भारतीय सांकेतिक विज्ञान संस्था हैदराबाद్
भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

Department of Computer Science and Engineering

IIT Hyderabad

2023
BROCHURE

Department of Computer Science and Engineering

2023 Brochure | *IIT Hyderabad*

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Message From the HOD

Subrahmanyam Kalyanasundaram

Head & Associate Professor

Welcome to CSE IITH!
I hope that you enjoy reading the brochure and join us in our journey in exploring Computer Science and Engineering!

The Computer Science and Engineering Department at IIT Hyderabad has been growing steadily since its inception in 2008, and is one of the most sought after destinations for incoming students as well as faculty. The department faculty comprises 26 faculty members with a good representation in the areas of theoretical computer science, artificial intelligence/machine learning, and computer systems areas.

Computer Science is entering an exciting yet challenging era, for example, with the advent of areas like machine learning and next generation secure communications. At the same time, several questions that were raised earlier remain open.

Our department is well-equipped and deeply involved in research and development in all these areas. CSE@IITH fosters an environment where students and faculty work together and contribute to these efforts. We also have deep rooted collaborations with academia, industry and government agencies in these endeavors.

Journey So Far

IIT Hyderabad

Dept. of CSE Timeline

2020

M.Tech. NIS Starts

2019

AI Dept. Starts
MDS Program Starts
IIIT Raichur Mentorship Starts

2016

EMDS Starts
IIT Bhilai Mentorship Starts

2015

First Ph.D. Students Graduate

2014

Fractal Academics

2012

First B.Tech. Batch Graduates

2010

First Ph.D. Students Join

2009

First Faculty Member Joins

2008

B.Tech. and M.Tech. Programs Start

Faculty

Faculty

Subrahmanyam Kalyanasundaram
Ph.D.: Georgia Institute of Technology

Head & Associate Professor

https://people.iith.ac.in/subruk/

Research Interests: Theoretical Computer Science, Graph Theory, Graph Algorithms and Combinatorics

Antony Franklin
Ph.D.: IIT Madras

Associate Professor

https://people.iith.ac.in/antony/

Research Interests: Mobile Networks, 5G/6G, Mobile Edge Computing and Internet of Things

Bheemarjuna Reddy Tamma
Ph.D.: IIT Madras

Professor

https://people.iith.ac.in/tbr/

Research Interests: Wireless Networks, Connected and Autonomous Vehicles, Network Security and Quantum Internet

C. Krishna Mohan
Ph.D.: IIT Madras

Professor

https://people.iith.ac.in/ckm/

Research Interests: Computer Vision and Machine Learning

J. Saketha Nath
Ph.D.: IISc Bangalore

Associate Professor

https://people.iith.ac.in/saketha/

Research Interests: Kernel Methods, Statistical Learning Theory and Generative AI

Faculty

Jyothi Vedurada
Ph.D.: IIT Madras

Assistant Professor

https://jyothivedurada.github.io/

Research Interests: Compilers, Program Analysis and High-performance computing

Karteek Sreenivasaiah
Ph.D.: IMSc Chennai

Assistant Professor

https://people.iith.ac.in/karteek/

Research Interests: Computational Complexity, Algorithms and Theoretical Computer Science

Kotaro Kataoka
Ph.D.: Keio University

Associate Professor

https://people.iith.ac.in/kotaro/

Research Interests: Internet Architecture and Blockchains

M.V. Panduranga Rao
Ph.D.: IISc Bangalore

Professor

https://people.iith.ac.in/mvp/

Research Interests: Applications of Formal Methods and Quantum Networks

Manish Singh
Ph.D.: University of Michigan, Ann Arbor

Associate Professor

https://people.iith.ac.in/msingh/

Research Interests: Social Network Analysis, Recommendation Systems, Data Mining and NLP

Faculty

Maria Francis
Ph.D.: IISc Bangalore

Assistant Professor

https://sites.google.com/view/maria-francis

Research Interests: Computational Algebra, Cryptography: Pairings-based and Lattice, Communication over Blockchains

Maunendra Sankar Desarkar
Ph.D.: IIT Kharagpur

Associate Professor

https://people.iith.ac.in/maunendra/

Research Interests: NLP, Information Retrieval and Machine Learning

N.R. Aravind
Ph.D.: IMSc Chennai

Associate Professor

https://people.iith.ac.in/aravind/

Research Interests: Algorithms and Graph Theory

Nitin Saurabh
Ph.D.: IMSc Chennai

Assistant Professor

https://nitinsau.github.io/

Research Interests: Computational Complexity Theory and its Connections to Algorithms, Algebra and Combinatorics

Praveen Tammana
Ph.D.: University of Edinburgh

Assistant Professor

https://praveenabt.github.io/

Research Interests: Networked Systems, Software Defined Networks and Programmable Data Planes

Faculty

Rajesh Kedia
Ph.D.: IIT Delhi

Assistant Professor

https://people.iith.ac.in/rkedia/

Research Interests: Computer Architecture, Embedded Systems and Digital VLSI design

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Rakesh Venkat
Ph.D.: TIFR Mumbai

Assistant Professor

https://people.iith.ac.in/rakeshvenkat/

Research Interests: Approximation Algorithms and Complexity Theory

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Ramakrishna Upadrasta
Ph.D.: INRIA and University Paris-SUD

Associate Professor

https://people.iith.ac.in/ramakrishna/

Research Interests: Compilers, Polyhedral Compilation and Program Embeddings

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Rameshwar Pratap
Ph.D.: CMI, Chennai

Assistant Professor

https://sites.google.com/site/prataprameshwaryadav/

Research Interests: Algorithms for Massive Data Sets, Machine Learning and Theoretical Computer Science

---

Rogers Mathew
Ph.D.: IISc Bangalore

Associate Professor

https://people.iith.ac.in/rogers/

Research Interests: Extremal and Probabilistic Combinatorics, Structural Graph Theory and Graph Algorithms

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Faculty

Sathya Peri

Ph.D.: University of Texas at Dellas, Richardson, TX, USA

Professor

https://people.iith.ac.in/sathya_p/

Research Interests: Blockchains, Parallel and Distributed Systems

Shirshendu Das

Ph.D.: IIT Guwahati

Assistant Professor

https://sites.google.com/view/shirshendudas/home

Research Interests: Computer Architecture, Hardware Security and Emerging Memory Technologies

Sobhan Babu

Ph.D.: IIT Bombay

Associate Professor

https://people.iith.ac.in/sobhan/

Research Interests: Big Data Analytics, Graph Theory and Algorithms

Srijith P.K

Ph.D.: IISc Bangalore

Associate Professor

https://sites.google.com/site/pksrijith/

Research Interests: Machine Learning, Deep Learning, Vision and Language Processing

Vineeth N. Balasubramanian

Ph.D.: Arizona State University, USA

Associate Professor

https://people.iith.ac.in/vineethnb/

Research Interests: Machine Learning, Deep Learning, Computer Vision and Explainable AI

Faculty

C. Siva Ram Murthy
Ph.D.: IISc Bangalore

Visiting Professor

http://www.cse.iitm.ac.in/~murthy/

Research Interests: Wireless Networks, Parallel and Distributed Computing

Aditya Nori
Ph.D.: IISc Bangalore

Adjunct Professor

https://www.microsoft.com/en-us/research/people/adityan/

Research Interests: Machine learning, AI for Health and Life Sciences

Kenzo Fujisue
Ph.D.: Waseda University, Tokyo Institute of Technology

Adjunct Professor

https://www.linkedin.com/in/kenzo-fujisue-005b1678

Research Interests: Web3 and Cybersecurity Policy

Naveen Sivadasan
Ph.D.: Max Planck Institute for Informatics

Adjunct Professor

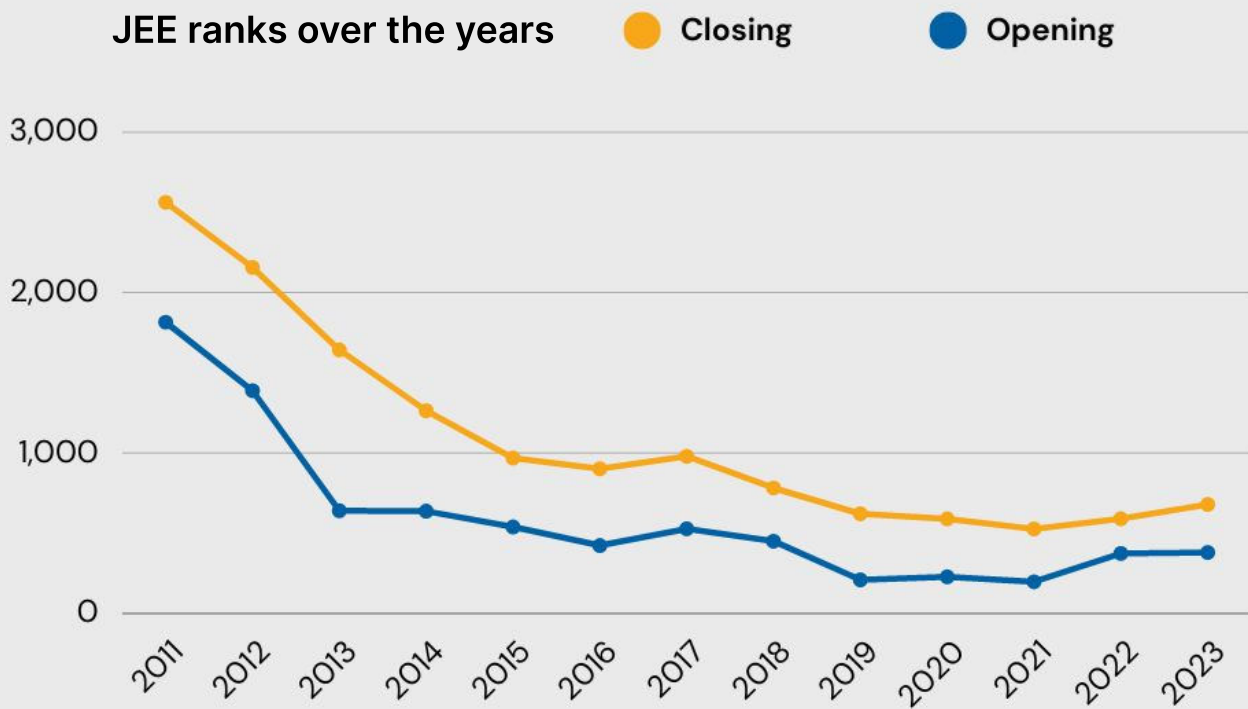https://www.linkedin.com/in/naveen-sivadasan-b71027b2/

Research Interests:
Computational Biology and Applied Algorithms

Academics

Academics

B.Tech. in CSE

- Started in 2008 with an initial intake of 40; current intake is 65.

JEE ranks over the years   ● Closing   ● Opening

Core Courses offered in B.Tech.

Semester 1

- Introduction to Programming
- Discrete Mathematics
- Introduction to Computing

Semester 2

- Software Development Fundamentals
- Artificial Intelligence

Semester 3

- Data Structures and Algorithms
- Computer Architecture
- Operating Systems I
- DBMS I

Semester 4

- Theory of Computation
- Operating Systems II
- Algorithms
- Compilers I
- DBMS II

Semester 5

- Computer Networks
- Compilers II
- Foundations of Machine Learning

Semester 6

- Software Engineering

Academics

Electives Offered in the Last 5 Years

Systems

- Advanced Computer Architecture
- Advanced Computer Networks
- Advanced Operating Systems for Pervasive Computing
- Basics of Blockchains: Distributed Computing Perspective
- Compiler Optimizations
- Computer and Network Security
- Concurrency Control in Transactional Systems
- Data Center Networking
- Distributed Computing
- Distributed Systems
- Introduction to Wireless Networks
- Network Engineering
- Networked Wireless Systems
- Parallel and Concurrent Programming
- Software Defined Networking
- The Blockchain: Theory and Practice
- Wireless Networks and Security

AI, ML and Data Science

- Advanced Topics in Data Management
- Algorithmic Techniques for Massive Data
- Bayesian Data Analysis
- Computational Topology: Theory and Applications to Data Analysis
- Computer Vision
- Data Mining
- Deep Learning for Vision
- Introduction to Statistical NLP
- Neural Networks
- Numerical Linear Algebra for Data Analysis
- Pattern Recognition
- Predictive Analytics and Knowledge Discovery
- Probabilistic Models for Machine Learning
- Soft Computing
- Text Processing and Retrieval
- Visual Recognition

Theory

- Algebra for Computer Science
- Approximation Algorithms
- Circuit Complexity
- Communication Complexity
- Computational Complexity
- Computational Number Theory and Algebra
- Convex Optimization
- Cryptography

- Formal Methods in Computer Science
- Graph Theory
- Linear Optimization
- Probabilistic Model Checking
- Probability in Computing
- Quantum Computing
- Quantum Cryptography

Academics

M.Tech. in CSE

- Started in 2008
- 24 credits of course work + 24 credits of thesis
- M.Tech. 2 years program

    - MoE-Sponsored
    - Self-Sponsored

- M.Tech. 3 years program

    - Project-Sponsored

Courses Offered in M.Tech.

- Advanced Data Structures and Algorithms
- At least two electives each from:

   - Data Science
    - Systems
    - Theory

M.Tech. in Data Science (MDS)

- Started in 2015 as an online program
- Exclusively for working professionals
- Self-paced course: 3-4 years
- 24 credits of course work + 24 credits of capstone project
- Executive M.Tech. in Data Science (EMDS) degree with 24 credits of coursework

Courses Offered in MDS

- Mathematical Foundations of Data Science
- Image and Video Analytics
- Foundations of Machine Learning
- Applied Machine Learning
- Probabilistic Models for Machine Learning
- Bayesian Data Analysis
- Theory of Learning and Kernel Methods
- Natural Language Processing
- Information Retrieval
- Deep Learning
- Programming Models for Multi-core and GPU Architectures
- Scaling to Big Data
- Internet of Things

M.Tech. Intake

Academics
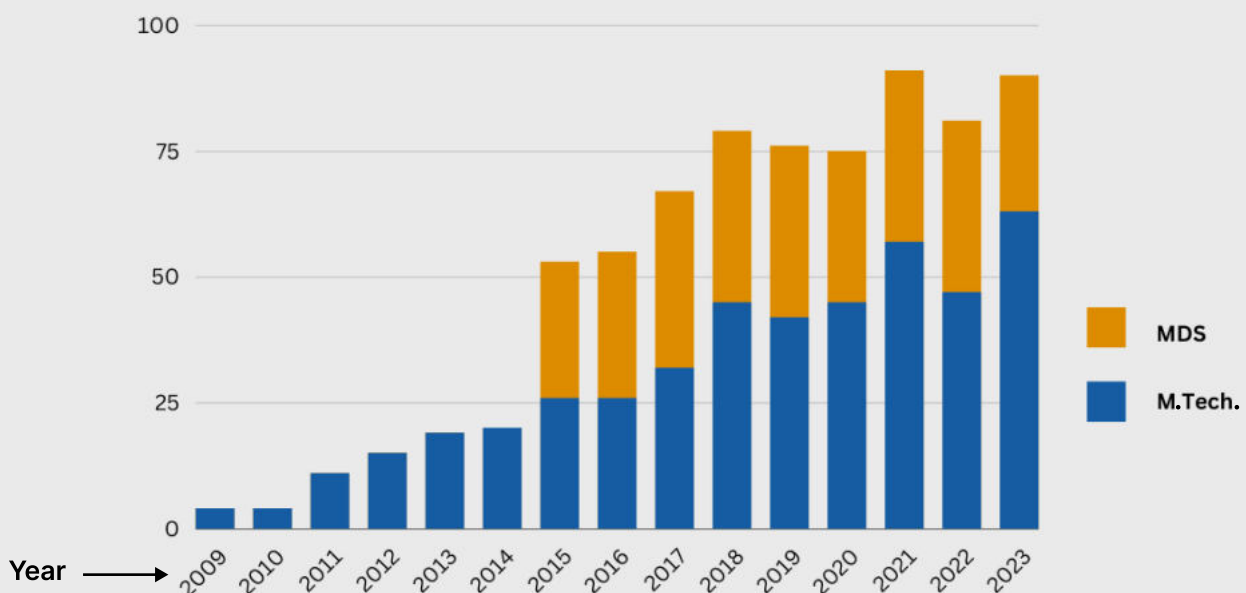
M.Tech. in Network and Information Security (NIS)

- Started in 2020
- 24 credits of course work + 24 credits of thesis

Courses Offered in NIS

- Advanced Data Structures & Algorithms
- Advanced Computer Networks
- Cryptology
- Topics in Wireless Networks
- Internet of Things
- Wireless Networks & Security
- Topics in Networks
- Networked Wireless Systems
- Advanced topics in Cryptology
- Quantum Cryptography
- Basics of Blockchains: Distributed Computing Perspective
- Software Defined Networks
- Data Center Networking
- Applied Machine Learning
- The Blockchain: Theory and Practice

Academics

Ph.D. Program

- Core Course: Advanced Data Structures and Algorithms
- 12 credits of course work
- 24 credits for direct Ph.D. Program
- Comprehensive exam and Research Proposal Seminar

Stream-wise Distribution Of Scholars

Streams	Current Scholars	Graduated Scholars
Theory	8	3
Networks	15	11
Distributed Systems	5	7
Formal Methods	2	2
Compilers/Architecture	8	2
Machine Learning & Data Sciences	11	16

Ph.D. Intake
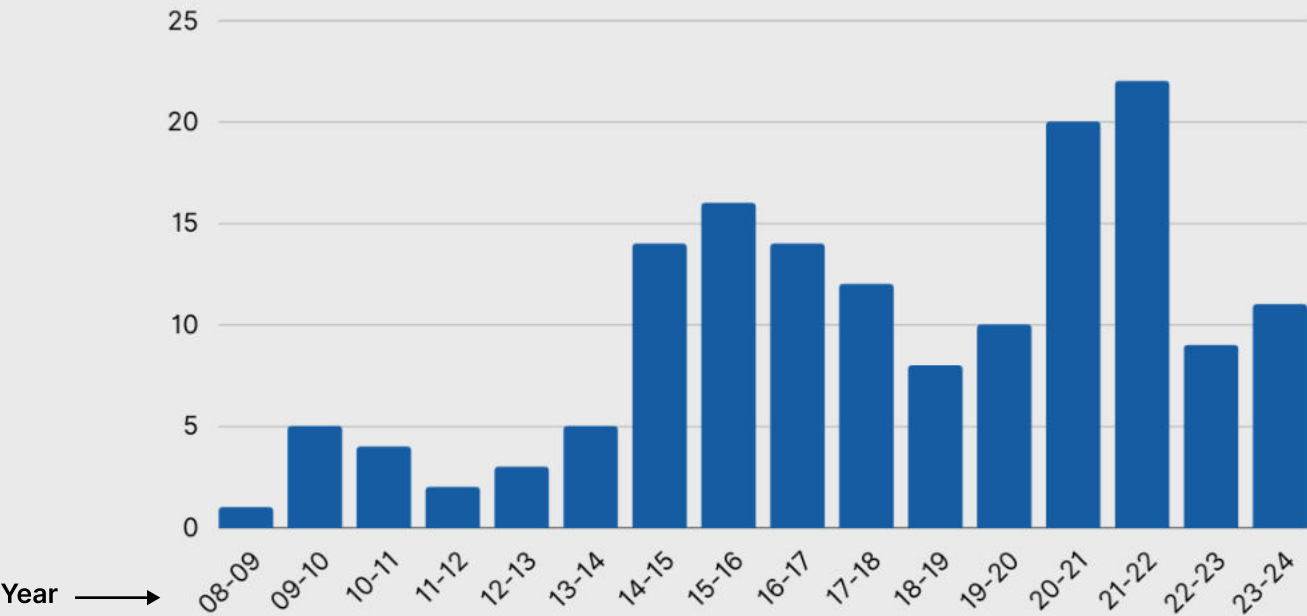
Year →

Academic Highlights

Firsts

- First Online M.Tech. Program for Data Science in the country
- Seeding of first AI department and AI undergraduate program in the country

Student Credits

- 107866 (from 2010 to 2023)
- About 7700 student credits per year
- About 300 student credit per Instructor per year
  (Calculated at peak faculty strength of 25)

Mentorship of Institutes of National Importance

- Department of CSE, IIT Bhilai: 2016 - 2018
- Department of CSE, IIIT Raichur: 2022-2023
- Department of CSE, CUK, Kalaburagi: 2018 - 2019

Institute Teaching Awards for Department Faculty

Maunendra Desarkar

C Krishna Mohan

Karteek Sreenivasaiah

Vineeth N Balasubramanian

Rakesh Venkat

Rogers Mathew

Praveen Tammana

Joint Ph.D. Programs

- Swinburne University, Australia
- Deakin University, Australia
- IDRBT, Hyderabad

Research

Research Areas

Broad Research Areas

Theory

Algorithms	Complexity	Graph Theory
Formal Methods		

Systems

Networks	Compilers	Architecture
Distributed Systems	Blockchains	Security

AI/ML & Data Science

Theoretical AI/ML	Vision	NLP
Applications	Social Media Analytics	Big Data

Publications

Numbers

Publications in the last five years

Venues

Project Funding

Year-wise Funding

FY 2022-23
12.4%

FY 2017-18
7.2%

FY 2018-19
17.7%

FY 2019-20
8.2%

FY 2020-21
7.5%

FY 2021-22
44.8%
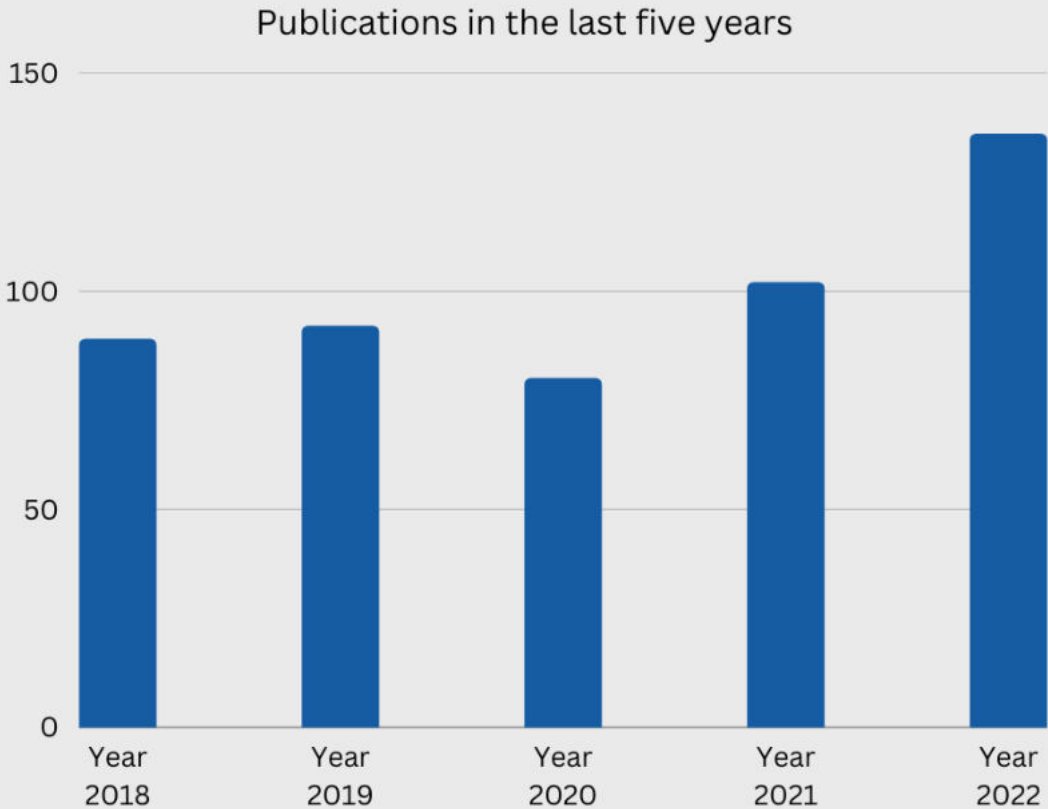
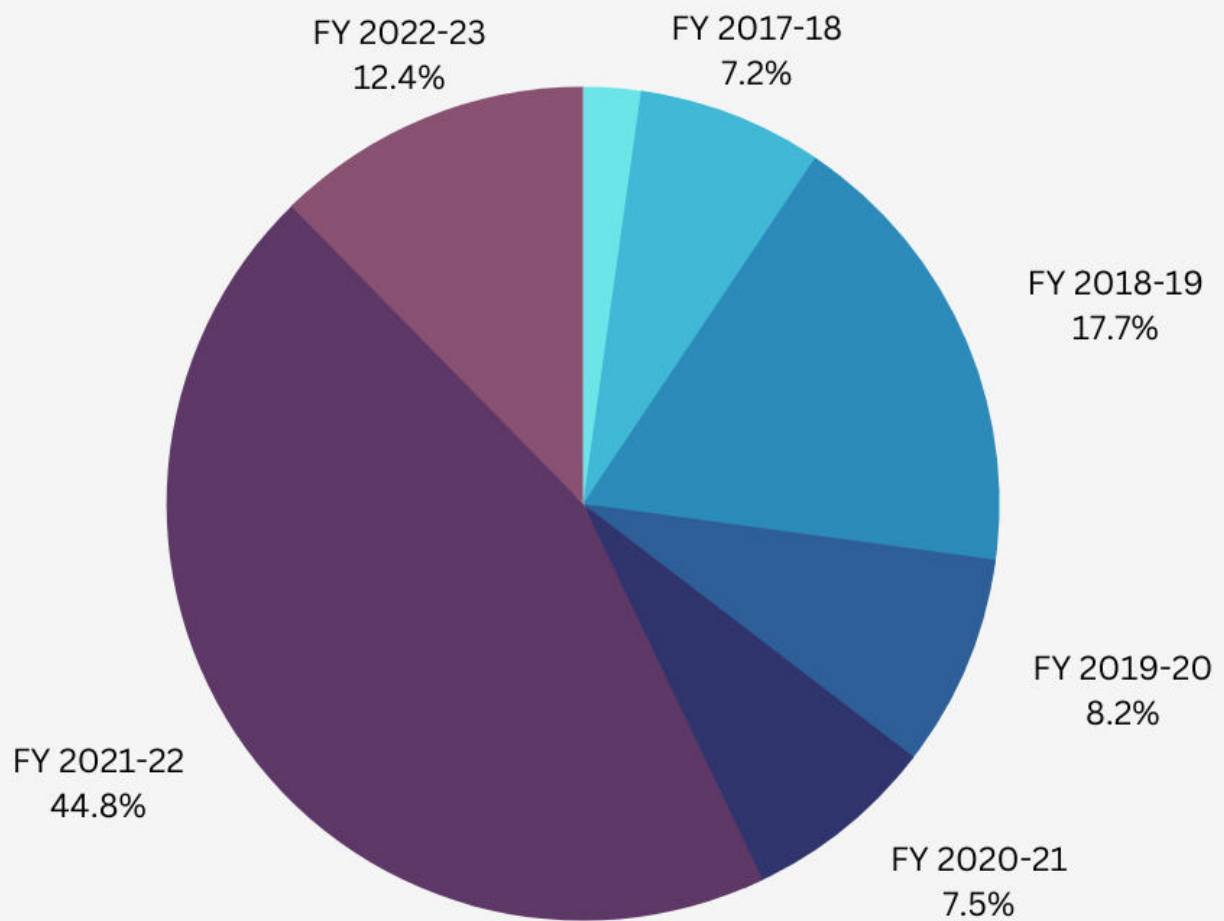**730 Million INR funding in the last five years**

Some Funding Agencies

Ministry of Electronics and Information Technology
Government of India

Collaborations

We take pride in fostering a culture of global collaboration and academic excellence. These partnerships have enabled us to engage in impactful research projects.

National Collaborations

International Collaborations

Industry Collaborations

Scientific Awards and Recognitions

Best/Distinguished Paper Awards

- International Conference on Communication Systems and Networks (COMSNETS), 2022
- ACM Joint International Conference on Data Science & Management of Data (CODS-COMAD), 2022
- ACM SIGPLAN International Conference on Object-Oriented Programming Systems, Languages, and Applications (OOPSLA), 2021
- Workshop on Causality in Vision, IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2021
- International Computing and Combinatorics Conference (COCOON), 2020
- International Workshop on Graph-Theoretic Concepts in Computer Science (WG), 2020
- IEEE International Conference on Advances in Computing, Communications and Informatics (ICACCI), 2018
- International Conference on Communication Systems and Networks (COMSNETS), 2018
- International Symposium on Stabilization, Safety, and Security of Distributed Systems (SSS), 2018
- ACM SIGCOMM Symposium on SDN Research (ACM SDN), 2018
- International Conference on Networked Systems (Netys), 2018
- IEEE International Telecommunication Networks and Applications Conference (ITNAC), 2016

Competitive Research Grant Awards

- Sony Research Award
- Qualcomm Faculty Award
- AMD Faculty Award
- Microsoft Academic Partnership Grant Award
- Google exploreCSR Grant Award
- Google Research Scholar Award
- IBM Shared University Research Award
- Verisk AI Faculty Research Award
- IBM Research Academic Award

Other Research Awards

- iKDD Outstanding Doctoral Dissertation Award, 2022
- Research Excellence Award, IIT-Hyderabad, 2022-23
- Senior Membership in AAAI (one of 15 globally selected), 2023
- Best Reviewer Awards, IJCAI 2023, ICLR 2021, ECCV 2020, CVPR 2019, OOPSLA 2019
- NASSCOM AI Gamechangers Award (DL Algorithms/Architecture category), Winner and Runner-up, 2022

Awards and Recognitions

Academic Awards and Distinctions

Visiting Fellowships

- Fulbright-Nehru International Education Administrators Seminar Fellowship, 2023-2024
- Mottez Fellowship (Host: Institute Henri Poincare, Paris, France), 2023
- Fulbright-Nehru Academic and Professional Excellence Fellowship (Host: Carnegie Mellon University, Pittsburgh, USA) 2022-23
- Visiting Scholarship, Erasmus Mundus - PIXNET (Host: Scuola Superiore Sant'Anna, Piza, Italy), 2020-22
- ASEM Duo Fellowship (Host: Sorbonne University, Paris, France), 2020

PhD Fellowships Obtained by Students

- Google Ph.D. Fellowship
- TCS Ph.D. Fellowship
- Intel Ph.D. Fellowship
- Reliance Foundation Fellowship
- PMRF Fellowship

Student Awards

- Winner, 6th IDRBT Doctoral Colloquium 2016
- Winner, 8th IDRBT Doctoral Colloquium 2018
- Indo-Canadian Shastri Student Research Fellowship
- S N Bose Fellowship
- Honda YES Fellowship
- Viterbi Fellowship
- Google AI Residency
- Facebook AI Residency

ICT Infrastructure

Cluster & Undercloud

SLURM

The CSE department has taken a significant stride in optimizing its server infrastructure by developing Slurm, an in-house cluster management and job scheduling system. This innovative solution has been seamlessly integrated, with an impressive 95% of the department's servers now operating within the Slurm ecosystem.

By harnessing the capabilities of Slurm, the department has achieved a more responsive and agile computing environment, where researchers, students, and faculty members can easily access the computational power they require for their projects and experiments. This not only enhances productivity but also promotes collaboration and innovation within the department.
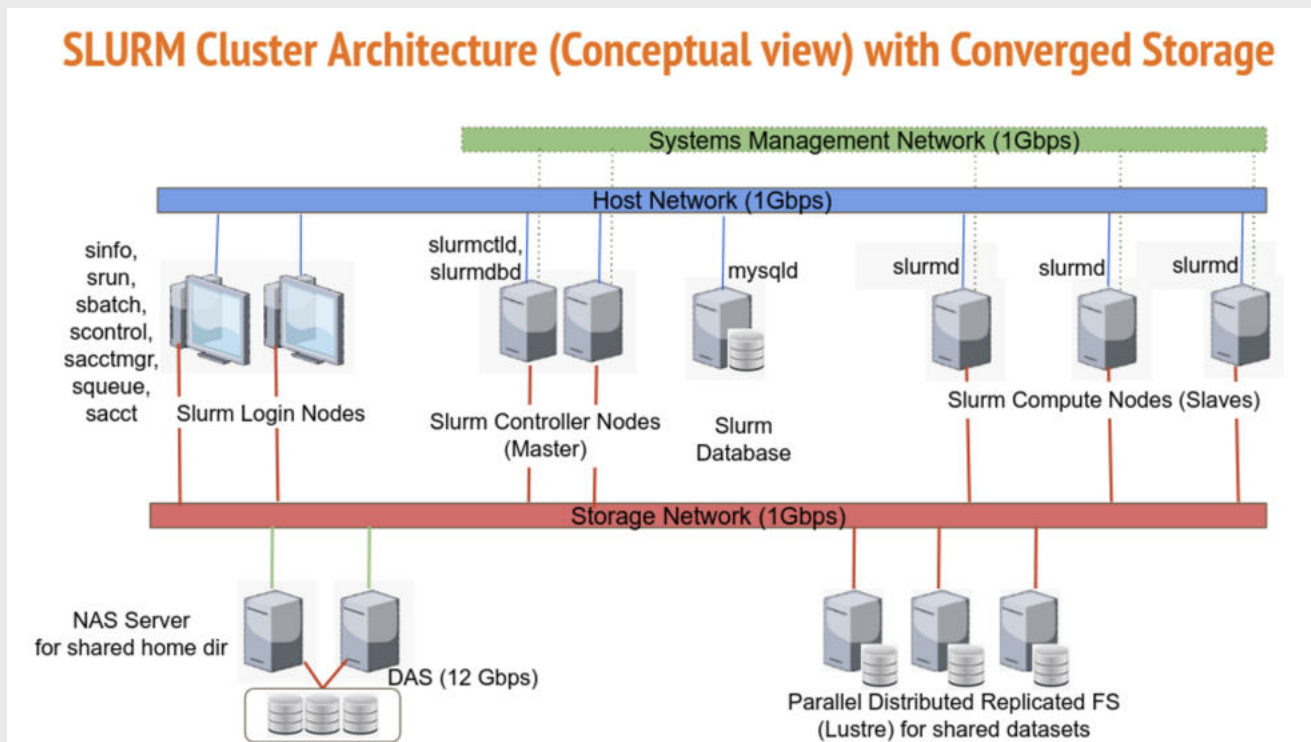
Unlock Limitless Computing Potential at CSE! Our Advanced Infrastructure features Dual Master and Login Nodes, Twelve High-Performance Computer Nodes with DGX Servers, and an Ansible Controller for Seamless Management. Powered by SLURM and equipped with NAS storage options ranging 2TB, 9.6TB and 70TB, along with a blazing-fast 100G Mellanox switch, this setup is tailored for Students and Faculty to seamlessly tackle high-end computational tasks

MAAS (Metal as a Service)

Simplify CSE Infrastructure Management with MAAS (Metal as a Service). Effortlessly deploy, manage, and scale Ubuntu-based servers in the Data Center. Achieve efficient resource utilization and seamless scalability with zero-touch provisioning.

- Automated OS installation, static IP, DNS setup on servers
- Automated hardware health monitoring and logging

Onboarded servers web interface

Over Cloud

OpenStack

The department has created a dynamic and scalable private cloud environment that caters to a wide array of computing needs. This private cloud serves as a versatile platform for hosting applications, services, and virtualized resources, all managed in-house. Researchers, students, and faculty members now have seamless access to on-demand computing capabilities, enabling them to explore and experiment with various technologies, conduct research, and engage in collaborative projects.

Moreover, the OpenStack-based private cloud ensures data security and compliance with the department's specific requirements. It also offers a self-service portal, simplifying resource provisioning and management for users, while allowing administrators to maintain granular control over the cloud infrastructure.

Societal Impact

Societal Impact

Projects with Societal Impact

Tax Fraud Analytics in Telangana:

Live ongoing implementation of data science-based methods to analyze taxation data in the state of Telangana, and highlight cases of potential fraud. This effort has led to savings of over several crores of rupees to the state exchequer.

Live Analysis of UPI Payments in NPCI:

Data mining-based live analysis of UPI payments in collaboration with the National Payments Corporation of India (NPCI). We are proud to be a part of one of the most exciting contributions of India towards the world's digitization.

Analyzing and Improving Urban Transportation:

The M2Smart (Smart Cities for Emerging Countries based on Sensing, Network and Big Data Analysis of Multimodal Regional Transport System) is a joint research project under Japan's SATREPS program between IIT Hyderabad, Nihon University, Japan, Nagoya Electric Works Co. Ltd, Tokyo Institute of Technology, and Ahmedabad Municipal Corporation (AMC). The project looked into development of technologies for collecting, processing, modelling and providing traffic information in the IITH campus using various sensing technologies,wireless communication technologies and big data processing techniques, developed by various approaches in the testbed, generated by integrating these technologies. It also considered the system to promote multimodal by providing traffic information to users and at the same time to improve traffic management, and confirm policies to implement this system socially through field experiments in Ahmedabad city. This project installed sensors and monitored traffic-related parameters near IIT Hyderabad campus and in Ahmedabad city longitudinally, and made several contributions to improving traffic flow in both these urban areas. Vision-based systems to detect unique traffic violations and road crimes (such as wearing of helmet and chain-snatching) were also developed.

Disaster Management Systems:

As one of the earliest efforts in the unique Indo-Japan partnership manifested in IIT-Hyderabad, the DISANET (Information Networks for Natural Disaster Mitigation and Recovery) project focused on mitigating the after-effects of natural disasters. This project resulted in the development of web portals and apps to mitigate disaster aftereffects and enable quick recovery and support. Our faculty's social media aggregator was also used during the Kerala floods of 2018 to collate resources and support for the flood victims.

Institution Mentoring

- IIT-Bhilai: Responsible for initial set up of curricula, teaching, campus development, computer centre, and faculty recruitment from inception, 2016-18.
- IIIT-Raichur: Responsible for complete management of the CSE department including curricula, teaching, faculty recruitment, student mentoring from 2022-2023.
- Central University of Karnataka, Kalaburagi: 2018-2019, mentored the CSE Department.

Societal Impact

Towards 5G,V2X, and Beyond:

Our faculty members are involved in the "Indigenous 5G Testbed" project funded by Dept. of Telecom (DoT), Govt. of India and "V2X Pilot Study" project funded by Suzuki Motor Corporation, Japan. Various network functions of 5G Core network are developed as per 3GPP specifications with network intelligent for delivering highly available, reliable, resilient, and secure slice services for diverse use cases of 5G and beyond. The IITH 5G Core is also tested for interoperability with both in-house and open-source 5G base stations and smartphones. Vehicles fitted with Vehicle-to-anything (V2X) radios and ITS apps are used to demonstrate various benefits of ITS technology for road users in India.

Data Science for Agriculture:

Our faculty members have also been involved in an Indo-Japan multi-institutional collaboration to collect, analyze and deploy data science-based technology solutions for agriculture. This effort, which includes the P Jaishankar Telangana State Agricultural University, has resulted in a longitudinal collection of sensor data in rice paddy and maize farms with different genotypes and phenotypes. We have also actively contributed to the AI for Agriculture challenge organized by NASSCOM and the Telangana government.

Academic Information Management System:

The Academic Information Management System (AIMS) system that ran IIT-Hyderabad's ecosystem including academics, reporting, human resource management and infrastructure management for a large part of the last decade, was a home-grown software created by a CSE faculty from design to deployment as part of an entrepreneurial effort. Not to forget, this system has also been deployed at other academic institutions across the country!

Conference/Workshop Organization:

- Organizer, ACM India Summer School on Algorithmic Techniques in Computational Biology, Jun 2023 (held at IIT-Hyderabad).
- General Co-chair and organizers of Asian Conference on Machine Learning, Dec 2022, Hyderabad (first ACML to be brought to India).
- TEQIP program on Advanced Algorithms between November - December 2020.
- Lead co-organizers of CSE and AI tracks in Vaibhav Summit (an effort of NITI Aayog invited global experts to discuss on promoting research in India), Oct 2020.
- General Co-chairs and Program Co-chairs of National Conference on Communications (NCC), Mar 2018 (held at IIT-Hyderabad).
- Organized the 6th International CALDAM 2020 at IIT-Hyderabad, Feb 2020.

Alumni and Placement Statistics

Percentage of Registered Students Placed

B.Tech.

M.Tech.
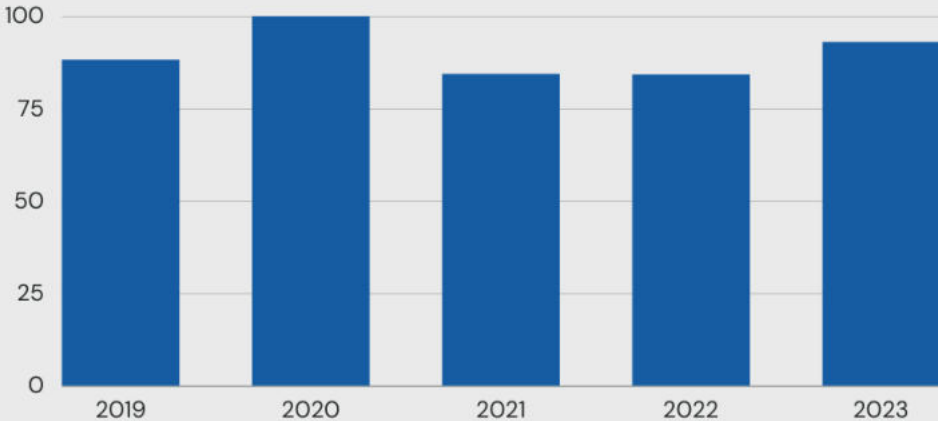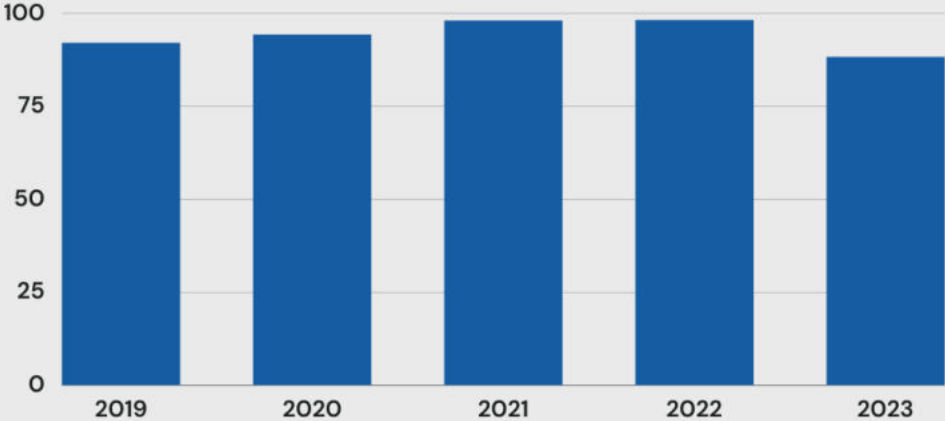
Alumni

Our Ph.D. Graduates have gone on to remarkable affiliations, showcasing the impact of their research and the quality of education they received at our institution. Here are some of the notable affiliations of our graduated Ph.D. students.

Alumni in Academia

IIT Dharwad
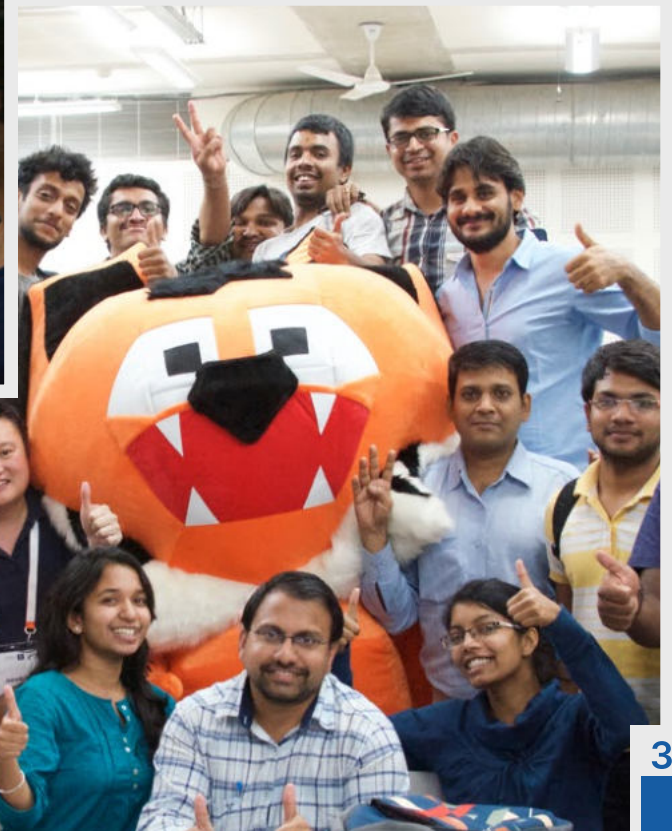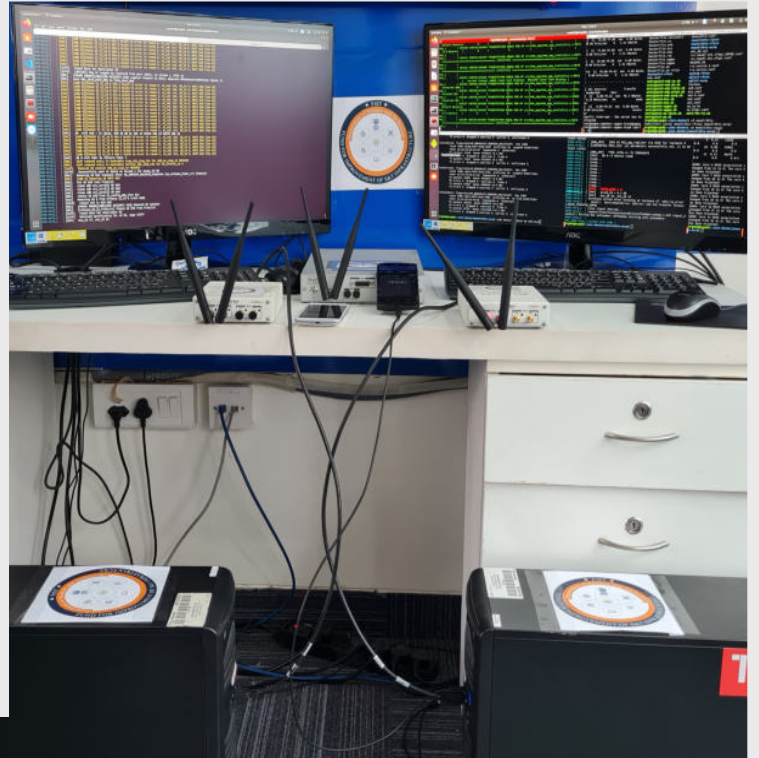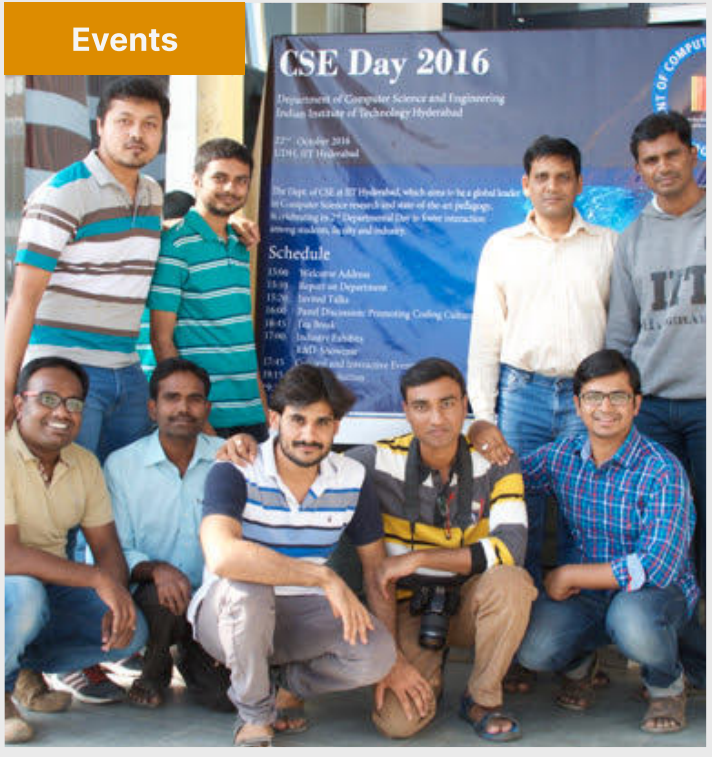NIT Calicut
NIT Rourkela IIT Indore
SSIPMT-Raipur IIT Bhilai
Monash University
Shivnadar University
University of Hyderabad
JNU Woosong University
JNTU Amrita University
IIT Tirupati IIITDM Kurnool
NIT Nagpur
BITS Pilani IIT Palakkad
IIIT Kottayam

Alumni in Industry

DRDO
Celona HCL
Salesforce ASCI
Supraoracles
Rakutan Mobiles
Samsung Research
Adobe Research
IIAI Jio Platforms
NPCI Qualcomm
Intel Amazon
DELL

Alumni in PostDoc Positions

Technion
IIT Kanpur
IMSc, Chennai A*STAR
Verisk AI Research
Monash University CSHL
University of Augsburg
University of Cambridge
University of Manchester
UTSA Harvard University MIT
Shizuoka University
Aalto University
Aalborg MBZUAI, UAE
Lip6 Paris

Events

Student Activities

To know more:

Scan the **QR**

Come and meet us!

📍 click here

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Link to - **FLIPBOOK**