

# CLICK!

## MAGAZINE

**SOCIAL UNDERSTANDING:  
CS @ ILLINOIS RESEARCH HELPS DRIVE  
SOCIAL MEDIA, AND EXAMINE ITS PROS AND CONS**

**ALSO IN THIS ISSUE:**

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# CS @ ILLINOIS

## Department of Computer Science

College of Engineering  
College of ACES | College of FAA | College of LAS  
University of Illinois at Urbana-Champaign

### WE DO THE IMPOSSIBLE EVERY DAY.



Interim Department Head Vikram Adve

CS @ ILLINOIS continues to benefit from numerous alumni and industry engagements to support faculty research and enhance the experience and opportunities for our students. We are pleased to announce our new partnerships with the Colleges of ACES and Fine + Applied Arts with the launch of our new CS + Crop Sciences and CS + Music undergraduate degrees, while our partnership with Coursera on our MCS in Data Science degree track continues to scale with tremendous positive impact. Our faculty continue earning top honors and many are being elevated into positions of leadership in the academy and across our industry associations. And our K-12 outreach programs have earned high honors from NCWIT (National Center for Women & Information Technology).

*CLICK! Magazine* is produced twice yearly to showcase the innovations of our faculty and students, the accomplishments of our alumni, and to inspire our partners and peers in the field of computer science.

Previous issues of *CLICK! Magazine* and the monthly E-News can be found online at [cs.illinois.edu/news](http://cs.illinois.edu/news).

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# Announcing New CS + X Degrees, New College Partners

“We are thrilled to not only launch two new CS + X undergraduate degrees, but doing so with two new College partners as well: ACES and FAA. Educating students in the fundamentals of computer science—both computational thinking and technical tool kits—greatly enhances their impact and marketability in the professional fields of their passions.”

—Lenny Pitt, Associate CS Department Head and Director of Undergraduate Programs

Momentum continues to build for CS @ ILLINOIS' popular CS + X family of blended degrees with the addition of two new undergraduate degrees: CS + Crop Sciences and CS + Music.

The CS + Crop Sciences program is a collaboration with the Department of Crop Sciences in the College of ACES (Agricultural, Consumer and Environmental Sciences), and the CS + Music program is a joint effort with the School of Music in the College of Fine + Applied Arts. Following recent approval by the Illinois Board of Higher Education, these programs are now open for student transfers, and the first freshman cohort will start in the fall of 2018.

These two new degrees are joining a strong and growing cohort of blended degree programs. In 2014, in collaboration with the College of Liberal Arts and Sciences, four new undergraduate degrees were launched: CS + Anthropology, CS + Astronomy, CS + Chemistry, CS + Linguistics. The majority of that first cohort will be graduating in the spring of 2018 and we are eager to see what kinds of jobs they pursue and how they impact their fields. We also have three long-standing legacy degrees: Mathematics & CS, Statistics & CS, and CS in Engineering. As of fall 2017, about one-third of our total student body, and 40% of our freshman, are in a blended degree program.

## NEW IN 2017

CS + Crop Sciences and CS + Music  
Now Open for Transfers  
Freshman Cohort Starts Fall 2018

## 172 CS + X STUDENTS SINCE 2014 LAUNCH

CS + Anthropology  
CS + Astronomy  
CS + Chemistry  
CS + Linguistics

## 12,798 ALUMNI SINCE 1965 IN LONG-STANDING DEGREE PROGRAMS

CS in Engineering Alumni: 10,521  
Mathematics & CS Alumni: 2,151  
Statistics & CS Alumni: 126

## 2018 AND BEYOND

CS + Many New Partners In The Pipeline

**ACES** College of Agricultural,  
Consumer and  
Environmental Sciences

**ENGINEERING  
AT ILLINOIS**

COLLEGE OF  
FINE + APPLIED  
**ARTS**

College of  
**Liberal  
Arts &  
Sciences**

For more information on these degree programs,  
visit: <http://cs.illinois.edu/cs-x>



## Cong Elected to National Academy of Engineering



Alumnus Jingsheng (Jason) Cong (MS CS '87, PhD '90) was elected to the U.S. National Academy of Engineering—one of the highest professional distinctions for engineers. Cong, who

is a Distinguished Chancellor's Professor of Computer Science at UCLA, was recognized for pioneering contributions to application-specific programmable logic via innovations in field programmable gate array (FPGA) synthesis.

At UCLA, Cong has led research in electronic design automation, energy-efficient computing, customized computing for big-data applications and highly scalable algorithms. In particular, FPGAs designed by his synthesis algorithms are now key components of the world's communication and computation infrastructures.

Cong has also founded or co-founded four companies—Aplus Design Technologies, which developed the first commercially available FPGA architecture evaluation tool and physical synthesis tool; AutoESL Design Technologies, which commercialized his research on high-level synthesis; and Neptune Design Automation, which produced the fastest and most scalable FPGA physical design tool of its time. He is currently chairman and chief scientific advisor at Falcon Computing Solutions.

Cong completed his doctoral work at Illinois under the supervision of Professor C.L. David Liu, and he received the CS @ ILLINOIS Distinguished Achievement Award in 2014. He is the 10th CS @ ILLINOIS graduate to be elected to the NAE.

## Chen receives SIGMM Outstanding PhD Thesis Award



Chien-Nan (Shannon) Chen (PhD CS '16) has been awarded the SIGMM Outstanding PhD Thesis Award for his dissertation, "Semantics-Aware Content Delivery Framework for 3D Tele-Immersion."

Advised by CS Professor and CSL Director Klara Nahrstedt, Chen's work focused on the advancement of 3D tele-immersion technology, which is an immersive type of virtual reality that allows full-body, multimedia interaction with people at different locations.

This technology has a multitude of applications for virtual collaborative environments, such as therapists helping patients with physical rehabilitation, full-body gaming with friends around the world, and even virtual art performances. However, it is very resource intensive.

Chen argues that a concept called "semantic information" can systemically define the factors that affect the tradeoffs needed for less-capable computers, which, in turn, can tailor the experience for each user in order to get the optimal experience.

He aims to exploit information about each system's computing environment, the activity, and the user's role in each 3D tele-immersion experience, so as to enhance the system's efficiency and fit the unique computational requirements of each system.

Now at Facebook, Chen works on the team that implemented the social media giant's 360-degree video streaming, and his work in semantics information facilitates effective dynamic streaming of 360-degree content to Facebook's billions of users.

# Lee, Rankin Receive College Alumni Award

Der-Tsai Lee (MS CS '76, PhD '78) and Sandra Rankin (BS CS '74) have each been recognized with a 2017 College of Engineering Alumni Award for Distinguished Service. The award honors alumni for professional distinction through outstanding leadership, contributions to the field of engineering, creativity, and entrepreneurship; as well as service to society, the professional community, and to the department, college, or university.

Lee, a Distinguished Research Fellow at the Institute of Information Science, Academia Sinica in Taiwan, was honored for contributions to computational geometry and design and analysis of algorithms. A pioneer in computational geometry, algorithm design and analysis, Lee is an accomplished researcher and academic leader. From 2011 to 2015, he served as president of National Chung Hsing University in Taiwan.

During his nearly 40 years in higher education, Lee has published more than 200 technical articles in scientific journals and conference proceedings, holds three U.S. patents, and one R.O.C. patent. He is a Fellow of the IEEE and ACM, an elected member of The World Academy

of Sciences, and Academician of Academia Sinica. In 2014, CS @ ILLINOIS honored him with the Distinguished Alumni Educator Award.

A retired vice president at IBM, Rankin was honored for leading efforts in software and hardware development on mainframes, personal computers, business applications, and emerging software industry standards.

Over a career spanning 33 years, Rankin contributed to IBM's personal computer and small server operating systems, worked with other computer vendors to set standards for then-emerging Internet technologies like Java and XML, led IBM's world-wide customer support, and managed IBM's mainframe software and firmware development teams—leading a team of 3,000 with a budget of \$250 million.

Rankin received a CS @ ILLINOIS Distinguished Alumni Achievement Award in 2013. She and her husband, John, have established an undergraduate scholarship in CS to help attract and retain more women in the computing and IT fields.



## Ong Featured Speaker at Fall Convocation

Peng T. Ong (MS CS '88) served as the commencement speaker at the College of Engineering's Fall 2016 Convocation. A managing partner of Monk's Hill Ventures, Ong co-founded and was CTO of Electric Classifieds, which launched dating service Match.com. Ong challenged graduates to find solutions to mitigate the impact of technology disruptions on society. Watch his address online! [http://engineering.illinois.edu/graduation/Fall\\_2016.html](http://engineering.illinois.edu/graduation/Fall_2016.html)



View the Fall Convocation, including Peng Ong's address, in its entirety.

# CS Alumni Get Involved

## On Campus

- Be an Engineer in Residence (EIR) for a day and schedule a custom itinerary to give a talk and meet informally with faculty and students .
- Attend or sponsor signature student-led events like ACM's Reflections | Projections Conference (September) and HackIllinois (February).
- Network at the annual Women in Computer Science Alumni & Student Dinner and the CS Distinguished Alumni Awards (October).



## On The Road

- Attend a CS alumni networking event in Chicago, San Francisco, or New York City.
- Host a large department event or a small, informal meet-up in your area.



## Online

If you're in the big data space and want to help current students, consider being a featured speaker in our new Master of Computer Science in Data Science professional development webinar.



**MCS in Data Science  
Professional Development  
Webinar Series**

**Mr. Isaac Hall  
Founder & Technology  
Fellow, Recurly**

Let us know how you'd like to get involved at: [alumni@cs.illinois.edu](mailto:alumni@cs.illinois.edu)



Visit the CS Master Calendar at:  
[go.cs.illinois.edu/calendar](http://go.cs.illinois.edu/calendar)



# CS @ ILLINOIS Welcomes Eight New Faculty

## Geoffrey Challen

*Teaching Associate Professor  
Sensor & Mobile Systems*



Geoffrey Challen has spent over a decade working in sensor and mobile systems. He has deployed sensors on active volcanoes; designed novel

ways to utilize, improve, and program smartphones; and operated public testbeds enabling both sensor network and smartphone platform research. He received the nsf career award in 2016 to support his work on adaptive programming language constructs and adaptive online courses

At Illinois, Challen will shift his focus to building computer systems that improve teaching and learning—both in computer science and across other disciplines. He has previously designed and taught hybrid courses on operating systems (ops-class.Org) and a large-scale flipped course on the internet (internet-class.Org), and he led the redesign of the university of buffalo’s entire computer science curriculum. He is excited about the challenges of efficient education at scale, and committed to creating an inclusive and exciting environment to help improve diversity in computing.

Prior to joining CS @ ILLINOIS, Challen was an assistant professor at the University at Buffalo, where he led the blue Systems Research Group and directed the phonelab smartphone platform testbed. He has undergraduate and graduate degrees from Harvard University, where his Ph.D. was advised by Matt Welsh. Challen is a Siebel Scholar, class of 2010.

## Mohammed El-Kebir

*Assistant Professor  
Phylogenetics*



During his work on tumor phylogenetics, Mohammed El-Kebir has developed novel algorithms for reconstructing the evolutionary

history of a heterogeneous tumor, given bulk DNA sequencing measurements. This allows him to study the life history of a tumor from its initial stage, where a healthy cell acquires its first somatic mutation, to the later stages, where tumor cells metastasize and colonize distant organs and tissues.

At Illinois, El-Kebir plans to develop novel phylogeny inference algorithms for data generated with single-cell sequencing technology. In addition, he plans to pursue the translational aspects of tumor phylogenies. El-Kebir’s goal is to comprehensively identify common patterns of tumor evolution by developing novel algorithms that infer landscapes of tumor phylogenies from large-scale tumor sequencing datasets. Doing so, would lead to valuable insights in the clonal co-occurrence, ordering, and progression of somatic mutations across different tumor types.

El-Kebir holds Bachelor’s and Master’s degrees in Computer Science and Engineering from Eindhoven University of Technology, plus a Master’s degree in Bioinformatics from Vrije Universiteit Amsterdam. In 2015, his PhD thesis was recognized with the BioSB Young Investigator Award, an annual Dutch award for the best PhD thesis in bioinformatics. After completing postdocs at Brown and Princeton, El-Kebir will join CS @ ILLINOIS in the fall of 2018.

## G. Carl Evans

*Teaching Assistant Professor  
Parallel Computing*



G. Carl Evans first developed an interest in teaching while working on the NovaNET educational computing system, first

as an operator and then as a systems administrator. NovaNET was a commercial outgrowth of the PLATO system developed at the University of Illinois. After leaving NovaNET, Evans returned to CS @ ILLINOIS to pursue graduate studies.

After earning a Master’s degree in 2011, Evans focused his doctoral work on the use of dynamic information to find vector parallelism. His tool, Vector Seeker, helps guide the optimization of legacy scientific codebases to take advantage of modern hardware. In the course of his doctorate, Evans completed internships at Sandia National Labs and the Exascale Computing Research Center in Versailles, France. After completing his studies in December 2016, Evans joined the CS @ ILLINOIS faculty in the fall of 2017.

As a graduate student, Evans assisted in teaching courses in data structures and discrete math. As an educator, he is focused on finding ways to efficiently provide the basics of computer science instruction so that students have a solid foundation for their exploration of the field. He also wants to reach out to underserved populations and make programming accessible to the widest audience possible.

## Albert Harris

*Teaching Assistant Professor  
Internet of Things*



A practicing attorney and research scientist, Albert Harris joins CS @ ILLINOIS this fall as a member of the teaching faculty. Harris

spent nearly six years helping Fortune 500 companies design solutions to avoid patent infringement by working with engineers to augment wireless networks and cloud computing source code and systems. He regularly educated other attorneys and judges about various technologies involved in the patent litigation. Additionally, Harris runs a solo practice law firm specializing in a variety of legal areas, including digital crime and related policies.

Harris's current research projects at Illinois focus on Internet of Things, drone communication, and sensing systems. His overall research interests include systems with massive numbers of embedded devices that control, sense, and communicate with each other, and autonomous vehicles that operate on land, underwater, or in the air.

Earlier in his career, Harris was an adjunct professor at the University of Missouri at Kansas City, teaching cognitive science and philosophy courses. A black belt in karate and judo, Harris runs his own martial arts school, where he has trained competitive fighters in multiple fighting disciplines.

Harris earned his doctorate under the supervision of CS @ ILLINOIS Professor Robin Kravets in 2006.

## Nan Jiang

*Assistant Professor  
Reinforcement Learning*



Nan Jiang's research focuses on how AI agents can learn to perform sequential decision-making from a limited amount of data,

under the framework of reinforcement learning. Many existing theories study the setting where the number of states is finite and small. However, they cannot handle the practical situation where an agent receives complex sensory observations (such as images). In light of that limitation, Jiang has borrowed theoretical insights and techniques from supervised learning to develop new reinforcement learning algorithms and analyses that scale to problems with large state or observation spaces. Specific research projects include state representation learning for optimal bias-variance trade-off and provable use of function approximation in large state space problems.

More recently, Jiang has investigated the problem of how to ensure the safety of AI systems by aligning the value of the agent and that of the human. He has proposed a new theoretical framework that allows repeated interactions between human and agent, and developed an algorithm for the agent to learn the human's reward function from watching task demonstrations.

Jiang received his PhD in Computer Science and Engineering from University of Michigan in 2017. Honors included a predoctoral fellowship from the University of Michigan, as well as a best paper award at AAMAS. He will join CS @ ILLINOIS in the fall of 2018 after completing a postdoc at Microsoft Research.

## Bo Li

*Assistant Professor  
Secure Machine Learning*



After completing a postdoc under Professor Dawn Song at the University of California, Berkeley, Bo Li will join the CS @ ILLINOIS faculty

in the fall of 2018. Her research combines machine learning, security, privacy, game theory, social networks, and adversarial deep learning.

Li has designed several robust learning algorithms, a scalable framework for achieving robustness for a range of learning methods, and a privacy preserving data publishing system. She is interested in both theoretical analysis of general threat models and developing practical systems. Li has evaluated the vulnerabilities of real-world machine learning models and developed resilient learning systems to not only preserve robustness, but also optimize resource allocation based on practical constraints. Another focus of her research is on developing scalable robust algorithms that can process massive amounts of data available for Internet-scale problems regarding specific cloud computing infrastructure to achieve secure learning for big data.

Her recent research is active in adversarial deep learning to develop robust defensive algorithms against adversarial examples as well as new black-box attack strategies. She is also interested in training generative adversarial networks (GANs) to generate malware that will in turn help train resilient malware detection system. She is also developing GANs based translation system between image and text.

Li received her PhD in Computer Science in 2016 from Vanderbilt University. In 2015, she received the Symantec Research Labs Graduate Fellowship, one of three recipients nationwide.

## Mariana Silva

Teaching Assistant Professor  
Large-Scale Teaching Tools



Mariana Silva received Bachelor's and Master's degrees in mechanical engineering from the Federal University of Rio de Janeiro,

Brazil and earned her Ph.D. in Theoretical and Applied Mechanics from the University of Illinois in 2009. Her doctoral research focused primarily on the theoretical and computational aspects of design optimization of physical systems that are governed by partial differential equations, addressing problems in the area of static and transient structural topology optimization, material design, wave mitigation, fracture mechanics and robust optimization.

Before joining CS ILLINOIS, Silva had served as a lecturer and undergraduate academic advisor with the Department of Mechanical Science and Engineering since 2012. There, she was primarily involved in large-scale teaching innovation activities, such as the re-design of the mechanics course sequence sponsored by the College of Engineering Strategic Instructional Innovations Program (SIIP). Silva is very passionate about teaching and improving the classroom experience for both students and instructors. She has been included in the List of Teachers Ranked as Excellent five times and has received the Engineering Council Outstanding Advisor Award every year since 2014.

Silva plans to continue to pursue educational research about effective teaching, including how technology and online tools, blended with in-person interactions, can be used to improve the educational experience in large classes.

## Tianyin Xu

Assistant Professor  
System Reliability & Security



Tianyin Xu's research aims at enabling principled design and implementation towards reliability for computer

systems, especially those operating at cloud and datacenter scale where failures are the norm. He received his PhD from UCSD in 2017, and will join CS @ ILLINOIS in the fall of 2018, after spending a year at Facebook's Core Systems team as a visiting scientist.

At Illinois, Xu will continue studying the reliability of computer systems built for cloud and datacenters. A major theme in his work is to understand how systems break in reality, and to reason out the implications respecting reliability and disaster-readiness for the systems in the wild, and then to harden the design and implementation to defend against bugs, misconfigurations, and malice, with principles and disciplines.

His doctoral work explored the systems approach to hardening cloud and datacenter systems against configuration errors---one dominant cause of today's cloud and datacenter failures. His work has helped both commercial and open-source systems to improve the configuration design and implementation. His research was recognized with the Jay Lepreau Best Paper Award at OSDI 2016 and the Doctoral Award for Research of CSE @ UCSD in 2017.

## CS Faculty Earn College & Campus Honors

In the spring, several CS faculty were recognized for their excellent work in research, teaching, and graduate mentoring.

**Wade Fagen** was recognized with the College of Engineering's Collins Award for Innovative Teaching for incorporating a series of open-ended and interesting assignments in both CS 105 and a pilot course on "Data Driven Discoveries". Students' visualizations from the latter course, like "GPAs of Every Course at the University of Illinois," may be found online.

**Karrie Karahalios** received the Dean's Award for Excellence in Research, given by the College of Engineering, for her work in social computing exploring how computer algorithms shape today's world, as well as the ethics behind them. The award honors only a handful of mid-career faculty each year.

**Josep Torrellas** was honored with the Campus Award for Excellence in Graduate Student Mentoring for guiding dozens of Illinois graduate students. Over the course of his career, Torrellas has graduated 36 PhD students, many who have gone on to successful careers in academia or industry.

# Jacobson, Parameswaran, Solomonik Earn Top Awards



**SHELDON H. JACOBSON**

Sheldon H. Jacobson has been honored with the David F. Baker Distinguished Research Award, recognizing his lifetime achievements. His work analyzing complex systems is well known for informing public policy, especially in the areas of aviation security and pediatric immunization engineering economics.

The Baker Award is typically granted once a year. The Institute of Industrial and Systems Engineers awards it based on, among other things, the significance and scope of the research and the use of the results.

In supporting Jacobson's nomination, 2011 winner Russell D. Meller cited Jacobson's impact on both the research of others and on public policy. Jacobson was an early researcher in transportation security, well before the Sept. 11, 2001, attacks, and his work heavily influenced the creation of the Transportation Security Administration's Precheck program.

Jacobson's work has also sometimes focused on the unconventional, such as the probability of a college basketball team's success in the NCAA Tournament, crossing over disciplinary lines and focusing on problems before they had the attention of other researchers.

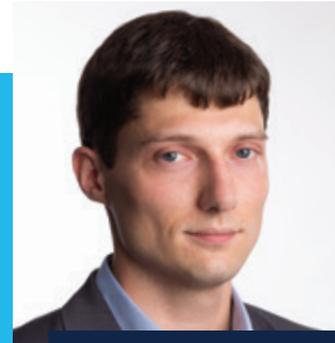


**ADITYA PARAMESWARAN**

Aditya Parameswaran was named this year's recipient of the IEEE TCDE Early Career Award, which honors an individual for their body of work in Data Engineering in the first 5 years after their PhD.

Parameswaran was recognized "for developing new interactive tools and techniques that expand the reach of data analytics." An expert in data management and data mining, his award-winning dissertation work was on crowdsourcing: understanding how to best incorporate humans into data analytics systems. He is co-author of a book on that topic, *Crowdsourced Data Management: Industry and Academic Perspectives*.

More recently, his work has focused on building systems to help human analysts extract insights from large datasets. His projects include Zenvisage, a visualization recommendation system, DataSpread, a scalable spreadsheet system, and DataHub, a collaborative analytics system (or a "github" for structured datasets).



**EDGAR SOLOMONIK**

Edgar Solomonik is one of two winners of the Householder Prize XX, a prestigious early-career prize in mathematics. The 27-year-old joins a short list of people who have received the prize since it was first awarded in 1971.

Honoring influential mathematician Alston Householder, the prize is presented just once every three years to recognize the best dissertation in numerical linear algebra. Solomonik, whose research focuses on high-performance and parallel computing, said he is particularly proud of winning the prize as a computer scientist.

Solomonik's PhD dissertation, "Provably Efficient Algorithms for Numerical Tensor Algebra," focused on how to design more efficient parallel algorithms for numerical linear algebra.

The award includes a cash prize, notable less for its size than how it is financed. "Every year they pass around a bag and give the money to the next winner," Solomonik said. "I got a mix of Euros and dollars and other currency. It's a fun tradition."

## Adve, Gropp, Olson Take Key Leadership Roles



Sarita Adve

The Defense Advanced Research Projects Agency (DARPA) has named Sarita Adve to a three-year term with its Information Science and Technology Study Group. This rotating group of 30 engineers and scientists works to identify future directions for computer and communications research.

Chris Rammin, the Study Group's Chair, said that part of the job is to alert DARPA to technological surprises that are on the horizon, or to create them itself. "Members have to look beyond shorter-term motivations to understand the potential for looming surprises with national security implications," he said.

Adve, the Richard T. Cheng Professor of Computer Science, hopes to lead at least one study that provides guidance on major challenges ahead, such as what she sees as the underappreciated threat of the looming end of Moore's Law.

"In my own field of architecture, this is a game-changing, perhaps once-in-a-lifetime paradigm shift," Adve said. "How to meet expected performance requirements of the future is anybody's guess."



William D. Gropp

William D. Gropp, has been named the fifth Director of the National Center for Supercomputing Applications (NCSA), after ten months serving as acting and interim director.

Gropp holds the Thomas M. Siebel Chair in Computer Science and, since 2015, has served as NCSA's chief scientist. He is a co-principal investigator of Blue Waters, the fastest supercomputer on an academic campus. Gropp was recently named principal investigator of the NSF-funded Midwest Big Data Hub, a growing network of partners investing in data and data sciences to address grand challenges for society and science.

Gropp's most widely known research contribution was the development of the MPICH implementation of the Message Passing Interface (MPI), which he designed with collaborators at Argonne National Laboratory. MPI allows large-scale computations to be run on thousands to millions of processor cores simultaneously and for the results of those computations to be efficiently shared. Gropp has authored more than 187 technical publications, including co-authoring the book *Using MPI*, which is in its third edition.



Luke Olson

Luke Olson, an expert in the field of scientific computing and numerical analysis, has been named Director of the College of Engineering's Computational Science and Engineering (CSE) program.

An interdisciplinary program, CSE sponsors several degree programs – an undergraduate certificate and minor, a graduate concentration for both PhD and MS students, and a Master of Engineering (M.Eng.). It also manages a number of research centers, including the Cyberphysical Manufacturing Network (CyMaN) and the Partnerships for International Research and Education (PIRE).

"Luke will bolster CSE's educational mission by preparing and training our students and researchers in the computing skills and tools needed for breakthrough scientific discovery and innovation," said Andreas Cangellaris, Dean of the College of Engineering.

Olson will also assume the leadership of the Parallel Computing Institute (PCI), which is being transitioned to CSE from the Coordinated Science Laboratory. "I look forward to Luke's efforts to strengthen PCI's role as a catalyst and enabler of cross-campus collaborations of Illinois researchers in new, application-focused research efforts that leverage the latest and most efficient parallel computing technologies for new scientific discoveries and innovations," Cangellaris continued.

## Warnow Elected 2017 International Society for Computational Biology Fellow



Tandy Warnow

Tandy Warnow, a Founder Professor of Engineering, was among the eight scientists recently elected as 2017 Fellows of the International Society for Computational Biology (ISCB) for outstanding contributions to the fields of computational biology and bioinformatics.

"ISCB Fellows represent the absolute pillars of our community," said Alfonso Valencia, ISCB

president. "Each of these very accomplished researchers has made exceptional contributions to the ISCB's mission to advance the scientific understanding of living systems through computation. ISCB Fellows are an increasingly active group of the society, driving the scientific excellence of our field and opening new avenues to our community."

An interdisciplinary researcher, Warnow is a faculty member in the Departments of Bioengineering and Computer Science, and she is a member of the Carl Woese Institute for Genomic Biology.

With more than 130 published papers, Warnow combines mathematics, computer science, and statistics to develop improved models and algorithms for reconstructing complex and large-scale evolutionary histories in both biology and historical linguistics. Her current research focuses on phylogeny and alignment estimation for very large datasets (10,000 to 1,000,000 sequences) that may be highly fragmentary, estimating species trees and phylogenetic networks from collections of gene trees, and taxon identification in metagenomics.

She and her students use real data and perform massive simulations to evaluate the performance of methods they develop. They also collaborate closely with biologists and linguists in data analysis.

## Torrellas Elected 2016 AAAS Fellow

Josep Torrellas is one of six University of Illinois at Urbana-Champaign faculty members who were elected 2016 fellows of the American Association for the Advancement of Science. They are among the 391 new fellows chosen for their efforts to advance science applications that are deemed scientifically or socially distinguished.

"These members of our faculty exemplify the extraordinary scholarship, innovation and teaching that defines Illinois," said Edward Feser, who was then interim vice chancellor for academic affairs and provost. "They are leaders in their fields who have made highly significant contributions to their disciplines and the academy. We are proud they are our colleagues."

Torrellas, the Saburo Muroga Professor of Computer Science, was recognized for "distinguished contributions to the field of

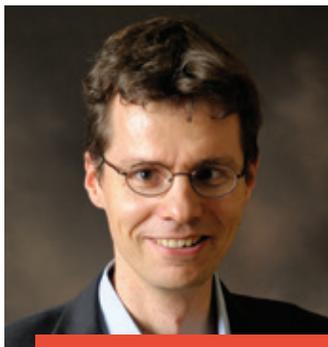


Josep Torrellas

computer architecture, particularly for designs of shared-memory multiprocessor architectures and thread-level speculation." He is the director of the Center for Programmable Extreme Scale Computing and his research explores new processor, memory and system technologies and organizations to build novel multiprocessor computer architectures.

Founded in 1848, the American Association for the Advancement of Science is the world's largest general scientific society. Fellows are chosen by their peers for their outstanding contributions to the field.

# Kloeckner, Parameswaran, Peng win NSF CAREER Awards



**ANDREAS KLOECKNER**

Andreas Kloeckner plans to use his award to make numerical simulation tools for applications such as fluid flow cheaper and easier for engineers to use.

Numerical simulations based on partial differential equations, or PDEs, are being used across a broad range of applications, from weather prediction to automobile design.

But wider adoption and broader use is being held back by the computational cost. Large-scale simulations often spend 80 percent or more of their computation time on one subset of PDEs, elliptic PDEs.

Kloeckner's research into a family of methods for solving elliptic PDEs points to a potential way to decrease that expense, provided he can overcome the need to perform a high degree of specialized engineering now required for each situation.

"What I am trying to accomplish is make it so the process of creating a simulation doesn't require someone to sit down and do all this work by hand for each new problem," Kloeckner said.

Kloeckner came to CS @ ILLINOIS in 2013 after spending nearly three years as an instructor at the Courant Institute of Mathematical Sciences at New York University. In 2016 he won the C.W. Gear Outstanding Junior Faculty Award.



**ADITYA PARAMESWARAN**

Aditya Parameswaran, an expert at incorporating humans into data analytics systems, plans to address challenges in managing and optimizing open-ended crowdsourcing.

Parameswaran's award-winning dissertation developed optimal ways to leverage crowdsourcing for closed-domain tasks.

However, open-ended crowdsourcing—where responses from human workers can come from an unbounded set of alternatives—presents a new set of research questions.

Challenges include deciding which task is appropriate to assign to workers, as well as ascertaining which responses from workers are correct. Parameswaran's goal of establishing foundational principles for efficient data management of open-ended crowdsourcing would allow researchers in machine learning to extend their reach to more challenging domains.

Prior to joining Illinois in 2014, Parameswaran spent a year as a postdoc at MIT CSAIL following his PhD at Stanford University. He has received multiple awards, including the IEEE TCDE Early Career Award for contributions to data engineering.



**JIAN PENG**

Jian Peng designs efficient algorithms for biological data analysis – software tools that are especially important for extracting meaningful information from genomic sequencing data and from the large repositories of experimental data now being generated in protein analysis and in biotechnology.

A comprehensive understanding of the various functional aspects of a gene or a protein is critical for research in biology and in medicine.

Peng plans to develop a new computational framework to integrate the large amounts of high-resolution data being generated by those applications, with the goal of enabling the annotation of genome-scale gene functions across species.

Peng joined Illinois in 2015 after completing a PhD at the Toyota Technological Institute and then spending a year as a postdoc at MIT. He is a prior recipient of a number of awards, among them the prestigious Sloan Research Fellowship in 2016.



## Statue Honoring Women in Engineering Dedicated

On Friday, April 28, the College of Engineering dedicated a statue honoring women in engineering.

"The new statue celebrates women engineers and their contributions to bettering our world through engineering," explained Andreas Cangellaris, Dean of the College of Engineering. "For the past several years, Engineering at Illinois has worked hard to increase the diversity of both our students and faculty, especially the number of women who chose engineering as their profession. We very much appreciate this gift from Texas Instruments as it reflects their interest and support for these efforts."

"It's TI's hope that this statue will inspire current and future female university students to make a natural connection between their talents and their career aspirations and that they will choose engineering," said Peter Balyta, PhD, president of TI Education Technology and vice president of Academic Engagement and Corporate Citizenship.

Sakshi Srivastava was a senior in electrical engineering when she started the movement behind the project. "I stumbled across an article about how public art conveys the sentiments of a community," Srivastava said. "I realized that having a statue erected can show our commitment to younger students that we endorse their dreams." She is pleased with TI's support of the project, and sees it as a validation of the time she had invested since June 2013 to make the statue a reality.

Entitled, "The Quintessential Engineer," the statue was created by Chicago sculptor Julie Rotblatt-Amrany, who described her motivation for the design:

"The face, the expression is one of wonder, exploration, and knowledge, one of curiosity and perseverance. She represents a multi-racial female, a young professional woman at work... always thinking, on the move.

"This piece is meant to engage the University's students, faculty, and visitors. It reflects the era in which she is from. It is about the engineer's journey. There is space for the observer to interpret what will be in her future; it allows for mystery and engagement.

Previously, Julie Rotblatt-Amrany has developed a number of well-known statues, including Michael Jordan (with her husband, Omri Amrany) and Scottie Pippen statues housed at the United Center in Chicago and a bas relief bronze of Abraham Lincoln that resides in the Lincoln Presidential Library in Springfield.

# CS @ ILLINOIS Honored for Increasing Women's Participation in Computing

BY COLIN ROBERTSON

The Department of Computer Science has received the \$100,000 Grand Prize for the NCWIT Extension Services Transformation (NEXT) Award. Sponsored by the National Center for Women & Information Technology (NCWIT) and Google, the NEXT Awards honor academic departments that show significant positive outcomes in increasing women's meaningful participation in computing education.

CS @ ILLINOIS was recognized for its long-term commitment to the recruitment and retention of undergraduate women. In 2015, women earned 57% of all undergraduate degrees in the U.S. However, women earned less than one-fifth of all computer and information science undergraduate degrees. Yet, thanks to outreach and recruiting efforts like Gems Computer Science Camp for Girls, ChicTech, Girls Who Code, Women in Computer Science (WCS) Visit Day, and SAIL, as well as efforts to eliminate the effects of implicit bias in admissions, the fall 2016 CS @ ILLINOIS freshman class in Engineering was 46% female, a record high.

"Not only are we proud to recognize these departments for their remarkable results, but we're also proud to recognize the ripple effect these institutions create among the computing community at large," said NCWIT CEO and Co-founder Lucy Sanders. "They are setting an example for other institutions – reinventing their culture by establishing better habits and practices for attracting and keeping a range of students in their computing programs."

"Computing touches nearly every field today, from the arts and science, to business, medicine, and engineering. We want computing's remarkable opportunities to be available to everyone," said then CS Department Head Rob A. Rutenbar. "The NCWIT NEXT Award Grand Prize is a fantastic acknowledgement of our efforts at Illinois to make the field more representative of the people around us, and it will help us to continue to move forward."

The Department's work to improve pedagogy and culture were also acknowledged in the award citation. Those efforts include hiring faculty in a new, specialized Teaching Professor track to teach lower-level courses, requiring teaching assistants to take a semester-long seminar on pedagogy, increased opportunities for collaborative learning, ongoing improvements to the introductory course sequence (including the new "Software Design Studio"), and strong support for student activities and department-wide student social events.



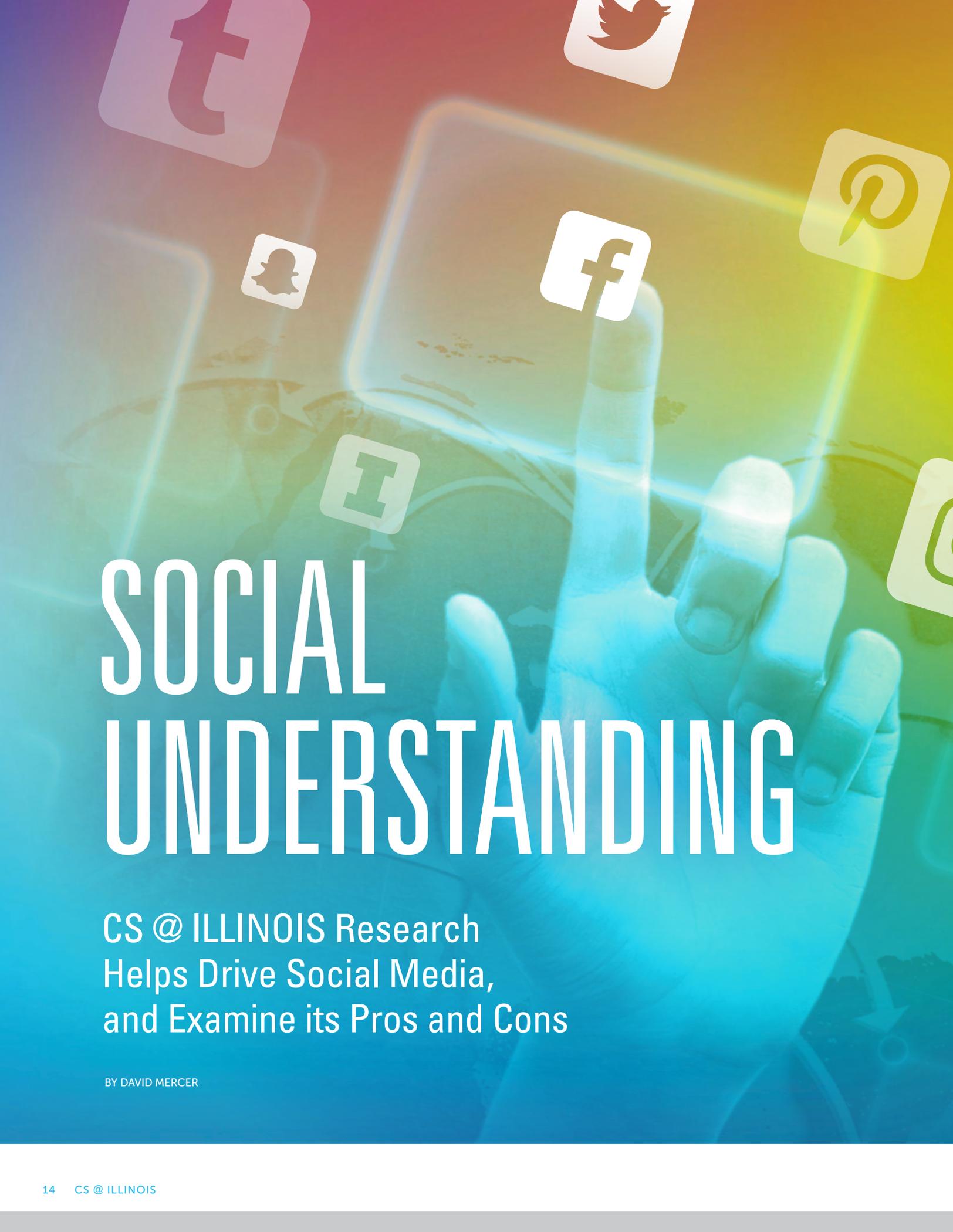
*C.J. Coleman, Sue Larson, and Heather Zike pose with NCWIT's Mo Fong and Lucy Sanders at the NCWIT Summit on Women and IT, after accepting the NCWIT NEXT Award Grand Prize.*

## CS @ ILLINOIS is being recognized for its long-term commitment to the recruitment and retention of undergraduate women.

The CS + X family of collaborative bachelor's degree programs was also cited as yielding notable success in attracting undergraduate women. CS + X allows students to pursue a program of study combining a strong grounding in CS with technical or professional training in the arts and sciences. Initially launched with four degrees (CS + Anthropology, CS + Astronomy, CS + Chemistry, and CS + Linguistics), additional CS + X programs are currently under discussion. In fact, CS + Crop Sciences and CS + Music were approved by the University's Board of Trustees and the Illinois Board of Higher Education earlier this year.

"Our faculty and staff do a wonderful job supporting all of our students," said Associate Department Head and Director of Undergraduate Programs Lenny Pitt. "But I'd especially like to thank the team that has helped implement our many programs that focus on recruiting and retaining women: Cynthia Coleman, Cinda Heeren, Heather Zike, and Engineering's Susan Larson."

Since 2016, CS @ ILLINOIS has worked with NCWIT ES-UP to identify those factors that have contributed to success in recruiting female undergraduates, as well as programs that will help retain women in the department's degree programs. The CS @ ILLINOIS is also a Regional Affiliate of the NCWIT Aspirations in Computing, which honors outstanding educators and young women at the high-school level for their computing-related achievements and interests.

A hand holding a smartphone is the central focus, with various social media icons floating around it. The background is a gradient of blue and green. The icons include a large 't' (Tumblr), a Twitter bird, a Snapchat ghost, a Facebook 'f', a Pinterest 'P', a large 'I' (Instagram), and a portion of a YouTube 'Y'.

# SOCIAL UNDERSTANDING

CS @ ILLINOIS Research  
Helps Drive Social Media,  
and Examine its Pros and Cons

BY DAVID MERCER



## How well do Facebook users understand the algorithm that determines what they see in their news feeds?

Interviews conducted as part of CS @ ILLINOIS Professor Karrie Karahalios' landmark 2015 study made it clear to her that the answer was "not very well."

Almost two-thirds of the people interviewed for the study, in fact, had no idea Facebook's algorithm determined what they saw and didn't see. One study participant said she used Facebook every day but never considered the possibility that an invisible hand selected what rolled through her feed.

"It's kind of intense, it's kind of waking up in 'The Matrix' in a way," she said.

Karahalios' groundbreaking study was conducted alongside her other work introducing the idea of auditing the algorithms that are increasingly being employed by social media platforms.

That concept caught the attention of the Obama White House, which issued a report in 2016 on Big Data and Civil Rights naming algorithm audits as one of five national priorities.

But it hasn't been that long since a CS researcher would have had a tough time getting someone to pay attention to or publish social media research.

"Starting out studying social media 20 years ago, it was challenging to publish work. It wasn't seen as a hardcore research area, despite the fact that there had been decades of research on telephone communication, mass media, etc.," Karahalios said. "After the popularity of Facebook in 2004, it felt as if overnight, the area became important." ▶

## SOCIAL MEDIA USE AMONG U.S. INTERNET USERS

79%

FACEBOOK

32%

INSTAGRAM

29%

LINKEDIN

24%

TWITTER

Source: Pew Research Center



**“Ultimately, I am interested in communication and how technology mediates it.”**

CS PROFESSOR  
KARRIE  
KARAHALIOS

That importance has only grown since then. During the 2016 U.S. presidential election and in the months since, politicians, academics, and others have argued over whether heavily slanted or sometimes fabricated news stories propagated through social media—or the insistence at times that real stories were “fake news”—influenced the election.

Computer science drives social media platforms, but, as Karahalios points out, the field of social computing emphasizes the study of both the technology and how it impacts society. So CS @ ILLINOIS research isn’t focused just on the programming that runs platforms like Facebook, Instagram and Twitter, but on how they affect their billions of users.

While Karahalios has focused on social media’s impacts and the degree to which its users understand them, CS Professor Wai-Tat Fu is developing a bot that uses virtual chats with users to check up on their mental health. Robert Deloatch (CS PhD ’17), focused some of his research on the possibility that social media could be used to ease the stress that students feel when they face an exam.

Facebook is the king of social media platforms: Almost 68 percent of American adults use it, and 76 percent of those users do so every day, according to a Pew Research Center report released in November 2016. Other popular platforms have smaller but still-significant levels of use: 28 percent use Instagram, 25 percent LinkedIn, and 21 percent Twitter.

Karahalios’ work wasn’t just focused on how little Facebook users knew about the algorithm or its role. She wanted to find out more about how that knowledge might affect how they saw Facebook and used it.

All of that fit well with the themes of her research. “Ultimately, I am interested in communication and how technology mediates it,” she said, explaining how an early experience with a piece of groundbreaking technology – a browser developed at the University of Illinois -- helped point her in that direction.

“I was lucky enough to see one of the first videos playing in a Web browser,” Karahalios said, recalling her time as a student at the Massachusetts Institute of Technology. “The team had managed to play clips from the David Letterman show in the Mosaic browser. I believe I slowly became interested in the endpoints of the network over time, how people engaged with the interface, and especially how people communicated over the interface.”

Karahalios has continually found surprises. In the 2015 paper, some users saw Facebook’s algorithm and the manipulation of what appeared in their feeds as acceptable, the tradeoff for using a service that charges them nothing.

“I feel like I’m a mouse, a little experiment on us. To me, that’s the price I pay to be part of this free thing,” one study participant said.

But Karahalios also found that, even if the revelation that Facebook decided what they would see in their feeds

# Most social media users only wanted limited information about the engine that was driving what was displayed.

annoyed or angered them, most social media users only wanted limited information about the engine that was driving those decisions.

“It turned out people didn’t care about the guts of the system—they didn’t want to know the 700-plus features in the machine-learning algorithm,” Karahalios said. “Instead, they wanted a high level overview about how their actions (e.g., page views, clicks, comments, etc.) affected what they saw on their feed.”

And in the end, a large number of study participants came to appreciate the algorithm as a useful filter on a gushing stream of information.

Since the uproar over the role social media played in last year’s election, Karahalios believes people have become more aware of the selective way in which information is fed into social media feeds. And she believes her idea for algorithm audits has even more relevance.

“We need to create reliable and objective algorithm audit tools, to detect bias in algorithmic social media systems,” she said.

## THE VIRTUAL THERAPIST IS IN

While Karahalios focus’ includes potential downsides of social media, its reach and the degree to which many people make it a regular part of their lives have led other CS @ ILLINOIS researchers to focus on how to use it to improve mental health.

Mindbot is a prototype of a social media-based virtual therapist, created by Professor Wai-Tat Fu and graduate student Pingjing Yang.

Fu and Yang set out to help fill what the federal government’s National Center for Health Workforce Analysis believes is a looming shortage of mental health professionals, and to ease the cost of what can be expensive treatment. Psychotherapy can cost \$150 an hour or more.

Mindbot relies on some of the same advances in natural language processing and machine learning that now allow some call centers to use virtual agents.

But rather than communicating by phone call, Mindbot relies on Facebook Messenger’s chat function. The virtual therapist might open with a simple question about how the patient is feeling and then go from there, responding more specifically as the patient offers details about what problems they might be having. Mindbot also tracks patients’ moods over time.

Fu told the Institute of Electrical and Electronics Engineers that, to his surprise, “People have expressed (that) they prefer chatting with a bot more than a real therapist.”

The project is still a work in progress, but Mindbot is being improved through feedback from human therapists on what they say in given situations. Mindbot also could eventually include video chatting that could allow it to read visual cues from patients’ body language.

## EASING ANXIETY BEFORE THE TEST

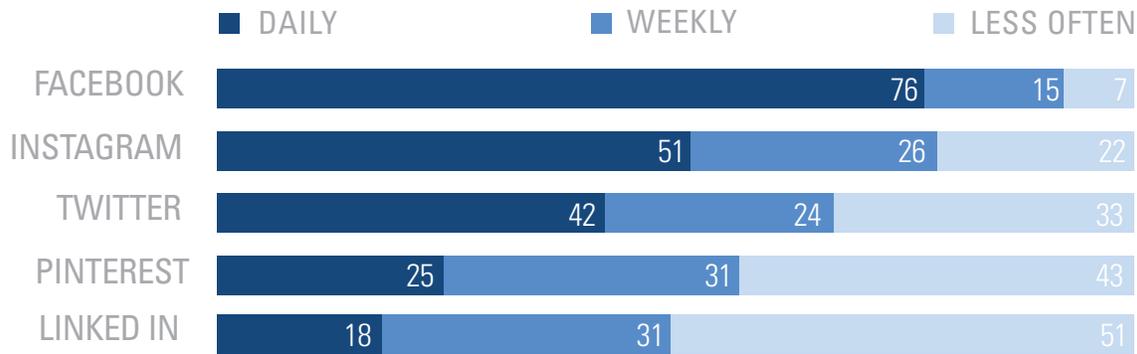
Robert DeLoatch didn’t have to look far to find visible signs of anxiety—high anxiety is, of course, a part of college life for many students, particularly ahead of tests.



**“People have expressed (that) they prefer chatting with a bot more than a real therapist.”**

CS PROFESSOR  
WAI-TAT FU

## AMONG USERS OF EACH SOCIAL NETWORKING SITE, % WHO USE THESE SITES...



Source: Pew Research Center

But could something as simple as a quick, positive instant message, or even a virtual “like” or two, ease some of that pretest anxiety? Deloatch’s research suggests they could.

The results of his study, published earlier this year, found that undergraduates with high test anxiety saw their anxiety levels reduced by an average of 21 percent after they received positive messages of encouragement. They performed as well on tests as students with low anxiety.

Deloatch says that he wasn’t a particularly high-anxiety student before he earned his PhD in August. But he pursued the subject after reading about how social media has been used to reduce stress in other situations.

He says he is a regular Facebook user, and his findings have changed his own social media use a bit.

“Now I am more comfortable asking for support from my network, especially before big presentations,” said Deloatch, who now works as a researcher and engineer for Apple.

But he points out that it wasn’t social media itself that drove his research—he wanted to find a way to help other people reduce anxiety, and social media just happened to be a tool that worked.

“I think social media has its pros and cons, even within context of being used as an anxiety reduction tool,” he said. “We have to consider how repeated use of this approach might lead to dependencies, or reduce the effectiveness of the messages or even strain the relationship between the sender and recipient.”

The contradictions inherent in social media and the many ways it can be used are readily apparent to researchers.

Karahalios, for instance, says she uses some platforms daily—Reddit and Slack. But Facebook and Twitter she tends to use only when someone sends her an email pointing out something interesting.

“With those two, I worry that I may sometimes go to the site and not feel time going by,” she said, citing a time drain that many users may find familiar. “At the same time, I find the serendipitous posts amazing catalysts for unexpected conversation, which is like finding hidden treasure.”

**“Now I am more comfortable asking for support from my network, especially before big presentations.”**

ROBERT DELOACH (CS PHD '17)



# ThinkChicago Roadshow Pitches City to Student Tech Talent

BY LAURA SCHMITT

Last spring, scores of CS and other Illinois students packed Siebel Center to hear a pitch from successful entrepreneurs and Mayor Rahm Emanuel about Chicago's tech ecosystem.

The ThinkChicago Roadshow, which continues to make additional stops at top universities nationwide, is designed to convince technology graduates to establish their careers and start their businesses in Chicago.

Illinois alumnus Mark Tebbe (BS CS '83) moderated the discussion between panelists Chris Gladwin, founder of Cleversafe and Ocient; Matt Maloney, CEO of GrubHub; Julie Novack, founder of PartySlate; Rohit Pasam, CEO of Xaptum; and Mayor Emanuel.

"In order for Chicago to become a great entrepreneurship center, we need to have great talent, and that great talent is at UIUC," said Tebbe, the chairman of ChicagoNEXT, World Business Chicago's council of technology leaders who promote the city's economic growth and opportunities.

According to Emanuel, Chicago's tech scene has grown since his last visit in 2012, with \$1.7 billion raised in venture capital funding last year alone, including 99 companies that raised \$1 million or more. The city also has the most diverse economy in the country, not tied to a specific sector like other cities, Emanuel said.

"As you're making your plans and you're thinking about where you want to branch out, I want you to see the



city of Chicago and what's happening today as a real opportunity to put your roots down," he told the students.

Novack, who started her company after spending 20 years in the digital advertising space, touted the city's supportive entrepreneurial community. "People go out of their way to help," she said.

"You can hire a level of talent that's significantly above what you can get anywhere else, and the talent tends to stay," Gladwin said. "You can build teams of people that become genuine friends and have a discipline of knowledge that's second to none."

Following the presentation and discussion, the students attended a job fair featuring twenty-eight Chicago companies.

CS @ ILLINOIS student and administrative leaders met with Emanuel and the team prior to the event, sharing some education and research highlights like the new virtual reality lab in Siebel Center, run by CS Professor Steve LaValle. Emanuel also toured the Department of Electrical and Computer Engineering and the university's Research Park, meeting with CS Professor Brighten Godfrey, whose company Veriflow Systems is the top VC-funded startup at the Park's EnterpriseWorks.



# HackIllinois: A Hack With a Twist

BY LAURA SCHMITT



Known as one of the biggest and best collegiate hackathons in the nation, this year's HackIllinois drew more than 1,100 students from around

the country. It was the first collegiate hackathon to focus on developing the open-source community.

Open source refers to the practice of sharing code so programmers can use, modify, and improve software that is free and publicly available. Technologies like the Linux operating system and the Apache web server are examples of open-source software that billions of people use almost anytime they access the Internet.

According to HackIllinois Outreach Director Nikitha Gajula, 30 teams worked on projects in the Contribute track, where

they were mentored by dozens of industry mentors from the event's nearly 40 sponsor companies. "The students in this track contributed to an existing open-source project," Gajula said. "Nearly 90 teams competed in the Create track, where they created a brand new open-source project that others can build upon after the event."

Sponsors included Fulcrum-GT, Microsoft, Google, and Facebook, said HackIllinois Director Arnav Mishra. In addition, participants could learn more about open-source projects and specific technology at a series of industry panel discussions, workshops, and keynote presentations.

Keynote speakers included Karl Fogel, author of Producing Open Source Software; Jean Baptiste-Kempf, founder and CEO of VideoLAN; Jessica McKellar, director of engineering at Dropbox and a Forbes 30 Under 30 honoree for 2017; and Jay Freeman, creator of Cydia and a pioneer of jailbreaking iOS technologies.

## CS @ ILLINOIS ICPC Team Tests Problem-Solving Skills

BY DAVID MERCER



The five hours that students had to complete their work at this year's International Collegiate Programming Contest were winding down and the team from CS @ ILLINOIS was stuck.

Working alongside 127 other teams in Rapid City, South Dakota, the team had finished just two of a possible dozen problems and was stalled on one related to the "posterize" feature included in many photo-editing programs, team member Yewen Fan said.

So they divided up the work – Fan bored in on the troubling problem, while his teammates, Yuting Zhang and Tong Li, moved on to another. They solved both, giving them a tie for 56th place in the Association for Computing Machinery's worldwide competition. Some teams don't solve any problems, and it was the best finish for a CS @ ILLINOIS team since 2009.

The problems are intended to be fun, but also difficult: How would you, for example, help a tiny island nation fit the longest possible runway across its limited land mass to jet in tourists?

The coaches – PhD students Uttam Thakore and Jingbo Shang, and Teaching Professor Mattox Beckman – believe the 2017 team improved the system for qualifying CS @ ILLINOIS students. "We're trying to move to a model where it's like an actual sport – you have to come to practices, we have tryouts," Beckman said.

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**Have questions or want to join? Contact coaches  
Mattox Beckman ([mattox@illinois.edu](mailto:mattox@illinois.edu))  
or Jingbo Shang ([shang7@illinois.edu](mailto:shang7@illinois.edu)).**

# Chambourova and Khandekar Named Knights of St. Patrick

BY LAURA SCHMITT

Two years ago, CS senior Sujay Khandekar attended the Knights of St. Patrick awards ceremony to see his friend Matthew Dierker (BS CS '15) receive the College of Engineering's highest student honor. "Matthew told me then that he expected to see me on the stage someday," Khandekar recalled.

Last spring, Khandekar was inducted with fellow CS senior Dana Nikolaeva Chambourova and eleven other engineering students as Knights of St. Patrick, an honor that recognizes leadership, excellence in character, and exceptional contributions to the College and its students.

Khandekar has played a key role in several CS student-run events. As a sophomore, he served as sponsorship director for the second annual HackIllinois, helping raise more than \$200,000 for the popular 36-hour programming and networking event that attracted more than 900 students from dozens of schools in 2015.

In 2016, he co-chaired the Association for Computing Machinery's (ACM's) annual Reflections | Projections tech conference, which also includes a puzzle competition, two job fairs, and an artificial intelligence hackathon. Not only did Khandekar organize and motivate a staff of more than 30 fellow CS students, he helped recruit industry speakers and build the conference's registration and logistics software platform.

Khandekar primarily got involved with these events through the ACM student organization, which he led as chair for a year (2015-16). "It's fun to stay involved," said Khandekar, who will graduate in May 2018 with BS and MS degrees. "I want to inspire [my fellow students] to keep doing good work, and I hope I'm an example to others about what's possible."

Chambourova had a huge impact on students across the entire College through her four-year involvement with the Engineering Employment Expo, one of the largest student-run career fairs in the country. Not only does the Expo help students find jobs and internships, it raises money to support many engineering student organizations and activities.

She served Expo in a variety of leadership roles from year to year, including as director. Her team of nearly two dozen students organized fairs that attract more than 500 companies and 3,000 students. She also led the Expo team in developing a new registration system that better facilitates interactions with students, and she helped refocus the team's mission so the event would be more student focused.

This past year, Chambourova used her Expo experience to help organize Reflections | Projections conference and job fairs, interacting with companies and managing registration and logistics.

"I'm passionate about career fairs—I think they're amazing," said Chambourova, who has started as a software engineer at Flexport, a freight forwarder and customs broker start-up company. "I've also found some of my best friends in school by working on the Expo."



Sujay Khandekar



Dana Nikolaeva Chambourova

## Illinois Researchers Build Dropbox-like Storage, Analytical System for Scientific Data

BY KIM GUDEMAN, COORDINATED SCIENCE LAB



Klara Nahrstedt

Studies suggest that it can take up to 20 years from the discovery of new materials to the fabrication of new and next-generation devices based on these materials. The delay is due in part to the time it takes to conduct research, thanks to slow data processes, and to the loss of knowledge that occurs when vital information is tossed out or inaccessible to researchers who seek to build upon earlier work.

Illinois researchers are looking to speed up the materials-to-device process through a novel framework called “4CeeD: Real-Time Data Acquisition and Analysis Framework for Material-related Cyber-Physical Environments.” 4CeeD connects microscopes and other scientific instruments to a cloud infrastructure through a high-speed University of Illinois campus network. The interface works much like Dropbox – with easy drag-and-drop uploading – but offers much more advanced data management, annotation, and analytics capabilities, along with a higher level of semantic understanding.

“We have developed a cloud architecture that makes it easy for scientists to not only upload their data, but also curate and manage the data, as well as get real-time search results,” said Principal Investigator Klara Nahrstedt, the Ralph and Catherine Fisher Professor of Computer Science and director of the Coordinated Science Laboratory (CSL). “4CeeD enables researchers to search for experiments with specific parameters and receive insights into their own work.”

The cloud is private and secure, and has strong access controls, says Nahrstedt, giving groups complete authority over who sees their data. In addition, the research team is creating a mirror storage system to keep back-up data

in the event one server fails. The system will eventually be maintained by the College of Engineering’s information technology group.

4CeeD recently won Best Paper at the 17th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing. The paper’s authors include Phuong Nguyen, a CS PhD student, plus programmers Steve Konstanty and Todd Nicholson, along with other researchers from CSL, the Micro and Nanotechnology Laboratory, Materials Research Laboratory, and the National Center for Supercomputing Applications. The work is funded through a Data Infrastructure Building Blocks grant sponsored by the National Science Foundation.

Nahrstedt hopes to extend 4CeeD’s research to other universities and labs in the future. The software is already available on GitHub and is being stress-tested by the National Institute of Standards and Technology.

**“We have developed a cloud architecture that makes it easy for scientists to not only upload their data, but also curate and manage the data, as well as get real-time search results,”**

**—CS Professor Klara Nahrstedt**

# Higher Mass Transit Use Associated With Lower Obesity Rates

BY LIZ AHLBERG TOUCHSTONE, ILLINOIS NEWS BUREAU

Healthy mass transit systems could contribute to healthier communities, according to a new study by University of Illinois researchers that determined higher mass transit use was correlated with lower obesity rates in counties across the United States.

"As local communities seek to allocate public funds to projects that will provide the most benefit to their residents, our research suggests that investing in convenient and affordable public transit systems may improve public health by reducing obesity, thereby providing more value than had been previously thought," said CS Professor Sheldon H. Jacobson. He conducted the study with graduate student Zhaowei She and Douglas M. King, a lecturer of industrial and enterprise systems engineering.

The study used publicly available county health and transportation data. To get the clearest picture of the relationship between mass transit use and obesity, the researchers controlled for a number of factors that could influence health or transportation, such as household income, poverty rate, education level, leisure physical activity and access to health care among the adult residents of each county.

"By viewing this link at the county level, we provide a national perspective by considering data from counties throughout the United States," King said. "Our research suggests that, in addition to benefits to the environment

and greater access to transportation for residents, community-level investments into public transit systems may also benefit public health by reducing obesity rates."

The analysis found that for each 1 percent increase in a county's population who frequently ride public transit, obesity rates dropped 0.2 percent. The study is published in the journal *Preventive Medicine*.

The latest findings correlate well with previous work by Jacobson and King that found a reduction in daily driving, even by a mile a day, was associated with a reduction in body mass index.

"The choice to ride public transit instead of driving can create an opportunity for physical activity," Jacobson said. "For example, when someone rides a bus, they may begin their trip by walking from their home to a bus stop before boarding the bus. Then, once they get off of the bus, they may still need to walk from a bus stop to their destination. Alternatively, if they had driven a car, they might simply drive directly from their home to their destination and eliminate the walking portion of the trip."



Sheldon Jacobson

# New Security Mechanism Aims to Guard Existing Real-Time Systems Against Cyberattacks

BY AUGUST SCHIESS, COORDINATED SCIENCE LAB

Technology processes with strict timing and safety requirements—from the operating mechanisms on your car (say, engine control or even anti-lock braking mechanisms) to unmanned aerial vehicle (UAV) controls—are called real-time systems.



Monowar Hasan

Due to the physical isolation and stringent safety requirements of real-time systems, they were considered immune from cyberattacks, yet recent attacks have highlighted their vulnerabilities.

In response, CS PhD student Monowar Hasan, advised by Research Assistant Professor Sibin Mohan, has developed novel methods to integrate safety algorithms within these systems without interrupting normal behavior.

Hasan's efforts were recognized with a Best Paper Award at the Real-Time Systems Symposium (RTSS), the top conference for this field. CS alumnus Rodolfo Pellizzoni (PhD CS '10), now with the University of Waterloo, and Assistant Professor Rakesh Bobba, from Oregon State University, collaborated on this work.

"Real-time systems are increasingly connecting and syncing to the Internet, which makes it easier to communicate between devices, but because of that, there are more sources of vulnerability and more chances for cyberattackers to intrude," said Hasan.

A well-known security attack on real-time systems—from a virus called Stuxnet—targeted automation like assembly factory lines or power plants. In 2010, it caused substantial damage to Iran's nuclear program by targeting the real-time systems that controlled the automation of the centrifuges separating nuclear material. Researchers have also demonstrated attacks against other real-time systems, such as the hacking of cars while on a highway.

Real-time systems often operate under time and safety constraints and automate processes that happen at the millisecond scale, not to mention limited computing power and memory. Malware can infiltrate within those tiny spaces. To create safety measures, Hasan had to work within those same constraints.

"The biggest challenge was timing and resource constraints, while trying to maintain the safety of the system," said Hasan. "So what we implement has to do be done efficiently and within the limited computational capabilities of the system."

His solution can work seamlessly with existing systems and does not interfere with the expected behavior of the system.

The safety measures, detailed in the paper, "Exploring Opportunistic Execution for Integrating Security into Legacy Hard Real-Time Systems," are being integrated now as prototypes. The team is conducting further testing, and they aim to make it more robust and adaptive to provide greater security based on varying cyberattack situations.



Sibin Mohan



*Autonomous Vehicles in AI (CS 598) was taken by 35 students. One group programmed a car to detect the distance to a stop sign using video taken from inside the vehicle, and then stop it in the right place.*



## Class Gives CS Students a Chance to Program an Autonomous Vehicle

BY MIKE KOON, COLLEGE OF ENGINEERING

David Forsyth couldn't image 30 years ago that his career in academia would involve standing in front of a moving driverless vehicle with a traffic cone on his head. However, this spring that's what the professor of computer science did as part of his course on artificial intelligence.

The class, Autonomous Vehicles in AI (CS 598), was the result of collaboration between Forsyth and Bobby Hambrick, CEO for AutonomouStuff, a Morton, Ill., based company that supplies research platforms for autonomous vehicles around the world.

The course, taken by some 35 students, included the usual mixture of lectures and reading, but a major component was writing software to be used on AutonomouStuff vehicles. The projects used a variety of standard technologies, including Yolo, a state-of-the-art real-time object detection system.

"Over the last 15 years or so, there have been absolute revolutions in computer vision, which are solving a lot of problems that were unsolvable 30 years ago," Forsyth said. "Now we're very good at detecting objects in images and video and classifying them. What that means is we can start figuring out how to use these as tools. A natural tool is a pedestrian detector."

AutonomouStuff invested heavily in time and its resources of autonomous vehicles to make the class happen, but in Forsyth's estimation, the experiment was a big success. "We're hoping that some of the technologies developed in class are going to help them in the internal development processes, either as proof-of-concept or guidelines," Forsyth said.

Forsyth's team is just one of a handful of similar projects coming out of University of Illinois research labs. Tim Bretl, an associate professor in aerospace engineering, for example, is working on autonomous cars in "smart" agriculture through a grant from the NSF's National Robotics Initiative. Shubhankar Agarwal, an undergraduate in computer engineering, is part of a student team that is building controls for autonomous submarines.

While Forsyth couldn't have imagined what was possible 30 years ago, he hesitates to make bold predictions about the future of autonomous vehicles.

"I don't think we will see large number of autonomous cars anytime soon," he surmised. "What I believe we are going to see are cars that are safer and easier to drive because of neat add-ons. They could regulate your speed more effectively; have better detection technology (such as spotting impaired drivers or pedestrians), and better avoidance technology. Hopefully that means fewer serious injuries and mortalities from motor cars."



David Forsyth

# Celebration of Excellence

## Faculty & Student Awards



Each semester, CS @ ILLINOIS honors faculty & staff who have received important distinctions. We extend congratulations to these individuals whose hard work is a credit to themselves and a source of pride for the department.



A third-year PhD student, **Monowar Hasan** has already published 4 papers at Illinois, including a paper that won the Best Student Paper Award and Outstanding Paper Award at IEEE RTSS 2016, the top conference in real-time systems. His work is focused on better integrating security into real-time systems.

### Graduate Fellowships & Awards

C.L AND JANE W.-S. LIU AWARD  
Monowar Hasan

C.W. GEAR OUTSTANDING  
GRADUATE STUDENT AWARD  
Motahareh Eslamimehdiabadi

FENG CHEN MEMORIAL AWARD  
Hoang Vu Dang  
Monowar Hasan  
Farnaz Jahanbakhsh  
Daejun Park  
Uttam Thakore

FENG CHEN MEMORIAL AWARD  
IN SOFTWARE ENGINEERING  
Wajih UI Hassan  
Owolabi Legunsen

GRADUATE STUDENT OUTSTANDING  
AMBASSADOR AWARD  
Michael Robson

GRADUATE STUDENT OUTSTANDING  
SERVICE AWARD  
Jason Rock

OUTSTANDING TEACHING ASSISTANT, FALL 2016  
Daniel Calzada  
Chase Geigle  
Huan Gui  
Steve Lee  
Patrick Lin

CS @ ILLINOIS OUTSTANDING  
TEACHING ASSISTANT AWARD  
Long Pham

SLOAN SCHOLAR  
Pedro Bello-Maldonado

STATE FARM COMPANIES FOUNDATION  
DOCTORAL SCHOLAR  
Casey Hanson  
Wing Lam  
Chao Xu

THOMAS M. SIEBEL FELLOW  
Hassan Eslami

### Undergraduate Scholarships & Awards

C.W. GEAR OUTSTANDING  
UNDERGRADUATE AWARD  
Robert Andrews  
Zifeng Huang

CROWE HORWATH LLP OUTSTANDING JUNIOR  
COMPUTER SCIENCE SCHOLARSHIP  
Daniel Johnson

DUNCAN H. LAWRIE STUDENT LEADERSHIP AWARD  
Nicholas Kortendick

HARVEY H. JORDAN AWARD  
Nishad Phadke

DUNN SYSTEMS SCHOLARSHIP IN  
MEMORY OF ARTHUR R. DUNN  
Daniel Johnson



Established by AVANT! Corporation in honor of **Professors C. L. (Dave) Liu and Jane W-S. Liu**, the Liu Award is given in support of a graduate student showing exceptional research promise relatively early in their graduate studies. Dave Liu is recognized as one of computer science's most prominent educators. As a researcher, he is best known for developing the rate-monotonic scheduling algorithm (1973), the theoretical basis of modern methods and tools for predicting the timing behavior of multiprogrammed real-time systems. Jane Liu is a renowned researcher in real-time systems. In 1993, she developed PERTS (Prototyping Environment for Real-Time Systems), a commercially successful system of analysis, validation, and simulation.

IBM WCS SCHOLARSHIP  
Manasa Sanka

ICCP JAMES N. SNYDER MEMORIAL AWARD  
Harshit Agarwal

JAMES N. SNYDER AWARD FOR SCHOLASTIC ACHIEVEMENT  
Laurel Chamberlin  
Ada Rosa

JEFFREY P. BLAHUT MEMORIAL SCHOLARSHIP  
Tingting Cai

JOHN R. PASTA AWARD  
Paige Kordas  
Qiwen Wang

JP MORGAN CHASE WCS SCHOLARSHIP  
Shannon Strum  
Pooja Welling

KNIGHTS OF ST. PATRICK  
Dana Chambourova  
Sujay Khandekar

SENIOR 100 HONORARY  
Arnav Mishra

DEAN'S AWARD FOR EXCELLENCE IN RESEARCH  
Karrie Karahalios

GOOGLE FACULTY RESEARCH AWARD  
Ranjitha Kumar

IEEE TCDE EARLY CAREER AWARD  
Aditya Parameswaran

ISCB FELLOW  
Tandy Warnow

MICROSOFT RESEARCH OUTSTANDING COLLABORATOR  
Tao Xie

NCSA FACULTY FELLOW  
Jian Peng

NSF CAREER AWARD  
Andreas Kloeckner  
Aditya Parameswaran  
Jian Peng

R&D 100 AWARD  
Paul Fischer

## Faculty & Staff Awards

AAAS FELLOW  
Josep Torrellas

ACM SIGIR PRE-2002 TEST OF TIME AWARD  
ChengXiang Zhai

ACM-IEEE COMPUTER SOCIETY KEN KENNEDY AWARD  
William Gropp

AD ASTRA AWARD  
Grigore Rosu

ASE MOST INFLUENTIAL PAPER AWARD  
Grigore Rosu

CAMPUS AWARD FOR EXCELLENCE IN GRADUATE STUDENT MENTORING  
Josep Torrellas

COLLINS AWARD FOR INNOVATIVE TEACHING  
Wade Fagen-Ulmschneider



## Support CS Students

Many of these awards were established by generous donations from alumni and corporate partners. Please consider making a gift to support CS students.

## Double or Quadruple Your Gift

There is no better time to invest in student scholarships to take advantage of leveraging the [Grainger Matching Challenge](#) as well as [matching funds from your employer](#). For full details, please see page 29.



## Malwarebytes CEO Marcin Kleczynski Pays It Forward, Impact Doubled By Grainger Match

BY DAVID MERCER

Kleczynski's donation reflects the culture of generosity he discovered as a teenager as he looked for a way to salvage his family's computer.

Malwarebytes CEO and founder Marcin Kleczynski (BS CS '12) has given a major donation to establish a named endowment supporting the Computer Science Visionary Scholarship Fund as part of the Engineering Visionary Scholarship Initiative.

The initiative was started in 2013 to recruit bright, highly motivated students to Illinois with large renewable scholarships. The new Grainger Matching Challenge goes further, doubling Engineering scholarship endowment gifts up to \$25 million. Kleczynski's gift is one of the first major donations to qualify.

Kleczynski, who is 28 and only a few years removed from CS @ ILLINOIS, says he decided to make the donation to help pave a way to the campus for entrepreneurially minded students, driven in part by his experience.

Malwarebytes has more than 500 employees and offices in four countries, but Kleczynski came to the University of Illinois from the Chicago suburbs unsure how he would pay for his education.

"I grew up in Bensenville to a middle-class family that definitely couldn't afford to pay for my schooling and yet I didn't qualify for financial aid," he said. "I got lucky and Malwarebytes started taking off my freshman year of school."

Kleczynski's story is a good one – 14-year-old infects the family computer with a virus while searching for video games, then, with help, fixes the problem, sparking a hobby eventually turned into a startup with hundreds of millions of users.

Kleczynski and current Vice President for Research Bruce Harrison founded the company while Kleczynski was in high school, and he ran it for a time from his dorm room. On campus he found people who understood the demands on him.

“My time on campus was phenomenal, but I was skeptical that the university would understand my position – running a several-hundred-person company out of a dorm room,” he said. “Near my senior year, things started heating up and I needed to move certain exams due to work. The CS Department was extremely flexible and supportive.”

Kleczynski’s donation reflects the culture of generosity he discovered as a teenager as he looked for a way to salvage his family’s computer. People he met online were eager to help, and at no charge.

“That blew my mind. There were hundreds of people in this community that were spending their free time helping people like me fix their computer,” Kleczynski said in a TEDxUIUC talk during a visit back to campus in 2016. “To me they were heroes and I wanted to be one of those heroes.”

Now he sees his gift as a similar way to help, and follow the example of other generous alumni.

“I spent a lot of time in the Siebel Center for Computer Science. The building is an amazing resource for students and I would be happy to influence the Computer Science program just 10 percent as much as someone like Thomas Siebel has.”

## Double or Quadruple Your Gift

There is no better time to support student scholarships and to take advantage of the Grainger Matching Challenge and leverage matching funds from your employer.

### MAJOR GIFT

Your Scholarship Donation	<b>\$25,000*</b>
Corporate Match	<b>\$25,000</b>
Grainger Foundation Match	<b>\$50,000</b>

**Total Support for CS Scholarships** **\$100,000**

### ANNUAL GIFT

Your Scholarship Donation	<b>\$100</b>
Corporate Match	<b>\$100</b>
Grainger Foundation Match	<b>\$200</b>

**Total Support for CS Scholarships** **\$400**

\*Outright, or as a 5-year pledge

To find out if your company has a gift-matching policy, check with your employer’s HR office or search the UI Foundation database at: <http://uif.uillinois.edu/WaysToGive/MatchingGifts.php>



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[cs.illinois.edu/alumni](http://cs.illinois.edu/alumni)

September 2017: The popular CS-ECE Corporate Connection After Hours career networking event, which began in 2009 with 20 companies and ~300 students, has grown to building capacity on two floors of Siebel Center with 31 companies and ~1,500 students.



[cs.illinois.edu](http://cs.illinois.edu)