



Department of Computer Science and Engineering Indian Institute of Technology Madras

Presentation to MS,
Direct PhD and PhD Candidates
16th November, 2021

Prof. C. Chandra Sekhar
Head of Department



Department Profile

- **Faculty Members: 35**
 - All have completed **Ph.D. Degree from Premier Institutions** in India or abroad
- **Technical and Administrative Staff Members: 10**
- **Ph.D. Students: 90**
- **M.S. Students: 78**
- **M.Tech. Students: About 135**
- **B.Tech. and Dual Degree Students: About 330**



Research Programmes

- **MS (by Research)**

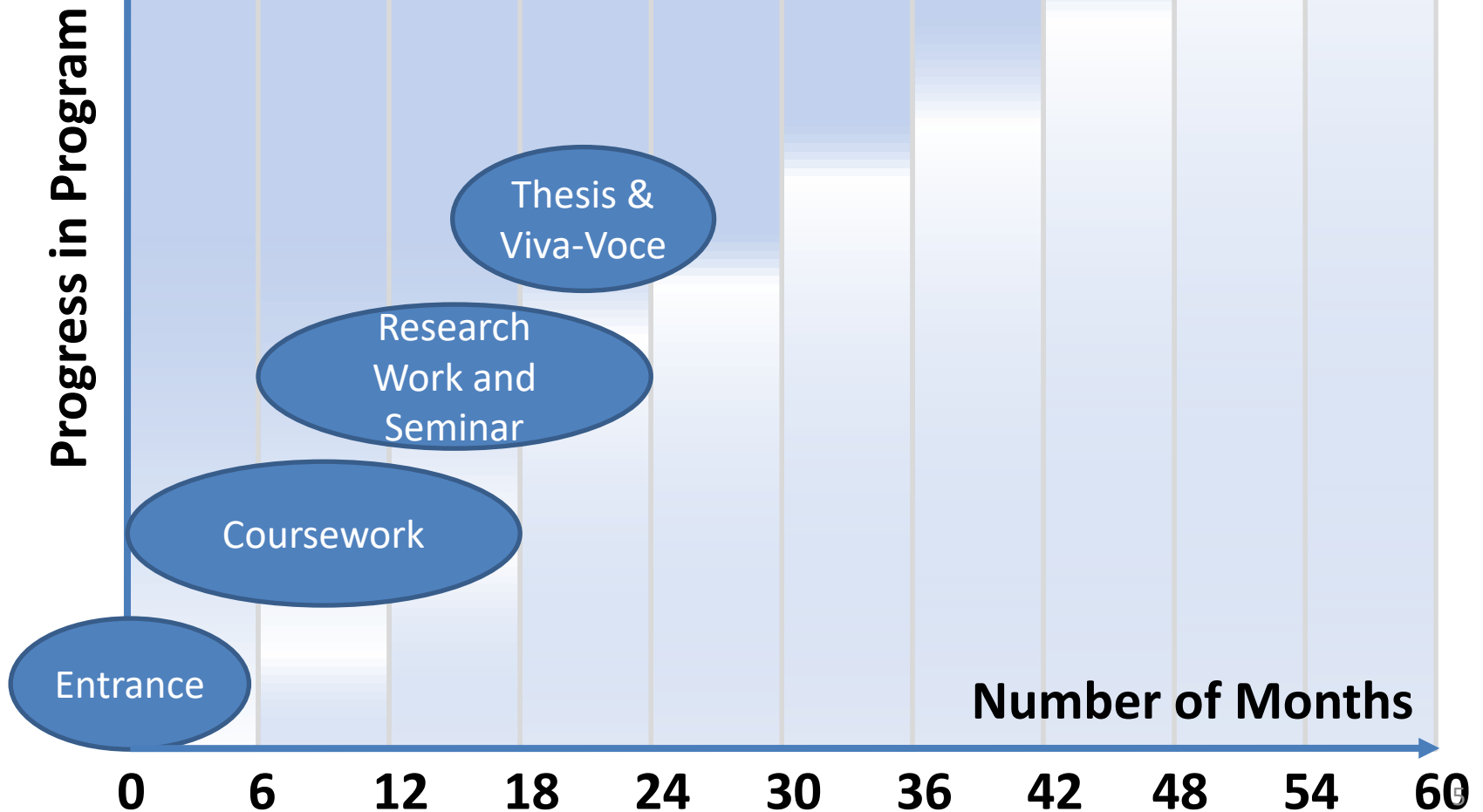
- Full-time MS (HTRA and Project)
- External MS (for industries certified by IITM/DSIR)
- Part-time MS (for industry) – within commuting distance of IIT Madras

- **PhD**

- Direct PhD (after B. Tech) will get both MS and PhD
- Regular PhD (Master's degree required)
 - Full-time PhD (HTRA and Project)
 - External PhD (for industries certified by IITM/DSIR)
 - Part-Time PhD (for industry) – commuting distance of IITM
 - AICTE/QIP PhD
- Upgraded PhD (from MS and M Tech programs at IITM)



MS Process





MS Requirements

- **Minimum of 5 courses**
- **M.S. Thesis:**
 - **Proposal and Seminar (around 1.5-2 years)**
 - **Synopsis and Thesis**
- **Publications (Conference and Journal) from thesis**
- **Thesis is reviewed by 2 experts outside or within IIT Madras**



MS Scholarship Support

- **HTRA Scholarship**
 - Provided by Government of India
 - Initially **up to 2 years**, based on regular performance review and recommendation by GTC. An **additional 6 months of support** may be granted by IITM
 - **One international conference travel during MS study**
 - **Two national conferences per year**
- **Project**
 - Supported on a CSE Faculty Member's Funded Research Project – Government or Industry funded
 - Several faculty have active research projects: Please visit their webpages or email them.

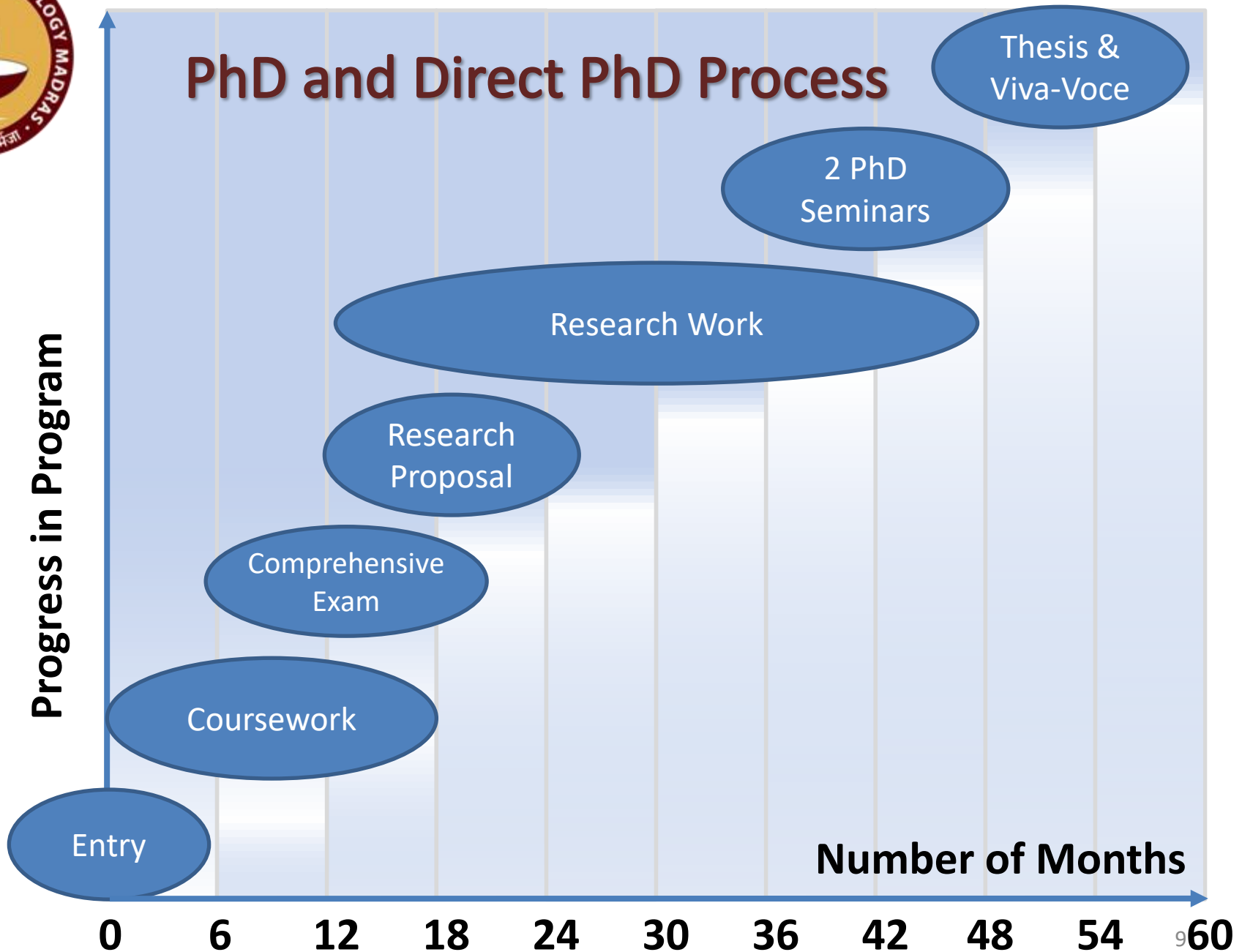


Upgrading to PhD

- **Students in MS degree program can upgrade to Dual MS+PhD degree program, before end of second year**
 - **Dual Degree (MS/PhD) students will receive 2 International conference travel grants**
- **Students in M.Tech. degree program can upgrade to Dual M.Tech+PhD degree program, after first year in M.Tech. program**



PhD and Direct PhD Process





Ph.D. Requirements

- Minimum of **4 courses** for **PhD**
- Minimum of **8 courses** for **Direct PhD**
- **Ph.D. Thesis:**
 - Proposal and Two Seminars
 - Synopsis and Thesis
 - Viva Voce Exam
- **Publications (Conferences and Journals) from Thesis**
- Thesis is reviewed by **2 experts outside IIT Madras**
- IIT Madras has signed **17+ Joint Doctorate programs** with foreign institutions
 - **Australia, Germany, NUS, US, France, Finland**



PhD and Direct PhD Scholarship Support

- **HTRA**
 - Provided by Government of India
 - Maximum of 5 years, based on regular performance review and recommendation by Doctoral Committee
 - One international conference travel during PhD study
 - 2 national conferences per year
- **Project**
 - Supported on a CSE Faculty Member's Funded Research Project
 - Several faculty have active research projects: Please visit their webpages or email them.
- **External Fellowships (after joining program)**
 - TCS, IBM, Google India, Prime Minister's Research Fellowship



Research Areas

- **Hardware Systems** (Computer Architecture, Embedded Systems, Secure Systems)
- **Human-Computer Interaction** (Computer Vision, Image Processing, Speech Processing)
- **Intelligent Systems and Knowledge Engineering** (Artificial Intelligence, Machine Learning, Deep Learning)
- **Networks and Distributed Systems**
- **Programming Languages, Compilers and Software Engineering**
- **Theoretical Computer Science and Algorithms** (including Cryptography)
- **Computational Brain Research (CBR)**
- **Bioinformatics**



Research Labs

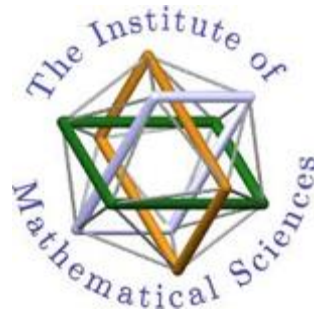
- **ACT Lab (Algorithms and Complexity Theory)**
- **AIDB Lab (Artificial Intelligence and Databases)**
- **BIRDS Lab (Bioinformatics and Integrative Data Science)**
- **DAWN Lab (Distributed and Adaptive Wired/Wireless Networks)**
- **SMT Lab (Speech and Music Technologies)**
- **PACE Lab (Programming Languages, Architecture, and Compilers Education)**
- **RISE Lab (Reconfigurable and Intelligent Systems Engineering)**



Research Labs

- **DOS Lab (Software Systems Research)**
- **Speech and Vision Lab**
- **Theoretical Computer Science (TCS) Group**
- **Cryptography, Cybersecurity and Distributed Trust (CCD) Group**
- **HPCN Lab (High Performance Computing and Networking)**
- **Computer Vision Lab**
- **VP Lab (Visualisation and Perception)**

Faculty Ph.D. Degree Institutions





Faculty



Shweta Agrawal
Cryptography,
Information
Theory



John Augustine
Distributed
Algorithms,
Randomized
Algorithms



Sutanu Chakraborti
Machine learning,
Case Based
Reasoning



Sukhendu Das
Visual perception,
Image Intelligence,
Graphics,
Visualization



Kartik Nagar
Automated Formal
Verification,
Program Analysis,
Programming
Languages



Harish Guruprasad
Machine Learning
Learning Theory
Optimization





Faculty

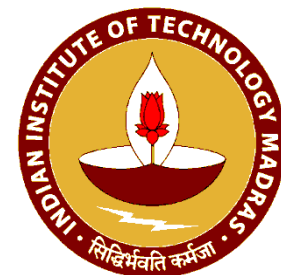
D. Janakiram

Large Scale Distributed Systems, Cloud and Grid Computing, Big Data Systems



V. Kamakoti

Software for VLSI Design, High-Performance Computing



Mitesh Khapra

Statistical Machine Translation, Text Analytics, Deep Learning, Crowd-Sourcing



Deepak Khemani

Artificial Intelligence, Case-based reasoning, Knowledge Representation, Planning, Logic



P. Sreenivasa Kumar

Semi-Structured Data, Semantic Web Technologies, Ontologies



Manikandan Narayanan

Bioinformatics, Computational network biology, Data science.





Faculty

Anurag Mittal

Computer Vision,
Multi-Camera Vision,
Sensor Planning,
Surveillance



C. Siva Ram Murthy

Ad hoc Wireless
Networks,
Real-Time Systems,
Parallel and
Distributed Computing



Hema A. Murthy

Speech Technology,
Music Analysis,
Computational Brain
Research



Madhu Mutyam

Computer
Architecture,
Network-on-Chip
Architectures



V. Krishna Nandivada

Compilers, Program
Analysis, Programming
Languages, Multicore
Systems



N.S. Narayanaswamy

Analysis of algorithms,
Parameterized
Complexity theory,
Artificial Intelligence





Faculty



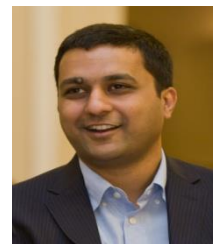
Meghana Nasre

**Graph Theory,
Algorithms, Matching
with Preferences**



Rupesh Nasre

**Compilers,
Parallelization,
Program Analysis**



L. A. Prashanth

**Reinforcement
Learning, Stochastic
Optimization, Multi-
armed Bandits**



B. V. Raghavendra Rao

**Computational
Complexity Theory,
Algebraic Complexity,
Combinatorial
Commutative Algebra**



Chandrashekar

Lakshminarayanan

**Deep Learning,
Reinforcement
Learning, Stochastic
Approximation and
Large Scale Markov
Decision Processes**





Faculty

B. Ravindran

Machine learning,
Deep Networks,
Reinforcement Learning,
Social Network Analysis,
Data and Text Mining



Chester Rebeiro

Hardware Security,
Operating System
Security, Side-Channel
Analysis, Cryptography



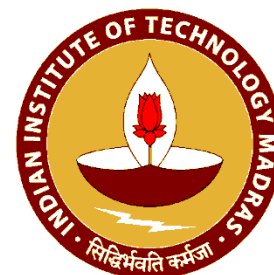
Jayalal Sarma M.N.

Computational
Complexity Theory,
Circuit Complexity,
Algebra and
Computation



C. Chandra Sekhar

Speech Recognition,
Machine Learning,
Deep Learning,
Kernel Methods



Krishna Moorthy Sivalingam

Wireless Networks,
Sensor Networks,
Optical Networks



Arun Rajkumar

Machine Learning,
Rank Aggregation,
Statistical Learning





Faculty



Yadu Vasudev

Sub-linear Algorithms,
Computational
Complexity Theory,



K.C. Sivaramakrishnan

Programming models,
Compilers, Static
Analysis, Schedulers,
Threading Systems, and
Memory Management



**Nishad Bharat
Kothari**

Graph Theory,
Matching Theory,
Combinatorial
Optimization



Ayon Chakraborty

Mobile systems,
Wireless sensing



Akanksha Agrawal

Parameterized
complexity,
Computational
geometry, Graph
algorithms



**Aishwarya
Thiruvengadam**

Cryptography,
Security, Privacy





Adjunct Faculty

[Manikantan Srinivasan](#)

[Veryx Technologies](#)

Data communication networks, Network virtualization and softwarized cellular mobile communication networks, Wireless LANs, Cybersecurity



[Sriyaam Natarajan](#)

[The University of Texas at Dallas, USA](#)

Artificial Intelligence, Machine learning, Graphical Models, Relational Learning



[Ravishankar Krishnaswam](#)

[Microsoft Research India, Bangalore](#)

Approximation Algorithms, Online Algorithms



[Deepak Padmanabhan](#)

[Queen's University Belfast](#)

Data Analytics, Machine learning, Similarity Search, Fairness in Machine Learning



[Sarath Chandar](#)

[École Polytechnique de Montréal, Canada](#)

Recurrent Neural Networks, Lifelong Learning, Reinforcement Learning, Deep Learning, Natural Language Processing





Distinguished Chairs and Visiting Chair Professors



Partha Mitra

**Cold Spring Harbor Lab,
New York, USA**

**Prof.H.N. Mahabala
Distinguished Chair In
Computational Brain
Research**



Vyas Sekar

CMU, Pittsburgh, USA

**Venky Harinarayan
and Anand Rajaraman
Visiting Chair Professor**



Mriganka Sur

MIT, Cambridge, USA

**Shri N.R.Narayana Murthy
Distinguished Chair in
Computational Brain
Research**



David Peleg

**Weizmann Institute of
Science, Rehovot, Israel**

**Venky Harinarayan
and Anand Rajaraman
Visiting Chair Professor**



Procedure for Interviews

There will be stream-wise panels to conduct the interviews for MS, Direct PhD and PhD admissions.

The panels are as follows:

Panel A: Theoretical Computer Science

Panel B: Computer Systems

Panel C: Artificial Intelligence, Machine Learning and Applications

The details of the research areas and the faculty associated with each of the streams are given in the subsequent slides



Panel A: Theoretical Computer Science

- **Design and Analysis of Algorithms** : Approximation Algorithms, Computational Geometry, Distributed Algorithms, Graph Algorithms, Online Algorithms, Parameterized Algorithms, Smooth Analysis of Algorithms, Structural Graph Theory. **Faculty:** [Akanksha Agrawal](#), [John Augustine](#), [Ravishankar Krishnaswamy](#), [N.S. Narayanaswamy](#), [Meghana Nasre](#), [Yadu Vasudev](#)
- **Computational Complexity Theory** : Algebra and Computation, Algebraic Complexity Theory, Boolean Function Analysis, Circuit Complexity Theory, Communication Complexity, Inapproximability, Parameterized Complexity Theory, Pseudorandomness, Structural Complexity Theory.
Faculty: [B. V. Raghavendra Rao](#), [Jayalal Sarma](#), [Yadu Vasudev](#)
- **Cryptography and Network Security** : Cryptography Protocols, Network Security, Secret Sharing Schemes, Secure Multiparty Computation. **Faculty:** [Shweta Agrawal](#), [Aishwarya Thiruvengadam](#)
- **Combinatorics and Graph Theory** : Combinatorial Optimization, Enumerative Combinatorics, Structural Graph Theory. **Faculty:** [Nishad Kothari](#)



Panel B: Computer Systems

- **Computer Architecture** : Cache Design in Multicore, Memory System Design, Network-on-chip architectures.
Faculty: [Madhu Mutyam](#), [K. C. Sivaramakrishnan](#)
- **VLSI Design** : Design Automation, Digital VLSI, Formal Design Verification, Software Aspects.
Faculty: [V. Kamakoti](#)
- **Computer Networks** : Adhoc Wireless Networks, Network Traffic Analysis and Modeling, Optical Networks, Performance Evaluation, Wireless Networks, Wireless Sensor Networks.
Faculty: [Ayon Chakraborty](#), [C. Siva Ram Murthy](#), [Krishna Moorthy Sivalingam](#), [Manikantan Srinivasan](#)
- **Programming Languages and Software Engineering** : Auto Parallelization & High Performance Compilers, Code Optimization, Compilers, Fault Localization, Parallelization, Program Analysis, Programming Languages, Verification.
Faculty: [Kartik Nagar](#), [V. Krishna Nandivada](#), [Rupesh Nasre](#), [K. C. Sivaramakrishnan](#)
- **Distributed Systems and Object Oriented Systems** : Anonymous Remote Computation and Communication, Cloud Computing, Concurrency Control, Distributed Operating Systems, Load Balancing, Object Oriented Programming.
Faculty: [D. Janakiram](#)
- **High Performance Computing & Parallelization** : Cluster Computing, Concurrent Programming & Data Structures, Cyber Physical Systems, Hardware Parallelization, Implementations on GPUs, Language Extensions, Numerical Methods and Approximate Computing, Runtime.
Faculty: [V. Kamakoti](#), [Madhu Mutyam](#), [V. Krishna Nandivada](#), [Rupesh Nasre](#)
- **Computer Network Security** : Hardware Security, Network System Security, Operating System Security, Side-channel Analysis.
Faculty: [Chester Rebeiro](#)
- **Information Management** : Associative Rule Mining, Data Warehousing, Database Management Systems, Indexing Semi-structured Data, Ontologies, Semantic Web, Text Summarization Systems.
Faculty: [Mitesh Khapra](#), [P. Sreenivasa Kumar](#), [Balaraman Ravindran](#)
- **Data Mining** : Graph Mining, Sequence Mining, Social Network Analysis, Text Mining, Trajectory Mining.
Faculty: [Mitesh Khapra](#), [Balaraman Ravindran](#)



Panel C: Artificial Intelligence, Machine Learning and Applications

- **Machine Learning** : Artificial Neural Networks, Deep Learning, Kernel Methods, Reinforcement Learning, Robot Learning. **Faculty:** [Sarath Chandar](#), [Harish Guruprasad](#), [Mitesh Khapra](#), [Deepak Khemani](#), [Chandrashekar Lakshminarayanan](#), [Sriraam Natarajan](#), [L A Prashanth](#), [Arun Rajkumar](#), [Balaraman Ravindran](#), [C. Chandra Sekhar](#)
- **Artificial Intelligence** : Knowledge Representation, Memory Based Reasoning, Memory Models, Natural Language Processing, Planning. **Faculty:** [Mitesh Khapra](#), [Sutanu Chakraborti](#), [Sarath Chandar](#), [Harish Guruprasad](#), [Deepak Khemani](#), [Sriraam Natarajan](#), [Balaraman Ravindran](#)
- **Speech Processing** : Music Information Retrieval, Music Processing, Speech Synthesis and Recognition. **Faculty:** [Hema A. Murthy](#), [C. Chandra Sekhar](#)
- **Computer Vision**: Computer Graphics, Digital Video Processing, Human Detection and Tracking, Image Reconstruction, Multi-camera Vision Systems, Soft Computing, Visualization and Perception. **Faculty:** [Sukhendu Das](#), [Anurag Mittal](#)
- **Computational Brain Research** : Cortical Development and Plasticity, Dynamics, Mouse Brain Architecture. **Faculty:** [Partha Mitra](#), [Mriganka Sur](#), [Hema A. Murthy](#)
- **Computational Biology** : Bioinformatics, Systems Biology. **Faculty:** [Manikandan Narayanan](#)



Procedure for PhD Interviews

A candidate can choose a maximum of 2 Panels.

- **For every panel, there will be two rounds of interviews, Round 1 and Round 2.**
- **All the candidates who gave a panel as their first preference or second preference will be interviewed in Round 1 by that panel.**
- **Only those candidates whose performance in the Round 1 of a panel is above a threshold will be interviewed in the Round 2 of that panel.**

Other details about the interviews by different panels will be shared with the candidates later



Procedure for MS and Direct PhD Interviews

A candidate can choose a maximum of 2 Panels.

For every panel, there will be one round of interview.

Other details about the interviews by different panels will be shared with the candidates later



MS (HTRA) Vacancies

For January 2022 Admissions, the MS (HTRA) vacancies are available with all the faculty, **EXCEPT THOSE LISTED BELOW:**

1. Dr. Arun Rajkumar
2. Dr. Krishna M. Sivalingam
3. Dr. Madhu Mutyam
4. Dr. Mitesh Khapra
5. Dr. Sukhendu Das
6. Dr. D. Janakiram
7. Dr. Hema A. Murthy



Timeline

MS interviews: 1st December, 2021

Direct PhD interviews: 1st December, 2021

PhD Round 1 interviews: 30th November, 2021

PhD Round 2 interviews: 2nd December, 2021

Announcement of results: 13-17 December, 2021

Tentative date for Admission: 7th January, 2022

Commencement of Classes: 17th January, 2022



Invitation

Department of Computer Science and Engineering
IIT Madras

Invites

YOU

to be part of the
Academic Expedition in the Department
to **LEARN, EXPLORE** and **ACHIEVE**



Wish You all the Best

THANK YOU