# UCLA
## COMPUTER SCIENCE DEPARTMENT

### ANNUAL REPORT FALL 2013

## 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 SCIENCE DEPARTMENT

## DEPARTMENT OVERVIEW: FALL 2013

### Faculty and Staff

| | |
|---|---|
| Ladder Faculty | 28 |
| Joint Faculty | 6 |
| Emeriti Faculty | 16 |
| Adjunct Faculty | 12 |
| Department Staff | 14 |

### Master's Degree

| | |
|---|---|
| Applicants | 921 |
| Admits | 184 |
| Enrolled | 91 |
| MS Degrees Awarded | 72 |
| MS Students Enrolled | 166 |

### Bachelor's Degree

| | |
|---|---|
| Applicants | 5079 |
| Admits | 576 |
| Enrolled | 170 |
| BS Degrees Awarded | 142 |
| BS Students Enrolled | 718 |

### Doctorate Degree

| | |
|---|---|
| Applicants | 362 |
| Admits | 56 |
| Enrolled | 22 |
| PhD Degrees Awarded | 30 |
| PhD Students Enrolled | 178 |

Applicants = number of applicants for Fall 2013
Admits = number of applicants offered admission for Fall 2013
Enrolled = number of applicants newly enrolled for Fall 2013
Degrees Awarded = number awarded during academic year 2012-2013
Students Enrolled = number enrolled Fall 2013

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# MESSAGE FROM THE CHAIR

The Computer Science Department continues to maintain and expand its research efforts across diverse scientific fields—artificial intelligence, system architecture & CAD, computational systems biology, graphics and vision, information & data management, network systems, software systems, and computer science theory. In consonance with these research efforts, we are providing our computer science students with one of the finest educations in computer science basics and state-of-the-art technological advances.

The Department's four research centers foster new and exciting research directions—including integrating computer science technology with healthcare, exploring techniques for cryptography and computer security, investigating the use of mobile intelligent agents, and creating customizable architecture platforms. The Department's faculty and students continue to be engaged in diverse and state-of-the-art research. For example, the Named Data Networking research team is focused on the development of a more robust, secure and reliable Internet; another team is working on a form of encryption called *homomorphic encryption*; several of our faculty are solving the challenges created by the exploding size and complexity of *big data*; and yet another group of researchers is collaborating with Peking University to foster breakthroughs in technology.

> *A pessimist sees the difficulty in every opportunity; an optimist sees the opportunity in every difficulty.*
>
> *— Winston Churchill*

The Department has been enriched by the addition of four new faculty members: Tyson Condie, with expertise in large-scale distributed systems for processing massive datasets and runtimes for declarative languages; Jason Ernst, whose research field is computational biology and bioinformatics; Van Jacobson, renowned for his work on TCP/IP network performance and scaling; and Wei Wang, with a focus on big data, data management, and computational biology.
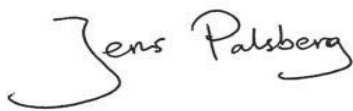
Our faculty received numerous honors during the 2012-2013 time frame. A small sampling of these includes Judea Pearl's ACM Turing Award and an election to the American Academy of Arts and Sciences; Stefano Soatto's election as IEEE Fellow; Leonard Kleinrock's induction into the Internet Hall of Fame; and Jennifer Wortman Vaughan's Presidential Early Career Award.

Our computer science curriculum continues to expand. In addition to the already sizable number of courses that we offer, we now have a game programming course that focuses on hard-core fundamentals and complements other game courses offered by UCLA's Department of Design Media Arts and the School of Theater, Film and Television.

We currently have 178 PhD students, 166 MS students, and 718 BS students. Since the number of applicants to our undergraduate program has more than doubled over the past three years, we are more selective than ever; currently we offer admission to about 13% of those who apply. I'm pleased to report that approximately 75% of our students go on to internships with laboratories such as Sandia and JPL, municipal agencies such as LA's Department of Water and Power, and industrial leaders such as Amazon, Cisco, Google, HP, Symantec, Northrop Grumman, etc.

In a wonderful surprise ending to the 2012-2013 academic year, we recently discovered—thanks to a keen-eyed computer science student—that in the pattern of 14 bars of two-tone floor tiles found on the second floor of Boelter Hall lies the binary-coded message, *Lo and behold!* It is a fitting tribute to the first words sent over the infant Internet from UCLA in 1969.

Thank you for making this a noteworthy year for the Department.

Jens Palsberg
Chair, Computer Science Department
October, 2013

*Clockwise from left: Graduate students Beayna Grigoriam and Kung-Hua Chang, CSD Chair Jens Palsberg, Professor Wei Wang, graduate students Jerrid Matthews and Sepideh Mazrouee*

# FACULTY AWARDS AND HONORS 2012-2013

## Leon Alkalai

**NASA Group Achievement Award (2012)** for outstanding and exceptional contributions by the GRAIL team in winning the Discovery-12 NASA competition.

**NASA Exceptional Achievement Medal (2012)** for exceptional achievement and technical contributions as proposal manager for the GRAIL Project.

Leon heads up the Lunar Robotic Exploration Program Office at NASA's JPL. He is a former adjunct professor in the Computer Science Department and continues to contribute as a lecturer.

## Algirdas Avižienis

**Eckert-Mauchly Award (2012)** from the ACM and IEEE Computer Society for fundamental contributions to fault-tolerant computer architecture and arithmetic.

**Jean-Claude Laprie Award in Dependable Computing (2012)** which recognizes papers published at least ten years ago that have significantly influenced the theory and/or practice of dependable computing (1967 paper "Design of Fault-Tolerant Computers").

Algirdas has been as member of the Computer Science Department's faculty since 1962, and is a distinguished professor emeritus.

## Jason Cong

**50th Design Automation Conference Prolific Author Award (2013)** for publishing 40-49 papers in the first 50 years of DAC.

**IBM Faculty Award (2012)** from the IBM Corporation in recognition of Jason's research and its importance to industry. Jason is a three-time recipient of this award; he also received the award in 2001 and 2007.

**Most Significant Contributions to FPGA Int'l Symposium (2012)** acknowledgement from ACM/SIGDA for two collaborative papers published in the 1992 to 2001 timeframe. Part of a special collection selected for the 20th anniversary of the FPGA symposium.

Jason has been with the Computer Science Department since 1990. He is a Chancellor's Professor, and director of the Center for Domain Specific Computing (CDSC) and the VAST Laboratory.

## Paul Eggert

**Lockheed Martin Excellence in Teaching Award (2012)** for faculty members who continue to dedicate an abundance of talent, time and energy to teaching.

Paul has served as an esteemed undergraduate class lecturer in the Computer Science Department for the past ten years.

## Milos Ercegovac

**Distinguished Alumni Educator Award (2013)** from the Department of Computer Science at the University of Illinois at Urbana-Champaign to alumni who have made outstanding contributions to computer science education and excel at motivating students.

Milos is a distinguished professor with the Computer Science Department and has been a member of the faculty since 1975.

## Jason Ernst

**Sloan Research Fellowship (2013)** awarded by the Alfred P. Sloan Foundation in recognition of distinguished performance and a unique potential to make substantial contributions to a scientific field.

**NSF CAREER Award (2013)** for expanding the dimensions of computational epigenomic modeling and analysis.

In 2012 Jason was appointed assistant professor in both the Computer Science and Biological Chemistry departments. Prior to this, he was at MIT and affiliated with the Broad Institute.

## Leonard Kleinrock

**Internet Hall of Fame (2012)** inaugural induction for those who were instrumental in the early design and development of the Internet.

**Eminent Member of IEEE's Electrical and Computer Engineering Honor Society (2012),** an honor conferred on those whose technical contributions to society through leadership in the fields of electrical and computer engineering have resulted in significant benefits to mankind.

**Alexander Graham Bell Medal (2012)** for pioneering contributions to modeling, analysis, and design of packet-switching networks.

**Honorary Doctorate (2013)** from Concordia University (Montreal, Canada). This is Len's seventh honorary doctorate.

Len has been with the Computer Science Department since 1963 and was instrumental in the creation of the Internet. He is now a distinguished professor emeritus with numerous awards that include a 2008 National Medal of Science presented by President George W. Bush.

## Todd Millstein

**Top Picks 2013** (IEEE's Micro magazine) selected Todd's 2012 paper, "End-to-End Sequential Consistency" as one of the most significant research papers in computer architecture in 2012 based on novelty and potential for long-term impact.

Todd joined the Computer Science Department in 2004 after receiving his Ph.D. from the University of Washington.

## Rafail Ostrovsky

**IACR Fellow (2013)** awarded by the International Association for Cryptologic Research in recognition of technical and professional contributions to cryptologic research.

**Pazy Memorial Research Award (2012)** from the USA-Israel Binational Science Foundation (co-winners Amit Sahai, Yuval Ishai and Eyal Kushilevitz). The Pazy Award is the Foundation's highest honor for mathematical and computer sciences research.

Rafail joined UCLA in 2003 after eight years with Bell Communications Research. He is currently the director of the Computer Science Department's Center for Information and Computation Security (CICS).

## Jens Palsberg

**ACM SIGPLAN Service Award (2012)** in recognition of the value and degree of service to the programming languages community.

Jens has been a professor of computer science at UCLA since 2003, and for the past three years he has served as chairman of the department. Prior to joining UCLA, Jens held visiting professor/scientist positions at several educational institutions, including MIT, and a faculty position at Purdue University.

## Judea Pearl

**ACM Turing Award (2011)** for innovations that have enabled remarkable advances in the partnership between humans and intelligence (AI). The Turing Award is widely considered to be the Nobel Prize in computing.

**Election to American Academy of Arts and Sciences (2012)** in recognition of Judea's outstanding accomplishments. The Academy's membership includes more than 250 Nobel laureates and more than 60 Pulitzer Prize winners.

**Appointment as Distinguished Visiting Professor at Technion IIT (2013)** to foster collaborative research in the areas of robotics and machine learning that will greatly benefit both Technion and UCLA.

Judea joined the Computer Science Department in 1970 and is currently an emeritus professor who holds numerous honors, including induction into the Artificial Intelligence Hall of Fame.

## Amit Sahai

**Pazy Memorial Research Award (2012)** from the USA-Israel Binational Science Foundation (co-winners Rafail Ostrovsky, Yuval Ishai and Eyal Kushilevitz). The Pazy Award is the Foundation's highest honor for mathematical and computer sciences research.

**Record Success at CRYPTO 2013.** Five research papers authored by Amit were accepted at this conference. No other researcher has had that many papers accepted at a single CRYPTO conference within the past 25 years.

Amit has been a member of the Computer Science Department faculty since 2004; preceding his appointment here, he was on the faculty at Princeton University. He is the associate director for the department's Center for Information & Computation Security (CICS).

## Stefano Soatto

**IEEE Fellow (2013)** for contributions to dynamic visual processes.

Stefano has been with the Computer Science Department since 2000. Prior to joining the department, he held a faculty position at Washington University and a research associate position at Harvard.

## Jennifer Wortman Vaughan

**Presidential Early Career Award (2012)**, the highest honor bestowed by the U.S. Government on science and engineering professionals in the early stages of their research careers.

Jennifer has been an assistant professor with the Computer Science Department since 2010. Prior to that, she was a Computing Innovation Fellow at Harvard University.
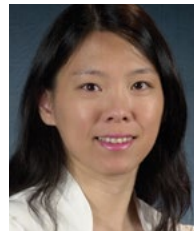
## Wei Wang

**IEEE ICDM Outstanding Service Award (2012)** for major contributions to the promotion of data mining as a field and to ICDM as the premier research conference on data mining.

Wei is a recent addition to the Computer Science Department faculty. Before joining the department in 2012, she was a faculty member at the University of North Carolina at Chapel Hill and a researcher at IBM's T.J. Watson Research Center.

# Center for Domain-Specific Computing (CDSC)

**Director**
**Jason Cong** (Computer Science, UCLA)

**Associate Director**
**Vivek Sarkar** (Computer Science, Rice Univ.)

**Team Members**
**Jens Palsberg, Miodrag Potkonjak, and Glenn Reinman** (Computer Science, UCLA)
**Denise Aberle, Alex Bui, Aichi Chien, and William Hsu** (Geffin School of Medicine, UCLA)
**M.C. Frank Chang** (Electrical Engineering, UCLA)  and **Luminita Vese** (Mathematics, UCLA)
**Richard Baraniuk** (Electrical & Computer Engineering, Rice Univ.)
**Tim Cheng** (Electrical & Computer Engineering, UCSB)
**Saday Sadayappan** (Computer Science & Engineering, Ohio State Univ.)

The Center for Domain-Specific Computing (CDSC) was funded in 2009 by NSF's Expeditions in Computing program for the purpose of developing high-performance, energy-efficient, customizable computing to revolutionize the way computers are used in health care and other important applications. The Center is a collaborative effort between UCLA'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.  For CDSC, a significant domain is health care—largely because health care has such a major impact on issues of national economy and quality of life. Specifically, our focus is on medical imaging and hemodynamic modeling to provide 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 new courses and summer programs developed by researchers from all four universities. For example, a new graduate course (CS 259) on architecture and compilation for domain-specific computing was introduced three years ago.

In May 2013, CDSC and Harvard's Microrobotics Lab were selected by NSF to host the first Expeditions in Computing PI Meeting, with over 100 attendees composed of members of the 14 Expeditions teams, NSF division and program directors, and interested parties from industry (such as Microsoft, Intel and IBM). The three-day meeting included talks, presentations and panels—culminating in a popular poster session at NSF headquarters. The diverse poster topics ranged from robotic bees that provide unique insights into how Nature conjures elegant solutions to complex problems, to domain-specific computing designs that will revolutionize the role of medical imaging and hemodynamic modeling in health care. (http://cadlab.cs.ucla.edu/expeditions_pi_meeting)

Research efforts within the Center have led to multiple awards: the FPGA 2013 best paper award for "Polyhedral-Based Data Reuse Optimization for Configuration Computing" (joint between OSU and UCLA); and two consecutive ACM TODAES best paper awards from Professor Cong's group for "Automatic Memory Partitioning and Scheduling for Throughput and Power Optimization," 2011, and "Behavior-Level Observability Analysis for Operation Gating in Low-Power Behavioral Synthesis," 2012.
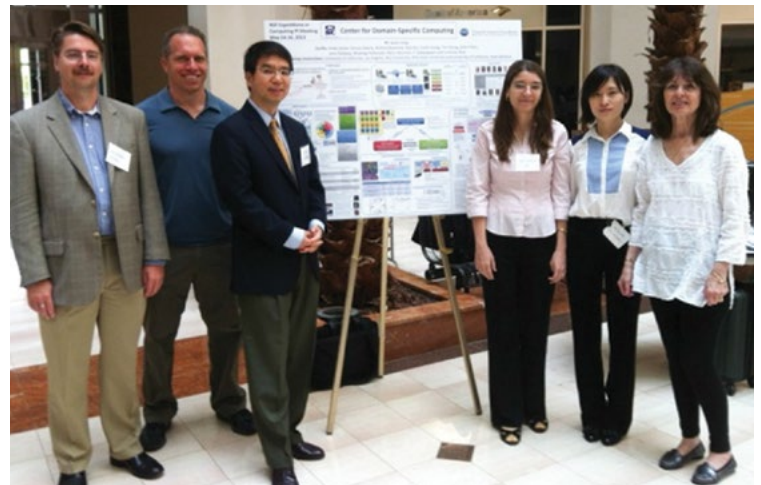


*Expeditions Poster Session, May 2013 (CDSC team members, left to right)*
*Jens Palsberg (Chair, CS Department, UCLA)*
*Glenn Reinman (CS Associate Professor, UCLA)*
*Jason Cong (CS Professor, Director CDSC, UCLA)*
*Alina Sbirlea (Graduate Student, Rice Univ.)*
*Hui Huang (Graduate Student, UCLA)*
*Janice Wheeler (Meeting Coordinator, UCLA)*

# UCLA Wireless Health Institute (WHI)

Directors
Bruce Dobkin (Medicine), William Kaiser (EE), and Majid Sarrfzadeh (CS)
http://www.wirelesshealth.ucla.edu/

Wireless health is by far the most comprehensive merging of medicine and technology yet conceived. No prior field has so broadly addressed the urgent needs of healthcare quality, healthcare delivery, and individual patient needs with matching technology solutions. And at no prior time has the cost of physiological monitoring products been lower or the accessibility of wireless network access been more universally ubiquitous. UCLA's Wireless Health Institute recognizes this and brings all elements of wireless health together with fundamental new measurement principles, complete wireless biomedical devices and instruments, signal processing, sensor fusion, and information technology. Our wireless health system begins first with wireless sensors that are worn by subjects, appear in handheld instruments, or are installed in a patient's home or clinic room. Next, data from wearable wireless sensors and instruments is conveyed by wireless networking to both smartphone handheld devices and also to the global Internet. Finally, algorithms hosted on both smartphone handheld devices and centralized enterprise computing deliver subject condition recognition and tracking, and guidance to users and caregivers.



*WHI Exergaming system*

**WHI Predicts and Reduces Readmission**. WHI has developed an end-to-end remote monitoring system for congestive heart failure patients that has been deployed in several clinical trials. Study participants are provided with Bluetooth-enabled weight scales, blood pressure monitors, landline or Ethernet gateways, and an Android smartphone that monitors daily activities. In some of the studies, the system achieves a greater than 93% compliance from patients. A large ongoing clinical study involves monitoring 1500 heart failure patients enrolled from six sites (UCLA, UC-Davis, UCSF, UCI, UCSD, and Cedar Sinai Hospital). The WHI analytics engine uses context-aware prediction to improve prediction accuracy and to evaluate the contribution of contextual factors such as patient demographics, biological factors, literacy, and genetic factors in medical complications, as well as in predicting hospital readmissions.



*WHI remote monitoring system (WANDA)*

**WHI Prevents Child Obesity Through Active Gaming**. Obesity is a growing epidemic that could affect half of all Americans in the next twenty years, and the problem is starting at increasingly younger ages due to increased sedentary behavior such as watching television and playing video games. The new field of exergaming integrates exercise activity and health information into the video games children and young adults are playing. The WHI Exergaming system uses gyroscope and accelerometer sensors attached to the foot of a user to create a soccer exerGUI that uses a machine-learning algorithm for analyzing real-time fine-motor skill movements of the human body. This system was presented at the 9th International Conference on Wearable and Implantable Body Sensor Networks where it won the award for best demonstration. Now this project has received institutional review board approval to conduct a pilot study of 25 healthy young adults to validate the clinical benefits.

**WHI Reduces HbA1c in Diabetes Patients**. WHI has developed an in-home monitoring system that reduces HbA1c in high-risk diabetes patients by 25% while enhancing patient compliance by minimizing the amount of daily tasks that patients need to complete. The study was designed as a randomized control trial for 56 Type 2 diabetes patients who are older than 18 years. Caregivers provided education materials related to diabetes to both standard care (control) and wireless monitoring (intervention) groups. Patients were asked to measure their blood sugar (using a Bluetooth-enabled blood glucose meter) three times a day and answer questionnaires once a day. Caregivers received email alerts when readings were out of the predefined acceptable ranges. HbA1c was reduced from 9.8 at enrollment to 7.3 at a three-month follow-up (HbA1c of less than 7.5 is considered normal).

# 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

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 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 Binational Science Foundation 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. It also explores applications of cryptography to other areas, such as bioinformatics, hardware-assisted technologies, and tamper-proof 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.

## CICS Exploration and Development

• 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

# Center for Autonomous Intelligent Networks and Systems (CAINS)



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

## Director
Professor Mario Gerla

## Scientific Board
Babak Daneshrad, Leonard Kleinrock, Izhak Rubin, Mani Srivstava, John Villasenor (UCLA); Rajive Bagrodia (SNT)
http://www.cains.cs.ucla.edu

The Center for Autonomous Intelligent Networks and Systems (CAINS) was established in 2001 with the participation of various 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 seminars, short courses and joint research projects.

Many research projects are underway—for example, the use of unmanned autonomous vehicles (UAVs), the coordination of vehicles into "computing clouds," and the integration of body sensors and smart phones into m-Health systems. 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
- Underwater unmanned vehicles
- Mobile sensor platforms
- Network coding



*Professor Mario Gerla and members of the graduate student research team*
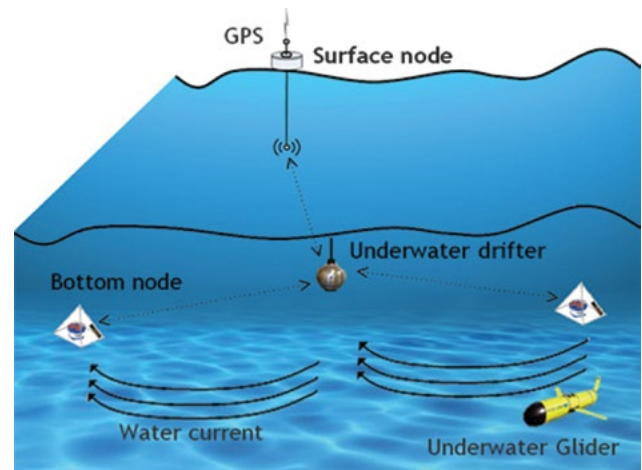


*Underwater positioning system for subsurface ocean current studies*

## Collaborations

Tactical MANETs (SRI)
Autonomous agent-based systems (Univ. Trento, Italy)
Vehicular clouds (CISCO)
Mesh networks (Politecnico di Milano, Italy)
Large-scale disruption-tolerant wireless networks (Boeing)
Vehicular communications research (Toyota)
Health networks (Politecnico di Milano, Italy)

# How to Encrypt Software

UCLA computer science professor Amit Sahai and a team of researchers have designed a system to encrypt software so that a user can only use a program as intended, while deciphering the code behind it would also be prevented. This is known in computer science as software obfuscation, and for the first time, it has become a reality. The research was funded in part by the National Science Foundation, awards from Xerox and Google, and grants from Intel and the Okawa Foundation.

Sahai, who specializes in cryptography at UCLA's Computer Science Department, collaborated with Sanjam Garg (former UCLA doctoral student now at IBM Research), Craig Gentry, Shai Halevi and Mariana Raykova (also at IBM Research), and Brent Waters (assistant professor at the University of Texas at Austin). Their peer-reviewed paper, "Candidate Indistinguishability Obfuscation and Functional Encryption for All Circuits," is being presented at the 54th annual IEEE Symposium on Foundations of Computer Science—one of the most prominent conferences in the field of theoretical computer science. Sahai also presented this research in recent invited talks at Stanford and MIT.

According to Sahai, the real challenge and the great mystery in this research is whether you can actually take a piece of software and encrypt it, but still have it runnable, executable and fully functional. This is a problem that a lot of companies have been interested in for a long time.

Previously, techniques for obfuscation presented only "speed bumps," forcing an attacker to spend some effort—perhaps even a few days—trying to reverse-engineer the software. This new system puts up an "iron wall," making it impossible for an adversary to reverse-engineer the software without solving mathematical problems that would take hundreds of years to work out on today's computers—truly a game-change in the field of cryptography.

The central innovation in this work is a way of transforming software into what Sahai terms a mathematical jigsaw puzzle. The puzzle pieces, which are actually just numbers, can only be meaningfully combined in very limited ways—any attempt to combine the puzzle pieces in an unauthorized way will result in a nonsensical jumble of numbers. This mathematical obfuscation has many applications, such as protecting intellectual property by preventing the theft of new algorithms and hiding the vulnerabilities for which software patches are designed and distributed.
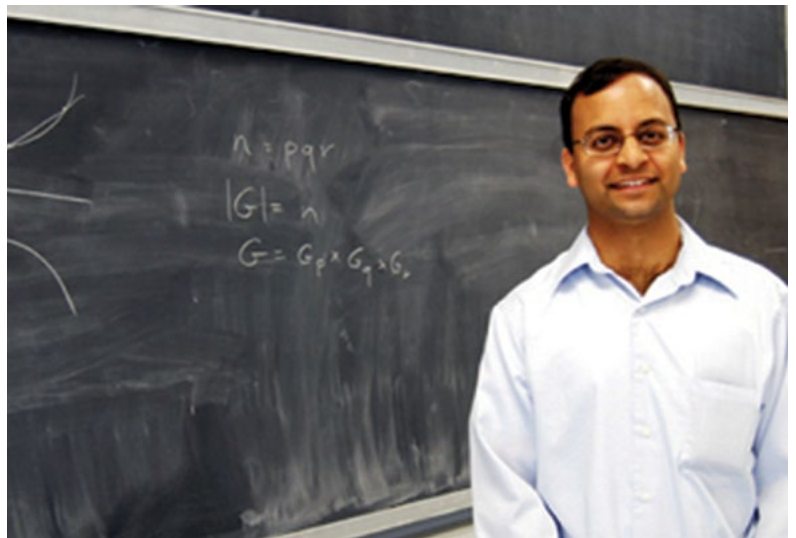


*Professor Amit Sahai*

The new technique for software obfuscation has paved the way for another breakthrough called functional encryption. With functional encryption, instead of sending an encrypted message, an encrypted function is sent in its place. This offers a much more secure way to protect information. With this technique, a single message can be sent to a group of people in such a way that each person will receive different information, depending on the characteristics of that particular receiver. For example, a hospital can share the outcome of a treatment without revealing any other information about the patient.

# UCLA/PKU Joint Research Institute in Science and Engineering

In 2008 UCLA Chancellor Gene Block visited Peking University (PKU) to propose a collaboration between the two universities—one that would reach across continents to transcend differences in language and culture, and foster breakthroughs in science and engineering, accelerate technology transfer, and enable researchers to approach their work from a global perspective. That proposal became a reality in 2009 with the establishment of the Joint Research Institute in Science and Engineering (JRI). Computer science professor Jason Cong has served as founding co-director of JRI since its inception and continues to be instrumental in its ongoing development.

JRI has accomplished its initial goals. Over the past four years, 100 UCLA faculty members from the diverse areas of physical science, engineering and applied science, life sciences and medical sciences became members of the UCLA/PKU collaboration. Research topics cover a wide range of areas—from clean energy and environmental studies to information technologies and biologic and medical sciences. This led to dozens of joint research papers in publications such as the *Journal of Geophysics Research, Applied Physics Express, Design Automation Conference*, and the *Chinese Journal of Electronics*.  CS faculty members authored several joint papers with PKU in the areas of electronic design automation (Jason Cong), wireless communication (Songwu Lu), and wireless health (Majid Sarrafzadeh). At least 13 collaborative projects are currently underway, including the Clean Energy Research Center at UCLA, the UCLA/PKU Center for Research on the Tibetan Plateau and Global Climate Change, and research that addresses the effect of pollution on air quality and health in Bejing.

As part of its global perspective, JRI also created research exchange programs for graduate and undergraduate students from both universities. To date, 64 PKU students have traveled here to engage in research under the mentorship of UCLA faculty. And, after completing a class in Chinese that is tailored to engineering and science, 48 UCLA students traveled to Beijing to engage in research with their Chinese counterparts.

JRI is now venturing into a new academic arena with a coordinated PKU B.S./UCLA M.S. program currently piloted in UCLA's computer science and electrical engineering departments. The program enables PKU students in their fourth year of undergraduate study to complete their PKU degree at UCLA, finishing their undergraduate thesis research in a UCLA lab while also taking graduate courses. Upon successful completion of their B.S. degree and 12 units of UCLA graduate coursework, PKU students will matriculate into a UCLA graduate program where they can complete a master's degree in one year. Under this program, five PKU students will be here at UCLA in the fall of 2013.

# Safe and Reliable Multicore Programming

Multicore computer chips, which contain multiple independent processing units that execute in parallel, are now the industry standard for everything from data centers to smartphones. The advent of multicore processors has moved parallel programming from a relative niche area to the mainstream—programmers must now "think in parallel" in order to get the maximum performance out of their hardware. Unfortunately, the support for multithreaded programming in mainstream programming languages such as C, C++, and Java is extremely fragile: one small programming mistake can cause unintuitive program behaviors and introduce subtle security vulnerabilities that are difficult to detect and correct.

For the past several years, Professor Todd Millstein and Ph.D. student Dan Marino (a recent graduate who is now with Symantec Research Labs), along with collaborators at the University of Michigan and Microsoft Research, have been working to restore program safety and programmer sanity to multicore programming. Contrary to popular belief, they demonstrated that it is possible to provide the most intuitive semantics for multithreading, known as sequential consistency (SC), with minimal performance penalty over the state of the art. The key to their success has been to take a holistic approach, carefully defining the interfaces among all levels of the programming stack in such a way that the hardware and the compiler retain the flexibility to perform aggressive optimizations while still providing strong guarantees to programmers.

Marino received the 2012 ACM SIGPLAN Outstanding Doctoral Dissertation Award, presented annually to the author of the outstanding doctoral dissertation in the area of programming languages, for his research on the compiler portion of this project. Further, the research team's paper on efficient SC hardware, presented at the flagship computer architecture conference ISCA, was selected by IEEE Micro magazine as one of 2012's most significant research papers in computer architecture based on novelty and long-term impact.
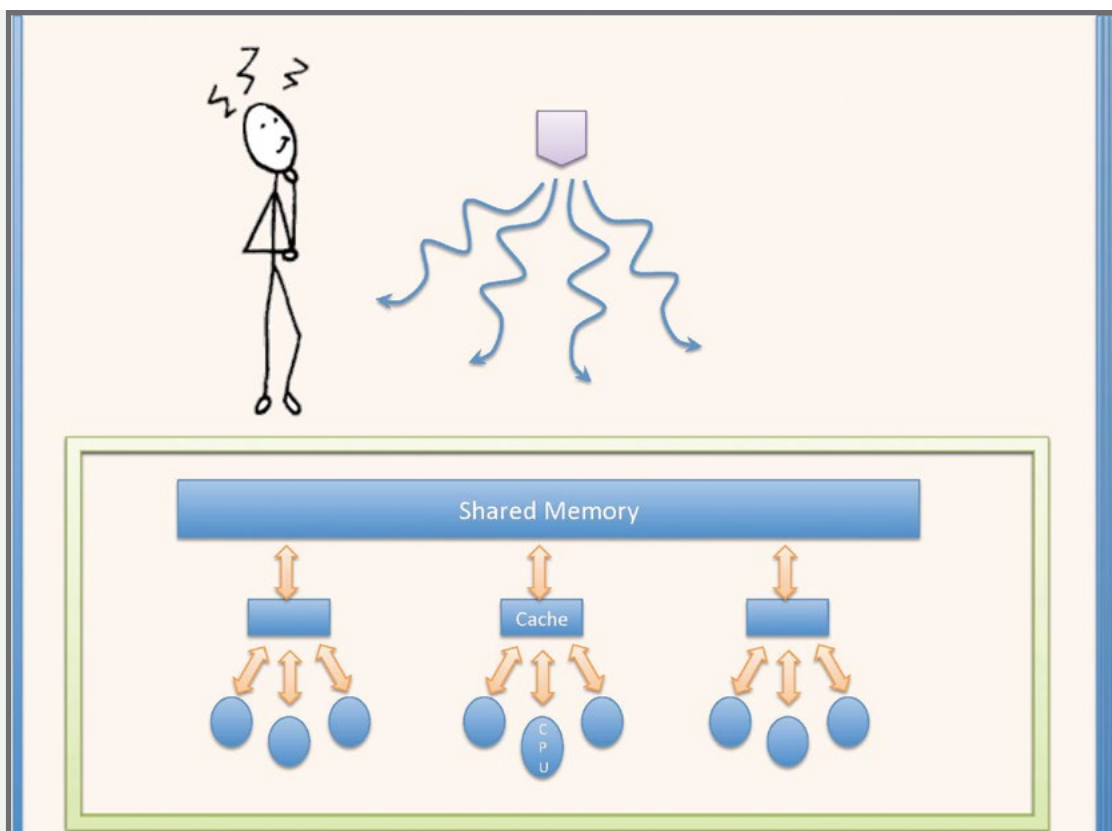


*The advent of multicore processors has moved parallel programming from a relative niche area to the mainstream—programmers must now "think in parallel" in order to get the maximum performance out of their hardware.*

# Searching for Complex Patterns in Databases and Data Streams

The continuous growth of data, and the demand for smart analytics to mine this data, are creating major transformative opportunities in science and industry. To fully capitalize on these opportunities, computing technology must solve the three-pronged challenge created by 1) the exploding size of "big-data," 2) the growing complexity of big data, and 3) the increased sophistication of analytics that can be used to extract patterns and trends from such big data. For instance, past information systems often relied on relational databases to query sets of flat records; now we must support scalable queries that can search for complex patterns in databases containing records with complex internal structure. Professor Carlo Zaniolo has made major research contributions in this area, starting with the introduction of Kleene-closure constructs that have provided the basis for new SQL standards. More recently, Zaniolo and his students have extended these ideas to XML query languages and documents, making possible many new applications—including those briefly discussed next.

The need to detect temporal patterns in the stored event sequences, or in real-time data streams, is ubiquitous. For example, stock analysts are keen to detect situations where the closing price of a stock obeys the double-bottom pattern, since this often precedes the price climbing above the previous maxima ($20 as shown below on the left). On the other hand, after a wedge of rising prices, any break through the bottom support level is often followed by further drops (as shown in the rising-wedge pattern on the right).
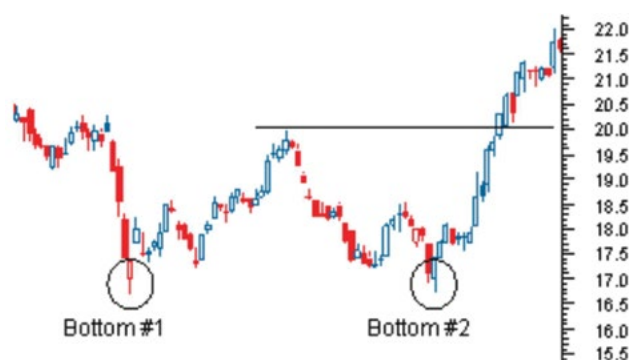


*Double-bottom pattern*
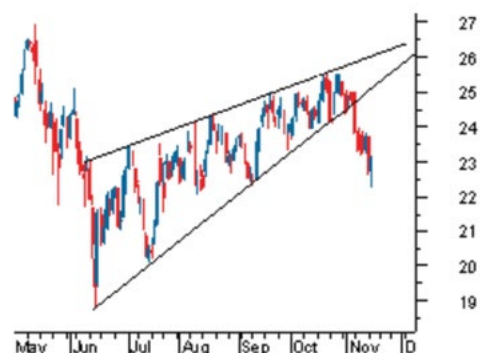


*Rising-wedge pattern*

Analysis of genomic sequences represents another important application area. For instance, RNA sequences consist of a primary linear sequence, e.g., the nucleotides sequence (A, C, G, U) shown below on the left, and several secondary nested structures, e.g., the hydrogen bonds between complementary nucleotides depicted by dotted red lines in the figure.
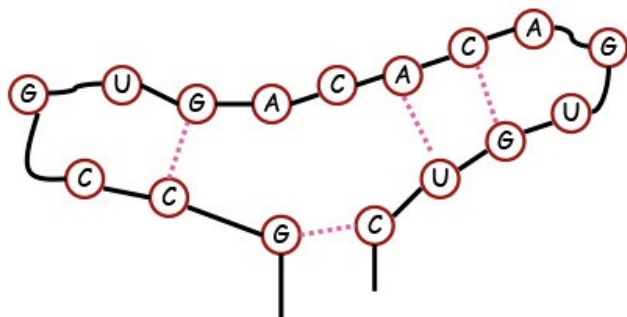


*Primary and secondary RNA structure*

```
<main>
   ...
      <fibonacci @input = '500'>
      <fibonacci @input = '499'>
       ...
         <exception @msg = 'overfolow' />
      </fibonacci>
   </fibonacci>
   ...
</main>
```

*XML code*

Software analysis and debugging provides yet another important application area. The XML snippet above right shows a software trace of a function `fibonacci` that recursively called itself, but in the end threw out an exception.

In addition to designing powerful user-friendly query languages for pattern-search analytics, Zaniolo and his students have developed very efficient query optimization techniques for these languages by exploiting recent advances in automata theory. This has produced several successful demos and best-paper awards.

# New Faculty

### Jason Ernst, *Assistant Professor*
*Ph.D. 2008 (Carnegie Mellon University)*

Jason Ernst joined the faculty at UCLA in 2012 as an assistant professor in both the Computer Science Department and the Department of Biological Chemistry. Prior to this, he was a postdoctoral fellow in the Manolis Kellis' Computational Biology Group in the Computer Science and Artificial Intelligence Laboratory at MIT and was affiliated with the Broad Institute.

Jason's research is in the fields of computational biology and bioinformatics, and concerns the development and application of machine learning methods for the analysis of high-throughput experimental data to address problems in epigenomics and gene regulation.

In 2013 Jason was the recipient of a Sloan Fellowship in recognition of his distinguished performance and unique potential, and an NSF CAREER Award for expanding the dimensions of computational epigenomic modeling and analysis.
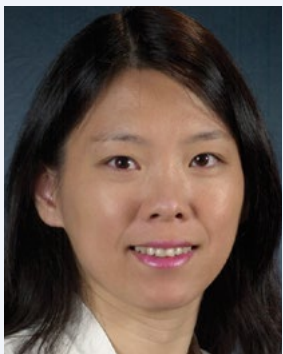
### Wei Wang, *Professor*
*Ph.D. 1999 (Univ. of California, Los Angeles)*

Wei Wang joined the Computer Science Department as a professor in 2012 after being with the University of North Carolina at Chapel Hill for 10 years working with the Carolina Center for Genomics Sciences and the Lineberger Comprehensive Cancer Center. Prior to that, Wei was part of the research staff at the IBM Watson Research Center.

Wei's research interests include big data, data mining, bioinformatics and computational biology, and databases.

Among other numerous awards, Wei recently received a 2012 IEEE ICDM Outstanding Service Award for major contributions to the field of data mining and to ICDM as the premier research conference on data mining. She has filed seven patents and published more than one hundred research papers in international journals and major peer-reviewed conference proceedings.

## Van Jacobson, *Adjunct Professor*

### M.S. 1972 (University of Arizona)

Van Jacobson, renowned for his work on TCP/IP network performance and scaling and a primary contributor to the TCP/IP protocol stack, joined the Computer Science Department as an adjunct professor in 2013.

Van first worked with the Lawrence Berkeley Laboratory as a research scientist, and later served as chief scientist for Cisco Systems, Packet Design, Inc., and Precision I/O. Since 2006 he has been with the Palo Alto Research Center where his research focus is on content-centric networking.

Van is widely credited with enabling the Internet to expand in size and support increasing speed demands—and helping it survive a major traffic surge in 1988-1989 without collapsing. His TCP algorithms were instrumental in solving the problem of congestion and are used in over 90% of Internet hosts today.  In 2012 Van was inducted into the Internet Hall of Fame. He is also a member of the National Academy of Engineering.

## Tyson Condie, *Assistant Professor*

### Ph.D. 2011 (Univ. of California, Berkeley)

Tyson Condie joined the Computer Science Department in 2012 as an assistant professor. His research is guided by extensive prior experience in today's high-tech industry— Intel Research, Yahoo! Research, and Microsoft's Cloud & Information Services Lab.

Tyson's main expertise is in building large-scale distributed systems for processing massive datasets and runtimes for declarative languages. For the last five years he has worked extensively on building technologies for the Hadoop (Big Data) runtime system. His MapReduce Online work extended Hadoop with novel streaming capabilities and provided the basis for startup ventures like HStreaming. He has also done extensive work on the Yahoo! Pig runtime, which is a SQL engine built on top of Hadoop.

As a founding member of the Declarative Networking/Systems project, Tyson helped explore the use of Datalog for building networking protocols and distributed systems. The research from this project today serves as a foundation for the OpenFlow architecture.

# Artificial Intelligence

The computational study of intelligent behavior. This includes 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.

### 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.

### Michael Dyer

*Professor, Ph.D.*
*(Yale 1982)*

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

### Jennifer Wortman Vaughan

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

Machine learning, learning theory, incentive design, and social computing.
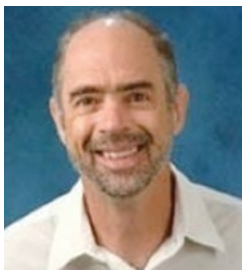
### Richard Korf

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

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

http://reasoning.cs.ucla.edu/samiam/

***Samiam*** *is a tool for modeling and reasoning with Bayesian networks developed by the Automated Reasoning Group; it has been adopted worldwide in both research and education. Color and size of dots indicate number of downloads.*

# 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; 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.

### 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.

### Milos Ercegovac

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

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

### Majid Sarrafzadeh

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

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

### 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.

### 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.

### Miodrag Potkonjak

*Professor, Ph.D.*
*(UC Berkeley 1991)*

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

# Computational Systems Biology

An integrative approach to understandng 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.

### 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.

### Eleazar Eskin

*Associate Professor, Ph.D.*
*(Columbia 2002)*

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

### 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)

### Jason Ernst

*Assistant Professor, Ph.D.*
*(Carnegie Mellon University 2008)*

Computational biology and bioinformatics with a focus on machine learning methods for the analysis of high-throughput experimental data to address problems in epigenomics and gene regulation. (Joint appointment with the Department of Biological Chemistry)

### 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.

# 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.



*Populating virtual scenes*

# 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, big data, data mining, distributed databases, data stream management systems, and information systems for medicine and science.

### Alfonso Cárdenas

*Emeritus 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.

### 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.
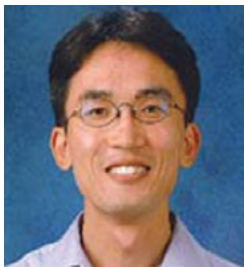
### Junghoo (John) Cho

*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.
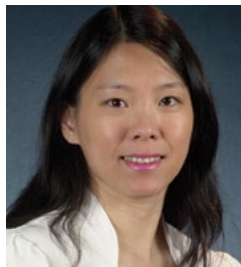
### Wei Wang

*Professor, Ph.D.*
*(UC Los Angeles 1999)*

Big data, data mining, bioinformatics and computational biology, and databases.

### Wesley Chu

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

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

### Carlo Zaniolo

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

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

### Tyson Condie

*Assistant Professor, Ph.D.*
*(Univ. of California, Berkeley 2011)*

Large-scale data analytics, distributed systems, Internet-scale query processing and optimization, declarative language design and implementation.

# Network Systems

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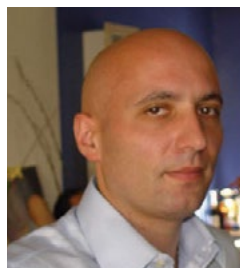
### Deborah Estrin

*Adjunct Professor, Ph.D.*
*(MIT 1985)*

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

### 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).

### Van Jacobson

*Adjunct Professor, M.S.*
*(University of Arizona 1972)*

TCP/IP network performance and scaling. Content-centric networking.

### 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.

### Songwu Lu

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

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

### Giovanni Pau

*Adjunct Professor, Ph.D.*
*(University of Bologna 1998)*

Mobile computer network environments, wired and wireless networks. Distributed systems, Internet information systems, replication, peer-to-peer, overlay networks.

### Peter Reiher

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

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

### 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.

### 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)

### Lixia Zhang

*Professor, Ph.D.*
*(MIT 1989)*

Internet architecture, principles of 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 programing 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.

### Rupak Majumdar

*Adjunct 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.

### Paul Eggert

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

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

### Carey Nachenberg

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

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

### Alan Kay

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

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

### 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)

### 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.

### Jens Palsberg

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

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

### Todd Millstein

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

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

### David Smallberg

*Senior Lecturer SOE, 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.

### Amit Sahai

*Professor, Ph.D.*
*(MIT 2000)*

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

### Sheila Greibach

*Emeritus Professor, Ph.D.*
*(Harvard 1963)*

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

### 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.

### 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.

have two tuples $(A_1, A_2, A_3)$ and $a_2, a_3)$ and $(b_1, b_2, b_3)$ with respect to want to prove that $a_1 + a_2 + a_3 = 0$ to $(A_1^{-1}, A_2^{-1}, A_3)$ or $(B_1^{-1}, B_2^{-1}, B_3)$ owing that

$$0 = \sum_{i=1}\sum_{j=1} a_i b_j = (a_1 + a_2 + a_3)(b_1 + b_2 + b_3).$$

We first give the intuition behind our scheme, and then the formal description and proof of correctness. Using the bilinear map, we can compute

$$
\begin{aligned}
e(A_1, B_1) &= e(f, f)^{a_1 b_1} & e(A_1, B_2)e(A_2, B_1) &= e(f, h)^{a_1 b_2 + a_2 b_1} \\
e(A_2, B_2) &= e(h, h)^{a_2 b_2} & e(A_1, B_3)e(A_3, B_1) &= e(f, g)^{a_1 b_3 + a_3 b_1} \\
e(A_3, B_3) &= e(g, g)^{a_3 b_3} & e(A_3, B_2)e(A_2, B_3) &= e(h, g)^{a_2 b_3 + a_3 b_2}
\end{aligned}
$$

The goal is to show that these six exponents sum to 0.
 Consider the following matrix

$$
M = \begin{pmatrix}
e(A_1, B_1) & e(f, h)^t e(A_1, B_2) & e(f, g)^{-t} e(A_1, B_3) \\
e(h, f)^{-t} e(A_2, B_1) & e(A_2, B_2) & e(h, g)^t e(A_2, B_3) \\
e(g, f)^t e(A_3, B_1) & e(g, h)^{-t} e(A_3, B_2) & e(A_3, B_3)
\end{pmatrix},
$$

# Emeriti Faculty

### Algirdas Avižienis

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

Computer system architecture, fault-tolerant computing.

### Lawrence McNamee

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

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

### Jack Carlyle

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

Communication, computation theory, algorithms and complexity.
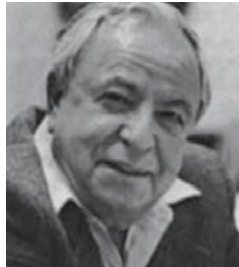
### Michel Melkanoff

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

Programming languages, data structures, database design.

### Thelma Estrin

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

Biomedical engineering, computers in neuroscience, engineering education.

### David Rennels

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

Computer systems architecture, fault-tolerant computing.

### Allen Klinger

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

Image and pattern analysis, database systems, computer education.

### Jacques Videl

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

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

### Leon Levine

*Senior Lecturer, M.S.*
*(MIT 1949)*

Computer methodology.

# Featured Faculty

### *"Renaissance Man": A person with many talents or areas of knowledge*

By any standards, Professor Judea Pearl would be called a "Renaissance man," although that term seems rather inadequate considering the scope of his accomplishments in science, philosophy, and human reasoning, and in his involvement with the community and international groups to benefit mankind.

World-renowned for research on the probabilistic approach to artificial intelligence, the invention of Bayesian networks, and a calculus of casual and counterfactual inference, Judea received his B.S. from the Technion-Israel Institute of Technology in 1960, and both an M.S. from Rutgers, and a Ph.D. from Brooklyn Polytechnic in 1965. Following his five years in industry, UCLA was immensely fortunate to have Judea join its faculty. His current passion is to convince universities that causal inference is easy and should be taught at the undergraduate level.

Judea's awards and honors are almost too lengthy to enumerate. To briefly describe a few:

*A.M. Turing Award*—for innovations that enabled remarkable advances in the partnership between humans and machines that is the foundation of artificial intelligence. The Turing Award is widely considered to be the Nobel Prize in computing.

*Distinguished Visiting Professor*—Technion-Israel Institute of Technology, to foster collaborative research in the areas of robotics and machine learning.

*Member American Academy of Arts and Sciences*—current membership includes more than 250 Nobel laureates and more than 60 Pulitzer Prize winners.

*Member National Academy of Engineering*—for developing the foundations for reasoning under uncertainty.

*Harvey Prize*—for foundational work that touched a multitude of spheres of modern life.

*David. E. Rumelhart Prize*—for outstanding contributions to the theoretical foundations of human cognition.

*Purpose Prize*—for creating the Daniel Pearl Dialogue for Muslim-Jewish Understanding.

*Benjamin Franklin Medal in Computers and Cognitive Science*—for creating the first general algorithms for computing and reasoning with uncertain evidence.

*ACM/AAA Allen Newell Award*—for career contributions that have breadth within computer science or that bridge computer science and other disciplines.

*IEEE AI Hall of Fame*—for a lifetime of accomplishments and contributions.

*Honorary Doctorates*—Chapman College, Texas A&M University, and University of Toronto.

*A Fellow of*—Cognitive Science Society, American Association of Artificial Intelligence (AAAI) and Institute of Electrical and Electronic Engineers (IEEE).

In addition to science, Judea's interests include music (piano, guitar and voice) and early books on science, philosophy, and Judaica. Judea also devotes a great amount of time and energy to the Daniel Pearl Foundation, which he founded to honor the memory of his son by promoting Daniel's values of tolerance and respect for people of all cultures, unshakable belief in the effectiveness of education and communication, and the love of music, humor, and friendship.

# Remembering

**Professor Bertram Bussell**, an esteemed member of the Computer Science Department and a long-time friend and colleague to many, passed away in July 2012, at age 88.

Born and raised in New York City, Bert first attended NYU, then moved on to UCLA to receive his B.S., M.S. and his 1962 Ph.D. In 1969 he joined the engineering faculty at UCLA and was one of the original members of the newly formed Computer Science Department. His research explored the areas of electric circuit theory, heat transfer, computer system architecture, and computer graphics.

During his tenure at UCLA, Bert taught abroad in Brazil, Chile, England, and Israel. He was selected many times by students as their favorite instructor and received an Outstanding Teaching Award from the School of Engineering.

**Professor Gerald Estrin**, an outstanding teacher, computer scientist, and friend to many here at UCLA, passed away in March 2012, at age 90.

Jerry earned his B.S., M.S. and 1951 Ph.D. at the University of Wisconsin. In 1954 Jerry left for Israel to lead the development of the first computer in the Middle East. Expertise was scarce, but in just 15 months, he and his team developed WEIZAC, the first large-scale computer outside the U.S. and Western Europe.

Jerry joined the UCLA faculty in 1956, serving as chair of the Computer Science Department from 1979 to 1982 and again from 1985 to 1988. His accomplishments were manifold, and many of the original Internet pioneers were fortunate to have been his students or colleagues.

**Professor Boris Kogan**, whose groundbreaking scientific work and his 1987 immigration from the Soviet Union were an inspiration to all, passed away in April 2012, at age 98.

Boris' B.S. and M.S. degrees were from the Charkov Electrical Engineering Institute, and his Ph.D. from Moscow's Institute of Automation & Telemechanics, USSR Academy of Science. In the Soviet Union his scientific interests targeted automatic control, computer design, and computer simulation. In 1951 he was awarded the USSR State Prize for creating the first analog computer.

Boris served as an adjunct professor with the Computer Science Department for over two decades, focusing his research on the peculiarities of electrical wave propagation along healthy and diseased heart muscle. Working with cardiologists, his goal was to find the mechanisms of heart fibrillation and the corresponding preventions.

**Professor Robert (Buz) Uzgalis**, an amazing individual and former professor in the Computer Science Department, passed away in March 2012, at age 71.

Buz served UCLA for many years, beginning in 1964 as a computer programmer in the sociology and anatomy departments. He later became a lecturer in the Computer Science Department, and then served as a professor from 1973 to 1985. He was a classic self-trained computer scientist and an inspiration to his colleagues and students.

Always an adventurer, after leaving UCLA Buz moved to the Far East, engaging in research at Sumitomo Metal Industries in Osaka until 1990, then research and teaching at the University of Hong Kong until 1993, and then off to New Zealand and the University of Auckland until 1997. After finally returning to Los Angeles, Buz developed the Tigertail Virtual Museum, one of the first successful virtual art museums.

# The Jon Postel Distinguished Lecturer Series (2013-2014)

This series is dedicated to the memory of Dr. Jon Postel—an alumnus of UCLA's Computer Science Department, a gentle man, and 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.



UCLA

**Computer Science Department**

**THE JON POSTEL
DISTINGUISHED LECTURER SERIES
2013-2014**

Thursday
November 14
2013

JOSEPH M. HELLERSTEIN*
UC Berkeley and Trifacta Inc.
The CALM Theorem: Positive Directions for Distributed Computing
*Norman E. Friedmann Distinguished Lecture*

Thursday
January 30
2014

LEONIDAS GUIBAS
Stanford University
The Functoriality of Data – Understanding Geometric Data Sets Jointly

Tuesday
April 29
2014

VIKRAM ADVE
University of Illinois at Urbana-Champaign
VISC: Virtual Instruction Set Computing

Lectures will be held in 3400 Boelter Hall at 4:15 p.m. and will be preceded by a reception.
For further information, visit www.cs.ucla.edu

# Federal and State: Contracts & Grants

| Agency | Title | Faculty |
|---|---|---|
| National Science Foundation | Scaling Machine Learning to Massive Datasets---A Logic Based Approach | Tyson Condie |
| Harvard University | NSF Expeditions in Computing PI Meeting | Jason Cong |
| Univ. of Michigan | The Center for Future Architectures Research (C-FAR) | J. Cong/G. Reinman |
| Office of Naval Research | Robust and Adaptive Machine Reasoning Under Uncertainty | Adnan Darwiche |
| Univ. of California, Berkeley | An Integrated Molecular Approach to Understand Variation in Iron Metabolism | Eleazar Eskin |
| National Science Foundation | Causal and Statistical Inference in the Presence of Confounding Factors | Eleazar Eskin |
| National Science Foundation | Meta-Analysis Reinterpreted Using Causal Graphs | Eleazar Eskin/Judea Pearl |
| National Institute of Health | Training Grant in Neurobehavioral Genetics | Eleazar Eskin |
| National Institute of Health | Informatics Center for Neurogenetics and Neurogenomics | Eleazar Eskin |
| National Science Foundation | Closing the Loop Between Traffic/Pollution Sensing and Vehicle Route Control Using Traffic Lights and Navigators | Mario Gerla |
| National Science Foundation | Ultraviolet Guardian: Real-Time Estimation of Pedestrians Ultraviolet Exposure | Mario Gerla |
| National Science Foundation | Ocean-Tune: A Community Ocean Testbed for Underwater Wireless Networks | Mario Gerla |
| Office of Naval Research | The Campus Vehicular Testbed: Vehicular Experiments to Support Tactical and Emergency Scenarios | Mario Gerla |
| National Science Foundation | Bridging Campus Resources via GENI and Openflow | Mario Gerla |
| Univ. of California, San Francisco | A New "Weigh" to Manage Ascites: Testing of a Weight Monitoring System for Patients with Decompensated Cirrhosis | Hassan Ghasemzadeh |
| U.S. Army Research Office | Applied Histography in Arpanet-Era Management and Innovation | Leonard Kleinrock |
| National Science Foundation | Symposium on Combinatorial Search - 2013 | Richard Korf |
| National Science Foundation | Scalable Scheduling for Program Transformations in Hetergeneous Computing | Louis-Noel Pouchet |
| National Science Foundation | Systematic Analysis of Protocol Implementations | Todd Millstein |
| National Science Foundation | IEEE Symposium on Foundations of Computer Science 2012 | Rafail Ostrovsky |
| National Science Foundation | Workshop on High-Level Programming Models for Parallelism | Jens Palsberg |
| National Science Foundation | Typed Self-Application | Jens Palsberg |
| U.S. Air Force Research Laboratory | Defensive Optimizing Compilation | Jens Palsberg |
| National Science Foundation | Participant Support and Organization of the Technical Demonstrations for the NSF-GENI GEC 13th at UCLA | Giovanni Pau |
| Office of Naval Research | Uncertain Multi-Modal Information Integration | Judea Pearl |
| National Science Foundation | Compositional Data Fusion | Judea Pearl |
| National Institute of Health | Center for HIV Identification, Prevention, and Treatment Services | Nithya Ramanathan |
| National Science Foundation | Transformative New Approaches to Efficient Secure Computation | Amit Sahai |
| National Science Foundation | Air Technology Translation Non-Invasive Monitoring Nutrition Necklace: Nimon Necklace | Majid Sarrafzadeh |
| National Institute of Health | Improving Health and Nutrition of Indian Women with AIDS and Their Children | Majid Sarrafzadeh |
| National Science Foundation | Limits of Communication | Alexander Sherstov |
| Univ. of California, Berkeley/ONR | Embedded Humans: Provable Correct Decision Making for Networks of Humans and Unmanned Systems | Stefano Soatto |
| National Geospatial-Intelligence Agency | Air-to-Ground and Ground-to-Air Correspondence for Pinpoint Localization, Mapping and Change Detection | Stefano Soatto |
| USAF Office of Scientific Research | Controlled Visual Sensing and Exploration | Stefano Soatto |

| Agency | Title | Faculty |
|---|---|---|
| National Institute of Health | Cancer Center Core Support Grant | Wei Wang |
| National Science Foundation | Toward Robust and Scalable Discovering of Significant Associations in Massive Genetic Data | Wei Wang |
| Univ. of North Carolina | Imputation and Analysis of Rare Variants in Admixed Populations | Wei Wang |
| National Science Foundation | Scaling Machine Learning to Massive Dataset - A Logic Based Approach | Carlo Zaniolo |
| Univ. of North Carolina | Discovering and Exploring Patterns in Subspaces | C. Zaniolo/W. Wang/E. Eskin |
| National Science Foundation | Scalable Analytics for Databases and Data Streams - A Unified Approach | Carlo Zaniolo |
| National Science Foundation | Bridging the Gap Between Application and Architecture and Network Architecture in Cyber-Physical Systems via Named Data Networking | Lixia Zhang |
| National Science Foundation | Making Internet Routing Data Accessible to All | Lixia Zhang |

## Industry and Other Organizations: Contracts & Grants

| Agency | Title | Faculty |
|---|---|---|
| Samsung Electronics | IEEE 802.11 Service Discovery | Mario Gerla |
| IBM Corporation | Inter-Domain Routing | Mario Gerla |
| Samsung Electronics | An Optimized Solution Toward Green Mobile Cloud Computing | Miodrag Potkonjak |
| Pelagique, LLC | Ultrasound Training for the Military Health System | Demetri Terzopoulos |
| Jackson Laboratory | Evolution, Organization, and Function | Wei Wang |

## Other Support From Industry

| Agency | Faculty | Agency | Faculty |
|---|---|---|---|
| Japan Patent Office | A. Cardenas/M. Potkonjak | Toyota | Giovanni Pau/Lixia Zhang |
| Google | Junghoo Cho | Association for Computing | Judea Pearl |
| Synopsys, Inc. | Jason Cong | Intel Corporation | Peter Reiher |
| Lockheed Martin | Jason Cong | Intel Corporation | Glenn Reinman |
| Mentor Graphics | Jason Cong | Wanda Corporation | Majid Sarrafzadeh |
| Broadcom Foundation | Jason Cong | Focus Ventures | Majid Sarrafzadeh |
| Intel Corporation | Jason Cong | Sage Products | Majid Sarrafzadeh |
| Xilinx | Jason Cong | Xerox Corporation | Yuval Tamir |
| IBM Corporation | Jason Cong | Blizzard Entertainment | Demetri Terzopoulos |
| Northrop Grumman | Adnan Darwiche | Cedars-Sinai Medical Center | Demetri Terzopoulos |
| Shopzilla | Milos Ercegovac | Okawa Foundation | Demetri Terzopoulos |
| Walt Disney Studio | Milos Ercegovac | Yahoo Inc. | Jennifer Vaughan |
| Adobe Systems | Milos Ercegovac | Microsoft Research | Jennifer Vaughan |
| Northrop Grumman | Mario Gerla | Teradata | Carlo Zaniolo |
| Utopia Compression Company | Mario Gerla | ARIN | Lixia Zhang |
| Futurewei Technologies | Songwu Lu | Verisign, Inc. | Lixia Zhang |
| Qualcomm | Jens Palsberg | Viasat, Inc. | Lixia Zhang |

## STUDENT LIFE AT UCLA

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 in student housing or apartment buildings within a one-mile radius of UCLA. The Village offers shops, restaurants, and theaters. Some of our students live in nearby communities like 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 when students need a temporary change of scenery, they can easily catch a bus to one of Southern California's sparkling beaches.

# Undergraduate Program

The Computer Science Department is home to over 700 undergraduate students. 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 infosessions 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. Further, the Department offers classes and research programs that are grounded in real-world problems existing in science and industry, thus giving undergraduates an experience of "life as a graduate student."

The Department offers a bachelor of science degree in both computer science (CS) and computer science and engineering (CS&E). The key difference between the CS and CS&E degrees is that the latter is designed to accommodate those students who desire a strong foundation in computer science, but who also have a strong interest in computer system hardware. The CS&E program is accredited by the Computing Accreditation Commission and the Engineering Accreditation Commission of ABET (http://www.abet.org). The CS program is accredited by the Computing Accreditation Commission of ABET.

## Undergraduate Program Advisory Board

The Undergraduate Advisory Board meets annually to review our undergraduate program and refine the department's goals. Chaired by David Smallberg, the advisory board comprises the following representatives from industry, academia, alumni, and our own student organization leaders.

**Leon Alkalai,** JPL & UCLA CSD
**Joseph Bannister,** USC, ISI
**Peter Blankenship,** Northrop Grumman
**Jon Canan,** Microsoft MSN Direct
**Preston Chan,** UCLA CSD Undergraduate
**Paul Eggert,** UCLA CSD
**Michael Erlinger,** Harvey Mudd College
**Leana Golubchik,** USC
**Ryan Kastner,** UCSB
**Pekka Kostamaa,** Teradata
**Laurie Leyden,** UCLA CSD Staff

**Samir Mody,** UCLA CSD Undergraduate
**Richard Muntz,** UCLA CSD
**Ross Niebergall,** Raytheon
**Joseph Ou-Yang,** IBM
**Frank Pearce,** Blizzard Entertainment
**David Rennels,** UCLA CSD
**John Rosati,** Cleo Consulting Partners
**Troy Sankey,** UCLA CSD Undergraduate
**Mike Sievers,** Time Logic, Inc.
**David Smallberg,** UCLA CSD
**Ben Zamanzadeh,** DataPop

# Graduate Program

Graduate students at UCLA have access to a friendly, cooperative, vibrant community. The Computer Science Graduate Student Committee (CSGSC) organizes events that include an annual fall picnic and a popular weekly "tea time" with gourmet food and informal conversation. There are also many funding opportunities for graduate students in the form of teaching assistantships or graduate research positions, and these positions offer salary, healthcare, and tuition remission.

Our approachable faculty and close-knit student body will help students find a good fit for their interests and abilities. And, because of the Department's academic and industrial affiliations, the relationships formed here promote opportunities for postdoctoral research and faculty positions at respected academic institutions, and internships and employment at exciting technology companies.

## 2013 Graduate Awards *(advisors in parenthesis)*

### Industry
| | |
|---|---|
| Sheng Wei *(Potkonak)* | Cisco Systems Outstanding Graduate Student Research Award |
| Navid Amini *(Sarrafzadeh)* | Google Outstanding Graduate Student Research Award |
| Chunyi Peng *(Lu)* | Northrop Grumman Outstanding Graduate Student Research Award |
| Sanjam Garg *(Sahai & Ostrovsky)* | Symantic Outstanding Graduate Student Research Award |

### Associations
| | |
|---|---|
| Ross Hansen *(Ernst)* | National Physical Science Consortium Fellowship |
| Bo-Jhang Ho *(Srivastava)* | Taiwan Ministry of Education Fellowship |
| Tonislav Ivanov *(Soatto)* | National Defense Science and Engineering Graduate Fellowship |
| Mark Montoya *(Korf)* | National Physical Science Consortium Fellowship |

### UCLA
| | |
|---|---|
| Elias Bareinboim *(Pearl)* | Dissertation Year Fellowship |
| Sanjam Garg *(Sahai & Ostrovsky)* | CS Department Outstanding Ph.D. Graduate |
| Ran Gelles *(Sahai & Ostrovsky )* | Dissertation Year Fellowship |
| Hui Huang *(Cong)* | Dissertation Year Fellowship |
| Wenjia Huang *(Terzopoulos)* | Dissertation Year Fellowship |
| Eun Yong Kang *(Eskin)* | Dissertation Year Fellowship |
| Chi-Yu Li *(Lu)* | CS Department Outstanding Master's Graduate |
| Jorge Munoz *(Potkonjak)* | Graduate Opportunity Program Fellowship |
| Jesse Navas *(Potkonjak)* | Graduate Opportunity Program Fellowship |
| Kimberly Swennen *(Palsberg)* | Malcolm R. Stacey Scholarship/UCLA Affiliates Scholarship |

## 2012 Graduate Awards *(advisors in parenthesis)*

### Industry
| | |
|---|---|
| Yi Zou *(Cong)* | Cisco Systems Outstanding Student Research Award |
| Mahsan Rofouel *(Sarrafzadeh)* | Google Outstanding Student Research Award |
| Nick Furiotte *(Eskin)* | Northrop Grumman Outstanding Graduate Student Research Award |
| Abhishek Jain *(Sahai & Ostrovsky)* | Symantic Outstanding Graduate Student Research Award |
| Chunyi Peng *(Lu)* | IBM Ph.D. Fellowship |
| Elias Bareinboim *(Pearl)* | Yahoo Exceptional Student Award |

### Associations
| | |
|---|---|
| Dan Marino *(Millstein)* | ACM SIGPLAN Outstanding Doctoral Dissertation Award |
| Reuben Vincent Rabsatt *(Gerla)* | National GEM Consortium Fellowship |
| Indranil Saha *(Majumdar)* | ACM SIGBED Frank Anger Memorial Award |

### UCLA
| | |
|---|---|
| Lorenzo Gomez *(Millstein)* | Eugene Cota-Robles Fellowship |
| Dan He *(Eskin)* | CS Department Outstanding Ph.D. Graduate |
| Saro Meguerdician *(Potkonjak)* | CS Department Outstanding Master's Graduate |
| Reuben Vincent Rabsatt *(Gerla)* | Eugene Cota-Robles Fellowship/Competitive Edge Award |
| Mahsan Rofouel *(Sarrafzadeh)* | HSSEAS E. K. Rice Outstanding Doctoral Student Award |
| Indranil Saha *(Majumdar)* | Dissertation Year Fellowship |
| Sheng Wei *(Potkonjak)* | Dissertation Year Fellowship |
| Lap Fai Yu *(Terzopoulos)* | Dissertation Year Fellowship |

## DOCTORIAL STUDENT PLACEMENT 2012-2013

| Student | Affiliation | Position | Advisor |
|---------|-------------|----------|---------|
| Navid Amini | Jules Stein Eye Institute | Postdoctoral Fellow | Majid Sarrafzadeh |
| Alper Ayvaci | Honda Research Institute | Scientist | Stefano Soatto |
| Nicholas W. Brown | Northwestern University | Researcher | Joseph DiStefano |
| Chien-Chia Chen | VMware | Member of Technical Staff | Mario Gerla |
| Pei-Chun Cheng | Cisco | Software Engineer | Lixia Zhang |
| Sung Chul Choi | Google | Software Engineer | Mario Gerla |
| Mohammad H. Falaki | Apple | Data Scientist | Deborah Estrin |
| Sanjam Garg | IBM | Josef Raviv Postdoc Researcher | R. Ostrovsky / A. Sahai |
| Eugenio Giordano | Symantec | Software Engineer | Mario Gerla |
| Karthik Gururaj | Intel | Hardware Engineer | Jason Cong |
| Dan He | IBM | Research Scientist | Eleazar Eskin |
| Yi Hong | Walmart Labs | Staff Engineer | Zhuowen Tu |
| Chu-Cheng Hsieh | eBay | Staff Software Engineer | Junghoo Cho |
| Abhishek Jain | MIT | Postdoc Researcher | R. Ostrovsky / A. Sahai |
| Mubbasir T. Kapadia | U. Penn Ctr for Human Modeling & Simulation | Postdoc Researcher | Petros Faloutsos |
| Wooseong Kim | Hyundai Motor Co. | Senior Researcher | Mario Gerla |
| Donnie H. Kim | Intel | Software Engineer | Deborah Estrin |
| Mars Lan | Google | Software Engineer | Majid Sarrafzadeh |
| Nikolay Laptev | Yahoo! Labs | Applied Scientist | Carlo Zaniolo |
| Rafael P. Laufer | Bell Labs, Alcatel-Lucent | Researcher | Leonard Kleinrock |
| Taehee Lee | Google Inc. | Software Engineer | Stefano Soatto |
| Jung S. Lim | City of LA Sanitation Dept | Senior Systems Analyst | Mario Gerla |
| Chunyue Liu | Google | Software Engineer | Jason Cong |
| Bin Liu | Micron Technology | Senior Architect | Jason Cong |
| Daniel L. Marino | Symantec Research Labs | Researcher | Todd Millstein |

| Student | Affiliation | Position | Advisor |
| --- | --- | --- | --- |
| Sven E. Mawson | Google Inc. | Staff Software Engineer | Michael Dyer |
| Roozbeh Mottaghi | Stanford University | Postdoc Researcher | Alan Yuille |
| Minyoung Mun | Samsung Research | Researcher | Deborah Estrin |
| Gabriele Nataneli | Google | Chief Software Architect | Petros Faloutsos |
| Young Tae Noh | Cisco Systems | Software Engineer III | Mario Gerla |
| Hyduke Noshadi | Google | Software Engineer | Majid Sarrafzadeh |
| Jong Han Park | AT&T Labs, Inc. | Senior Technical Staff Member | Lixia Zhang |
| Chunyi Peng | Ohio State University | Faculty | Songwu Lu |
| Michail Raptis | Disney Research | Postdoc Researcher | Stefano Soatto |
| Mahsan Rofouei | Google | Software Engineer | Majid Sarrafzadeh |
| Indranil Saha | UC Berkeley & U. Pennsylvania | Postdoc Researcher | Rupak Majumdar |
| Hesam Samini | Viewpoints Research Institute | Researcher | Todd Millstein |
| Uri Schonfeld | Google | Software Engineer | Junghoo Cho |
| Shawn Iqbal Singh | Univ of Pennsylvania | Postdoc Researcher | Petros Faloutsos |
| Myung-Kyung Suh | Sandia National Laboratories | Sr. Member of Technical Staff | Majid Sarrafzadeh |
| Brian Kazuo Tagiku | Google Inc. | Software Engineer | Adam Meyerson |
| Kanit Therdsteerasukdi | NVIDIA | Researcher | Glenn Reinman |
| Yi-Tao Wang | Amazon | Software Engineer | Rajive Bagrodia |
| Sheng Wei | Adobe | Researcher | Miodrag Potkonjak |
| Kamil Andrzej Wnuk | WireWAX | Computer Vision Lead | Stefano Soatto |
| Jonathan S. Woodbridge | Sandia National Laboratories | Software Engineer | Majid Sarrafzadeh |
| Zhao Yi | Google Inc. | Software Engineer | Stefano Soatto |
| Lap Fai Yu | Stanford University | Postdoc Scholar | Demetri Terzopoulos |
| Zhenkai Zhu | LinkedIn | Software Engineer | Lixia Zhang |
| Yi Zou | Arista Networks | Software Engineer | Jason Cong |

## 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 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 AP Readiness program, LAUSD students (predominantly from underrepresented groups) and teachers participate in weekend AP computer science enrichment sessions.

• Faculty members Alfonso Cardenas and David Smallberg co-lead in collaboration with the School's Center for Excellence in Engineering and Diversity (CEED) on the NSF-funded FOCUS program (Frontier Opportunities in Computing for Underrepresented Students). The goal is to increase the participation, retention and performance of URM students pursuing baccalaureate degrees in computing disciplines. FOCUS encourages and fosters current and potential community college underrepresented transfer students through summer courses, bridge programs, school-year seminars, and support programs. NSF funding for this program concluded in 2013. The FOCUS website provides highlights and the accomplishments/outcomes report. http://www.cs.ucla.edu/focus/index.html

• CEED is committed to the development, recruitment, retention, and graduation of underrepresented engineering and computing students. Its support includes an intensive Computing Immersion Summer Experience to better prepare incoming underrepresented freshman and transfer students for university-level computer science courses and to expose them to research and industry. It supports student chapters of the American Indian Science and Engineering Society, the National Society of Black Engineers, and the Society of Latino Engineers and Scientists. http://www.ceed.ucla.edu/about



• We have supported a number of women and underrepresented graduate students under the DOE-sponsored GAANN fellowship program and the National GEM Consortium.

• Several of the Department's "centers" have received funding for programs and partnerships that focus on increasing diversity in the field of computer science. For example, the *Center for Domain-Specific Computing* has an educational component with an emphasis on attracting underrepresented students at all levels through partnerships with campus organizations focused on diversity.

# 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 accordance 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 several other activities that are posted on the department's alumni website (http://www.cs.ucla.edu/csd/people/alumni).

## Alumni Advisory Board Members

James Anhalt, III
Lead Software Engineer, Blizzard Entertainment, Inc.

John Busch
Vice President and Senior Fellow. SanDisk Corp.

Alfonso Cardenas *(Alumni Advisory Board Faculty Chair)*
Professor, UCLA Computer Science Department

Milos Ercegovac
Professor, UCLA Computer Science Department

Eytan Elbaz
Chairman and cofounder, Scopely and Deep Dive Media

Tim Ford
Lead Software Engineer, Blizzard Entertainment, Inc.

William Goodin *(Alumni Advisory Board Chair)*
Associate Director of Alumni Relations, UCLA SEAS

Nader Karimi
VP Information Technology, BCBG MAXAZRIA

Jacquelyn Leong
Technical Lead, Amgen

Andrew Louie
Founder and CEO, Hexaflex Strategies

Michael Parker
Lead Developer, Ad Hoc Labs, Inc.

David Smallberg *(Alumni Advisory Board Faculty Vice Chair)*
Senior Lecturer SOE, UCLA Computer Science Department

Sze Ki Pat (Alumni Advisory Board Vice Chair)
Sr. Staff Software Engineer, MySpace

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

John Rosati
Founder and Managing Director, THR Associates

James Winchester
Owner, Avionic Products, Inc.

Ben Zamanzadeh
VP of Engineering, DataPop

# Industrial Affiliate Program Members

The Computer Science Department maintains close ties with industry, collaborating on state-of-the-art research and engaging in mutually beneficial exchanges of technology. The Department's Industrial Affiliate Program facilitates these goals while providing many benefits to its Affiliates through its two levels of membership. Benefits include invitations to our Internship Day and Tech Forum events, access to in-house reports and technical publications, recruiting assistance, and interactions with faculty members in areas of interest. www.cs.ucla.edu/about/industrial-affiliate-program/industrial-affiliate-membership program

Premier developer/publisher of entertainment software.
Faculty Liaison: Professor Demetri Terzopoulos

Hardware, software & services to create IT solutions.
Faculty Liaison: Professor Songwu Lu

Developer of world's largest search engine.
Faculty Liaison: Professor John Cho

Leader in electronic design automation (EDA).
Faculty Liaison: Professor Jason Cong

Provider of systems and technologies—from under sea to outer space.
Faculty Liaison: Professor Mario Gerla

State-of-the-art wireless communication technologies.
Faculty Liaison: Professor Jens Palsberg

Helping customers secure and manage information.
Faculty Liaison: Professor Jennifer Vaughan

Leader in data warehousing and analytic technologies.
Faculty Liaison: Professor Carlo Zaniolo

Innovative satellite communications products.
Faculty Liaison: Professor Lixia Zhang

## Lo and Behold! . . . .

In a recently discovered pattern of two-tone floor tiles on the second floor of Boelter Hall lies the binary-coded message "Lo and behold!" As we now know, these tiles and the message they convey have actually been there since 2011, but because this had been a last-minute design decision by UCLA architect Erik Hagan, no one even knew this message existed . . . that is, until a keen-eyed computer science student noticed that the 14 bars of eight tiles each could be interpreted as a binary message if the dark tiles were treated as zeros, and the light tiles were treated as ones.

Hagan meant his binary-coded design to be a tribute to Professor Leonard Kleinrock and his team of computer science researchers who, in 1969, sent the first message over what is today's Internet. That now famous message consisted of the letters "LO" (the first two letters of "LOGIN" were successfully keyed in before the system crashed). In Len Kleinrock's words, "We didn't plan it, but we couldn't have come up with a better message: short and prophetic."

**UCLA** ENGINEERING

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Engineering and Applied Science
*Birthplace of the Internet*

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