

Computer Science Welcomes New Faculty in Machine Vision and Cryptography



Jiebo Luo joins URCS as an associate professor after spending over 15 years at Kodak Research Labs. He brings a wealth of experience and expertise in computer vision, machine learning, data mining, computational photography, biomedical informatics, and ubiquitous computing. He has published

over 160 papers in top conferences and journals including CVPR, ICCV, TPAMI, IJCV, TCSVT, TMM, and TKDE and has been awarded over 60 US patents. He is the Editor in Chief of the *Journal of Multimedia*, and has served on the editorial boards of leading journals such as TPAMI, TMM, TCSVT, and PR. He has organized numerous conferences, including serving as a program chair of the 2010 ACM Multimedia conference, and the 2012 IEEE CVPR. He is a fellow of the SPIE, IEEE, and IAPR.

Luo is a pioneer in using contextual inference in semantic understanding of images, videos, and other multimedia. His 2003 CVPR paper on probabilistic spatial context models for scene understanding and 2004 CVPR paper on fusion of metadata context and image content for image classification were among the first of this now popular approach, inspiring subsequent works by other leading researchers. His 2006 IEEE Signal Processing overview paper (coauthored with Christopher Brown) on exploiting context for semantic scene content understanding was among the Reader's Choices (top downloads) in IEEE Xplore. Luo's current research in this area continues to push the frontiers in incorporating geo-location context and social context in semantic understanding.

A recent research thrust of Luo is the exploitation of social media for machine learning, data mining, and human-computer interaction. Several representative works by him and his collaborators have demonstrated the power of this approach. In the 2010 CVPR Best Student Paper (selected from 461 accepted papers), visual event recognition in personal videos is accomplished

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Muthu Venkitasubramaniam has joined the faculty in computer science as an assistant professor. Venkitasubramaniam's research focuses on securing sensitive exchange of information on the Internet when millions of transactions run simultaneously.

Venkitasubramaniam received his BTech degree in computer science from the Indian Institute of Technology, Madras, in 2004. He attended Cornell University, where he worked with Rafael Pass, receiving his PhD in computer science in 2010. Before arriving at Rochester, he spent a year at the Courant Institute of Mathematical Sciences (NYU) as a postdoctoral researcher supported by the Computing Innovation Fellowship.

Following the ground-breaking works on public-key encryption, the field of cryptography has evolved far beyond its traditional goal of secure message transmission. Through the notion of a *secure computation*, a set of mutually distrustful agents can collaborate to accomplish a common goal while preserving each agent's privacy to a maximal extent. Examples include *anonymous electronic elections, privacy-preserving electronic auctions or contract-biddings, privacy-preserving data-mining, fault-tolerant distributed computations*, and more. Traditionally the rules governing privacy have been designed to work only when a single execution running in isolation is under attack. However, with the advent of the Internet, many transactions occur simultaneously, such as an online banking system, air traffic control network, online auction, or Facebook update, and the protocols designed so far fail to remain secure.

A key property that makes the Internet useful is the possibility of having many processes running at the same time, i.e., *concurrent*, unaware of each other. However, the same property also brings forth new challenges. The concurrent setting allows for a coordinated attack in which an adversary controls many parties, interleaving the executions of the various protocol instances and

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A MESSAGE FROM THE DEPARTMENT CHAIR

Why Democracy Needs Computer Science Education by Henry Kautz



Countless gallons of ink (real and virtual) have been spilled on the need to infuse the humanities into science and engineering education. For example, philosopher Martha Nussbaum's recent book, *Not For Profit: Why Democracy Needs the Humanities*, passionately argues that the liberal arts teach the abilities to think critically, criticize authority, and sympathize with those who are marginalized and different. These abilities, she argues, are necessary for the citizens of democratic societies, if democracy is to survive.

Many computer science majors deeply engage with the humanities during their undergraduate years. At our university, as at many others, it is not uncommon to meet computer science majors who double-major in the humanities or spend an extra year studying subjects as diverse as music, Japanese, anthropology,

political science, or dance. At the same time, computer science departments nationwide have begun initiatives to enlarge the base of nontraditional students studying computer science. For example, in the past three years we have more than doubled the number of students from the humanities, social sciences, and physical and life sciences enrolled in our courses by offering both specialized courses for non-majors and advanced courses with broad appeal, such as human-computer interaction and web programming.

Beyond teaching particular useful skills, computer science teaches ways of thinking that are necessary in order to be an effective and engaged citizen. Computer science teaches an appreciation for complex systems, including the need to understand context and requirements, the unexpected consequences of small changes, and tradeoffs between maintaining a legacy system and building anew from scratch.

As computer scientists, we understand the necessity of testing and iteratively refining solutions to problems, a lesson often missed by followers of political or social dogma. We value both abstraction and attention to detail, a lesson that leaders of government or business sometimes ignore to their peril.

Perhaps most importantly, computer science teaches optimism in the face of enormous complexity. We can reframe ill-posed problems into well-defined ones; we can tame the tyranny of complexity using the tools of structured design. We strive to distinguish failures based on errors in our solutions and failures that arise because the problem we are working on has no precise solution; indeed, much of the theory of computer science deals with what *cannot* be computed. Even in the latter case, we retain our optimism and work on good *approximate* solutions to inherently intractable problems.

These lessons from computer science support vibrant and progressive democracies. While the humanities may help us sympathize with those who are marginalized and different, the habits of mind inculcated by computer science can lead us to go beyond mere sympathy and create a society that promotes human rights and economic security. Nussbaum wrote, "A catalogue of facts, without the ability to assess them, or to understand how a narrative is assembled from evidence, is almost as bad as ignorance, since the pupil will not be able to distinguish ignorant stereotypes purveyed by political and cultural leaders from the truth, or bogus claims from valid ones."

Computer science certainly involves assessing evidence and the validity of arguments but also goes on to the tasks of designing, building, and validating solutions to problems. The great political scientist, economist, psychologist, sociologist, and computer scientist Herbert Simon pioneered the research area of "general problem solving," studying how people solve problems and exploring the degree to which general problem solving expertise could be encapsulated in a computer program. However, the importance of computer science to society does not depend upon whether the dream of artificial intelligence, the mechanized general problem solver, is ever actually created. Instead, we would argue that computer science is crucial to democracy because it promotes attitudes and cognitive skills that enable citizens, in a spirit of confidence tempered by a respectful humility before the complexity of the world, to actively shape the future.

Jiebo Luo joins URCS (con't. from front page)

by learning from web data with only a small amount of labeled training data. In a similar spirit, textual queries are facilitated for searching and retrieving images in personal collections by learning real-time from a large-scale database of annotated web images.

Luo is also a pioneer in the use of geotags in visual recognition and media mining. He has published a series of works on this subject in the past few years, such as an ACM Multimedia paper on event recognition with satellite views through geotags. He and his colleagues just published a comprehensive 2011 survey on geotagging in multimedia and computer vision.

Luo is also among the trailblazers in action and activity recognition for videos "in the wild" (i.e., of unconstrained content). In 2007, he initiated research on large-scale multimodal semantic concept detection for consumer videos, leading a research focus shift away from structured news and broadcast sports videos that the commu-

nity had been limited to. He also initiated action recognition aimed at YouTube videos a public dataset that is the first and largest of its kind available for vision research.

Luo is an accomplished researcher in an industrial laboratory. He was a principal contributor to the Kodak Digital Radiography System, at the core of which is a suite of innovative image segmentation, classification, and rendering technologies detailed by a family of US patents. These algorithms played a crucial role in helping grow Kodak's market share by an order of magnitude over four years. This contribution was recognized by the 2004 Eastman Innovation Award, Kodak's highest technology prize.

Luo mentored over 30 graduate students, research interns, and junior researchers. Liangliang Cao (cosupervised by Thomas S. Huang of UIUC) was chosen among the IBM "Emerging Leaders" and was a finalist for the highly coveted Face-

book Fellowship; Junsong Yuan (cosupervised by Ying Wu of Northwestern) won the CVPR 2009 Doctoral Spotlight Award and is currently a titled Nanyang Assistant Professor in the Nanyang Technological University in Singapore; and Matthew Boutell (cosupervised by Christopher Brown of URCS) is now a tenured associate professor in the Department of Computer Science and Software Engineering at the Rose-Hulman Institute of Technology.

At URCS, Luo plans to focus his research on mega-trends such as social media, crowd sourcing, ubiquitous computing, health care, and security. He is also keen on attracting top students with cutting-edge research and courses, and building on URCS's vision/NLP heritage and his external connections to other universities and companies to establish national research leadership.

Muthu Venkatasubramaniam joins faculty in computer science (con't. from front page)

creating rogue interactions between protocols. The *Chess Masters Dilemma* is a classic example. A beginner chess player would have almost no hope of beating a grandmaster, but by playing two grandmasters simultaneously, duplicating the moves of one against the other, he or she can beat a grandmaster.

This approach can break the security of protocols that otherwise seem impenetrable.

While both the need and definitions for concurrent security were realized in the early '90s, practical protocols that are concurrently secure are lacking. The protocols designed for concurrent security, thus far, have mostly relied on having a trusted setup during which all participat-

ing parties are initialized with some trusted information. An example of such a setup is a Public-Key Infrastructure maintained by a trusted key registration authority; that is, if the key registration authority gets compromised, security no longer holds. But in many settings it might be hard to agree on a trusted party (such as the trusted key registration authority), or such a party might not even exist!

Venkatasubramaniam's thesis work presented a unified framework for the construction of concurrently secure protocols both with, and without, trusted setup. This framework not only provides a conceptually simpler solution for essentially all previous results, but also significantly improves efficiency and reduces the requirements

on the trusted setup used in these works. Furthermore, this work also yields new alternative models of security that can be achieved without any trusted setup. In particular, when looking at specific cryptographic tasks, this result shows, for the first time, how playing bridge or poker on the Internet can be securely implemented, while providing strong guarantees on the computational advantages gained by a player in a concurrent execution of the protocol.

BOUTELL KEEPS LEARNING WHILE TEACHING

Matt Boutell received his PhD from URCS in 2005 and is a tenure track professor in the Department of Computer Science and Software Engineering at Rose-Hulman Institute of Technology in Terre Haute, Ind. While a graduate student at Rochester, Matt was nominated by URCS for a graduate teaching award. As a TA in some of our more difficult theory core classes, his love of teaching and his ability to reach out to students in creative ways was evident. Today, Matt continues to enjoy the journey of teaching and learning.



Boutell instructing students at Rose-Hulman

ED.: You began your career as a high school teacher, changed gears to become a PhD and now teach at Rose-Hulman. Your focus has always been on being an educator. What drove your passion for teaching? How was teaching high school preparation for your current position?

MB: I started my teaching career helping my friends with math in high school and served as a calculus tutor as an undergrad at Worcester Polytechnic Institute. I majored in math but took a few CS courses, too, and programmed quite a bit to generate results for my math thesis. I really liked being able to explain concepts to my peers in a different way than they had been taught, so I decided to try teaching as a career. I taught high school math for six years in Norton, Massachusetts, and loved it. But two things happened that changed the focus of my teaching. First, I got the chance to teach programming at my high school, which was fun because I got to use my background in computing. I taught myself C++ to prepare myself to work as a consultant at a software company one summer and got the opportunity to redesign my school's APCS course when the language on the exam changed from Pascal to C++. This all kept my love for computer science strong. Second, teaching C++ at the high school led to an opportunity to teach as an adjunct

professor at Stonehill College for 1.5 years. I enjoyed the students and appreciated having time outside of the classroom to stay current in a rapidly changing field. There's no better way to stay excited about teaching than to keep learning. Bottom line: I wanted to teach CS to undergrads, so I headed back to school. When I came to URCS, I had already spent over 4,300 hours in the classroom, which gave me confidence serving as a TA, presenting results at conferences, and teaching my first classes at Rose-Hulman. While I enjoyed my research with Chris Brown and with my colleagues at Kodak, my desire to teach gave me additional focus as a grad student.

ED.: What is your teaching load like? How much time do you have for research? What is your current research work like?

MB: At Rose-Hulman, we have three 10-week quarters each year.

In my department, the teaching load is 12 contact hours, which translates into two to three courses, depending if any have labs. We have an open-door policy too—students drop in my office often. I usually have one to two preps, including fundamentals of software development, data structures, cryptography (following CB's lead), and image recognition. I volunteered to teach three preps once, which included teaching a senior-level mechatronics course for mechanical engineers for the first time. But I'm glad that's not the norm!

Schools like Rose have different expectations for research, due to the large amount of time required in the classroom. I need to stay current but don't need to find funding. I currently don't do much in the way of classical research. I have coauthored some vision papers with undergraduates and have published some work on computer science education. I also helped create and lead a new multidisciplinary robotics minor. I don't have any grad students working for me or much time during the year. But I try to stay current during the summer or through mentoring students on senior theses, projects, and independent studies.

ED.: Tell me more about SPLICE. How long have you been using this method? What assessments are done to measure its effectiveness? How do the students react to this? Do they actually come to class prepared? Are the video homework/quizzes graded? Who is featured on the video instruction? With the basics covered in the out-of-class video, what does that enable you to do during classroom time? How was this idea developed? Have other schools adopted it? Can the students do it on their smart phones?

MB: This past year, a colleague and I worked on a project we dubbed SPLICE: Self-Paced Learning in an Inverted Classroom Environment. Many students comment that they "get" the concepts of programming but just have a hard time writing programs! In an ideal world, an instructor could focus classroom time on helping students where they get stuck the most: programming. So we created videos for a C programming unit that we use for the last third of CS1. In one type of video, we record our voices over a slideshow to present concepts. In the second type of video, we pose a problem and then explain the problem-solving process while we write code in Eclipse. Teaching the process, not just the final product, of programming is important because programming is very dynamic and nonlinear. Students watch the videos each day to prepare for class and stay engaged by solving and submitting on paper active learning problems and doing follow-along coding exercises as they watch. They come to class primed to put what they've learned into practice and spend most of each class period solving problems either alone or in pairs. Students get expert coaching and receive individual attention. Students focus on confronting their misconceptions because we can immediately help with tool problems and obscure error messages. We have been collecting survey data and data on grades and video downloads to measure students' perceptions and performance. From what we can tell so far, students really like being able to ask questions while they program and especially like the flexibility of watching the videos at their own pace, replaying key sections as needed, and either watching or skipping optional videos we created. Creating videos takes lots of time; we estimate that for each 15 minutes of video, it took us around three hours, from creating good clean visuals to editing to refining the recording. But we've used them in seven sections of the course so far, and have posted them on YouTube so that others can use them.



Boutell's teaching continues outside the classroom.

ED.: What is your nonacademic life like? Busy dad with kids going in many directions, I imagine. I see you coach soccer. Do all the kids play soccer? What are the age ranges of your children?

MB: My life is very busy outside of work. Many of my fellow grad students probably thought I was crazy as our family grew from one to four children during my time in the department. My wife, Leah, was and is amazing as a mom: there's no way I could do any of this without her! We now have three boys and two girls, ranging from 3 to 12 years old—there is never a dull moment in our house. The oldest four love to play soccer in the spring and fall, and I've coached or helped each season since 2007. We have also hosted a church in our home the last two years. We have doubled in size, because others also like what home churches offer: close relationships, shared leadership and discussions, and families worshipping together. And just to keep things exciting, we'll be traveling to Zambia next year so I can teach at Copperbelt University in Kitwe as a Fulbright scholar. I hope to learn more about how teaching is done in other cultures to teach courses, and advise student projects. I especially look forward to teaching a course on Android app development, as everyone in this rapidly developing nation already uses cell phones. Preparing a family of seven for our trek is consuming this summer. Any student who thinks that life slows down after graduation might want to reconsider. I think it's possible in theory, but I certainly haven't found it to be the case in practice!

ADMISSIONS BY COMMITTEE: THE URCS APPROACH TO GRADUATE ADMISSIONS

The Graduate Admissions Committee has one of the department's most important tasks: deciding whom to admit to URCS's PhD program. Randal Nelson is the department's longtime point person in this process, having chaired the committee for most of the past 10 years. Nelson agreed to be interviewed on the work his committee does.



Randal Nelson leads students and faculty on Admissions Committee.

ED.: Who makes up Admit-Comm, and how are the members chosen?

RN: The committee is made up of a faculty chair, graduate administrator JoMarie Carpenter, four to six faculty members representing the various interest areas in the department, and 8 to 10 graduate student members. The faculty members of the committee are selected by the department chair after consultation with the faculty. The student members are volunteers, or sometimes slightly volunteered, and are crucial to the process. They do much of the work in making and maintaining contact with, and gathering information about, our top candidates, each of whom is assigned a grad student "shepherd."

ED.: How has evolving technology and the Internet changed the admissions process during your years at URCS?

RN: Five years ago, the system was mostly paper based, with each application centered on a folder. The folders were kept in several boxes, and any components submitted electronically were printed out and placed there. Comment sheets in the folders served to coordinate evaluation of the candidates by various committee members. Today, the system is mostly electronic, based on a web interface designed by George Ferguson and later connected to the University system when the school went to a web-based interface. The online system contains the electronic equivalent of community comment sheets and has a number of useful search and indexing facilities. The folders still exist, because we still get paper materials that are not available electronically (transcripts, some letters of recommendation, and

official exam scores), but they are no longer the primary access point. An unexpected downside is that the electronic comments sheets are not used nearly as much as the hard-copy ones were. One reason seems to be a reluctance to put comments that might be negative in fluid digital form.

ED.: To what extent do external funding trends determine how many students and to which areas your committee admits?

RN: We typically have a reasonable guess about how many funding lines will be available, in what areas, and which faculty members are looking for new students. Because the department commits to continue supporting all graduate students in good standing, and because students are free to switch areas and advisors, the constraints are necessarily loose. As you might imagine, it requires a fair bit of juggling behind the scenes to make the system work.

ED.: We've heard that "managing variance" plays a large role in the admissions process. What does that mean, why is it important, and how do you manage variance? More generally, how does your committee approach its core task, namely, selecting the best and the brightest, and then having them select us as their graduate school?

RN: We generally have fairly tight bounds on the number of new students we want to admit (e.g., 10 or 11 can be department-supported). Our overall hit rate for offers we make is somewhere around 50 percent. If we just made offers on the assumption of 50 percent yield with an expected value

of 10.5 (e.g., 21 offers) the Poisson statistics would tend to give us plus or minus two or three, or outside of the range 8–13 about 30 percent of the time (even if the 50 percent statistic were exactly correct). This is too much variation for our financial system to handle. To deal with this, we put out offers only after personal interviews with each candidate, and we keep in touch with the candidates as the season goes on, collecting as much information as we can about what options they are considering, where they are waiting to hear from, etc. We typically will not make an offer to a candidate who shows no interest in talking to us.

The process allows us to keep an evolving estimate of each candidate's likelihood of coming, which tends toward 0 or 1 as the deadline approaches. This provides an increasingly sharp estimate of our expected yield and allows us to put out offers to secondary candidates that we have "kept warm" as the need arises. We start with an expected yield below the desired and ramp up as the variance tightens. Most years, we hit the target for accepts exactly, and rarely are we off by more than one.

ED.: Given your insider's understanding of how students are chosen, what advice do you have for students applying to URCS and other CS graduate schools?

RN: Getting undergraduate research experience is good. Having papers in conferences is even better. A good letter of recommendation from a figure well known to us can be priceless. A personal statement that is well written, focused, and illustrates some technical knowledge of current research issues in an area of interest to the faculty will tend to get your application looked at. We also look to get a picture of your background and what motivates you, as this helps us estimate whether you are likely to be successful in our research program.

ED.: Each year in early March, there is a Visitors' Weekend bringing prospective students to campus. Is that to help them learn more about us or to help us decide whether to accept them?

RN: Both. It's all about match. With a small department, we must run a focused research program to produce world-class results. The extended personal contact the visit weekend provides is the best way we have found to evaluate whether candidates are right for our program, and for them to evaluate whether we are right for them.

ED.: What is URCS's most attractive feature to prospective students? What about URCS most worries prospective students?

RN: The most attractive aspects have been our high-quality research program, the faculty and graduate students who make it run, and the close-knit nature of the department. The freedom to choose and change advisors and areas and guaranteed department support are also attractive to some students. It is also our small size that most worries some prospectives. Candidates who do not find themselves excited by one of our focal research areas may be concerned they will not fit in. This is a legitimate concern, and such students may be better off choosing a different school with projects that better spark their interest. The comprehensive exams were traditionally a source of anxiety, but as of this year (2011), they have been eliminated, and so will probably be replaced by worries as yet unknown.

ED.: What insights have you gained, as Admit-Comm chair and as a professor, into which traits most strongly predict success in a CS career?

RN: Most of them are predictive of success in any endeavor: perseverance, curiosity, knowledge, good planning ability, and the ability to work well as part of a group. More specific to CS are a mathematical/analytic bent and an interest in precise, formal description and specification. And despite the geek-nerd stereotype, social skills have become increasingly crucial as computer technology has permeated mainstream society.

ED.: Thank you so very much, and we wish you and your committee continued success in recruiting to URCS the next generation of bright minds.

If you graduated in a year that ends in 6 or 1,
please join us Meliora Weekend,
Oct 21, 3:30–5:30 p.m.,
for the Computer Science Undergraduate
and Graduate Reunion Open House
in 601 Computer Studies Bldg.

GRADUATE ALUMNI NEWS

Paul Ardis '10 (PhD), after 1.5 years at the Air Force Research Laboratory, is switching jobs. He is going to be a Diagnostic Systems Development Scientist in the Center for Integrated Manufacturing Studies (CIMS) at Rochester Institute of Technology (RIT). This is a research faculty appointment, so he will be performing research (within the center and collaborative throughout Rochester), securing corporate and government funding, and mentoring graduate students.

Tanu Ardis '06 (MS), '11S (MBA) is working as an Analyst at Forensic Economics in Rochester.



Anushka Balasubramonian

Rajeev Balasubramonian '03 (PhD) welcomed his daughter, Anushka Nikita Rajeev, on 6/11/2011, weighing in at 6 lbs., 11 oz., and measuring 20 inches long. She bears a striking resemblance to her brother, Shurik. The family is doing great; Shurik is especially excited about the new arrival.

Rahul Bhotika '03 (PhD) recently became the manager of the Image Analytics Lab at GE Global Research where he leads the development of algorithms and software to automatically quantify and interpret images.

Manu Chhabra '08 (PhD) has moved back to the US (Chicago). He has joined the Citadel Investment Group as a Senior Quantitative Researcher.

Peter Dibble '90 (PhD) is working at Google in Pittsburgh.

Hemayet Hossain '10 (PhD) is a GPU architect at NVIDIA in California.

Abhinav Jalan '05 (MS) moved to Bangalore and joined Google India in December 2005. In March 2010, he moved to Mountain View, Calif., where he continues to work.

Ashwin Lall '08 (PhD) enjoyed his first year of teaching at Denison in Granville, Ohio. He and wife, Erin, bought and moved into a house in the area.

Bryan Lyles '77 (MS) began a new position in July 2011 as Program Director in the National Science Foundation CISE/CNS. Also, he received a 2010 IEEE Region 1 Award for "For Innovative and Exemplary Contributions to the Field of Computer Systems, Communication, and Networking."

Bradford W. Miller '86 (MS) is now at GE Global Research in Niskayuna, N.Y. He works from home in Rhode Island.

Massimo Poesio '94 (PhD), a professor at the Università di Trento, recently attended ACL with many URCS students and alumni.

Eric Ringger '00 (PhD) has been promoted to associate professor of computer science at Brigham Young University.

Bob Schudy '82 (PhD) writes that his son, Warren, earned his PhD in computer science from Brown and is now at IBM TJ Watson. All is well.

Jonathan Shaw '06 (PhD) works at Sensory, Inc. developing speech recognition algorithms. Two weeks after he started there, Kaylee was born, and last August, wife, Joanna, gave birth to their third child, Ella Hope, who, except that she actually has hair, is a carbon copy of Ariana at her age, so you have met her twin already!

Xipeng Shen '06 (PhD) had two important events happen this year. The birth of his third child, Alex Yan Shen, on April 29, 2011. And he received a DOE 2011 Early Career Research Award.

Vinod Sivasankaran '07 (MS) changed jobs in April of this year and is working at Morgan Stanley, New York, as an associate.

Rahul Tripathi '05 (PhD) is an assistant professor of computer science and engineering at the University of South Florida.

Benjamin Van Durme '01 (BS/BA), '10 (PhD) is an assistant research professor in computer science (co-supervising) four to eight PhD students, depending on how one counts. This role blends into his position as co-lead of the Language Understanding initiative, as a Research Scientist at the JHU Human Language Technology Center of Excellence.



Zoe holding Mia Yi

Graeme Williams '80 (PhD) is working for dynaTrace as a sales engineer.

Weilie Yi '06 (PhD) left Microsoft (his first job) last October and is now working for a Seattle start-up called Sewichi as the principal scientist. He works on mobile analytics, trying to make sense of mobile users' location data. Wife, Zhu, and he had their second child, baby girl Mia.

Xiao Zhang '10 (PhD) and wife, Yang, are doing well in California. They are expecting a baby later in December. He will be a proud parent ;-). He currently works at Google in Mountain View, Calif., as a software engineer.

RECENT PHD'S

Carlos Gomez-Gallo

Harvard University Department of Linguistics
Incremental Understanding and Production Across Clauses

Hemayet Hossain

NVIDIA Corporation
Effective On-Chip Cache Utilization in Chip Multiprocessors

Ding Liu

Nuance Communication, Inc.
Towards Semantic-based Machine Translation

Philip Michalak

Digital Reasoning Systems
Task Model Reasoning

Matthew Post

Johns Hopkins University
Syntax-based Language Models for Statistical Machine Translation

Arrvindh Shriraman

Simon Fraser University
Architectural Support for Overseeing Memory in Multiprocessors

Bin Wei

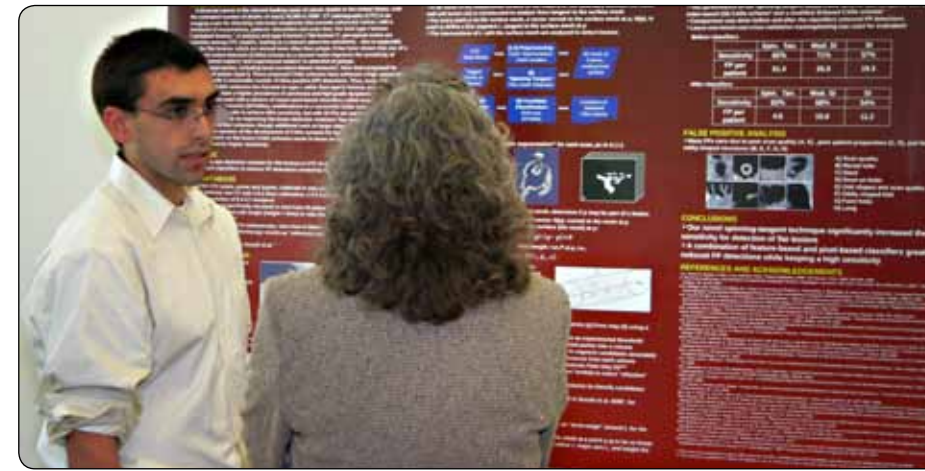
Netbase Solutions
Graphical Models for Heterogeneous Transfer Learning and Co-reference Resolution

Xiao Zhang

Google
Operating System-Level On-Chip Resource Management in the Multicore Era

Shaojun Zhao

Amazon.com
On Word Alignment Models for Statistical Machine Translation



Frank Ferraro presents poster at Senior Design Day '11

ACADEMIC CAREERS CONTINUE

“The UR Computer Science curriculum gave me the freedom to take interesting courses while not sacrificing rigor! These experiences, particularly with high-caliber, very well-respected research professors, helped provide me with confidence and problem-solving skills needed for internships, awards and fellowships.”

—Francis Ferraro

Ferraro Leads Stellar Class of 2011

Francis (Frank) Ferraro, our 2011 class valedictorian, won both an NSF Graduate Research Fellowship and the 2011 National Defense Science and Engineering Graduate Fellowship. Frank received two degrees, a BS in computer science and a BS in mathematics, with a minor in Slavic studies. Besides maintaining a near-perfect GPA, Frank has conducted very successful research in several areas: computer-assisted flat lesion detection in colonoscopy (as an NSF-sponsored Medical Informatics intern at the University of Chicago Medical Center), leading to greatly improved detection rates as well as coauthored papers; statistical natural language processing at the Summer Research for Undergraduates program at the Johns Hopkins Center for Language and Speech Processing; dismantling of an attempted proof by a serious computer scientist that $P=NP$ (the most famous open question in computer science); and new methods of distinguishing metonymy from literal language use, based on the use of MIT's Concept Net, a large informal base of general knowledge. Besides being a stellar performer in academics, Frank has been a very active and valued member of the University of Rochester swim and dive team, a coach for younger swimmers, and a person with keen musical interests and talents. He is heading for graduate studies in computer science, specifically natural language processing, and will be at the Center for Language and Speech Processing at Johns Hopkins University.

Several other students from the Class of 2011 are also headed to graduate school. Aaron Gorenstein is attending the University of Wisconsin, Madison; JangSun (Karl) Lee is attending Columbia University; Scott Ames is attending the University of Rochester; and Sara Melnick is attending Washington University in St. Louis.

CLASS OF 2011

Scott Ames
Daniel Bartkowski
Cole Brown
Nicholas Butkowski
Frank Ferraro
Aaron Gorenstein
Christopher Hill
Benjamin Hopkins
Jang Sun (Karl) Lee
Garett Matheis
Sara Melnick
Robin Miller
Ahmad Muhammad Firdau
Mark Needham
Bradley Orego
Brandon Peterman
Andrew Richardson
Isaac Richter
Adina Rubinoff
Michael Schermerhorn
Jay Slater
Nicholas Tien
Katherine Tucker
Evan Vandegriff

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“INNOVATOR” TITLE SUITS KIMBALL WELL

Erin Kimball enjoys a good challenge, whether it's a difficult double major in chemical engineering and computer science at Rochester, rock climbing in the Alps, or living up to her title of “Innovator” at TNO, a company in The Netherlands that connects people and knowledge to create innovations for sustainable industry and society. Erin graduated from the University of Rochester in 2004, completed her PhD in chemical engineering at Princeton in 2010, and currently lives in Rotterdam, The Netherlands.

ED.: While at Rochester, you majored in two very difficult subjects, computer science and chemical engineering. What were your challenges? Why those two majors?

EK: I enjoyed chemistry and math and liked knowing how things worked. I talked to my high school chemistry teacher, and he said, “Have you ever thought about chemical engineering?” I hadn't even heard about it at that time, but the rest is history. Choosing to also go for computer science was different. I knew nothing about computers when I entered college so thought doing a minor in CS would give me a bit of an edge in the future. I then saw it was only a few more classes to get a major, so I figured why not?

The challenges—let me just say sometimes I am amazed it all worked out! First I had to make sure I could take all the classes I needed each semester without conflicts and apply each term to overload in order to finish in four years. Then there was finding the time to study . . . well, I didn't sleep much while I was a student at Rochester! The first year was quite difficult, but then I met some great friends to study with who kept me company while I worked at Starbucks. I just had to find a rhythm and routine that worked for me, and in the end it was worth it!

ED.: Was the ratio of female/male students in the two majors similar? If not, can you consider why that might be?

EK: The ratios were not even close; there were many more girls in CHE. I think it can be intimidating to enter into a field that is known to be male-dominated, and I'm sure this deters some girls from CSC. In general, girls don't grow up playing computer games, which, I think, leads to an interest in the programming behind them. On the other hand, though, we do grow up maybe cooking or playing with makeup—all chemistry, if you think about it!

ED.: What is your current job at TNO? Why is it a good fit for a person with your combination of skills? Though it's more suited to your chemical engineering background, what role does your CSC skill set play in your job?

EK: My current job at TNO is quite varied, which is described well by my rather vague title as “Innovator.” I get to work on all kinds of projects doing technical research and leading the scientific components of the projects. My focus is on carbon dioxide (CO₂) capture and a technology called Chemical Looping Combustion, which is a novel way to burn fuel that allows for almost 100 percent capture of the CO₂ without a high efficiency penalty. It is mostly chemical engineering problems—process design and analysis—but I actually use my CS skills with the modeling and data analysis that I do. It's great to be able to write a program in a couple hours that can manipulate data and do all kinds of calculations that would take weeks to do with Excel! And then, of course, the skills you need to handle two majors—time management, working in groups, being efficient—are extremely useful.

It's really amazing to work with all kinds of people in countries all over Europe while being between academia and industry. I still have freedom in my research but get to work directly with those who will apply it on a large scale.

ED.: How do you see technology improving the world's sustainability methods both now and in the near future?

EK: I think technology is essential. How we do things in the future may be completely different from how things are now. There's a focus in research now of mimicking natural processes that utilize CO₂ to do something useful. The European Union just put out a proposal call for the conversion of CO₂ to fine chemicals, most likely using solar energy or algae. These types of processes are so complex, having been evolved and optimized by nature for millions of years. They are only now becoming something that we can understand and learn from. It might then be that something that is a major pollutant today is a key feedstock in the future. Developments are also under way for utilizing other waste products that are now only accumulating somewhere. I think you will also see much more interdisciplinary technologies involving biologists, engineers, chemists, etc., and requiring much more complex optimization and control strategies from computer scientists.

ED.: Are there different environmental priorities in Europe than in the United States?

EK: I would say so. The EU is ahead of the United States, I think. It seems that the EU is willing to take more of a risk and a setback to reduce pollution, probably because the risk is shared among several countries. This is also tied to the more socially conscious systems that you see in Europe. As a single, very capitalist

economy, the United States is more cautious and doesn't have any agreements to keep with neighboring countries. The United States commits a lot to research, but the actual implementation of systems, such as carbon capture and storage, I don't think will have the necessary governmental incentives or industrial support to be realized in the United States before the EU.

ED.: Looking back at your computer science education, what was the skill that has had the most impact on your current success?

EK: I think the skill to take initiative has been the most important for me. In CS, you have to take initiative to make your projects function well and be what you want them to be. You need to find people to work with that will form a productive group. This was much more important in CS than ChE, I think because ChE has been around much longer and you must learn a larger body of techniques and practices that have been already developed over decades; in CS, you have more freedom, and the field is more dynamic. In my work now, I could easily sit back and do the projects that are just given to me, but it has been so much more rewarding to get out there and snatch the really interesting work. I have taken initiative to start a program to help international employees practice speaking Dutch with our colleagues and am currently organizing a study trip to Iceland. I have built a much larger network and have grown much faster in the company than I ever would without having taken the initiative to get out from behind my computer!

ED.: It's not all about work. What activities do you do for fun and relaxation? Since you seem to travel about Europe, what's your favorite spot to go on the continent?

EK: It is definitely not all about work! I'm still very much into rock climbing, which I got into with my CS friends at Rochester; salsa dancing, which I learned in graduate school; and snowboarding, which has been a passion since high school in Seattle. And of course traveling! I have been able to see so many different places since being in Europe, each with such a different character. From hiking in the fjords of Norway to climbing in French wine country to taking the train to Paris for the weekend, it has been an amazing experience! I would have to say my favorite spot to go so far is Switzerland. I had an amazing time seeing Zurich and Bern, and of course getting some Alpine snowboarding in. I went last summer for some more extreme rock climbing in the Alps doing all day multi-pitch routes and staying in a hut that had all of its supplies delivered by helicopter. It is the most beautiful country I have seen so far! The trains are good, the food is great, and there is always a new mountain to discover!



Front: Julian Lunger '14; Middle: Brad Orego '11, Scott Ames '11, Rintaro Kuroiwa '12, Robin Miller '11; Back: Josh Pawlicki '12, Sam Atlas '12, David Klein '12, Harry Ledley '12. Not pictured: Andrew Richardson '11

THE CS GAMES CUP HAS RETURNED

Two teams of undergraduates represented the University of Rochester's Computer Science at this year's CS Games, held at Concordia University in Montreal, Quebec, from March 4 to 6. Thirty-one teams, mostly Canadian, competed in a three-day marathon of events, from algorithms to artificial intelligence to team sports. With overall points totaling 75.96, our team, "Watson+Jennings <3Children," came away with a solid victory, winning first place in six out of 15 events and finishing in the top three on four more. Our other team "IMA FIRIN MAH LAZER" finished in 11th place, earning the second place trophy in the Algorithms event.

For the third time in nine years of this competition, our team returned victorious with the CS Cup in hand. Like the Stanley Cup of Computing, the CS Cup resides with the winners throughout the year and returns to the organizers before the next competition. Previously, our 2006 and 2007 teams dominated and brought the trophy home in back-to-back years. The cup temporarily resides in CSB 735 along with multiple event trophies. A new, more permanent home for the growing collection of URCS trophies is still in the planning phase.

Erik Wright, a Google Canada recruiter, remarked, "I wasn't surprised [that they did great at the Games], as I had a chance to talk to several of the team members during the recruiting fair, and they

really impressed me in terms of their enthusiasm, attitude, and camaraderie. The University of Rochester should be very proud of its delegates."

Team members on "W+J<3 Children" included Sam Atlas '12, Robin Miller '11, Brad Orego '11, Andrew Keenan-Richardson '11, Josh Pawlicki '12, Harry Ledley '12, Scott Ames '11, Julian Lunger '14, Rintaro Kuroiwa '12, and Dave Klein '12. Team members on "IFML" included Emily Danchik '13, Darcey Riley '12, Chris Hill '11, Dan Bartkowski '12, Chris Miller '14, Hap Willis '14, Phillip Cohn-Cort '14, and Mike Garber-Barron '11. Team captains Sam Atlas and Emily Danchik worked hard to make sure each team was where they needed to be at all times, recruited team members to work on ongoing competitions (Puzzle Hero), and dealt with bumps along the way.

Team members were very grateful for the support they received from the computer science department, HSEAS, and Student Activities. This financial backing allowed 18 students the opportunity to participate. Next year's competition will be held at the University of Manitoba, in Winnipeg, which will present new travel challenges, a new mix of teams represented, and less of a language barrier. For now, however, the trophy is home.

UNDERGRAD ALUMNI NEWS

Seema Bhopale-Plaisier '04 has been traveling with her 1-year-old daughter, Aashana, most notably to India and to Banff, AB, Canada. She is now officially a PhD, and her diploma is one of the last ones with Arnold Schwarzenegger's signature on it! Seema coauthored three more papers, including Cell Autonomous Role of PTEN in Regulating Castration-Resistant Prostate Cancer Growth (Cancer Cell. 2011 May 25. PMID: 21620777). Also, since April, she has been working remotely doing gene expression analysis and bioinformatics for Delphine Lee, MD at John Wayne Cancer Institute in Santa Monica, Calif.

Diana Calarese Baird '03 and Tyrone Baird '01 welcomed their second daughter, Evelyn Denise, on February 8.

Ross Camara '04 has had a big year. He turned 30, bought his first home, and his wife is expecting their first child (a girl) at the end of August. Additionally, he recently accepted a job offer with Booz Allen Hamilton and will be working at the McClean, Va., offices doing front-end development.

Nate Chambers '02 completed his PhD in computer science from Stanford University and joined the CS department of the U.S. Naval Academy as an assistant professor.

Allison Chang Hirakami '01 had a second son, Nikko, in February.

Ross D'Eredita '04 married Rachel Leib on 9/4/10. In the fall, he'll be attending the Fuqua School of Business at Duke, class of '13.

Lee Frankel-Goldwater '06 will soon be graduating from NYU with an MA in environmental conservation education. Presently he is a Green Apprentice on Kibbutz Lotan in Israel. He will be returning to NYC to "fight the good fight" with Permaculture and homemade sauerkraut.

Brendan Heavey '02 started at Independent Health, an HMO in Buffalo, N.Y., in May after receiving a master of public health in biostatistics at SUNY, Buffalo. His new position at Independent Health will allow him to build on his statistical knowledge and SAS programming skills.

Shawn Hershey '99 is currently working at Lyric Semiconductors in Cambridge, Mass. In addition to working as a developer, he teaches lindy hop and blues dancing (www.newschoolswing.com).

Dennis Huo '10 has been thoroughly enjoying his work at Google, although his work is in infrastructure, so is minimally visible to outside users. He received a promotion, and his team has won an internal award called the OC Award (operating committee award).

Nikita Imennov '04 has defended his PhD thesis ("Estimating Temporal Sensitivity of Cochlear Implant Sound Coding Strategies with a Stochastic Model of the Auditory Nerve"). Although his new degree is from the bio-



Nate Chambers '02 completed his PhD in computer science from Stanford University



Ross D'Eredita '04 married Rachel Leib on 9/4/10

If you graduated in a year that ends in 6 or 1, please join us Meliora Weekend, Oct 21, 3:30–5:30 p.m., for the **Computer Science Undergraduate and Graduate Reunion Open House** in 601 Computer Studies Bldg.

engineering department, his work was closer to computational neuroscience, with a strong emphasis on large-scale, distributed computing and analysis of neural coding patterns. Nikita has joined a Quantitative Risk/Portfolio Analytics team at a mid-sized financial software company, where he finds the work fascinating and, at times, related to his past academic pursuits. All in all, good times!

Joseph Kachinsky '10 started a new job in July at iCims in Hazlet, New Jersey.

Cristina Luis '01 has separated from active duty in the Air Force and is moving to Oslo, Norway. She hopes to use her CS skills in her next career, as she misses coding and problem solving!

Fred (Trey) Marcus '01 is Owner/President of Electron Consulting, Inc. The company provides customized software solutions, network support, and IT staffing. Personally, his specialty is software architecture and implementation. His other interests are beach volleyball and music: vocals/piano/guitar.

Mac McCauley '00 and wife, Leesa, were blessed with the birth of their second boy, Elliott James, on November 5, 2010. Mac was promoted to Project Manager at Floyd Browne Group, where he works on business development, funding assistance, design of water and wastewater treatment plants and infrastructure, and construction administration. The McCauleys are working toward taking a trip to Zambia this fall for mission work, which will include evangelism and teaching, as well as helping with medical, water, and sanitation needs.

Eric Meisner '03 defended his PhD thesis entitled "Learning Controllers for Human-Robot Interaction" in February 2009 at RPI and is currently doing a post-doc at Johns Hopkins University.

Jonathan Moldover '99 recently started a new gig at Rivet Games (San Francisco-based online gaming startup) as a game-play programmer.

Justin Morgan '04 married Alison Albee on 6/11/11 and moved to St. Louis. He is working at an engineering company, MECS, and doing internal application development in VB .NET and SQL Server.

Jonathan Blair Norwood '04 earned an MS in computer science from the University of Washington last year and switched roles at Amazon. He is now managing a team called Global Fulfillment by Amazon, which is a third-party import and export business.

Trevor Oldak '06 married Elizabeth DeGrush '06 on June 5, 2010. They recently moved from Chicago to Worcester, Mass., and he is the lead engineer at a startup called Cellit.

Tom O'Neill '07 is on Bing's core ranking team, improving the relevance of the 10 blue links—it's algorithms galore!

Eric Osisek '07 finished his second year in CUNY's PhD program in CS.

Preethum Prithviraj '05 was recently promoted to Director of Operations for LifeCare Ambulance and has started working on articles for continuing education with Gannett Healthcare for EMS. His wife received a fellowship in oncology in Tampa, Fla., so sometime next year they will move down to sunshine and hurricanes! Not sure what he will be doing down there, but he is sure it'll be a little of everything as usual!

James Regan '10 married Jennika Stamm '10 on May 13. He is currently working for Pearson Education as an associate .NET developer.

Eric Reynolds '02 is doing contract development at Carestream Health.

Andrew Keenan Richardson '11 has a job in the northern Virginia area with a small medical software company, Medicomp. The job involves some computational linguistics so he thinks he will enjoy it.

Kiana Ross '01 graduated with a PhD in mathematics from the University of Washington! She will be moving back to Los Angeles for a position with an aerospace FFRDC and is really looking forward to it.

David Sankel '02 and his wife welcomed their third child, Christina, with another phenomenal home birth. His business, Sankel Software, gets more exciting every year! A new "top secret" product is in the works that promises to fundamentally change the way people think about software. To say the least, taking advantage of functional programming continues to build an insurmountable precipice between his business and its competition. A new startup he is developing with business colleagues, Definitive



Trevor Oldak married Elizabeth DeGrush



Sankel family

Bone, is working on synthetic bones that will impact several medical fields. As a result of this new venture, they will likely be moving their headquarters to Albuquerque, New Mexico, later this year.

Jonathan Schmid '03 is working for the Navy Postgraduate School, in a department called the MOVES Institute. He is doing Java Net Beans coding for a new system that automates data collection for LSOs (Landing Signaling Officers) who evaluate jet-landings on all the aircraft carriers. He now lives in nearby Pacific Grove, Calif.

Anand Shahi '03 recently won an award from the New York Society of Securities Analysts. He writes that it is a great honor for him to be mentioned along with some very significant award winners. He switched jobs over a year ago and was promoted to senior analyst at Atlas Capital Partners, a long-only hedge fund.

Jay Slater '11 is working for SDG Systems, a small mobile device company in Zelienople, Pa.

Thank you to all donors who have contributed to the University of Rochester in the last year. If you are interested in donating to the department or the University, please go to the alumni website and look for "Online Giving."

www.rochester.edu/college/alumni/index.html

Ahren Studer '04 and his wife, Casey, welcomed their son Connor on Valentine's Day 2010. Since then, he completed his PhD thesis, "Verification of Physical Endpoints to Secure Digital Systems," at Carnegie Mellon University and moved to Boston for a position at MIT's Lincoln Laboratory.

Jonathan Tomer '04 was married last August and lives in Washington, DC, with his wife, Becky. He also just started working as a software engineer at Google's office in DC.

Andrew Uzilov '05 married fellow alum, Kathleen Hutchison, on September 5, 2010, in Carmel Valley, Calif. They are both still attending graduate school at the University of California, Santa Cruz. Andrew had a major bioinformatics paper published last year, on which he is joint first author (Underwood and Uzilov, Nature Methods 2010).

Robert Van Dam '05 finally gave in/gave up on getting out of Utah and bought a house. It was hard to pass on the current market and even harder to walk away from his job (Bluehost). So hopes of getting back east are on hold for now, but the kids love finally having a trampoline. Also, oldest (Katie) is very excited to start kindergarten this fall.

Benjamin Van Durme is an assistant research professor in computer science (co-supervising) four to eight PhD students, depending on how one counts. This role blends into his position as co-lead of the Language Understanding initiative, as a Research Scientist at the JHU Human Language Technology Center of Excellence.

Evan Vandegriff '11 is working at a digital ad agency in NYC called adMarketplace. The company located at 3 Park Avenue is looking for both front-end and back-end web developers. He is currently doing front-end.

Scott Ventura '97 moved to Deefield, Ill., a suburb of Chicago, to be with his fiancée, a fellow Rochester alum. He is still working (albeit remotely) for Allworx/PAETEC and likes to tease his colleagues that he has the biggest office in the company (his basement) and that unlike them, has a window office (or at least a window well office!). He reports to Liudy Bukys, and his work is focused almost exclusively on Android app development.

Pamela Vong '08 joined a startup company called OurBond in Bethesda, Md., to help develop their web and mobile platform that combines publishing, e-commerce, and social-networking capabilities for a targeted audience. Some of the already established demographics they're focusing on are the cycling, bartending/nightlife, and food and wine communities. It's basically her ideal job at this point in her career, and she is very excited!

Alex Wang '07 works at Draper Laboratory developing software for the Trident missile. In his free time he started coding Android apps under the moniker Quadddd.com. So far he has released a simple inflation calculator and a fantasy sports app.

Dennis Wheeler '09 has worked at Local Edge in Tonawanda, N.Y., as a programmer analyst since early April.

Jonathan Williams '05 lives in Brooklyn, N.Y., developing network security appliances at Xceedium, Inc. in Jersey City, N.J. In his spare time, he directs/programming computer graphics for music videos.

Lauren Wood '03 left EMC in December and began working at Dell/EqualLogic in Nashua, N.H., where she continues to do software performance analysis.

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Hajim School of Engineering and Applied Sciences

Return Service Requested



At ACL '11, URCS Current students and faculty as well as alumni: Front Row: Licheng Fang, Tag Young, Micha Elsner, Joel Tetrault and Mehdi Manshadi; **Middle Row:** Hao Zhang, Ashwin Lall, Darcey Riley, Diane Littman, David McCloskey, Nate Blaylock, Matt Post; **Back Row:** Massimo Poesio, Eric Ringger, Myrosia Dzikovska, Dan Gildea, Ben VanDurme, Nate Chambers

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