Welcome to Computer Science and Engineering (CSE) at the University of California, Riverside!

Fostering groundbreaking research and producing graduates who are in demand, our department has established itself as a leader in the field of computer science and engineering. In recognition of the quality of our research and educational opportunities, the department has been highly ranked by the National Review Council, the Princeton Review, and *U.S. News & World Report*.

Our department offers a variety of degrees for undergraduates and graduates in computing-related areas. All degree programs combine the teaching of core principles with hands-on laboratory experience, preparing students for exciting careers in industry and academia. Students at all levels can enrich their educational experience by participating in sponsored research projects and professional student organizations like ACM or IEEE. The majority of our undergraduates go on to work in the computer industry at major companies like Google, Microsoft, or Facebook, while others get involved in start-ups, work for government agencies, or continue their education in graduate school. A number of our graduate students continue into careers in academia.

Our department’s 24 faculty are involved in cutting-edge research in the areas of computer architecture, compilers, embedded systems, algorithms, computational biology, databases, data mining, machine learning, computer networks, distributed processing, artificial intelligence, software engineering, and graphics. Attesting to the quality and impact of the research conducted in our laboratories are the prestigious awards won by our faculty, who include 3 ACM Fellows, five IEEE Fellows, five AAAS Fellows, and nine NSF CAREER awardees. Research projects in our department receive more than $10 million in funding per year from external sources, including federal agencies like NSF, NIH, and DARPA as well as high-tech companies like Google, HP, Intel, AT&T, and Samsung.

Nestled in the foothills of Box Springs Mountains, with its warm and dry climate, the campus offers beautiful scenery and year-round opportunities for outdoor activities. UCR students enjoy the benefits of a smaller campus, a relaxed atmosphere, personal attention and guidance, and opportunities for informal, one-on-one interaction with our faculty and staff. I invite you to learn more about the innovative research and learning taking place at CSE at UCR.

Marek Chrobak
Professor and Chair, CSE Department

The Bourns College of Engineering is the fastest-rising college of engineering in the UC System and ranks first among public schools of engineering of the same size (*U.S. News & World Report*, 2014). BCOE combines the intellectual and material resources of the UC system with a uniquely intimate research environment, facilitating frequent interaction between faculty and students.
The Computer Science and Engineering Department encourages breaking boundaries through integrated, interdisciplinary educational programs as well as innovative research with colleagues from other academic disciplines and in industry. The following are a few examples of our collaborations:

- Stefano Lonardi has teamed up with the International Barley Sequencing Consortium to develop a draft of the barley genome, a resource that will lead to greater crop yields and disease resistance as well as enhance the nutritional value of one of the world’s most important cereal crops.
- Victor Zordan and UCR Psychology professor Aaron Seitz have established the UCR Brain Game Center for mental fitness and well-being, where they work with a team of neuroscientists and computer scientists, game designers, and other researchers to create brain fitness games that have successfully improved a wide range of cognitive abilities in players. Zordan is also collaborating with researchers at MIT and Columbia on an NSF-sponsored project developing 3D printing technology for the digital design and fabrication of textiles.
- Christian Shelton is working with researchers at the Children’s Hospital Los Angeles, using machine learning to understand data from their pediatric intensive care unit. Among the results of this collaboration is their jointly-authored article, published in the journal Respiratory Care, on their development of algorithms for estimating blood gases in order to optimize the ventilator management of patients.

Labs and Facilities

The department is located in a state-of-the-art College of Engineering complex. Our facilities host both teaching and research laboratories supported by the department’s technical staff. The department maintains Microsoft Windows, Linux, Unix, and virtualized systems and servers. Remote access from home or while traveling is provided via access to Linux and Windows servers. Low latency and high bandwidth availability provided through redundant connections to Internet core backbones allow our students and faculty uninterrupted access to leading technology; labs are connected to the department’s 10 gigabit-speed network backbone. In addition, our labs have sophisticated equipment and high-performance computing platforms for research.

The department’s major research laboratories are:
- Algorithms and Computational Biology Lab
- Computer Architecture and Embedded Systems Lab (CARES)
- Cybersecurity Lab
- Database Lab
- Networks and Communications Lab
- Riverside Graphics Lab (RGL)
- Riverside Lab for Artificial Intelligence Research
- Riverside Programming Languages and Software Engineering (RIPLE)
- SPRUCE: Smartphone Research Lab
- SuperLab: Supercomputing Lab

Interdisciplinary Research

The Computer Science and Engineering Department encourages breaking boundaries through integrated, interdisciplinary educational programs as well as innovative research with colleagues from other academic disciplines and in industry. The following are a few examples of our collaborations:

- Stefano Lonardi has teamed up with the International Barley Sequencing Consortium to develop a draft of the barley genome, a resource that will lead to greater crop yields and disease resistance as well as enhance the nutritional value of one of the world’s most important cereal crops.
- Victor Zordan and UCR Psychology professor Aaron Seitz have established the UCR Brain Game Center for mental fitness and well-being, where they work with a team of neuroscientists and computer scientists, game designers, and other researchers to create brain fitness games that have successfully improved a wide range of cognitive abilities in players. Zordan is also collaborating with researchers at MIT and Columbia on an NSF-sponsored project developing 3D printing technology for the digital design and fabrication of textiles.
- Christian Shelton is working with researchers at the Children’s Hospital Los Angeles, using machine learning to understand data from their pediatric intensive care unit. Among the results of this collaboration is their jointly-authored article, published in the journal Respiratory Care, on their development of algorithms for estimating blood gases in order to optimize the ventilator management of patients.

Labs and Facilities

The department is located in a state-of-the-art College of Engineering complex. Our facilities host both teaching and research laboratories supported by the department’s technical staff. The department maintains Microsoft Windows, Linux, Unix, and virtualized systems and servers. Remote access from home or while traveling is provided via access to Linux and Windows servers. Low latency and high bandwidth availability provided through redundant connections to Internet core backbones allow our students and faculty uninterrupted access to leading technology; labs are connected to the department’s 10 gigabit-speed network backbone. In addition, our labs have sophisticated equipment and high-performance computing platforms for research.

The department’s major research laboratories are:
- Algorithms and Computational Biology Lab
- Computer Architecture and Embedded Systems Lab (CARES)
- Cybersecurity Lab
- Database Lab
- Networks and Communications Lab
- Riverside Graphics Lab (RGL)
- Riverside Lab for Artificial Intelligence Research
- Riverside Programming Languages and Software Engineering (RIPLE)
- SPRUCE: Smartphone Research Lab
- SuperLab: Supercomputing Lab

did you know…?

The National Research Council (NRC)’s recent ranking of PhD programs, widely accepted as the gold standard, places CSE in the top echelons of programs nationwide, ranking it highly for its research as well as overall program quality. For more information and to download the data, see the NRC website: http://sites.nationalacademies.org/pga/Resdoc/

Department Highlights

- CSE department researchers secured over $10 million in new funding for the year 2013-14 and beyond. Noteworthy among them are a USAID grant for $5 million sponsoring work by Stefano Lonardi (Co-PI) on breeding climate-resilient cowpeas, $3.7 million in funding from the Army Research Lab (APR) for work by Srikantan Krishnamurthy (PI) and Iulian Neamtu (Co-PI) on cybersecurity, and an NSF grant received by Laxmi Bhuyan (PI) for $500K for his project, “Efficient CPU-GPU Communication for Heterogeneous Architectures.”
- Michael Pazzani won the 2014 AAAI Classic Paper Award for his 1996 paper demonstrating how a user’s interests and web browsing behavior could be identified by a machine learning algorithm. Co-authored with Daniel Billsus and Jack Marumatsu, the paper was the first at the AAAI conferences to explore the now-ubiquitous feature of content-based personalization.
- Eamonn Keogh became the only individual to have received the Bill and Melinda Gates Foundation Grand Challenges Explorations Grant three times, having won most recently for his project on incentivizing healthy behaviors using a human computation game. He is also the most prolific author in the prestigious Data Mining and Knowledge Discovery, with 12 papers published in the journal.
- Christian Shelton was awarded a DARPA sole-PI grant of $700K as part of the agency’s Probabilistic Programming for Advanced Machine Learning (PPAML) program for his project, “Inference for Continuous-Time Probabilistic Programming.”
- The most recent faculty to be elected Fellows of premier worldwide organizations for computer science and engineering are Rajiv Gupta (ACM, AAAS), Walid Najjar (AAAS), and Srikantan Krishnamurthy (IEEE). We now have 3 ACM Fellows (Bhuyan, Gupta, Jiang), 5 IEEE Fellows (Bhuyan, Gupta, Krishnamurthy, Najjar, Ramakrishnan), and 5 AAAS Fellows (Bhuyan, Gupta, Jiang, Molle, Najjar) in the department.
- Philip Brisk received an NSF CAREER Award of $500K for his research to design automation software for microfluidic large-scale integration laboratories-on-a-chip. With the addition of this new awardee, we now have nine NSF CAREER awardees, one NSF Presidential Young Investigator and one AFOSR Young Investigator in the department.
- Vassilis Tsotras received two new NSF grants to continue his research on building a Big Data Management System (AsterisDB) in collaboration with UC Irvine researchers. One grant, for $250K, is for making AsterisDB ready for community usage. The other, for $715K, will fund his and co-PI Vagelis Hristidis’ efforts to enhance AsterisDB to become a Big Active Data system that can monitor petabytes of data and send notifications to millions of users.
- Many of our faculty and graduate students have won best paper awards at top conferences. Among them are Frank Vahid and recent Ph.D. graduate Alex Edgcomb, who co-authored a paper on the effectiveness of course materials used in online education that won the best paper award at the American Society for Engineering Education’s 2014 conference. In addition, a paper co-authored by Walid Najjar, Vassilis Tsotras and recent Ph.D. graduate Roger Moussalli and Marcos Vieira on FPGA-based acceleration of Complex Pattern Trajectory Queries received the best paper award at the 13th International Symposium on Spatial and Temporal Databases.
- Two CSE faculty have received the UCR Graduate Council and Graduate Division Doctoral Dissertation Advisor/Mentor Award: Rajiv Gupta and Eamonn Keogh.
- In the 2013-14 academic year, the CSE Distinguished Lecture Series welcomed notables such as Ian T. Foster (University of Chicago), Gary L. Miller (Carnegie Mellon), Leslie P. Kaelbling (Massachusetts Institute of Technology), Keshav Pingali (University of Texas at Austin), and Wen-mei W. Hwu (University of Illinois at Urbana-Champaign). Please visit our website for upcoming seminars.
Areas of Research

The department focuses on interrelated high-impact areas of research. It prides itself on its highly productive and visible faculty, many of whom serve on international journal editorial boards and national technology boards.

Algorithms, Bioinformatics

Design and analysis of algorithms • Approximation algorithms • Combinatorial optimization • Complexity • Computational molecular biology • Bioinformatics • Data compression • Data mining • Mathematical programming • Online algorithms

\[
d_{st} = \ln \prod_{i=1}^{n} \frac{1}{\cos^2(\theta_i)}
\]

Architecture, Compilers, Embedded Systems

Computer architecture • Embedded systems and software • Verification • Compilers • Network processors • Parallel architectures and computing

Cybersecurity

Internet, mobile, and system security • Security analysis on Internet and cellular networks • TCP/IP security • Android security • Side channel attacks and defenses • Vulnerability discovery and assessment

Adjunct Faculty

Gianfranco Ciardo, Professor
Ph.D. (Computer Science) Duke University

Michalis Faloutsos, Professor
Ph.D. (Computer Science) University of Toronto

Harsha Madhyastha, Assistant Professor
Ph.D. (Computer Science) University of Washington

www.cs.ucr.edu/people/faculty/
Databases, Data Mining, AI
Big data • Spatial and temporal databases • Indexing • Semistructured data management • Knowledge discovery • Text mining • Search • Machine learning • Reasoning under uncertainty • Decision making • Time series analysis

Evangelos Christidis  Chinya Ravishankar
Eamonn Keogh  Christian Shelton
Michael Pazzani  Vassilis Tsotras

High-Performance Computing, Graphics
Scientific computing • Computational fluid mechanics • Numerical algorithms and software • Large-scale computer simulations • Parallel and distributed computing • Multiprocessor scheduling • Compilers and architectures for high-performance systems • Power-aware algorithms and software • Grid and cloud computing • Graphics modeling and techniques • Computer animation programming

Laxmi Bhuyan   Walid Najjar
Zizhong Chen   Tamar Shinar
Rajiv Gupta   Victor Zordan

Programming Languages and Software Engineering
Programming and compiler support for parallel systems • Software tools for profiling, slicing, and debugging • Static and dynamic analysis • Type systems • Dynamic software updating • Software evolution • Smartphone analysis and testing

Rajiv Gupta  Iulian Neamtiu

Systems, Networks
Internet technologies • Broadband networks • Theoretical foundations of networking • Wireless cellular networks • Ad hoc and sensor networks • Satellite networks • Queuing theory and performance evaluation • Protocol design • Router design • Experimentation of wired and wireless networks • Operating systems • Distributed systems

Laxmi Bhuyan  Srikanth Krishnamurthy  Mart Molle
Chinya Ravishankar
Undergraduate Programs

Our B.S. in Computer Science program has been accredited by the Computing Accreditation Commission of ABET and our B.S. in Computer Engineering program has been accredited by the Engineering Accreditation Commission of ABET (http://www.abet.org).

Undergraduate students receive personal attention throughout their careers and are continually offered numerous resources such as academic assistance, study and time management workshops, career guidance, and professional development opportunities. Incoming students are enrolled in an Engineering First-Year Learning Community, in which they are matched with a cohort of peers and take the same math, engineering and science courses together to foster their academic and career development and provide them with support networks. Our unique Professional Development Milestones program helps students stay on track as they move toward careers or graduate school by charting their progress and encouraging planning. Undergraduate research, a hallmark of the Bourns College of Engineering, allows students to work with faculty on cutting-edge research projects. Three of the College’s research centers, CE-CERT, CRIS, and CNSE, also employ students in working labs, bringing to life subjects discussed in classes.

UCR student chapters of professional engineering organizations related to CSE include:

- Association for Computing Machinery (ACM)
- American Indian Science & Engineering Society (AISES)
- Biomedical Engineering Society (BMES)
- Computer Science Graduate Student Association (Comp. Sci. GSA)
- Institute of Electrical and Electronics Engineers (IEEE)
- Linux Users Group
- National Society of Black Engineers (NSBE)
- Optical Society of America
- Society of Hispanic Professional Engineers (SHPE)
- Society of Women Engineers (SWE)
- Tau Beta Pi Honor Society

The Project in Computer Science, required for graduation, gives undergraduates a workplace experience to encourage creativity and stimulate analytical skills and mastery of synthesizing principles as well as techniques from engineering, mathematics, engineering planning, and project management.
Our recent graduates have found careers at companies including Google, Cisco, Facebook, Yahoo!, Hewlett-Packard, IBM, Intel, Microsoft, Oracle, Samsung, Amazon, and eBay, and faculty positions at UC Irvine, the University of Massachusetts, Boston University, George Mason University, the University of Florida, the University of Arizona, the University of New Mexico, and Northeastern University. Some of our Ph.D. graduates have already received NSF CAREER awards. See our website for a list of our graduate student placement.

Graduate Programs

We are a young graduate program offering research and educational opportunities with an established tradition of close collegial relations between graduate students and faculty that is rare at other universities. We graduated our first Ph.D. student in 1998 and are now graduating more than 20 Ph.D. students annually.

The CSE graduate program emphasizes the following areas:

- Algorithms, Bioinformatics, and Theory of Computation
- Artificial Intelligence and Machine Learning
- Compilers, Programming Languages, and Software Engineering
- Computer Architecture, Embedded Systems, and CAD
- Computer Networks and Distributed Systems
- Databases, Data Mining, and Information Retrieval
- High Performance and Parallel Computing
- Reconfigurable Computing
- Smartphones Research
- Cyber Security

Graduate students in CSE are able to perform innovative research in various projects within the college and campus because of our collaborative faculty and labs. Our faculty's extensive collaborations with industry result in many summer internships for our graduate students, which lead to successful industry positions after graduating.
UC Riverside is a scenic, 1200-acre campus located between Los Angeles, Palm Springs, and San Diego. Riverside is uniquely situated so that the Ontario International Airport, desert resorts, snow-capped mountains, the Pacific Ocean, and Southern California attractions are within driving distance. The city is well-known for its Mediterranean climate, affordable housing and the landmark Mission Inn. Riverside has evolved into a hub of higher education, technology, commerce, law, finance, and cultural attractions, including a symphony orchestra, a ballet company, and a variety of museums.

Board of Advisors
This group of senior executives with backgrounds related to the Department’s areas of emphasis meets annually to provide industry perspectives on our activities and programs. Throughout the year, its members offer support ranging from advocacy to facilitating job and internship placements for our students. For a complete list of our Board of Advisors, please visit www.cs.ucr.edu/.