CIS students help younger students embrace computer science

An impressive number of CIS students are helping in under-represented Philadelphia area neighborhoods get interested in technology and computer science. “It’s remarkable how committed these students are,” says Professor Claudia Pine, the faculty advisor for both the Temple Association for Computing Machinery (ACM) student chapter and its ACM-Women chapter. “Most of them are balancing rigorous academic schedules and have jobs, but they still find time to give back.”

TechGirlz

Since 2017 both ACM student organizations, which total about 60 members, have been working with TechGirlz, a national organization dedicated to inspiring middle-school girls to explore the possibilities of technology to empower their future careers. The Temple student offers occasional Saturday workshops, including one this semester on programming in C. In March they joined Drexel University in helping TechGirlz achieve a world record of more than 500 girls coding simultaneously in 17 U.S. cities.

“Our organization is committed to inspiring and retaining women in STEM, and the best way to do that is to expose girls to technology when they are younger,” says Mary Liu, a junior data science major from Northeast Philadelphia who is the past president and current treasurer of Temple’s ACM-W chapter.

STARS Computing Corps chapter

Supported by the National Science Foundation and headquartered in the CIS Department, the STARS Computing Corps is a national alliance and headquartered in the CIS Department, the Philadelphia Military Academy (PMA), located just north of Temple’s Main Campus. Each weekday, two or more Temple STARS students are helping a biology/chemistry teacher teach PMA’s two computer science classes, and they are also frequently mentoring individual students in-person and via phone and email. The chapter also is broadening its outreach with workshops for middle and elementary school students.

“The students’ desire for computer science and how excited they are about it is really cool,” says chapter president Gabriella Forni, a senior information science and technology major. “Our goal is to expose younger students who might not have the same resources we enjoy to computer science and different career possibilities.”

‘Internet of Things’ continued from page 1

There are also concerns that, as usage of these devices increases, systems could be challenged by the large amounts of IoT data communicated over networks and stored in cloud-based data centers.

In response, the CIS team is developing a new testbed and infrastructure for exploring security and performance issues that make the IoT vulnerable and for exploring new approaches to make the IoT more robust, scalable and secure. The testbed incorporates hundreds of IoT devices, an IoT edge-computing server, multiple software-defined network (SDN) switches, and state-of-the-art storage facilities.

“These IoT devices, and our research, have a wide range of applications,” says Du, “including for smart homes, healthcare and life sciences, cybersecurity, municipal infrastructures, in manufacturing, agriculture, education, automation and entertainment.”

In addition to developing a new graduate course in IoT security, the IoT infrastructure researchers develop will be made available to external researchers and educators.

Securing and enhancing ‘Internet of Things’ performance

Smart security cameras. Smart locks. Smart thermostats. Smart appliances. Thanks to what’s called the Internet of Things (IoT), modern homes and businesses increasingly feature everyday objects that, through a smart hub or router connected to the internet, offer sophisticated sensing and remote activation capabilities.

But as smart as they are, they—and the smart phones used to access and control them—are vulnerable to security threats. To address these concerns, four CIS researchers—Professor Xiaojian Du, Laurel H. Carnell Professor Jie Wu, Professor Xubin He and Associate Professor and Chair Jamie Payton—recently received a three-year $400,000 grant from the National Science Foundation and an additional $171,000 from CST.

According to Du, the principal investigator, IoT devices are vulnerable because there are tens of thousands of manufacturers and many often don’t follow best security practices; some simpler devices don’t have strong encryption capabilities; interactions between apps on IoT devices could create security issues; and software bugs in some of apps could be exploited by hackers.

“These hackers could unlock your smart door, or use your security cameras to watch you,” says He.

Chair’s message

The Department of Computer & Information Sciences (CIS) is continuing its tradition of excellence in research, teaching and community engagement. Our faculty are advancing research in several important areas of computing, with projects that make fundamental contributions to data, algorithms, and systems—and that have real-world impacts.

This newsletter highlights just a few of our research accomplishments, including advancing security in the Internet of Things, devising high-performance solutions for storing large-scale “big” data, and introducing new computer vision techniques that are being applied to images to combat human trafficking. Research funders include the National Science Foundations, Amazon, Cisco, NASA and National Institutes of Justice.

We continue to strengthen our faculty, with three stellar new hires—Xinghua Shi, Yan Wang and Yu Wang—bringing expertise in, respectively, solving large-scale computational problems in biology, smart healthcare and large-scale networked systems.

Our students also excel, including graduate students with strong academic publication records, undergraduates participating in CST’s Undergraduate Research Program, and students helping to bring computing skills to the community. We have also introduced a new online master’s in information science and technology, which you can learn about at cst.temple.edu/izonline.

I want to thank all of our alumni and friends who support our department and incredible students. I invite you to learn more about our work at cis.temple.edu.

Sincerely,

Jamie Payton
Chair

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For more news, go to cis.temple.edu
Heng Fan already cited 450 times

Heng Fan is expected to earn his PhD in computer science next year, but his research has already been cited 450 times by other researchers—far more than most PhD candidates garner before they earn their degrees. Of the 11 papers he has published in since coming to Temple in 2016, he has been the lead author on nine of them.

“I am interested in computer vision, artificial intelligence and machine learning, particularly robust and efficient visual object tracking,” said Heng Fan. He developed that interest while pursuing a master’s degree in engineering at Huazhong Agricultural University in Wuhan, China, where he also earned his undergraduate degree.

While a doctoral student at Temple, Fan has had research internships with researchers at the Toyota Research Institute in Ann Arbor, Michigan, and at Hilcience, an information technology company in Shanghai, China. After receiving his doctorate, he hopes to pursue a career in academic research.

NEW FACULTY

Xinghua Shi, Associate Professor, comes to CST from the University of North Carolina at Charlotte, where she was an assistant professor in the Department of Bioinformatics and Genomics. Before joining UNC Charlotte, she was a postdoctoral research fellow at Brigham and Women’s Hospital and Harvard Medical School. Shi earned her PhD in computer science from the University of Chicago, and bachelor’s and master’s degrees in computer science and technology from Beijing Institute of Technology. Her research focuses on development of tools and algorithms to solve large-scale computational problems in biology and biomedical research. Her work is supported by Wells Fargo Foundation Fund, DARPA, NIH and NSF, including a 2018 CAREER Award.

Yun Yang, Assistant Professor, comes to CST from SUNY Stony Brook, where he was an assistant professor in the Department of Computer Science. He earned his PhD from Stevens Institute of Technology, specializing in computer engineering. His research interests include mobile and pervasive computing, cyber security and privacy and smart healthcare. Yang has authored and co-authored 16 papers in top journals and conferences, including ACM MobileCom, ACM MobiHoc, ACM MobileSys, IEEE InfoCom and IEEE Pervasive Computing. His research has been reported by numerous media outlets including The Wall Street Journal, Fox News Channel, Inside Science TV, National Public Radio and CNET.

Yu Wang, Professor, comes to CST from the University of North Carolina at Charlotte, where he was professor and senior associate chair in the Department of Computer Science. He earned his PhD in computer science from the Illinois Institute of Technology. Wang’s research focuses on the design and analysis of algorithms/protocols/systems for large-scale networks (such as wireless networks, social networks and vehicular networks), smart sensing (using wireless or leveraging mobile crowds), and mobile computing (including mobile edge computing and AI-enabled mobile systems). He is a fellow of the IEEE.

Xubin He making sure big data doesn’t swamp storage and performance capabilities

Big data is revolutionizing many scientific fields. Professor Xubin He is committed to ensuring that the big data storage and input/output (I/O) systems can keep up with the demand. Over the last two years, He—who joined Temple in 2016 from Virginia Commonwealth University—has participated in research projects totaling $3.7 million, with his share of that funding exceeding $2 million. According to He, this data represents three main challenges from the computer systems aspect:

1. Huge growth of digital data has made it harder for systems to find room for it as quickly as possible.
2. New file and data management systems are needed because traditional systems have become swamped by data volume.
3. As data volumes increase, failures become more common.

“We may be able to tolerate slightly slower computers, but none of us can tolerate data loss, whether it’s business sensitive data or five years of our personal data,” said He, director of the Storage Technologies and Architecture Research (STAR) lab. He is also collaborating with his team on the Oak Ridge National Laboratory, New Jersey Institute of Technology and China’s Huazhong University of Science & Technology, one of the world’s premier computer science institutions. “We aren’t generating data ourselves, but we’re trying to design algorithms and solutions that create reliable, high-performance building blocks that adequately support data storage and I/O systems,” he says.

Computer vision and crowdsourcing to combat trafficking

More than 60 percent of child sex trafficking survivors were at one point advertised online, according to a 2016 research by the University of New Hampshire. These advertisements often include photos of children, sometimes used provocatively in a hotel room.

To help law enforcement identify where these photographs might originate, Professor Richard Souvenir has teamed up with Georgia Washington University to develop a Cyber Forensic Tool Kit for Machinery Control.

Souvenir said. “But it’s one more tool that can solve cases on its own,” Souvenir said. “But it’s one more tool that can help law enforcement identify where these photographs might originate, sometimes used provocatively in a hotel room.

The project is part of an effort to tackle trafficking. The team has worked with researchers at the University of Science & Technology to Combat Human Trafficking, a non-profit organization, to better understand the patterns of trafficking and how to combat it.

Recently funded by a three-year, $1 million grant from the National Institutes of Justice, the research agency of the U.S. Department of Justice, TraffickCam incorporates millions of U.S. hotel room images collected from both publicly available travel websites and crowdsourced photos submitted by more than 100,000 users of the project’s mobile app, who voluntarily take photos while traveling, and a new computer vision approach that suggests the location of the hotel room images and fast image-search capabilities for particular objects in rooms—all powered by deep neural networks.

The system, which the researchers continue to refine, has already been used in several prosecutions. “It’s not a silver bullet that solves cases on its own,” Souvenir said. “But it’s one more tool that can help law enforcement identify where these photographs might originate, sometimes used provocatively in a hotel room.”