motivated you to return back to India and join academia?

One is definitely because my family is in India and I never really had an intention of staying in abroad. The plan was always to return and join academia, and it was a decision taken after a lot of thought process. I always wanted to be part of scientific or industrial research. It was a sort of late decision for me. I grew up in the Indian academic system and so I had a feeling that I knew the system very well. It gives me a great peace of mind to be in this system than a system abroad. Mostly the decision was dominated by personal reasons and I always wanted to be in Indian academic community.

Q5. What are your interests outside academia?

It may sound like a cliché but I extremely enjoy reading. Since my childhood, my father always encouraged me to read, and never forced to only spend time on studies. This motivated me to take time out of studies and finish a book perhaps. I grew up loving to read as an exercise, using libraries. In general, I like reading about medieval history of India. The other thing I like is music which might again sound cliché but as Indians I believe we all like music a lot and I was also briefly trained as a vocalist in Rabindra Sangeet for few years. In Bengal, it is a popular semiclassical genre of songs and many people train in it. I continued it till my undergraduate and I took part in live performances even during my PhD.

Q6. What is your advice for students starting to pursue research at CDS?

First of all I would like to say that please consider CDS because we are a very nice mix of folks and our students have come from very diverse academic background. They finally graduate and specialize in topics very different from their undergraduate major. We have a good set of interdisciplinary research labs -- in fact the most diverse at IISc in terms of academics. I assume that a person is already motivated in research if they have joined as a student here. Research is quite a long term commitment and the kick that one gets out of it is the sense of creation all the time. Research is all recorded and archived so you know that whatever you do, you are contributing towards the greater good of humankind in some sense. In research, life is never boring as we do something novel every day. One has to know how to extract pleasure out of doing research. If you are faint hearted then maybe research is not for you. One of my senior student at UCR used to say, "Research is eleven months of hard work/failure and one month of success". The experience that you gain out of every failure will make you a better researcher. One has to enjoy the 90% of days where failure happens because you know that your are on the right track towards succeeding in your research problem.

Facebook's Data for Good Event

In today's world, more than two billion people use Facebook. The *Facebook Data for Good* initiative uses the data to solve some of the world's greatest humanitarian issues through privacypreserving ways. It's motto is to responsibly share the data with the communities and organizations that need it, to improve well-being and save lives. Key data tools comprise disaster maps, electrical distribution grid maps, population density maps,



future of business survey, disease prevention maps, etc. These aggregate and de-identify the data to protect privacy. These then are used for disaster response, health, connectivity, energy access, and economic growth.

CDS hosted a Facebook Data for Good event on 25th May 2019 from 4-7:00PM as part of a roadshow in India. It featured a fireside chat with Srikanth Viswanathan, CEO of Janaagraha Centre for Citizenship and Democracy, a non-profit working towards transforming quality of life in India's cities and towns. Prof. Yogesh Simmhan delivered a talk on Project SATVAM to monitor Urban Air Quality using IoT. A case study was presented by Gautham Ravichander of eGov Foundation, who highlighted the role of open data and APIs. At the end, Alex Pompe, Research Manager at Facebook's Data for Good team, talked about how their initiative is helping the society. E.g. the relief group SEEDS India used Facebook Displacement Maps to deploy early communications at optimal time when Kerala floods displaced over a million people in 2018.

More details on the public datasets are at https://dataforgood.fb.com.

IndoSys 2019



The 6th Indian Symposium on Computer Systems (IndoSys) was hosted by IISc on 19th and 20th July, 2019. The symposium provides a platform for discussing the state-of-the-art research in the field of computer systems with leading experts in India, helps in networking with peers, and establishing collaborations. It also promotes mentoring of early-career faculty and students. This edition saw the participation over 40 faculty and students from across India.

The first day started with keynote by Prof. Sathish Vadhiyar (CDS) on *Heterogeneous Computing for Graph Applications*. It was followed by presentations by early-career faculty whose proposals were reviewed and selected. Over lunch, there was poster session where students showcased their work. There were also invited talks on erasure coding for distributed storage systems by Dr.Vadlamani (IIIT-H), cloud federation for infrastructure provisioning by Dr. Chakraborty (IIT-Kgp), and identifying meeting groups using smartphones by Dr. Mitra (IIT-Kgp). The rest of the day was spent on mentoring sessions by invited speakers for the early-career faculty and students on how to focus and accelerate their research. On the second day, Prof. Govindarajan (CSA) gave the keynote on *Memory Hierarchy Design for Multicore Architectures*. Invited talks included topics on structured parallelism for high performance and productivity by Dr. Kumar (IIIT-D), concurrent garbage collector for OCaml by Dr. Sivaramakrishnan (IIT-M) and on understanding consistency by Dr. Sidhanta (IIT-Bhilai). The symposium concluded with a panel discussion on *Systems Research in India: Challenges and Opportunities*. More details at indosys.org.

Systems Research Highlights

Systems research at CDS investigates the use of computing systems, middleware, data platforms and algorithms to support novel applications in science, engineering and enterprises. There are several systems labs at CDS: *the Database Systems Lab (DSL), Middleware and Runtime Systems (MARS) lab, Distributed Research on Emerging Applications and Machines (DREAM:Lab), Computer Aided Design (CAD) Lab, and Cloud Systems Lab (CSL).* They work on Big Data Platforms, Database Systems, High-Performance Computing, Reconfigurable Computing and Cloud Computing.

Some of their recent and significant publications from the systems groups include :

- Adaptive Partition Migration for Irregular Graph Algorithms on Elastic Resources, Dindokar and Simmhan, *IEEE Cloud Computing Conference (CLOUD)*, 2019. (Best Paper Award)
- Dynamic Scaling of Video Analytics for Wide-area Tracking in Urban Spaces, Khochare, Ramachandra, Ramesh and Simmhan, *IEEE SCALE*, 2019. (*SCALE 2019 Challenge Winner*)
- ElfStore: A Resilient Data Storage Service for Federated Edge and Fog Resources, Monga, Ramachandra and Simmhan, *IEEE International Conference on Web Services (ICWS)*, 2019.
- AutoBoT: Resilient and Cost-effective Scheduling of a Bag of Tasks on Spot VMs, Varshney and Simmhan, IEEE Transactions on Parallel and Distributed Systems (TPDS), 2018
- Platform-Independent Robust Query Processing, Karthik, Haritsa, Kenkre, Pandit and Krishnan, *IEEE Transactions on Knowledge and Data Engineering (TKDE)*, 2019. (Special Issue on Best Papers of ICDE 2016)
- A Concave Path to Low-overhead Robust Query Processing, Karthik, Haritsa, Kenkre and Pandit, *Proceedings of the VLDB (PVLDB)*, 2018.
- Collusion-Resistant Processing of SQL Range Predicates, Manish Kesarwani, Akshar Kaul, Gagandeep Singh, Prasad Deshpande and Jayant R Haritsa, *Data Science & Engineering*, Springer, 2018.
- Scalable and Dynamic Regeneration of Big Data Volumes, Sanghi, Sood, Haritsa and Tirthapura, International Conference on Extending Database Technology (EDBT), 2018.

- HyPar: A divide-and-conquer model for hybrid CPU-GPU graph processing, Panja and Vadhiyar, Journal of Parallel and Distributed Computing (JPDC), 2019.
- A real-time implementation of SIFT using GPU. Aniruddha, Babu and Vadhiyar, Journal of Real-Time Image Processing (JRIP), 2018.
- Metascheduling of HPC Jobs in Day-Ahead Electricity Markets, Murali and Vadhiyar, *IEEE Transactions on Parallel and Distributed Systems (TPDS)*, 2018.
- MND-MST: A Multi-Node Multi-Device Parallel Boruvka's MST Algorithm, Panja and Vadhiyar, International Conference on Parallel Processing (ICPP), 2018.
- A Systematic Approach for Acceleration of Matrix-Vector Operations in CGRA through Algorithm-Architecture Co-Design. Merchant, Vatwani, Chattopadhyay, Raha, Nandy, Narayan, Leupers, VLSI Design 2019
- A Hardware Architecture for Radial Basis Function Neural Network Classifier. Mohammadi, Krishna, Sivanandan, Nandy, IEEE Transactions on Parallel and Distributed Systems (TPDS), 2018.
- Migrating VM Workloads to Containers: Issues and Challenges. Garg, Lakshmi, Johny, IEEE Cloud Computing Conference (CLOUD), 2018
- Towards Improving Data Center Utilisation by Reducing Fragmentation. Shravan, Lakshmi, Bisht, IEEE Cloud Computing Conference (CLOUD), 2018

Besides research outcomes, systems research also has practical impact and marked by societal footprints. Projects like **SATVAM** on urban air quality monitoring and **EqWater** on equitable water supply help make mega-cities liveable and sustainable. **Studying Clusters in Brain Network** using deep unsupervised learning and HPC Frameworks helps understand brain networks. Developing **enterprise data workloads** helps test relational databases used by large businesses.



About the DREAM:Lab



The Distributed Research on Emerging Applications and Machines Lab (DREAM:Lab) led by Dr. Yogesh Simmhan focuses on holistic distributed systems research that enables the effective and efficient use of emerging distributed data and computing systems, using scalable software architectures, innovative programming and data abstractions, and algorithms for optimal distributed execution, to support data intensive scientific and engineering applications, which can lead to transformative advances to society.

The core competency of DREAM:Lab lies in Big Data Platforms, Programming Abstractions and Bench marking distributed applications. Current research areas of the lab are (1) Scalable platforms, distributed algorithms, processing and storage for Temporal Graphs; (2) Distributed storage, orchestration and analytics for Edge Computing; (3) IoT for Smart Cities including autonomous drones, urban air quality and equitable water distribution; amd (4) Big Data for Genomics in collaboration with the Center for Brain Research.

DREAM:Lab has collaboration with industry partners such as Microsoft, NetApp, VMWare, and other research groups at the Robert Bosh Center for Cyber Physical Systems, IIT-Kanpur and IIT-Bombay. The lab has also open sourced several in-house research software prototypes that are the outcome of publications.

The students and staff of DREAM:Lab have published at reputed high impact conferences, journals and workshops and have won many accolades, including the IEEE TCSC SCALE Challenge Award for 2019, a Best Paper Award at IEEE Cloud Computing Conference in 2019, a Distinguished Paper Award at EuroPar 2018 conference, and Best Paper Finalist at IEEE HiPC 2017 conference. Students of the lab have also won the Motorola Gold Medal for the best student in the M Tech (CDS) program in 2015 and 2017, and been awarded Student Fellowships from Microsoft, Cargil and Maersk through the department. Graduates of the lab have joined companies like NetApp Research, Ericsson Research, Samsung Research, Oracle, Amazon, and NVIDIA, while others have gone on to pursue graduate studies at USC, UC Irvine, Virginia Tech, and Indiana University.

Life @ DREAM:Lab is fun, crazy and energetic with cutting-edge research work literally happening 24x7. The culture is quite agile and feels like a startup. The lab is well-equipped with latest hardware resources and a comfortable work space aiding high productivity. The peer group at the lab welcome brainstorming, criticisms, debate on all topics and ensure a satisfying learning experience for all members of the lab.

DREAM:Lab welcomes highly motivated PhD, M.Tech. Research and M.Tech. Course students with demonstrated programming experience to work on challenging state-of-the-art topics in scalable platforms and IoT, with a strong emphasis on innovative research. There are opportunities for research assistants and project staffs to collaborate with students on research projects. Limited summer internships for undergraduates are also available for pursuing research.



Ultimate Frisbee at the 5th year lab Anniversary

For more details see www.dream-lab.in



Lab members@the 25th IEEE HiPC Conference

Freshers Interview



Shivangi Khare *M.Tech. (CDS)*

I have joined the Department of Computational & Data Sciences as an M.Tech student after completing my B.Tech. from IIIT Jabalpur in Electronics & Communication Engineering. I come from a town in Sagar district of Madhya Pradesh. CDS, being an interdisciplinary engineering department, gives the perfect platform for students like me from diverse backgrounds to come together and explore the broad research areas of computational science and data systems. I feel two years won't suffice for all the IISc offerings. However, I am looking forward to make the most of it. Presently I am excited about everything, right from clubs to international conferences to the entire campus in general. I believe the program will make me more independent and a liberal thinker for sure. By the time I graduate, I'm proudly willing to call myself as "A survivor/product of IISc", as I've heard a lot: "Getting out of IISc is more tough than getting in."

I am from Lucknow. I did my B.Tech. in Computer Science from IIT Bombay in 2017 and then worked with Samsung for 2 years. I mostly worked on application development, memory profiling, improving rendering algorithms and some minor deep learning solutions. Academics aside, I enjoy reading a lot and have been completing my target of 36 books per year for the last 2 years.

I enrolled in the M.Tech. Research program with the primary motive to push myself out of my comfort zone. Since it is a thesis-based program, I am sure I will learn a lot and then there is always that joy of creating something and contributing to the academic community. Apart from the many clubs and gymkhana facilities, I think the visibility of seminars happening across the campus is much more than I saw at IIT Bombay. Getting accustomed to Hostel life after a job is definitely a challenge, but is an excitement in itself as well. The one 'transformative' experience which I very much look forward to is the ability to ideate. Developing solutions aside, finding relevant problems is also an art in itself. I am looking forward to learning that art as well. By the time I graduate, I'm proudly willing to call myself as "an IISc Alumnus".



Animesh Baranwal *M.Tech. (Research)*



Abhishek Pasula *Ph.D.*

I completed my masters in Climate Science and Technology from IIT Bhubaneswar and have joined IISc for the Ph.D. program through a PMRF scholarship. My native place is Tirupati, Andhra Pradesh. My research work revolves around Oceanography. The objectives which drive me towards the programme are scope of the research work and amenities that I will get in IISc to carry forward the work. I'm excited about courses, lab facilities, work environment and lifestyle in IISc. By the time I graduate, I'm proudly willing to call myself as "A potential researcher and an alumnus of IISc".

Alumni Interview



Rajrup completed his M.Tech. (CP) from the CDS department in 2017. He won the CDS Motorola Award for best student in his graduating class. Anshu completed his M.Tech. (Research) from the CDS department in 2017. He investigated distributed stream processing frameworks during his degree.



I have just started off with the Ph.D. program in Computer Science at the University of Southern California (USC), Los Angeles. Before joining for Ph.D., I have worked for 2 years in Samsung R&D Institute, Bangalore as a Research Engineer. My interests primarily lie in the area of Edge Computing which has recently attracted the interest of researchers in Distributed Systems.

At CDS, I enjoyed the late-night assignment submissions, course projects and hours long problem discussions. I loved the blackboards attached at different places in the department, which always were the hotspots for problem discussions among everyone.

CDS has an application-oriented course design. There are courses offered in the field of Computer Systems and Data Science which have received a significant boom in recent years and have become essential requirements in a research position at R&Ds. CDS provides a balanced platform for both research and industry, thus giving a chance to students for choosing an appropriate career track.

And it's not all study. IISc has regular activities like cricket, football, volley, badminton and many more. If someone is interested in hiking - I was one - then they may find small groups doing the same in the Western Ghats.

CDS is а great place for а Masters in Computational and Data Sciences. We have some of the best professors and labs in our department. My advice is that sometimes assignments, projects, and research take a heavy toll, but in the end, it's worth it. We get prepared for the next level of our career when deadlines and new projects will seem a piece of cake. My suggestion is to focus on the learning, pursue topics of your interest and last but not the least have fun.

Currently, I am working as a Researcher in the Cloud group at Ericsson, Bangalore. My work involves exploring abstractions, algorithms, and applications on distributed systems, spanning Cloud computing and software architectures for large-scale applications. As of now, I am working on building distributed data provenance framework for Edge & Cloud based systems.

I have always loved the open culture of CDS. Profs are always keen to discuss the idea irrespective of where it is coming from. Along with that, I enjoyed late night "Chai pe Charcha" at Prakruthi with my peers.

The professors in CDS are very supportive and helpful. They imbibed in us the spirit to ask questions "Why", "What", "How" etc. which really helped us to come up with very good papers. On a broader level, IISc and particularly CDS prepared me to look into the problems not superficially but at depth. It gave me the vision to deep dive into situations.

The green campus of IISc gives you the sense of belonging. You get the complete peace and at the same time the campus makes you fall in love with it. One of the best things in IISc are Public Lectures. I was lucky to get chances to attend a lot of lectures given by Nobel Laureates and Fields Medalists. There are various co-curricular clubs like Rangmanch, Rhythmica and societies like Hindi Samiti, Spandan and many more for recreational activities.

I would advise the students to choose their research domain (lab) very wisely because your research interest in the domain impacts your productivity and it also helps in deciding your future goals -- say your PhD area or your job profile in industry. Also, always discuss your technical or non-technical problems with your peers. That helps in getting other's perspective on things. Finally, "You might leave IISc one day but IISc never leaves you".

Upcoming Systems Conferences

The following are some of the upcoming deadlines for notable conferences on systems research.

IEEE High Performance Computing Conference (HiPC): The conference focuses on all aspects of high performance computing systems, and Scalable Algorithms and Analytics, and Systems for Data Science. The deadline for the main conference is past, but the Student's Research Symposium (SRS) deadline is on 16 Sep 2019. For more details, see https://hipc.org/students-research-symposium/

IEEE International Parallel and Distributed Processing Symposium (IPDPS): The conference focuses in all areas of parallel and distributed processing, including the development of experimental or commercial systems, emerging technologies and interdisciplinary work. **Deadline: 7/14 Oct 2019**, For more details, see http://www.ipdps.org

IEEE International Conference on Data Engineering (ICDE): This is a leading conference on data and information engineering and addresses research on designing, building, managing, and evaluating advanced data-intensive systems and applications.

Second Round Deadline: 7/14 Oct 2019, For more details, see https://www.utdallas.edu/icde/

International Conference on Management of Data (SIGMOD): The conference is a leading international forum for database researchers, practitioners, developers, broadly on topics related to data management. Second Round Deadline: 15/22 Oct 2019, For more details see https://sigmod2020.org/

IEEE/ACM International Symposium on Cluster, Cloud and Internet Computing (CCGrid): The conference invites papers on Cluster, Cloud, and Internet computing, Adaptive Elastic Computing, Green Computing, and Cyber-Physical Computing.

Deadline: 10 Dec 2019, For more details, see http://cloudbus.org/ccgrid2020/



Know Your CDS Staff

Pushpavalli Tirumalai, Administrative Staff, CDS

Ms. Pushpavalli handles a lot of administrative responsibilities at the department, along with overseeing some of the finance logistics of the department. She enjoys listening to both classical and movie songs, in both Kannada and Tamil.

Mary Anitha, Administrative Staff, CDS

Ms. Mary is from Bangalore, She manages the academic paperwork related to the students and the department. She is associated with IISc for about 12 years. Before joining IISc, she was a primary school teacher for 7 years. She enjoys listening to old Kannada movie songs.





Shivanna, Staff, CDS

Mr. Shivanna is from Allalasandra near Yalahanka, and he is associated with IISc for about 25 years now. He coordinates all the general activities and leads the effort for the hospitality. He is a good volleyball player, and has played for IISc at many occasions and has won. Chamundi hills is one of his favorite destinations.

Ramu, Staff, CDS

Mr. Ramu is from Belagavadi, Magadi Taluk near Ramanagara. He has been with IISc for 7 years. He takes care of all the on-ground logistics involved in smoothly conducting an event. In his spare time, he likes to read, and spends his time in the library over Kannada novels. His favorite author is Dattatreya Ramachandra Bendre. He loves to watch cricket and visits Sringeri often.



Alan Turing

Alan M Turing is one of the most celebrated intellectuals of the 20th century. His works span from philosophy to theoretical biology, and he is famously remembered for his contributions to breaking the ENIGMA cipher during the World War 2, which cut down the war by at least 2 years and saved over 10 million lives by certain estimates.

Turing was born in Maida Vale, London in 1912. His father Julius was an Indian Civil Servant (ICS) in the Madras presidency. His mother, Ethel Sara Turing, was a chief engineer in the Madras Railways. He had an elder brother named John. Turing was a prodigy in the making, which was quite evident during his childhood days. He had a natural inclination towards Science and Mathematics, at the age of 16, he could solve advanced calculus problems without even the education of basic calculus.



Alan M Turing (1912 - 1954)

Image courtesy : Wikipedia

He did his undergraduate studies in Royal College, Cambridge between 1931-34, and obtained a PhD from the Department of Mathematics from Princeton in 1938 for his dissertation on Systems of Logic Based on Ordinal.

The name 'Turing' is not as familiar as Einstein or Maxwell and it is usually restricted to the computing community quite often. Nevertheless, he is a genius who stands at the same level. Especially, after the declassification of documents from Bletchley Park, the code breaking center in UK, after the late 1970s, we now have more insight into his life during the crucial months of the World War 2.

It is normal to be lost in the genius of Turing, but one should also not forget that he is an excellent leader who could lead large groups. He led the group of Hut 8, which was a wing of Government Code and Cypher School (GC&CS), responsible for code-breaking of German ciphers. He had an excellent knack of not only bringing machines and Mathematics together, but also proved to be a much needed liaison between his group, the commanders and the political administration.

His influence on popular science and culture has been immense and his life and work are immortalized in the movie "Imitation Game", where Benedict Cumberbatch dissolves himself into the character of Alan Turing. The movie is a fitting tribute to a much loved hero. Recently, in recognition of his contributions to Science and Society, the Bank of England decided to imprint his photo on their 50 pound currency notes. This came after a 6-week long public comment period, where over 200,000 suggestions were made for about 900+ eligible nominees. The final 12 shortlisted nominees included giants of the like Stephen Hawking, Ernest Rutherford, Srinivasa Ramanujan, among many others. Turing was finally chosen among all the entries. The teaching cluster in the CDS department is named "Turing", in his honour.

In his short lifetime of 42 years, he has contributed immensely to the foundations of Computer Science. Since 1966, the Association of Computing Machinery (ACM) has instituted 'The Turing Award' for lasting technical or theoretical contributions in the field of Computer Science. It is considered as the equivalent of 'The Nobel Prize' in Computer Science. There are 70 computer scientists so far who have been bestowed this award of excellence.

Some of the popular scientists who have won the Turing award are Vincent Cerf for his works on the internet communication and TCP/IP protocol design, Jim Gray for database and transaction processing, Hennessy & Patterson for their work on Computer Architectures, Frances Allen for compiler optimizing, and Barbara Liskov for foundations of systems design, among many others.

In the word puzzle in the last page, can you spot some of the Turing Award winners?

References : The Essential Turing:Seminal Writings in Computing, Logic, Philosophy,Artificial Intelligence, and Artificial Life:Plus The Secrets of Enigma, B. Jack Copeland, https://en.wikipedia.org/wiki/Alan_Turing

Recent Seminars @ CDS

- "Towards Interpretable and Responsible AI", Vaishak Belle, Chancellor's Fellow University of Edinburgh, July 02, 2019.
- "Question Answering in Healthcare: Challenges and Opportunities", Dr. Chandan K. Reddy, Associate Professor, Virginia Tech, July 04, 2019.
- "Query Classification for E-Commerce Search", Dr. Richard Wang, Principal Data Scientist at Target, July 19, 2019.
- "Bayesian Learning Machines for Coupled Biogeochemical-Physical Ocean Science", Mr. Abhinav Gupta, MIT, July 24, 2019.
- "Human Sensing: the Past, Present and the Future", Dr. Arjun Jain, CEO of Perceptive Code LLC, August 05, 2019.
- "Chip Backend Analysis A peek into verifying the world's most powerful microprocessors before sending to the mask house", Dr. Natesan Venkateswaran, IBM, August 07, 2019.

New Lecture Hall @ CDS





Renovated CDS 202 Lecture Hall

Progress can be noisy! If you have been beset by drilling and cutting sounds in the second floor, it is in the pursuit of science...well, in making the task of imparting science more productive.

In keeping up with the growing size of our department and to catch up to contemporary teaching needs, the erstwhile classroom in CDS 202 has received a much needed upgrade to a Lecture Hall. The room is larger, thanks to an expansion to the neighboring lab space, with seating for 60+. Seats with cushions have been strategically placed in the front rows, while back-benchers make do with (almost) benches. We have lots of whiteboard and chalk board real-estate for those long equations and pseudocode. The lighting is brighter and eco-friendly, and may eventually save you a visit to the optician. The flooring has been raised to assist the vertically challenged and slouchers get an uninterrupted field of view. The instructors get a raised floor as well. So besides tripping over complex topics, you may see them literally trip over with a misplaced step. You even have clear new window and door panes to gaze out and wonder at life outside the classroom. Golden cage or melting pot of innovation? Depends on your perspective. Either way, enjoy! If you have thoughts on making the facility even more effective, feel free to share it with the department.



New Flooring near 2nd Floor Elevator

The Turing Awards Puzzle

QKVLLZDRKBDDQYJR LPRAKDRAHCI E R Y V HEGTNTYNKMKDOC T K Т DSQKT Т ZL QRKHH S U IJLLTDPL SACT K L т RT N JKT 1 XDVM QOP R K K Y VZ ER J L D 1 PNQA N D SVJYDLAHRQEZJ Y Y LL JKRASKBJRMA L Т A RNT DAMIMRMEQRX NANYBMNJAPDXGQPL VYRINLKBDOMKV QL D BANEBERYKIRYB Y Y NBGDRRQDNJDGTRBR

- 1 Wanted to be a doctor, known for his contributions on NPcompleteness
- 2 Programming is an art! 3 A theoretical physicist
- ended up being a humble programmer
- 4 Introduced the Error Correcting Codes
- 5 The only Indian who made to the list.
- 6 Two words, you will "see"

- that his language is rich!
 7 He is known for his contributions to the databases.
- 8 SOLID, design principles for Object Oriented Programming
- 9 He has worked on geospatial mapping, but his disappearance was a sad irony.
- 10 Physical clocks are not enough!

It is time to test your knowledge on the Turing award winners!

Word searches can be in all eight directions: up, down, left right and the diagonals.

Use the hints to figure out who the Turing award winner is.

The answers are mentioned below (invert the page)

Tool courtesy : https://www.puzzle-maker.com/

ANSWERS

İ. richardkarıp
 İ. dönaldkruth
 İ. dönaldkruth
 J. dijkstra
 J. dijkstra
 J. siljkstra
 G. dennisritchie
 Z. stonebraker
 Barbaraliskov
 Jimgray
 Ijmgray



Piled Higher and Deeper by Jorge Cham

| Seminar | SEMINAR | | | | | |
|--|--|---|---|--|---|---|
| BINGO! | В | 1 | Ν | G | 0 | |
| To play, simply print out this bingo sheet and attend a departmental seminar. | Speaker bashes previous work | Repeated use of "um" | Speaker sucks up to host professor | Host Professor falls asleep | Speaker wastes 5 minutes explaining outline | eaker stes 5 nutes laining utline atant ypo |
| Mark over each square that occurs throughout the course of the lecture. | Laptop malfunction | Work ties in to Cancer/HIV or War on Terror | "et al." | You're the only one in your lab that bothered to show up | Blatant typo | |
| The first one to form a straight line (or all four corners) must yell out | Entire slide filled with equations | "The data clearly shows" | FREE Speaker runs out of time | Use of Powerpoint template with blue background | References Advisor (past or present) | |
| why we was | There's a Grad Student wearing same clothes as yesterday | Bitter Post-doc asks question | "That's an interesting question" | "Beyond the scope of this work" | Master's student bobs head fighting sleep | |
| | Speaker forgets to thank collaborators | Cell phone goes off | You've no idea what's going on | "Future work will" | Results conveniently show improvement | |
| 12 | JORGE CHAM & | 2007 | | | | |

Issue Editor: Yogesh Simmhan Coordinator: Shriram R

Contributors: D Awadhesh Singh Tanwar, Diksha Chaudhary, Sheshadri K Ramachandra, Shriram R