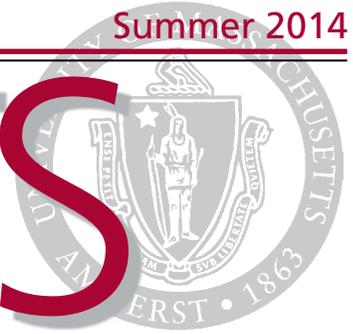


Significant BITS

Newsletter of the
School of Computer Science



School welcomes five new faculty

We are pleased to announce that five new faculty will join our School of Computer Science this fall. Amir Houmansadr, Subhransu Maji, Brendan O'Connor, and Barna Saha will join the School in September as Assistant Professors, and Gordon Anderson will join as a Lecturer. The new faculty have research strengths in network security and privacy, computer vision, natural language processing, algorithm design and analysis, and computer education and software engineering.

"We are delighted that we were able to attract such strong and promising researchers and teachers, especially with so many schools and industries aggressively recruiting computer scientists this year,"

continued on page 4

Taming Massive Graphs

Pick up your favorite algorithms textbook, flip to a random page, and there's a good chance that you'll find an algorithm for solving a problem about graphs. This shouldn't be surprising given that many interesting types of data are naturally represented as graphs. Examples include the transportation networks represented in Google Maps; social networks such as Facebook and Twitter; and protein-protein interaction networks in biology. However, implicit in the design of many of the existing algorithms is the assumption that the graphs of interest are static and are small enough to fit in the main memory of a single machine.

Unfortunately, in many applications these assumptions are no longer reasonable.

"Many of the graphs that we need to process these days are massive and are constantly changing," says Associate Professor Andrew McGregor. "For example, the web graph has over ten billion nodes and hyperlinks are constantly being added or removed. This necessitates new approaches to the design and analysis of algorithms for such graphs." He goes on to explain that algorithms whose running time is even quadratic in the size of the graph can often no longer be considered practical. Furthermore, algorithms may need to handle data that is distributed between numerous machines or is defined by data streams.

McGregor and his group have been investigating various aspects of the problem. One approach to dealing with a massive graph is to first compress the graph in a way that approximately preserves the relevant properties of the graph. The idea is analogous to using MP3 and JPEG files on your phone rather than the original songs and photos. While some of the information is lost, the hope is that the difference is imperceptible.



Andrew McGregor

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Sixth Annual Outstanding Achievement and Advocacy Awards

The accomplishments of this year's Outstanding Achievement and Advocacy (OAA) Award winners and CS undergraduate and graduate student award recipients were celebrated during a banquet held at the Mullins Center on Friday, May 2, 2014.

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(l. to r.): CS Chair Lori Clarke, Zhi-Li Zhang, Donald House, CNS Dean Steve Goodwin, Randy Ellis, Mary-Ellen Prescott, Vanessa Murdock, Prof. Leon Osterweil, and EMC's Cindy Gallerani.



Lori A. Clarke

Computer Science undergraduate enrollment is skyrocketing. The figure below shows CS Amherst enrollments since we first introduced the undergraduate program. This graph is similar to the national trends over this same period of time. Some people predict that this recent rise in enrollments is just another cyclic increase that will once again be followed by a sharp decline. Others, myself included, believe that folks are

finally starting to understand how integral computing is to our society. Although there will undoubtedly be economic downturns, computing and all the many manifestations of computational thinking will continue to be in high demand. We are fortunate to have a selective enrollment policy, helping us to attract some of the brightest and most promising undergraduates and allowing us to manage our resources and class sizes. Our undergraduates are highly sought after by industry, and this year, one of our seniors, Daniel Stubbs, was awarded the Computing Research Association Outstanding Undergraduate Research Award, which is awarded to two undergraduates each year, one male and one female, selected from all the CS degree granting programs in the U.S. and Canada.

After graduation, our alumni, both undergraduate and graduate, continue to do amazing things. This issue of *Significant Bits* notes recent accomplishments of some of our alumni, including Jody Daniels, who is a Brigadier General in charge of the African Command; Alex Wolf who was recently elected President of the ACM and won the SIGSOFT Outstanding Researcher Award; Carla Brodley who recently was appointed Dean of the College of Computer and Information Science at Northeastern University; and Michael Franklin who became chair of the CS division at the University of California Berkeley. We love to hear about your successes and transitions, so please send an email and keep us informed.

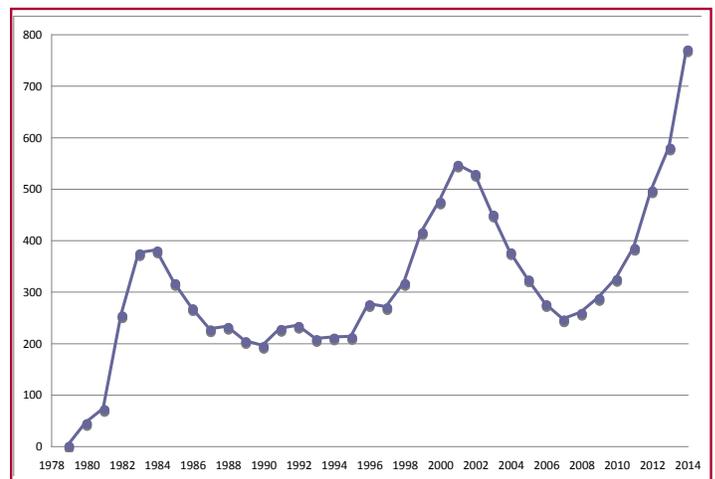
As many of you know, every year we honor about half a dozen alumni, as well as graduating students and their families, at the Outstanding Achievement and Advocacy Banquet the first Friday in May. This is a terrific way to end the school year, recognizing the accomplishments of our students and alumni. All of our alumni are invited and most faculty attend. We select the alumni awardees from the nominations we receive, so please send us suggestions.

In July, there was a CS Amherst alumni gathering in Mountain View, California, held at the Google campus. We had a terrific turn out, with over seventy alumni attending. We provided the food, drink, and swag, and several faculty attended. A special thanks goes to Marc Cartright, Jay Corbett, and Naghi Prasad, who live in the area and organized the event. Last year we did a summer alumni event in Seattle that also was a success. And this fall, we plan to do another alumni event in Boston. If you are interested in helping to organize an alumni event (e.g., New York City, Washington

DC, Los Angeles), please let us know. If there is enough interest, we're in!

This fall marks the end of our Community Drive to celebrate our 50th anniversary. To commemorate the event, we were challenged by a matching grant from alum Steve Vinter, to increase our giving by 50% in four areas. We still have a few months to go and we have met two of these four goals. We increased the total number of donors by over 50% and increased the number of first time donors by 50%. We also added three new endowed scholarships, the Flynn Scholarship for undergraduates and the Kurose Scholarship and Clarke Scholarship for graduate students. Both Jim and I are absolutely flattered and humbled that alumni would start scholarships in our names. And best of all, these scholarships will provide support to our students so that they can accomplish their goals in life (and perhaps someday pay it back by supporting a scholarship for other students). We still have a ways to go to increase the number of alumni email addresses (that is one reason we still send *Significant Bits* by snail mail!). We have even made it easy for our alumni to have a lifetime CS email address that they can count on, whether they change jobs or get annoyed with their current email provider. Although we would like to use this email address to send you (infrequent) messages about CS activities, you can request an account and opt out of receiving our messages. To send us your email address go to www.cs.umass.edu/forms/email-address-form and to sign up for an alumni email address go to www.cs.umass.edu/lifetime-email-forwarding – help us reach our email address goal.

Finally, I am delighted to welcome five new faculty members this September: Assistant Professors Amir Houmansadr, who is working in cyber security, Subhransu Maji, who is working in computer vision, Barna Saha, who is working in theory, Brendan O'Connor, who is working in natural language processing, and Lecturer Gordon Anderson, who has done work in computer education and software engineering. (See page 4 for more information about their research backgrounds.) These new faculty will expand our research profile as well as expand our teaching offerings. We wish them the very best as they embark on what we are sure will be very exciting and fulfilling careers.



TAMING MASSIVE GRAPHS – – – – – cont. from page 1

For graphs, we need to be careful with what it means for the difference to be imperceptible and different notions (e.g., the distances between pairs of nodes or the size of cuts are approximately preserved) lead to different forms of compression. The benefits of compressing the graphs include the fact that running any existing algorithm on a smaller graph will be faster than running the algorithm on a large graph. The compressed graph may also fit in main memory thus avoiding I/O bottlenecks, and even if the graph data is stored across numerous machines, compressing the input reduces communication overheads.

However, this naturally raises the question of how to efficiently perform the compression. A popular technique for compressing some other types of data is to use random projections. For a simple example, consider representing a collection of text documents as vectors where the entries encode the frequency of the different words in the corresponding document. Then the similarity of two documents can be measured in terms of the distance between the corresponding vectors. The dimension of the vectors would be the size of the vocabulary which would be roughly hundreds of thousands in the case of English. However, by first applying random projections to the vectors, an existing result shows that it is possible to dramatically reduce their dimension without significantly perturbing the distance between any pair of vectors.

It initially seemed very unlikely that the random projections technique, also known as “sketching”, would be of any use when it came to graph problems. In particular, the answer to a graph problem can be very sensitive to slight changes in the input and a single edge could make a big difference for even a simple problem like trying to test whether a graph was connected. “We actually spent a considerable amount of time failing to prove impossibility results,” admits

McGregor “and I remember very clearly the moment I realized there was a good reason; because it was, in fact, possible!”

Their initial result still strikes McGregor as surprising. He illustrates it in the following way. Imagine we ask all the students at the university to determine whether the graph of their friendships is connected. A simple solution would be if every student listed all their friendships and we then studied these lists. Unfortunately, this could involve a lot of writing for the students that had many friends and someone who was friends with everyone would be there all day! The new result shows that even if each student knows nothing about the graph other than their immediate friends, she can summarize the list of her friends using a number of bits that is roughly logarithmic in the number of students. What makes this particularly surprising is that there could be a friendship between two students, say Alice and Bob, that is essential to the connectivity of the entire graph but neither Alice nor Bob would know this friendship was important when they summarize their lists. The solution devised by McGregor and his colleagues combines ideas from spectral graph theory and a new sampling technique developed in the context of data stream processing.

McGregor’s research group have been working on extending their results to other classic graph problems. There also seem to be wider applications for the techniques they have developed including designing faster data structures for dynamic graphs; verification of outsourced graph processing; and new “sliding window” algorithms where the goal is to ensure that no outdated information corrupts the graph being processed. McGregor is organizing workshops in Japan and Canada next year to further explore connections between graph compression, graph streaming, and distributed graph processing.

McCallum receives Conti Fellowship



Professor Andrew McCallum is a 2014-2015 UMass Amherst Samuel

F. Conti Faculty Fellowship Award Recipient, one of three chosen from the UMass Amherst campus. As a Conti Fellow, McCallum receives a year’s leave of absence to concentrate on activities related to graduate education, research, creative work and scholarly attainment. Selection of the awardees is based on demonstrably outstanding accomplishments and potential for continued excellence in research and scholarly or creative activity.

Osterweil receives ACM SIGSOFT Award

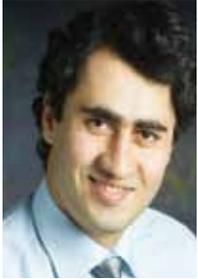


In June, Professor Leon Osterweil accepted the 2014 Association for Computing Machinery (ACM) Special Interest Group on Software Engineering (SIGSOFT) Distinguished Service Award “for promoting and expanding the field

of software engineering through visionary leadership of the Impact Project and for bringing the community to China, and China into the community, by organizing ICSE 2006 in Shanghai, as well as sustained editorial, program, and award committee service.” This annual award is presented to an individual who has contributed dedicated and important service to the software engineering community. The award was presented to Osterweil at the 36th International Conference on Software Engineering, Hyderabad, India.

FIVE NEW FACULTY – cont. from page 1

says Professor Lori Clarke, CS Chair. “Our new faculty hires will bring expertise in areas of computing that were our highest priority areas for growth. They will add both depth and breadth to our teaching offerings and provide new opportunities for research collaborations, both within Computer Science and with faculty in other disciplines across campus.”



Amir Houmansadr’s research interests revolve around various network security and privacy problems with a focus on Internet censorship, anonymity, and traffic analysis. He has researched network flow watermarking and its applications to several security and privacy problems, and he has been involved in investigating network situation awareness, social network botnets, covert timing channels, and smartphone security. He was previously a Postdoctoral Scholar in the Department of Computer Science at the University of Texas at Austin. In 2012, he received a Ph.D. in Electrical and Computer Engineering from the University of Illinois at Urbana-Champaign. He also received an M.S. and B.S. degrees in Electrical Engineering from Sharif University of Technology. Houmansadr’s paper won the Best Practical Paper at the 34th IEEE Symposium on Security & Privacy (Oakland) in 2013, and he received the UIUC ECE Department of Computer Engineering Fellowship in 2012 for research excellence in the area of computer engineering.



Subhransu Maji’s research interests are in computer vision and machine learning with the goal of advancing visual recognition algorithms. He is interested in developing representations of visual categories that can enable various high-level recognition tasks such as detection, pose estimation, segmentation, attribute recognition. A goal of his research is to learn representations that are semantically meaningful by leveraging humans “in the loop” during learning and inference. He was previously a Research Assistant Professor at Toyota Technological Institute at Chicago, a philanthropically endowed academic computer science institute on the University of Chicago campus. He obtained his Ph.D. in Computer Science from the University of California at Berkeley in 2011 and B.Tech degree in Computer Science and Engineering from IIT Kanpur in 2006. He won a number of academic excellence awards during his undergraduate studies, including the medal for graduating on top of the CSE department. He was awarded a Google Graduate Fellowship in 2008, and a Best Paper Award at the 2009 International Conference on Information Fusion.

Brendan O’Connor’s research interests are in machine learning and natural language processing with a focus on computational social science to develop methods that address linguistic and political questions by analyzing large corpora of textual data. One example of his research involves developing algorithms to understand and predict international conflict by analyzing millions of news articles. He has studied large-scale social media data, investigating public opinion, political censorship, language evolution, and computational linguistic tools. His work has been featured in the *New York Times*, *Wall Street Journal*, and other news media. O’Connor will be affiliated with the Computational Social Science Institute when he joins CS starting this Fall. He will receive his Ph.D. in Computer Science from Carnegie Mellon University this summer. He received an M.S. and B.S. in Symbolic Systems from Stanford University, and was a Facebook Fellowship Program finalist in 2010 and 2011.



Barna Saha’s research interests span algorithm design and analysis, discrete optimization, and foundational aspects of databases and data management. She particularly enjoys working on practical problems that lead to beautiful theoretical questions. She is currently a Research Scientist at AT&T Shannon Research Laboratory, which she joined after completing her Ph.D. in Computer Science from the University of Maryland, College Park in 2011. She received an M.Tech. in Computer Science and Engineering from the Indian Institute of Technology Kanpur and a B.E. in Computer Science and Engineering from Jadavpur University. She received the Dean’s Dissertation Fellowship Award from the University of Maryland, College Park, the Best Paper Award at the 2009 Very Large Data Bases Conference (VLDB), and was among the finalists for the Best Paper Award at the 2012 International Conference on Data Engineering (ICDE).



Gordon Anderson’s computer education and software engineering research interests include educational applications, biological computation models, and psychological and philosophical aspects of artificial intelligence. He is expected to receive his Ph.D. in Computer Science from UMass Amherst this month.

Alumni Social in October

The School of Computer Science’s next alumni social will be held on Thursday, October 23, 2014 from 6 – 9 p.m. at Amazon’s Cambridge, MA facility. More details at www.cs.umass.edu/alumnievent.

Visit us at
www.cs.umass.edu
for the latest news

Mahadevan elected an AAAI Fellow

Professor Sridhar Mahadevan has been elected a Fellow of the Association for the Advancement of Artificial Intelligence (AAAI) “for significant contributions to the field of machine learning including pioneering work in robot learning and representation discovery.”

Mahadevan’s research spans across many areas of artificial intelligence (AI) and machine learning (ML). Currently, he and his students are investigating a new framework “rethinking” AI and ML based on the concept of *equilibration*. “We are exploring many applications of this framework, including economic models of the next-generation of Internet architectures, new safe, scalable, and reliable reinforcement learning algorithms for solving sequential decision problems, and new methods for learning low-dimensional representations of high-dimensional scientific datasets, such as spectroscopic measurements

of rocks on Mars from Curiosity, the rover currently on Mars, and materials from near-Earth asteroids” says Mahadevan.

AAAI celebrated the newly elected Fellows at a dinner during AAAI-14 in Quebec City, Quebec, Canada in July. The AAAI’s Fellows program recognizes individuals who have made significant, sustained contributions—usually over at least a ten-year period—to the field of artificial intelligence. The committee generally selects 5-10 new Fellows each year.

CS alum, Carla Brodley (Ph.D. 94) also was elected to the 2014 class of AAAI Fellows.



Croft receives 2014 IEEE Computer Society Award

The Institute of Electronics and Electrical Engineers (IEEE) Computer Society named Distinguished Professor Bruce Croft as a recipient of its 2014 Technical Achievement Award for “outstanding contributions to information retrieval and the development of search engines.” The award recognizes contributions in the past 10-15 years that significantly promoted technical progress in the field.

Croft is the founder of the UMass Amherst Center for Intelligent Information Retrieval, which combines basic research with technology transfer to a variety of government and industry partners. His research interests are in information retrieval (IR), including retrieval models, representation, web search, query processing and search architectures. He has published more than 250 articles on these and other subjects, was editor in chief of the Association for Computing Machinery *Transactions on Information Systems* and is the editor for the Springer *Information Retrieval Series*. Croft was the Chair of Computer Science from 2001 to 2007. Professor Lori Clarke, current Chair of the School of Computer Science, notes that Croft’s research has had a tremendous impact on how we access the internet, influencing industry as well as other researchers.

Croft was elected a Fellow of ACM in 1997. He received the Research Award from the American Society for Information Science and Technology in 2000, the Gerard Salton Award from the ACM Special Interest Group in Information

Retrieval in 2003, and the Tony Kent Strix Award in 2013, all of which are career achievement awards.

IEEE’s Computer Society is the world’s leading computing membership organization and the trusted information and career-development source for a global workforce of technology leaders including: professors, researchers, software engineers, IT professionals, employers and students.

Sitaraman chosen for Outstanding Teacher Award

Associate Professor Ramesh Sitaraman was presented with the 2014 College of Natural Sciences Outstanding Teacher Award during the 2014 CNS Faculty and Staff Awards Reception held in May. The purpose of the award is to recognize excellence in teaching and to honor individual faculty members for their teaching accomplishments. In addition to the CNS reception, Sitaraman was also named in the Commencement Program.

Sitaraman’s innovative techniques for teaching the algorithms courses for both undergraduate and graduate students have received high marks from student reviews. Many of the students have lauded him as being an extraordinary teacher. Aspects of his style that stand out in the student reviews are his lucid lecturing style with the use of real-world application examples to make the abstract concrete, his mastery of the subject, and his use of active learning in discussions and end-to-end projects that tie together algorithm design and software development.



(l. to r.) Dejan Milojevic, IEEE Computer Society President, Bruce Croft, and Rich Belgard, IEEE Computer Society Awards Chair.



Marlin receives NSF CAREER Award

Award is to develop machine learning methods for complex health data

Assistant Professor Benjamin Marlin received a five-year National Science Foundation (NSF) Faculty Early Career Development (CAREER) award for the project “Machine Learning for Complex Health Data Analytics.” Marlin’s CAREER award research will address several fundamental sources of complexity in the analysis of both clinical and mobile health (mHealth) data, enabling researchers in health and behavioral science to extract more useful knowledge from these data sources.

“The fields of health and behavioral science are currently undergoing a data revolution,” says Marlin. “Electronic health records are seeing wide adoption across the U.S., resulting in the emergence of increasingly vast stores of clinical data.” Marlin’s research will also explore data from emerging mHealth sensor systems that are enabling the collection of large volumes of continuous physiological measurements in non-clinical settings. These data sources are widely regarded as having the potential to yield transformative advances in the fundamental understanding of human behavior and health. They also have the potential to significantly enhance numerous applications including data-driven clinical decision support and continuous health monitoring.

According to Marlin, the fundamental problem with analyzing data from these sources is that they exhibit a number of complicating factors that can include sparse and irregular sampling, incompleteness, noise, non-stationarity, between-subjects variability, high volume, high velocity and heterogeneity. Marlin’s research aims to develop new models and algorithms with the ability to meet the challenges posed by complex health data, and in the process significantly expand the frontiers of machine learning. Marlin’s CAREER Award research is enabled by collaborations with researchers at the UMass Amherst School of Computer Science, the University of Memphis Department of Computer Science, the Yale University School of Medicine, and Children’s Hospital Los Angeles, who are providing access to unique mHealth and clinical data resources.

Marlin’s CAREER Award activities will also extend beyond research. “An important goal of the CAREER Award program is the integration of education and research,” Marlin says. His work will include the development of a new applied machine learning course aimed at the growing segment of master’s students in the School of Computer Science. It also includes a significant community educational outreach component that was supported by Girls Inc. of Holyoke and integrated with the Girls Inc. Eureka! summer program (see article on page 8).

Marlin joined the School of Computer Science in 2011 where he co-founded and co-directs the Machine Learning for Data Science Laboratory with Profs. Hanna Wallach and Daniel Sheldon. Marlin was previously a fellow of the Pacific Institute for the Mathematical Sciences and the Killam Trusts at the University of British Columbia where he was based in the Laboratory for Computational Intelligence. Marlin received his Ph.D. in machine learning from the Department of Computer Science at the University of Toronto in 2008. He

is a 2013 Yahoo! Faculty Research Engagement Award recipient. He has served as a senior program committee member for the Conference on Uncertainty in Artificial Intelligence and the Neural Information Processing Systems Conference. This summer, he is serving as the general co-chair of the Meaningful Use of Complex Medical Data symposium. Marlin also serves as the School of Computer Science’s Honors Program Director.

The CAREER Program is a Foundation-wide activity that offers the National Science Foundation’s most prestigious awards in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations. Such activities should build a firm foundation for a lifetime of leadership in integrating education and research.

National symposium on machine learning and big data for health

Marlin served as the general co-chair of the symposium on Meaningful Use of Complex Medical Data (MUCMD) held on Aug 7-8 at Children’s Hospital Los Angeles. The symposium, founded in 2011, brings together machine learning and artificial intelligence researchers, experts on big data, healthcare providers, and medical researchers. “By bringing members of the computer science and medical communities together,” Marlin says, “we’re actively fostering collaborations that we hope will lead to advances in data analytics, clinical decision support, and knowledge discovery from complex medical data.”

Marlin, who was invited to speak at the meeting in 2012 and 2013, served as general co-chair this year along with Dr. Jesse Ehrenfeld, who directs the Anesthesiology and Perioperative Informatics Research Division at Vanderbilt University. Prof. Carla Brodley, dean of the College of Computer and Information Science at Northeastern and a UMass Amherst CS alum (Ph.D. ’94), serves on the symposium’s organizing committee along with senior computer science and medical school faculty from Johns Hopkins, USC, MIT, Vanderbilt, and Children’s Hospital of Los Angeles.



Organizing committee members and speakers at the 4th annual symposium on Meaningful Use of Complex Medical Data

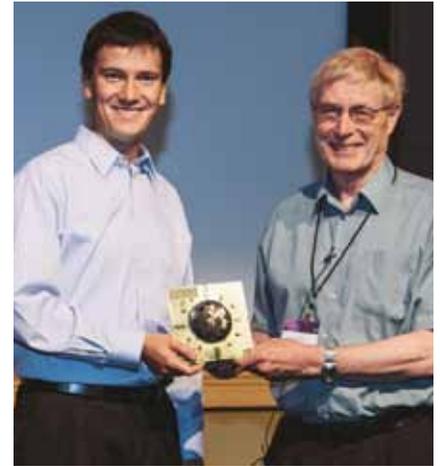
Children's Hospital of Los Angeles photo

Brun selected for 2014 SEIF Award

Assistant Professor Yuriy Brun has received one of twelve 2014 Microsoft Research Awards from the Software Engineering Innovation Foundation (SEIF), which supports academic research in software engineering technologies, tools, practices, and teaching methods. Brun's SEIF award project is "Augmenting Testing with Performance-Aware Behavioral Models."

Brun received the award for his research on improving software quality through model inference and testing. This work automatically infers models of how software has been tested, and uses these models to generate brand new tests that identify behavioral flaws. "Today, software is vital to our economy and everyday lives, but the quality of that software could improve," notes Brun. "Errors in software, like the Heartbleed bug that compromised the security of nearly two thirds of all active internet sites last spring, can have severe negative effects on our lives. While testing software systems is one of the most effective ways of improving quality, this process is often manual and expensive, and so many systems are under-tested."

Yuriy Brun (l.) accepts the SEIF award from Tony Hey, Vice President of Microsoft Research



PLDI 2014 awards for Berger and PLASMA students

Professor Emery Berger and members of his PLASMA research lab were well-represented in the list of award recipients at the 35th annual ACM Special Interest Group on Programming Languages (SIGPLAN) Conference on Programming Language Design and Implementation (PLDI 2014).

Doctoral student Emma Tosch won the PLDI 2014 Student Research Competition for her work on programming and debugging surveys (SurveyMan). She will be advancing to the 2015 national student research competition. A paper describing this work will be presented at OOPSLA 2014, a premier programming languages conference, in October. In addition, a paper that describes a memory allocator based directly on Berger's Hoard memory allocator won the 2014 Most Influential PLDI Paper Award (a test of time award for a paper presented 10 years prior).

Berger and doctoral student John Vilks won the PLDI

2014 Distinguished Artifact Award for their work on Doppio, a runtime system that makes it possible to run general-purpose programming languages inside the browser, "breaking the browser language barrier." DoppioJVM, part of this work, is currently being used by a variety of projects, including codemoo.org, an educational website from the University of Illinois, to make it possible to run Java programs directly in any web browser, without the need to install a Java plug-in. In June, Vilks presented the paper on this work during PLDI 2014 in Edinburgh.



Emery Berger

CS Community Drive nears completion; scholarship awarded

The CS Community Drive was launched during our 50th anniversary celebration last fall. The friends and alumni of the School of CS have stepped up to help us achieve our goals, but we can still use your help. CS still needs to gather many more alumni email addresses, and there is still time to take advantage of the matching gift challenge. CS alum Steve Vinter (Ph.D. '85) will match gifts to the Community Fund (up to \$50,000) made before October 31, 2014 in order to encourage fellow alumni to donate. The Fund provides student scholarship support. See www.cs.umass.edu/donate for details.

Undergrad Linda Yeboah is the first recipient of a CS Community Fund Award. She received scholarship funds to support her summer research project with Assistant Professor Alexandra Meliou. "We often rely on other people's

opinions to make every-day decisions: which restaurants to visit, where to go on vacation, which products to buy," says Meliou. "Online marketplaces and dedicated review websites cater to this need by providing a platform to publish users' reviews. However, reviews are sometimes published by spammers, or users with very different preferences and interests." Yeboah's summer research focuses on improving the usability of reviewing platforms by analyzing and publishing information on the provenance of each review. Her work helps identify unreliable sources and personalizes reviewing platforms by highlighting reviews by people with the most similar interests to specific users.

Eureka! workshop introduces girls to computer science

In July, the School of Computer Science hosted ten rising eighth graders for a five-day workshop as part of the Girls Inc. of Holyoke Eureka! program. Eureka! is a national Girls Inc. initiative that brings girls onto college and university campuses for an intensive summer program that combines hands-on workshops across all STEM fields with sessions focused on personal development and health and wellness. The Holyoke Eureka! program launched in summer 2013 on the UMass Amherst campus in collaboration with the College of Natural Sciences.



(above) CS grad student Katerina Marazopoulou assists one of the participants

(right) Prof. Arjun Guha and CS grad student Emma Strubell work with middle school students

In 2013, the School contributed space and staff support to the Eureka! program. The School continued to provide a home for Eureka! on campus



this year while launching its first educational contribution to the program, a workshop titled *An Introduction to Creative Computing with Scratch*. The workshop was coordinated by Assistant Professor Benjamin Marlin and provided a five-day introduction to computer science through creative, hands-on programming activities using MIT's popular programming language *Scratch*. Scratch programs are created by dragging and dropping instructions that are visually represented as interlocking blocks. "Scratch is a great environment for teaching introductory programming concepts," says Marlin. "None of the girls had prior experience with Scratch, but we were able to introduce fundamental object oriented programming and control flow concepts, and have the girls use these ideas to program animations by the end of the first two-hour session."

The remaining workshop sessions focused on designing simple games using mouse and keyboard interaction, incorporating input from external Scratch sensor boards, and building and programming LEGO NXT robots. By the end of the workshop, the girls were using Scratch to program mobile NXT robots to respond to sound, touch and ultrasonic sensor inputs. According to Marlin, the volunteers who participated in the workshop and the staff who helped to coordinate materials and facilities were key to the workshop's success. Assistant Professor Arjun Guha and Michael Lanighan, a Ph.D. student in the Laboratory for Perceptual Robotics, led workshop sessions along with Marlin. Lanighan also designed the activities for the robotics sessions. Eight additional graduate student volunteers from across the School worked with the girls one-to-one during hands-on programming sessions. Volunteers included Roy Adams

continued on next page

Graduate fellowships and scholarships awarded

Daniel Stubbs (BS '14) received a 2014 National Science Foundation (NSF) Graduate Research Fellowship. Stubbs, who also received the Computing Research Association 2014 Outstanding Undergraduate Researcher Award, is pursuing a Ph.D. in Computer Science at Stanford University. The competitive fellowship provides three years of support for graduate study leading to research-based masters or doctoral degrees and is intended for students who are in the early stages of their graduate study. **Rick Freedman** and **Ted Smith** received Honorable Mention in the 2014 NSF Fellowship competition.

Dan Zhang, a first year doctoral student, is the recipient of the 2014 Jim Gray Scholarship in Computer Science. She received a B.S. in Computer Science from Harbin Institute of Technology, China. In 2013, she won the first *Applied Surface Science* journal Frans Habraken Best Paper Award.

First year doctoral student **Amee Trivedi** is the first recipient of the Sudha and Rajesh Jha Scholarship. She received a B.S. in Information Technology Engineering from the University of Mumbai. Prior to joining UMass, she was a member of the technical staff at NetApp in Bangalore.

Doctoral student **Kaleigh Clary** is the 2014 recipient of the Victor Lesser Graduate Scholarship in Artificial Intelligence. She received a B.S. in Computer Science and Mathematics from Hendrix College. She was awarded a competitive Goldwater Scholarship in 2013.

Tsung-Yu Lin, a first year doctoral student, received the 2014 Robin Popplestone Fellowship in Robotics & Artificial Intelligence. He received a B.S. and M.S. in Electrical Engineering and Computer Science from National Tsing Hua University, Taiwan. His research interests are in computer vision.

Kristina Fedorenko is the 2014 recipient of the Paul Utgoff Memorial Graduate Scholarship in Machine Learning. She received a B.A. in Astronomy and Computer Science from Smith College. Prior to joining the Ph.D. program this fall, she was a developer at the Gemini Observatory.

The 2014 Tuition Award recipient is **Liudmila Elagina**. The School of Computer Science initiated a tuition award program after the International Programs Office discontinued its program. She is a Master's student who received a B.A. in Mathematics and Economics from the State University of New York, Buffalo.

CAITE holds robotics workshop for middle school girls

Nearly 40 middle school students gathered at the School of Computer Science this spring to build and program robots in an all-girl team environment. The event, *Girls Connect*, introduced girls to LEGO Mindstorms robot building and programming and was organized by the Commonwealth Alliance for Information Technology Education (CAITE) and Expanding Computing Education Pathways (ECEP), two NSF-sponsored programs based in the School that aim to broaden participation in computing.

Girls Connect bridges programming to real world issues for students. The one-day workshop guides the girls to work in teams while building and programming robots; the teams then complete challenges using the playing fields developed for FIRST LEGO League (FLL) competitions. The girls who participated said they found increased confidence in their ability to program and solve problems, and they discovered that working with robots can be fun and creative.

Between 2010 and 2014, CAITE has hosted 13 *Girls Connect* workshops to reach nearly 300 girls. At least six new FLL teams have spun out of the workshops, giving those students increased experience with robotics at the middle-school level and increasing the gender balance in FIRST programs. Co-sponsors of the workshops include LEGO Education, FIRST (For Inspiration and Recognition of Science and Technology), Girls Incorporated of Holyoke, and the Massachusetts Green High Performance Computing Center (MGHPCC).

This year, Girl Scout troops, classroom teams, and parent-led groups from Amherst, Springfield, West Springfield and surrounding communities participated in the March event. A second workshop in early May at the MGHPCC included 40 students from Holyoke, Springfield, and other com-



Girls prepared their robot to carry out challenges on the playing field at the end of the Girls Connect robotics workshop

One of the seven teams built a LEGO Mindstorms NXT robot



munities in the surrounding area. In August, educators and parents attended a Coaches Connect workshop to have their own hands-on practice with robots and to get tips on coaching an FLL team. This workshop joins six other professional development workshops on computing education for teachers that will be held across Massachusetts with the support of the ECEP alliance.

EUREKA! – – – – – cont. from page 8

(MLDS), Rick Freedman (RBR), Katerina Marazopoulou (KDL), Pinar Ozisik (Ctr. for Forensics), Kate Silverstein (IESL), Emma Strubell (IESL), Kevin Winner (MLDS) and Kyle Wray (RBR). “Our grad students did a fantastic job working with the girls and guiding them through the workshop activities,” Marlin says. “There’s no way the workshop would have run as smoothly without their help.”

The workshop was also supported by staff from Girls Inc., the Commonwealth Alliance for IT Education (CAITE), and the Computer Science Computing Facilities. The LEGO NXT robotics kits and laptops used in the workshop were provided by Girls Inc. and CAITE, respectively. The School provided funding for the Scratch sensor boards. The boards were designed by Marlin and Addison Mayberry, a Ph.D. student in the Sensors Research Group, who also coordinated the assembly of the boards.

“Putting the materials and content together for the workshop and running it for the first time was a tremendous collaborative effort,” Marlin says. “Everyone is very happy with the outcome this year. We’re looking forward to working with Girls Inc. and continuing to contribute to Eureka! as the program goes forward.”

Nominate a fellow alum

Nominations are now being accepted for the 2015 Outstanding Achievement and Advocacy Awards. Nominations should be sent by email to outreach@cs.umass.edu. The information below would be appreciated with your nomination:

- The name, title, email, phone number, and organizational affiliation of the nominee,
- The name(s), email(s), and phone number(s) of the nominator(s),
- A brief biography summarizing the nominee’s career (no more than one page),
- A statement of the nominee’s outstanding achievements in the award category,
- A very brief (no more than 25 word) suggested citation to be written on the OAA winner’s award plaque.

Save the date:

Next year’s OAA events are planned for Friday, May 1, 2015. Details will be posted on www.cs.umass.edu/oa2015.

Industrial Affiliate News



Yahoo! servers in use

Through the Yahoo! university equipment donation program, Yahoo! recently provided two sets of servers to our School of Computer Science. One group of servers provides our School with a significant upgrade for our Education Lab enabling us to create a new cluster to support our courses. The other set of servers is being used by CS Professors Jerome Miklau, Yanlei Diao, and Alexandra Meliou to build a cluster for their databases group research. The cluster consists of approximately 30 compute nodes from Yahoo! that will be

used for both education and research purposes. Students in undergraduate and graduate data management courses will use the cluster for course assignments and project work. The graduate students will use the cluster to investigate topics related to efficient computation on big data. Examples of these topics include designing techniques for large-scale data cleaning, investigating computation markets in which a cloud-based service answers database queries for a fee, and evaluating advanced algorithms and software systems for big data applications, such as click stream analysis, Twitter feed analysis, genomic data analysis, and scientific computing.

Yahoo! also sponsored the 7th Annual CS Foosball Tournament that was held on April 8th. Thirty-two students, faculty, and staff competed while many others cheered on the teams. This year's winning team consisted of Dan Masi and Will Dabney. The second place finishers were Pan Hu and Fangyu-an Zhou. Yahoo! continues to sponsor the graduate student award recipients who are honored during the annual Outstanding Achievement and Advocacy (OAA) Awards banquet. Winners of the 2013-2014 Yahoo! Award for Accomplishments in Search & Mining are Jeff Dalton and Luke Vilnis.

EMC Corporation, one of this year's Outstanding Achievement and Advocacy Awards recipients, established the EMC Student Participation Award this year. The 2014 inaugural EMC Award recipients are: Elisabeth Baseman, Shiri Dori-Hacohen, Amanda Gentzel, Chang Liu, Ayse



Grad Cohort Attendees (l. to r.): Chang Liu, Emma Tosch, Elisabeth Baseman, Shiri Dori-Hacohen, Jennie Steshenko, Ayse (Pinar) Ozisik, CS Chair Lori Clarke, Assoc. Prof. Yanlei Diao, Cibele Freire, and Amanda Gentzel



Cisco Scholarship recipients (l. to r.): Steven (Tung) Pham, Cisco's Carla Leigh, Molly McMahon, Lauren Higgins, and Rachel Gordon (not pictured: Aleksandr Burkatovskiy)

Pinar Ozisik, and Jennie Steshenko. EMC has established this new award to assist CS students in conference travel and other activities. The 2014 award funding helped defray costs to attend this year's CRA-W Grad Cohort Workshop. Two other CS students, Cibele Freire and Emma Tosch, were also able to attend the Workshop through CRA-W funding. EMC also provided a much-needed carpet and abstract art to adorn the wall of the undergraduate space.

Thanks to support from EMC and Cisco Systems, the CS Women's group was able to travel to both EMC and Cisco's facilities in Eastern Massachusetts to speak with the companies' engineers and to tour the buildings.

Cisco also sponsored the 5th Annual Cisco Programming Competition, held on April 30th, that was hosted by the UMass Amherst ACM Student Chapter. The first through third place competition winners were Tung Pham, Anthony Moh, and Thai Nguyen.

Cisco continued to provide undergraduate scholarships. Molly McMahon was awarded the 2014 Cisco Systems Scholarship for Underrepresented Undergraduate Students at UMass Amherst Computer Science. She will graduate in 2016. The recipients of the 2014 Cisco Systems Awards for Outstanding Achievement as a Junior Undergraduate are Aleksandr Burkatovskiy, Rachel Gordon, Lauren Higgins, and Steven (Tung) Pham. This award is given to the top junior year undergraduates in the School as determined by a faculty committee who took into account recommendations by faculty members, GPA, coursework, independent studies or honor projects, and course citations.

Fiksu sponsored this year's Outstanding Undergraduate Awards that were presented during the OAA Award banquet in May. Fiksu also generously donated an arcade game table for undergraduate and graduate students to enjoy during breaks from their studies and research.

Google sponsored a number of events for students this past academic year. Something new this year – Google sponsored Pi Day contests and provided whoopee pies on 3/14 at 3:14 p.m. to commemorate the day. Undergraduate Esther Wolf won the contest for the most Pi digits recited. Google also hosted a resume review session where students received individualized feedback from Google recruiters. They also sponsored transportation to the Google Cambridge Ph.D. Summit and other funding for student activities.

continued on next page

Arnold Rosenberg, post-retirement

Distinguished University Professor Emeritus Arnold (Arny) Rosenberg retired from UMass Amherst CS in 2007, but that does not mean that he has slowed down in private life or in research. This year, he and his wife Susan celebrated 50 years of marriage, he ran the Falmouth Road Race, he sang with the Kingston Trio cover band, he has an upcoming paper at the 2014 Euro-Par conference that is a counter-balance to his 1964 paper at the IEEE conference that evolved into FOCS (IEEE Symposium on Foundations of Computer Science), and he received the Outstanding Service Award from IEEE/CS TCPP (see page 17).

Throughout his career, Rosenberg has been a theoretical computer scientist/engineer. He has worked in almost every branch of theoretical computer science, with a multi-decade concentration on a range of issues relating to what is commonly termed “parallel and distributed computing.” His career began with 16 years at the IBM Research Center in Yorktown Heights, NY. “It was a magical place in those days, where I rubbed shoulders with the likes of Michael Rabin, Benoit Mandelbrot, and Dick Karp,” notes Rosenberg. He then moved into academia for 26 years, mostly at UMass Amherst, after a short experiment at Duke. His latest endeavors involve research professorships, first at Colorado State, and now at Northeastern.

His research life has intensified once again, mirroring his time at IBM. He has participated in three multi-person research grants since retirement, his first since IBM. He currently works on these projects:

- a solo (unsupported) study of finite-state robots [shades of 1964!, notes Rosenberg];
- a quest for high performance computing in “dynamically heterogeneous” environments such as clouds, in collaboration with Rajmohan Rajaraman (Northeastern) and Michela Taufer (U. Delaware);
- an education-oriented project focusing on parallel and distributed computing (PDC), which is embodied in the CDER Center for Curriculum Development and Educational Resources. He co-directs this effort with Sushil Prasad (GSU, the PI), Anshul Gupta (IBM), Alan Sussman (UMd), and Chip Weems (UMass Amherst).

Rosenberg’s study of finite-state robots seeks scalable provably efficient algorithms for a variety of path-planning and exploration problems. “As usual, the problems that I study are idealized versions of problems studied by ‘real’ roboticists,” says Rosenberg.

His primary research focus is the scheduling study, joint



Rosenberg sings with the Kingston Trio cover band

research with Rajaraman and Taufer, along with former postdoc Trilce Estrada (UNM) and students. This research extends earlier work on the same problem, with Gennaro Cordasco (Naples) and Greg Malewicz (Google). The basic question is, “How does one achieve high performance when computing in an environment about which one has no reliable performance information?” This study arose from a conversation with Fran Berman (RPI) after she gave a distinguished lecture at UMass Amherst. His response to this question was the IC-scheduling paradigm that he studied for several years, which has evolved into the AREA-oriented scheduling paradigm that is his main focus now. “Extensive simulations suggest that the purely mathematical/algorithmic setting of AREA-oriented scheduling does, indeed, enhance the likelihood of efficient performance in dynamically heterogeneous environments,” notes Rosenberg. “Thus far, we have tested our schedules on primitive simulators of such environments. Taufer and Estrada are developing sophisticated simulators that will take us to the next stage of our work.”

The CDER Center grew out of a task force supported by NSF and IEEE/CS/TCPP, which was charged with developing guidelines for incorporating material about PDC throughout undergraduate CS/CE curricula. Under Prasad’s leadership, the Center now: (a) runs educational workshops at research conferences (most notably the EDUPAR Workshop at IPDPS), (b) collects and sponsors the development of educational resources; (c) runs the Early Adopter Program, under which more than 100 institutions of various levels worldwide are incorporating PDC into their curricula; and (d) is assembling a leading-edge computing cluster that will be dedicated 100% to undergraduate education and research activities. Rosenberg is gratified to see an international community building around the CDER Center’s efforts.

“I thought that I was going to spend my retirement years writing poetry and contemplating the grandeur of Vineyard Sound,” says Rosenberg. “Instead, I find myself busier and more fulfilled than ever. Thankfully, I am still able to nurture my love of singing and jogging, but I am doing that with the comforting knowledge that ‘the juices are still flowing’.”

INDUSTRIAL AFFILIATE NEWS – – – cont. from page 10

A Mock Technical Interview event was organized by the undergraduate outreach committee. In April, representatives from Cisco, Fiksu, and Vistaprint provided advice to students on effective technical interview techniques. Along with the Industrial Affiliate Program (IAP) member companies mentioned above, IAP members BBN/Raytheon, HP, Pegasystems, and TripAdvisor participated in the fall CS Career Fair and other CS events held throughout the year.

SIXTH OAA AWARDS - - - - - cont. from page 1

Prior to the banquet, OAA events included building tours, a reception, and a panel discussion to highlight the varying technical career paths of our award recipients who shared their knowledge and experiences as students at UMass Amherst or as employers of our graduates.

During the banquet, School Chair Lori Clarke and Steve Goodwin, Dean of the College of Natural Sciences, welcomed the attendees. Professor Leon J. Osterweil presented awards to the 2014 OAA award recipients.

The 2014 OAA Award Recipients are:



Outstanding Contributions to Society:
Randy E. Ellis (UMass Amherst CS Ph.D. '87), Professor in the School of Computing, Department of Mechanical Engineering, and Department of Surgery at Queen's University at Kingston, Ontario. Dr. Ellis's work focuses on using imaging to support and improve the work of surgeons. His work has focused most

closely on supporting musculoskeletal surgery. This work has doubtlessly improved the lives of countless thousands of people suffering from problems with their hips, knees, and other joints. He is the Project Leader of a large multidisciplinary group that investigates advanced health-care delivery for the coming decade.



Outstanding Achievement in Education:
Donald H. House (UMass Amherst CS Ph.D. '84), Professor and Chair, Division of Visual Computing in the School of Computing at Clemson University. Dr. House is well known for his research in the area of physically-based modeling, including approaches to the simulation of cloth, drapery, and other

flexible materials. More recently, he has been focusing on perceptual issues in visualization, including texturing volumetric surfaces, eye tracking in stereo display environments, and visualization of uncertainty in data and predictions.



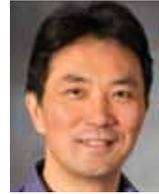
Outstanding Achievement by a Young Alum: **Vanessa Murdock** (UMass Amherst CS M.S. '05, Ph.D. '06), Principal Applied Researcher, Microsoft Bing, Relevance Sciences Group. Her research there focuses on leveraging social media to improve local search. Previously Dr. Murdock worked at Yahoo! Research in Barcelona, Spain, first as

a Research Scientist and then as a Senior Research Scientist. At Yahoo! Research she led the Geographic Context and Experience Group, setting the research agenda for topics related to geographic information and user-generated content, and securing nearly a million Euros in funding for her research group.



Outstanding Achievement in Management:
Mary-Ellen Prescott (UMass Amherst CS B.S. '84), New Technology Program Manager at Bose Corporation. She leads cross-functional teams in the development of high quality-innovative noise cancelling, stereo Bluetooth wireless, and in-ear headphones, while providing leadership, vision, and direction in

the execution of strategic goals. Prior to her current position at Bose, Ms. Prescott was a Deputy Program Manager at iRobot Corporation, where she led and managed teams in product development of robotics.



Outstanding Achievement in Research:
Zhi-Li Zhang (UMass Amherst CS M.S. '92, Ph.D. '97), Qwest Chair Professor and McKnight Distinguished University Professor in the Department of Computer Science and Engineering at the University of Minnesota. Dr. Zhang developed a theory for Internet

Quality-of-Service (QoS) and applied it to multimedia applications in the Internet including on-line video streaming. He developed foundational mathematical models for this as well as resource allocation algorithms for this purpose. He also developed a variety of innovative mechanisms such as video smoothing and pre-fetching to support on-line video streaming, and has also contributed to the development of resilient Internet routing algorithms.



Outstanding Support for the School: **EMC Corporation**, a global leader in enabling businesses and service providers to transform their

operations and deliver IT as a service. Fundamental to this transformation is cloud computing. Through innovative products and services, EMC accelerates the journey to cloud computing, helping IT departments to store, manage, protect and analyze their most valuable asset — information — in a more agile, trusted and cost-efficient way. EMC has had a longstanding dedication to computer science education within the Commonwealth of Massachusetts and has been a particularly strong supporter of the research and teaching missions of the School of Computer Science at UMass Amherst.

More details on the OAA award recipients, with photos, are posted at www.cs.umass.edu/oa2014.

During the OAA awards celebration, current students and recent alumni were also recognized. The graduate student awards are sponsored by **Yahoo!**, a member of the School's Industrial Affiliates Program (IAP). Professor Sridhar Mahadevan, Graduate Program Director, presented these **Outstanding Graduate Student Awards:**

Outstanding Doctoral Dissertation Award:
Akshat Kumar (Ph.D. '13) and **Chao Li** (Ph.D. '13)

Outstanding Synthesis Project Award:
Niall Emmart and **Fabricio Murai Ferreira**

Outstanding Teaching Assistant Award:
Aditya Sundarrajan and **Kyle Wray**

This year's undergraduate are sponsored by IAP member **Fiksu**. Professor Rod Grupen, Undergraduate Program Director, presented these **Outstanding Undergraduate Awards:**

Overall Academic Achievement: **David B. Lowell**
Overall Achievement in Research: **Daniel M. Stubbs**
Achievement in Networking: **Kyle R. Hughes**
Achievement in Interdisciplinary Studies: **Yael Kaufman**
Achievement in Computing Systems: **Patrick N. Pegus II**
Achievement in Software Engineering: **Elizabeth A. Staruk**
Achievement in Theory: **Sofya Vorotnikova**
Achievement in Robotics: **Jay Ming Wong**



Undergraduate student Fiksu award recipients (l. to r.): Fiksu's Mark Corner, Prof. Rod Grupen, Yael Kaufman, Kyle Hughes, Patrick Pegus II, Elizabeth Staruk, Daniel Stubbs, Jay Ming Wong, Prof. Andrew McGregor, David Lowell (not pictured: Sofya Vorotnikova)



Graduate student Yahoo! award recipients (l. to r.): Aditya Sundarajan, Kyle Wray, Niall Emmart, and Chao Li (not pictured: Akshat Kumar and Fabricio Murai Ferreira)

CS alumni enjoy CA meet-up

On July 24, 2014, the School of CS hosted an alumni meet-up for UMass Amherst CS alumni (and student interns) at Google's Facility in Mountain View, CA. CS Chair Lori A. Clarke welcomed everyone to the event with an update on the state of the School, and Professor James Allan gave a presentation on "Who, Where, When, and What? Augmenting things for better search." Professors Leon Osterweil and Robbie Moll also traveled to Mountain View to meet and chat with alumni and interns. It was great to see so many of our alumni at the event: over 70 attended, which is the highest number to attend a CS alumni-organized west coast event! The CS alumni organizing committee consisted of Marc Cartright (Ph.D. '13), Jay Corbett (Ph.D. '93), and Naghi Prasad (Ph.D. '97). Visit www.cs.umass.edu/alum-nievent for upcoming alumni events (plans are in the works for another CA event next summer). Be sure to join our LinkedIn and Facebook groups for event announcements. See photos page 17.

Dr. Carla Brodley (Ph.D. '94), was appointed Dean of the College of Computer and Information Science at Northeastern University. Previously, she was a Professor of Computer Science at Tufts University and was Chair of Tufts Department of Computer Science from 2010 to 2013.

Alexander L. Wolf (Ph.D. '85) was elected ACM President for a two-year term beginning July 1st. Wolf, a Professor in Computing at Imperial College London, UK, was also awarded the 2014 SIGSOFT Outstanding Research Award "for formative work in software architecture, influential research in distributed event-based systems, and important contributions in software deployment, configuration management, and process."

Akshat Kumar (Ph.D. '13) was selected as the winner of the ICAPS (International Conference on Automated Planning and Scheduling) 2014 Best Dissertation Award. His dissertation "Exploiting Domain Structure in Multi-agent Decision-Theoretic Planning and Reasoning" was completed in 2013. The award was presented at the 24th International Conference on Automated Planning and Scheduling that took place in Portsmouth, NH in June. Kumar is currently a faculty member at the School of Information Systems, Singapore Management University.

The Computing Research Association (CRA), in consultation with the National Science Foundation, appointed Debra Richardson (Ph.D. '81) as one of six new members of the Computing Community Consortium (CCC) Council. She began a three-year term on July 1st.

Dr. Michael Franklin (B.S. '83), Thomas M. Siebel Professor of Computer Science, was named the Chair of the Computer Science Division, Electrical Engineering and Computer Sciences, at the University of California Berkeley.

Bruno Ribeiro (Ph.D. '10) and Benyuan Liu (Ph.D. '03), current graduate student Kun Tu, Distinguished Professor Don Towsley, and co-authors collaborated on a research project involving studying the behavior of users of dating websites. Their paper "Who is Dating Whom: Characterizing User Behaviors of a Large Online Dating Site" was featured in *MIT Technology Review* and a number of other media sites. In another of Ribeiro's projects, partially completed while a Postdoc, a model that he developed predicts the growth and potential death of Facebook and other membership-based websites. Ribeiro notes that his model shows Facebook will not fail anytime soon.

Jennifer (Cotter) Cannon (B.S. '03) is a Software Engineer working at BAE Systems in Hudson, NH for the past 10 years. She received a Master's in Systems Engineering from Johns Hopkins University in 2012. She and her husband are the proud parents of a 10 month old son. "I am grateful for the education I received at UMass Amherst," notes Cannon.

CS is saddened to announce the passing of one of our alumni, James Tung (M.S. '69), who died on July 21, 2014 in Poughkeepsie, New York. He was a Systems Analyst for IBM and SAIC.

Jody Daniels accepts campus Distinguished Alumni Service Award

Jody Daniels (M.S. '93, Ph.D. '97) accepted the 2014 UMass Amherst Distinguished Alumni Award during a ceremony held at the Massachusetts State House in April. The Distinguished Alumni Awards are the most prestigious awards conferred by the Alumni Association upon its alumni, faculty, staff and friends.

Daniels is currently serving as a Brigadier General on active duty with the U.S. Africa Command (AFRICOM) in Stuttgart, Germany. She is the Deputy Director, Intelligence and Knowledge Development Directorate (J2), responsible for the intelligence and counterintelligence to facilitate situational awareness, warning and assessments on the threats across the 54 countries in the AFRICOM area of responsibility. We saw it fitting to share her award acceptance speech with our *Significant Bits* audience.

Distinguished guests, faculty, family, friends:

Thank you very much for this honor. I am quite surprised to be standing here today as I hadn't ever considered going to graduate school until my first Army boss asked why I hadn't applied. It had never crossed my mind. A few years later I decided to apply and UMass was an easy choice.

As I transitioned from being a full-time military intelligence officer to being a graduate student in the fall of 1990, the U.S. was just beginning the activities over in the Gulf that would eventually become Operation Desert Storm. As I was the only person that most of my fellow students knew to have served in the military, I was frequently called upon to explain "all things Gulf," "all things Army," and "all things military." I was suddenly thrust into the position of being the Expert on topics about which I knew very little. This caused me to pay a lot more attention to newspapers. So, while I was learning how to read journal and conference papers, I was also learning how to read and interpret the media.

It caused me to take a whole new view of how I looked at the world and my role in it. I realized I was also in a position of influence. I had to be far more careful and conscious with my words. I finally internalized the saying that "Words matter." This came to be ever more true as I reached higher civilian and military positions and more people relied on my words to guide their actions.

Lifetime email addresses for Computer Science alums

We are pleased to announce that CS alum email forwarding addresses are now available for any of our UMass Amherst CS alums. Although you might change employers or Internet providers, your CS alum email address will always stay the same and will forward your email to whatever address you choose. The email address will generally be **firstname.lastname@alum.cs.umass.edu**. To sign up for your email forwarding address, go to **www.cs.umass.edu/lifetime-email-forwarding**.



(l. to r.): UMass President Robert Caret, UMass Amherst Chancellor Kumble Subbaswamy, Jody Daniels '97, Alumni Association President Andrew MacDougall '95, and Assistant Vice Chancellor for Alumni Relations JC Schnabl.

I left UMass a whole lot wiser in ways I hadn't imagined. It wasn't just a degree or two; it was how to do research, how to frame arguments, how to make an impression, how to create a network. I learned how to listen better.

Those skills have served me well – regardless of whether I'm working with a team of scientists, a battalion of new recruits, or the National Chief of Intelligence for one of our African country partners.

I have had the pleasure of living a dual life – crossing frequently between my civilian and military careers. The overlap has not been as much in technical areas as it has been in communications, management, and leadership skills.

I was fortunate to have the strong academic background that the UMass Amherst Computer Science department gave me that allowed me to succeed at Lockheed Martin. I was fortunate that Lockheed Martin also valued my continuing service to the Army and the Army Reserve. I believe that the combination allowed me to migrate skills between the two careers and be a better leader than otherwise.

I'd like to thank all those faculty who helped me successfully complete the master's and Ph.D. programs, especially, Edwina Rissland, Bruce Croft, James Allan, Nick Belkin, Victor Lesser, Paul Utgoff, and Eliot Moss, but also Lori Clarke, Susan Landau, and Bev Woolf, who never knew it, but I looked upon as role models.

I'd also like to recognize and thank my fellow graduate students who forced me to better articulate my thoughts and arguments while they also supported and encouraged my dual track life. My family deserves much recognition and thanks for their endless support across everything I've done and continue to do.

Finally, I'd like to close with a quote from a leader and statesman who clearly recognized that words matter, and who had multiple careers – serving as the Chairman of the Joint Chiefs of Staff and then as Secretary of State – General Colin Powell: "Tell me what you know. Tell me what you don't know. Then tell me what you think. Always distinguish which is which." As a leader and as an intelligence professional, these are words I try to live by. Once again, thank you for this honor.

Scholarship established in honor of Jim Kurose

As a tribute to Distinguished Professor James “Jim” Kurose’s many outstanding, and on-going, contributions to both the UMass Amherst CS community and the field of computer science, alumnus Steve Vinter (’85) has established the *James Kurose Scholarship in Computer Science*. Once fully funded, the scholarship will be awarded to first year graduate students in the field of systems.

Jim is a world-renowned pioneer and leader in the area of computer networks. His research has been honored with numerous prestigious awards from the international research community. The textbook he co-authored (with Keith Ross), *Computer Networking, a Top Down Approach*, now in its 6th edition, is one of the leading textbooks in networks and has been translated into seven languages.

Jim joined the UMass Amherst Computer Science faculty in 1984. In the intervening 30 years he has mentored generations of Ph.D. students and young faculty members. Of

the more than 30 Ph.D. students he has advised or co-advised more than half have gone on to careers in academia. Year in and year out, his teaching evaluations have been consistently among the CS faculty’s highest.

“UMass is fortunate to have Jim on the exceptional CS faculty team.

He is kind, cheerful, and generous toward students. Jim is a role model in every way for those scholars benefitting from this scholarship in his name. I’m delighted to honor my friend and colleague in this lasting and impactful way,” states Vinter.

If you would like to make a donation, please go to www.umass.edu/give, choose the designation “School of Computer Science” and scroll to “James Kurose Scholarship.”



Ben Barnhart photo

Lori A. Clarke Scholarship created

CS Alumnus Rajesh Jha (’90 MS) and his wife, Sudha Mishra, have stepped forward with a donation to create a scholarship in Professor Lori A. Clarke’s honor. Once it is fully funded, the *Lori A. Clarke Scholarship in Computer Science* will be awarded to a first year graduate student (or students) from an underrepresented group.

Professor Clarke is part of the first generation of women to achieve their Ph.D.s in Computer Science. She joined the UMass Amherst Computer Science faculty in 1975. Today, she serves as Chair of the School. In addition to her award-winning research, she has advised dozens of bachelors, masters and doctoral degree students, including Jha who appreciates the mentoring he received from Clarke, as well as the scholarship he received from UMass Amherst.

“Lori is a pioneer and leading scholar in the area of

software engineering. In addition to her groundbreaking research, she has been a hardworking advocate for creating more diversity in this critically important field. It’s fitting that a scholarship bearing her name should be used to provide opportunities for others,” notes Steve Goodwin, Dean of the College of Natural Sciences.

Please consider joining Rajesh and Sudha in making a donation to the Lori A. Clarke Scholarship in Computer Science. To donate, please go to www.umass.edu/give, choose the designation “School of Computer Science” and scroll to “Lori Clarke Scholarship.”



Why we give



No matter how large or how small, every single gift to CS is greatly appreciated and put to good use. Here is why two of our CS alums chose to give...

“After realizing how much positive impact the graduate program in computer science at UMass Amherst has had on our lives we knew it was time to make our first gift.” Brent Heeringa (’06) and Courtney Wade (’05) met at UMass Amherst while earning their graduate degrees in Computer Science. Brent and Courtney have since gone on to build their careers at Williams College where Courtney is the Director of Institutional Research and Brent is the Chair of the Department of Computer Science. Long after their time as UMass Amherst students, the couple recognizes the strong impact the CS community had on their lives: “We hope our contribution will encourage others to also give in whatever amount they can, and know that by doing so, we are all helping to increase our CS Alumni Participation Rate, and show appreciation to the friends and faculty that helped us get where we are today.”

Brent Heeringa (’06) and Courtney Wade (’05) pictured with their children

Keep up-to-date on the School’s latest events and announcements. Join us!

We’re on **Facebook** (UMASS CS) and **LinkedIn** (UMass Amherst Computer Science)

Faculty News



Emery Berger was promoted to full Professor and Andrew McGregor was promoted to Associate Professor with tenure.

Berger gave an invited talk at the Annual Software Engineering Innovation Foundation (SEIF) Day at Microsoft Research in July on CheckCell, a “data debugging” tool for spreadsheets. The technical paper describing this work will appear at OOPSLA 2014, a premier programming languages conference, in October. Berger and Ben Zorn of Microsoft Research co-organized the First Workshop on Approximate and Probabilistic Computing at PLDI 2014, in Edinburgh.



Distinguished Professor Jim Kurose was re-elected to a third term on the Computing Research Association (CRA) Board of Directors. In ACM’s Computing Reviews (CR) annual “Best of 2013” report, two of the ten publications cited in the area of Computer Systems Organization were co-authored by UMass Amherst CS researchers: Kurose and K. Ross for the book “Computer Networking: a top-down approach (6th edition; Pearson publishers) and Elisha Rosensweig, Daniel Menasche, and Kurose for the paper “On the Steady-state of cache networks” in the IEEE *Proceeding of the 32nd Annual IEEE International Conference on Computer Communications*. The “Best of” list is based on nominations from Computing Reviews referees, CR category editors, the editors in chief of ACM journals and computer scientists in both industry and academia.



Distinguished Professor Don Towsley is the founding co-Editor-in-Chief of the ACM journal *Transactions on Modeling and Performance Evaluation of Computing Systems*. He and co-authors (including Ph.D. alum Bruno Ribeiro) received the Best Paper Award for their paper “Pay Few, Influence Most: Online Myopic Network Covering” at the 6th IEEE International Workshop on Network Science for Communication Networks (NetSciCom 2014). Towsley and co-authors also received a Best Paper Award for their paper “Measuring and Maximizing Group Closeness Centrality over Disk-Resident Graphs” presented at the 6th Annual Workshop on Simplifying Complex Networks for Practitioners (SIMPLEX 2014) held in Seoul S. Korea in conjunction with WWW2014.



Professor Prashant Shenoy received a NEC grant for his research in the area of mobility and software defined networking in databases. Separately, Shenoy is the co-PI on a new Energy Extension Initiative that will serve as a resource on renewable and clean energy options for cities and towns, industry, hospitals, colleges and universities, nonprofits and other organizations across the Commonwealth. A four-year grant was awarded to form the initiative.



Professor Andrew McCallum received a Yahoo! Faculty Research and Engagement Award for his research on “Knowledge Base Augmentation of

Entities and Relations with Tensor Factorization.”



Distinguished Professor Bruce Croft and Associate Professor Erik Learned-Miller each received Adobe System’s grants in support of their research activities.



For their paper “Planning and Practice in Agile Software Development: an Empirical Study” Professor Leon Osterweil and co-authors received the Best Paper Award at the 2014 International Conference on Software and System Processes, held in Nanjing, China.



In February, Professor Emeritus Rick Adrion gave the keynote address, “The Computer Workforce in Massachusetts,” at the Pioneer Valley STEM Network Symposium held at Holyoke’s Massachusetts Green High Performance Computing Center. He also was recently appointed by the Massachusetts Department of Elementary and Secondary Education to a new panel charged with developing computer science and digital literacy standards for the state.

Fountain named to Top Federal 100



Jane Fountain, Distinguished Professor in political science and public policy, was named to the “Top Federal 100” by *Federal Computer Week*. She is one of only two academics to make the list of leaders from government, industry and academia who had the greatest impact on the federal IT community in 2013. Fountain, a CS Adjunct Professor, is the founder and director of the National Center for Digital Government.

In other news, Fountain was appointed to a three-year term on the Experts Advisory Committee of the E-Government Research Center of the Eastern Regional Organization for Public Administration (EROPA). EROPA is an organization of states, groups, and individuals in the area of Asia and the Pacific designed to promote regional cooperation in improving knowledge, systems, and practices of government administration in order to help accelerate economic and social development. Fountain served as the keynote speaker at the first international conference organized jointly by EROPA and the Chinese Academy of Personnel Science.

Also recently, Fountain wrote a chapter for the report, *The Future of Government Smart Toolbox*, that was released by the World Economic Forum’s Global Agenda Council on the Future of Government to help governments use technology to build better trust and deliver more efficient public services.



Distinguished University Professor Emeritus **Arnold Rosenberg** received the 2014 Outstanding Service Award from the IEEE Computer Society Technical Committee on Parallel Processing (IEEE/CS TCPP) “for his career-long outstanding contributions to the parallel processing community nationally and internationally and numerous contributions to conferences and journals.” Also, ACM recognized his longstanding commitment as a Professional Member by giving him a Lifetime Membership to the ACM.

Adjunct Assistant Professor **Michael Zink** (ECE faculty) received a five-year NSF CAREER Award for his work on “Sensing as a Service - Architectures for Closed-Loop Sensor Network Virtualization.”



Adjunct Professor **Hong Yu** received a three-year grant from the U.S. Department of Veterans Affairs for the project “Systems for Helping Veterans Comprehend Electronic Health Record Notes.”



Assistant Professor **Benjamin Marlin** (left) and his wife **Krisztina** welcomed their daughter **Elizabeth**, born on April 16th.

McGregor (center) and wife **Christie** are the proud parents of **Alexander**, born on July 13.

Associate Professor **Gerome Miklau** (right) and his wife **Johanna** announced the birth of **Lucas**, born on August 1.

Researcher News

Former IESL Postdoc **Sebastian Riedel** is the winner of the NAACL 2013 Best Talk Award for his talk on “Relation Extraction with Matrix Factorization and Universal Schemas,” a paper co-authored by Riedel, IESL graduate student **Limin Yao**, and Professor **Andrew McCallum**.

Vasanta Chaganti joined the NETWORKS lab as a Research Fellow.

Hyun-Chul joined the BINDS lab as a Senior Research Fellow.

Nada Naji is a Visiting Scholar from the University of Neuchatel, Switzerland, working with the CIIR.

Working with PLASMA, **Stephen Freund** is a Visiting Professor from Williams College.

Benoy Varghese, a doctoral student at University of New South Wales in Sydney, Australia, is a Visiting Scholar working with LASS.

Student News

Computer Science and Computer Systems Engineering double-major undergrad **Walter Everett Brown** received a UMass Amherst Rising Researcher Award for 2014. Brown is a co-author on work that was presented and published at the 2013 Haifa Verification Conference and at the 2014 Design Automation Conference. He was awarded two REUs (Research Experiences for Undergraduates) through the

National Science Foundation for summer 2014 and 2013 and received funding to attend the DAC conference to make the poster presentation.

CIIR doctoral student **Kriste Krstovski** received a second Harvard University-Smithsonian Center for Astrophysics Fellowship to continue support of his research on latent variable models by applying the research to NASA’s Astrophysics Data System.

Tung Pham, a CS undergrad and Commonwealth Honors College student who works with Professors **Tim Richards** and **Rick Adrion**, received a **Barbara B. Burn Memorial Scholarship**. Dr. Burn founded the International Programs Office at UMass Amherst and devoted her career to the ideal of making international education accessible to any student.

PLASMA doctoral student **John Vilk**’s work on **Microsoft’s SurroundWeb** received extensive press coverage in the spring. According to Microsoft, “SurroundWeb is a ‘3D Browser’ that gives web pages the ability to display across multiple surfaces in a room, adapt their appearance to objects present in that room, and interact using natural user input.” Vilk worked on the project while interning at Microsoft Research in 2013.

Staff News

Bethany Seeger joined IESL as a Software Engineer 1.

During a panel session in June at Holyoke Community College sponsored by the Pioneer Valley STEM Network, CAITE’s **Renee Fall** spoke about feeding the computing/IT pipeline. **Cheryl Kiras**, of ECEP/CAITE, presented best practices for community college to four-year transfer in STEM fields at the National Institute for the Study of Transfer Students conference in Georgia and at the New England Transfer Association conference.

CS alumni meet-up in California



A few photos of the nearly 70 alumni present (see page 13)



Elif Aktolga; *Integrating Non-Topical Aspects into Information Retrieval*; (James Allan, Advisor); May 2014; Research Engineer, Apple

When users investigate a topic, they are often interested in results that are not just relevant, but also strongly opinionated or covering a range of times. Often several queries need to be issued with reformulations if initial search results are not satisfactory. In this thesis, we focus on two non-topical dimensions: opinionatedness and time. For improving search results with respect to non-topical dimensions, we use diversification approaches. Results are diversified across a single or multiple non-topical dimensions. The burden of analyzing pre-existing biases for a query and discovering times at which important events happened is fully carried by the system. We show how to combine several dimensions with individual biases for each, while also presenting approaches to time and sentiment diversification. The insights from this work will be very valuable for next generation search engines and retrieval systems.



Jeff Dalton; *Entity-based Enrichment for Information Extraction and Retrieval*; (James Allan, Advisor); May 2014; Software Engineer, Google Inc.

The goal of this work is to leverage knowledge of the world to improve understanding of queries and documents using entities. An entity is a thing or concept that exists in the world, such as a politician, a battle, a film, or a color. Entity-based enrichment (EBE) is a new expansion model for both queries and documents using features from similar entity mentions in the document collection and external knowledge bases, such as Freebase and Wikipedia. With the ultimate goal of improving information retrieval effectiveness, we start from unstructured text and through information extraction, build up rich entity-based representations linked to external knowledge resources. We study the application of entity-based enrichment to improve the effectiveness of each step in the pipeline: 1) Named Entity Recognition, 2) Entity Linking, and 3) Ad hoc document retrieval. The empirical results for EBE in each of these tasks shows significant improvements.



Van Dang; *A Proportionality-based Approach to Search Result Diversification*; (W. Bruce Croft, Advisor); May 2014; Software Engineer, Google Inc.

Search result diversification addresses the problem of queries with unclear information needs by providing a document ranking that covers multiple possible topics for a given query. This increases the likelihood that users will find documents relevant to their specific intent. This dissertation introduces a new perspective on diversity: diversity by proportionality. We consider a result list more diverse, with respect to some set of query topics, when the ratio between the number of documents it provides for each topic matches more closely with the topic popularity distribution. Consequently, we derive a ranking framework for optimizing proportionality and an effectiveness measure. We also show that topical diversity can be achieved by diversifying search results using a set of terms that describe the query topics. This simplifies the task of finding a topic set to finding a term set. We present a technique and several data sources for generating these terms effectively.



Dan Gyllstrom; *Making Networks Robust to Component Failures*; (James Kurose, Advisor); May 2014; Senior Performance Engineer, Akamai Technologies

In this thesis, we consider instances of component failure in the Internet and in networked cyber-physical systems, such as the communication network used by the modern electric power grid (termed the smart grid). We design algorithms that make these networks more robust to various component failures, including failed routers, failures of links connecting routers, and failed sensors. This thesis divides into three parts: recovery from malicious or misconfigured nodes injecting false information into a distributed system (e.g., the Internet), placing smart grid sensors to provide measurement error detection, and fast recovery from link failures in a smart grid communication network.



Andrew Kae; *Incorporating Boltzmann Machine Priors for Semantic Labeling in Images and Videos*; (Erik Learned-Miller, Advisor); May 2104

Semantic labeling is the task of assigning category labels to regions in an image. For example, a scene may consist of regions corresponding to categories such as sky, water, and ground. Labeling regions allows us to better understand the scene itself as well as properties of the objects and their interactions within the scene. Typical approaches for this task include the conditional random field (CRF), which is well-suited to modeling local interactions among adjacent image regions. However the CRF may be limited in dealing with complex, global (long-range) interactions between regions in an image, and between frames in a video. This thesis presents ways to extend the CRF framework and incorporate priors based on the restricted Boltzmann machine (RBM) to model long-range interactions within images and video, for use in semantic labeling.



Tongping Liu; *Reliable and Efficient Multithreading*; (Emery Berger, Advisor); May 2014; Assistant Professor, Univ. of Texas San Antonio

To take advantage of multiple cores, software needs to be written using multithreading. It is notoriously far more challenging to write multithreaded programs correctly and efficiently than sequential ones. I developed Dthreads, a deterministic threading library that automatically ensures deterministic executions for unmodified C/C++ applications, without requiring programmer intervention or hardware support. Dthreads often matches or even exceeds the performance of standard thread libraries, making deterministic multithreading a practical alternative for the first time. I developed two other systems to attack false sharing, a performance issue that arises when multiple threads access distinct parts of the same cache line simultaneously. The first, Predator, not only precisely identifies but also predicts potential false sharing that does not get manifested. The second system, Sheriff-Protect, automatically eliminates false sharing inside parallel applications without programmer intervention.



Marwan Mattar; *Unsupervised Joint Alignment, Clustering and Feature Learning*; (Allen Hanson and Erik Learned-Miller, Advisors); May 2014; Research Data Scientist, Electronic Arts

Joint alignment is the process of transforming instances in a data set to make them more similar based on a pre-defined measure of joint similarity. This process has great utility in many scientific disciplines including radiology, psychology, and vision. This thesis takes steps towards developing an unsupervised data processing pipeline that includes alignment, clustering and feature learning. We first present an efficient curve alignment algorithm that is effective on many synthetic and real data sets. We show that using the byproducts of joint alignment, the aligned data and transformation parameters, can dramatically improve classification performance. We then incorporate unsupervised feature learning based on convolutional restricted Boltzmann machines to learn a representation that is tuned to the statistics of the data set. We show how these features can be used to improve both the alignment quality and classification performance. Finally, we present a nonparametric Bayesian joint alignment and clustering model which handles data sets arising from multiple modes.



Sameer Singh; *Scaling MCMC Inference and Belief Propagation to Large, Dense Graphical Models*; (Andrew McCallum, Advisor); May 2014; Postdoctoral Research Associate, Department of Computer Science, Univ. of Washington

In the past decade, single-core CPUs have given way to multi-core and distributed computing platforms. At the same time, access to large data collections is progressively becoming commonplace. Inference for probabilistic graphical models, that has been designed to operate sequentially, seems destined to become obsolete in this world of multi-core, multi-node systems. Further, modeling large datasets leads to an escalation in the number of variables, factors, domains, and the density of the models, all of which have a substantial impact on the computational complexity of inference. Motivated by the need to scale inference to large, dense graphical models, in this thesis we explore approximations to Markov chain Monte Carlo (MCMC) and belief propagation (BP) that induce dynamic sparsity in the model to utilize parallelism. These tools for inference enable us to tackle relation extraction, entity resolution, cross-document coreference, and other information extraction tasks over large text corpora.

CS Undergraduate Dean's List – Spring 2014

See full Spring 2014 Dean's List and list of Student Citations (students recognized for their outstanding performance in the classroom) at www.cs.umass.edu/people/spring2014-deans-list-citations.

CS graduates celebrated

On Friday, May 9, 2014, the School of Computer Science hosted M.S. and Ph.D. graduates for a post-graduation celebration luncheon. The following day, the undergraduate student graduation celebration luncheon was held. Over 400 CS student graduates, faculty, staff, families, and friends gathered to celebrate the new CS alumni.



Significant Bits

**Newsletter of the
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College of Natural Sciences
at the University of Massachusetts Amherst**

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Your news, suggestions, comments, and contributions are welcome. Please mail them to the address above or send them electronically to bits@cs.umass.edu.

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