

Indian Institute of Technology Madras

Department of Computer Science and Engineering

Report for Department Degree Distribution Program in November, 2020

The Department has a vibrant student body numbering around 620 and faculty numbering 35. The full-time faculty currently consists of 15 Professors, 7 Associate Professors and 13 Assistant Professors. The current faculty include 2 Fellows of IEEE, 4 Fellows of Indian National Academy of Engineers (INAE), 1 Fellow of Indian National Science Academy (INSA) and 1 Fellow of Computer Society of India. The current faculty also include 1 awardee of the Swarnajayanti Award, 2 awardees of the Srimathi Marti Annapurna Gurunath Award for Excellence in Teaching, 1 awardee of the Institute Research and Development Mid-Career Award, and 5 awardees of the Young Faculty Recognition Award. The current faculty also include 3 Institute Chairs. The Department has Prof.Mriganka Sur from MIT, USA and Prof.Partha P. Mitra from Cold Spring Harbor Laboratory, USA as Distinguished Chair Professors in Computational Brain Research instituted by an alumnus, Mr.Kris Gopalakrishnan, a Founder of Infosys. The Department has Prof.David Peleg from Weizmann Institute of Science, Israel and Prof.Vyas Sekar from CMU, USA as Visiting Chair Professors instituted by two alumni, Venky Harinarayan and Anand Rajaraman. In the past one year, one faculty member, Prof.C.Pandurangan, has superannuated. Four faculty members, Dr.Kartik Nagar, Dr.Nishad Bharat Kothari, Dr.Ayon Chakraborty and Dr. Akanksha Agrawal joined as Assistant Professors.

The Department presently offers B.Tech. programme, dual-degree B.Tech./M.Tech. programme, M.Tech. M.S., Ph.D., dual M.Tech.-Ph.D. and dual M.S.-Ph.D. degree programmes. There are about 280 B.Tech. students, 40 dual-degree B.Tech./M.Tech. students, 130 M.Tech. students, 80 M.S. students and 90 Ph.D. students. The Department also offers the web based M.Tech. in Computer Science and Engineering with specialization in Information Security for employees of companies, with about 30 students admitted per year.

The total number of graduands receiving degrees this year is 147. The number of graduands in different degree programmes is as follows: 9 dual-degree M.S.-Ph.D. graduands, 1 dual-degree M.Tech.-Ph.D. graduand, 12 Ph.D. graduands, 15 M.S. graduands, 50 M.Tech. graduands, 4 dual-degree B.Tech. (Honors)-M.Tech. graduands, 10 dual-degree B.Tech.-M.Tech. graduands and 46 B.Tech. graduands. It is heartening to note that a large number of Ph.D. students, i.e., 22 Ph.D. students graduated in the past one year.

Out of about 150 Ph.Ds graduated from the Department till 2019, 97 of them are in Indian academia, 26 in Indian industries, 19 in academia abroad and 7 in industries abroad. Several alumni of the Department hold important positions in the academia and industry worldwide. According to a Brown University study reported in May 2014, IIT Madras was the fifth largest

contributor of faculty members to the Computer Science Programmes in U.S. universities including MIT, Stanford and Yale.

The faculty and research scholars of the Department are actively engaged in research activities in several areas of current research topics in Computer Science and Engineering. During the calendar year 2019, one book and 134 research papers have been published. These include 60 in International Journals and 74 in International Conferences. The papers published in International Conferences include several papers published in Core Australasia A* and A rated conferences.

During the past one year, the faculty and students of the Department have won several fellowships and awards. Dr.V.Kamakoti was selected for the Abdul Kalam Technology Innovation National Fellowship. Dr.Shweta Agrawal was selected for the Swarnajayanti Fellowship. Dr.B.Ravindran was selected for the Mindtree Faculty Fellowship. Dr.B.Ravindran was elected as AAAI Senior Member, one among 12 internationally. The prizes and awards won by students and faculty of the Department are as follows:

- (1) Joint winner of INAE Innovative Students Project Award 2020 at Masters Level by MS student Suman Banerjee guided by Dr.Mitesh Khapra
- (2) Best Student Paper Award at WACV 2020 by MS student Janani Ramaswamy and Dr.Sukhendu Das
- (3) Best Student Paper Award at ICONIP 2019 by MS student Saptakatha Adak and Dr.Sukhendu Das
- (4) Best Paper Award at WACV 2020 by Dr.Harish Guruprasad Ramaswamy
- (5) Best Paper Award at CSR 2020 by PhD student Vijayraghunathan
- (6) Best Paper Award at Eurocrypt 2020 by Dr.Shweta Agrawal
- (7) Best Program Committee Member at Asiacrypt 2019 by Dr.Shweta Agrawal
- (8) Best Paper Runner-Up Award at AAMAS 2020 by Dual-degree student P.K.Harshavardhan and Dr.B.Ravindran
- (9) First Prize in the Embedded Security Challenge at Cyber Security Week 2019 by students Sareena KP, Gokulan Ravi, Nikhilesh Kumar Singh and Milind Srivastava
- (10) Third Prize in the Applied Research Contest at Cyber Security Week 2019 by PhD student Keerthi K.
- (11) First Prize in the undergraduate category at the ACM Student Research Competition at ICCAD 2019 by Dual-degree student Milind Srivastava

During the financial year of 2019-2020, the faculty of the Department have been involved as Coordinators or Co-coordinators for 51 ongoing sponsored research projects with a total budget of Rs.119 Crores. During this period, 14 new sponsored research projects with a total budget of Rs.19.72 Crores have been sanctioned. The major sponsored research projects that have been newly sanctioned are as follows:

- (1) Security and Edge Intelligence Hardware Extension for SHAKTI based Compute Environment with a budget of Rs.9.9 Crores sponsored by MEITY, Govt. of India, with Dr.V.Kamakoti, Dr.Chester Reberio and Dr.Pratyush Kumar as Investigators
- (2) Programming Model/Language and Compiler for Emerging HPC Systems with a budget of Rs.2.55 Crores sponsored by MEITY, Govt. of India, with Dr.Venkata Krishna Nandivada as Investigator
- (3) Multicore Support for Tezos Blockchain with a budget of Rs.1.69 Crores sponsored by Tezos Foundation, with Dr.K.C.Sivaramakrishnan as Investigator
- (4) HPC Application Frameworks with a budget of Rs.1.3 Crores sponsored by MEITY, Govt. of India, with Dr.Rupesh Nasre as Investigator
- (5) Design and Development of Blockchain based Technologies with a budget of Rs.1.0 Crore sponsored by SERB, Govt. of India, with Dr.Shweta Agrawal as Investigator
- (6) Post Quantum Cryptography Challenges, Opportunities and Beyond with a budget of Rs.84.73 Lakhs sponsored by SERB, Govt. of India, with Dr.Shweta Agrawal as Investigator

During the financial year of 2019-2020, the faculty of the Department have been involved as Coordinators or Co-coordinators for 51 ongoing consultancy projects with a total budget of Rs.49 Crores. During this period, 10 new consultancy projects with a total budget of Rs.9.57 Crores have been sanctioned. The major consultancy projects that have been newly sanctioned are as follows:

- (1) Design and Realisation of SHAKTI based Controller for IISU Applications sponsored by ISRO Inertial Systems Unit, with a budget of Rs.64.26 Lakhs and with Dr.V.Kamakoti as Coordinator
- (2) Tata Elxsi - IIT Madras CSR project on Open Source based Translation Research in ICT sponsored by Tata Elxsi Limited, with a budget of Rs.98 Lakhs and with Dr.V.Kamakoti as Coordinator
- (3) Pratap Subrahmanyam Centre for Digital Intelligence and Secure Hardware Architecture sponsored by Mr.Pratap Subrahmanyam, an alumnus of IIT Madras, with a budget of Rs.7.10 Crores and with Dr.V.Kamakoti, Dr.Pratyush Kumar, Dr.Arun Rajkumar, Dr.B.Ravindran, Dr.Chester Rebeiro, Dr. Harish Guruprasad Ramaswamy, Dr.K.C.Sivaramakrishnan and Dr.Mitesh Khapra as Coordinators.

The faculty of the Department have been involved in organization of workshops during the past one year. Dr.B.Ravindran was Co-organizer of (1) Workshop on Lifelong Learning: A Reinforcement Learning Approach at RLDM 2019, (2) Networking session on Data Science in India at KDD 2019 and (3) Lifelong Learning Workshop at ICML 2020. Dr.B.Ravindran organized the Workshop on Reinforcement Learning for DRDO. Dr.V.Kamakoti organized the Micro-Architectural Security Workshop 2019. Dr.C.Pandurangan organized the discussion meeting on

Foundational Aspects of Blockchain Technology at International Centre for Theoretical Sciences, Bangalore.

The international engagements by the faculty of the Department during the past one year include visits by the faculty to universities abroad for research collaboration and discussions. Dr.B.V.Raghavendra Rao visited Leibniz University of Hannover, Germany. Dr.Madhu Mutyam visited State University of New York, Binghamton, USA. Dr.Hema A. Murthy visited INRIA, France. Dr.Shweta Agrawal visited Lyon, France. Dr.John Augustine visited University of California, Irvine, USA. Dr.Deepak Khemani visited an AI Company in Paris, France. Dr.L.A.Prashanth visited University of Maryland, USA. Dr.Manikandan Narayanan visited the National Institute of Health, Maryland, USA. Dr. John Augustine visited Weizmann Institute of Science, Israel. Dr.Shweta Agrawal was on sabbatical to work at University of Texas, Austin, during January-March 2020.

The faculty of the Department have been engaged in editorial activities of international journals. Dr.Madhu Mutyam is an Associate Editor of IEEE Transactions on Computer Aided Design of Integrated Circuits and Systems. Dr.B.Ravindran is a member of Editorial Board of Journal of Artificial Intelligence Research, an Academic Editor of Plos ONE journal and an Associate Editor of Frontiers in AI and Machine Learning journal. Dr.Krishna Sivalingam is a member of Editorial Board of IEEE Networking Letters. Dr.C.Pandurangan is a member of Editorial Board of IET Information Security journal. Dr.Venkata Krishna Nandivada is an Associate Editor of Sadhana journal. Dr.K.C.Sivaramakrishnan is a Guest Editor for the special issue of the Journal of Functional Programming on the Theory and Practice of Algebraic Effects and Effect Handlers.

The faculty of the Department have been involved in developing technological solutions for social problems. Dr.Krishna Sivalingam has been involved in development of 5G Network Core software, along with IIT Bombay and CeWIT at IIT Madras Research Park, as part of the Indigenous India 5G Testbed, a Rs.240 Crore project funded by Dept. of Telecommunications, Govt. of India, and led by Prof.Bhaskar Ramamurthi of IIT Madras. The Pratap Subrahmanyam Center for Digital Intelligence and Secure Hardware Architecture has been involved in design and fabrication of an indigenous RISC-V based microprocessor, named, MOUSHIK. This is the third microprocessor fabricated in the SHAKTI family and all three of them were first time successes. These processors are now an integral part of the "The Swadeshi Microprocessor Challenge 2020 towards Atmanirbhar Bharat" launched by MEITY, Govt of India. Dr.V.Kamakoti and his team was involved in the development of Aarogya Setu application and its back-end data analytics platform named ITIHAS. Dr. Mitesh Khapra and Dr. Pratyush Kumar partnered with Pratham Books and Google to develop input tools for underrepresented Indian languages such as Maithili and Konkani. Pratham is an NGO that works in the education space and uses these tools to create storybooks for children in these underrepresented languages. This work was funded by Google's "AI for Social Good" initiative with the intention of developing AI

solutions for the next 1 billion. Dr.B.Ravindran and his team built robust deep learning based models to predict short term and long term dropout risk using the data in the anonymized call-records of over 300,000 women registered in an awareness program created by ARMMAN, an NGO that uses cellphone calls to disseminate health related information.

In the year 2019, Mr.Bala Vamsi Tatavarthy, a dual degree student of 2005 batch, and his family instituted the Prof.B.Yegnanarayana Award for Excellence in Research and Teaching in Computer Science and Engineering. Dr.Mitesh Khapra received this award for the year 2020. Prof.Richard M. Karp, Winner of Turing Award, University of California, Berkeley, visited IIT Madras, during 15-16 October, 2019. During the visit, the Prof.Richard M. Karp Institute Chair instituted by Dr.Prabhakar Raghavan, a Distinguished Alumnus of IIT Madras, was launched. Prof.C.Siva Ram Murthy is the first occupant of the Prof.Richard M. Karp Institute Chair. The Malathi Veeraraghavan Scholar Program, a fellowship in the memory and honour of Prof.Malathi Veeraraghavan, an alumnus of IIT Madras, was instituted by family, classmates and friends of Prof.Malathi Veeraraghavan in 2020. This fellowship is intended to recognize and encourage a promising woman research scholar in Departments of Electrical Engineering and Computer Science and Engineering. The first recipient of this fellowship is Ms. Lakshmi Areekath, PhD student in Department of Electrical Engineering

The ground breaking ceremony for construction of new Annex Building for the Department was performed in June 2019. It is expected that the new Annex Building will be ready for occupation by August 2021.

The academic year 2019-2020 has been highly rewarding in many ways. The Department will strive to grow further and reach higher levels of accomplishment in the coming years.