COMPUTER SCIENCE

UC Santa Barbara Computer Science 2009 Newsletter

Welcome to our first CS@UCSB newsletter! We have had an amazing couple of years, and we just wanted to share some of our most recent happenings with all our alumni and friends. CS@UCSB is still the young, energetic and dynamic department you all recall, but over the last decade we have also managed to grow even further in both ranking and quality – a trend we plan on continuing.

With 33 faculty, we now teach and perform cutting-edge research across an extremeley broad set of topics, and we continue to strive to equip our students with the skills they need to survive in our ever-changing field. In fact, we have recently revamped our entire BA program to reflect the interdiciplinary nature of Computer Science at UCSB through three new emphases: Computational Biology, Computational Economics, and Computational Geography. To help us with this and our many other educational goals, we are also pleased to announce the addition of Phill Conrad and Diana Franklin to our faculty as full time lecturers.

Over the last ten years our external research funding has increased an incredible six-fold, and our graduate program (which conferred its first doctorate in 1990) now has over 100 Ph.D. and 50 masters students. In industry, our graduates are represented in all parts of the IT spectrum, from successful start-ups to research labs at the most established companies. In academia, you will find UCSB Ph.D.s teaching at Cornell University, ETH Zurich, the University of Florida, Purdue University, the University of Rochester, the Chinese University of Hong Kong, Ohio State University, Cal Poly San Luis Obispo, and the Naval Postgraduate School.

Last but certainly not least, we are very excited to have received generous private donations from alumni and friends. Karl and Pamela Lopker and the Lopker Family Foundation established the Venkatesh ``Venky'' Narayanamurti Chair, Mark and Susan Bertelsen established the Eugene Aas Chair, and an anonymous donor established the Leadership Chair. We are very excited to welcome our new faculty hires Christopher Kruegel as the first Eugene Aas Chair holder and Xifen Yan as the first Venkatesh ``Venky'' Narayanamurti Chair, and to announce Professor Dick Kemmerer as the very first holder of the Leadership Chair. While I wish I could list all of our donors, there are simply too many, but please know that even the smallest contributions are deeply appriciated by our students. Thank you!

In the rest of this newsletter you can read about our new capstone project course, the growth of our student chapter of the ACM, developments from the Women in Computer Sceince group (WICS), highlights from our award winning research, and many other aspects of our department. Please also consider this an invitation to keep in touch and send us your news too. We look forward to including a special section on alumni news in future newsletters!

Amr El Abbadi
Chair, Department of Computer Science
University of California, Santa Barbara

Rising Above the Clouds
Faculty Awards and Honors

Professor Ibarra elected to **Academia Europaea,** receives the **2007 Blaise Pascal Medal from the European Academy of Sciences.** Professor Oscar Ibarra has received two extremely distinguished awards, first receiving the 2007 Blaise Pascal Medal, and then being elected a Foreign Member of the Academia Europaea in the Informatics Section. The medal was given to Professor Ibarra in recognition of his outstanding contributions in several areas of computer science, including theory of computing, design and analysis of algorithms, computational complexity, parallel computing, VLSI computation, formal verification, and membrane computing. Academia Europaea is a non-governmental association of scientists and scholars who collectively aim to promote learning, education and research. As of 2007, IS had 73 members of which 7 are Foreign Members. Professor Ibarra now joins this elite group.

Professor Suri named ACM Distinguished Scientist. Professor Subhash Suri has been elected a **Distinguished Scientist by the Association of Computing Machinery,** the leading professional society for Computer Science. Prof. Suri is one of the 20 engineers and scientists to receive this award in 2007, which recognizes "significant accomplishments or significant impact on the computing field". Professor Suri directs the Applied Algorithms research lab at the University of California, Santa Barbara.

Professor Linda Petzold elected AAAS Fellow. Professor Petzold was elected as a **Fellow of The American Association for the Advancement of Science (AAAS).** AAAS is an international non-profit organization dedicated to advancing science around the world by serving as an educator, leader, spokesperson and professional association. Election as a Fellow of AAAS is a great honor bestowed upon members by their peers. Fellows are recognized for meritorious efforts to advance science or its applications.

Two young faculty members, **Wim van Dam and Tobias Hollerer,** both received the **National Science Foundation Early Career Development (CAREER) awards in 2007.** CAREER awards, given to only the most promising of academic leaders, are the foundation's most prestigious grants for young teacher-scholars. The awards each provide support for research in the amount of half a million dollars over a five-year period.

Professor Van Dam's award is titled **"Algebraic and Semiclassical Methods for Quantum Computing"** and the project it funds analyzes the power and limitations of quantum computers using new techniques from algebraic geometry and the physics of semi-classical systems. Whether it will be worthwhile to develop a quantum computer depends largely on the expected computational benefits of such a machine, but our current understanding of this issue is still very limited. Van Dam's research investigates the differences between classical and quantum computers by rephrasing their properties into the language of algebraic geometry, such that one can compare their –more intuitive– geometric characteristics.

Professor Hollerer's award is titled **"Anywhere Augmentation: Practical Mobile Augmented Reality in Unprepared Physical Environments."** Anywhere Augmentation refers to the idea of linking location-specific computing services with the physical world, making them readily and directly available in any situation and location. Anywhere Augmentation constitutes a powerful interface for wearable computing. If computer users are enabled to place arbitrary annotations in 3D space, wherever they go, the physical world becomes the user interface. The proposal pursues novel interaction techniques based on efficient human input through both sketch-based interfaces on hand-held devices and direct-overlay 3D user interfaces using near-eye displays.

Professor Ben Zhao named one of *ComputerWorld's* **Top 40 Innovators Under 40 in 2008.** Ben Zhao, has been selected for ComputerWorld magazine's "40 under 40" list of top IT innovators for his work on developing structured peer-to-peer overlay networks. A profile of him and his research is published in the July print and web editions of ComputerWorld magazine. The list, which honors 40 top innovators under the age of 40, said Zhao's work in large-scale networks made him among the "people to watch" in the coming years. Ben is now building systems to provide users with their desired level of anonymity and privacy while protecting the network from misbehaving and malicious nodes.

Professor Krintz Receives the Prestigious **Borg Early Career Award for 2008** for Significant Research Contributions and Outreach to Women. This award is given annually by CRA-W to a woman in computer science and/or engineering who has made significant research contributions and who has contributed to her profession, especially in the outreach to women. Specifically, Chandra has implemented courses in which computer science and engineering students use their computer skills (of different levels) to help others in the community (e.g., non-profit organizations) with technology and to introduce other young people to the potential of computer science (e.g., local high school students). Since 2007, Chandra has partnered with Microsoft Research (MSR) and Girls Incorporated, a nationwide non-profit organization dedicated to inspiring young girls to be strong, smart, and bold.

Professor Frédéric Gibou awarded the Prestigious Sloan Fellowship. Frédéric G. Gibou, now an Associate Professor of Computer Science and Mechanical Engineering is among this year's 116 national winners of prestigious **Sloan Research Fellowships from the Alfred P. Sloan Foundation.** The new Sloan Research Fellows were selected from among hundreds of highly qualified scientists in the early stages of their careers on the basis of their exceptional promise to contribute to the advancement of knowledge. Professor Gibou's research is focused on the design of new computational algorithms for a variety of applications including materials science, computer vision with an emphasis on the segmentation of medical images, and computational fluid dynamics.

Professors Zheng and Zhao named among **The Top 35 Young Innovators by MIT Technology Review.** In successive years, Professor Haitao (Heather) Zheng and Ben Zhao were named to the TR35, a list that features 35 of the top innovators in science and technology under the age of 35. According the Jason Pontin, Editor-in-Chief of Technology Review: "The TR35 is an amazing group of people. Their accomplishments are likely to shape their fields for decades to come. It's evident when you scroll back and see names like Sergey Brin, Jonathan Ive, and Steve Jurvetson among the past winners." The magazine recognized Zheng and Zhao, along with other chemists, biologists, software engineers, and chip designers for gravitating to "the most interesting and difficult scientific and engineering problems at hand, and arrive at solutions no one had imagined. They take on big issues."

Award-Winning Research

Cha Lee, Stephen DiVerdi, and Professor Tobias Höllerer's recent paper at the ACM Virtual Reality Software and Technology (the premier conference in the field of Virtual Reality) on **"An Immaterial Depth-Fused 3D Display"** was selected to receive the Best Student Paper Award. They use two "FogScreens" and head tracking to create live 3D imagery on a walk-through display. More information can be found at http://ilab.cs.ucsb.edu/

UCSB students **Krishna Ramachandran and Irfan Sheriff** along with **Professors Elizabeth Belding and Kevin Almeroth** have studied link quality information collected over several days on real wireless mesh networks. Their award winning paper on **Routing Stability in Static Wireless Mesh Networks,** was published in the Proceedings of Passive and Active Measurement (PAM) Workshop, and it found that: wireless routes are weakly dominated by a single route; dominant routes are extremely short-lived due to route flapping; simple stabilization techniques can provide significant improvement in route persistence.

The paper **"A General Framework for Clearing Auction of Wireless Spectrum"**, by students **Sorabh Gandhi, Chiranjeeb Buragohain, Lili Cao, and Professors Zheng and Suri,** has been awarded one of two best student paper awards at IEEE DySPAN 2007, the leading forum for academia and industry research on dynamic spectrum allocation and cognitive radios.

Lamia Youseff's paper titled **"Paravirtualization for HPC Systems"** and co-authored by **Prof. Rich Wolski, Brent Gorda** (from Lawrence Livermore Laboratories), and **Prof. Chandra Krintz** was one of two best papers presented at the recent Workshop on XEN in High-Performance Cluster and Grid Computing. Lamia, a PhD student, investigates the use of cutting edge software virtualization to enable effective high-performance computing.

Each year, a panel of 30 senior computer architects chooses 10 of the year's most significant research publications for publication in a special issue of IEEE Micro. For the 3rd Year in a row, a paper from UCSB Computer Science is present: **Introspective 3D Chips** by **Shashi Mysore, Banit Agrawal, and Sheng-Chih Lin, Navin Srivastava, Professor Kaustav Banerjee, and Professor Timothy Sherwood.** In their paper, the authors argue that a new way to attack the problem of the complexity of modern systems is with the addition of specialized analysis hardware, literally stacked on top of the processor die using 3D-integration technology.

The paper **"Approximate Isocontours and Spatial Summaries for Sensor Networks"** by graduate student **Sorabh Gandhi and Professor Subhash Suri** (co-authored with research colleague **Dr. John Hershberger** from Mentor Graphics) was awarded one of two best paper awards at the 6th Annual IPSN '07. The paper decribes lightweight in-network data aggregation in sensor networks by proposing an algorithm to approximate a family of isocontours to any user-specified representation size.

Our Undergraduate Program

The last few years have seen some exciting changes to our undergraduate program, including the addition of an optional capstone class, a complex revamping of our BA Program, more awards for our staff and for our teaching, the growth of our student chapter of the ACM, and a new initiative aimed at increasing the diversity of our program.

Undergraduates and Industry team up in our new Computer Science Capstone Class

Following the success of last year's Senior Capstone projects, **Professors Tevfik Bultan and Rich Wolski** invited companies to again propose projects to students in UC Santa Barbara's Computer Engineering and Computer Science programs.

The capstone project gives Computer Science and Computer Engineering students an opportunity to put their education into practice. Students, working in small teams, design and engineer innovative hardware and software systems using techniques from robotics, distributed systems, circuit design, networking, and real-time systems to tackle problems "donated" from local industry.

"I see this as a great example of partnership between industry and the University at the educational level for the benefit of everyone involved," said Professor Bultan. This year students had more than ten projects to choose from as well as the option to create their own. In the end twenty students formed four project teams with four company partners.

Over the last six months three local Santa Barbara companies, Novacoast, Callwave, and Rightscale, along with Google have worked with students to design, engineer, and implement significant software projects. This year's teams included a wide range of software applications at the forefront of computer tech-

nologies. "UCSB is critical to our company's success" Eron Howard, VP Development at Novacoast, notes.

This year, team members Jonathan Kupferman, Jeff Silverman, John Morse, Frank Jones, and Jesse Wang took home the "Best Computer Science Project" award at the June 5th event. By leveraging the power of new, large scale computing systems and programming technologies they attempted to tackle the Netflix Prize. They built a fully distributed data mining application using MapReduce, and running it on Amazon's EC2 through RightScale's server management environment, and they explored how these emerging technologies can be used in concert to solve challenging new data-intensive problems at scale.

The capstone award committee consisted of local entrepreneurs Klaus Schauser from AppFolio and Bernd Christiansen from Citrix Online.

http://www.cs.ucsb.edu/~cs189/

"We've been really impressed with the nine students we've worked with on the capstone projects this year, and three of them are joining us this summer."

Eron Howard, VP
Development at Novacoast

Adventures as Undergraduates

For many of us, our college educations were as much about what we did and learned outside the classroom as in it during our four or five years on campus, and Computer Science majors are no exception. **Bryce Boe,** (right) who graduated in CS last year and is now a first-year Ph.D. student, and **Michael Rosengarten,** (left) a fourth-year undergraduate, came to their undergrad educations with very different approaches—but they both found rich experiences outside the classroom and common ground in helping other CS students through the rigors of the demanding CS program.

Boe came to CS at UC Santa Barbara for our five-year BS/MS program, intending to go into industry on completing the two degrees. Rosengarten also came for a five-year program, but it was his own: a BS in Computer Science over five years, rather than the standard four, to allow him time for business and extracurricular activities.

Rosengarten arrived on campus and was immediately involved in his own start-up company, which developed a website for college students. The website was school-specific, and implemented what is now called social networking. Unfortunately, a couple of similar ideas emerged at about the same time, and both had major backing from venture capitalists—they became Facebook and ULoop. The company shut down after two years, and the student entrepreneur was recruited by CallWave, another local web-based start-up. CallWave, in turn, began to have difficulties, and Rosengarten found himself a member of the CallWave "alumni" network. It wasn't long before another member of that network, CallWave's former CTO, called to recruit the start-up veteran/undergrad as the first employee of yet another start-up, his third. He continues to work for that company,

RingRevenue, today.

Boe worked in web development during his undergrad years and at Google during the summer after he received his bachelor's degree in CS, but found his focus in research rather than in start-ups. As a result, he entered Ph.D. program instead of his planned MS program, and is now, as part of Ben Zhao's group, continuing to conduct research on using social networks to improve the functionality and utility of other applications. (Another change is that Boe is now looking toward academia rather than industry for his career.)

Boe and Rosengarten found that their interests overlap in more than social networking applications—they were among the co-founders of UCSB's student chapter of ACM (the Association for Computing Machinery, the world's largest educational and scientific computing society). Boe was drawn initially to ACM for its programming competitions, but rapidly got involved in the organization's mentoring and tutoring programs, and served as the chapter's second president. The chapter recently restructured, and Boe and Rosengarten are now two of the three co-chairs. Rosengarten has cut back on his time at RingRevenue, so that he can devote more time to the ACM programs.

The ACM's mentoring program connects incoming freshmen with upper division CS students who will help them get started in the CS major and ease the adjustment to student life at UCSB. There were about 15 students in the program this fall quarter. ACM tutors provide drop-in learning support in the CS instructional laboratory twice a week for two hours, and are also available by appointment. During tutoring hours, there are always at least two tutors available.

"The ACM student chapter's programs are invaluable service for the members' fellow students," commented Prof. Tim Sherwood, the chapter's advisor. "They've helped more than a few lower-division CS students get through some

Additional Highlights

Voting

UCSB's Security Group, led by **Professors Kemmerer and Vigna,** find potentially serious security flaws in the Sequoia electronic voting system
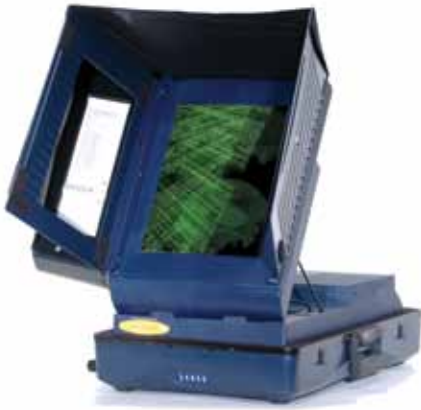

The Security Group at UCSB recently completed an analysis of the Sequoia electronic voting system as part of a "Top-to-Bottom Review" of the electronic voting systems used in California. The study was commissioned by California Secretary of State Debra Bowen. The intention was to restore the public's confidence in the integrity of the electoral process and to ensure that California voters are being asked to cast their ballots on machines that are secure, accurate, reliable, and accessible.

The UCSB Security Group acted as a "Red Team" and performed a series of security tests of both the hardware and the software that are part of the Sequoia system to identify possible security problems that could lead to a compromise. A "compromise" is defined as "tampering or error that could cause incorrect recording, tabulation, tallying or reporting of votes or that could alter critical election data such as election definition or system audit data."

The team was able to expose a number of serious security issues. They were able to bypass both the physical and the software security protections of the Sequoia system, and they demonstrated how these vulnerabilities could be exploited by a determined attacker to modify (or invalidate) the results of an election.

In addition to the Sequoia system evaluated by the UCSB team, the "Top-to-Bottom Review" included electronic voting machines from two other manufacturers: Diebold Elections Systems and Hart InterCivic. These three voting systems are used in 43 of the 58 counties in California by 9 million of the state's 15.7 million registered voters. The complete red team report, as well as the reports for the Diebold and Hart systems, are available online at http://www.sos.ca.gov/elections/elections_vsr.htm.

Interactive Supercomputing Wins HPC Challenge Awards Competition

This year at SuperComputing (SC07), the spinoff company commercializing Prof. John Gilbert's group's work, Interactive Supercomputing, won the HPC Challenge for productivity. The goal of the competition is to focus the HPC community's attention on developing a broad set of HPC hardware and HPC software capabilities that are necessary to productively use HPC systems. The winning entry was done in the Python language, extended to a parallel environment with Star-P, and won in the category of "Most Productivity" - based 50% on performance, and 50% on code elegance, clarity, and size.

Women and Diversity in Computer Science

Right, Vlasia Anagnostopoulou, a second year Ph.D. student in Computer Science with a research area in Computer Architecture. Vlasia is involved with mentoring women in engineering. Left, Ceren Budak's, also a second year Ph.D., research area is in distributed systems, and is currently working on capacity modeling for large-scale systems.

During the past two years, the Department of Computer Science has embarked on a number of activities with the goal of increasing the diversity of our undergraduate and graduate student populations, including the establishment of an Outreach and Diversity Committee; the initiation of outreach activities with Cal Poly, SBCC, and local high schools; the development of an outreach course where students leverage their computer skills to help local non-profits; and the re-design of our BA program to include emphases in biology, economics, and geography.

Our new BA program emphases focus on computing's impact on such diverse areas as biology, economics and geography. The course requirements for this program cross traditional academic boundaries, involving multiple departments at UCSB and ensuring a mix of classes that keeps students interested, excited, and challenged. The program teaches students the teamwork, collaboration, and the interdisciplinary skills that modern careers require. Fluency in the languages of multiple disciplines will help students build the collaborative, social, and technical skills that today's employers demand.

One of the most notable outcomes of our outreach and diversity work is the composition of our incoming class of Ph.D. students. Nationwide, computer science departments suffer from low percentages of female students – typically less than 30% of bachelor's degrees and 20% of Ph.D. degrees in computer science are awarded to female students. The UCSB Computer Science Department is proud to say that of our 18 Fall 2007 new Ph.D. students, 10 (55%) are women. This brings the total percentage of female graduate students (MS and Ph.D.) in our department to 22%. To ensure the retention of these students, we have launched a Women in Computer Science (WICS) group, which will support and empower our female students through social, mentoring and outreach activities.

"A goal that we set for this year was to reach the female undergrads. Typically there are way more male students in CS, than female, and we have noticed that it can be a bit discouraging. We wanted the female undergraduates to see first-hand how it is to be female and pursue a career in Computer Science."

Vlasia Anagnostopoulou
President of the
Women In Computer Science

Computer Science Staff Members Carl-Halle and Voita receive Staff Excellence Awards

Student Affairs Manager **Greta Carl-Halle** and Senior Systems Administrator **Don Voita** received the Citation of Excellence Award from the UCSB Staff Assembly. The purpose of this award is to acknowledge and celebrate outstanding achievements and meritorious service of the career staff.

With these two new awards, the Computer Science Staff have a total of three Citation of Excellence Awards in the last three years. Graduate Program Assistant **Amanda Hoagland** received the Citation of Excellence Award in 2006. As a department, we are fortunate to attract many of the very best staff from across the campus. We couldn't do anything without them!

Professor Sherwood selected for Northrop Grumman Excellence in Teaching award

Timothy Sherwood, Associate Professor in the Department of Computer Science, along with Jeffrey Moehlis, Associate Professor in Mechanical Engineering, have been selected as the co-recipients of this year's Northrop Grumman Excellence in Teaching Award. The award honors junior faculty who have demonstrated a commitment to high teaching standards, reflected in part by feedback from the students, and it is Northrop Grumman's way of simultaneously recognizing the importance of great teaching as well as the institutions that support it. This is the first year that the award has been bestowed upon a faculty member at UC Santa Barbara.

The Growth of the Student Chapter of the ACM

Over the last two years the UCSB Student Chapter of the ACM has grown significantly, both in membership and in it's importance to our educational mission. The modern incarnation of the ACM is trying to help build a student community for those interested in computer science, one that will both help directly with studies, and indirectly through encouragement and inspiration.

Younger students are often so caught up with their low-level engineering requirements they lose the bigger picture—the fact that computer science is used to help cure diseases, that computer science has helped provide education to those living under oppressive regimes, that computer science helps control everything from your antilock brakes to the Mars rover, etc.

The ACM students have designed and implemented both mentoring and tutoring programs, and have arranged for workshops and guest lectures. They competed in the Regional ACM Programming Contest (Two years ago, a UCSB team solved five of seven problems, finishing in the top five out of over 100 teams and placing them above the top teams from UCSD, UCLA, UC Irvine and many other top Southern California Universities), and they promote engaging activities aimed at building a community of thoughtful and idealistic computer scientists at UCSB. **A popular computer science scavenger hunt is one example...**

ACM looks for alumni or industry partners for mentorship, technical talks, and financial support. Contact either Mike (mfrosengarten@gmail.com) or Professor Sherwood (sherwood@cs.ucsb.edu).

Donors Making A Difference

Professor Richard Kemmerer appointed to Computer Science Endowed Chair

Richard Kemmerer, Professor of Computer Science at the University of California, Santa Barbara, is the first scholar appointed to the Leadership Chair in Computer Science. The Leadership Chair was established in 2006 with a $500,000 gift from an anonymous donor. "I am really honored to be the first recipient of the Computer Science Leadership Chair," said Kemmerer. "I was the first faculty member hired into the department when it was established 28 years ago and I have watched it grow from a core of five professors to a first-rate nationally and internationally ranked department. I am really proud of what we have accomplished."

Amr El Abbadi, Chair of the Computer Science Department, added, "Professor Kemmerer is a pioneer in the field of computer security, and his appointment to the Leadership Chair is a clear indication of his stature and eminence. Security of computer systems is of utmost importance, and Professor Kemmerer and UCSB are clearly in a leadership position. They are forging the way for the future."

Thomas Jagodits received his M.S. from UC Santa Barbara. He has taken his skills to Hughes Network systems in Maryland as a Senior Technical Director, but he has not forgotten his friends and those who helped in shaping his career.

We asked Thomas a few questions about his time at UCSB:

Why did you choose to attend UCSB?

One year after completing my bachelors degree at the University of Texas, I was ready to start in a MSc program. The West Coast was high on my list of graduate schools and while vacationing, my wife and I drove through Santa Barbara. We liked what we saw, and after learning about UCSB's good reputation- I applied!

What is unique/special about CS/Computer Engineering at UCSB?

The spirit of cooperation was important. Academically, the DSL lab was a great experience and opportunity. The seminars provided students with information beyond the classroom, I also enjoyed working on my thesis. Of course playing ultimate frisbee and water polo were high on the list.

What has motivated you to direct your philanthropy to Computer Science?

UCSB provided us with more than just an education, it also provided a distinct approach towards life and education. Furthermore the hope is that our contribution can further enhance the UCSB CS Department.

The demand and guidance from the faculty (Amr El-Abbadi, Ambuj, Divy, John and others) have been a reference in my subsequent career.

Furthermore it was outstanding not only to learn the theory about specific subjects but how all these subjects somehow relate.

The Department is enormously proud of Thomas' distinguished career, and grateful for his long-time support of CS at UCSB.

The Department of Computer Science Wants to Hear from You!

Please fill out the questionaire amd mail in in the attached envelope

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