In the span of just a few decades, computer science-based systems, principles and techniques have pervaded modern society. People from all sectors depend on critical applications developed in our field. Examples range from telecommunications, manufacturing, defense, education and finance, to agriculture, healthcare, transportation and entertainment. We are committed to preparing our graduates to meet tomorrow’s challenges with diverse educational and research opportunities.

Our 31 faculty members have a broad range of expertise. Eight are National Science Foundation Career Award recipients, five are professional society fellows, 15 hold chief editorial positions or sit on boards of professional journals, and seven have received teaching excellence awards. The faculty is also growing with eight new members since 2001 and two more additions by 2007.

Our faculty obtains major federal grants and contracts, and actively partners with industry in research. As a result, the UIC Department of Computer Science is a leading research unit with annual research funding exceeding $7 million.

We actively engage in interdisciplinary, multi-institutional collaboration, such as 10 Gigabit Ethernet trials, which positions UIC as a leading university worldwide in advanced network testing and technology development.

The department also serves as a resource for surrounding business and academic communities.

Most important, we serve the students who come to UIC seeking a quality education and access to advanced computing resources. Our BS, MS and PhD programs are designed to prepare students for successful careers in a rapidly evolving discipline.

I invite you to explore all the UIC Department of Computer Science has to offer.

Pete Nelson, Professor and Head
Department of Computer Science
Graduate Program

The UIC Department of Computer Science emphasizes a broad range of computer science knowledge areas including:

- Artificial intelligence
- Computational biology
- Computer graphics
- Databases and data mining
- Design automation
- Human-computer interaction
- Learning technologies
- Networking
- Security
- Software engineering
- Theory

These areas are applied to the development of grid middleware and advanced applications such as bioinformatics, learning environments, manufacturing and transportation systems.

The UIC Department of Computer Science offers three degrees: the Bachelor of Science in Computer Science (including a specialized Computer Systems option), the Master of Science in Computer Science and the Doctor of Philosophy in Computer Science.

Academic programs are designed to prepare students for successful careers in a rapidly evolving discipline, and place a strong emphasis on design principles and practice.

The department is one of six academic units in the UIC College of Engineering. Computer science admissions are competitive. There are approximately 185 undergraduate, 150 master’s and 100 doctoral students enrolled in the department.
The UIC Electronic Visualization Laboratory, known as EVL, is an interdisciplinary laboratory that combines art and computer science, and specializes in advanced display systems, interactive computer graphics, and high-speed networking. Funded research projects include tele-immersion, collaborative software, the development of viable, scalable, deployable stereo displays and management of next-generation advanced networking initiatives.

EVL invented the CAVE® virtual reality theater and subsequently the ImmersaDesk®. These are used globally for tele-immersive scientific discovery, art exhibition and industrial prototyping.

EVL’s Quanta and CAVERNsoft software are tele-immersion and collaboration toolkits used by the global visualization community—from novice to expert users—to perform distributed virtual reality. Quanta has built-in networking protocols and performance monitoring to optimize the transmission over advanced networks.

The lab's equipment research aims at deploying smaller, low-cost alternatives to its active stereo systems. Recent systems include GeoWall, a passive stereo projection system, LambdaVision, a 100 megapixel ultra-high-resolution tiled display, and Varrier, a scalable autostereo display.

The OptIPuter project developed a new model of computing called the LambdaGrid in which ultra high-speed networks form the backplane of a planetary-scale computer. This new model provides an unprecedented way for bioscientists and geoscientists to work with enormous data-sets in realtime.

UIC’s EVL, along with Northwestern University and Argonne National Laboratory, manages StarLight(sm), the leading next-generation Optical Internet Exchange in the nation. StarLight ties together metropolitan, regional, national and international advanced research networks at a single point in the Midwest. It is one of many partnerships the lab maintains with other academic and research institutions to manage, build and optimally utilize optical networks. These are funded by state, federal and industrial initiatives.
Artificial Intelligence Laboratory

The artificial intelligence laboratory conducts theoretical and applied research in the field of artificial intelligence.

The theoretical research includes knowledge representation for intelligent systems and agents, automated planning and rational decision-making, probabilistic reasoning, and capabilities for intelligent interaction among multiple agents (including humans). Related projects involve intelligent search techniques, natural language processing with applications to human-computer interaction and intelligent tutoring systems, text summarization, and the evolution of languages that agents can use to communicate.

Other active research combines computer vision with elements of computer graphics and databases. This includes computer and biological vision, pattern recognition, visual information retrieval and perceptual organization, as well as multimedia and Web-based educational technology that use natural language, perceptive tools and machine learning.

The laboratory’s applied research includes building intelligent systems that use search and optimization techniques in the areas of transportation, molecular biology and electronics manufacturing optimization. Applications include the design of prototype systems for both automated management of telecommunications networks, and for controlling autonomous systems on a modern battlefield. In collaboration with the Illinois Department of Transportation, the lab created and now maintains a Web-based real-time Chicago traffic map used by drivers in the greater Chicago area. The Web site is accessed more than 100 million times annually.

Kernel Security and Networking Laboratory

The kernel security and networking laboratory finds and implements new methods of providing computer and network security. Many of the tools developed are implemented at low levels in the hardware-to-software spectrum to thwart an attacker’s ability to circumvent them. The research involves a mix of theoretical mathematical work, simulation and systems implementation.

The two main projects of the lab are currently KernelSec and Integrated Network Barriers. KernelSec aims to implement powerful protection mechanisms in the operating system kernel that can then be uniformly applied to all processes running on the computer system. The research will apply to both stand-alone systems and networked and distributed systems.

The Integrated Network Barriers research develops and implements novel techniques to improve routing network performance in parallel processors.
Simultaneously working on two master’s degrees at UIC defined the course of my life and my career. EVL’s interdisciplinary environment provides an enormous amount of creativity and talent, as well as a fascinating family of scientists and artists that are my mentors, and continue to inspire me.

Maria Roussou
MS ’97
Founder of makebelieve, creative design and consulting
UIC is a place where a self-motivated individual can thrive and exceed even their own expectations. The students, staff and faculty I had contact with had a great impact on shaping my life as I know it today.

Matt Szymanski
MS ’98
Chief Technology Officer
VRCo, Inc.

UIC has a great reputation and fantastic location—the Windy City. After learning about the variety of research opportunities in CS, I was convinced that UIC would be an excellent place to pursue my PhD degree. Looking back, the education and training I received at UIC thoroughly prepared me to be successful in my current position as a faculty member at a research university.

Haiping Xu, PhD ’03
Assistant Professor of Computer and Information Science, University of Massachusetts Dartmouth
RESEARCH GROUPS

Theory
The theory group conducts fundamental research in computer science, which falls broadly into three areas: core theory, fundamental algorithms and application-specific theory.

Core theory research concerns machine learning, complexity theory and cryptography. Within the fundamental algorithms field of activity, emphasis is placed on combinatorial algorithms. Application-specific theory work develops methods and techniques to solve problems in computational biology, computer security and computational linguistics.

Computational Biology
From the Human Genome Project to mobile sensor collars on zebras, modern biology yields massive amounts of data. Computational biology utilizes computer science to manage and analyze these data. The resulting interdisciplinary approach furthers such diverse goals as finding cures to disease, understanding mechanisms of evolution, and conservation of endangered species.

Electronic Design Automation
The electronic design automation group conducts research in several areas of the automated design of integrated circuits and systems. These include standard cell placement, device-level placement for analog design, dataflow analysis in the memory management of multidimensional processing systems, performance-driven interconnect synthesis and chip-level timing optimization.

Software Engineering
Software engineering devises methods to aid in the design and analysis of software systems, particularly concurrent and network-based real-time systems. This type of software supports advanced applications, such as aviation, multimedia, teleteaching, telemedicine and various client/server and Web-based systems.

Specific areas of interest include: design and analysis methods for distributed-object systems, manufacturing plants, multiagent software, techniques for performance analysis of network protocols, automatic generation of control code for discrete manufacturing plants and quality-of-service analysis for networks connecting distributed real-time applications.

Tools and techniques for the verification of security constraints, the testing of object-oriented programs, and seamless design processes for embedded systems software that satisfy high levels of correctness criteria are also investigated.

Ongoing research projects involve development of new modeling, design and analysis techniques and tools used for concurrent, distributed and real-time computing systems, including embedded systems.

The group has significant experience in applying Petri nets as a formal graph model for concurrency and coordination, and in automated system verification using temporal logic and model-checking algorithms.
Databases And Data Mining

Miniaturization of computing devices and advances in wireless communication and sensor technology have moved computing from the stationary desktop to the mobile outdoors. The information managed by mobile computer systems is both spatial and temporal in nature, and requires novel database methodologies. The ability to efficiently manage such information lays the groundwork for some important classes of new applications such as location-based services, tourist services, mobile electronic commerce and the digital battlefield. It will also benefit some existing application classes such as transportation and air traffic control, weather forecasting, emergency response, mobile resource management, and the mobile workforce.

Databases and data mining research includes:

- Web search engines
- Image and video retrieval
- Scalable content-based indexing and retrieval for audio and image data archives
- Visual queries and result presentation
- Data integration
- Text classification
- Spatio-temporal information management

Learning Technologies

One of the most exciting and challenging applications of computing technologies is their use in support of learning and training. In collaboration with learning sciences colleagues at UIC and partner universities, the CS Learning Technologies group is engaged in a broad spectrum of research in learning, funded by the National Science Foundation, that spans an age range from elementary school to undergraduate education.

At the K-8 levels, UIC designs classroom learning technologies and instruction to support science inquiry. Employing a wide range of traditional and emerging technologies, using simulations of the ocean floor, earthquakes, the solar system, and many others, allows students to actively investigate scientific phenomena. UIC enjoys strong partnerships with Chicago and suburban public school districts where we have worked with more than 1000 students and dozens of teachers.

At the college level, UIC works with geoscientists, bioscientists and medical faculty on interactive visualizations and simulations as course materials. UIC also works with museums such as the Adler Planetarium and the Science Museum of Minnesota applying advanced visualization and interaction technology to the public presentation of science.

Other research at UIC focuses on computational models of tutoring dialogues and peer-learning interactions, to build natural language interfaces to intelligent tutoring systems and pedagogical agents. Closing the cycle of research informing education and vice versa, these systems will help students in basic CS courses.
**FACULTY**

**Florin Balasa, Assistant Professor**  
PhD, Katholieke Universiteit Leuven, Belgium, 1995  
CAD for VLSI, Data-Flow Analysis

**John Bell, Lecturer**  
PhD, University of Wisconsin, 1990  
Virtual Reality, Educational Software

**Tanya Berger-Wolf, Assistant Professor**  
PhD, U of I at Urbana-Champaign, 2002  
Computational Biology, Algorithms, Dynamic Network Analysis

**Ugo Buy, Associate Professor**  
PhD, University of Massachusetts, 1990  
Software Engineering, Real-Time Verification

**Isabel Cruz, Associate Professor**  
PhD, University of Toronto, 1994  
Databases, Information Visualization, Semantic Web

**Bhaskar DasGupta, Associate Professor**  
PhD, University of Minnesota, 1995  
Bioinformatics, Computational Biology, Neural Networks

**Thomas DeFanti, Distinguished Professor**  
PhD, The Ohio State University, 1973  
Virtual Reality, Computer Networks, Computer Graphics

**Barbara Di Eugenio, Associate Professor**  
PhD, University of Pennsylvania, 1993  
Natural Language Processing, Artificial Intelligence

**Piotr Gmytrasiewicz, Associate Professor**  
PhD, University of Michigan, 1992  
Artificial Intelligence, Multi-Agent Systems, Decision Theory

**Andrew Johnson, Associate Professor**  
PhD, Wayne State University, 1994  
Virtual Reality, User Interfaces, Learning Environments

**Robert Kenyon, Associate Professor**  
PhD, University of California, Berkeley, 1978  
Human–Computer Interaction, Computer Graphics

**Ashfaq Ahmad Khokhar, Professor**  
PhD, University of Southern California, 1993  
Data Mining, Distributed Multimedia Databases/Networks

**Ajay Kshemkalyani, Associate Professor**  
PhD, The Ohio State University, 1991  
Computer Networks, Distributed Computing, Algorithms

**Jason Leigh, Associate Professor**  
PhD, University of Illinois at Chicago, 1998  
Tele-Immersion, High-Speed Networks
COMPUTER SCIENCE FACULTY FACTS

- Eight NSF Career Awards
- Five Professional Society Fellows
- 15 Professional Journal Editors/Board Members
- Seven Teaching Excellence Awards

John Lillis, Associate Professor
PhD, University of California, San Diego, 1996
CAD for VLSI, Combinatorial Optimization

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PhD, University of Edinburgh, 1989
Data Mining, Text Mining, Web Mining, Machine Learning

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PhD, University of Minnesota, 1983
Learning Technologies, Human–Computer Interaction

Tadao Murata, Distinguished Professor
PhD, U of I at Urbana–Champaign, 1966
Petri Nets, Modeling, Analysis, Design of Concurrent Systems

Peter Nelson, Professor and Department Head
PhD, Northwestern University, 1988
Applied Artificial Intelligence, Transportation, Manufacturing

Dale Reed, Lecturer
PhD, Northwestern University, 1995
Web-Based Technology in Education, Artificial Intelligence

Sol Shatz, Professor
PhD, Northwestern University, 1983
Software Engineering, Distributed Computing

Prasad Sistla, Professor
PhD, Harvard University, 1983
Formal Methods in Distributed Systems, Database Systems

Robert Sloan, Associate Professor
PhD, Massachusetts Institute of Technology, 1989
Computational Learning Theory, Algorithms, Education

Jon Solworth, Associate Professor
PhD, New York University, 1987
Security, Networking, Operating Systems, Distributed Systems

Mitchell Theys, Assistant Professor
PhD, Purdue University, 1999
Distributed/Heterogeneous Computing, VHDL Design, Networking

Patrick Troy, Lecturer
MS, Pennsylvania State University, 1990
Computer Science Education

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PhD, Northwestern University, 1985
Software Engineering, Intelligent Systems, Bioinformatics

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PhD, Stony Brook University, 2004
Computer Security, Network Security

Ouri Wolfson, Richard and Loan Hill Professor
PhD, New York University, 1984
Database Systems, Wireless and Mobile Distributed Systems

Clement Yu, Professor
PhD, Cornell University, 1973
Database Management and Multimedia Information Retrieval

Lenore Zuck, Associate Professor
PhD, Weizmann Institute of Science, Israel, 1987
Theorem Proving, Formal Methods, Translation Validation
Chicago is:

- The third largest city in the United States with nearly 3 million in population and more than 9 million people residing in the greater metropolitan area
- An affordable big city, ranking eighth in the cost of living index
- A city of diverse neighborhoods representing many nationalities from around the world
- 29 miles of lakeshore with Lake Michigan and its beaches adjacent to downtown
- A city known for its great nightlife, restaurants, shopping, culture, museums and sports
- The home to 30 of the Fortune 500 companies including Boeing, Motorola, Abbott Laboratories and Exelon

UIC is:

- Home to a College of Engineering that takes pride in its academic excellence and its 115 outstanding faculty
- The engineering school of choice for 1550 undergraduate and 850 graduate students
- An engineering faculty that includes two members of the National Academy of Engineering, 40 Fellows of professional societies and 20 National Science Foundation award recipients
- The largest university in the Chicago area with 25,000 students, 15 colleges and more than $290 million in annual research expenditures
- The home of the Great Cities Commitment in which students join faculty and staff in community, corporate, government and civic partnerships to improve the quality of life around the world
- Among the top 50 universities in federal research funding
- Recognized with many prestigious awards to faculty, and nationally competitive awards to students including the Rhodes Scholarship, Goldwater Scholarship, Fulbright Fellowship and more
- Located within walking distance of the vibrant Chicago Loop business district providing distinct ties with many companies hiring UIC graduates
- Boasts a sports program with more than 300 student athletes and 18 varsity teams

www.cs.uic.edu