UCLA

Computer Science Department

Annual Report

2011 – 2012

Mission Statement

The Computer Science Department strives for excellence in creating, applying, and imparting knowledge in computer science and engineering through comprehensive educational programs, research in collaboration with industry and government, dissemination through scholarly publications, and service to professional societies, the community, the state, and the nation.

UCLA Computer Department 2011-12 Annual Report
Editor: Janice Wheeler, UCLA / Production Coordinator: Cassandra Franklin, UCLA
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Table of Contents

Department Statics: Fall 2011

Faculty and Staff

Ladder Faculty	29
Joint Faculty	6
Emeriti Faculty	16
Adjunct Faculty	8
Department Staff	15

Bachelor's

Applicants	2803
Admits	620
Enrolled	174
BS Degrees Awarded	122
BS Students Enrolled	618

Master's

Applicants	607
Admits	149
Enrolled	64
MS Degrees Awarded	86
MS Students Enrolled	152

Doctorate

Applicants	396
Admits	67
Enrolled	24
PhD Degrees Awarded	43
PhD Students Enrolled	219

Applicants = number of applicants for Fall 2011 • **Admits** = number of applicants offered admission for Fall 2011 • **Enrolled** = number of applicants newly enrolled for Fall 2011 • **Degrees Awarded** = number awarded during academic year 2010-2011 • **Students Enrolled** = number enrolled during academic year 2010-2011

Message From the Chair

Life is like riding a bicycle.
To keep your balance you must keep moving.

— Albert Einstein

In the Computer Science Department we are striving to maintain and expand our research efforts across many areas and to give our students the best possible education. In 2010 the National Research Council placed our department 9th in the nation's rankings, and I am confident that we will continue this excellence in the coming years. I am proud of our department's accomplishments and equally proud of the faculty, staff, and students who made it all happen.

Our five centers within the department have continued to flourish with new and exciting ideas and research directions—several with a focus on integrating computer science technology with education and patient care. CENS, partnered with UCLA's Center X, LA's Unified School District, and the Computer Science Teachers Association, is overseeing the Mobilize project, a five-year, $12M program funded by NSF to foster innovation and inventiveness, and to guarantee quality and rigorous education for all students. The Wireless Heath Institute, partnered with four other UC schools and with Cedars-Sinai Medical Center, is using a three-year $9.9M grant from the U.S. Department of Health and Human Services to improve the quality of patient care, while also reducing cost.

The university's technology transfer thrust is growing, and the Computer Science Department continues to foster faculty participation in start-up ventures. AutoESL, a start-up founded in 2006 by department faculty and staff, was recently acquired by an industry leader in digital programmable logic devices. MediSens is another start-up venture that evolved from our work in using computer science tools for medical applications. Currently, MediSens products are in clinical trials and are expected to be in commercial use soon.

Our faculty continues to be strong—both in research and in teaching. This strength is illustrated by the numerous awards and honors received by our faculty every year. In the 2010-2011 time frame, the awards and honors included IEEE and ACM achievement awards, honorary doctorates, the Dan David Prize, an NSF CAREER Award, the Rumelhart Prize, influential paper awards, and many others. Adding to the strength of our faculty are two new faculty members—Alexander Sherstov (computer science theory) and David Heckerman (computational systems biology).

We have experienced solid expenditure levels ($18.2M) during 2010-2011 and steady student enrollment and graduation rates. During the 2010-2011 academic year, the department had enrollments of 618 BS, 152 MS and 219 PhD students. In that same time frame, we graduated 122 BS, 86 MS and 43 PhD students. Companies pursue our students well before graduation and multiple job offers are common. The balanced education across many areas of computer science will be our students' foundation for life-long learning and for contributing to society.

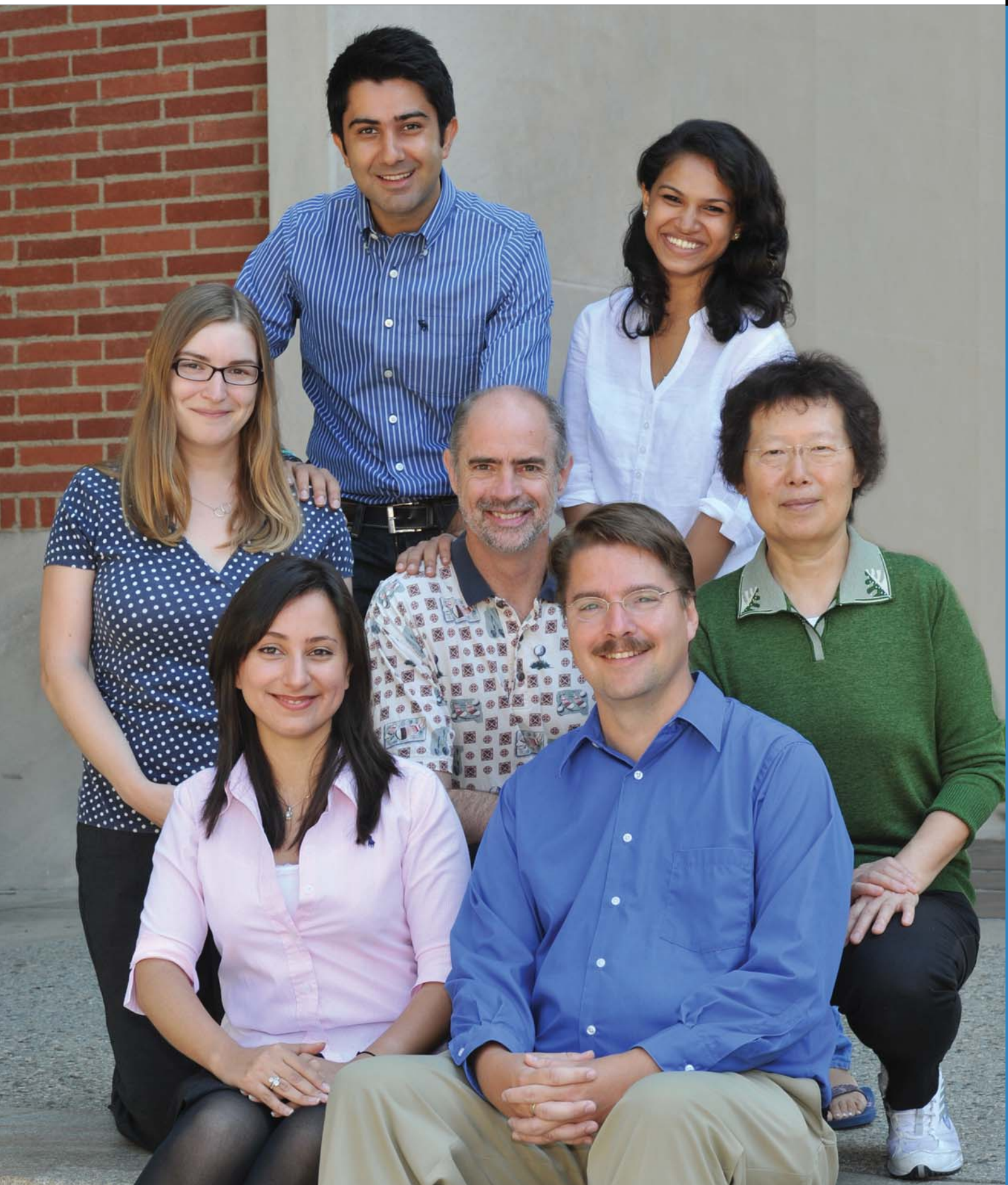
Thank you all for a tremendous year.

Jens Palsberg

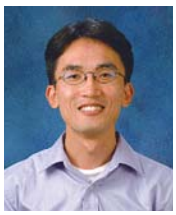
Chair, Computer Science Department

October, 2011

Top: Graduate students Mahdi Eslamimehr and Siji Rachel Tom
Middle: Faculty Jennifer Wortman Vaughan, Richard Korf, and Lixia Zhang
Bottom: Graduate student Mahsan Rofouei and CSD Chair Jens Palsberg



Faculty Awards: 2010 – 2011



Junghoo (John) Cho

Ten-Year Best Paper Award (2010) from the International Conference on Very Large Data Bases for the 2000 paper, *Evolution of the Web and Implications for an Incremental Crawler* (coauthorized with Hector Garcia-Molina).

John joined the Computer Science Department after receiving his Ph.D. from Stanford University in 2002. He has received an NSF CAREER Award, an Okawa Research Award and teaching awards from IBM and Northrup Grumman.

Jason Cong

IEEE Circuits and System Society Technical Achievement Award (2010) for seminal contributions to electronic design automation, especially in FPGA synthesis, VLSI interconnect optimization, and physical design automation.

ACM/IEEE A. Richard Newton Technical Impact Award in Electronic Design Automation (2011) for pioneering work on technology mapping for FPGAs as evidenced by the 1994 paper, *FlowMap: An Optimal Technology Mapping Algorithm for Delay Optimization in Lookup-Table Based FPGA Designs* (coauthored with Eugene Ding).

Jason has been with the Computer Science Department since 1990. He is a Chancellor's Professor, co-director of the VLSI/CAD Lab, director of the Center for Domain-Specific Computing, and is a Fellow of ACM and IEEE.

Deborah Estrin

Focused Research Award (2010) from Google for leading efforts to develop mobile phones into powerful data collection devices for public health and environmental monitoring.

Deborah joined UCLA in 2000 after 14 years with the faculty of USC. She has a joint appointment with the EE Department, holds the John Postel Chair in Computer Networks, and is the founding director of the Center for Embedded Networked Sensing. Deborah is a Fellow of AAAS, ACM and IEEE.

Mario Gerla

MILCOM Technical Achievement Award (2011) in recognition of outstanding contributions to military communications.

Mario has been a department faculty member since 1977. He is the recipient of an Okawa award, a Northrup Grumman Award, and is an IEEE Fellow.

Alan Kay

Doctor Honoris Causal (honorary doctorate 2010) from the University of Murcia, Spain, for contributions to the development of the personal computer and object-oriented programming.

Alan has been teaching at UCLA for 17 years while also continuing to be involved in commercial technology endeavors. He is the creator of the Smalltalk programming language—the technical basis of the McIntosh and subsequent Windows-based systems. Alan has received the Charles Stark Draper Prize and the Turing Award, and is a Fellow of ACM, AAAS, NAE and RSA.

Leonard Kleinrock

Doctor Scientiarum Honoris Causa (honorary doctorate of science 2010) from the Technion-Israel Institute of Technology for seminal work on Internet communication and contributions to the mathematical theory of modern data networks.

Dan David Prize (2010) for seminal research contributions in communications networks, establishing the fundamental principles upon which many of the most important aspects of information communication and the Internet are based.

E. Leonard Arnoff Memorial Lecture (2011) on *A Brief History of the Internet and Its Dynamic Future*, sponsored by the University of Cincinnati's College of Business.

Len has been with the department since 1963. It was here that he and his research team played a key role in the creation and development of the Internet. He is now a Distinguished Professor with numerous awards that include the 2008 National Medal of Science presented by President George W. Bush, the Okawa Prize, and the NAE Charles Stark Draper Prize. He is an INFORMS, ACM, IEEE, and IEC Fellow.

Rupak Majumdar

Sloan Research Fellowship (2010) for work on formal verification techniques.

Rupak joined the Computer Science Department in 2003 after earning his Ph.D. from UC Berkeley. He also serves as a scientific director at the Max Planck Institute for Software Systems, and is the recipient of an NSF CAREER Award.

Todd Millstein and Rupak Majumdar

ACM SIGPLAN Most Influential PLDI Paper Award (2011) for the 2001 paper, *Automatic Predicate Abstraction of C Programs* (coauthored with Thomas Ball and Sriram Rajamani of Microsoft).

Todd received his Ph.D. from the University of Washington where he was a member of the Cecil group—a research cluster that focused primarily on constructing practical programming systems (languages, implementations and environments). He joined the Computer Science Department in 2004.

Judea Pearl

Rumelhart Prize (2010) from the Cognitive Science Society for making a significant and contemporary contribution to the theoretical foundations of human cognition.

Celebrating a Lifetime of Work in Artificial Intelligence Symposium (2010) honoring Pearl for his influential contributions to artificial intelligence and related sciences. A book of tributes entitled *Heuristic, Probability and Causality: A Tribute to Judea Pearl* has been published by College Publications.

Invitation from the Institute of Mathematical Statistics (2011) to present the *Medallion Lecture* on statistics and probability at the Annual IMS Joint Statistical Meeting in 2013.

Induction into the Artificial Intelligence Hall of Fame (2011) from IEEE Intelligent Systems for seminal contributions to the field of artificial intelligence (one of ten AI pioneers selected).

Judea joined UCLA in 1970 and is currently the director of the Cognitive Systems Laboratory. He is the recipient of numerous awards that include the AI Research Excellence Award, the Allen Newell Award, and the Benjamin Franklin Medal. Judea is a NAE member and an AAAI and IEEE Fellow.

Amit Sahai

Rethinking Encryption Award (2010) from Google for leading the development of new notions of encryption to provide security and usability suitable for cloud computing and general networked environments.

Amit joined the Computer Science Department after four years as a member of the faculty at Princeton University. He has received numerous awards that include an Okawa Research Award and a Google Faculty Research Award. Amit is also an Alfred P. Sloan Foundation Research Fellow.

Demetri Terzopoulos

Keck Futures Initiative Award (2011) from the National Academies for research on *A Multilinear (Tensor) Algebraic Framework for Multifactor Manifold Learning With Applications to Image Science,* jointly with M. Alex O. Vasilescu.

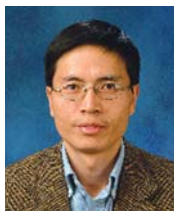
Prior to joining UCLA in 2005, Demetri served on the CS, EE and Math faculties at New York University and the University of Toronto. He currently holds the title of Chancellor's Professor. Among his many awards are a Guggenheim Fellowship and a 2005 Academy Award for Technical Achievement from the Academy of Motion Picture Arts & Sciences. He is a Fellow of ACM, IEEE, and the Royal Society of Canada.

Jennifer Wortman Vaughan

CAREER Award (2010) from the National Science Foundation for research on *Learning- and Incentives-Based Techniques for Aggregating Community-Generated Data.*

Symantec Term Chair in Computer Science (2011) for research in the realm of artificial intelligence that is at the forefront of computer science.

Jennifer received her Ph.D. from the University of Pennsylvania in 2009. She joined the department in 2010 after spending a year as a Computing Innovation Fellow at Harvard University.



Song-Chun Zhu

Election to IEEE Fellow (2010) for contributions to statistical modeling, learning and inference in computer vision.

Song-Chun joined UCLA in 2002 with joint appointments in the Department of Statistics and the Computer Science Department. He is the director of the UCLA Center for Image and Vision Science (a collaboration between the Statistics, Computer Science, and Psychology departments). Song-Chun has received the J. K. Aggarwal Prize, the Marr Prize, ONR's Young Investigator Award, NSF's CAREER Award, and a Sloan Fellowship.

Center for Autonomous Intelligent Networks and Systems (CAINS)

Lead Sponsors
Office of Naval Research (ONR), National Science Foundation (NSF)

Director
Mario Gerla

Scientific Board
(UCLA) Rajive Bagrodia, Babak Daneshrad, Leonard Kleinrock, Izhak Rubin, Mani Srivstava, John Villasenor
(ONR) Clifford Anderson

http://www.cains.cs.ucla.edu

The **Center for Autonomous Intelligent Networks and Systems (CAINS)** was established in 2001 with six laboratories in the Computer Science and Electrical Engineering departments of UCLA's Henry Samueli School of Engineering and Applied Science.

The Center's mission is to serve as a forum for intelligent agent researchers and visionaries from academia, industry, and government, with an interdisciplinary focus on such fields as engineering, medicine, biology and the social sciences. Information and technology will be exchanged through symposia, seminars, short courses, and through collaboration in joint research projects sponsored by the government and industry.

Many research projects are underway—for example, the use of unmanned autonomous vehicles (UAVs) to communicate and behave as intelligent clusters in the air or under water, the coordination of vehicles into storage and computing clouds, and the integration of body sensors and smart phones into the Health Guardian System. Our current research includes work in the following areas:

- Personal and body networks
- Cognitive radios
- Ad hoc multi-hop networking
- Vehicular networks
- Dynamic unmanned backbone
- Mobile sensor platforms
- Systolic OFDM radios
- Adaptive transceivers

Vehicular networks

Collaborations

Biology-inspired systems (USC, Caltech)
Learning systems (SRI)
Autonomous agent-based systems (Univ. Trento, Italy)
Vehicular clouds (CISCO)
Mesh networks (Politecnico di Milano, Italy)
UAV navigation system (UCB, MIT, ACR)
Mobile sensor platforms (Istituto Boella, Torino)
Large-scale disruption-tolerant wireless networks (Boeing)
Vehicular communications research (Toyota)
Health networks (Politecnico di Milano, Italy)

Center for Embedded Networked Sensing (CENS)

Lead Sponsor
National Science Foundation (NSF)

Director
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Deputy Director
Greg Pottie (56-174G Engineering IV, UCLA) (pottie@ee.ucla.edu)

Administrative Director
Jeffrey Goldman (3563 Boelter Hall, UCLA) (jgoldman@cens.ucla.edu)

http://research.cens.ucla.edu/

UCLA's **Center for Embedded Networked Sensing (CENS)** is a major research enterprise focused on developing wireless sensing systems and applying this revolutionary technology to critical scientific and societal pursuits. In the same way that the development of the Internet transformed our ability to communicate, the ever-decreasing size and cost of computing components is setting the stage for detection, processing, and communication technology to be embedded throughout the physical world, thereby fostering both a deeper understanding of the natural and built environment and, ultimately, enhancing our ability to design and control these complex systems.

By investigating fundamental properties of embedded networked sensing systems, developing new technologies, and exploring novel scientific and educational applications, CENS is a world leader in unleashing the tremendous potential these systems hold.

Established in 2002 as a National Science Foundation Science and Technology Center, CENS is a partnership between UCLA, UC Riverside, UC Merced, USC, and Caltech. The Center's current research portfolio encompasses projects across nine technology and applications areas, including the following examples:

- Developing cameras and image analysis approaches that assist scientists in making biological observations. Together, the camera and analysis systems comprise a new type of biosensor that takes measurements otherwise unobservable to humans.
- Harnessing the technological power of mobile phones and the ubiquitous wireless infrastructure for applications in areas as diverse as public health, environmental protection, urban planning, and cultural expression, each of which is influenced by independent personal behaviors adding up in space and time.

Harnessing the technical power of cell phones in a coastal environment

Center for Information & Computation Security (CICS)

Director
Rafail Ostrovsky (rafail@cs.ucla.edu)

Associate Director
Amit Sahai (sahai@cs.ucla.edu)

http://www.cs.ucla.edu/security

Securing the Internet

The **Center for Information & Computation Security (CICS)** was founded in UCLA's Henry Samueli School of Engineering and Applied Science in the fall of 2003 under the directorship of Professor Rafail Ostrovsky. In 2004 Professor Amit Sahai joined the leadership team to serve as associate director. Headquartered within the Computer Science Department, the Center's mission is to promote all aspects of research and education in cryptography and computer security. Since its inception, the Center has raised significant amounts of federal, state and private sector funding, including international collaboration with Israel through multiple BSF grants. It has also attracted multiple international visiting scholars.

The Center explores novel techniques for securing both national and private-sector information infrastructures across various network-based and wireless platforms, as well as wide-area networks. The Center also explores applications of cryptography to other areas, such as bioinformatics and cyber-physical systems. The inherent challenge is to provide guarantees of privacy and survivability under malicious and coordinated adversarial attacks in various settings. Meeting this challenge is especially complex because solutions must achieve several conflicting goals. While making applications more accessible, ubiquitous, and widespread, any solution must also be resilient against a wide range of both internal and external coordinated attacks, simultaneously providing strong privacy and security guarantees to both individuals and organizations. The Center's research directions include the exploration and development of the following:

- State-of-the-art cryptographic algorithms, definitions, and proofs of security.
- Novel cryptographic applications, such as new electronic voting protocols and identification, encryption, and data-rights management schemes; privacy-preserving data mining, searching on encrypted data, and searching with privacy.
- Security mechanisms underlying a "clean-slate" design for a next-generation secure Internet.
- Novel biometric-based models and tools, such as encryption and identification schemes based on fingerprint scans.
- The interplay of cryptography and security with other fields, including bioinformatics, cyber-physical systems, algorithms, complexity theory, networks, communication complexity, machine learning, compiler and language design, operating systems, hardware design, and distributed computing.

UCLA Wireless Health Institute (WHI)

Directors
Bruce Dobkin (Medicine)
William Kaiser (EE)
Majid Sarrafzadeh (CS)

http://www.wirelesshealth.ucla.edu/

The **Wireless Health Institute (WHI)**, established in 2008, comprises a community of UCLA experts and innovators from a variety of disciplines—including engineering, medicine, nursing, pharmacology and public health—who are dedicated to improving the timeliness and reach of health care through the development and application of wireless, network-enabled technologies integrated with current and next-generation medical enterprise computing.

Selected Projects

WANDA: WANDA (Weight and Activity with Blood Pressure Monitoring System) is a remote patient monitoring system. Congestive heart failure (CHF) is a leading cause of death in the United States, with approximately 670,000 afflicted Americans. Wireless health technologies, including pervasive sensors and wireless communications, can potentially help CHF patients through daily monitoring, along with guidance and feedback. Patients who have cardiovascular system disorders can measure their weight, blood pressure, activity, and other health-related measurements by using wireless health applications whenever and wherever there is a need. This remote real-time monitoring system is being clinical trialed with1500 CHF patients.

mDiabetes: mDiabetes is a remote diabetes patient monitoring system that facilitates wireless sensors, communication technologies and electronic health records. 8.3% of the total population in the United States has diabetes, resulting in expenditures of $174 billion each year. Patients with diabetes suffer from many complications—blindness, hypoglycemia, infection, etc. The developed system provides patient monitoring applications for archiving and reviewing sensor data and hospital records with texting support. The mDiabetes system performs data backup/recovery, caregiver alerts, and data export/analysis. It is being clinical trialed at the UCLA Medical Center.

Realistic Gaming: Realistic Gaming helps to promote health and physical activity. Obesity is a growing concern in this country, as it is in much of the world. As the general population continues its ever-increasing sedentary behavior, a push has been made to monitor and enforce physical activity. Realistic Gaming uses body-wearable sensors to identify numerous sports-related activities. This system calculates the health benefits of continual repetitions of activities and monitors a person's effectiveness when engaged in such an activity. This same system can also be adapted to allow use of the human body itself as a controller.

SEM Scanner: The SEM Scanner measures subepidermal moisture (SEM) in a patient's body. It is a means to detect and monitor the early symptoms of pressure ulcers. There is a 50% incidence of pressure ulcers for hospitalized patients, and the cost of treatment is high. We have developed a smart and compact, capacitive-sensing, hand-held wireless device with supporting software that provides a basis for early intervention. The software system also tracks user compliance to ensure quality of care.

Center for Domain-Specific Computing (CDSC)

Director

Jason Cong (Computer Science, UCLA)

Associate Director

Vivek Sarkar (Computer Science, Rice University)

Team Members

Denise Aberle & Alex Bui (Radiological Sciences, UCLA)

Richard Baraniuk (Electrical & Computer Engr., Rice Univ.)

M.C. Frank Chang (Electrical Engr., UCLA)

Tim Cheng (Electrical & Computer Engr., UCSB)

Aichi Chien (Geffin School of Medicine, UCLA)

Jens Palsberg, Miodrag Potkonjak, & Glenn Reinman (Computer Science, UCLA)

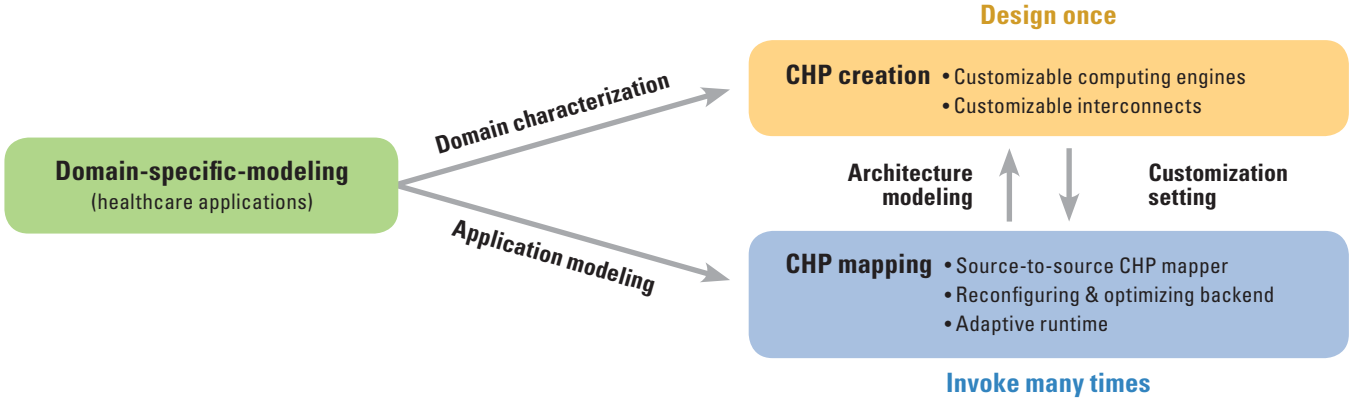
Saday Sadayappan (CS & Engr., Ohio State Univ.)

Luminita Vese (Mathematics, UCLA)

The **Center for Domain-Specific Computing (CDSC)** was funded in 2009 by NSF's Expeditions in Computing program to develop high-performance, energy-efficient, customizable computing that will revolutionize the way computers are used in health care and other important applications. The Center is a collaborative effort between the university's computer science, electrical engineering, mathematics, and radiological sciences departments, as well as the computer science and engineering departments of Rice University, UC Santa Barbara, and Ohio State University.

The objectives of the CDSC are to develop a general (and largely reusable) methodology for creating novel and highly efficient customizable architecture platforms and the associated compilation tools and runtime management environment to support domain-specific computing. CDSC's novel computing platform includes: 1) *a wide range of customizable computing elements*, from coarse-grain customizable cores to fine-grain field-programmable circuit fabrics; 2) *customizable and scalable high-performance interconnects* based on the RF-interconnect technologies; 3) *highly automated compilation tools and runtime management systems* to enable rapid development and deployment of domain-specific computing systems; and 4) *a general, reusable methodology* for replicating such success to different application domains.

For CDSC, a significant domain is healthcare — largely because healthcare has such a significant impact on issues of national economy and quality of life. Specifically, our focus is on medical imaging and hemodynamic modeling, and providing more cost-effective and convenient solutions for preventive, diagnostic and therapeutic procedures. The Center also integrates this research with education — exposing graduate, undergraduate and high school students to new concepts and research through several new courses and summer programs developed by researchers from all four universities. Special efforts are made to attract underrepresented students through partnerships with campus organizations focused on diversity.



Featured Faculty

A Former Student Returns to the Classroom

Carey Nachenberg, former student and a current leader in computer security technology, is one of those talented, multifaceted, oft-quoted individuals who we sometimes hear about and wish we knew—corporate vice president and fellow at Symantec Corporation (Norton antivirus and intrusion detection), holder of over 50 patents, philanthropist, a more than simply popular teacher here on campus (CS 31 and 32), and an avid rock climber. (Carey actually began climbing with other Bruins while still an undergraduate. Seventeen years later, the tradition is still strong—former students often join him for outdoor climbing at local haunts like Malibu Creek, Point Dume and Bishop... and he's always looking for new recruits.)

Carey, an Angelino from birth, attended UCLA from 1989 to 1995. During that time, he not only excelled as a student, but also became very active in his department, participating in engineering competitions and even setting up some of his own. He became a department scholar, which allowed him to receive both his undergraduate and master's degree concurrently.

During college Carey interned at Symantec, and after graduation became a full-time employee, working in both product development and research capacities, prototyping and developing many of the company's core security technologies, including the antivirus and intrusion detection technology at the heart of the company's Norton line of products. Carey now serves as the chief architect of Symantec's Security Technology and Response Division—the group responsible for delivering all of Symantec's core security technology and security content.

After many years as a popular lecturer for the Computer Science Department, Carey accepted a position as adjunct assistant professor in 2009. As a teacher, Carey is known for his unorthodox but rigorous teaching style. He likes to encourage (bribe?) students with Pop Tarts and other edible goodies, offers prizes to students who have the best final project, and also delivers highly-animated PowerPoint presentations to simplify the complex computer science theories covered in his courses. In addition to this, Carey is teaching without pay due to recent budget cuts, but probably more so because he simply loves the job. And clearly, his students love his classes. Student blogs say it all—and this is just a small sampling:

Do whatever you can to take Nachenberg... He's funny, good at communicating, has plenty of real insight...

He's the most down-to-earth teacher you'll ever meet at any university.

UCLA is incomplete without the Nachenberg experience.

And no description of Carey would be complete without including at least one of those funny and epiphany-like classroom quotes for which he is so famous:

I think that I shall never see
A data structure as lovely as a tree.

Inspiration Through Education

Mobilizing for Innovative Computer Science Teaching and Learning is a $12.5M National Science Foundation math/science partnership funded for 2010-2015. UCLA's Center for Embedded Networked Sensing (CENS), headed up by Professor Debra Estrin, is partnered with UCLA's Graduate School of Education and Information Studies (Center X), the Los Angeles Unified School District (LAUSD), and the Computer Science Teachers Association (CSTA).

Mobilize builds upon a high school student's enchantment, fascination, and engagement with mobile technology. At the heart of this project is the CENS Participatory Sensing System—an innovative method of data collection and analysis in which individuals use mobile phones to systematically collect and interpret data about issues important to them and their communities. The project will develop a hands-on, query-based curriculum along with professional development for teachers in computer science, mathematics, and science high school classes. Mobilize brings together computational thinking with our students' sense of civic involvement in their own communities.

The project is especially committed to ensuring access to innovative instruction in the Los Angeles Unified School District—especially those schools with high numbers of African American and Latino students. In LAUSD, interdisciplinary teams of students and teachers in computer science, mathematics, life and physical science, as well as social science, will participate in this project. As computer science is now an integral part of innovation across all fields, our goal is to strengthen computer science instruction throughout our educational system.

We are sitting at the crux of critical educational issues facing our country: How can we foster innovation and inventiveness, and how do we guarantee quality and rigorous education for all students? What we learn about increasing opportunities for query-based, rigorous learning of computer science and about innovative professional development for teachers, especially in large urban school districts, will be critically important for the entire country across multiple disciplines, communities, and institutions.

High school students using mobile phones as part of Mobilize project

A New Internet for Tomorrow's Users

Using the Internet for school projects

As part of the Future Internet Architecture (FIA) program, the National Science Foundation has awarded a three-year, $8M grant to UCLA (and collaborating universities) for support of the **Named Data Networking (NDN)** project. NDN was one of four projects funded under the FIA program, whose goal is to help develop new ideas and innovations toward the development of a more robust, secure and reliable Internet.

In UCLA's Computer Science Department, the NDN project is under the direction of Professor Lixia Zhang, whose experience with the design of the Internet is preeminent. Collaborating institutions are Colorado State University, Palo Alto Research Center, University of Arizona, University of Illinois/Urbana-Champaign, UC Irvine, University of Memphis, UC San Diego, Washington University and Yale University.

While the Internet has far exceeded expectations, it has also stretched initial assumptions, often creating problems that challenge its underlying communication model. Users and applications operate in terms of content, making it increasingly limiting and difficult to conform to the IP's requirement to communicate by discovering and specifying location. To carry the Internet into the future, a conceptually simple yet transformational architectural shift is required—and that is what NDN is all about.

NDN capitalizes on the strengths—and addresses the weaknesses—of the Internet's current host-based, point-to-point communication architecture in order to naturally accommodate emerging patterns of communication. The proposed architecture will move the Internet's communication paradigm from today's focus on "where" (i.e., addresses, servers, and hosts) to "what" (i.e., the content that users and applications care about).

The current Internet secures the data container. NDN will secure the contents, a design choice that decouples trust in data from trust in hosts, enabling several radically scalable communication mechanisms, such as automatic caching, to optimize bandwidth. The project studies the technical challenges that must be addressed to validate NDN as a future Internet architecture—routing scalability, fast forwarding, trust models, network security, content protection and privacy, and fundamental communication theory.

A More Secure Internet

In February 2011 the Computer Science Department received a $2.6M grant from DARPA/ONR to study the mathematical interplay between two-party and multi-party secure protocols, coding theory including probabilistically checkable proofs, and other cryptographic primitives. The effort, **Novel Foundations of Advanced Security (N-FAST)**, is headed up by Professor Rafail Ostrovsky, who is also the director of the department's Center for Information & Computational Security (CICS).

The N-FAST research will cover a broad array of theoretical approaches and intricate interplay between those approaches, with one unifying theme—that of achieving novel mathematical foundations that lead to revolutionary improvements in the efficiency of secure two-party computations, as well as dramatic improvements in the efficiency of zero-knowledge arguments (and witness-indistinguishable proofs), both in terms of communication and computation efficiency as well as levels of security achieved.

Professor Ostrovsky is a well-known leader in the world of cryptography and has gathered a team of highly qualified researchers for the N-FAST effort. The research team will work with security technologies that prove good behavior without violating privacy, including a win-win approach that builds efficient verification protocols. The impact of the research will be the establishment of novel mathematical structures and insights to bring about significant improvements in the mathematical foundations and future capabilities of national cyber security.

Cyber security for global-scale systems

Technology Teams Up With Patient Care

In October 2010, a UCLA-led consortium of five UC schools (Los Angeles, Davis, Irvine, San Diego, San Francisco) and the Cedars-Sinai Medical Center received a three-year $9.9M grant from the U.S. Department of Health and Human Services' Agency for Healthcare Research and Quality. The effort, **Variations in Care: Comparing Heart Failure Case Transition Intervention Effects**, will research the use of wireless and telephone care management to reduce hospital readmissions for heart failure patients.

Given that this research involves not just healthcare but technology, the project will take a "team science" approach among the six institutions and within UCLA. The UCLA team includes the Geffen School of Medicine (Dr. M. Ong, Dr. C. Mangione, Dr. J. Escarce, Dr. G. Fonarow); the School of Nursing (Prof. L. Evangelista); the School of Dentistry (Prof. H. Liu); and the Henry Samueli School of Engineering and Applied Science (Prof. Majid Sarrafzadeh, co-director of the Computer Science Department's Wireless Health Institute).

The project will examine the effect of two interventions: managing the transition from inpatient to outpatient care via telephone, and managing the transition from inpatient to outpatient care via wireless remote monitors and telephones. These two interventions will be compared to the standard care for heart failure patients. The goal is to improve quality and reduce cost of care and, most importantly, to identify approaches that are applicable in every community, not just in large academic centers.

Intervention for heart failure patients

Cultivating Innovation

Universities are seeking ways to commercialize their academic work with "technology transfer" programs, and in the process are creating new businesses, jobs and revenue streams. The success of UCLA's program is apparent by its growth—currently it is four times the level it was just five years ago.

C++ computer code

Auto ESL

AutoESL is one example of how research coming out of universities gives start-up companies the kind of technology that fosters a competitive edge and helps the U.S. economy grow. AutoESL was founded in 2006 by Professor Jason Cong and former PhD students Yiping Fan and Zhiru Zhang from the Computer Science Department. With a license to xPilot, a system-level synthesis software developed here with support from the National Science Foundation, Giga-Scale System Research Center, and Semiconductor Research Corporation, the company developed an automated synthesis tool from high-level design specification (in C/C++/SystemC languages) to produce cycle-accurate hardware designs that significantly reduce design time and in many cases also improve the quality of integrated circuit design. In less than five years AutoESL was acquired by Xilinx, a world-wide leader in programmable logic devices.

Computer technology and medicine team up

MediSens

MediSens is a start-up venture founded by Professor Majid Sarrafadeh of the Computer Science Department and several of his colleagues. MediSens is part of the California NanoSystems Institute (CNSI) incubator program which is located on UCLA's campus, giving entrepreneurs from start-up companies unparalleled access to the university's research community and business and law schools. MediSens is creating high-tech body monitoring systems to allow doctors to have access to round-the-clock information on a patient's status. These monitoring systems include, for example, a "smart shoe" that allows physicians to monitor a patient's balance, and the "smart bedsheet" that helps reduce the risk of bedsores among bedridden patients. The company's products are in clinical trials and on the verge of entering the marketplace.

New Faculty

David Heckerman

Adjunct Professor
Ph.D. 1990 and M.D. 1992 (Stanford University)

David Heckerman joined UCLA this year as an adjunct professor in the Computer Science Department. David obtained both his Ph.D. and M.D. in bioinformatics at Stanford University.

David's main theoretical interests have been in learning from data, especially using probabilistic graphical models. General applications of his work include data mining, intelligent systems, and causal discovery. His recent work has concentrated on applications of graphical models to problems in biology and medicine—such as the creation of a vaccine for HIV and the identification of genetic causes of disease.

David is currently the senior director of eScience at Microsoft Research, Los Angeles. He is the founder of Microsoft's Machine Learning and Applied Statistics Group, which he managed from 1996 to 2008. At Microsoft he co-created applications that include data-mining tools in the SQL Server and Commerce Server, junk-mail filters in Outlook Exchange and Hotmail, handwriting recognition in the Tablet PC, text-mining software in the Sharepoint Portal Server, troubleshooters in Windows, and the Answer Wizard in Office. His dissertation, *Probabilistic Similarity Networks*, received the ACM doctoral dissertation prize in 1990. David is an AAAI Fellow and a Distinguished Scientist at Microsoft Research. In his spare time, David enjoys biking, hiking, and playing music with his two teenage sons.

Alexander A. Sherstov

Assistant Professor
Ph.D. (University of Texas at Austin, 2009)

Alexander Sherstov joined UCLA this year as an assistant professor in the Computer Science Department. Alexander obtained his Ph.D. in computer science in 2009 at the University of Texas at Austin, followed by a two-year postdoctoral fellowship at Microsoft Research.

Alexander's research is in theoretical computer science and focuses on computational complexity theory, learning theory, and quantum computing. As a Ph.D. student at UT Austin, he won four best-student-paper awards at premier conferences in his research area. His Ph.D. thesis, *Lower Bounds in Communication Complexity and Learning Theory via Analytic Methods*, won the department's nomination for the ACM Doctoral Dissertation Competition. The proof techniques that he developed, notably in communication complexity theory, have been widely adopted by other researchers and have enabled considerable progress in this area.

Much of Alexander's work revolves around the notion of communication. Consider a function whose arguments are distributed among several parties, making it impossible for any one party to compute it in isolation. Communication complexity theory studies how many bits of communication are needed to evaluate the function. A trivial approach is for the parties to communicate their inputs to each other. While this costly solution is optimal in some cases, one can often accomplish the task with surprisingly little communication. To cite a famous example, one can determine, with an accuracy of 99%, whether two geographically separated databases are identical by communicating only eight bits, regardless of how large the databases actually are. Initiated three decades ago, communication complexity has evolved into a central area of theoretical computer science, with applications to computational complexity, computational learning, quantum computing, and more. Alexander's research will tackle major open problems in these areas through the study of communication.

In his spare time, Alexander enjoys running and hiking. He likes to travel to remote places and plans to visit the Kamchatka Peninsula in Russia's Far East within the next few years.

Artificial Intelligence

The computational study of intelligent behavior—including research in logical and probabilistic reasoning, causality, heuristic search and combinatorial optimization, natural language processing, neural networks, and artificial life.

Adnan Darwiche

Professor, Ph.D.
(Stanford 1993)

Probabilistic and logical reasoning and its applications, including diagnosis, planning, and system design and analysis.

Michael Dyer

Professor, Ph.D.
(Yale 1982)

Processing and acquisition of natural language through symbolic, connectionist and genetic algorithm techniques.

Richard Korf

Professor, Ph.D.
(Carnegie Mellon Univ. 1983)

Problem-solving, heuristic search, planning and parallel processing in artificial intelligence.

Judea Pearl

Emeritus Professor, Ph.D.
(Polytechnic Institute of Brooklyn 1965)

Artificial intelligence and knowledge representation, probabilistic and causal reasoning, nonstandard logics, and learning strategies.

Jennifer Wortman Vaughan

Assistant Professor, Ph.D.
(Univ. Pennsylvania 2009)

Machine learning, learning theory, incentive design, and social computing.

Photo: UCLA Photography

Computer System Architecture & CAD

The study of the structure and behavior of computer systems; development of new algorithms and computing structures to be implemented in hardware, firmware, and software; and development of tools to enable system designers to describe, model, fabricate, and test highly complex computer systems.

Jason (Jingsheng) Cong

Chancellor's Professor, Ph.D.
(UI at Urbana Champaign 1990)

Computer-aided design of VLSI circuits, computer architecture and reconfigurable systems, fault-tolerant designs of VLSI systems, design and analysis of algorithms.

Milos Ercegovac

Distinguished Professor, Ph.D.
(UI at Urbana Champaign 1975)

Computer arithmetic and hardware-oriented algorithms, design of digital and reconfigurable systems.

Ani Nahapetian

Adjunct Assistant Professor, Ph.D.
(UC Los Angeles 2007)

Hardware-based system security, mobile & wireless health systems, embedded systems, and algorithms for reconfigurable computing.

Miodrag Potkonjak

Professor, Ph.D.
(UC Berkeley 1991)

Complex distributed systems, including embedded systems, communication designs, computer-aided design, ad hoc sensor networks, comutational security, electronic commerce, and intellectual property protection.

Glenn Reinman

Associate Professor, Ph.D.
(UC San Diego 2001)

Processor architecture design and optimization, speculative execution, profile-guided optimizations, techniques to find and exploit instruction-level parallelism.

Majid Sarrafzadeh

Professor, Ph.D.
(UI at Urbana Champaign 1987)

Embedded and reconfigurable computing, VLSI CAD, and design and analysis of algorithms.

Yuval Tamir

Associate Professor, Ph.D.
(UC Berkeley 1985)

Computer systems, parallel and distributed systems, software systems, computer architecture, dependable systems, virtualization, cluster computing, multicore architectures, interconnection networks and switches, transactional memory.

Computational Systems Biology

An integrative approach to understanding biological systems, with research areas that span systems biology, bioinformatics, genomics, computational biology, and biomedical engineering.

Joseph DiStefano III

Distinguished Professor, Ph.D.
(UC Los Angeles 1966)
(Also Prof. of Medicine and Biomedical Engineering)

Integrative, data-driven systems biology and multi-level dynamic biosystems modeling. Focus on disease (cancer, HCV, diabetes, neuroendocrine) process dynamics and optimal therapies. Internet-based intelligent software for life sciences research.

Boris Kogan

Adjunct Professor, Ph.D.
(Moscow Institute of Automation and Telemechanics 1945)

Mathematical modeling and computer simulation of engineering and biological dynamic systems (particularly cardiac electrophysiology and processes) using parallel super computers.

Eleazar Eskin

Associate Professor, Ph.D.
(Columbia 2002)

Computational biology and bioinformatics, and specifically, analysis of human variation and its relation to complex disease.

D. Stott Parker

Professor, Ph.D.
(UI at Urbana Champaign 1978)

Knowledge-based modeling and databases, stream processing, logic programming, rewriting, and systems for constraint processing.

David Heckerman

Adjunct Professor, Ph.D., M.D.
(Stanford 1990 & 1992)

Application of graphical models to problems in biology and medicine, data mining, intelligent systems and causal discovery.

Zhuowen Tu

Assistant Professor, Ph.D.
(Ohio State Univ. 2002)

Statistical modeling/computing, computational biology, machine learning, and brain imaging. (Joint appointment with Department of Neurology)

Christopher Lee

Professor, Ph.D.
(Stanford 1993)

Information metrics for statistical inference, bioinformatics analysis of high throughput genomics data, graph databases for bioinformatics and genomics, scalability principles of scientific data sharing, integration and mining. (Joint appointment with Chemistry and Biochemistry Departments)

Graphics & Vision

The synthesis and analysis of images by computer. Graphics—rendering, motion capture, and geometric, physics-based and artificial life modeling/animation for the movie and game industries. Vision—texture, shape, motion and illumination, 3D reconstruction from images, object recognition, real-time vision/control for autonomous vehicles, visual sensor networks and surveillance, and medical image analysis.

Stanley Osher

Professor, Ph.D.
(New York Univ. 1966)

Image science, scientific computing, level set methods. (Joint appointment with Mathematics Department)

Alan Yuille

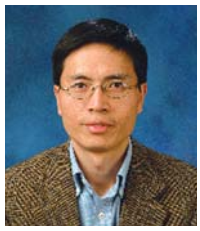
Professor, Ph.D.
(Cambridge 1976)

Computer vision, Bayesian statistics, and pattern recognition. (Joint appointment with Statistics and Psychology Departments)

Stefano Soatto

Professor, Ph.D.
(Caltech 1996)

Computer vision, non-linear estimation, control theory.



Song-Chun Zhu

Professor, Ph.D.
(Harvard 1996)

Computer vision, statistical modeling and computing, machine learning. (Joint appointment with Department of Statistics)

Demetri Terzopoulos

Chancellor's Professor, Ph.D.
(MIT 1984)

Computer graphics, computer vision, medical image analysis, computer-aided design, artificial intelligence/life.

Photo: UCLA Photography

Information & Data Management

The development of models, techniques and tools to improve the functionality, performance, and usability of database management and Web systems that provide enabling technology for our information society—including Web search engines, digital libraries, data mining, distributed databases, data stream management systems, and information systems for medicine and science.

Alfonso Cárdenas

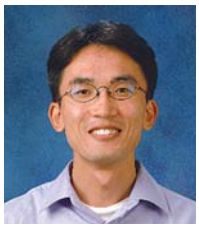
Professor, Ph.D.
(UC Los Angeles 1969)

Database management, distributed heterogeneous and multimedia (text, image/picture, voice) systems, information systems planning and development methodologies, medical informatics, legal and intellectual property issues, and software engineering.

Wesley Chu

Distinguished Professor Emeritus, Ph.D. (Stanford 1966)

Distributed processing and distributed database systems, and intelligent information systems.



Junghoo (John) Cho

Associate Professor, Ph.D.
(Stanford 2002)

Internet search engines, database systems, information management systems, and digital libraries. Development of new algorithms and techniques to manage large-scale data on the Internet.

Richard Muntz

Emeritus Professor, Ph.D.
(Princeton 1969)

Distributed and parallel database systems, temporal data models and query processing, knowledge discovery in database systems, and computer performance evaluation.

Photo: UCLA Photography

Carlo Zaniolo

Professor, Ph.D.
(UC Los Angeles 1976)

Knowledge-based systems, database systems, non-monotonic reasoning, spatio/temporal reasoning, and scientific databases.

Network Systems

The study and design of distributed and often mobile systems—including computers, vehicles, people, and sensors interconnected by a communications network—and also the applications that run on these systems and protocols that make the various network components work together and perform well; and to optimize performance, a study of the wired or wireless network itself.

Deborah Estrin

Professor, Ph.D.
(MIT 1985)

Wireless sensing systems, Internet architecture and protocols, with particular applications to environmental sensing applications.

Peter Reiher

Adjunct Professor, Ph.D.
(UC Los Angeles 1987)

Network security, operating system security, distributed systems, and file systems.

Mario Gerla

Professor, Ph.D.
(UC Los Angeles 1973)

Performance evaluation, design and control of distributed computer communication systems, and high-speed computer networks (B-ISDN and optical).

M. Y. "Medy" Sanadidi

Adjunct Professor, Ph.D.
(UC Los Angeles 1982)

Congestion control and adaptive multimedia streaming in heterogeneous networks; analytic modeling of computer and communications systems.

Leonard Kleinrock

Distinguished Professor Emeritus, Ph.D. (MIT 1963)

Queueing theory, networking (including packet switching, packet radio, local area (LAN), broadband, and peer-to-peer), nomadic computing and intelligent agents.

Mani B. Srivastava

Professor, Ph.D.
(UC Berkeley 1992)

Low-power and energy-aware embedded systems, wireless sensor and actuator networks, mobile and wireless computing and networking, pervasive computing. (Joint appointment with Electrical Engineering Department)

Songwu Lu

Associate Professor, Ph.D.
(UI at Urbana Champaign 1999)

Wireless networking, mobile computing, network security, sensor networks, network middleware.

Lixia Zhang

Professor, Ph.D.
(MIT 1989)

Internet architecture, principles in network protocol designs, security and resiliency in global scale systems.

Software Systems

A broad array of ongoing research that spans the entire spectrum of software systems—including programming language design and implementation, software engineering, operating systems, and embedded systems.

Rajive Bagrodia

Emeritus Professor, Ph.D.
(Univ. Texas, Austin 1987)

Wireless networks, mobile computing and communications, network simulation and analysis, parallel and distributed computing.

Paul Eggert

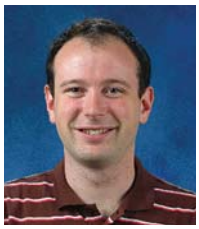
SOE Lecturer, Ph.D.
(UC Los Angeles 1980)

Software design and engineering, programming language design and implementation, and software internationalization.

Alan Kay

Adjunct Professor, Ph.D.
(Univ. of Utah 1969)

Object-oriented programming, personal computing, graphical user interfaces.



Eddie Kohler

Adjunct Professor, Ph.D.
(MIT 2001)

Operating systems, software architecture, network measurement, network protocol design, and programming language techniques for improving systems software.

Todd Millstein

Associate Professor, Ph.D.
(Univ. Washington 2003)

Programming languages and language design, compilation, software model checking, formal methods, and database systems.

Rupak Majumdar

Professor, Ph.D.
(UC Berkeley 2003)

Formal verification and control of reactive, real-time, hybrid, and probabilistic systems; software verification and programming languages; game theoretic problems in verification; logic and automata theory.

Carey Nachenberg

Adjunct Assistant Professor, M.S.
(UC Los Angeles 1995)

Anti-virus and intrusion detection technology. Automatic identification of new/unknown malicious software.

Peter S. Pao

Adjunct Professor, Ph.D.
(Univ. of Michigan 1975)

System engineering, knowledge management and technology networking. (Joint appointment with Anderson School of Management).

Jens Palsberg

Professor, Ph.D.
(Univ. of Aarhus, Denmark 1992)

Compilers, embedded systems, programming languages, software engineering, and information security.

David Smallberg

SOE Lecturer, M.S.
(UC Los Angeles 1978)

Computer science education, programming languages, generic programming, student software analysis.

Computer Science Theory

The use of simple and concise mathematical models to investigate computational questions and issues—including research in centralized, parallel and distributed models of computation; optimal, approximate and randomized online algorithms; complexity, cryptography, games, auctions and mechanism design theory.

Eliezer Gafni

Professor, Ph.D.
(MIT 1982)

Distributed algorithms, mathematical programming with application to distributed routing and control of data networks, and computer science theory.

Sheila Greibach

Emeritus Professor, Ph.D.
(Harvard 1963)

Algorithms and computational complexity, complex program schemes and semantics, formal languages and automata theory and computability.

Rafail Ostrovsky

Professor, Ph.D.
(MIT 1992)

All aspects of theory of computation, especially cryptography and security, distributed algorithms, high-dimensional search, and routing and flow control in communication networks.

Amit Sahai

Professor, Ph.D.
(MIT 2000)

Theoretical computer science, primarily foundations of cryptography and computer security.

Alexander Sherstov

Assistant Professor, Ph.D. (University of Texas at Austin, 2009)

Theoretical computer science with an emphasis on computational complexity theory, learning theory and quantum computing.

Photo: UCLA Photography

Other Emeriti Faculty

Algirdas Avizienis

Emeritus Professor, Ph.D.
(UI Urbana-Champaign 1960)

Computer system architecture, fault-tolerant computing.

Bertram Bussell

Emeritus Professor, Ph.D.
(UC Los Angeles 1962)

Computer system architecture, computer graphics.

Jack Carlyle

Emeritus Professor, Ph.D.
(UC Berkeley 1961)

Communication, computation theory, algorithms and complexity.

Gerald Estrin

Emeritus Professor, Ph.D
(Univ. Wisconsin 1951)

Computer systems architecture, design of concurrent systems, restructurable architectures.

Thelma Estrin

Emeritus Professor, Ph.D.
(Univ. Wisconsin 1951)

Biomedical engineering, computers in neuroscience, engineering education.

Allen Klinger

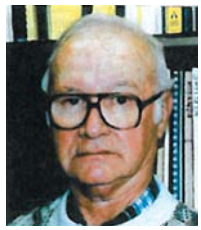
Emeritus Professor, Ph.D.
(UC Berkeley 1966)

Image and pattern analysis, database systems, computer education.

Leon Levine

Senior Lecturer, M.S.
(MIT 1949)

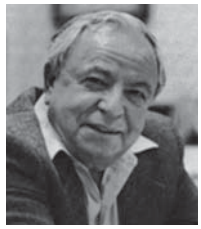
Computer methodology.



Lawrence McNamee

Emeritus Professor, Ph.D.
(Univ. Pittsburgh 1964)

Computer graphics, discrete simulation, digital filtering, computer-aided design.



Michel Melkanoff

Emeritus Professor, Ph.D.
(UC Los Angeles 1955)

Programming languages, data structures, database design.

David Rennels

Emeritus Professor, Ph.D.
(UC Los Angeles 1973)

Computer systems architecture, fault-tolerant computing.

Jacques Videl

Emeritus Professor, Ph.D.
(Univ. of Paris 1961)

Pattern recognition, neural networks, fuzzy systems and genetic search.

Programs and Annual Events

Jon Postel Distinguished Lecturer Series (2010 to 2011)

The Jon Postel Distinguished Lecturer Series is dedicated to the memory of Dr. Jon Postel—an alumnus of UCLA's Computer Science Department, a quiet and gentle man, a brilliant and dedicated scientist who made many key contributions to the formative days of the ARPANET. Each year the Computer Science Department hosts a series of lectures by world-renowned scientists in academia and industry, covering a broad range of topics that are timely and relevant to today's high-technology world.

Berthier Ribeiro-Neto*
Google Inc./Universidade Federal de Minas Gerais
Web Search: Challenges and Opportunities
October 7, 2010

Tomaso Poggio
McGovern Institute, MIT
Intelligence in Minds, Brains & Machines: The Neuroscience Perspective
November 4, 2010

Don Towsley
University of Massachusetts
Towards a Network Measurement Science
December 2, 2010

Madhu Sudan
Microsoft Research
Semantic Communications
March 1, 2011

Peter M. Chen
University of Michigan
Deterministic Replay
April 21, 2011

**Normal E. Friedmann Distinguished Lecture*

Annual Tech Forum (2011)

Each spring the Computer Science Department participates in the Annual Tech Forum—an event sponsored by the Henry Samueli School of Engineering and Applied Science that gathers leading minds from industry and academia to share insights into the future of technology and innovation. In addition to exciting speakers, the Tech Forum also showcases research programs from all seven of the departments within the school of engineering. Here, our emerging Ph.D. students have an opportunity to participate in the popular poster session while describing their research results to faculty, classmates and industrial guests. This year's speakers included:

David A. Honey
Assistant Secretary of Defense for Research & Engineering
Department of Defense

Dr. Alison Moore
Vice President for Process & Product Engineering
AMGEN

Patricia A. Hoffman
Assistant Secretary for Office of Electricity Delivery & Energy Reliability
Department of Energy

Federal and State: Contracts & Grants

AGENCY	TITLE	FACULTY
Central Intelligence Agency	Identifying Complex Activities by Tracking Communication and Belief	Demetri Terzopoulos
National Science Foundation	Trust-Hub: Design of Trust Benchmarks, Hardware Validation Platform	Miodrag Potkonjak
National Science Foundation	Workshop for Women in Machine Learning	Jennifer Vaughan
National Science Foundation	A Server-Centric Approach to Data Center Networks	Songwu Lu
National Science Foundation	Toward an Adaptive Programming System for Cloud-Enabled Smartphone Applications	Todd Millstein
National Science Foundation	Named Data Networking (NDN)	Lixia Zhang
National Science Foundation	Frontiers of Activity Recognition	Stefano Soatto
National Science Foundation	Private Identification of Relatives and Private GWAS: First Steps in the New Field of Computing	Eleazar Eskin Rafail Ostrovsky Amit Sahai
National Science Foundation	Routeviews Infrastructure for Monitoring, Tracking and Diagnosing IPV6 Deployment	Lixia Zhang
National Science Foundation	Modeling and Parsing Time Series for Causal Analysis with Application to Action Interpretation	Stefano Soatto
National Science Foundation	Symposium on Combinatorial Search-2010	Richard Korf
National Science Foundation	Collaborative Research: Program Analysis for Smartphone Application Security	Todd Millstein
National Science Foundation	Mobilizing for Innovative Computer Science Teaching and Innovation	Debra Estrin
UC Riverside/NSF	Recognition and Tracking in a Multiple Camera System	Manuela Vasilescu
US Army Research Office	DARPA Workshop: Frontiers of Activity Recognition	Stefano Soatto
U.S. Dept. of Health & Human Services	Variations in Care: Comparing Heart Failure Case Transition Intervention Effects	Majid Sarrafzadeh
Office of Naval Research	Novel Foundations of Advanced Security Technologies (N-FAST)	Rafail Ostrovsky
Office of Naval Research	New Direction for Fully Homomorphic Encryption	Amit Sahai
University of California	Discovery: Hardware Acceleration for Electronic Design Automation	Jason Cong

Industry and Other Organizations: Contracts & Grants

AGENCY	TITLE	FACULTY
National Academy of Sciences	Multilinear (Tensor) Algebraic Framework for Multifactor Manifold Learning	Demetri Terzopoulos
Alfred Sloan Foundation	Research Fellowship	Rupak Majumdar
Altera Corporation	Hardware Acceleration for Electronic Deisgn Automation	Jason Cong
BBN Technologies	The GENI Project-Campus Vehicular Testbed (C-Vet)	Mario Gerla
Computing Research Association	CI Fellows Project: Crowdsourcing for Science Education	Jennifer Vaughan
DSO National Laboratories	Network Coding in Manets	Mario Gerla
HRL Laboratories	Task & Context Awareness Knowledge Enhanced Compressive Imaging	Stefano Soatto
Intel Corporation	Deductive Verification of Software	Rupak Majumdar
Mentor Graphics	Hardware Acceleration for Electronic Deisgn Automation	Jason Cong
Netscientific America, Inc.	Home Monitoring Systems and Devices	Majid Sarrafzadeh
Solute, Inc.	Development of Navy Wave Rich Collaboration for C & C	Junghoo Cho
Toyota Motor Corporation	Systematic Testing of Control Software	Rupak Majumdar
UtopiaCompression Corporation	Generation Waveform Agnostic Gateway Architecture	Jens Palsberg
UtopiaCompression Corporation	A Thin Layer Approach to Highly Mobile Ad Hoc Networks	Mario Gerla

Other Support From Industry

AGENCY	FACULTY
Adobe	Miodrag Potkanjak
Alcatel-Lucent	Leonard Kleinrock
Cedar-Sinai Medical	Demetri Terzopoulos
Daum Communication	Junghoo Cho
Futurewei Technologies	Songwu Lu L. Zhang
Google	Amit Sahai Todd Millstein
Intel Corp	Glenn Reinman Jason Cong
JPO Ministry of Economy	Miodrag Potkanjak Alfonso Cardenas
Macao Polytechnic	Giovanni Pau

AGENCY	FACULTY
Mentor Graphics	Jason Cong
Mozilla Corporation	Jens Palsberg
ST Microelectronics	Mario Gerla Giovanni Pau
Tecnosens	Giovanni Pau
Toyota	Lixia Zhang
UtopiaCompression	Mario Gerla/G. Pau Mario Gerla/J. Palsberg
Verisign	Lixia Zhang
Xerox Corp.	Amit Sahai Yuval Tamir

Undergraduate Student Life

Each year, the Computer Science Department enrolls over 125 new undergraduates. Along with our strong academic foundation, we offer opportunities for undergraduates to interact with the department in unique ways to balance their academic quest. Student members of the ACM (Association for Computing Machinery) explore their interests on campus and work on projects related to their pursuits, while also conducting info-sessions for fellow undergrads. Our UCLA chapter of Upsilon Pi Epsilon, an international honor society for computing and information disciplines, provides information on internships and opportunities for graduate school workshops.

The department offers classes and research programs that are grounded in real-world problems in science and industry, thus giving undergraduates an experience of "life as a graduate student." The Digital Design Project Laboratory (CS152B) is an opportunity for students to design digital systems for real-world applications. The Center for Embedded Networked Sensing (CENS) has a proven approach for engaging undergraduates in hands-on research, with a focus on increasing the number of women and underrepresented students in science and engineering.

Educational Objectives for Computer Science and Computer Science & Engineering Majors

- For CS—make valuable contributions to design, development, and production in the practice of computer science and related engineering areas, particularly in software systems and algorithmic methods. For CS&E—make valuable contributions to design, development and production in the practice of computer science and related engineering or application areas, and at the interface of computers and physical systems.
- Demonstrate strong communication skills and the ability to function effectively as part of a team.
- Demonstrate a sense of societal and ethical responsibility in all professional endeavors.
- Engage in professional development or post-graduate education to pursue flexible career paths amid future technological changes.

Undergraduate Program Advisory Board

Our *Undergraduate Program Advisory Board for Engineering and Technology* meets twice a year to review our undergraduate program and refine the department's goals. This board comprises the following representatives from industry, academia, alumni and our own student body.

Leon Alkalai
JPL & UCLA CSD

Joseph Bannister
USC, ISI

Peter Blankenship
Northrop Grumman

Jon Canan
Microsoft MSN Direct

Paul Eggert
UCLA CSD

Michael Erlinger
Harvey Mudd College

Leana Golubchik
USC

Jiho Kim
UCLA CSD Undergrad

Pekka Kostamaa
Teradata

Laurie Leyden
UCLA CSD Staff

Richard Muntz
UCLA CSD

Ross Niebergall
Raytheon

Nima Nikzad
UCLA CSD Undergrad

Joseph Ou-Yang
IBM

Daniel Quach
UCLA CSD Undergrad

David Rennels
UCLA CSD

John Rosati
Cleo Consulting Partners

Mike Sievers
Time Logic, Inc.

David Smallberg
UCLA CSD

Frank Pearce
Blizzard Entertainment, Inc.

Ben Zaman
Yahoo!

Graduate Student Life

UCLA is located in Westwood—one of the most beautiful areas of Los Angeles. The Computer Science Department is one of seven departments within the Henry Samueli School of Engineering and Applied Sciences. Housed in Boelter Hall, it is conveniently close to the Ackerman Student Union and the John Wooden Fitness Center in the heart of UCLA's tree-laden campus. Most students live in Westwood Village, either in student housing or apartment buildings within a one-mile radius of UCLA. The Village sports many shops, restaurants, theaters, and a bustling nightlife. Some of our students live in nearby communities such as Culver City or Santa Monica, and others commute from other areas of Los Angeles or beyond. Public transportation and ample parking on campus provide many options for getting to and from school. Finally, UCLA is just six miles from the ocean, so if students need a temporary change of scenery, they can easily catch a bus to one of Southern California's sparkling beaches.

Graduate students at UCLA have easy access to a friendly, cooperative, vibrant community. The student-run Computer Science Graduate Student Committee (CSGSC) organizes regular events within the department that include an annual fall picnic, and a popular weekly "Tea Time" with an ever-changing menu of gourmet food and informal conversation. There are also many funding opportunities for graduate students such as teaching assistantships or graduate student research positions, and these positions include a salary, healthcare, and tuition remission. Students are encouraged to build relationships with faculty before coming to UCLA, but it is common to find a project and advisor once a student has arrived and settled in. Our open, approachable faculty and our close-knit and cooperative student body will help students find a good fit for their interests and abilities. Additionally, because of the CS Department's academic and industrial affiliations, the relationships formed here promote opportunities for internships, postdoctoral research, professorships, and jobs at some of the most exciting technology companies.

Graduate Student Awards (advisors in parenthesis)

2011	Beayna Grigorian *(Reinman)*	NSF Graduate Research Fellowship
	Jong H. Ahnn, Uichin Lee & Hyun J. Moon *(Potkonjak/Gerla/Zaniolo)*	CCGrid Best Paper Award
	Vladimir Braverman *(Ostrovsky)*	Google Outstanding Graduate Student Research Award CS Department Outstanding Ph.D. Graduate
	Dan He *(Eskin)*	Northrup Grumman Outstanding Graduate Student Research Award
	Navid Amini *(Sarrafzadeh)*	Symantec Outstanding Graduate Student Research Award
	Bin Liu *(Cong)*	Cisco Outstanding Graduate Student Research Award
	Manu Jose *(Majumdar)*	CS Department Outstanding Master's Graduate
2010	Donnie Kim *(Estrin)*	Intel Ph.D. Fellowship
	Bin Liu & Yi Zou *(Cong)*	First-place winners at ICCAD's CADathlon
	Taehee Lee & Teresa Ko *(Soatto/Estrin)*	Qualcomm Innovation Fellowship
	Knot Pipatsrisawat *(Darwiche)*	Google Outstanding Graduate Student Research Award
	Nils Homer *(Eskin)*	Northrup Grumman Outstanding Graduate Student Research Award
	Alireza Vahdatpour *(Sarrafzadeh)*	Symantec Outstanding Graduate Student Research Award
	Hyduke Noshadi *(Sarrafzadeh)*	Cisco Outstanding Graduate Student Research Award
	Trevor Standley *(Korf)*	CS Department Outstanding Master's graduate
	Knot Pipatsrisawat *(Darwiche)*	CS Department Outstanding Ph.D. graduate

Doctorial Student Placement

STUDENT	AFFILIATION	TITLE	ADVISOR
Brian F. Allen	UCLA/Duke University	Postdoctoral Researcher	Petros Faloutsos
Sandra Leonidas Batista	Univ. North Carolina	Postdoctoral Researcher	Sheila Greibach
Vladimir Braverman	Johns Hopkins University	Assistant Professor	Rafail Ostrovsky
Teresa Breyer	FatCloud	Principal Engineer	Richard Korf
Nishanth Chandran	Microsoft Research	Postdoctoral Researcher	Ostrovsky/Sahai
Brian Nicholas Chin	Google	Software Engineer	Todd Millstein
Arthur Young Choi	Univ. of California, Los Angeles	Postdoctoral Researcher	Adnan Darwiche
Aaron Daniel Cote	Univ. of Southern California	Lecturer	Adam Meyerson
Paul Alexander Dow	Microsoft Corporation	Software Development Engineer	Richard Korf
Michael Joseph Emmi	Liafa, Universite Paris Diderot	Postdoctoral Researcher	Rupak Majumdar
Vipul Goyal	Microsoft	Researcher	Ostrovsky/Sahai
Jianming He	Google	Software Engineer	Wesley Chu
Nils William Homer	Life Technologies Inc.	Algorithm Developer	Eleazar Eskin
Ruey-Lung Hsiao	Alexandria Investment Res. & Tech.	Chief Technical Officer	D. Stott Parker
Eric Huang	Palo Alto Research Center	Researcher	Richard Korf
Joshua Mark Hyman	Google	Senior Software Engineer	Deborah Estrin
Rafit Izhak-Ratzin	Palo Alto Networks	Senior Software Engineer	Rupak Majumdar
Jiayan Jiang	Facebook	Software Engineer	Zhuowen Tu
Wei Jiang	Google	Software Engineer	Jason Cong
Amruta Sadanand Joshi	Google	Software Englineer	John Cho
Zohreh Karimi	Extreme DA	Technical Researcher	Majid Sarrafzadeh
Trent Eliot Lange	Lange Fund Management LLC	President	Michael Dyer
Kevin C. Lee	CISCO Systems	Software Engineer	Mario Gerla
Suk Bok Lee	Carnegie Mellon University	Postdoctoral Researcher	Songwu Lu
Kelvin T. Leung	Intel	Rotation Engineer, PTAC	D. Stott Parker
Martin Ladislav Lukac	Netleaf Analytics	Cofounder and CTO	Deborah Estrin

STUDENT	AFFILIATION	TITLE	ADVISOR
Guojie Luo	Peking University	Assistant Professor	Jason Cong
Jamie Macbeth	Private Consultant	Software Engineer	Majid Sarrafzadeh
Michael D. Mammarella	Google	Software Engineer	Eddie Kohler
Gustavo Marfia	University of Bologna	Postdoctoral Researcher	Mario Gerla
Shane Andrew Markstrum	Bucknell University	Assistant Professor	Todd Millstein
Michael Richard Meisel	ThousandEyes	Chief Architect	Lixia Zhang
Jason Todd Meltzer	HRL Laboratories	Postdoctoral Researcher	Stefano Soatto
Eitan Gilad Mendelowitz	Smith College	Asst. Professror, Tenure Track	Deborah Estrin
Kirill Minkovich	HRL Laboratories	Postdoctoral Researcher	Jason Cong
Ryan J. Moriarty	AppRats Inc.	Co-Founder and CTO	Rafail Ostrovsky/ A. Sahai
Barzan Mozafari	Mass. Institute of Tech.	Postdoctoral Researcher	Carlo Zaniolo
Mishali Naik	Intel Corp.	Hardware Engineer	Glenn Reinman
Eric Osterweil	Verisign	Senior Research Engineer	Lixia Zhang
Omkant Pandey	Microsoft	Researcher	R. Ostrovsky/ A. Sahai
Andrew Dang Parker	Google	Software Engineer	Deborah Estrin
Thammanit Pipatsrisawat	Google	Software Engineer	Adnan Darwiche
Michael Shindler	Oregon State University	Postdoctoral Researcher	Rafail Ostrovsky
Sasa Slijepcevic	Texas Instruments	Software Systems Engineering	Miodrag Potkonjak
Eun-Sook Sung	Samsung Electronics	Principal Engineer	Miodrag Potkonjak
Alireza Vahdatpour	University of Washington	Postdoctoral Researcher	Majid Sarrafzadeh
Steven Vincent Vandebogart	Google	Software Engineer	Eddie Kohler
Luiz Felipe Menezes Vieira	Univ. Federal De Minas Gerais	Assistant Professor	Mario Gerla
Michael Jason Welch	Yahoo! Inc.	Software Development Engineer	John Cho
Heng Yuan	Teradata Corporation	Software Engineer	D. Stott Parker
Biao Zhou	IAC Search & Media (Ask.com)	Senior Research Software Engineer	Mario Gerla

Departmental Diversity Program

The Computer Science Department and its faculty members strive for diversity within the department's student population. We do this by engaging in a number of outreach activities in order to attract a greater number of women and members of underrepresented groups to our undergraduate and graduate programs, and by further providing excellent opportunities once these students join the department. Some of these diversity activities are described below.

- We are working with the Graduate School of Education & Information Studies (GSEIS) and the Los Angeles Unified School District (LAUSD) to increase the number of women and underrepresented students in computer science. For example, as part of the GSEIS AP Readiness program, one of our faculty members leads LAUSD students and teachers in AP Computer Science in support and enrichment activities on campus throughout the school year.
- Faculty members Alfonso Cardenas and David Smallberg co-lead in collaboration with the School's Center for Early Education and Development (CEED) on the NSF-funded program FOCUS (Frontier Opportunities in Computing for Underrepresented Students). FOCUS encourages and fosters current and potential community college transfer students to pursue computer science through summer courses, bridge programs, school-year seminars, and support programs.
- We have supported a number of women and underrepresented graduate students under the DOE-sponsored GAANN fellowship program and the National GEM Consortium. Additionally, we have set aside funding to support selected undergraduate and graduate students to attend the annual Grace Hopper Women in Computing conference.
- Several of the department's Centers have received funding for programs and partnerships that focus on increasing diversity in the field of computer science. One of those, the *Center for Embedded Networked Sensing (CENS)* has a large women and minority educational component that includes undergraduate and graduate research programs and recruitment efforts, grants from NSF for "Gender Diversity in Science, Technology, Engineering, and Mathematics," and the "Women@CENS," an educational grant. Additionally, during 2010-2011 the Center for Domain-Specific Computing (CDSC) engaged over 15 female and minority undergraduate and high school students for summer research.

Photo: Matthew Chin

UCLA's diversity programs attract pre-college students

Computer Science Department Alumni Advisory Board

MISSION STATEMENT: To promote the communication, growth, and shared activities of the UCLA Computer Science Department alumni, faculty and students.

The Board has represented several generations of the department's alumni since its inception in the fall of 1969. Composed of leaders in education and industry, it also reflects the major fields of computer science.

The Board meets on a quarterly basis and, in keeping with its mission, is involved in a number of activities—including the department's Annual Research Review, the career panel and job interview workshop for graduating students, the Rose Bowl pre-game tailgate party for UCLA's homecoming football game, and other activities that are posted on the department's alumni website *(www.cs.ucla.edu/csd/people/alumni).*

Alumni Advisory Board Members

Alfonso Cardenas (Faculty Chair)
Professor, UCLA Computer Science Department

Eytan Elby
Chairman and cofounder, Deep Dive Media

Milos Ercegovac
Professor, UCLA Computer Science Department

Braulio Estrada
Analyst, Accenture

William Goodin
Manager, Short Course Program, UCLA Extension

Nader Karimi
VP Information Technology, BCBG MAXAZRIA

Anil Kripalani
President, TiE-San Diego and WirefreeCom, Inc.

Jacquelyn Leong
Technical Lead, Amgen

Andrew Louie (Alumni Chair)
VP of Information Technology, Iris International

Carey Nachenberg
Fellow and Vice President, Symantec Corporation
Adjunct Prof., UCLA Computer Science Department

Sze Ki Pat
Sr. Staff Software Engineer, MySpace

Frank Pearce
Executive Vice President Product Development
Blizzard Entertainment, Inc.

Maria H. (Lolo) Penedo
NGMS Technical Fellow, Northrop Grumman Corp.

John Rosati
Founder and Managing Director, THR Associates

David Smallberg
Lecturer, UCLA Computer Science Department

James Winchester
Owner, Avionic Products, Inc.

Behzad Zamanzadeh (Alumni Vice Chair)
VP of Engineering, LeadPoint Inc.

Close Ties With Industry

The Computer Science Department is committed to maintaining strong ties to industry, collaborating on state-of-the-art research, and engaging in a mutually beneficial exchange of information regarding advances in technology. The department's Industrial Affiliate Program facilitates these goals, while also providing many benefits to its Affiliates through memberships.

Basic Membership Benefits

- A faculty member assigned to serve as a liaison for the program (through mutual agreement between the Affiliate member and the department).
- Customized assistance to member recruiting needs; graduate student listings and resumes, on-site job interviews, and one technical talk per year at our seminar series to highlight the member's research and technology.
- Interaction with faculty members in areas of interest to facilitate research collaboration, summer internships, and consulting; access to in-house research reports and technical publications, as available and on request.
- Invitation to the Annual Research Review (with up to five free admissions), a venue where students and faculty showcase current research and exchange ideas with Affiliate members; invitation to the department's John Postel Distinguished Lecture series.

Gold Membership Benefits

- All of the benefits provided under the Basic membership.
- Close ties with a specified research laboratory or center; exchange of technology and research results.
- Departmental visitor status for up to 12 months for one representative from the member company; office space and full access to computer facilities, libraries, classes and lectures.
- Position on the department's Advisory Board, providing valuable input and receiving feedback.
- Participation in the undergraduate senior-year project program; member companies propose projects for teams of three to four students (under supervision of faculty advisor).

Our Thanks to Affiliate Members for Their Support

Internet Heritage Site and Archive

Preserving Internet History

On October 29, 1969, a team led by UCLA professor Leonard Kleinrock sent the first ARPANET message to fellow scientists at the Stanford Research Institute. These two sites formed a network which, through years of innovation, became today's Internet. This event symbolized the beginnings of a communications revolution that, four decades into its infancy, has already led to profound changes—both globally and in the details of our everyday lives.

To preserve the early histories of the Internet that are captured by this event, the UCLA Computer Science Department and Henry Samueli School of Engineering and Applied Science have collaborated in creating the **Kleinrock Internet Heritage Site and Archive (KIHSA)**. This historical center is housed in 3420 Boelter Hall—the very room from which that first message was sent. As both a repository of Internet history and an interactive heritage site, access is completely free and open to the public. It has brought together specialists from such diverse fields as the Computer Science and History Departments, the University Archives and the Fowler Museum of Cultural History.

Historical documents from the Internet's early history are being identified, acquired, and made available to all through social media and major scholarly databases. The physical copies are held permanently and securely in the world-class archival facilities at UCLA. This repository will be available both off-line and digitally, and as such, will serve as an important resource for social scientists all over the world.

Our heritage site is an immersive recreation of that original 1969 UCLA/ARPA lab. This site already features key artifacts, including the first piece of Internet infrastructure—the Interface Message Processor (IMP) developed by a team at Bolt, Beranek and Newman (BBN). We will use teaching tools from the 1960s, such as slide projectors and blackboards, to tell stories of the Internet's early history. We also plan to use this site to host special events.

In the history of science and technology, events understood as single achievements always involve whole cadres of individuals and groups. It is crucial to have documentation concerning the process of interaction and collaboration between these participants, for it is a fundamental part of this discovery process. This is the spirit in which the Kleinrock Internet Heritage Site and Archive was created. It is our conviction that the more information we make available, the more we will see an increasingly inclusive, objective, and fascinating history of the Internet.

http://internethistory.ucla.edu

3420 Boelter Hall (circa 1969)

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