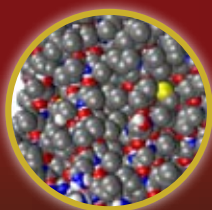
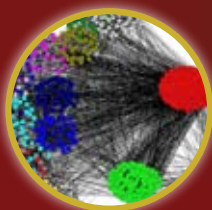
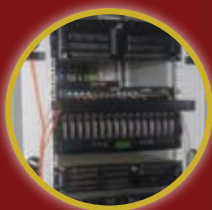




# **Department of Computer Science and Automation**

**Indian Institute of Science, Bangalore**



<http://www.csa.iisc.ernet.in>



## CSA@IISc

The Department of Computer Science and Automation (CSA) was created in 1969 and was originally called the School of Automation till the mid-eighties. Ever since its inception, the department has been a pioneering academic centre for higher education, research, and innovation in key areas of computer science. The vision of the department is to enable India's excellence in the world of computer science and automation. The driving mission for the department is to advance the frontiers of research in computer science and automation and offer world-class pedagogical and research experience to its students. CSA is recognized as a Centre for Advanced Study by the University Grants Commission and has recently been awarded a FIST (Fund for Infrastructure in Science and Technology) grant by the Department of Science and Technology, Government of India. The department is ranked among the top 100 computer science departments in the world (Source: Academic Ranking of World Universities, ARWU, June 2010).

CSA researchers contribute to cutting-edge research in topical areas of computer science and are actively engaged in many high impact collaborative projects. The faculty members have received numerous awards in recognition of their excellence in research, including the J.C. Bose National Fellowship, IEEE Fellowship, Fellowships of National Academies, Shantiswarup Bhatnagar Award, Swarnajayanti Fellowship, Faculty Awards from global R&D companies, Young Scientist Awards, and Best Paper Awards.

The department attracts talented students from all over India. There are currently more than 80 Ph.D. students on roll. All graduates of CSA find excellent placements in research-oriented industries, top ranking global companies and as faculty in prominent national institutes and universities.

CSA alumni are at the forefront of research and development in computer science and related fields within India and internationally. The department's alumni include renowned academicians, leaders in computer and IT industry, distinguished scientists, and trendsetting entrepreneurs.

# Research@CSA

Research is the primary activity and focus of the department. Faculty members are active researchers in their respective domains of expertise and lead various projects within the department. In addition, faculty members often work in collaboration with researchers from other groups and departments on interdisciplinary projects. CSA faculty members are active members of institute-wide interdisciplinary research efforts like the Institute Mathematical Initiative (IMI), the DST Centre for Mathematical Biology, the Computational Neuroscience program, and the Centre for Infrastructure, Sustainable Transportation and Urban Planning (CISTUP). Research within CSA can be broadly grouped into three clusters. The clusters and the research topics follow.

## **Theoretical Computer Science**

Algorithms, algorithmic algebra, random projections, graph theory, combinatorial geometry, computational geometry, computational topology, coding theory, cryptology, logic, formal verification.

## **Computer Systems**

Computer architecture, multi-core systems, parallelization, embedded systems, energy aware computing, compilers, operating systems, storage systems, database systems, distributed computing, cloud computing, systems security, mobile and wireless systems, cyber-physical systems, performance modeling, graphics, visualization, program analysis, software engineering.

## **Intelligent Systems**

Pattern recognition, machine learning, convex optimization, graphical models, soft computing, data mining, information retrieval, bioinformatics, social network analysis, network science, reinforcement learning, stochastic control and optimization, stochastic simulation, electronic commerce, game theory, auctions and mechanism design, cognitive systems.

## Research and Computing Laboratories

CSA houses several research and computing laboratories. CSA faculty and students also conduct research within labs located in sister departments such as CEDT, ECE, EE, and SERC.

A list of these laboratories:

Algorithmic Algebra Lab  
Compilers Lab  
Computer Architecture Lab (SERC)  
Computer Architecture and Systems Lab  
Database Systems Lab (SERC)  
Distributed Computing Lab  
Electronic Commerce Lab  
Formal Verification Lab

High Performance Computing Lab (SERC)  
Informatics Lab  
Machine Learning Lab  
Microprocessor Applications Lab (CEDT)  
Programming Languages Lab  
Stochastic Systems Lab  
Theory Lab  
Visualization and Graphics Lab

# Recent-Highlights@CSA

## Research Publications

During 2006-2009, CSA researchers have published **7** books/monographs, **25** book chapters, **159** journal publications, and **204** conference publications. These publications have appeared in leading journals and top-ranking conferences.

## Citations

As of December 31, 2010, **71** papers authored by CSA researchers have a citation count of at least **50** as reported by [www.scholar.google.com](http://www.scholar.google.com). These **71** papers have accumulated **16568** citations. The paper *Data Clustering: A Review* co-authored by M. Narasimha Murty has garnered more than **5000** citations.

## Best Paper/Demo/Poster Awards

- Best Demo Award at VLDB-2010 : The tool PICASSO designed by Jayant Haritsa's Group
- Best Paper Award, IEEE T-ASE: *A Theory of Mechanism Design for Stackelberg Problems* authored by Dinesh Garg and Y. Narahari (for the *IEEE Transactions on Automation Science and Engineering*, awarded in 2009)
- Best Poster Award, IBM I-CARE, 2010: K. Vasanta Lakshmi and K.V. Raghavan
- Best Paper Award, Student Research Symposium, HiPC 2009: Preeti Malakar, Vijay Natarajan, and co-authors

## IISc Research/Teaching Awards

Alumni Award for Research Excellence – C.E. Veni Madhavan (2011), Y. Narahari (2009), M. Narasimha Murty (2007)

Jaya Jayant award for Teaching Excellence – Priti Shankar (2008)

## Faculty Awards

IBM (7), MSR (3), MSRI (4), Yahoo! (2), GM (1), Google (1) have awarded unrestricted research grants to CSA faculty members in recognition of their achievements.

## National Awards

J.C. Bose National Fellowship (2010) – Y. Narahari

Shantiswarup Bhatnagar Prize (2009) – Jayant Haritsa

Vikram Sarabhai Research Award (2008) – Jayant Haritsa

### **Young Scientist Awards**

INSA Young Scientist – Sunil Chandran (2009), Vijay Natarajan (2010)

SSI Young Scientist - Shalabh Bhatnagar (2007)

IASc Young Associate – Vijay Natarajan (2010)

NASI Young Scientist – Sunil Chandran (2009)

MSRI Young Researcher – Sunil Chandran (2009, 2010), Chiranjib Bhattacharyya (2008), Shalabh Bhatnagar (2007, 2008)

### **Collaborative Research Program with Infosys Technologies**

A three-year research program on Analytics and Algorithms for Business Optimization is initiated, involving **7** faculty members, **7** CSA students, and **10** Infosys researchers.

### **Collaborative Projects**

During 2010, collaborative projects were initiated with GM, IBM, Infosys, MindTree, NetApp, SAP, Xerox.

### **Indo-US Workshop on Machine Learning, Game Theory, and Optimization**

A two day Indo-US workshop involving leading researchers from India and USA was organized in November 2010 by Shivani Agarwal and Chiranjib Bhattacharyya.

### **General/PC Chairs of International Conferences**

HPCA, PPOPP (2010) – Matthew Jacob, R. Govindarajan

ICDE (2010) – Jayant Haritsa

IEEE CASE (2009) – Y. Narahari

### **Granting of Patents**

Three patents authored by Shalabh Bhatnagar were granted during October-December 2010.

### **Publications from M.E. Projects**

**60** publications have resulted out of M.E. Projects during 2006-2009.

### **Student Distinctions**

Yahoo! Key Scientific Challenges Award (2010) – Ramasuri Narayanam

Yahoo! University Hack Day Competition (2010) – Award winning performance by CSA

MSRI PhD Fellowship – Harish Doraiswamy

IBM PhD Fellowship – Saheli Bhadra

### **Alumni**

The department has more than 1500 alumni who include renowned academicians, leaders in computer and IT industry, distinguished scientists, and trendsetting entrepreneurs. Cellstream, Encore, Integra Microsystems, Ittiam, MyBantu, Picopeta Simputers, Strand Life Sciences, Suryasoft and a host of other companies have been created by CSA alumni and faculty.

# Opportunities@CSA

The department has maintained an excellent reputation for high quality degree programs. Entry into all degree programs is highly competitive. All students are offered scholarships during their period of study, subject to satisfactory performance.

## **Post-Doctoral/ Research Associate Fellowships**

The department invites accomplished Ph.D. graduates to apply for post-doctoral fellowships/ research associate positions, including the IISc Centenary Post-Doc positions.

## **Research Programs**

CSA offers two research programs, M.Sc. (Engg.) and Ph.D., that train a student to become a perceptive and sound researcher. Students are expected to conduct independent research under the supervision of a faculty member, prepare a research proposal, and write a dissertation describing their original work. The anticipated time to earn the Ph.D. and M.Sc. (Engg.) degrees are 4 and 2 years, respectively. Before completion of their programs, students are expected to present and publish their research results at premier international fora.

## **Course Programs**

The two course-based masters programs currently offered by the department are structured to provide a solid foundation in core areas of computer science through course work while allowing enough flexibility for the student to pursue an area of specialization in their research projects. M.E. (Computer Science and Engineering) is the flagship program of CSA that attracts the best students in the country. The M.E. (Systems Science and Automation) program, jointly offered with the Electrical Engineering Department is a unique program that blends computer science and systems science towards problem solving.

## **External Registration Program (ERP)**

This program enables graduates working in public or private organizations including educational institutions to pursue a research degree at the department.

## **Quality Improvement Program (QIP)**

This program is meant for faculty members in AICTE affiliated engineering colleges who wish to pursue an M.E. or a Ph.D. degree in the department.

## **Summer Internship Program**

The department hosts about 25 undergraduate engineering students during summer towards an exciting research internship program.

# Faculty@CSA

**Shivani Agarwal**, Assistant Professor  
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Machine learning, statistical learning theory, computational biology, chem-informatics, information retrieval

**Shalabh Bhatnagar**, Associate Professor  
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Performance analysis, stochastic control and optimization, simulation, communication networks

**Indrajit Bhattacharya**, Assistant Professor  
<indrajit@csa.iisc.ernet.in>

Machine learning, data mining, graphical models

**Chiranjib Bhattacharyya**, Associate Professor  
<chiru@csa.iisc.ernet.in>

Machine learning, convex optimization, bioinformatics

**Sunil Chandran**, Associate Professor  
<sunil@csa.iisc.ernet.in>

Graph theory, combinatorics, algorithms

**Sanjit Chatterjee**, Assistant Professor  
<sanjit@csa.iisc.ernet.in>

Cryptology, information security

**Susheela Devi**, Senior Scientific Officer  
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Pattern recognition, data mining, soft computing

**Deepak D'Souza**, Associate Professor  
<deepakd@csa.iisc.ernet.in>

Automated verification

**Ambedkar Dukkipati**, Assistant Professor  
<ambedkar@csa.iisc.ernet.in>

Algorithmic algebra and algebraic geometry, Information theory and statistical learning

**K. Gopinath**, Professor  
<gopi@csa.iisc.ernet.in>

Operating systems, storage systems, systems security

**R. Govindarajan**, Professor  
<govind@csa.iisc.ernet.in>

Computer architecture, compiler optimizations, high performance computing

**Sathish Govindarajan**, Assistant Professor  
<gsat@csa.iisc.ernet.in>

Combinatorial geometry, spatial data structures, computational geometry

**R.C. Hansdah**, Associate Professor  
<hansdah@csa.iisc.ernet.in>

Operating systems, fault tolerant and secure distributed computing, wireless networks

**Jayant R. Haritsa**, Professor  
<haritsa@csa.iisc.ernet.in>

Database systems

**Aditya Kanade**, Assistant Professor  
<kanade@csa.iisc.ernet.in>

Formal methods, software design and analysis, analysis of embedded software

**Ravi Kannan**, Professor  
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Theoretical computer science, optimization, massive data sets, sampling, clustering

**P. Vijay Kumar**, Professor  
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Information theory, coding theory

**C.E. Veni Madhavan**, Professor  
<cevm@csa.iisc.ernet.in>

Cognitive science, computational number theory, cryptography, security

**M.Narasimha Murty**, Professor  
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Pattern recognition, data mining

**Y. Narahari**, Professor and Chairman  
<hari@csa.iisc.ernet.in>

Game theory, auctions and mechanism design, social network analysis

**Vijay Natarajan**, Assistant Professor  
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Scientific visualization, computational topology, computational geometry, graphics

**L.M. Patnaik**, Professor  
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Architecture, VLSI, neural networks, genetic algorithms, real-time systems (Currently Vice-Chancellor, Defence Institute of Advanced Technology, Pune)



**Dilip P. Patil**, Professor  
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Commutative algebra, algebraic  
geometry

**K.V. Raghavan**, Assistant Professor  
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Programming languages, programming  
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Parallelization, compiler design,  
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Compiler tools, formal languages and  
applications, error-correcting codes

**Shirish K. Shevade**, Associate Professor  
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Machine Learning, data mining

**Y.N. Srikant**, Professor  
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Compiler design, power aware  
computing, program analysis

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**Pushparaj B.K.**, Scientific Assistant  
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**Shankar T.**, Scientific Assistant,  
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