Indian Institute of Technology Kanpur

IITK

Computer Science & Engineering

Indian Institute of Technology Kanpur was the first Institute in India to start Computer Science education in the country. The initial courses were started at IIT Kanpur in August 1963 on an IBM 1620 system installed in the nation's first “computer classroom”. In 1971, the Institute initiated an independent academic program, leading to Ph.D and M.Tech degrees. The undergraduate program leading to B.Tech Degrees started later, with the first batch graduating in 1983. The department was formally established in 1984. Many of the nations leading experts, educationists and consultants in computer science today are the alumni of this department. Currently, the department has a faculty of 22 whose interests span almost all areas of Computer Science. In addition, the department has two chaired Professors positions and some visiting/adjunct faculty members.

Areas of Research

IITK CSE department is actively involved in research in various fields of Computer Science. The faculty is involved in both theoretical as well as experimental research. The domain of research ranges from abstract theory to down-to-earth problems of immediate interest of industry.

- Software Engineering and languages
- Computer Architecture and Operating System
- Information and database Systems
- Computer Security
- Algorithms
- Theoretical Computer Science
- Computer Graphics and CAD
- Artificial Intelligence
- Hardware Design
- Networks and Mobile Computing
- Compiler Design
- Computational Biology

Recent Research and Development Activities

Major Breakthrough in theory
One of the major outstanding problems in the area of computational number theory was solved by one of the faculty member recently. The problem was whether a number could be tested for primality in polynomial time. This is considered the most important research result during last 15 year in the area of Theoretical Computer Science.

Smart Card Technology Development
A standard for smart card operating system has been developed which is used by the government of India for all their smart card based applications. A smart card operating system has also been implemented which is compliant to this standard. This technology is in the process of being commercialized.

Computer System security
Recently, a center on computer security has been set up. This center aims to promote research in all aspects of computer security. Department has already made several contributions in this area including designs of new private key cryptosystems, packet filtering system, etc.

Language Technology
Development of Indian language technology has been one of the major activities at IIT Kanpur. Some path breaking contributions have been made in Indian language coding (ISCII), keyboard design, transliteration ,OCR machine translation, Linux ware, NLP, Indian scripts on Linux, Web content creation and search. Some of our landmark achievement is: GIST multilingual technology, AGLABHARTI & ANUBHARTI MACHINE aided translation strategies and popular web sites such as Gita-supersite.

Medical Application
The medical applications group supported by media lab Asia is developing a portable mobile model of printing healthcare delivery which uses ICT and digital devices to contact individual requiring medical attention with doctors who are remotely studies. The 'Sehat Saathi' software being developed will allow at the backend for diagnoses and treatment if real-time connectivity is not available them the patient is virtualized and the doctor give advice based the data gathered about the patient.

Biometric
Multipurpose Multimodal Human Identification System is being developed at IIT Kanpur. The primary aim is to design a robust system which is capable of handling problems like security, personal, verification/identification and other related applications. It consists of three modules-weaker modules that contains least features, medium level module containing more features, while strong features module that is packed with most of the features. The various traits that are considered are Face, Iris, Signature, Fingerprints and Ear. Finally, these traits are integrated together to achieve the maximum reliability and accuracy.

Wireless Networking

Wireless networking research aims at making telecom affordable to rural areas that cannot be served profitably by conventional wireless technologies. A large scale outdoor experiment is being conducted to assess viability of using IEEE 802.11 technology for this purpose. Work in progress includes: wireless networks monitoring, MAC and routing protocol design, and novel application for wireless networks. This is the largest outdoor multi hop system anywhere in the country.

Facilities

Networks
CSE department is equipped with 100 mbps switched network. All systems (server & clients) are equipped with 100 mbps Ethernet cards. CISCO Catalyst 2900 switch is acting as back bone switch.

Servers
The CSE lab provides NFS, SMTP mail, DNS DHCP, NIS(YP) Mysql database server, Tomcat servlet runner, FTP server, Intranet website, Internet website, NTP, pop & I map services. Multiple Xeon based linux server provide NFS Services for all CSE Lab users.

Clients
Most of the CSE-Lab clients are multi boot systems. Sixteen SUN workstation having Solaris 9 are also being used in the Lab. Twenty Opteron based multi boot system are running Linux, Solaris 9, Java desktop, Windows 2000 and Fedora Core 3. Most of the PCs in offices are equipped with laser printer and DVD ROM cum CD-Writer unit.

Printer
Three Laser printers (Both colors & b/w) and one line printer are available for general use and provide networked printing.

UPS and Genset
CSE-lab is fully air conditioned and backed up by UPS/Genset.

Library
The department has a library, which has important text books, conference proceedings and journals. This is besides the central library which is very well equipped and subscribes to most of the digital libraries.

Hardware lab
The hardware lab in the CSE department is the state of the art lab equipped for embedded computing. The lab provides several FPGA based stations for hardware programmability. The lab is used both for UG education and research.

Sun Grid
Sun grid has been established in the department with funding from Sun Microsystems, USA. The grid has 20 workstation based on Opteron (64 bit AMD processor) and it is available to all the users who want to do research and explore the area of High Performance Technical Computing. The department is recognized as the “Sun Regional Academic and Research Partner for Excellence in Grid Computing”.

Books

Kishor S. Trivedi and K. Vaidyanathan, Software Reliability and Rejuvenation: Modeling and Analysis, in Perfonnance Evaluation of Complex Systems: Techniques and Tools, M. C. Calzarossa and S. Tucci (eds.), Lecture Notes in Computer Science, LNCS 2459, pp. 318-345, Springer Verlag, Heidelberg, 2002.

Kishor S. Trivedi, H. Suzuki, J: Dohi and K. Goseva-Popstojanova, Analysis and Estimation of Multistep Failure Models with Periodic Software Rejuvenation, in Advances in Stochastic Modeling, J. R. Artalejo and A. Krishnamoorthy (eds.), Notable Publications, Neshanic Station, New Jersey, pp. 85--108, 2002

Rekha Jain and D. Sanghi, Untangling Wireless in Local Loops India infrastructure Report, 2002, Chapter II,pp. 313-317,Dec2001

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Sanjeev K. Aggarwal and M. Sarath Kumar, Debuggers for Programming Languages, in The Compiler Design Handbook: Optimizations and Machine Code Generation, Editors Y. N. Srikant and Priti Shankar, CRC Press, 2002

P. Jalote, Software Project Management in Practice, Addison Wesley, Massachussets, USA, 2002

P. Jalote, CMM in Practice: Processes for executing software projects at Infosys, Addison Wesley, Longman, Low cost Edition by AWL India, 2000.

P.Jalote, An Integrated Approach to Software Engineering, Springer Verlag New York, Third Edition July 2003.

P. Jalote, Fault Tolerance in Distributed Systems, Prentice Hall, Englewood Cliffs, NJ, USA, 1994.V

R.K. Ghosh, R. Moona, and P. Gupta, Foundations of Parallel Algorithms, Narosa Publishing House, New Delhi, 1995.

R.M.K. Sinha (Ed), Computer Processing of Asian Languages, Tata McGraw Hill, New Delhi, 1992.

A. Bharati, K Chaitanya, and R. Sangal, Natural Language Processing using Paninian Framework, Prentice Hall of India, New Delhi, 1995.

R. Sangal, Introduction to LISP Programming, Tata- McGraw Hill, 1995.

R. Sangal, Programming Paradigms in LISP, McGraw Hill, New York, 1991. [Int'l Student Edition, Singapore, 1992.

G.K. Dubey, S.R. Doradla, A. Joshi and R.M.K. Sinha, Thyristorised Power Controllers, New Age Intemational, New Delhi, 1986

R.K.Ghosh and H. Mohanty, "Distributed Computing and Internet Technology Proceedings of ICDCIT 2004", Lecture Notes in Computer Science volume 347, Springer.

Faculty

- **Ajai Jain,** *Research Interests:* Fault-tolerance in VLSI, Parallel Processing, Machine Translation.
- **Amitabha Mukerjee,** *Research Interests:* Artificial Intelligence, Geometric Modeling, Robotics.
- **Anil Seth,** *Research Interests:* Logic in Computer Science.
- **Arnab Bhattacharya,** *Research Interests:* Database, Data Mining, Sensor Networke, Bioinformatics
- **Dheeraj Sanghi,** *Research Interests:* Computer Networks, Protocols, IPv6, Telecom Regulation.
- **Harish Karnick,** *Research Interests:* Automated & Commonsense Reasoning, AI, Programming Languages.
- **Mainak Chaudhuri,** *Research Interests:* Computer Architecture.
- **Manindra Agrawal,** *Research Interests:* Computational Complexity Theory.
- **Pankaj Jalote,** *Research Interests:* Software Engineering, Fault-tolerance, Distributed Systems.
- **Phalguni Gupta,** *Research Interests:* Sequential and Parallel Algorithms, Image Processing.
- **Piyush Kurur,** *Research Interests:* Computational Complexity, Computational Algebra
- **R M K Sinha,** *Research Interests:* AI, Pattern Recognition, Vision, Natural Language Processing.
- **Rajat Moona,** *Research Interests:* Computer Hardware and Architecture, VLSI Design.
- **Ratan K Ghosh,** R*esearch Interests:* Parallel Algorithms, Parallel Processing, Genetic Algorithms.
- **Sanjay G Dhande,** *Research Interests:* CAD/CAM, Computer Graphics, Robotics.
- **Sanjeev K Aggarwal,** *Research Interests:* Parallelizing and Vector zing Compilers, Programming Languages. Grid Computing.
- **Sanjeev Saxena,** *Research Interests:* Parallel Processing, VLSI, Data Structures, Algorithms, Heuristics.
- **Shashank Mehta,** *Research Interests:* Computational Geometry, VLSI Testing.
- **Somenath Biswas,** *Research Interests:* Complexity Theory, Logic.
- **Sumit Ganguly,** *Research Interests:* Databases.
- **Surendra Baswana,** *Research Interests:* Graph Algorithms, Randomijed Algorithms
- **T V Prabhakar,** *Research Interests:* Databases, Multimedia Systems, Object Orientation and User Interface Design.

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