

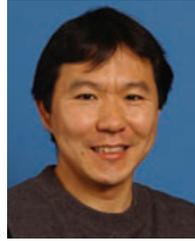
**Department of Computer Science**  
**USC Viterbi School of Engineering**

The USC Department of Computer Science is a research and education leader in computation, information, and digital media. Its faculty are highly interdisciplinary, including pioneers in socially assistive robotics, computer animation, natural language processing, computational neuroscience, DNA computing, and computational economics.

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**USC Viterbi**  
School of Engineering





I'd like to extend you a warm welcome on behalf of the faculty, staff and students of the USC Viterbi School of Engineering Department of Computer Science.

It is with great enthusiasm that I begin my tenure as department chair. I came to USC because the Department of Computer Science is not only excellent but also unique. It has more than 40 research faculty members from the world-renowned Information Sciences Institute (ISI)- a major player in the creation of the Internet- and from the Institute for Creative Technologies (ICT). Its faculty contains pioneers in modern cryptography, Internet technologies, database, computational neuroscience, robotics, natural language processing, computational biology and network sciences, and it has an innovative education program, including one of the nation's first programs in game development. In addition, the USC Viterbi School of Engineering offers one of the best environments for interdisciplinary research and international collaboration in the nation.

As an alumnus, I am proud of the record of innovation in our department and its affiliated centers: the Domain Name System and the TCP/IP protocols, the invention of DNA computing, and historic interdisciplinary studies relating brains, machines and mathematics. A former student wrote one of the first computer viruses and led the theoretical study of the computer virus concept.

I am equally proud of the accomplishments of our current faculty. Their profound and diverse research and educational contributions to a wide array of computer science and interdisciplinary arenas are impressive. I hope you will continue to follow our progress.

**Prof. Shang-Hua Teng**  
Chair, Department of Computer Science



*ICT Light Stage: used by Hollywood studios to create photoreal digital actors.*

## Highlights: Department of Computer Science

The USC Department of Computer Science offers the following programs:

- » B.S. in Computer Science - CSCI
- » B.S. in Computer Engineering and Computer Science - CECS
- » B.S. in Computer Science (Games) - CSGM
- » B.S. in Computer Science and Business Administration - CSBA

The department has 28 tenured and tenure track faculty and over 40 research faculty in two world-renowned research institutes:

USC's **Information Sciences Institute (ISI)** has been an agent of innovation and a research powerhouse in computer science for over 35 years. With more than 300 researchers, graduate students and staff, ISI is a major contributor to the nation's information technology knowledge base. It has helped create many key Internet technologies, including the Domain Name System and the TCP/IP protocols.

The **Institute for Creative Technologies**, founded in 1999 through a much sought-after award from the U.S. Army, blends cutting-edge computer science technologies with a potent dose of Hollywood to break new frontiers in learning. Researchers with expertise in artificial intelligence, computer graphics and communications are collaborating with creative talents from the entertainment and videogame industries.

The department has a broad spectrum of computer science expertise. Below we highlight three of the areas:

- » **Robotics.** One of the largest robotics programs in the nation. Research programs span humanoids, socially assistive robotics, networked robots, space robotics, self-reconfigurable robotics, among others, and focus on robotics as a tool for science exploration and healthcare. Our faculty had a leadership role in the 2008 IEEE International Conference on Robotics and Automation (ICRA), the largest annual meeting in the field, as general chair and program chairs of the event.
- » **Computational Neuroscience.** A strong research thrust with a focus on using computational modeling to gain insight into biological brain function. Its applications include machine vision, image processing, robotics, and artificial intelligence.
- » **Game Development.** Two innovative degree programs: a B.S. in Computer Science specializing in games, and an M.S. in Computer Science specializing in game development. Students in the B.S. program receive a solid grounding in computer science in addition to the art and design required for functioning in the game industry. The goal of the M.S. degree is to graduate professionally educated students capable of engineering next-generation games and their required technologies.

## A New Chair for the USC Viterbi School Department of Computer Science

Shang-Hua Teng, a theoretical computer scientist with broad experience in academia and industry, has joined the USC Viterbi School Department of Computer Science as professor and chair effective fall 2009.

"I am thrilled to have such a distinguished scholar as our new Department of Computer Science Chair" said Viterbi Dean Yannis C. Yortsos. "His rich experience in both academia and industry, his global ties and his leadership potential augur well for a stellar future for our department."

Born in Beijing, Teng earned dual undergraduate degrees, a B.S. in Computer Science

and a B.A. in Electrical Engineering, from Shanghai Jiao Tong University. He received a master's degree from USC and his Ph.D. from Carnegie Mellon University in 1991, both in computer science. Since receiving his Ph.D., Teng has been a distinguished researcher and has taught extensively. He was a research scientist at the Xerox Palo Alto Research Center, the NASA Ames Research Center, the IBM Almaden Research Center, Intel Corp., three separate Microsoft research centers and Akamai Technologies.

Immediately before coming to USC, he served as a professor of computer science at Boston University, a research affiliate professor of

mathematics at MIT and a visiting professor at Tsinghua University in Beijing.

His distinguished research has involved the smoothed analysis of algorithms, scientific computing, computational game and economics theory, and spectral graph theory. He is a recipient of the 2008 Gödel Prize awarded by Association of Computing Machinery and the European Association for Theoretical Computer Science, and the 2009 Delbert Ray Fulkerson Prize sponsored by the Mathematical Programming Society and the American Mathematical Society.

## Google Borg Scholarship Awarded to Computer Science Student

Mary S. David is one of 20 recipients nationwide of a Google Anita Borg Memorial Scholarship, and the first USC student ever to receive the honor. She received a \$10,000 award for the 2009-2010 academic year and an invitation to attend this year's Google Scholars' Retreat.

Unusual for an undergraduate, she is working on potentially publishable research. "Mary studies approximation algorithms for network vaccination problems," said her faculty advisor, David Kempe, "on how to select a set of people or computers to inoculate to ensure that the network does not suffer from the outbreak of a virus at a random node in the network."

A USC Trustee Scholar, Miss David is active in student government as executive director of the undergraduate program board. She has served continually as a volunteer in USC outreach activities, in roles ranging from volleyball coach to Spanish interpreter, and she's also a flutist in the USC concert orchestra.

"This summer I'll be at USC taking summer school and continuing research with Professor Kempe," she says. "In the upcoming year, I'll be finishing my M.S. in Computer Science through USC's Progressive Degree Program, and I'll be applying to Ph.D. programs in the fall. In the future, I would like to teach and research computer theory at a major university."



Mary S. David

## Award Winning Visual Effects Pioneer Continues to Impact Hollywood

Visionary. Pioneer. These are the names of two computer graphics awards recently bestowed on Paul Debevec, associate director of the Graphics Lab at the USC Institute for Creative Technologies and a research associate professor in the Department of Computer Science at the USC Viterbi School. The honors, from the Elan Awards and 3D World Magazine respectively, recognized Debevec's innovations in high dynamic

range imaging and image-based lighting, which enable virtual worlds and characters to look more real and convincing.

At ICT, Debevec has led the development of several Light Stage systems (see picture on previous page) that capture and simulate how people and objects appear under real-world lighting conditions. These Light Stages have been used by major Hollywood studios to create photoreal digital actors as part of the Academy Award-winning visual effects in *Spider Man 2*, *King Kong*, and *The Curious*

*Case of Benjamin Button*. Future work is focused on animating captured facial data in to new poses and motions while retaining the high level of detail.

Debevec and colleagues at ICT have also leveraged aspects of their facial scanning system to develop HeadSpin, a 3D teleconferencing system, which creates and transmits a three-dimensional floating head that can be seen at different angles by multiple audience members simultaneously without any 3D glasses. Headspin indeed.



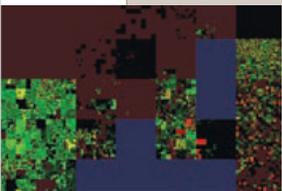
Paul Debevec

## Creating an "Atlas" of the Internet

Research faculty at the Viterbi School's Information Sciences Institute, one of the birthplaces of the Internet, continue to build on a recent comprehensive census of 2.8 billion allocated addresses – the first complete effort of its kind in more than two decades.

Known as the ANT project, Research Professor John Heidemann and his collaborator Yuri Pryadkin sent every single assigned address in the entire Internet a probe. The census results allowed the creation of an Internet "atlas," not geographic, (although geographic areas like North America, and Europe appear) but rather numerical, building on the mathematical structure of the Internet address system.

The team is continuing censuses to create a dynamic movie of Internet evolution which can aid in detecting and monitoring trends. "Internet census data is useful for several reasons," Heidemann says. "As the Internet use becomes widespread, we are running out of Internet addresses." It is hoped that the census can also improve Internet security, with researchers creating maps of cyber attack sites. ISI was one of the original nurseries of the Internet, playing a key role in the development of the domain name system and other features. ISI computer scientist Jon Postel (1943-1998) directed the Internet Assigned Numbers Authority for years. ANT's most recent results are at <http://www.isi.edu/ant/address/browse>



From the cover: *Visualizing the Internet – A census of the Internet address space*



Undergraduates from all over the country who paired with faculty leaders in their area of interest

## Computer Science Summer Interns Get a Head Start on Research Methodology

### NSF-funded program provides 10 weeks of research experience

Professors Gaurav Sukhatme and Leana Golubchik organized the 2009 Research Experiences for Undergraduates (REU) program at the Viterbi School. The REU program supports active research participation by undergraduate students in any of the areas of research funded by the National Science Foundation and is administered through the Department of Computer Science.

Students get involved in ongoing research or in research projects specifically designed for the REU program. The main objective? Training undergraduate students in research methodology.

This summer's program attracted an impressive array of undergraduates from all over the country. Students paired with faculty leaders in their area of interest.

## Can Robots Help Improve the State of U.S. Healthcare? Congress Wanted to Know

Maja Mataric, Viterbi School Senior Associate Dean, Director of USC's Center For Robotics and Embedded Systems and Professor of Computer Science recently briefed the Congressional Robotics Caucus on the potential for robotics in three key growth areas: socially-assistive robotics, surgical robotics and rehabilitation robotics.

Mataric' focused on her area of research, socially assistive robotics, and its use for helping large and growing populations including children with autism, adults recovering from stroke, and elders suffering from chronic conditions.

Use of such robots, Mataric' told the legislators, can reduce health costs, improve health outcomes, provide personalized treatment and efficient monitoring, in a way that she said is affordable and, – because the robots interact socially, rather than physically – inherently safe.

Mataric' specializes in assistive interactive robotics. She's designing robot companions to help convalescent patients who have suffered strokes, partial paralysis, blindness or neurological conditions. A growing number of Americans will have to live with physical limitations like these as the population ages and people live longer.

"In the long run, we're really looking at putting robots in everyone's home," says Mataric', "We're building them really to help people in whatever area they need help."



Left to right: Maja Mataric; Maja Mataric' briefs the Congressional Robotics Caucus about the potential for robotics in healthcare



Left to right: Jernej Barbic, William G.J. Halfond, Fei Sha

### New Tenure Track Faculty

**Jernej Barbic** joined the Department of Computer Science in Fall 2009 as Assistant Professor. He earned his Ph.D. from Carnegie Mellon University and was a postdoctoral fellow at MIT. His research interests are in computer graphics, computer animation, physically based modeling, interactive simulation, haptics, sound simulation and virtual medicine.

**William G.J. Halfond** will join the department in Spring 2010 as Assistant Professor. He received his Ph.D. from Georgia Tech, and his research interests are in software engineering, with a special focus on quality assurance techniques for Web applications.

**Fei Sha** joined the Department of Computer Science in Fall 2008 as Assistant Professor. Sha specializes in computer and information science, machine learning, visualization, artificial intelligence, speech recognition and computational models of auditory perception.

### New Honors for USC Computer Science Faculty

**Leonard Adleman**, Professor:  
C&C Foundation Prize co-recipient for the invention of the RSA encryption algorithm, 2009

**Michael Arbib**, Professor:

- » Helmholtz Prize, International Neural Network Society, 2009
- » Elected a Fellow of the AAAS in 2008
- » Okawa Foundation Research Award, 2009

**Barry Boehm**, Professor:

- » 2010 IEEE Simon Ramo Medal Winner
- » IEEE Fellow in 2009
- » Received two mentions in the IEEE Software Journal's list of best publications in the field over the last quarter century

**Paul Debevec**, Research Associate Professor:  
Named one of the 7 CGI pioneers by 3D World magazine

**Shahram Ghandeharizadeh**, Associate Professor:  
Recipient of the Association for Computing Machinery's 2008 Software Systems Award

**Leana Golubchik**, Associate Professor:  
2008 IBM Faculty Award

**Laurent Itti**, Associate Professor:  
Received an Okawa Foundation research award, 2008

**David Kempe**, Assistant Professor:  
Awarded a Sloan Fellowship

**Craig Knoblock**, Research Professor  
Distinguished Scientist of the ACM during the FY 08/09 academic year

**Nenad Medvidovic**, Associate Professor:  
Most Influential Paper at the International Conference on Software Engineering, 2009

**Louis-Philippe Morency**, Research Assistant Professor:  
Recipient of the 2008 IEEE Intelligent Systems 10 to Watch for the future of AI: 2008

**Aristides Requicha**, Professor:  
» IEEE Robotics and Automation Society Pioneer in Robotics an Automation Award, 2008  
» Elected a Fellow of the AAAS in 2008

**Cyrus Shahabi**, Professor:  
Distinguished Scientist of the ACM, 2009

**Bill Swartout**, Research Professor:  
Awarded the Robert Englemore Award

**Milind Tambe**, Professor:  
» Commendation, City of Los Angeles, Los Angeles World Airports Police Department: As a leader of a team of researchers from CREATE: 2009  
» Department of Homeland Security Certificate of Recognition: CREATE-Center for Risk and Economic Analysis of Terrorism Events, 2009

**Shang-Hua Teng**, Professor:

- » Received the 2008 Gödel Prize awarded by Association of Computing Machinery and the European Association for Theoretical Computer Science
- » Received the 2009 Delbert Ray Fulkerson Prize sponsored by the Mathematical Programming Society and the American Mathematical Society
- » ACM Fellow in 2009

**Michael Waterman**, Joint Professor:

- » First Class and Honorary Fellow of the Society of Industrial and Applied Mathematics
- » First Class and Honorary Fellow of the International Society of Computational Biology, 2009

### USC Awards

At the 27th annual Academic Honors Convocation held last April, renowned roboticist **George Bekey**, a university professor emeritus, received the USC Faculty Lifetime Achievement Award.

At the same ceremony, **Maja Mataric**, **David Kempe** and **Sven Koenig**'s were recognized for their support when they received 2008-2009 USC Mellon Awards for Excellence in Mentoring.

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### About the USC Department of Computer Science

- » More than 100 primary and affiliated faculty conducting advanced research as well as 21st century computer science and interdisciplinary education
- » The much-honored faculty includes five members of the National Academy of Engineering and a Turing Award winner, Leonard Adleman, computer science's Nobel prize equivalent
- » Affiliated with USC's world renowned Information Sciences Institute, the Institute for Creative Technologies and five other major research centers
- » Home of one of the nation's largest robotics programs
- » One of the top software engineering, natural language processing, computer vision and graphics, internet and network sciences programs
- » One of the nation's first games and game development programs

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### About the USC Viterbi School of Engineering

- » Consistently listed in the top ten of *U.S. News and World Report's* national ranking of graduate engineering programs
- » Among a select group of engineering schools with three national research centers
- » Home of the USC Information Sciences Institute (ISI), a progenitor of the Internet and the global communications revolution
- » A national leader in technology-enhanced access to the classroom
- » Known for its innovative "Engineering +" value-added engineering curriculum

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