

# Computer Engineering Annual Report, 2007-2008

*Computer Engineering focuses on the design, analysis and application of computers and on their applications as components of systems. The UCSC Department of Computer Engineering sustains and strengthens its teaching and research program to provide students with inspiration and quality education in the theory and practice of computer engineering.*

Departmental Mission Statement

## Achievements

The past year has seen many achievements within the Department of Computer Engineering.

- We are joined by new Associate Professor Jacob Rosen, who works on the forefront of biomedical robotics, and brings new strength to our budding mechatronics program and the interdepartmental bioengineering program.
- We were awarded funding from HP to continue our research and teaching trajectory in student-centered learning technology. <http://press.ucsc.edu/text.asp?pid=1536>
- We began development of a cell-phone based speech therapist with funding from Microsoft Research. <http://press.ucsc.edu/text.asp?pid=1944> also covered in the San Jose Mercury News, Cell Phone Digest, Speech Technology Magazine, KION, and other media outlets.
- We surpassed \$1 million of research funding in our new target area of assistive technology research.
- We created an innovative internship program with Cisco Systems to provide undergraduate and graduate students with custom-designed industrial experiences jointly overseen by UCSC and Cisco.
- We established the California Alpha Delta chapter of Tau Beta Pi, the National Engineering Honor society. <http://press.ucsc.edu/text.asp?pid=2029>
- We attracted, with biomolecular engineering, electrical engineering, and molecular, cell & developmental biology, a large first frosh class in bioengineering, bringing the program to over 100 majors and premajors in Fall 2008  
[http://www.ucsc.edu/news\\_events/press\\_releases/text.asp?pid=1050](http://www.ucsc.edu/news_events/press_releases/text.asp?pid=1050)
- We assisted and lead the creation of the Technology in Information Management graduate program, approved by campus and awaiting system-wide review.
- We earned two highly competitive best paper nominations (IEEE MASS 2007, IEEE MASS 2008 top 2% of submissions) and one best paper award (SPECTS 2007) with our world-class networking research.
- We received notice of a \$1 million expansion to our Multi-University Research Institute (MURI) on ad hoc networks.
- We completed an external review, and are proud to continue our tradition of a “strategic leadership role within the SoE,” to have recognized our “strong program that is serving [our] students well,” and to hear that our “efforts to broaden into bioengineering and mechatronics are commendable, indicating an ambitious effort to attract good students and evolve with technology.”
- We launched a new course on game console architectures, merging issues of computer architecture, parallel processing, and computer game design, especially targeted to student in the new computer science: computer game design program.

- We expanded the interdisciplinary offerings of the School of Engineering by cross-listing undergraduate and graduate courses with Psychology, and received high accolades from engineering and psychology students.
- We received grant and gift income of \$4.3M, up 33%, and had research expenditures of \$3.2M, up 40% from 2006-7.
- We educated 190 majors and premajors, up 18% from 2006-7, and maintained 60 graduate students, and will grow to 300 majors and premajors and 79 graduate students in Fall 2008.
- We graduated 4 minors, 18 BS, 19 MS, and 3 PhD students.

## Goals

The Department of Computer Engineering has goals of excellence in research, undergraduate and graduate teaching, and service. In research, we target four specific areas of research excellence:

- computer system design
- sensing and interaction
- computer networks
- embedded and autonomous systems.

We have also defined a cross-cutting interdisciplinary emphasis in assistive technology as a targeted area of opportunity as we seek to train undergraduate and graduate engineers for the future. In teaching, we strive for innovation and excellence in the classroom and in academic programs. We have led efforts to integrate modern technology in teaching (<http://press.ucsc.edu/text.asp?pid=1536>), and are constantly working to improve our undergraduate and graduate curricula. In service, we dedicate ourselves to serving the Baskin School, UCSC, and our professional disciplines. Computer Engineering faculty frequently dedicate themselves to leading many efforts, both on campus and off.

Our goals for 2007-8 were:

- Successful recruitment of an exceptional leader in Autonomous Systems.  
**Completed exceptionally, with Jacob Rosen's hire.**
- Development, with the SOE, of a comprehensive publicity campaign to ensure awareness of the excellence of our programs, in an effort to enhance graduate recruitment and increase reputation-based rankings.  
**Completed in part, with departmental pamphlets and web site updates, 2-day graduate student recruitment event, and SOE plans for publication updates.**
- Establishment of the Network Sciences Institute  
**Nearing completion.**
- Increase of undergraduate majors.  
**Completed, with 50% growth in majors for Fall 2008.**

Our goals for 2008-9 include:

- Work with the SOE and departments to implement the recommendations of the external review report, including joint appointments, cross-listing of courses, and a growing collaboration and commonality in graduate programs.
- Prepare for a seamless ABET review in Fall 2009.
- Create a comprehensive awareness campaign for our graduate program.
- Propose an undergraduate program in mechatronic engineering and a multi-program graduate emphasis in autonomous systems and control.

## Opportunities

The Department envisions two leading opportunities for the near future, in addition to the promise of the multi-program bioengineering program:

- **Autonomous Systems.** Computer engineering has proposed as part of the five-year perspective, the development of a graduate program in autonomous systems and undergraduate degree in mechatronic engineering. This cross-cutting area would be expected to include faculty in CE, EE, AMS, ISM, Economics, and potentially other areas. Although we have been disproportionately affected in the incremental budget changes responding to increasingly gloomy outlooks, we concur with the external review committee that these are areas of excellence fit and potential within the School. As budgets are restored, we trust that so too shall be our two additional positions in autonomous and embedded systems, potentially also related to assistive technology, not to mention our one additional position in networks.
- **Entrepreneurial Connections.** Our MS in computer engineering with an emphasis in network engineering, with founding chair and dean Mantey's leadership, was the campus' first degree program targeted at working professionals. In collaboration with UCSC Extension and with the leadership of graduate director Brandwajn, we have been pursuing an opportunity to significantly expand the reach of this program with Lockheed Martin, via a distributed cohort throughout the company. With leadership from professors Mantey and Smith, we have expanded our relationship with Cisco Systems from networks technology instructional support to a formal internship program with students pursuing research projects as Cisco interns both at Cisco locations and within a dedicated internship laboratory at UCSC, the "Network Management and Operations Lab". Assistant Professor Jose Renau has developed a Sun Center of Excellence at UCSC, and is working to similarly expand our relationships with nVIDIA.

## Collaborations

The Department will continue its high level of interdepartmental, interdivisional, and inter-campus collaborations. During the past year, these collaborations have included:

- Professor Ferguson served as Provost of Crown College and Chair of the Council of Provosts.
- Professor Mantey chaired the Technology and Information Management program, which also oversees the Information Systems Management degree program.
- Professor Hughey chaired the multi-department Bioengineering B.S. program.
- In the Academic Senate, Professor de Alfaro chaired Computing and Telecommunication and served on UCCT, Professor Ferguson represented the Provosts to Educational Policy, Professor Larrabee served on Planning and Budget, Professor Hughey chaired Admissions and Financial Aid and served on the Executive Committee.
- Professor Ferguson chairs and Professor Larrabee serves on the search committee for the Baskin Dean. Professor Hughey served on the search committees for Director of Admissions.
- Professor Tao serves as Associate Editor of Pattern Recognition, the leading journal in the area, and of the Machine Vision and Applications Journal.
- Professor de Alfaro is co-chair of the 2008 ACM EMSOFT conference on embedded software.
- Professor Manduchi is co-chair of the 2008 Workshop on Computer Vision Applications for the Visually Impaired.

- Professor Garcia-Luna-Aceves is chairing MOBICOM 2008, the premier conference on mobile computing and networking. Professor Obraczka is chair of the poster session, and Professor Sadjadpour of registration.
- Professors Mantey and Garcia-Luna-Aceves received continuing recognition of their achievements through reappointment to Baskin Chairs in Computer Engineering.
- Professor Mantey has been involved in STEPS, IGPP, UARC, IUCRP Steering Committee, CRS (Center for Remote Sensing, a part of IGPP), CIMT (Long Marine Lab) and SSRC (CS). He served as director of CITRIS at UCSC, and facilitated seed funding for projects throughout the School.
- Faculty also served on many program committees, including ISMB2008, Hot Chips, ICCD, IPDPS, CCHP, TOF-CV, IASTED AT, VISN, and other conferences.

## **Advancing diversity**

The Department of Computer Engineering will continue to address issues of diversity in manners similar to prior years.

- Professors Ferguson and Larrabee joined with Professors McDowell and Kubby to successfully propose a \$600,000 program to the National Science Foundation featuring the development of a supportive live-and-learn community of engineering students at Crown College especially targeting women, students from other groups underrepresented in engineering or from disadvantaged backgrounds.
- Professors Manduchi, Moulds, Obraczka, and Hughey with Assistant Hangen led an NSF Research Experiences for Undergraduates Site SURF-IT, [surf-it.soe.ucsc.edu](http://surf-it.soe.ucsc.edu), a summer research program with a focus on increasing the number of women and underrepresented minorities in engineering. Professor Hughey served on the organizing committee of the 2008 PI Workshop for the NSF REU Sites focused on computing.
- Professor Hughey was recognized with a Chancellor's Achievement Award in Diversity for his efforts to bring greater diversity to the School and provide a supportive environment for all students. Cited activities include SURF-IT, serving as faculty advisor to our Society of Women Engineers chapter, sponsorship of the eWomen graduate group, as well work to establish the undergraduate bioengineering program.
- CE, CS, and the Baskin School sponsored fellowships to the Grace Hopper Celebration of Women in Computing for 3 students.
- Professor Kurniawan developed new courses in human-computer interaction and human factors, including issues concerning persons with special needs. The courses bring psychology and engineering students together to solve problems. Professor Kurniawan will serve on the Senate's Committee on Affirmative Action and Diversity next year.

## 2007-8 Graduate Degrees Granted by Computer Engineering

Student	Degree	Advisor	Title
Bakekar, Nachiket	MS	Brandwajn	Networks Project Course
Balasubrammaniam, Harish	MS	Brandwajn	Networks Project Course
Bayar, Roopa	MS	Brandwajn	Networks Project Course
Bazeghi, Cyrus	Ph.D	Renau	System and Processor Design Effort Estimation: Using Complexity and Variability to Explore New Opportunities for Optimizarion
Brennan, Shane	MS	Tao	Co-Tracking and the Automated Learning of Image Descriptors
Connors, John	MS	Elkaim	Development, Alanalysis and Implementation of a Spline Based, Obstacle Avoiding, Path Planning Algorithm for Autonomous Ground Vehicles
Das, Suparna	MS	Guthaus	MS:
Fischler, Matthew	MS	Chan	MS: Performance Routing of As Hoc Routing Protocols with Dominating set
Gao, Li Jun	MS	Garcia-Luna	Extensions
Hutter, Anthony	MS	Varma	MS:
Krishnamurthy, Sarvana	MS	Brandwajn	Networks Project Course
Manickavasagan, Hemalatha	MS	Brandwajn	Networks Project Course
Nayfach-Battilana, Joseph	MS	Renau	Accurate, Full-System, Thermal Characterization of Semiconductor Devices
Nunez, Melisa	MS	Renau	Implementation for the Santa Cruz Out-Of-Order Risc Engine (SCOORE)
Poonawala, Abyn	Ph.D	Milanfar (EE)	Mask Design for Single and Double Exposure Optical Microlithography: An Inverse Imaging Approach
Tang, Feng	MS	Tao	Local Feature Based Representation for Onject Tracking
Zhao, Qi	MS	Tao	Object Tracking Using Simplified Color Correlograms
Bakekar, Nachiket	MS	Brandwajn	Networks Project Course
Balasubrammaniam, Harish	MS	Brandwajn	Networks Project Course
Bayar, Roopa	MS	Brandwajn	Networks Project Course
Bazeghi, Cyrus	Ph.D	Renau	System and Processor Design Effort Estimation: Using Complexity and Variability to Explore New Opportunities for Optimizarion
Brennan, Shane	MS	Tao	Co-Tracking and the Automated Learning of Image Descriptors

## 2006-7 Extramural Research Funding and Gifts

July 2007 through June 2008. Several prior active multiyear awards not included.

Amount	Researcher(s)	Agency	Grant or Gift Title
129,559	Hughey, Richard	NIH/NIGMS	Predctorial Bionformatics Training at UCSC
100,000	Tao, Hai	NSF	CAREER: Elements in Solving the Multiple Object Tracking Problem
144,565	Garcia-Luna, J.J	UCSD	MURI: Space-Time Processing for Enhanced Mobile Ad-Hoc Wireless Networking
467,000	Garcia-Luna, Obraczka, Sadjadpour	US Army/AROD	DAWN: Dynamic Ad-hoc Wireless Networking
612,500	Garcia-Luna, Obraczka, Sadjadpour	US Army/AROD	DAWN: Dynamic Ad-hoc Wireless Networking
80,000	Renau, Jose	NSF	CAREER: Understanding, Estimating, and Reducing Processor Design Complexity
128,462	Dunbar, William	NIH/NHGRI	Feedback control of Biological Polymers in a Nanopore
94,765	Manduchi, Roberto	Smith-Kettlewell Eye Institute	Wayfinding for the Visually Impaired Using Passive Environmental Labeling
2,846	Tao, Hai	UC DIMI Digital Media	Ubiquitous RFID (match is HP)
71,689	De Alfaro, Luca	CITRIS	Author Reputation and Text Trust in Wikipedia
75,000	Kurniawan, Massaro	CITRIS	Virtual Speech Therapist for Stroke Survivors in Malaysia
75,000	Elkhaïm, Gabriel	CITRIS	Personal Rapid Transit Energy and Traffic Simulator
40,000	Mantey, Patrick	CITRIS	Modeling Electric Usage in Residential Load Groups
80,000	Renau, Shakouri, Guthaus	NSF	SMA: Accurate Temperature Measurement Infrastructure and Methodology for Power, Variability and Reliability
12,000	Renau, Shakouri, Guthaus	NSF	SMA: Accurate Temperature Measurement Infrastructure and Methodology for Power, Variability and Reliability
80,000	Renau, Shakouri, Guthaus	NSF	SMA: Accurate Temperature Measurement Infrastructure and Methodology for Power, Variability and Reliability
285,000	Garcia-Luna, J.J	UC Davis	ARSENAL: A Cross layer Architecture for Secure Resilient Tactical Mobile Ad Hoc Networks
110,000	De Alfaro, Luca	NSF	Directed Real-Time Testing
400,000	Garcia-Luna, Sadjadpour	NSF	Many to Many Communications for Scalable Ad Hoc Networks
70,485	Garcia-Luna, Sadjadpour	BBN Technologies	Wireless Network after Next Adaptive Network Development (WAND)
35,242	Garcia-Luna, Sadjadpour	BBN Technologies	Wireless Network after Next Adaptive Network Development (WAND)
203,645	Garcia-Luna, Sadjadpour	BBN Technologies	Wireless Network after Next Adaptive Network Development (WAND)
212,750	Varma, Anujan	LGS Innovations	Optical Data Router (ODR) Architecture Design and Evaluation
275,000	Renau, Jose	NSF	Temperature Measurement Infrastructure for Power, Variability, and Reliability Analysis
90,000	Mantey, Elkaim, Musacchio, Dunbar	UARC	ARP: Space Traffic Management Research Center
110,519	Mantey, Patrick	HP	Tablet Computers
15,000	Mantey, Patrick	HP	HP 2007 Technology for Teaching
25,000	Obraczka, Katia	Wionics Research	Research
100,000	Kurniawan, Massaro	Microsoft Corporation	Cell Phone as a Platform for Healthcare
75,000	Renau, Jose	NVIDIA	GPU dynamic power measurement
1,300	Renau, Jose	Sun Microsystems	Sun Center of Excellence in OpenSPARC
120,000	Mantey, Smith, Garcia-Luna	Cisco Incorporated	Networking Internship Program
336	Computer Engineering	Cypress Semiconductor	Instructional Laboratories
1,425	Computer Engineering	Various Donors	Gifts
1,100	Computer Engineering	Various Donors	Fellowships