NEW DIGS
NEW FACULTY
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TREKKING TO SILICON VALLEY
CONGRATS TO THE CLASS OF 2017

MULTICAST
THE DEPARTMENT OF COMPUTER SCIENCE AT THE UNIVERSITY OF ROCHESTER

OUR BIG MOVE
FULL STORY ON PAGE 2

HAJIM
SCHOOL OF ENGINEERING AND APPLIED SCIENCES
UNIVERSITY OF ROCHESTER

FULL STORY ON PAGE 2
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 computer and servers went first, and our brilliant tech staff, Jim Roche and Dave Costello, had everything up and running in 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.
I obtained my PhD from the Indian Institute of Science in Bangalore and was a Postdoctoral Fellow at the University of Texas at Austin. Before joining the department, I was a Postdoctoral Fellow at the University of Mumbai. Before that, I obtained my BE in Computer Engineering from the Institute of Science in Bangalore and my MS in Computer Science from the Indian Institute of Science in Bangalore. 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 even to a different laptop GPU. 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’re 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).

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.

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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 speculate each program for the different kinds of graphs that may exist out there. This problem inspired the design of IRL, a programming language and compiler for GPUs, where programmers only need to write one program and the IRL 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 IRL 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 IRL 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 program interacts with a general-purpose processor could lead us 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.
New Faculty NEWS: Yuhao Zhu

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.

From the CHAIR

2016–17
IN RETROSPECT

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: Seeepathi Pai (PhD from IISC, India, post-doc at UT Austin) and Yuhao Zhu (PhD from UT Austin). Seeepthy 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 Kozn; Excellence in Undergraduate Research: Chuyang Ke, Yinhen Zhou, and Joyce Zhu; Entrepreneurship Award: Ann Kallet; Women in Computing Award: Ami Kallet; Women in Computing Award: Rachel Lyles; and Outstanding Senior: J. Hasler Thornton.

Twenty seniors studied abroad: Saul Aboucl (Hong Kong), Laura Cobbeheen and Megan Marken (South Korea), Antonio Cardenas, Maggie Curtis, Willie Cohen, Kevin Garami, Lance Floto, Brandon Slaght, Josh Stern, and Zoe Tiet (Budapest, Hungary); Nathan Contino (United Kingdom); Ami Kallet (Madrid, Spain); Joseph Phan-Franke (Thailand); Nathaniel Potepka (Germany); Daniel Satz (New Zealand); Jorge Sanchez De Liano and Miljana Surbatovic (Russia); rainy Langenvi (India); and Charlie Norvil (Italy).

Our Association for Computing Machinery (ACM/IEEE) 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, TSL, Yahoo, and Xerox have yielded awards to fund research. International collaborations span Austria, Belgium, China, France, Germany, Greece, Italy, Poland, Sweden, and Switzerland. John Creswell 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 Banchirr (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.”

Banchirr, who did his thesis work with Tom Bianchini, 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 Melora Weekend, when we will have an open house and research showcase.
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 expectations. “ Is this your advising style? How do you bring out the best in your own expectations. “

**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 studying 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 computer scientists. Could you describe the MALLET 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 U. of Rochester 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 founded in 1999) went under, I realized I really needed a research project to focus on. 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 10,000 lines of Java, which became MALLET.

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.

**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 loving advice from the sidelines. I really see my advisers as additional children—my academic offspring. There are a lot of parallels: they both need nurturing and freedom in careful measures or can just run off the track. But often can 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? How do you feel it has influenced machine learning today?

**AM:** 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.

But FACTORIE doesn’t have any deep learning. So I’m now trying to decide whether to collaborate with some Oracle R&D 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 nearing 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 had 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:** How many students have you worked with over your career? What is your favorite memory from working with a PhD student?

**AM:** I’ve had the privilege of working with many students—many more than I can list here. I find them all special. It’s hard to pick a favorite memory. But one thing that has helped me in my work is hearing from students who have gone on to have successful careers. I think it’s an important part of what we do as advisors. I like to think of us as persevering sponsors of our students, helping them achieve their goals.

**ED:** You have created some machine learning tools that are well known and widely used by computer scientists. Could you describe the MALLET 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 U. of Rochester 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.

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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 inference and is often ten times faster, more accurate, and more portable than other software packages.

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.
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.

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

I am now an Applied Scientist with the Amazon AI team. I worked on embodied AI when I’m allowed to do what I want!

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

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 hackathon: http://pgbovine.net/publications/html/student_perceptions_of_college_hackathons_ICER_2017.html.
I was intimidated by the idea of studying computer science. I think maybe because I was only mildly interested in “singing” computers and many people that I knew who pursued CS spent lots and lost 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 computers 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 liked working about 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 come hear my music live. I do enjoy seeing other alumni play, though. It’s fun! Do 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 publishing. If I were to start a new band, I might hire someone with 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 analysis and algorithms, operating systems, and computer architecture. At the U of R I got a B+ instead of an A. 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 startup. I taught myself quite a bit about linear algebra, probability and statistics, linear programming and other optimization techniques, and machine learning.

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?

SH: I think 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 have in the field of AI for a long as others, I consider myself more of a developer of infrastructure and tools for research rather than a visionary. With that disclaimer, I think it will be a long time before computers can create a score as interesting and sensual as what a human can write. It’s also a bit more imaginative, even 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, 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.

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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 BS 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 jobs, 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 is 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.

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.

Photo by Jerry Almonte
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 CEOs to software engineers, witnessing the Silicon Valley culture of transparency, where everyone’s voice counts.

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 M’s and PhD’s, 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 McKinney, Adam Scivener, Mark Mullock, Joe Brunner, Iftekhar Nami, and Brian Kim), Aaron Rolette at Twitter, Tom O’Neill, Harry Glaser, Jason Friedman, and David Gangholt at Periscope; Ian Christopher at AnalyticMD, and Gautam Atkekar at Merlo 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 Atkekar, Iftekhar Nami, 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 we taught our students lessons about life beyond the halls of CSB.

One of the companies that our students visited was Periscope Data, founded by Harry Glaser and Tom O’Neill (both ’17). Harry and Tom now employ nearly 100 people, including URCS alumni Jason Friedman and David Gangholt (both ’17) and Chris Tice (’18), 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 biggest 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 M’s and PhD’s, 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.

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AWAKENING EXPECTATIONS, Continued

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 in the deep neural network revolution has exploded. The combination of deep learning and structured prediction is still largely unexplored. In 2016 and 2017 ICM 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 to see how this idea is used in 10 years.

AM: So many UR alumni are now in such exciting areas. How have our alumni contributed to this field? Where were we in the mid-’90s? How have things changed?

ED: Deep neural networks for computer vision 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 are just the perfect place to grow, learn, and be inspired. I applied to PhD programs, I was waitlisted at MIT, I was waitlisted at MIT, I was waitlisted at MIT. I’m so glad I didn’t go to MIT; I think I 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?


(1) Unsupervised discovery of task structure, e.g. reinforcement learning subroutines, exploration, and curiosity.

Continued from Page 9

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 gradu ate 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 we’ve worked 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.
Michael Isman’s sons, Henry and Samuel, welcomed our second son, Samuel! He joins his brother, Henry, this February (amazing how time flies). Hard to believe but Renée (’00 and ’01), Yoel Bakas, Yael ’01–Bakas, Yael ’01–but still calling Atlanta home. Ingrid Brill Albright and family and Japan. It’s been a wild ride, but I’m really enjoying the new career choice.

Hathaway, Sam ’03–Dennis Lambe ’03 and I are working together at his consultancy, Bodek, Haim ’95–Bodek, Haim ’95–which is Genie. I’m working on their next-generation control system for their boom products and an upcoming handheld device.

I'm now employed at a software developer for actifish (actifish.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, 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 in Isoft attending the wedding, including two others from the CS program (Matt Wagner and Mike Titton).

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

Erica Hyman–Erica Hyman–I just started a new job 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.

Kelman, Charlie ’16–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–Koch, Matthew ’06–I moved to Seattle to start a new job at Microsoft.

Lahnas, Charles ’11–Lahnas, Charles ’11–I am living off-grid in Hawaii and working on free and open source software for peer-to-peer collaboration.

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

Luis, Cristina ‘01–Luis, Cristina ‘01–I just started a new job as a developer with Ifixd, a Nordic salesforce.com solutions company. Still in Oslo, Norway.

Kortepeter, Luke ’15–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 Debotte and continue to live in the Baltimore/DC area.

Bakken, Luke ’98–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 Horsetail 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 Hells Canyon.

Bakas, Yael ’01–Bakas, Yael ’01–Things are going great over here … almost 14 months at Varian, I left in July and moved to Medtron 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 (’01 and Warner ’10) and I will have been together for 20 years this February (amazing how time flies).

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**Undergraduate Alumni NEWS, Continued**

**Rauf, Feroz ’16** - I’m currently working at TD Securities Investment Bank in New York City.

**Sankel, David ’02** - I’m still working for Bloomberg, but I’m now team lead of our core microsecond platform (BMS). Our team’s job is to build and maintain the high performance analytics system that powers all Bloomberg services. I’m currently based in New Jersey. I’m active on the C++ standardization committee and also I’m a University of Rochester alumnus!

**Nock, Andrew ’14** - I’m now a software engineer at Draftkings in Boston.

**Panza, Robert ’13** - I’m now a software engineer at Facebook in New York City.

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

**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/IN 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** - I met 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 ’12-16** - I have a new job! I quit Axosoft 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 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 Gitlab, which is a really amazing place to work!

**Scheid, Jonathan ’03** - I’m continuing with my research in Condensed Matter Theory) there beginning Fall 2017.

**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 Ph.D. 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, Tod ’14** - I left Epic at the end of last summer. I know 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 Flynn, Hary Glazer, David Gandhom, and Jason Freedman (all URCS ’07) at Peregrine Data. I’m in my second year at Peregrine Data. I’m in my second year.

**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 Lingra, where I am a full stack software engineer. I’m glad to see the number of female graduates go up for URCS.

**Uzlov, Andrew ’05** - After working at Mount Sinai in New York City for five years as a bioinformatics scientist, I am now Director of Cancer Genomics for our spinout company, Samal, 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, 75-year-old house, a 23-year-old pickup, and a 22-year-old ragtop Beamer.

**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 25-year-old pickup, and a 22-year-old ragtop Beamer. Vengkatsraman, Carlee ’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 Patirnis, attended Syracuse University, and we’ve known each other since our undergraduate days.

**Wang, Alexis ’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 EverQuote after the company ran out of money.

**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, Chug ’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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Faculty Advisor: Randal Nelson; Editor: Marty Guenther;
Contributors: Randal Nelson, Marty Guenther, Sreepathi Pai, Yuhao Zhu, Andrew McCallum, Shawn Hershey, Sandhya Dwarkadas

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