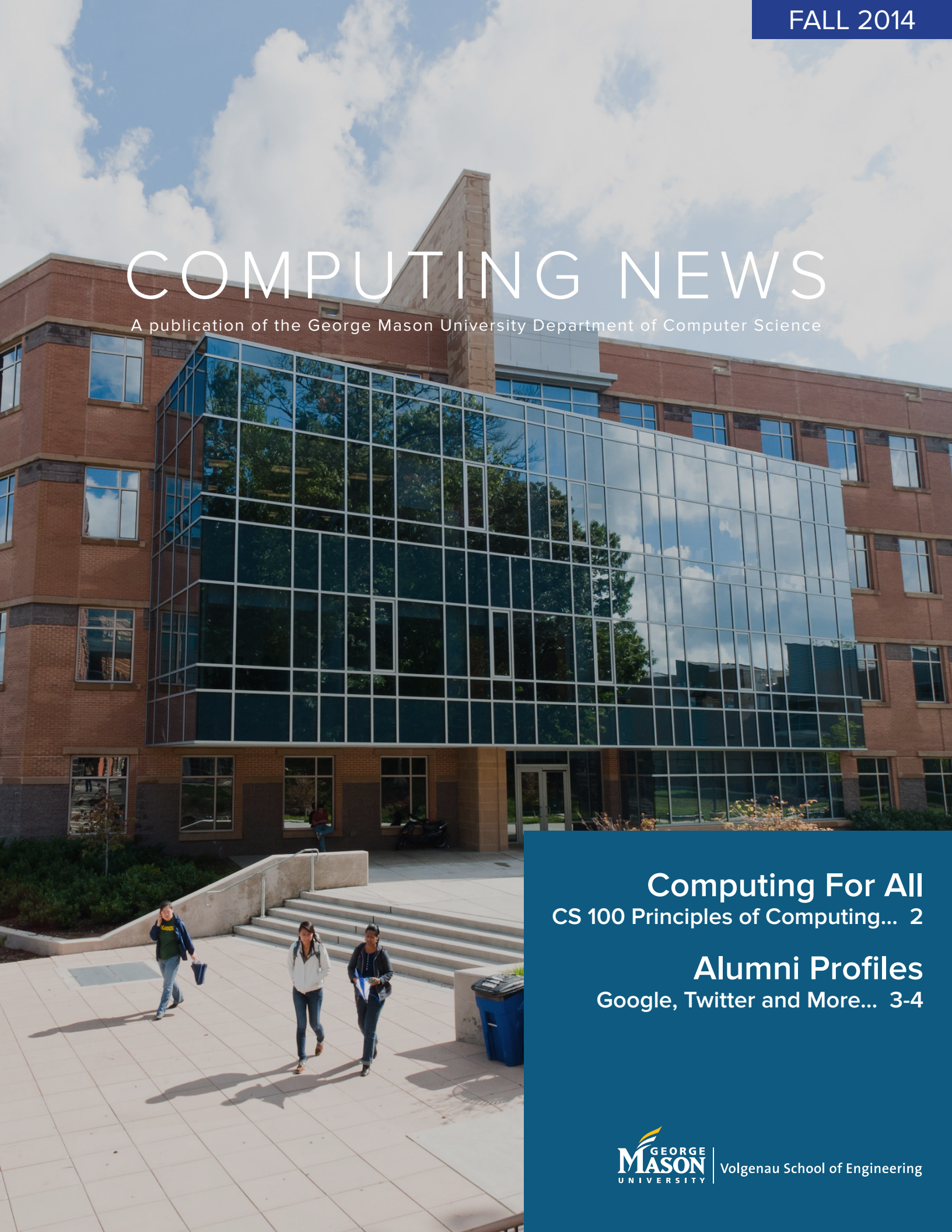
FALL 2014



COMPUTING NEWS

A publication of the George Mason University Department of Computer Science

GEORGE MASON UNIVERSITY | Volgenau School of Engineering

Message From
THE CHAIR

Welcome to the fall 2014 issue of the CS Department's newsletter.

This issue contains a profile of one of our distinguished alumni, Abdur Chowdhury, who was the Chief Scientist at Twitter before moving on to other pursuits. Abdur worked as a Graduate Assistant in my research group when he was a Masters student at Mason (way back in the 1990s!). As a faculty member, I can confidently state that there is no better feeling than to see your students go on to great success!

We want all our students to succeed and believe that in the 21st century, all college graduates, whether they are majoring in the sciences or in the arts or the humanities, should have a basic understanding of computational approaches to problem solving. Our newest course CS 100 (Principles of Computing), which is included in the Mason Core, is our latest effort in this direction. We are optimistic that this course will introduce students in all disciplines at Mason to the power of computing!

Our junior faculty continue to excel. We congratulate Sam Malek, Huzefa Rangwala, and Amarda Shehu, who have recently received the Mason Emerging Creator/Researcher Award. Each year, Mason selects three faculty members who show exceptional promise in their disciplines to receive this award. The CS department now has six faculty members who have been selected for this award since its inception in 2008 – more than any other department on campus!

In addition to the Emerging Researcher Award, Huzefa Rangwala also received a Mason Teaching Excellence award for 2014, thus becoming the third CS faculty member to receive a Teaching Excellence award in the last three years. (Tamara Maddox and Jeff Offutt received the award in 2012 and 2013 respectively).

Last but not least, this issue contains the second column of Computing Recreations by Dana Richards, who is our resident puzzle master. Enjoy!

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CS 100: COMPUTING FOR ALL

What happens when you use data mining techniques for medical research or apply game theory with a social science experiment on a developing nation's voting habits? The answer is quite a bit. The tools in the CS toolbox have powerful applications to affect change and provide solutions to anything in our modern society from arts and entertainment to finance and space exploration.

In response to this growing need, the Department of Computer Science has developed a new course, CS 100, Principles of Computing. The course, which fulfills the Mason IT core requirement, has been developed for non-CS students as a foundation class to introduce students to the power of technology. Additionally, students explore privacy and ethics as it relates to technology and how technology can power big ideas and solve problems.

Professor Chris Kauffman is teaching the inaugural class and says, "We once wanted students to be computer literate, essentially know how to use software. We've moved beyond that. Today it's important for students to understand how computers and technology can solve problems. We aren't asking these students to become programmers per se. But we do want them to know that many of the problems they will encounter professionally can be given to a computer scientist to solve. They need to speak the language of CS."

Associate Chair Pearl Wang has been instrumental in developing this new course along with Kauffman and Professor Dana Richards who will teach in the spring. She has shepherded it through the approval process and feels the timing is perfect. She explains that in 2016, there will be a new advanced placement (AP) exam for something similar to the computing principles class. "If we are going to accept college credit for a course of study, we need to offer an equivalent class."

Kauffman has been working to make the concepts relevant to students of all disciplines and for this first batch of 44 students, which includes business, theatre, English, and computer science majors. "I want them to think more about the technology around them. We've discussed Google bombing, drones, and the idea of self-driving cars."

"The future of CS is interdisciplinary," says Wang. "We also hope this class encourages more students to consider studying CS." As a bonus, enrollment is about 35% women, a nice development for a discipline working hard to bring in more under represented groups.

ALUMNI PROFILE

Abdur Chowdhury

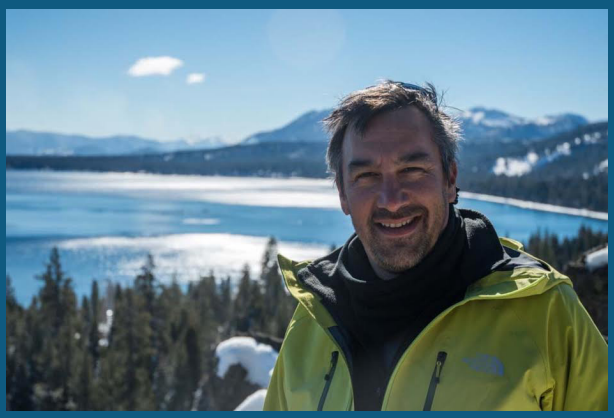
INFORMATION EXCHANGE ARTIST

Abdur Chowdhury is a man who isn't trying to change the world. He is trying to change the technology to allow the world to change itself. That may sound like a tall order but he's already doing it. His resume reads like a CS major's fantasy career path: chief architect at AOL and co-founder of Summize a search engine with the ability to crawl through listings identifying hot reviews and popular products found on blogs, YouTube, etc., and provide summaries and ratings. In 2008, Summize merged with a small start-up, Twitter. Chowdhury became the new company's Chief Scientist building the Search, Analytics and User Discover teams.

In a short time, as short as a tweet, Twitter transformed the social media landscape from the most intimate to the international. But what makes this Mason alumnus a technology leader goes beyond his CS education and business skills. It's more like an action plan. Chowdhury says, "I see the world as it could be, and I believe you should study technology to make the world a better place."

Chowdhury earned his BS and MS degrees at Mason and his PhD from the Illinois Institute of Technology. He chose Mason for reasons familiar to many students. Mason offered a solid CS program in a great location also close to home, and for Chowdhury, close to his girlfriend, who is now his wife. He enjoyed his studies and research and after completing his PhD taught for a while at Georgetown University. However, for him, academia was missing the connection of how technology affects real people's lives. He feels that education gives you theory and tools to investigate problems but misses out on the practical applications of technology to solve real world issues. Few academics actually build anything. He uses the Internet as an example explaining that the Internet is more than applications, "The Internet is about people."

Chowdhury's manner is measured and easy going. He's not into self-promotion. He wants his work and his accomplishments to speak for themselves. But there is a crackle of energy just below the surface and it sparks when he talks about his time at Twitter. He explains that the idea for Summize was based on a research idea that took off – the need to improve information retrieval and review. When the companies merged, Summize had five employees and Twitter had fifteen. The new company built so much momentum so fast some weeks they were realizing 100% growth. "Twitter was a place where everything you thought about was challenged. I loved the idea of thoughts flowing into real-time." He describes how the power of the new platform changed how we communicate. "The 2009 Hudson River plane crash was reported first on Twitter before the news media even knew. Something small became something transformative."



Abdur Chowdhury

The idea of using technology for transformation flows through him like a beacon. He predicts that as more and more people connect to the Internet, and we're talking billions not millions, that the exchange of thoughts and ideas will bring people together. "Humans are already a huge sensory network spread around the world. We are human cyborgs sharing instant information through content, photos, and sounds." And while that sounds like a sci-fi plot, Chowdhury sees cell phone technology as the way it will happen. "There are seven billion people on the planet and five billion of them have cell phones. Smart phone costs will continue to fall allowing people in developing parts of the world to connect to the Internet." He sees this as a merging of technology and people to build a new awareness.

Chowdhury's transformation message is steeped in his interest in technology but he has applied it to other causes. In 2010, he helped to found Alta Vista an independent elementary school (K-8) that is experienced based. "We use the concept of STEAM – science, technology, engineering, arts, and math." He started the school because he saw a need for his own child saying, "The schools in San Francisco were not that good but we love living here and wanted to stay. So we started the school and it has been growing ever since." Chowdhury also speaks to students at the other end of their studies, the newly minted CS majors. He urges them to think beyond their first jobs and to look at how they can apply their knowledge to something they love their entire career to do something powerful.

As for his next big technology product, the tech press is full of rumors of a stealth start-up called Pushd. Chowdhury laughs a bit matter-of -factly and says, "I could tell you all about it but it's most likely going to change." We'll have to wait and see. Hold on to your phone, most likely the news will come in the form of a tweet – or will it?

CS Alumni
GMU to **GOOGLE**

Sam Blasiak

Naeem Esfahani

SAM BLASIAK

If you have ever given more than a passing thought about how Google maps can know where you are, and help you navigate to even the remotest location in the country, the answer is data. Lots and lots of data. Behind that data is a team of computer scientist, like Sam Blasiak , a recently minted George Mason University CS PhD, who is working to analyze, organize, and synthesize that data into the most comprehensive consumer mapping application available.

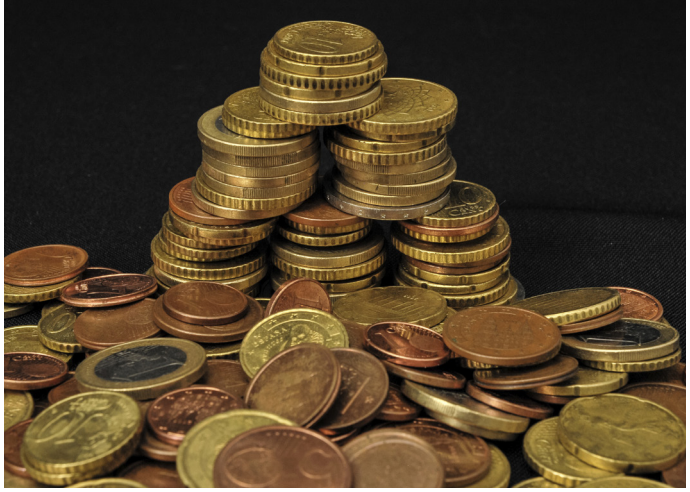
Blasiak is quick to explain that he has nothing to do with how the user sees and interacts with the application. He is officially a software engineer but his work is more like a data cartographer working behind the scenes on a portion of the application.

Google Maps is a fitting professional home for a person who has navigated his life through unexpected turns and destinations. Blasiak first earned a BA in English from Colorado College and then enlisted in the Army. While on active duty, he enrolled in an MS program at Brandeis University in Massachusetts. During his program, he was deployed to Afghanistan where he was an Army Gunner and driver. “My job involved interacting with the local Afghans, talking with them, drinking tea, and seeing how they lived.” From Afghanistan, Blasiak came to Virginia working in a variety of technical positions before enrolling in the PhD program at George Mason University. He received the GMU Presidential Scholarship that is awarded to only one PhD student per program in an admission cycle. His interest in machine learning led him to work with Professors Huzefa Rangwala and Kathryn Laskey and together they published several papers on data mining and machine learning. He gives credit to both Rangwala and Laskey for his success and to the CS Department for providing him with a challenging environment. And now his challenge is to help the rest of us find our way safely back home.

NAEEM ESFAHANI

Naeem Esfahani’s resume is the envy of any computer science major. While studying as an undergraduate at the University of Tehran, he received recognition as the top student in the school two years in a row and graduated as the top student of his class. While working for his Master’s in Computer Engineering at the Sharif University of Technology, he served as a designer, developer, and consultant for numerous Iranian software corporations. Today this Mason graduate is a software engineer at Google.

Esfahani came to America in 2008 to work on his PhD at Mason. “I never had a problem transitioning, it was rather easy for me,” he said. “The hardest part was not being able to see family and loved ones.” He worked closely with his advisor, Sam Malek, collaborating with him on numerous papers on self-adaptive software —software that alters itself in response to new conditions: “It’s hard for humans to keep all aspects of a large software system running, so we need to develop software that is responsible for itself to some extent; we need software that can monitor and adjust to new situations.” As he pursued his degree, he landed a coveted internship at Google. “Google is all about problem solving and innovation. You expose yourself to challenging problems all the time, which you have to prepare for.” As he rose through the program, he mentored other Mason students applying for Google internships, helping them to prepare for the rigorous demands of the industry. “I loved that time working with them and helping them to grow. I loved helping them to find their own path.” Esfahani received his doctorate this year and, after turning down offers for assistant professorships, now works as a full-time software engineer at Google’s California headquarters. “The only place I prefer over academia is Google. It is a company that innovates, and I find that fun.”



COMPUTING **RECREATIONS**

Interview Questions from the Sphinx

DANA RICHARDS

In the Greek legend of Oedipus and the Sphinx, the only way to survive an encounter with the Sphinx was to answer her riddle. Oedipus answered the riddle and lived to tell about it. In recent decades, there has been something similar happening in high-tech interviews. The interviewer might ask you a puzzle or two.

This is discussed in William Poundstone's book *How Would You Move Mount Fuji*?, subtitled "Microsoft's Cult of the Puzzle." These types of question are supposed to test your ability to question assumptions and see things in new ways. The "puzzles" may be open-ended, or so speculative that any answer is only good as the reasoning behind it. For example "If you could remove any of the fifty states, what would it be?"

Puzzles have been used in the past within IQ tests (which is arguably a bad idea), but an interviewer is looking for problem-solving skills, including the ability to propose ideas even for ill-posed problems. But what is subtle is how some puzzles test your ability to "think like a computer scientist." Consider this one:

Five pirates on an island have 100 gold coins. They divide the loot as follows: The senior pirate proposes a division amongst all the pirates and everyone votes on it. Provided at least half the pirates vote for the proposal they split the coins that way. If not, they kill the senior pirate and start over (with the same scheme using the senior surviving pirate). This continues until a proposal is accepted. If you are the senior pirate at the beginning what division would you propose? (All pirates are logical, greedy and want to live.) (p. 119)

Arguably this puzzle is much easier for computer scientists than the general public.

Can you see why? *Find your answer on page 7.*

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Faculty Awards

Congratulations to professors Huzefa Rangwala and Amarda Shehu, who are among this year's recipients of the **George Mason University Emerging Researcher Award**. This is the second year in a row that Computer Science faculty have received this honor. Last year, Sam Malek was one of the recipients of the award.

In addition to being recognized for his research, Professor Rangwala also received a **George Mason University Teaching Excellence Award** for 2014.

Congratulations also to Professor Danny Menascé for becoming **fellow of the IEEE**.

Center for Assurance Research and Engineering (CARE)

This past April, the CS Department experienced a boost in its computing power with the launch of a new research center, The Center for Assurance Research and Engineering (CARE).

CARE was founded by Angelos Stavrou, who co-chairs the new center with Duminda Wijesekera. Both are recognized information security experts. The Center also pulls in the research and skills of professors Daniel Barbara, a machine learning and data mining expert and Dan Fleck, a CS research professor who has been working closely with Stavrou on several DARPA-funded programs related to malware and intrusion.

The Center is located on the 4th floor of Research Hall.

RESEARCH **ROUNDUP**

The CS Department is one of the most research prolific departments at George Mason University. With funding from the National Science Foundation, the Department of Defense, and the Defense Advanced Research Projects Agency, to name just a few, our researchers are involved with the experimentation and testing of new technologies and solutions with broad applications across society. In this issue of CS News, we are presenting a snapshot of three of our many CS researchers and their current projects.

Autonomic Computing

Daniel Menascé stands out as one of the department's most involved researchers, with 230 technical publications and five books to his name. One of his enduring research interests is autonomic computing: the concept of computer systems that can manage themselves. Menascé says that he has been working on this for close to thirteen years and explains that IBM coined the concept of the autonomic computer in 2001. "When we look at complex search engines such as Google or ecommerce platforms like Amazon, it's essential that these systems have some level of automation." He explains an autonomic system has four dimensions: self-optimization, self- configuration, self-healing, and self-protection. He and his students are researching applications to cloud computing — virtual machines fielding ever-changing requests. If you consider an ecommerce platform such as Amazon there are "lots of moving parts." Each new request requires the system to change and it is not something humans can handle.

One of his applications of autonomic computing is in designing autonomic schedulers in the Hadoop environment. The research involves adapting schedulers to specific jobs and needs. Menascé's research is based on scientific analysis of systems, understanding how they are going to perform, and building models to make determinations on different options.

Menascé will also serve as the 2015 chair of the IEEE Cloud and Autonomic Computing Conference (CAC) to be held at MIT.

The Internet of Things

Robert "Bob" Simon, like many Mason researchers, has a lot of big ideas in his areas of research, namely networks and distributed systems. Simon is most interested in tiny things with big results — low power and lossy networks that are essential to sensors used in smart devices connected to the Internet. He explains that the term "the Internet of things" originally referred to RFID devices, tiny sensor tags used to store data and the potential these tags had to store data. Today, the concept has expanded and with the move to Internet Protocol version 6 (IPv6), there is seemingly limitless space for anything and everything to be connected. But tiny things still need to be powered and are limited by size.

One project, sponsored by the Department of Defense and the National Science Foundation, tests an ad hoc networking system. Simon explains that the sensor's ability to communicate and work together has applications for building automation and search and rescue, specifically where a GPS system does not work or any place without a base system. Simon is now testing low power sensors on the ground that can communicate with a UAV. He is working with Sean Luke on robotics and Hakan Aydin, who is researching power management. Simon reports success on the first tests and is continuing his project with a team of seven students.

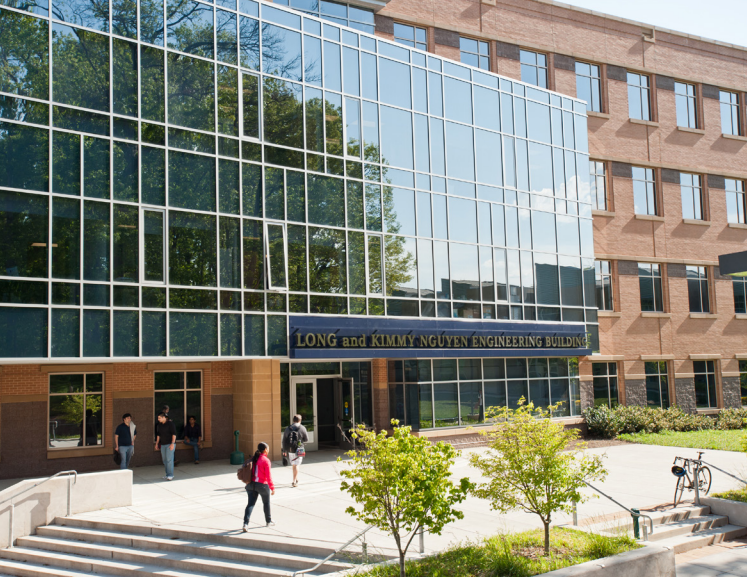
Real-Time Embedded Systems

Hakan Aydin's research focuses on real-time embedded systems, the systems that must deliver their services in a timely manner and that play important roles in safety-critical computer applications such as control and transportation systems. In particular, he is involved in research on power management and fault tolerance solutions for real-time embedded systems.

Aydin says that power management for computer systems was not a well-established research area even 15 years ago. But with the emergence of battery-powered portable systems, the situation has changed forever.

Systems need to implement tradeoffs to save power. One solution is to slow a system down. However, when a system slows, it risks missing critical deadlines. Another problem can be seen and felt with the growth of data centers housing thousands of servers. These computing farms produce a lot of heat that can compromise how the machines work. Solutions need to be developed to ensure that the systems continue to provide acceptable service given energy and temperature constraints.

Aydin's NSF-funded research is looking at developing fault tolerance solutions for real-time embedded systems. He is also working with Bob Simon on another NSF project to allow sensor networks to operate unattended for months thanks to the energy-harvesting technologies.



WELCOME NEW TEACHING FACULTY

ASSISTANT PROFESSOR JOHN OTTEN

John Otten had a plan: teach music at public schools, and then transition into college band conducting. He earned a Bachelor's of Music Education and a Master's in Music Theory but was unable to find a job, he had to adjust. "I supported myself for several years by performing. Eventually, I obtained several public school teaching positions, but the environment was not what I expected, and I had already begun considering alternative careers." Fortunately, the lifelong Virginia resident had another talent up his sleeve: computer science. "Computers had always been an interest of mine. Graduate school in Computer Science seemed like a natural way to go once I considered something other than music."

In 1992, he earned an MS in Computer Science and worked as a Software Engineer at General Dynamics in Fairfax in automotive network protocols and GSM and cellular technology. He also served as an adjunct professor of Computer Science at Mason before joining as a full-time Term Faculty Member this year. "Most of the students who graduate with CS degrees will be working in the industry, and I have the opportunity to give them first-hand knowledge about what they can expect."

Otten is teaching C Programming and Computer Ethics and Society, which allow him to combine his real-world experience with the theoretical concerns of the classroom. He hasn't given up his love of music though. In his earlier graduate work with Mason professor Tamara Maddox, he helped program an evolutionary algorithm that can create musical chorales according to the rules of 18th century harmony. "We published a paper, which appears to have been well received by later researchers. If possible, I would like to expand on that work, since it is an interesting way for me to combine my expertise in music theory with computer science."

ASSISTANT PROFESSOR YUTAO ZHONG

"The first semester back is really crazy," says Assistant Professor Yutao Zhong, and with nearly 500 students in her CS 112 class, Introduction to Computer Programming, it's easy to understand. But Zhong is handling it in stride and with experience. She first taught in the CS Department in 2010 and then took a few years off to raise two sons now ages three and six. Zhong received a PhD degree and an MS in Computer Science both from the University of Rochester, and an ME and a BS degree in Computer Science from Nanjing University, China. She specializes in programming and computer systems with research interests focused on program analysis and optimization, compilers, performance monitoring and modeling, and programming languages.

Zhong is happy to back on campus and is impressed with how the university has changed as well as the increase in the number of undergraduates.

Computing Recreations Answer: Suppose the pirates are numbered by increasing seniority. Pirate 5 offers pirate 4 nothing, pirate 3 one coin, pirate 2 nothing, pirate 1 one coin, and keeps 98 coins for himself. This will receive 3 votes!

COMPUTING NEWS

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5 Postdoctoral Researchers

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$5M fiscal year 2014

Faculty **AWARDS**

10 NSF Career Awards

1 AFOSR Young Investigator Award Recipient

2 ACM Fellows

3 IEEE Fellows

1 IAPR fellow

PROGRAMS

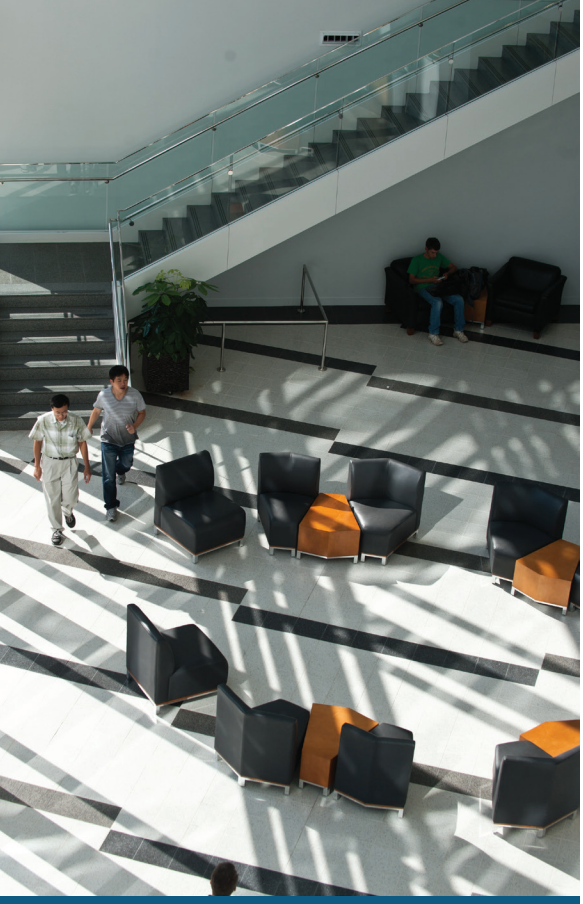
BS in Computer Science, BS in Applied Computer Science with concentrations in Bioinformatics, Computer Game Design, Geography, & Software Engineering

MS in Computer Science, MS in Information Systems, MS in Information Security, MS in Software Engineering

PhD in Computer Science

Students

Undergraduates **841** Masters **363** PhD **114**



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