Computer Science & Engineering

The Department of Computer Science & Engineering offers PhD programs in Computer Science and in Computer Engineering. Computer Science research encompasses the fundamentals of software and algorithm design, machine learning and bioinformatics, visual and cyber-physical computing, and human-computer interaction. Computer Engineering focuses on the interaction of software and hardware in the design of computing systems and networks. Our research groups have extensive interdisciplinary ties across the university, with collaborations in medicine, science, the humanities, and social work. Recent graduates have accepted research and teaching faculty positions, and research and engineering positions in leading technology companies.

Both PhD programs require a combination of course work, research, and teaching. The course work is often completed early in the program, since students are integrated into research groups in their first year and the program emphasis is on creative research. The program has milestones with both written and oral components that provide structure to the five- to six-year degree. The program considers applicants with either bachelor's or master's degrees and has had successful applicants in the past whose prior training is outside of computer science.

**Chair**

Roch Guérin
Harold B. and Adelaide G. Welge Professor of Computer Science
PhD, California Institute of Technology
Networked Systems

**Endowed Professors**

Aaron Bobick
James M. McKelvey Professor and Dean
PhD, Massachusetts Institute of Technology
Computer vision, graphics, human-robot collaboration

Michael R. Brent
Henry Edwin Sever Professor of Engineering
PhD, Massachusetts Institute of Technology
Systems biology, computational and experimental genomics, mathematical modeling, algorithms for computational biology, bioinformatics

Chenyang Lu
Fullgraf Professor in the Department of Computer Science & Engineering
PhD, University of Virginia
Real-time and embedded systems, wireless sensor networks, mobile computing

**Professors**

Jeremy Buhler
PhD, Washington University
Computational biology, genomics, algorithms for comparing and annotating large biosequences

Shantanu Chakrabarty
PhD, Johns Hopkins University
Computer engineering, networked systems, cyber-physical systems and sensing

Roger D. Chamberlain
DSc, Washington University
Computer engineering, parallel computation, computer architecture, multiprocessor systems

Ron K. Cytron
PhD, University of Illinois at Urbana–Champaign
Programming languages, middleware, real-time systems

Christopher D. Gill
DSc, Washington University
Distributed real-time embedded systems, middleware, formal models and analysis of concurrency and timing

Raj Jain
PhD, Harvard University
Wireless networks, network security, next generation Internet, sensor networks, telecommunications networks, performance analysis, traffic management, quality of service

Robert Pless
PhD, University of Maryland
Computer vision, medical imaging, sensor network algorithms, citizen science

Weixiong Zhang
PhD, University of California, Los Angeles
Computational biology, genomics, machine learning and data mining, and combinatorial optimization

**Endowed Associate Professor**

Caitlin Kelleher
Hugo F. & Ina Champ Urbauer Career Development Associate Professor
PhD, Carnegie Mellon University
Human-computer interaction, programming environments, and learning environments
Associate Professors

Kunal Agrawal
PhD, Massachusetts Institute of Technology
Parallel computing, cyber-physical systems & sensing, theoretical computer science

Yixin Chen
PhD, University of Illinois at Urbana-Champaign
Mathematical optimization, artificial intelligence, planning and scheduling, data mining, learning data warehousing, operations research, data security

Patrick Crowley
PhD, University of Washington
Computer and network systems, network security

Sanmay Das
PhD, Massachusetts Institute of Technology
Design of algorithms for complex environments, computational social science, machine learning

Viktor Gruev
PhD, Johns Hopkins University
Low power integrated sensory systems, integrated polarization imaging, focal plane spatiotemporal image sensors, current mode image sensors, sensory systems in 3-D fabrication technology, micro/nano fabrication, micro fluidics, and low power analog/digital integrated circuits

Tao Ju
PhD, Rice University
Computer graphics, visualization, mesh processing, medical imaging and modeling

William Richard
PhD, University of Missouri-Rolla
Ultrasonic imaging, medical instrumentation, computer engineering

Assistant Professors

Yasutaka Furukawa
PhD, University of Illinois at Urbana-Champaign
Computer vision and computer graphics

Roman Garnett
DPhil, University of Oxford
Machine learning and artificial intelligence

Brendan Juba
PhD, Massachusetts Institute of Technology
Theoretical approaches to artificial intelligence founded on computational complexity theory and theoretical computer science more broadly construed

Angelina Lee
PhD, Massachusetts Institute of Technology
Designing linguistics for parallel programming, developing runtime system support for multithreaded software, and building novel mechanisms in operating systems and hardware to efficiently support parallel abstractions

Benjamin Moseley
PhD, University of Illinois at Urbana-Champaign
Design and analysis of algorithms, online and approximation algorithms, parallel computing, large data analysis, green computing and algorithmic applications

Research Faculty

Sharlee Climer
PhD, Washington University
Computational biology, artificial intelligence, mathematical modeling, combinatorial optimization, pattern recognition

Lecturers

Ruth Miller
PhD, University of Houston
Data mining, database, bioinformatics

Marion Neumann
PhD, University of Bonn
Machine learning with graphs; solving problems in agriculture and robotics

Douglas Shook
MS, Washington University
Imaging sensor design, compiler design and optimization

Todd Sproull
PhD, Washington University
Computer networking and mobile application development

Senior Professors

Jerome R. Cox Jr.
Senior Professor
ScD, Massachusetts Institute of Technology
Computer system design, computer networking, biomedical computing

Mark A. Franklin
Hugo F. and Ina Champ Urbauer Professor of Engineering
PhD, Carnegie Mellon University
Computer architecture, systems analysis and parallel processing, storage systems design

Jonathan Turner
Barbara J. and Jerome R. Cox, Jr. Professor of Computer Science
PhD, Northwestern University
Design and analysis of internet routers and switching systems, networking and communications, algorithms
Professors Emeriti

Richard A. Dammkoehler
MS, Washington University
Computer programming theory, information retrieval, computer systems architecture

Takayuki D. Kimura
PhD, University of Pennsylvania
Communication and computation, visual programming

Seymour V. Pollack
MS, Brooklyn Polytechnic Institute
Intellectual property, information systems

Degree Requirements

Students can choose to pursue a PhD in Computer Science or Computer Engineering. The requirements vary for each degree. Here are the core requirements:

- Complete 72 credits of regular courses (at least 33 units), seminars (at least 3 units), and research credits (at least 24 units), including 9 units of breadth requirements for both the PhD in Computer Science and Computer Engineering degrees
- Satisfy fundamental teaching requirements by acting as a teacher or course TA, pedagogical teaching requirements by completing a certain number of qualifying pedagogy workshops, and scholarly communication requirements by participating in the Doctoral Student Research Seminar
- Pass milestones demonstrating abilities to understand research literature, communicate orally and in writing, and formulate a detailed research plan. These milestones include an oral qualifying examination, a portfolio review for admission to candidacy, and a dissertation proposal defense, culminating in a dissertation defense.

For more information, visit the Doctoral Program Guide on our website.