

University of Washington

Computer Science Graduate Program 2001-02

The Department

The University of Washington is consistently ranked among the top ten programs in the nation. We are growing and diversifying: faculty additions in the past five years include Tom Anderson, Brian Curless, Chris Diorio, Alon Halevy, Pedro Domingos, Hal Perkins, David Wetherall, Barbara Mones, Henry Kautz, Zoran Popovic, Rimli Sengupta, Larry Arnstein, Emer Dooley, Dieter Fox, Steve Gribble, Raj Rao, Steve Seitz, Dan Suciu, Mark Oskin and Venkat Guruswami. Younger members of our faculty have received roughly 40 PYI/NYI/PFF/CAREER/PECASE/ONRYI/Sloan/Packard awards. Senior faculty have received roughly 30 Fulbright/Guggenheim/Professional Society Fellow awards. Recent graduates have received offers of employment from essentially every top academic department and industrial lab. The 150 Ph.D. students in our program enjoy many advantages, including:

An Active Research Environment. Special areas of expertise include:

Embedded Systems, VLSI Systems, and Reconfigurable Computing. The design, analysis, and construction of task-specific computing systems ranging from ubiquitous computing devices to reprogrammable hardware to biologically-inspired neural devices. Our approach is to develop new applications that require either new building blocks or a novel combination of existing elements. Applications have focused on learning systems, high-performance signal processing, and networked portable computing. Complementary work includes development of design tools required to specify, simulate, synthesize, and verify these complex systems.

Computer Architecture. We have developed and analyzed a processor architecture called simultaneous multithreading (SMT) that can issue multiple instructions from multiple threads each cycle; currently we are investigating the impact of SMT on operating systems design and its use for web workloads. A second thrust is the design and analysis of memory systems including hardware/software assists for prefetching and data reuse in multi-level cache organizations.



Networking. Networking research includes Enforceable Protocols that are robust against misbehavior, the ANTS active network toolkit and self-organizing overlays, the Detour project on informed Internet routing and transport, Web caching and peer-to-peer measurements, stream merging for media-on-demand, and the Gigabit-to-the-Desktop (G2D) consortium through which UW has captured various "Internet speed records." UW is the only university that is the sole operator of a regional GigaPoP Internet exchange, creating many unique opportunities.

Operating Systems and Distributed Systems. Distributed, parallel, and wide-area scalable systems are major thrusts of the systems group, with an emphasis on modern web-based, cluster-based, and pervasive systems. The Denali project is building lightweight virtual machines and VM monitors for isolating untrusted, dynamically uploaded code, including content generation code. Several projects involve the measurement and analysis of web, multimedia, and content-distribution traffic and access patterns to improve performance and motivate new architectures. The Portolano Expedition project is examining all aspects of "invisible/pervasive" computing, including the one-world project, which provides an OS platform for implementing pervasive applications.

Programming Systems. Integrated language and compiler efforts include object-oriented programming (Cecil and Vortex) and parallel programming (ZPL). Additional compiler efforts include run-time optimization and code generation (DyC) and compilation for simultaneous multithreaded architectures (SMT).

Database Systems, Intelligent Data Management, and Information Retrieval. The emphasis is on advanced systems for data management and information integration. Research includes work on searching the Internet, data mining, web-data management, adaptive query processing, semi-structured data/XML, peer-based data management, integration of heterogeneous database systems, integration of genomic data sources, applications of materialized views, automatic construction of metadatabases of remote database servers, and intelligent Internet agents.

Software Engineering. Current activities include software evolution, empirical studies of software systems, software tools and environments, the integration of static and dynamic analysis, and economic-driven software engineering research. We also apply software engineering techniques to diverse domains including integrated land-use, transportation, and environmental models, as well as ubiquitous/invisible computing for scientific and consumer applications.



Computer Graphics, Computer Vision, and Animation. Photorealistic and non-photorealistic image synthesis, image-based modeling and rendering, curve and surface design, image editing and compositing, multiresolution methods, color reproduction, digital typography, physically-based modeling and animation, character animation, motion editing, content-based image retrieval, architectures for vision, model-based vision, 3D object reconstruction and recognition, use of image processing in mathematics education, and visual languages for interpersonal communication.

Human Interface to Computing. Current activities include agent-based interfaces, development of authoring methods for pedagogical agents, flexible constraint-based web page layout, ubiquitous/invisible computing for scientific and consumer applications, and full-body human interfaces for computer animation. A key focus is the use of machine learning and natural-language processing techniques to develop intelligent user interfaces.

Artificial Intelligence and Robotics. Areas of active research include machine learning & data mining, intelligent user interfaces, mobile robotics, computational neuroscience, natural language processing, vision, planning, and knowledge representation. Current projects include multi-robot collaboration, tractable reasoning via satisfiability testing, discovery of patterns in massive databases, and much more.

Theory of Computation. Active research areas include computational biology, parallel and distributed computing, combinatorial optimization, competitive analysis, computational geometry, cryptographic protocols, probabilistic algorithms, lower bounds, and computational complexity. Interdisciplinary projects involve active collaboration with colleagues in Astronomy, Biochemistry, Electrical Engineering, Molecular Biotechnology and Genetics.

Computing and Biology. Cross-disciplinary research includes: *computational molecular biology*, focusing on algorithmic problems such as discovering regulatory motifs in DNA and protein sequences, inferring regulatory relationships among genes, and analyzing gene expression data; *computational neuroscience* and *neurally inspired computing*, focusing on models, algorithms, and silicon circuits for understanding how neurobiological systems perceive, act, learn, and "compute"; *implantable computers*, focusing on implanting standalone electronics into or onto animals (without injury to electronics or animals) to study the neural substrates of behavior; and *laboratory automation*, focusing on applying ubiquitous computing to capture and disseminate the entirety of the procedures and results of laboratory experiments.

State-of-the-Art Departmental Computing. Research computing for faculty, staff, and students is provided by more than 500 Unix- and Windows-based workstations located in offices and labs throughout the department. Research in specific areas (e.g., graphics) is supported by advanced dedicated equipment.

Outstanding Geographic and Cultural Advantages. Seattle, consistently acclaimed as one of the most livable cities in the nation, is a cosmopolitan city situated in the midst of the beauty and diversity of the Pacific Northwest. The University is located on Lake Washington, a few miles east of Puget Sound. The Cascade Mountains are one hour to the east; the Olympic Peninsula and Olympic Mountains are one hour to the west. Seattle is increasingly prominent as a national and international technology center in software, biotech, the health sciences, and other fields.

The Faculty

Richard Anderson, Professor (1986). B.A., 1981, Reed; Ph.D., 1985, Stanford. Educational technology, algorithms.

Tom Anderson, Professor (1997). A.B., 1983, Harvard; M.S., 1990, Ph.D., 1991, Washington. Internetworking, local and wide area distributed systems, operating systems, computer architecture.

Larry Arnstein, Research Assistant Professor (1999). B.S., 1985, Case Western Reserve; M.S., 1991, Ph.D., 1993, Carnegie Mellon University. Ubiquitous computing, bioinformatics, embedded systems design.

Jean-Loup Baer, Professor, Adjunct Professor of Electrical Engineering (1969). Diplomes d'Ingenieur, 1960, Doctorat 3e Cycle, 1963, Grenoble; Ph.D., 1968, UCLA. Computer architecture and performance evaluation.

Paul Beame, Professor (1987). B.S., 1981, M.S., 1982, Ph.D., 1987, Toronto. Computational complexity, proof complexity.

Brian Bershad, Associate Professor (1993). B.S., 1986, UC Berkeley; M.S., 1989, Ph.D., 1990, Washington. Operating systems, architecture, distributed systems, parallel systems.

Alan Borning, Professor, Adjunct Professor in the Information School (1980). B.S., 1971, Reed; M.S., 1974, Ph.D., 1979, Stanford. Human-computer interaction, constraint-based languages and systems, and integrated land use, transportation and environmental modeling.

Gaetano Borriello, Professor (1988). B.S., 1979, Polytechnic Institute of New York, Brooklyn; M.S., 1981, Stanford; Ph.D., 1988, UC Berkeley. Invisible and ubiquitous computing, embedded and networked systems, computer-aids for the design of the hardware and software of distributed systems.

Craig Chambers, Associate Professor (1991). S.B., 1986, MIT; Ph.D., 1992, Stanford. Programming language design, optimizing compilation, object-oriented systems.

Brian Curless, Assistant Professor (1998). B.S., 1988, UT-Austin; M.S., 1991, Ph.D., 1997, Stanford. Computer graphics, active machine vision.

Martin Dickey, Senior Lecturer (1996). B.A., 1969, Kent State; M.S., 1971, Kentucky; Ph.D., 1992, Arizona State. Computer science education, computational linguistics.

Chris Diorio, Associate Professor / Adjunct Associate Professor of Electrical Engineering (1997). B.A., 1983, Occidental College; M.S., 1984, California Institute of Technology; Ph.D., 1997, California Institute of Technology. Silicon learning chips, neural networks and learning algorithms, implantable microcontrollers for studying neural signaling in intact behaving animals.

Pedro Domingos, Assistant Professor (1999). Licenciatura, 1988, M.S., 1992, Instituto Superior Tecnico, Lisbon; M.S., 1994, Ph.D., 1997, UC Irvine. Artificial intelligence, machine learning, data mining.

Emer Dooley, Lecturer (2000). B.Sc., 1982, M. Eng., 1986 University of Limerick; MBA, 1992, Ph.D., 2000, Washington. Entrepreneurship and strategic management in high-tech industries, competitive dynamics and sustainable competitive advantage.

Carl Ebeling, Professor, Adjunct Professor of Electrical Engineering (1986). B.S., 1971, Wheaton College; M.S., 1976, Southern Illinois; Ph.D., 1986, Carnegie Mellon. VLSI architectures, configurable computing, computer-aided design.

Susan Eggers, Professor (1989). B.A., 1965, Connecticut College; Ph.D., 1989, UC Berkeley. Uniprocessor and parallel architectures and program behavior, back-end compiler optimizations, dynamic optimization.

Oren Etzioni, Associate Professor and Career Development Scholar (1991). B.A., 1986, Harvard; M.Sc., 1988, Ph.D., 1990, Carnegie Mellon. Artificial intelligence and information retrieval, natural language interfaces, software agents, web search.



Dieter Fox, Assistant Professor, Assistant Professor of Electrical Engineering (2000). B.S., 1990, M.S., 1993, Ph.D., 1998, University of Bonn, Germany. Artificial intelligence and mobile robotics, probabilistic state estimation, particle filters.

Steven Gribble, Assistant Professor (2000). B.Sc., 1995, University of British Columbia; M.S., 1997, Ph.D., 2000, UC Berkeley. Cluster computing, operating systems, Internet infrastructure and services, distributed computing, and mobile computing.

Venkatesan Guruswami, Assistant Professor (2002). B.Tech., 1997, Indian Institute of Technology, Madras; M.S., 1999, Ph.D., 2001, MIT. Coding theory, approximation algorithms, complexity theory.

Alon Halevy, Associate Professor (1998). B.Sc., 1988, Hebrew University, Jerusalem; Ph.D., 1993, Stanford. Database systems, artificial intelligence, data integration, peer-based data management, knowledge representation.

Anna R. Karlin, Professor (1996). B.Sc., 1981, Ph.D., 1987, Stanford. Online algorithms, probabilistic algorithms and probabilistic analysis.

Henry Kautz, Associate Professor (2000). B.A., 1978, Cornell; M.A., 1980, Johns Hopkins; M.S., 1982, Toronto; Ph.D., 1988, Rochester. Artificial intelligence, knowledge representation, decision-theoretic control of reasoning, theory and applications of satisfiability testing.

Richard Ladner, Professor (1971). B.S., 1965, St. Mary's College of California; Ph.D., 1971, UC Berkeley. Design and analysis of algorithms, data compression, network algorithms, cache performance, computational complexity, computers to aid disabled persons.

Edward D. Lazowska, Bill & Melinda Gates Chair (1977). A.B., 1972, Brown; M.Sc., 1974, Ph.D., 1977, Toronto. Computer systems: modeling and analysis, design and implementation, distributed and parallel systems.



Henry M. Levy, Microsoft Professor (1983). B.S., 1974, Carnegie Mellon; M.S., 1981, Washington. Operating systems, distributed and parallel systems, web systems and performance, computer architecture.

Barbara Mones, Senior Lecturer, Creative Director for Digital Animation, (1999). B.F.A., 1974, Michigan; M.F.A., 1979, Rhode Island School of Design; Cert. in Animation, 1986, Sheridan College. Computer graphics, character animation.

David Notkin, Boeing Professor (1984). Sc.B., 1977, Brown; Ph.D., 1984, Carnegie Mellon. Software engineering, software evolution, software tools and environments.

Mark Oskin, Assistant Professor (2001). B.S., 1996, Ph.D., 2001, UC Davis. Computer architecture, intelligent memory systems.

Hal Perkins, Senior Lecturer (1998). B.S., 1975, Arizona State; M.S., 1982, Cornell. Computer science education, programming languages and compilers.

Zoran Popovic, Assistant Professor (1999). B.S., 1991, Brown; M.S., 1993, Ph.D., 1999, Carnegie Mellon. Computer graphics, character animation, physically based modeling, simulation.

Rajesh Rao, Assistant Professor (2000). B.S., 1992, Angelo State; M.S., 1994, Ph.D., 1998, Rochester. Neural computing, machine vision and learning, robotics, computational neuroscience.

Walter L. Ruzzo, Professor (1977). B.S., 1968, California Institute of Technology; Ph.D., 1978, UC Berkeley. Computational biology.

David Salesin, Professor (1992). Sc.B., 1983, Brown; Ph.D., 1991, Stanford. Computer graphics.

Steven Seitz, Assistant Professor (2000). B.S., 1991, UC Berkeley; Ph.D., 1997, Wisconsin. Computer vision, computer graphics.

Rimli Sengupta, Research Assistant Professor (1999). B.Engg., 1987, Jadavpur University, India; M.Tech., 1989, IIT-Kanpur, India; M.S., 1993, Ph.D., 1995, Georgia Institute of Technology. Computational complexity, computational biology.

Linda Shapiro, Professor, Professor of Electrical Engineering, Adjunct Professor of Biomedical and Health Informatics, (1986). B.S., Illinois, 1970; M.S., 1972, Ph.D., 1974, Iowa. Computer vision, multimedia information systems, medical informatics, pattern recognition and learning, robotics.

Lawrence Snyder, Professor (1983). B.A., 1968, Iowa; Ph.D., 1973, Carnegie Mellon. Parallel computation, especially hardware, languages and algorithmic issues, and computer fluency for beginners.

Dan Suciu, Assistant Professor (2000). B.S., 1982, Polytechnic Institute of Bucharest; M.S., 1991, University of Bucharest; Ph.D., 1995, University of Pennsylvania. Databases, XML.

Steven L. Tanimoto, Professor, Adjunct Professor of Electrical Engineering (1977). A.B., 1971, Harvard; M.S.E., 1973, M.A., 1974, Ph.D., 1975, Princeton. Visual languages, image analysis, computer graphics, artificial intelligence, educational technology.

Martin Tompa, Professor (1978). A.B., 1974, Harvard; M.Sc., 1975, Ph.D., 1978, Toronto. Computational complexity, computational biology.

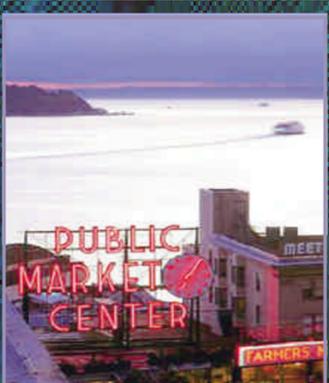
Dan Weld, Thomas J. Cable / Washington Research Foundation Professor (1988). B.S., 1982, Yale; M.S., 1984; Ph.D., 1988, MIT. Artificial Intelligence, intelligent user interfaces, software agents, planning, database and data integration.

David Wetherall, Assistant Professor (1999). B.E., 1989, University of Western Australia; M.S., 1994, Ph.D., 1998, MIT. Networks and distributed systems.

John Zahorjan, Professor (1980). Sc.B., 1975, Brown; M.Sc., 1976, Ph.D., 1980, Toronto. Computer systems, performance analysis; parallel programming models, scheduling, and runtime support.

Adjunct, Affiliate, and Emeritus Appointments

Dimitris Achlioptas, Microsoft Corporation
Les Atlas, Electrical Engineering
Amir Ben-Dor, Agilent Technologies
Josh Benaloh, Microsoft Corporation
Philip Bernstein, Microsoft Corporation
Karl Bohringer, Electrical Engineering
James Brinkley, Biological Structure
Surajit Chaudhuri, Microsoft Corporation
Michael Cohen, Microsoft Corporation
Steve Corbato, UCAID
Manuvir Das, Microsoft Corporation
David B. Dekker, Emeritus
Tony DeRose, Pixar
Tom Duchamp, Mathematics
Batya Friedman, Information School
Hellmut Golde, Emeritus
Terence Gray, UW Networks and Distributed Computing
Phillip P. Green, Molecular Biotechnology
Steven J. Hanks, Amazon.com
Scott Hauck, Electrical Engineering
Leroy E. Hood, Institute for Systems Biology
Earl Hunt, Psychology



Ronald A. Johnson, Information School and VP of UW Computing & Communications
Ira J. Kalet, Radiation Oncology
Ted Kehl, Emeritus
Yongmin Kim, Electrical Engineering and Bioengineering
Gary Kimura, Microsoft Corporation
Janusz Kowalik, Boeing Computer Services
Jim Larus, Microsoft Corporation
Paul Leach, Microsoft Corporation
John G. Lewis, Boeing Computer Services
Marina Meila, Statistics
Jerre D. Noe, Emeritus
Maynard V. Olson, Genetics, Molecular Biotechnology and Medicine
Venkata Padmanabhan, Microsoft Corporation
Eve Rinkat, Electrical Engineering
Benno Schwikowski, Institute for Systems Biology
Alan C. Shaw, Emeritus
Burton Smith, Cray Inc.
Werner Stuetz, Statistics
Rick Szaliski, Microsoft Corporation
Paul Young, Emeritus

Application and Information

For application forms and additional information on the Full-Time Ph.D./M.S. Degrees Program, write to the Graduate Program Advisor (grad-admissions@cs.washington.edu).

For the Professional Master's Program, contact the Master's Program Advisor (ms-admissions@cs.washington.edu).

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