

Summer 2015

Dear Computer Science Alumni and Friends,

Last September I took over as the Stanford CS department chair when Jennifer Widom stepped down after serving the department for 5½ years. The ensuing year has been a whirlwind and a major education for me (in a good way!). I have been particularly struck by the enormous support and genuine enthusiasm of the department's extended family. On behalf of our faculty and students, I'm grateful for the time and attention of the department's alumni and friends, and I look forward to meeting many more of you in the coming year.

And now it's on to this year's highlights, of which there are more than a few ...

CS 50th Anniversary

The number one event of the year was undoubtedly the department's 50th Anniversary celebration. How can anything capture a half century of scientific progress, the occasional world-changing discovery and multiple generations of faculty and students? Well, the 50th actually did a pretty good job! It was fascinating to see so many people affiliated with the department, some from the founding years and some recent graduates, comparing notes about Stanford, the department and local industry past and present. Many faculty (both current and retired) discovered old friends they hadn't seen since, well, at least the 40th Anniversary! Besides the informal socializing and catching up, the formal presentations (often with spontaneous audience participation) were excellent. One attendee was overheard saying to another afterwards: "Even the panels were good, and that *never* happens."

If you didn't get a chance to attend the 50th, it's not too late. You can still catch all of the talks and panel discussions on the department's [web site](#).

New Faculty

The department has been in "hiring mode" for the last several years, and this year was no different. Most noteworthy is that an effort begun several years ago to hire a few new faculty at the senior level came to fruition as we added three new full professors:

Maneesh Agrawala comes to us from UC Berkeley, where he was a Professor of Electrical Engineering and Computer Science. Maneesh works in the fields of human-computer interaction and graphics, frequently combining the two in novel and creative ways. Maneesh is a graduate of the department; he received his PhD in 2002 and Pat Hanrahan was his adviser. Maneesh has received a long list of awards, including a MacArthur Fellowship, and has been [named the next director](#) of the [Brown Institute for Media Innovation](#).

Moses Charikar is moving to Stanford from Princeton University. Moses is very well-known for his work in algorithms; he received the ACM Paris Kanellakis Theory and Practice award for his role in developing locality-sensitive hash functions. He is also the latest in what has turned out to be a string of high profile faculty hires in computer science theory over the last several years. Moses is another Stanford PhD, having received his doctorate under the direction of Rajeev Motwani in 2000.

Doug James is coming to Stanford from Cornell University. Doug's areas of interest are in computer graphics and simulation, where he is famous for, among other things, his pioneering research on simulating sounds from first principles and wavelet-based techniques for simulating turbulence, for which he received a technical Academy Award. Doug received his PhD from the University of British Columbia in 2001.

And while we are very excited about our new senior faculty, we haven't been neglecting hiring at the junior level, either.

Peter Bailis is receiving his PhD at UC Berkeley under the co-supervision of Joe Hellerstein, Ali Ghodsi and Ion Stoica. Peter works in the area of large-scale data management, especially on the systems problems that arise in the context of managing very large amounts of data in a necessarily distributed environment. Peter's thesis is on the topic of communication avoidance, that is, finding ways to avoid communicating data or performing synchronization while still providing guarantees about the correctness of the computation. Peter will be spending a post-doctoral year at MIT before joining us for the 2016-17 academic year.

Chris Piech is the latest addition to our lecturer staff. Chris is finishing his PhD at Stanford under Leo Guibas' direction. Fittingly, Chris' thesis topic is on applying machine learning to student learning, and in particular on using traces of student activity in doing homework (think recording every keystroke while someone works on a programming assignment) to help provide high quality, automated feedback. But as anyone who has seen Chris in the classroom will tell you, he is also a dynamite teacher. Chris will be finishing up his work as a student this fall and will begin appearing on the other side of the lectern in classes in the winter quarter.

Retirements

Eric Roberts retires in September. Eric joined Stanford and the CS department in 1990 to help build the CS undergraduate program. To say that he succeeded would be an understatement! The model Eric developed for teaching introductory computer science has been widely replicated and many of the people that Eric mentored are now leading figures in the world of computer science education. Eric has written a number of textbooks and won numerous university-level teaching awards, the ACM's Karl V. Karlstrom Outstanding Educator Award, and the IEEE Taylor L. Booth Award. We look forward to Eric's continued involvement in the department in his new role as an emeritus faculty member.

Yoav Shoham also retired this summer. Yoav joined the department after receiving his PhD from Yale in 1987. He is well-known for his work in artificial intelligence, particularly in multi-agent systems and logic-based knowledge representation. In 2012 Yoav received the ACM AAAI Alan Newell award for "fundamental contributions at the intersection of computer science, game theory, and economics, most particularly in multi-agent systems and social coordination (broadly construed), which have yielded major contributions to all three disciplines". I think that pretty much says it all! Yoav will be spending a substantial portion of his time in Israel, but also claims that we will "not get rid of him so easily". We look forward to whatever time Yoav will be able to spend on the Farm.

Changing of the Guard

There are always changes afoot at Stanford, but this year saw a rare turnover in the leadership of the School of Engineering. For those who haven't been keeping up, Persis Drell became the new Dean of Engineering last September, replacing Jim Plummer who returned to teaching and research after an amazing 15 years leading the school. Jennifer Widom had no relief from her administrative duties after her stint as CS chair and reports that she has been "demoted" to the school's Senior Associate Dean for Faculty and Academic Affairs. And if that isn't enough, John Hennessy has announced he will step down as Stanford's 10th president at the end of the 2015-16 academic year.

The CS Major: Continued Growth

In recent years the news about the undergraduate CS major has varied only between “rapid growth” and “very rapid growth”. The story isn’t any different this year. There is a limit out there somewhere, but we have yet to reach it. Last year it appeared that CS106A enrollments had plateaued, but enrollment increased from 1555 in 2013-14 to 1706 in 2014-15. That’s up 9.7%, so while not quite matching the jumps well into double-digit percentages that we were seeing until a couple of years ago, it’s still a significant increase. Meanwhile, many of the students coming out of CS106A are working their way ever further through our courses. The number of students declaring CS as a major increased to 360 this year from 325 last year, up 11%. And, by the way, the fraction of all CS majors who are women is now up to 30%.

So, we’re busy, but also still excited to have so much student interest and enthusiasm for the CS program!

SDSI

The [Stanford Data Science Initiative \(SDSI\)](#), led by [Hector Garcia-Molina](#), is a multi-disciplinary research effort spanning almost all groups on campus that are interested in applying computational techniques to the analysis of data sets – which is to say, it encompasses a huge and very diverse set of research interests across the university. To give you an idea of the breadth, the current research portfolio includes, among other things, data science topics in the Internet of Things, the social genome, personalized health, genomics, cosmology, neurology and particle physics. It’s not a set of topics that normally would be mentioned in the same sentence.

Outreach

The Artificial Intelligence lab hosted its first-ever outreach program this summer, dubbed [SAILORS](#), for the “Stanford Artificial Intelligence Laboratory’s OutReach Summer” program. SAILORS is designed to expose high school students in underrepresented populations to the field of AI. Along with technical content, a major focus of the program is to introduce students to compelling applications of AI to real-world problems. This year the two-week, full-time program provided 24 girls with both broad exposure to AI topics through faculty lectures, industry field trips and an in-depth experience with a research area through hands-on projects. This summer’s program was co-directed by AI lab director, [Fei-Fei Li](#), her (just graduated) PhD student Olga Russakovsky and Rick Sommer (director of the Stanford Pre-Collegiate Summer Institutes program). Many other members of the department, as well as generous financial support from industrial sponsors and individuals, helped make the program possible.

Research Activities

As always there is a tremendous amount of research activity in the department, and it isn’t possible to give more than a very small sample of what is going on. Here is one such sample of three activities:

Mobile Security

Recently some brands of mobile phone have added a power meter that enables any app to measure how much power is currently drained from the battery. Apps can use this facility to improve power management on the phone, an important consideration given that battery power is a very limited resource.

What possible harm can be caused by a power meter? Well, as [Dan Boneh](#) and his students report in [this paper](#), a lot. It turns out that the amount of power used by the cellular radio depends on the distance to the closest cell tower and on obstacles along the way. As one drives down a street, the amount of power

used by the radio fluctuates, and the resulting power graph uniquely identifies the street. In other words, being able to measure power consumption as one drives down a street can be used like a GPS to identify a phone's location. The moral of the story? In the looking-glass world of computer security, adding new functionality (and especially new kinds of sensors) can have major unintended consequences.

Programming Packets

Professor [Nick McKeown](#) and his students have been part of a team developing the P4 programming language. P4 stands for “Programming Protocol-independent Packet Processors”, a domain specific language for declaring how packets are to be processed by Internet switching chips. With the advent of software defined networking (developed by the same group) there is growing interest in programming networks “all the way down to the wire”. The goal is for future owners of big data centers, and builders of network equipment, to compile their own target-independent P4 programs to a variety of different programmable forwarding devices. The [P4 paper](#) won the best ACM Sigcomm CCR paper of 2014.

Finding Bugs in Patient Genomes

The human genome is an amazing distributed operating system that runs every cell in our bodies. The code is written in DNA, biology provides the interpreter, and the output is us. Recently, [Gill Bejerano's](#) group has turned its focus to devastating human diseases (output errors), caused by a handful of mutations (bugs) anywhere in patients' code. Finding these bugs is a complex computational challenge, requiring comparing millions of noisy fragments of patient genome code to billions of noisy fragments from thousands of healthy individuals, followed by numerous steps of data integration, post-processing and filtering. A concerted two year computational effort has enabled Gill's group to reach the point where they can pinpoint causal patient mutations (the bugs) where others have failed before, revealing new paths to individualized treatment and opening the door to a world where new genome editing technologies will allow us to directly attack diseases with a genetic basis by identifying and fixing the bugs in the genome.

Faculty and Staff Awards and Honors

As usual a number of faculty and staff were honored with significant awards this year:

- **Dan Boneh** — *Infosys Foundation Award in the Computing Sciences, Simons Investigator*
- **Ron Fedkiw** — *Technical Academy Award*
- **Christos Kozyrakis** — *ACM SIGARCH Maurice Wilkes Award*
- **Percy Liang** — *Microsoft Faculty Fellow, Sloan Foundation Fellow*
- **Nick McKeown** — *American Academy of Arts and Sciences*
- **Subhasish Mitra** — *SRC Technical Excellence Award*
- **Keith Schwarz** — *Stanford's Walter J. Gores Award for teaching*
- **Jennifer Widom** — *ACM-W Athena Lecturer Award*

Our long-serving department manager, **Peche Turner**, won the Kay Bradley Award for her “professionalism, integrity and devotion” to serving the School of Engineering's students.

Student News

- *Research Awards* This year's Ben Wegbreit Prize for the best CS undergraduate honors thesis went to **Hiue Pham** for his thesis titled *Improving Neural Machine Translation with an N-Gram Auxiliary Layer*. **Nick Shelley's** *Flow Caching for High Entropy Packet Fields* won the Christofer Stephenson Award for the best Master's research report. And the Arthur Samuel Thesis Award for the best PhD thesis of the 2013-14 academic year went to Richard Socher for his dissertation *Recursive Deep Learning for Natural Language Processing and Computer Vision*.
- *Teaching and Service Awards* **Reid Watson** was this year's recipient of the Student Service Award for outstanding service to the Computer Science department. Reid has been the head of the section leader program for our introductory courses during a time of extraordinary growth (and corresponding stress!). Thanks, Reid! **Rishi Gupta** was the recipient of the department's Forsythe Teaching Award; Rishi also won a School of Engineering Centennial TA Award.
- **Adam Perelman** was the recipient of the School of Engineering's Ford Scholar Award, which goes to the graduating student with the highest GPA in the entire school.
- **Angela Sy** received an honorable mention Collegiate Award for her project "Nomz: Building Communities Around Passions" from NCWIT, the National Center for Woman and Information Technology.
- *ACM International Collegiate Programming Contest* This year Stanford placed 4 teams in the top 10 in the ICPC's Pacific Northwest Regional Contest, with the team of **Lingxiao Li, Chuanqi Shen** and **Kaidi Yan** taking 2nd place overall. For the second year in a row, Berkeley took the top spot in the regionals, but both teams advanced to the World Finals in Marrakech, Morocco. Congrats to Lingxiao, Chuanqi and Kaidi on a solid performance!

Staying Connected

Please visit our CS Department website (cs.stanford.edu) for current information about the department, including faculty, students, research programs and teaching initiatives. I am always interested to hear from our alumni and welcome any thoughts and suggestions you may have about the department and its direction. One very important thing is to keep us informed of where you are; we had a few inquiries from people who heard about but didn't get invited to the 50th Anniversary, but we can't invite you if we can't find you! You can always go to the alumni section of the School of Engineering website to update your contact information (soe.stanford.edu).

Finally, I want to thank the many alumni and friends who support the department and school through annual gifts, which are vital to our continued success and outreach. Please know that these gifts are truly important to us. They allow us to award fellowships each year to our most outstanding new students, to help new faculty set up their research and teaching programs, to match funds for contracts and grants, and to purchase equipment for our teaching laboratories. Your engagement and your financial support are much appreciated – thank you!

Until the next newsletter, have a terrific year.



Alex Aiken