

MULTICAST

THE DEPARTMENT OF COMPUTER SCIENCE AT THE UNIVERSITY OF ROCHESTER

OUR BIG MOVE

FULL STORY ON PAGE 2



HAJIM
SCHOOL OF ENGINEERING
& APPLIED SCIENCES
UNIVERSITY OF ROCHESTER

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New Digs

The Computer Science Department Moves to Wegmans Hall

This year saw the move of Computer Science from the Computer Studies Building, where it has resided for the past 30 years, into brand new digs. To wit, Wegmans Hall: Rochester's just-completed interdisciplinary hub for work involving data science. The ultramodern building, initiated by a \$10-million grant from the Wegman Family Charitable Foundation, has been under construction through wind, sun, and snow for the last two years. It is the centerpiece of the Edmund A. Hajim Science & Engineering Quadrangle, to which visitors are welcomed by a newly dedicated eight-foot-high bronze statue of Ed himself. Computer Science occupies the second and third floors. The first floor is dedicated to the new Goergen Institute of Data Science, while Chemical Engineering has the fourth.

The new building is full of glass and light, with architectural details that suggest historic data representations such as punch cards and Morse code. It is constructed around open public spaces that span multiple floors and are intended to draw different disciplines together. A first-floor coffee shop provides a natural forum for informal discussions, and a state-of-the-art auditorium is designed as a central venue for presentations from all fields.

From our perch on the sixth and seventh floors of CSB, we in Computer Science watched the new building rise with a mixture of regret and anticipation. On the one hand, we liked our view. On the other, heating and air conditioning have not worked well for years, and our data communication infrastructure was antiquated.

The actual move, just after Commencement in May, went surprisingly smoothly. The central computers and servers went first, and our brilliant tech staff, Jim Roche and Dave Costello, had everything up and running within a week with virtually no glitches. The rest of us packed everything into boxes, which a professional crew moved in two days. AI faculty Len Schubert won the contest for the most boxes with 60+. AI faculty Dan Gildea had the least, throwing out all paper in the belief that modern data does not reside on cellulose. The rest of us purged varying amounts of accumulated academic detritus, a process that should probably be repeated at least every 30 years. . . .

So here we are. The lights are bright (LED), the walls are clean, the air is comfortable, and the coffee is decent. The washrooms are smart, and you can clean and dry your hands without touching anything. The students have returned, and the department has arisen, phoenix-like, from its summer slumber. And the gears, like those in the Dale Rogers sculpture by the building's northeast corner, have started to turn.



ACCELERATING PROGRAM PERFORMANCE

Background image: EuroVis 2005 and USA Highway System map from Wikipedia.



I obtained my PhD from the Indian Institute of Science in Bangalore and my BE in Computer Engineering from the University of Mumbai. Before joining the department, I was a Postdoctoral Fellow at the University of Texas at Austin.

My research revolves around general-purpose accelerators, which are add-on processors that can perform some computations much faster than the main processor. I've focused largely on graphics processing units (GPUs), which were originally designed to

speed up games and graphics rendering. But modern GPUs are also much faster than CPUs at performing the number crunching required by scientific computations. So, around 2006, GPUs started showing up in the fastest supercomputers in the world as CPU speeds faltered and then stagnated. Now it's hard to find a supercomputer that does not rely on GPUs or other accelerators to achieve its performance. GPUs have also enabled recent advances in deep learning, often out-computing racks of CPU-based servers.

"This knowledge could lead to deeper insights into how we build processors, how we design programming languages, and how we compile programs.

Unfortunately, just plugging in a GPU doesn't speed up programs automatically, and most systems today require that you rewrite your program to run on the GPU. While languages like OpenCL allow programmers to write a program that can run on both CPUs and GPUs, getting a program to run fast on a GPU is a nontrivial task. At a high level, a programmer must do three things to write fast programs: perform fewer operations, make them the cheapest operations on the machine, and execute as many of those operations in parallel as possible. Most programmers rely on smart compilers and complex processors to automate these tasks, but compiler technology for GPUs is fairly immature, and GPUs are incredibly simple by design. Currently, it falls on programmers to manually speed up GPU programs, but ultimately this isn't really a viable option.

Unlike CPUs, which usually all look alike, GPUs are very heterogeneous. Nearly every computational device you own—from your mobile phone to your laptop—contains a GPU. Yet, these GPUs differ so much from each other that "tricks" and "rules of thumb" learned to speed up programs on your laptop GPU are unlikely to carry over to mobile phone GPUs or even to a different laptop GPU.

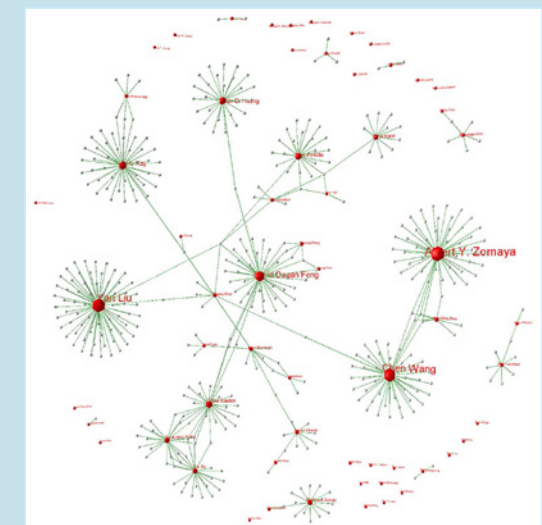
To make things even harder, in this age of big data, the performance of many interesting programs is largely dictated by the data they consume. Consider a program to calculate the number of hops (or "degrees of separation") between two scientists where two scientists are at a distance 1 if they've co-authored a scientific paper. You'd solve this by modeling co-authorship between scientists as a graph, which is a mathematical structure built out of vertices and edges, and where scientists are modeled as vertices and an edge between two vertices represents co-authorship. Such a graph is often called a social network and once this graph is built, it's relatively simple to figure out the number of hops between two vertices using an algorithm called breadth-first search (BFS).

Surprisingly, on GPUs, a BFS implementation that processes social network graphs well tends to process other kinds of graphs, like road networks, significantly more slowly. In fact, modifying the program to make it run fast for road network graphs slows it down for social network graphs! Ultimately, you'd decide to write two separate programs and switch between them depending on what kind of graph you were processing.

Not only is this counter-intuitive—road networks can have thousands of hops between vertices while social networks rarely exceed six hops—it's a lot of work for the programmer to specialize each program for the different kinds of graphs that may exist out there. This problem inspired the design of IrGL, a programming language and compiler for GPUs, where programmers only need to write one program and the IrGL compiler will generate hundreds of variants of that program automatically. Among those variants are the two that correspond to the fastest versions for road networks and social networks respectively. The IrGL compiler is so good at generating fast GPU programs for graph

computations that it outperforms nearly all expertly written graph processing code in the literature with very little programmer effort.

Although using IrGL solves the immediate problem, we'd really like to know why running a particular program on a particular input on a particular machine takes so much (or so little) time. This knowledge could lead to deeper insights into how we build processors, how we design programming languages, and how we compile programs. Towards this goal, I've been building performance models for graph programs running on GPUs and now have a system that can automatically pinpoint bottlenecks in code and hardware. Knowledge of these bottlenecks can be fed back to the programmer, who can decide to work around them, and also to computer architects who can build better processors. Ultimately, knowing exactly how a



Citation network from Ahmed et al.

program interacts with a general-purpose processor could lead to custom machines that are faster and consume lower energy than both CPUs and GPUs.

The department has a strong tradition of cutting-edge research on systems, and I hope to contribute to that tradition. Some of my research goals involve significantly automating many low-level tasks, and I hope to collaborate with the AI and Theory faculty in the department as well.

I should note that Rochester, the city, is my first chance to experience all four seasons. When I am not writing programs that write programs, I like to bicycle long distances. I am particularly looking forward to biking the trails along the historic canals in the region. And come winter, I'm hoping to pick up cross-country skiing.

GOLDEN AGE OF MOBILE COMPUTING

Yuhao Zhu will join the Department of Computer Science starting with the spring semester of 2018 as an Assistant Professor.

Zhu's research is in computer architecture and systems. "I like building better software and hardware to make next-generation client and cloud computing fast, energy efficient, intelligent, and safe," he says. His dissertation research for his PhD from the University of Texas at Austin (2017) advocates the "Watt Wise Web" as the next major milestone in Web evolution, driven by mobile devices' need for energy efficiency. He spent the last year of graduate school as a research fellow at the Architecture, Circuits, and Compilers Group at Harvard and will join Rochester after finishing his appointment as a visiting researcher at ARM Research.

Yuhao's research is motivated by the rapid penetration of today's mobile devices and the implications of that growth for computing technologies. "We are in a golden age of mobile computing," he says. Over the past two decades, mobile computing has evolved from communicating simple messages to personal supercomputers that are capable of recognizing, mining, and synthesizing user-originated "big data." Coupled with the increasing capability, mobile computing is also becoming more ubiquitous than ever. However, a key challenge as mobile computing hits the critical mass is energy efficiency. Energy efficiency fundamentally limits the computation capability of mobile devices and is a major roadblock to the vision of Green Information Technology.

Yuhao aspires to address the core problem of improving the energy efficiency of mobile computing via architecting better and more practical computing systems. He believes that addressing the energy-efficiency issue requires that we break traditional software and hardware boundaries, which means designing computing systems that combine hardware, software, and application domain knowledge.

What drew Yuhao to URCS is the world-class computer science and engineering program, to which he hopes to contribute through his research and educational activities, as well as the breathtaking nature scenes in the Rochester area. When not in the lab, he can often be found hiking in the wilderness with his wife.



2016–17 IN RETROSPECT



Sandhya Dwarkadas
Chair of Computer Science

Culminating with our move to Wegmans Hall, 2016–17 has been an eventful year.

Two new faces will join the ranks of our tenure-track faculty this coming year: Sreepathi Pai (PhD from IISc, India, post-doc at UT Austin) and Yuhao Zhu (PhD from UT Austin). Sree works in the space of high-performance heterogeneous and accelerator-based computing. His most recent work revolves around optimizing compilers for high-performance irregular/graph algorithms on GPUs. Yuhao's research focuses on a holistic approach to energy efficiency—especially in the mobile space—involving networks, applications, programming languages, runtime system, and processor architecture. His dissertation research yielded the "Watt Wise Web." Yuhao will spend six months at ARM research before joining us in the spring.

Our Bachelor's program continues to grow in popularity, with more than 115 students in the entering class of 2021 declaring an interest in computer science. Additionally, students in the interdisciplinary majors of

Data Science, Computational Biology, and Computational Linguistics draw heavily on computer science.

We will continue to receive support from the BRAID (Building, Recruiting, and Inclusion for Diversity) initiative for at least another year. Our participation in the BRAID initiative has yielded tremendous results: our 2017 graduating class had 104 students, of which 34 percent were women, compared to a national average of 15 percent.

Three Computer Science students, seniors Daniel Rubery and David Fink and sophomore Zachary Polansky, placed in the elite top 4 percent of finishers in the annual William Lowell Putnam Mathematical Competition.

The following students received awards at our Commencement Ceremony: Outstanding Teaching Assistant: Mikayla Konst; Excellence in Undergraduate Research: Chuyang Ke, Yinhen Zhou, and Joyce Zhu; Entrepreneurship Award: Anis Kallel; Women in Computing Award: Eakarn Som Liengtiraphan; Most Valuable Programmer (MVP): Daniel Rubery; and Outstanding Senior: J. Hassler Thurston.

Twenty seniors studied abroad: Saul Aboudi (Hong Kong); Laura Bochenek and Megan Markert (South Korea); Antonio Cardenas, Maggie Curtis, Willie Cohen, Kevin Gerami, Lance Floto, Brandon Slaght, Josh Stern, and Zoe Tiet (Budapest, Hungary); Nathan Contino (United Kingdom); Annis Kallel (Madrid, Spain); Joseph Pivan-Franke (Thailand); Nathaniel Potrepka (Germany); Daniel Saltz (New Zealand); Jorge Sanchez De Llano and Milijana Surbatovich (Russia); Raina Langevin (India); and Charlie Norvell (Italy).

Our Association for Computing Machinery (ACM-ICPC) Programming Team (Daniel Rubery, Zachary Polansky, and Jackson Abascal) came in first place in the Regional Semifinals at SUNY Oswego and second

place in the Regional Finals. They advanced to the World Finals, held May 20–25 in Rapid City, South Dakota, where they tied for 20th place with MIT.

Our faculty continue to grow their research enterprise and reach, both nationally and internationally. In addition to NSF, DARPA, and DoD, collaborations with Adobe, Futurewei, IBM, Google, Microsoft, NEC, Samsung, TCL, Yahoo, and Xerox have yielded awards to fund research. International collaborations span Austria, Belgium, China, France, Germany, Greece, Italy, Poland, Sweden, and Switzerland. John Criswell was the recipient of an NSF CAREER award for his work on protecting applications from the underlying system. Ehsan Hoque was named an MIT "Innovator Under 35" and was also a recipient of a 2016 World Technology Award in IT Software for his achievements in "applying emotion technologies in the domains of social skills training, public speaking preparation, customer service modeling, assessment technologies, and assisting individuals with social developmental disabilities."

Our students and alumni continue to do and be recognized for their outstanding work. PhD alumni Bryan Lyles ('83) and Ricardo Bianchini ('95) were named ACM Fellows. Lyles, who did his thesis work with Jerry Feldman, currently serves as a Research and Development Manager at Oak Ridge National Laboratory. He was cited for "contributions to Internet infrastructure technology, measurement, and research." Bianchini, who did his thesis work with Tom LeBlanc, currently serves as Chief Efficiency Strategist at Microsoft. He was cited for "contributions to power, energy, and thermal management of servers and data centers."

Do come visit us in our new location! We hope to see many of you during Meliora weekend, when we will have an open house and research showcase.

AWAKENING EXPECTATIONS



Andrew McCallum is a professor and director of the Information Extraction and Synthesis Laboratory, as well as director of the Center for Data Science in the College of Information and Computer Science at University of Massachusetts Amherst. He has published more than 250 papers in many areas of AI, including natural language processing, machine learning, and reinforcement learning; his work has received more than 50,000 citations. McCallum obtained his PhD from the University of Rochester in 1995 with Dana Ballard. He is an AAAI Fellow; the recipient of the UMass Chancellor's Award for Research and Creative Activity, the UMass NSM Distinguished Research Award, the UMass Lilly Teaching Fellowship, and research awards from Google, IBM, Microsoft, and Yahoo.

ED: You have an unattributed quote on your website: "A master can tell you what he expects of you. A teacher, though, awakens your own expectations." Is this your advising style? How do you bring out the best in your students?

AM: Dana Ballard, my PhD advisor at Rochester, was a big influence on my advising style. He led by inspiration. I remember seeing him give a talk about his latest ideas for active vision and walking away completely jazzed, ready to change the world.

I try to lead my own students by inspiration. I certainly guide with a light touch. I make suggestions for broad directions or certain technical approaches, but the students make their own choices. Sometimes it can turn into sink or swim but hopefully with a lot of calm, loving advice from the sidelines. I really see my advisees as additional children—my academic offspring. There are a lot of parallels: they both need nurturing and freedom in careful measures on just the right schedules, which can often be hard to discern.

ED: Your PhD thesis was in reinforcement learning. Since machine learning was in its infancy, how significant was your early work in establishing machine learning as a new direction in computer science?

AM: Before I finished my thesis I was already becoming disenchanted with reinforcement learning, and I really wanted to start a side project on machine learning for natural language. Dana very wisely said, "No. Finish your thesis first." I was disenchanted because at the time I felt that RL was a solution in search of a problem. The RL community was mostly stuck solving maze problems. (I certainly contributed to that problematic trend.)

Of course now we are seeing how wrong I was, given the fantastic success of reinforcement learning with deep neural networks, not just in DeepMind's AlphaGo, but in education, medicine, energy, and many other areas. I think it is one of the most exciting research directions on the landscape in a decade.

My later work on machine learning for text perhaps had more influence (for example, conditional random fields), but I certainly wouldn't have been able to do that without the mental exercise and confidence building of first doing my Rochester reinforcement learning thesis.

ED: You have created some machine learning tools that are well known and widely used by technologists. Could you describe MALLETT and FACTORIE, how they are being used, and who would be most likely to use them?

AM: I have always tremendously enjoyed engineering large systems and writing code. In fact, during my PhD, during a low-confidence moment I considered exiting the UR CS PhD to work as a coder on a Free Software Foundation project. (That probably would have been fun, but I'm very glad I stuck with research.) I did, however, waste a huge amount of time in the final months of my PhD reading through much of the source code to the GNU Hurd project.

Anyway, after WhizBang Labs (the start-up company that Tom Mitchell and I helped found in 1999) went under, I realized I really missed working with students and focusing on research. So I decided to apply for an academic position. I feel very fortunate that UMass Amherst said yes. In the early days of WhizBang Labs I did a lot of coding, helping design a system that eventually turned into over 1 million lines of machine learning and data integration infrastructure. But during the final six months of WhizBang I hardly had any time to code. When I arrived at UMass I knew my students and I would need some software infrastructure to do our research. And I had a lot of pent-up coding energy. So during my first three months at UMass (before I had many students or too many responsibilities), I wrote something like 30,000 lines of Java, which became MALLETT.

It was used by nearly all my students for almost ten years. I'm happy that many others seem to have found it useful, too. I estimate that about 500 companies (large and small) have used it, and it has been cited almost 2,000 times. It mostly does efficient classification, clustering, topic modeling, and sequence labeling (the later with conditional random fields).

By 2009 my research was requiring more general graphical models than MALLETT could provide. I was also getting tired of the verbosity of Java. So on the advice of my UMass colleague Emery Berger, I took a look at the programming language Scala, and I started work on FACTORIE. I wrote most of it during my sabbatical in Grenoble, France. It is a general-purpose graphical model toolkit

designed to be fast and scalable (not a teaching toy). It also has a complete NLP pipeline that is in many cases faster, more accurate, and more compact than the Stanford Core NLP toolkit. It is also fairly widely used. For example, it is part of some shipping products from Oracle.

But FACTORIE doesn't have any deep learning. So I'm now trying to decide whether to collaborate with some Oracle JVM engineers on some JVM-GPU integration and extend FACTORIE, or whether to build something new.

ED: The day you defended your PhD thesis was a cold, snowy Rochester day. As you were racing around preparing for your talk, you slipped on melted snow in the CSB hallway and cut open your head on a corner wall, requiring a trip to the ER and stitches. Later that day, you successfully defended your thesis with a bruised and bandaged forehead. Has this experience helped you prepare your students through all the inevitable ups and downs a grad student might experience along the path to a PhD?

AM: Ah! I remember slipping in the hallway and getting stitches at the hospital. And I remember giving Leslie Kaelbling a tour of our virtual reality lab before my thesis oral defense. But I had forgotten that they happened the same day!

The CS staff was so kind when I walked into Marty Guenther's office, blood streaming down my forehead. I think Jill Forster drove me to the ER, stayed, and drove me back.

Finishing a PhD is a surprisingly emotional journey, I find. From the intellectual search of the last year or so, to the final few months' push to finish the writing, to the oral presentation—and throughout the self doubts and the accomplishments. I find myself thinking a lot about this as I guide my own students through to the end. I admit I shed a few tears myself along the way, including a few in Dana's office. The majority of my own PhD students can attest to the same thing.

ED: You are well known for your work in conditional random fields. Your 2001 paper on this topic received the ICML "Test of Time Award" in 2011 because of its applicability for more than a decade. Could you have imagined your work would be cited more than 10,000 times? What makes this paper so important after so many years?

AM: When John Lafferty, Fernando Pereira, and I were working on these ideas, I knew they were a great solution to the information extraction problem I was working on at the time, but we had no idea the idea would grow to be so influential.

In the beginning the experimental results weren't even very good. I had tremendous fun working on improving and extending the idea with my students at UMass. I was thrilled when a few people from other universities began to build on the ideas.

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McCallum and his son Logan

Graduate Alumni NEWS

Altman, Art (MS '87)

I'm retired from career at Electric Power Research Institute, Palo Alto, California, where I managed research in algorithms for energy market modeling and financial risk management of energy portfolios. I moved to New York City, where I volunteer with the Climate Reality Project and, also, my lifelong hobby of portrait photography has become a business! See www.artmaltman.photography.

Bianchini, Ricardo (PhD '95)

My latest news is that I've become an ACM Fellow in 2016 and IEEE Fellow in 2015.

Boutell, Matt (PhD '05)

I am still Associate Professor of Computer Science and Software Engineering at Rose-Hulman Institute of Technology. I received the Dean's Outstanding Teacher award in 2016, but it's easy to teach when you get to work with hard-working, motivated students. I am happy that my oldest son, Jonathan, will start at Rose-Hulman this Fall, studying engineering. How time flies—Jonathan was only two when Leah and I arrived at Rochester! The photo shows our crew indulging in some good authentic Mexican food. From left to right are me, Leah, Elise, Jonathan, Elliot, Anna, and Caleb.



Matt Boutell and family

Byron, Donna K. (PhD '02)

I'm a Senior Software Engineer working as a technical lead for natural language processing software and have built a variety of systems for IBM customers ranging from dialogue systems that converse about product features, logical reasoning from patient medical histories to compute criteria for matching the patient to clinical trials, and cooking recipe information extraction and commonsense reasoning for ibmchefwatson.com. I also received the title of Master Inventor due to being both a prolific inventor and a mentor within the IBM inventor community. Due to the range of technologies we work with at IBM, I put to use everything I learned at URCS from AI to architecture to compilers. IBM is a terrific place to work.

Chung, Tagyoung (PhD '13)

I am now an Applied Scientist with the Amazon Alexa Machine Learning team.

Cottrell, Garrison W. (PhD '85)

I was elected a Fellow of the Cognitive Science Society this year.

Denber, Michelle (PhD '80)

I'm working on an interesting project to once again network the Xerox Alto for the first time in over 35 years. I received an adapter board from the Living Computer Museum in Seattle that will provide IFS services on a PC and connect to my Alto over a 3 MB Ethernet. I have a length of coax to serve as an Ethernet and expect to be tapping the cable in the next week or so. I also have an Alto disk from Alan Kay that I hope to be able to copy and then email to him. The photo is of an Alto Ethernet transceiver with the red LED lit, in a test before attaching it to the cable.



Art Altman



Michelle Denber's project

Jain, Sanjay (PhD '90)

I am a Professor for the School of Computing at the National University of Singapore. Photo is of me, twin daughters Krati Jain and Urvi Jain, and wife, Shobha Jain.

Lyles, Bryan (PhD '83)

Bryan is still working at Oak Ridge National Labs, and this year was elevated as a Fellow of IEEE for his contributions to local network technology, Internet measurement, and research cyberinfrastructure. In December 2016, he was named as an ACM Fellow for his contributions to Internet infrastructure technology, measurement, and research.

Miller, Bradford (MS '86)

I've been at GE Global Research (located in Niskayuna, New York) since 2011. Not much to report other than that; mostly working on embodied AI when I'm allowed to do what I want!

O'Riain, Colm (MS '95)

After 15 years working in the video game industry at companies including Electronic Arts and Activision, I moved into philanthropy work at Zynga.org and Music Team before joining Machine Intelligence Research Institute in July 2016. I'm still also a professional violinist and composer, playing in and around the Bay Area.

Pinheiro, Eduardo (MS '00)

Back on December 17, 2016, my first child was born. Her name is Cora Martins Pinheiro.

We want to hear from you!

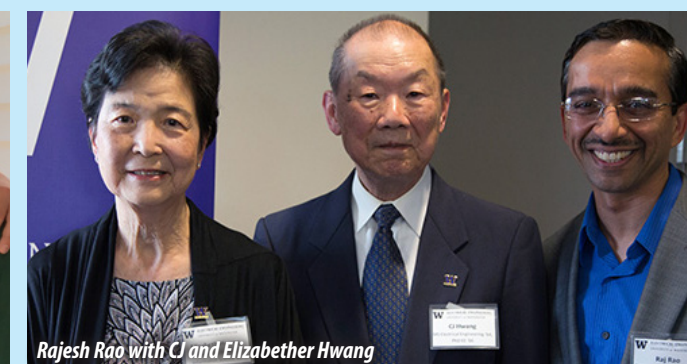
With staff turnover, we've lost contact information for so many graduate alumni. Please help us update our records by emailing Michelle Kiso (mkiso@cs.rochester.edu) with your current email, job, and mailing addresses so that we may stay in touch.



Colm O'Riain



Michael Swain's sons, Matthew and Daniel



Rajesh Rao with CJ and Elizabeth Hwang

Rao, Rajesh (PhD '98)

I have been awarded an endowed professorship and am now the CJ and Elizabeth Hwang Professor of Computer Science and Engineering and Electrical Engineering at the University of Washington.

Shani, Uri (PhD '81)

I will retire from IBM this September and will be working part time at the ESML (Enterprise Systems Modelling Lab) of the Industrial Engineering & Management department of the Technion (as of October 2017) and will also be a freelancer.

Swain, Michael J. (PhD '90)

I'm still at athenahealth. My wife, Karen, is a graduate of the University of Rochester—she has a master's in geology—and my son, Matthew, will be attending the University of Rochester in the fall as an undergraduate. I've included a picture of Matthew with his older brother, Daniel, who is currently playing professional minor-league baseball in the Diamondbacks organization.

Tao, Yiyang (MS '99)

I received my MS degree in 1999. I have been doing investment banking for the last 10 years, and I'm currently with Morgan Stanley in Hong Kong.

Warner, Jeremy (MS '16)

I will be presenting a paper that I worked on with Philip Guo while at Rochester at ICER in August. Here is an address for the research: http://pgbovine.net/publications.htm#student_perceptions_of_college_hackathons_ICER_2017.



Sanjay Jain and family



Eduardo Pinheiro and family

FROM TRUMPET TO TECH



Shawn Hershey

Shawn Hershey graduated from URCS in 1999 with a BA in Computer Science, after spending two years as a performance trumpet student at the Eastman School of Music. Shawn now works at Google Research in New York City and enjoys playing in a swing band and teaching and performing the Lindy hop.

ED: You were forced to abandon your trumpet performance major at ESM due to a lip injury. Tell us about that time, why you changed to Arts & Sciences (we weren't yet part of the Hajim School in 1998), and why you chose Computer Science.

SH: As a kid I was always interested in understanding the universe, and three of my grandparents were in the sciences. So when it came time to apply to colleges, I tried for schools like Princeton to study physics and ESM for music. It was a tough choice, but I ended up deciding to pursue music. There's just something so viscerally thrilling about performing. When I injured my lip (nerve damage from over practicing), it was therefore fairly natural for me to switch my focus to physics, and staying at U of R made the most sense in terms of finances. I also wasn't sure if I would eventually be able to play again and switch back to music.

I was intimidated by the idea of studying computer science. I think maybe because I was only mildly interested in *using* computers and many people that I knew who pursued CS spent lots and lots of time with computers before going into CS. Regardless, a high school math teacher had told me that because I was good at logic I would probably enjoy programming, and I had a friend at Columbia pursuing it. So I tried a CSC 171 course and loved it. It felt more like music than other course that I had taken. Something about the hands-on nature of it and the feedback that compilers and programs give me when developing feels similar. As I started learning about computers, I began to get really excited about unraveling the mysteries of how they work.

ED: How difficult was it to have your life's plans change so drastically during your sophomore year? Do you think you'd be where you are today if fate hadn't dealt you that blow?

SH: It was a deeply emotional time. A lot of my identity surrounded being a musician and trumpet player. In retrospect, wrapping your identity too deeply into any pursuit seems kind of dangerous and leads to a pride that sometimes undermines the humility needed for self-analysis and improvement.

It was a bit of a relief switching to CS. I was having issues with endurance and high register, and those are essential skills for a trumpet player. It could be that the injury enabled what I consider to be a very exciting lifestyle today. But it's hard to say. I might have transferred to CS anyway, without the injury (just later) or maybe succeeded and enjoyed being a professional musician very much.

ED: You have two very distinct lives—Google Research by day and swing dancing and playing trumpet by night. Do they balance each other? Does the creativity inspire you? Do flexible work hours at Google allow for such an active nightlife?

SH: I'd say I have four lives: SW engineering, music, dance, and socializing. I think they very much balance each other out. I remember early on in my career I did a few programming side projects and it was exhausting to code during the day *and* at night. Then again, it can be exhausting to try to do all four of these things intensely during a week. So I tend to go through phases where I focus more on music, dance, or socializing while continuing to work hard at my day job.

Google is indeed very generous, flexible, and encourages a healthy work-life balance. I likely work about 40 hours a week. It depends on your manager, but I will sometimes work remotely on a Friday and Monday around a weekend that I'm traveling to some other city to teach dance or play music. However, throughout my entire career, I've prioritized my hobbies while making sure I still worked 40 hours a week and was always given the opportunity to work late hours (usually noon–8). So I sometimes suspect that people who work more than 40 hours a week as programmers do it because they really want to or don't specifically carve out time for other things.

ED: Are you playing in a swing band in New York City? Can alumni come hear you play?

SH: I mostly travel with my swing and blues band, The Fried Bananas (thefriedbananas.com), and we rarely play in New York City. So alumni will have to start traveling to dance events to hear me play. It's fun! Do it! Though I think I will be transitioning away from traveling for music and might start playing in New York City more. I currently sit in with friends' bands and sometimes play gigs with them, but I'm not very good at publicizing. One way I get by doing so many things is to prioritize and not try to do everything, such as publicizing. Ha! But if any alumni want to come out swing dancing or blues dancing in New York City, they should try to find me and say hello.

ED: Your work prior to joining Google Research was much more applied. Why the move to Google Research, and how does it differ from your previous jobs? Can you describe what kind of projects you work on and what CS skills or coursework from your UR education you find most useful?

SH: My first job at Teradyne was very applied. My next job was actually at a start-up company trying to build hardware accelerators for machine learning. I would say that the start-up company was actually my least applied job, though it was very fun. Actually, interestingly enough, I got that job through music. I played in a band with Ben Vigoda, an MIT Media Lab graduate student and eventual entrepreneur. We played in a jam band together, and then I worked on a musical video game with him as a side project, and so when it was time for him to hire a SW engineer, he hired me. AI has always seemed incredibly exciting to me. I worked on Google Maps for two years, but when my friend Rif, who is now my boss's boss, suggested I apply for the research team, I was excited to do so. Yet again, to some extent I owe the arts for this opportunity. Rif is a social dancer, like myself, and a friend, which is why he thought to reach out to me to apply to the Research job. My Google Research job is actually quite applied. Some teams at Google do purely basic research, but Google puts a lot of stock in considering how your research can fit into a product and have big impact. My team's work is already affecting products.

Google is indeed a very different place to work from my previous jobs. Both the Google Maps and Research work I've done is at very large scale—huge data sets and large numbers of users. Learning to use many computers to do things fast with large amounts of data and all of the Google infrastructure to do this has taken a lot of time. They say your first six months at Google are not super productive, and despite thinking I could beat this metric, it was after about six months that I started to feel really capable there.

It is true that working in research is also different in its own way. You can read more about what I do in a recent paper I co-authored, but the summary is that I've been training neural networks to listen to audio clips and find audio events (such as musical instruments, animal sounds, human sounds, etc.). Much of machine learning is actually building pipelines to move large amounts of data around for training and evaluation.

I often tell people that the most impactful courses for me were CSC 171, data structures and algorithms, operating systems, and computer architecture. At the U of R I got a BA instead of a BS. As a result I had to do quite a bit of self-study to catch up on the research side of things while working at the start-up. I taught myself quite a bit about linear algebra, probability and statistics, linear programming and other optimization techniques, and machine learning.

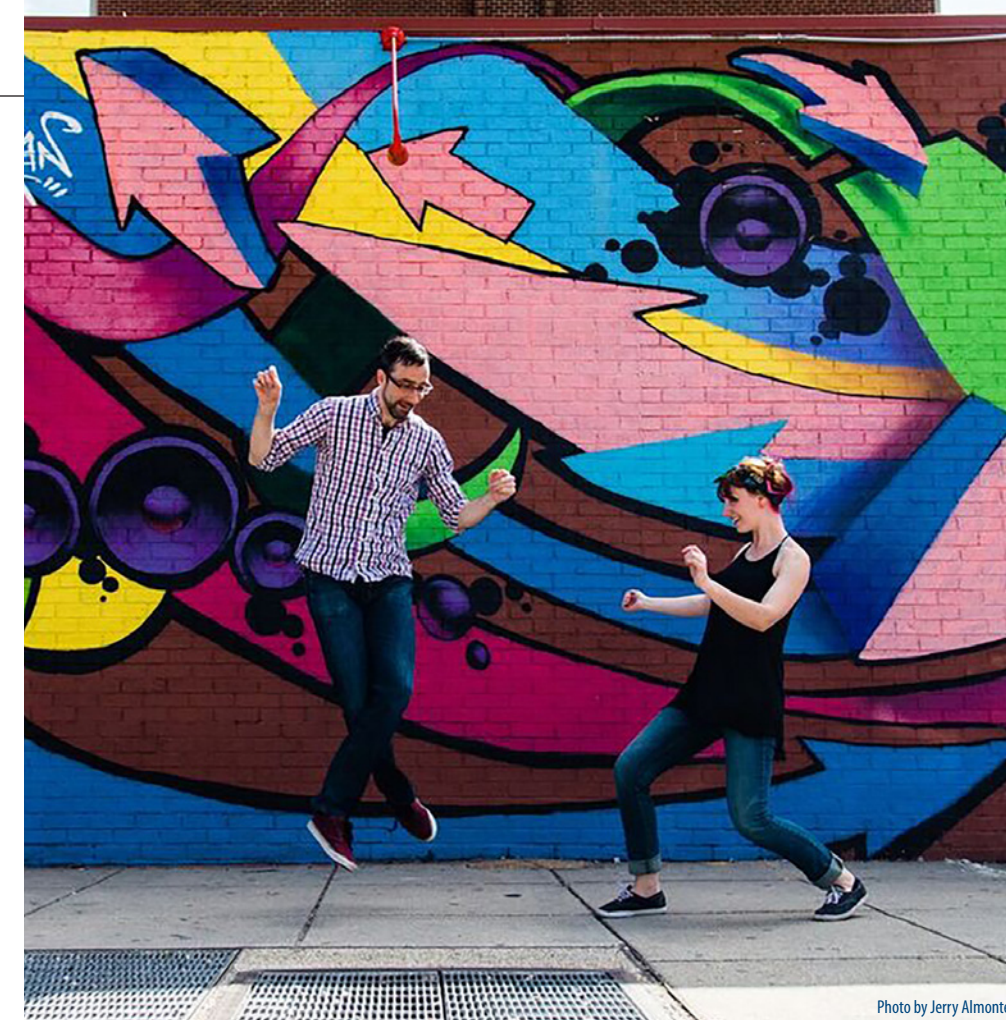


Photo by Jerry Almonte

ED: Have you done any computational models of music or genetic algorithmic music? Will machines be the musical composers of the future? How would you feel about that? Do you ever think you will work at the intersection of music and computer science?

SH: Quite by accident I ended up in a group dedicated to algorithms related to sound. As a result, I'm working with music to some degree. As mentioned previously, we've done some work to teach computers to understand various sound classes, which include music and various musical genres. Most of our work has been applying neural networks designed for computer vision to spectrograms (pictures of sound) rather than specifically modeling music. Other people at Google are doing more with music than I am, but it's conceivable I'll get more into music-related algorithms at some point.

In regard to genetic algorithms specifically, I've never used them except once in a CS course at U of R. Maybe someday I will, but they haven't proven useful or necessary for the work I've been doing thus far.

The question of whether or not computers will be able to compose and do a better job than humans is an interesting one. Because I haven't

been in the field of AI for as long as others, I consider myself more of a developer of infrastructure and tools for research rather than an AI visionary. With that disclaimer, I think it will be a long time before computers can create a score as interesting and sensical as what a human can write. That being said, I imagine that, over time, computers will do more to aid humans in writing music. Google's Magenta project is looking at some of these questions. And, even if computers are eventually able to write something very coherent and interesting, that can allow for even more creative projects.

ED: How do you approach life—more as a scientist or an artist? How are the two alike, and how do they differ?

SH: I feel like I approach science, engineering, and the arts in similar ways. They all require diligence, thoughtful problem solving, an ability to collaborate with others, and a willingness to ask interesting questions. Many of the exceptional dancers and musicians I have met have traits that I think would make them very successful engineers at Google if they took the time to develop the relevant skills.

I suppose one major difference is that the performing arts require real-time execution and

tapping deeply into emotion. Being able to execute something difficult in a performance setting takes a lot of specific and diligent practice. That skill, however, can be useful for giving presentations, so it is not entirely divorced from science and engineering. Another difference is that, in all pursuits, there's a tradeoff between pursuing what you consider most fun and what others most desire of you. Artists and employees at software companies both encounter this. Because I am not pursuing the arts as a full-time profession, I have the luxury to weight my time in the arts heavily toward fun. I am fortunate that I have been able to align fun and effectiveness pretty well in my software career as well.

ED: Many students are met with obstacles to their life goals. What would you advise students to do when met with this kind of life-altering challenge?

SH: I've recently been reading about fixed vs. growth mindsets. I think the basic summary is that, with a fixed mindset, you believe your capabilities are fixed and a failure means that you are inherently not good at something and a success means you are inherently good at it. A growth mindset assumes that consistent hard work allows you to build skills and even improve your intelligence. Although I feel like I developed a growth mindset over time, I wish I had read about this earlier and applied it to all things in my life from a younger age. I applied to Google twice (about five years apart) and the first time I was not even offered an onsite interview. It hit my ego pretty hard. I think with a growth mindset I might have been more comfortable accepting that I could, with hard work, acquire the skills that would allow me to interview well and get the job. That's just one example, but I like to think now that I could accomplish almost anything with enough time.

In my case, there was also the fact that I injured myself and was physically unable to pursue music for several years. I guess this is proof that not all goals can be accomplished, even with a growth mindset, so, on the flip side, it's useful to recognize that there are many ways to enjoy life, and allowing yourself to find new paths when one is blocked can be healthy.

ED: We're often asked if a student with a BA can compete in a market where most jobs require a BS in computer science. What did you do in the workplace or after UR to advance your skills till you were at the level of Google Research, which frequently hires PhDs?



Photo by Jerry Almonte

SH: My experience is that one's degree is useful for getting an interview, but once you get the interview, your acceptance is based mostly on your performance in the interview. I would imagine for many programming jobs, a BA is completely sufficient. Once you get into more math-intensive areas, though, a BS or master's starts to seem more useful. At Google it's not very uncommon for folks without PhDs to transfer into Research from another division and, once you're in research, it doesn't matter what your title is, you can decide what balance of programming vs. science you want to do. That being said, I feel like a PhD could have helped me improve skills related to being in research: asking better questions, wider knowledge of the field of machine learning, how to write papers and give talks, etc. . . . though learning on the job is arguably cheaper and equally as effective.

In answer to a previous question, I mentioned that I continued building my skills by buying books and taking online classes to learn linear algebra, probability and statistics, and machine learning. In addition, for my research job, I started reading more papers about neural networks.

ED: Nearly two decades after your graduation, what words of wisdom would you give a student pursuing a degree in CSC today?

SH: I suppose I can reiterate a few things I've already mentioned. Check your ego and always be willing to grow and learn. Embrace the growth mindset and assume you can always get smarter and better at all skills with hard work and the humility to ask the most basic questions. Assume that with time and effort you can achieve incredible things.

Another thing that I often think about as a differentiating skill relates to collaboration. A willingness to do whatever the team needs most from you both helps the team and often leads to recognition for the team and yourself individually. At the same time, it's also useful to let your managers know what you'd like to be working on, so they can help position you to do the things you find fun and rewarding. They can't give you what you want if they don't know what you want. Additionally, I've learned over time that it's important to make sure your managers know what work you do so they can recognize and compensate you for it.

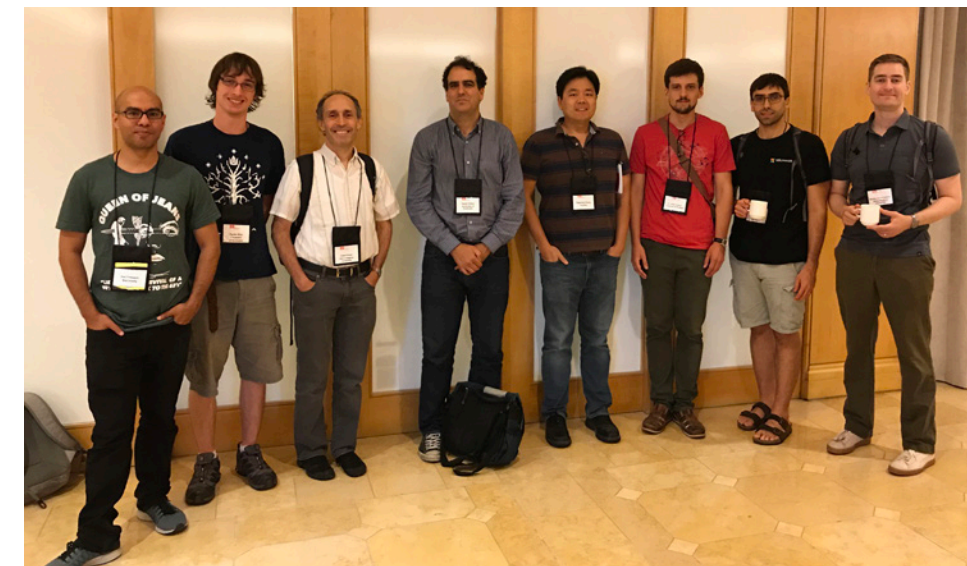
I guess I'd also like to reiterate what many people already know, that the tech industry has a problem with diversity and inclusion. So I'd like to encourage all humans to give programming a shot. And to encourage anyone who may become a manager or software engineer to try to help create an inclusive and diverse environment. I think it can help make the world a better place.

COMPUTER SCIENCE

Professional Development



With the help of BRAID funding this last year, we sent 27 women, two staff members, and one faculty member to the Grace Hopper Conference Celebration of Women in Computing in October in Houston. The department also hosted a booth for recruiting women and minorities for graduate studies and faculty positions and held a dinner to network with alumnae.



Rochester was also represented at the annual meeting of the Association for Computational Linguistics in Vancouver, Canada, from July 30 to August 4, 2017. From left to right are Joel Tetrault, Parker Riley, Jason Eisner, Dan Gildea, Tagyoung Chung, Kyle Richardson, Frank Ferraro, and Benjamin VanDurme.

RECENT PhDs

Omid Bakhshandeh Babarsad

Language Learning Through Comparison
IHMC

Zhuan Chen

System Support for Data-Intensive Sensing in the Field
Microsoft

Timothy R. Kopp

Symmetry Exploitation for Inference in Relational Theories
Pivotal

Pengcheng Li

Optimizing Memory Management Using Timescale Theories
Google

Hao Luo

Optimizing Parallel Programs Using Composable Locality Models
Google

Nasrin Mostafazadeh

From Event to Story Understanding
BenevolentAI

Young Chol Song

Fine-grained Activity Recognition Using Multimodal Datasets
GE Research

Shibo Wang

Content-Aware Memory Systems for High-Performance, Energy-Efficient Data Movement
Google



Trekking to SILICON VALLEY

Photo by Marty Guenther

As part of an initiative by the Gwen M. Greene Career and Internship Center's new director, Joe Testani, 15 engineering students headed to Silicon Valley and the Bay Area in January to connect with alumni and employers in the tech industry. Joe's vision of industry-specific road trips for sophomores provides a mechanism to better connect our students with alumni and employers and to showcase their enthusiasm and talents.

While in Silicon Valley, they visited eight companies in three days, checking out mega companies like Google, Facebook, and Twitter, and start-ups ranging from 25 to 100 employees. At each stop along the way, they met with our alumni, listened to the intricacies of their work, and observed the casual environments with micro-kitchens, arcades, restaurants, and interesting meeting spaces. But, most of all, they asked insightful questions that belied their sophomore status. They had been well prepared by the Career Center staff, who had briefed them on the companies they would visit and the officers, alumni, and engineers to whom they would be speaking. They were encouraged to further research the companies prior to the visit so that they would be ready when an opportunity arose to show their knowledge.

Though Google, Facebook, and Twitter were a big hit among all our students, the start-ups were particularly interesting to students with an entrepreneurial eye to the future. We visited AnalyticsMD (now Qventus), cofounded by Ian Christopher '10, where they have been developing a real-time decision management platform for hospitals to improve patient experience and clinician satisfaction. At AnalyticsMD, as well as at each of the start-ups, students asked questions about building the company from the ground up, choosing the right idea, developing the product, deciding on the technology to be used, gaining investor capital, hiring skilled workers, managing growth, working at a big company first, life outside owning/working at a start-up, failure rates, etc. As we moved among small companies, similar questions were asked, allowing students to compare each alumni's experiences. Gautam Altekar '04, is cofounder and chief architect of Menlo Security, a company that uses a cloud isolation platform to prevent phishing and document and web attacks. Officers at Menlo Security were extremely impressed with the caliber of questions that our sophomore students were asking and how well the students engaged

with their engineers to dig deeper into the methods and tools they use to develop their products.

Another fast-growing start-up on the schedule was Periscope Data, founded by Harry Glaser and Tom O'Neill (both '07). Harry and Tom now employ nearly 100 people, including URCS alumni Jason Freidman and David Ganzhorn (both '07) and Chris Tice ('08), who recently joined them from Facebook. Periscope Data turns SQL data into interactive dashboards and now counts SurveyMonkey, ZipRecruiter, American Red Cross, and Adobe among their clients.

Reflecting on their whirlwind trip, our students gave it high marks. Patrick Conway ('19) said, "The greatest insight that I gained was the thought process people have when founding a start-up. . . That feeling of controlling your own destiny is so empowering and intense, it makes me want to do something like that."

Marty Guenther, URCS Undergraduate Coordinator, who also traveled with the group, described the trip as an incredible opportunity for the students to see firsthand what the career opportunities might be for them when they graduate. Students also got to interact with

alumni and employers in a range of positions, from CEOs to software engineers, witnessing the Silicon Valley culture of transparency, where everyone's voice counts.

Due to the success of this pilot program, the Career Center has already begun planning another trip to Silicon Valley this January. If you or your company are located in and around Silicon Valley and would be interested in participating or attending an alumni reception, please contact Megan Vargulick in the Greene Career and Internship Center (megan.vargulick@rochester.edu). In the future, we hope to expand this to other regions of the country with a high concentration of technical companies. We're always looking for companies to visit, and with our high graduation numbers, companies might find talented new hires to fill their open positions.

This trip may have inspired our students to work harder toward their goals or change their goals entirely. But whether they choose an industry career at a tech giant, a mid-level company, or a start-up, they now have a vision of life after college. Thanks to Joe Testani and the Gwen M. Greene Career and Internship Center for making it all possible.

A Staff Member's Point of View

One of the pleasures of accompanying our students to Silicon Valley was reconnecting with so many familiar faces who no longer walk the halls of CSB. Though social media allows me to follow their public-facing life events, it's wonderful to see them functioning beyond academia, putting their knowledge to work to touch so many lives. Now parents to children and pets, CEOs and CTOs, newly minted MS and PhDs, and maybe a little grey around the edges, we shared memories of URCS life then and now and reminisced about the hallowed halls of CSB.

Thanks to all who came to the Google meet-up (David Ahn, Hao Luo, Xiao Zhang, Dan Mullowney, Adam Scrivener, Mark Mullock, Joe Brunner, Iftekhar Naim, and Brian Kim); Aaron Rolett at Twitter; Tom O'Neill, Harry Glaser, Jason Friedman, and David Ganzhorn at Periscope; Ian Christopher at AnalyticsMD; and Gautam Altekar at Menlo Security. Special thanks to those CS alumni who attended our reception during an incredible California downpour (Tergel Purevdorj, Robin Miller, Eric Meisner, Ryan Lee, Gautam Altekar, Iftekhar Naim, and Shantonu Hossein). It's a good thing you were used to driving in Rochester weather, or you wouldn't have ventured out that night. You were all very gracious hosts, gave us food and drink, and taught our students lessons about life beyond the textbooks. You were also very kind to say that I hadn't changed a bit!



Photo by Marty Guenther

Tom O'Neill '07, cofounder of Periscope Data, shows our students the early beginnings of their start-up.



Photo by Matt Wittmeyer

Gautam Altekar of Menlo Security answers questions from Luba Le, Sidhant Ahluwalia, and Carolyn Zelicof.



Photo by Matt Wittmeyer

Alumnus Joe Brunner '14 meets with Austin Peng and Abdullah Alsayari at Google.



Photo by Marty Guenther

CONGRATS TO THE CLASS OF 2017!

- | | | | | |
|----------------------|--------------------|-----------------------------|------------------------|----------------------|
| Saul Aboudi | Mariana Flores-Kim | Lia Klein | Benjamin O'Halloran | Brenden Sullivan |
| Brandon Allard | Lance Floto | Mikayla Konst | Xeufeng Peng | Milijana Surbatovich |
| Evan Basta | Justin Fraumeni | Emily Kraft | Christopher Perkins | Garrett Sweeney |
| Muhammed Binici | Jessica Freeze | Sangcheon Lee | Joseph Plvan-Franke | Thomas Tavolaro |
| Jacob Bisnett | Kevin Gerami | Samuel Lerman | Nathaniel Potrepka | Jesse H. Thurston |
| Laura Bochenek | Nicole Giggey | Brian Leu | Ruby Reynoso | Zoe Tiet |
| Herbert Bolimovsky | Grace Heard | Euakarn (Som) Liengtiraphan | Caroline Rodewig | April Uzzle |
| Jean-Marc Boullianne | Matthew Hoke | Minfeng Liu | George Rossney | Jack Valinsky |
| Jordan Brown | Chester Holtz | Yuhan Liu | Daniel Rubery | Ye Wang |
| Hector Cardenas | Matthew Hood | Violeta Lopez-Aldaco | Kyle Ryan | Scott Wittlinger |
| Hao Chen | Connor Hunt | Yichen Lu | Daniel Saltz | Christan Williams |
| Moses Chen | Alessandro Incerto | Joseph Majesky | Jorge Sanchez De Llano | Shuchen Wu |
| Zhiming Chen | Yukako Ito | Jacob Margolis | Jonathan Schoeller | Jingyao Zha |
| Vishnusai Chittari | John Jacobs | Megan Markert | Jonathan Scott | Jiageng Zhang |
| William Cohen | Maria Janczak | Emily Michel | Ebrahim Shah | Annie Zhang |
| Nathan Contino | Sarah Jeter | Gabriel Morales | Zijing Sha | Honglin Zheng |
| Margaret Curtis | Kian Jones | Lee Murphy | Kim Sitthisack | Yiheng Zhou |
| Jie Deng | Anis Kallel | Mamiko Nagasaka | Brandon Slaght | Yuntao Zhou |
| Connor Dent | Enoch Kan | Madeline Neumiller | Joshua Stern | Joyce Zhu |
| Ilya Dyskin | Chuyang Ke | Thomas Nichols | Evan Strohm | |
| David Fink | Sarah Kingsley | Charlie Norvell | ShengQi SuiZhu | |



Andrew and Bob Wisniewski playing Go in 1995

Continued from Page 9

In some ways I see the inspiration for conditional random fields as related to my Rochester thesis work on "utile distinctions." In both, the algorithm is striving to focus on what is important for the problem at hand and not waste modeling effort on capturing parts of the data that are not relevant.

It has been exciting to see interest in CRFs morph as the deep neural network revolution has exploded. The combination of deep learning and structured prediction is still largely unexplored. In 2016 and 2017 ICML papers, my student David Bellanger and I have proposed a new approach we call "structured prediction energy networks" in which the factor graph is replaced by a new energy function based on a neural network. I'll be interested where this idea ends up in 10 years.

ED: As president of the International Machine Learning Society, you have other UR alumni on the board with you. Jeff Schneider (PhD '95) and Corinna Cortes (PhD '94) both serve with you as secretary and board member. Was URCS at the forefront of machine learning in the mid-'90s? How have our alumni contributed to this field?

AM: So many UR alumni are now in such great leadership positions. Corinna is heading research in Google NYC. Jeff is leading various machine learning projects at Uber. I feel fortunate to have shared our grad school

years together. I remember studying for quals with Corinna. With Jeff I remember lots of studying for Lane's theory class and Michael Scott's systems class, as well as big Friday night dinners and game nights, in which I did most of the cooking (which I loved), and Jeff did most of the winning at poker (which I assume he enjoyed also).

URCS has always been a gem—small but sparkling with creativity and warmth. When I applied to PhD programs, I was waitlisted at MIT. I'm so glad I didn't go to MIT; I think it would have eaten me alive. URCS was the perfect place to grow, learn, and be inspired.

ED: What are the top three biggest machine learning successes? What do you see as the next big problem that machine learning will solve?

AM: Deep neural networks for computer vision in self-driving cars. Structured prediction by various methods for natural language understanding. Reinforcement learning with function approximations for the game of Go.

(By the way, I think Dana and I spent more time playing Go together than we did talking about research. I believe I learned just as much about life, strategic choices, and resilience from those games as I would have by conversations about research or any other topic.)

Next big problems? I'll give two related ones: (1) Unsupervised discovery of task structure, e.g. reinforcement learning subroutines, exploration, and curiosity. (2) Conversational dialog.

ED: Outside of work, how do you spend your recreation time? Do you still contra dance like you did when you were a graduate student?

AM: My wife, Donna, and I met at the regular weekly contra dance in Rochester. I started contra dancing there because George Ferguson invited me to play Ultimate, and after the frisbee game someone there invited me to stay in the field, where there was a rare outdoor contra dance.

Donna and I still occasionally dance here in western Massachusetts (where some of the hottest contra dance folk bands in the country call home), but we spend more time doing things with our kids. My youngest loves mountain climbing. We have nearly finished the highest peaks in each of the New England states, and soon we'll work on all 48 4,000 footers in the New Hampshire White Mountains. My oldest son heads to university this fall to study industrial design at Rochester Institute of Technology. So I'll have additional reasons to come back to Rochester and visit. I'd love to drop in on the URCS department again and thank you all in person for the kind-hearted and inspirational help you gave me and so many others.

Undergraduate Alumni NEWS

Abraham, Sunil '00—I still work at Nomura as a Software Investment Banker. I just had my third child in February 2017.

Acharya, Athul '06—I'm now employed at Fenwick & West LLP.

Ahluwalia, Vedant '14—I graduated last year from Stanford and am running my own data analytics company in India now.

Anderson, Darrell '96—I got married in 2014 to another UofR alum, Melissa Guyre. I'm currently working for myself doing a mixture of contract work and developing my own software.

Aronson, Michael '04—I'm moving to Bloomington, Indiana, to pursue a PhD in Jewish Media and Culture at the Media School at Indiana University.

Bakas, Yoel '01—Things are going great over here . . . after almost 14 years at Varian, I left in July and moved to Mevion Medical Systems, a manufacturer of Proton Therapy Systems, leading their sales team as Vice President of Sales, The Americas. After just nine months, I was promoted to Senior Vice President of Sales for both The Americas and EMEA. I have been traveling the world (most recently to Austria and a quick jaunt to Japan) but still calling Atlanta home. Hard to believe but Renée ('00 and Warner '01) and I will have been together for 20 years this February (amazing how time flies).

Bakken, Luke '98—I have a new employer, Pivotal Software, and I'm one of the engineers on the RabbitMQ team. Last August, I backpacked the John Muir Trail from Horseshoe Meadow to Yosemite National Park (250+ miles) in 14 days. I continue to get outside whenever I can and spent this past Memorial Day in Hell's Canyon.

Blumberg, Joshua '97—I just completed my fifth year as Director of Academic Technology at Champlain College. My daughter Naomi will be two years old in August, and it has been a great joy playing with her and watching her explore. I am also teaching some computer science courses for the college, so I guess sometimes things come full circle.

Bodek, Haim '95—I started a new electronic trading firm called Area 11 Research (<https://www.area11research.com/>).

Brill Albright, Ingrid '02—We welcomed our son, Tyler, into the family at the beginning of December. We are all smitten with him, and Anneliese is proving to be a wonderful big sister.

Brown, Cole '11—I've been happily freelance since February and at this point mostly using my freelance work as a means of funding more artistic pursuits. I taught myself some electrical engineering fundamentals and have started designing analog synthesizers.

Bulatewicz, Tom '01—I've been with a company called ExakTime, Inc. for quite a few years now.

Clubb, David '06—I'm now working at imgix.

Coimbra, Hilario '08—I joined a new start-up in Cambridge back in January called Sense (sense.com). We work on an energy-monitoring device that people can install in their homes. There's machine-learning tech in the background that, based on your home energy consumption, starts uniquely identifying the various devices in your home. I manage the consumer product team, which includes an iOS app, Android app, and soon a web app. On the personal news side: I am getting married in December! There will be several friends I made at UofR attending the wedding, including two others from the CS program (Matt Wagner and Mike Tilton).

Dremeaux, Andy '06—I'm now working at Facebook in New York City.

Edwards, Kyle '12—I recently relocated to Ann Arbor to work for Deepfield Networks (now acquired by Nokia).

Eisenstat, David '06—I'm working for Cockroach Labs in New York City.

Ferraro, Frank '11—I'm joining the CSEE department at the University of Maryland, Baltimore County, this fall as an Assistant Professor.

Fredrickson, Chris '14—I started working at Google in September—I'm working in the Cambridge office, in the Chrome organization (on the online ads ecosystem). I also started a Master's in CS from Georgia Tech, through their Online Master's in CS program. I'm only on class number 3 (taking them one at a time), but they're going well so far.



Becky Galasso's dog, Sadie



Erica Hyman



Dan Panzarella and Bernadette Rose

Galasso, Becky '15—I don't have any significant human changes, but I did adopt a dog named Sadie in August! She's a sato (Puerto Rican mixed breed), rescued by a fellow UR alum from the track team. Her favorite activities are playing with other dogs, hunting rabbits, learning new tricks, and cuddling. I've attached a picture just in case you want to see her.

Gattuso, Steven '16—I quit Weebly back in January to go back to the world of consulting/traveling! Since leaving, I've been to Spain, the UK, Belgium, the Netherlands, Denmark, and Japan. It's been a wild ride, but I'm really enjoying the new career choice.

Hart, Catherine '16—My current employer is Genie. I'm working on their next-generation control system for their boom products and an upcoming handheld device.

Hathaway, Sam '03—Dennis Lambe '03 and I are working together at his consultancy, Professional Firmware Services, LLC. After a period of despair at Macmillan, Dennis helped me learn embedded software development so I could quit my job and go work with him.

Hyman, Erica '12—Last November, I joined Spotify in New York City. I work on a website called Spotify for Artists, which gives musicians tools to better understand and connect with their fans. I continue to specialize in data visualization.

Isman, Michael '04—In May, my wife and I welcomed our second son, Samuel! He joins his brother, Henry.

Kelman, Charlie '16—I actually quit my job at Epic in March (I really wasn't a big fan of the job), and I moved to New York City to work as a software engineer for FactSet with a May start date. I'm really happy with the move and new job. I'm getting to work on far more interesting projects, and the culture is a much better fit.

Koch, Matthew '06—I moved to Seattle to start a new job at Microsoft.

Lehner, Charles '15—I am living off-grid in Hawaii and working on free and open source software for peer-to-peer collaboration.

Lehr, Mike '01—three kids now. Rhett, Rachel and Micah (5, 3, 1). Still at MayStreet LLC.

Luis, Cristina '01—I just started a new job as a developer with Fluido, a Nordic salesforce.com solutions company. Still in Oslo, Norway.

Kortepeter, Luke '15—I graduated from Johns Hopkins University last month with an MS Ed. I completed my Teach For America commitment in June. This summer I went backpacking in Iceland and Italy and studied for the GMAT, and this fall I will start work at Deloitte and continue to live in the Baltimore/DC area.



Michael Isman's sons, Henry and Samuel



Ingrid Brill Albright and Family



Renée and Yoel Bakas

Undergraduate Alumni NEWS, Continued

McCusker, James '99—My current employer is RPI, where I'm the Director of Data Operations. I finished my PhD in 2015 and graduated in 2016 from RPI.

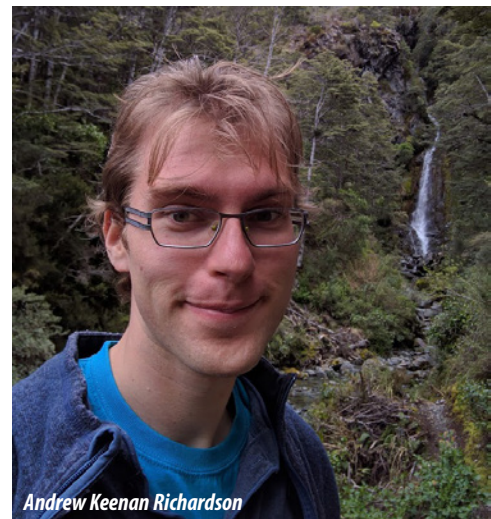
Nocka, Andrew '14—I'm now a software engineer at Draftkings in Boston.

Panzarella, Dan '12—My wife, Hannah Attard, and I welcomed our daughter Bernadette Rose to our family in July 2016.

Pok, Grace '01—My daughter, Audrey, recently turned one. I'm learning to enjoy being a stay-home mom. Who knew it would be harder than doing data structure assignments?



Grace Pok and daughter, Audrey



Andrew Keenan Richardson

Rauf, Feroz '16—I'm working at TD Securities Investment Bank in New York City.

Rawal, Sagar '08—New employer and position: NVIDIA Corporation, Senior Director of Engineering.

Richardson, Andrew Keenan '11—I'm working at Google in Boston, working on Google Assistant. It really uses the NLP background I got at Rochester with a CS/LIN degree, which is awesome.

Rogers Green, Jennifer '02—I live with my husband and three-year old son, Calvin, in Chapel Hill, North Carolina. I work as a transit service planner for GoTriangle, a regional transit agency.

Rotondo, Mike '07—Elizabeth and I had a baby! Her name is Flora Andromeda Rotondo. She was born October 2, 2016, and she's a cute little doofus.

Rubinoff, Adina '12–6/17: I have a new job! I quit FactSet last November and started working for Google in January. I'm at their Cambridge office, so still in Boston.

Ruskin, Jon '06—After Axosoft I tried my hand at the entrepreneur/start-up life, and, wow, that's a hard one! Sadly, it didn't work out, but I had a blast along the way, and it was a great learning experience. Currently I'm at GitHub, which is a really amazing place to work!



Mike Rotondo's daughter, Flora

Sankel, David '02—I'm still working for Bloomberg, but I'm now team lead of our core microservice platform (BAS). Our family's had the addition of #6, Theresa Maria Sankel, and we've moved to New Jersey. I'm still active on the C++ standardization committee and giving talks at C++Now, and CppCon. Programming, like always, is super fun!

Schmid, Jonathan '03—I'm continuing with Raytheon but on NASA's Joint Polar Satellite System (JPSS) project following some work on the Navy's Triton Drone this past spring. Will be moving soon to Riverdale, Maryland, to start JPSS.

Schmit, Isabelle '16—I completed my MS in Data Science at UR and will be joining Microsoft in Dallas, Texas.

Schmitt, Ryan '09—I'm currently on the Service Frameworks team with Amazon.com.

Scrivener, Adam '16—I'm working at Google on search ranking.

Stoeckl, Peter '16—I accepted an offer from the University of Minnesota and will be pursuing my PhD in Physics (specializing in Condensed Matter Theory) there beginning Fall 2017.

Stratos, Karl (Jang Sun Lee) '11—I'm now a research assistant professor at TTIC. This position will give me three years of complete freedom to do whatever research I want.

Teumer, Ted '14—I left Epic at the end of last summer. I now work for REZ-1 in Wellesley, Massachusetts, as a Business Intelligence Developer since September 2016. I will be getting married at the Interfaith Chapel at the U of R in September of 2017 as well. My new house is under construction, and we'll move into it in September.

Tice, Chris '08—I left Facebook and joined Tom O'Neill, Harry Glaser, David Ganzhorn, and Jason Freidman (all URCS '07) at Periscope Data in April. My wife, Candace, and I are expecting our first child in September. :)

Tong, Matthew '03—I'm now at IBM Research in Austin. At least to start out, I'm working on a couple computer vision and machine learning projects. I'm still in touch with Mary Hayhoe and Dana Ballard too!

Uvina, Jennifer '14—I moved to the San Francisco Bay Area to join a start-up called Lingia, where I am a full stack software engineer. I'm glad to see the number of female graduates go up for URCSI!

Uzilov, Andrew '05—After working at Mount Sinai in New York City for four years as a bioinformatics scientist, I am now Director of Cancer Genomics for our spinout company, Sema4, focusing on diagnostics, genomics, and big data in healthcare (read about us in *Wired* magazine). Just bought a house in Metuchen with my lovely wife, Kathleen, (also UR alum, where we met) and our two children.

VanSwol, Nicholas '15—I bought my own little house just south of Seattle. I'm still working at Nuance Communications in Seattle as a Systems Engineer for the Tier 3 support team, monitoring initiatives, and new product development and testing. Most of my time is currently going to fixing up and maintaining a 75-year-old house, a 23-year-old pickup, and a 22-year-old ragtop Beamer.

Vengkatraman, Cartic '03—I am building my own studio and working as a producer/musician with a partner in New York.

Ward, Justin '03—I am now working at Google as a solutions engineer. I work with sales teams to help clients build and manage new solutions on top of Adwords, Youtube, and other Google ads products. I got married last June! My wife, Katie Palmiter, attended Syracuse University, and we've known each other since our undergraduate days.



Tom Weingarten

Wang, Alex '07—I joined EverQuote in September 2016 to lead development of the EverDrive app for Android and iOS, which gives drivers feedback on their driving so they can develop safer habits. Unfortunately, I left my previous position at Ecovent after the company ran out of money.

Weeks, Jeff '16—I'm a software engineer at Eagleview Technologies!

Weingarten, Tom '06—I'm still the engineering manager for the DNS teams at Google New York City (8.8.8.8, Cloud DNS, and the rest). I don't have a lot of photos, but I've attached one of me at one of Google's local volunteering projects.

Yang, Chuq '99—My new employer is BAO Systems, in Washington, DC. I'm a Systems Administrator for the PEPFAR (President's Emergency Plan For AIDS Relief) contract.

Zschau, Aaron '02—I have been working for TripAdvisor, coming up on my second year working with the Technical Operations team.

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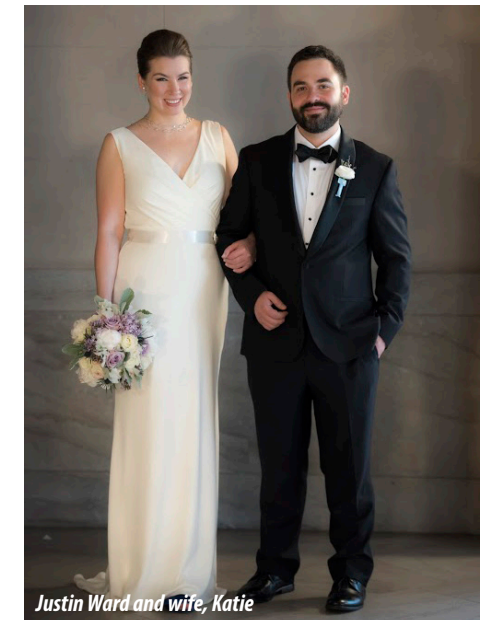


Are you an
entrepreneur
with a
successful
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We would like to hear
about your business
for our next newsletter.

Please send Marty Guenther
(marty@cs.rochester.edu) a short
blurb about your company, the
nature of your business, number
of years in progress, location, and
number of employees.

We will be in touch!



Justin Ward and wife, Katie



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Robot Construction class final project of a snake bot. From left to right are Luka Sherman, Samuel Blumberg, Kennedy Agusi, Mathew Shems, and Kurtis Haut.

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