RazorBytes ©

The University of Arkansas Computer Science & Computer Engineering Department

FAST FACTS

Annual New research awards: $3M

PhD enrollment: 57

NSF CAREER Awardees: 4

Endowed Chairs: 4

UNIVERSITY OF ARKANSAS®

College of Engineering
Computer Science
& Computer Engineering

FROM THE DESK OF
DR. FRANK LIU

**Professor and Department Head
Rodger S. Kline Leadership Chair**

Last year was a record year for the Computer Science and Computer Engineering (CSCE) Department at the University of Arkansas, the flagship campus in the University of Arkansas system. We reached historical records in annual new research awards, undergraduate enrollment, size of PhD program, average starting salary of undergraduates in computer science, and faculty size. The total amount of annual new research awards for the past year reached $3M for the first time, and it tripled over the past four years. Our enrollment continues to grow and the Department of Computer Science and Computer Engineering became the largest among all engineering Departments in the College of Engineering at the University of Arkansas in terms of student enrollment. The Department had a total of 571 undergraduate students, excluding freshmen and 57 PhD students. Our undergraduate enrollment increased 30% over the past four years. The average starting salary of our undergraduate in computer science was the highest among all engineering majors in the College of Engineering. We hired three new faculty members and our faculty size grew to 20.

We continue to expand our excellent research enterprise. Many faculty received new research awards from government agencies and industrial sponsors. For example, Dr. Jia Di led an interdisciplinary team of faculty members from the Computer Science and Computer Engineering Department, Electrical Engineering Department, and Industrial Engineering that received a $4.6 Million award from the National Science Foundation to create a program to train cybersecurity professionals. Our annual research expenditure for 2018-2019 also increased by double digits and reached $2.2M. This is the third consecutive year that research expenditure was increased. With new annual research awards of $3M for the past year, our research expenditure is expected to continue to grow. In addition to funded research, our faculty and students published many high quality technical papers in top journals and conferences. You can find a list of our sample publications in this newsletter.

Our education programs also grew rapidly to meet our state's and societies needs for talented professionals in computing, information, and data technologies in both hardware and software. The PhD programs grew at a very fast pace and CSCE PhD student enrollment has increased from 19 in academic year of 2010 to 57 in 2019, representing an increase of two hundred percent. The growth of our PhD programs was supported by expanded sponsored research programs in the department.

We also did well in our development and outreach. We hosted the banquet and business meeting of the University of Arkansas Academy of Computer Science and Computer Engineering (UAACSCE) in April 2019 and inducted six distinguished alumni as new members. We also hosted a banquet and business meeting of Arkansas Academy of Computing (AAoC). In addition, department successfully hosted an annual University of Arkansas High School Programming Contest, sponsored by Acxiom and JB Hunt in March of 2019.

In summary, the Computer Science and Computer Engineering department at the University of Arkansas has made excellent progress in research, teaching, and service. CSCE has been transformed into a research-active department that has made tremendous strides in terms of sponsored research and PhD production over the past four years. We have received two new faculty positions for the next academic year and we are currently conducting a search to fill these positions. Overall, we have laid a solid foundation for further growth.

AWARDS

2019 FACULTY AWARDS

PHILLIPS 66 RESEARCH AWARD
Qinghua Li

KARL SCHUBERT TEACHING AWARD
Dale Thompson

PHILLIPS 66 SERVICE AWARD
Brajendra Panda

YOUNG AUTHOR PAPER AWARD
Ana Jevtic, Fengli Zhang, Qinghua Li, and Marija Ilic, "Physics - and Learning-based Detection and Localization of False Data Injections in Automatic Generation Control," IFAC Sym. on Control of Power and Energy Systems (CPES), Sept. 2018

BARRY M. GOLDWATER SCHOLARSHIP
Austin Kreulach

DISTINGUISHED DOCTORAL FELLOWSHIPS
Richard Beeker
Mark Howard
Kelby Haulmark
Cole Sherril

DOCTORAL ACADEMY FELLOWSHIPS
M.D. Arafat Kabir
Daniel Hader

$4.6 Million Award Creates Program to Train Cybersecurity Professionals

A five-year, $4.63 million award from the National Science Foundation will enable a multi-disciplinary team of researchers at the University of Arkansas to recruit, educate and train the next generation of c y b e r s e c u r i t y professionals. The program will provide the knowledge and tools necessary to protect network and computer systems in three critical industries – cybersecurity, transportation security, and critical infrastructure security.

"The federal agencies that support these industries – all critical to our nation's security and economic health – understand that new cybersecurity challenges are met with an increasingly insufficient security workforce," said Jia Di, professor of computer science and computer engineering and principal investigator for the program. "But people at these agencies also understand that our university, with its specific research strengths, is uniquely positioned to expand the pool of highly skilled professionals who can address these challenges."

The program will address a national shortage of a highly skilled cybersecurity professionals. Over a one-year period, from September 2017 to August 2018, for example, there were more than 300,000 open cybersecurity jobs in the United States, Di said. Professionals at these companies cited lack of education as the reason for this shortage. To qualify for these jobs, students must understand not only computer systems, networks and software, but also data storage protection, cryptography, malware and software vulnerabilities, as well as the nature of cyber-crimes and other threats to infrastructure.

Fairness in Data Science

As huge volumes of information about individuals are generated and processed using big data and AI technologies, government agencies and private companies increasingly integrate individual data and predictive models to make critical decisions about employment, college admissions, credit, insurance, and legal judgements. A 2014 White House report on data collection and analysis concluded "big data technologies can cause societal harms beyond damages to privacy, such as discrimination against individuals and groups." This March, the National Science Foundation and Amazon partnered to launch a new program and jointly support computational research focused on fairness in AI, with the goal of contributing to trustworthy AI systems that are readily accepted and deployed to tack grand challenges facing society.

Dr. Xintao Wu, Professor and the Charles D. Morgan/Acxiom Endowed Graduate Research Chair, has been working on fairness-aware data analytics, machine learning and AI, as one of core focus areas in his Social Awareness and Intelligent Learning (SAIL) lab, since he joined University of Arkansas in 2014. Wu and his team have developed novel technologies to make sure both training data and decisions from predictive models are not subject to discrimination against individuals from disadvantaged groups based on gender, race, age, religion, or disability status. The developed novel technologies increase fairness and decrease discrimination in machine learning, data mining, and text analysis. Their work has been published in have been published in top conferences in such as KDD, IJCAI, AAAI, NeurIPS, and the Web Conference.

Dr. Yarui Peng, Assistant Professor in Computer Science and Computer Engineering (CSCE), was recently awarded a CRII grant by the National Science Foundation (NSF) to conduct research on Design, Extraction, and Optimization of Multi-Chip Fan-Out Wafer-Level-Packaging for Low-Power Heterogeneous Systems.

The $175,000 grant is to develop a Computer-Aided Design framework to improve the performance and energy efficiency of next generation computers and mobile phones while reducing the design time and efforts for chip engineers. This project will develop the key models and Computer-Aided Design (CAD) tools to enable integrating various heterogeneous components into advanced 2.5D and 3D integrated circuits. It aims to address the major challenge of maintaining signal integrity and electro-thermal reliability in a powerful yet compact system with multiple ICs closely packed together to improve energy and cost efficiency. Additionally, a graduate course on CAD and physical design will be offered, where undergraduate and graduate students will have the opportunity to learn CAD algorithms, circuit design techniques, VLSI design flows, and to practice their programming skills by developing their own CAD tools through course projects.
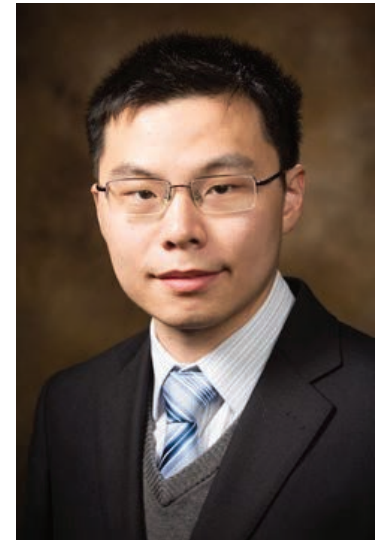
U of A Students Named as Goldwater Scholars, Udall Honorable Mentions

Three University of Arkansas honors students have been named 2019 Goldwater Scholars, an award for top students in mathematics, science, and engineering. They will each receive a scholarship of up to $7,500 from the Barry Goldwater Scholarship Foundation. The newest U of A Goldwater Scholars are: Tyler Bishop of Fayetteville, a junior honors physics and astronomy major, Austin Kreulach, of Bentonville, a junior honors computer and information science and engineering major, and Meagan Olsen of Fayetteville, a sophomore honors chemical engineering major.

"The Goldwater Scholarship recognizes exceptional students who are asking important questions in their fields," said Chancellor Joe Steinmetz. "Tyler, Austin, and Meagan are just such students. All three have engaged actively in a variety of research projects. They already have among them five published papers, four submitted or in-progress publications, and a list of presentations. This is simply remarkable. Kudos go to them and also to the faculty who are supporting their efforts. Student and faculty research partnerships are at the center of the University of Arkansas' mission. These students are planning careers in research, and they will go on to mentor others in turn. Though these three students received the scholarships, we all win from this cycle of discovery."

Justin Zhan

Justin Zhan is an ARA Scholar & Professor of Data Science in the Department of Computer Science and Computer Engineering. He received his Ph.D. in Computer Science from the University of Ottawa in 2006. His research interests include big data, information assurance, social computing, and biomedical informatics. He has served as a conference chair or a program committee member for 150 international conferences. He has published 230 articles in peer-reviewed journals and conferences and delivered more than thirty keynote speeches and invited talks. He has been involved in more than 45 projects as a Principal Investigator (PI) or a Co-PI, which were funded by the National Science Foundation, Department of Defense, National Institute of Health, and other national funding agencies.

Justin Zhan Receives New Award

A new award will provide major upgrades for big data research. Funding from the Army will allow a faculty member from the Department of Computer Science and Computer Engineering to build a device that can process huge data sets more than 100 times faster than previous technology.

Justin Zhan, an Arkansas Research Alliance Scholar and Professor of Data Science, will build a GPU cluster, a network of computers equipped with graphics processing units, that can perform calculations at least 100 times faster than a central processing unit, or CPU. The cluster will be the first of its kind in the College of Engineering, but its uses will expand far beyond engineering research.

The GPU provides an advantage because it processes data in parallel, while traditional CPUs process instructions sequentially. That means the CPU performs one calculation at a time, then moves on to the next. The GPU can perform 100 calculations simultaneously.

Zhan, who joined the faculty in August, was awarded $200,000 from the Army Research Office to build a GPU cluster to be used for big data research and education at the University of Arkansas. He said the device is key for expanding the breadth of data research at the U of A.

"This GPU cluster will be used for data-intensive research," Zhan said. "Deep learning, AI, these concepts can be used in many different areas – biomedical computing, neuroscience, quantum computing. It also has uses in industries like agriculture, education, any area that can benefit from being able to analyze large amounts of data."

"This will be a significant contribution to the state plan for data analytics and data science, and will be a boost to the University of Arkansas and we work to expand our capabilities in these areas," he said.

Zhan said he plans to pursue more grants to expand the cluster.

Thi Hoang Ngan "Nancy" Le

Nancy Le received her B.S and Master in Computer Science from the National University of Science of Vietnam in 2005 and 2009, respectively. She received her Master's degree and Ph.D. in Electrical & Computer Engineering from Carnegie Mellon University in 2015 and 2018. Le worked as a research associate at Carnegie Mellon University from 2018 to 2019. Her current research interests focus on computer vision, machine learning, deep learning, deep reinforcement learning in areas including biometrics, face analysis, medical imaging, scene understanding and semantic segmentation.
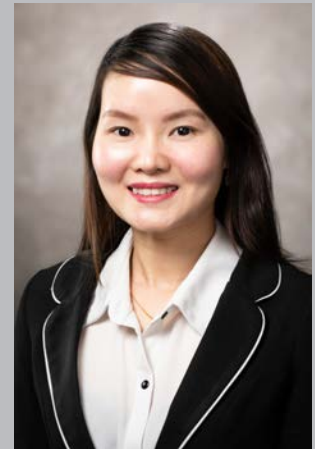
Lora Streeter

Lora Streeter received her B.S., M.S. and Ph.D. in Computer Science from the University of Arkansas in 2010, 2018, and 2019 respectively. She served as the Department Chair and an instructor of Information Systems at Northwest Technical Institute in Springdale, Arkansas for two years. Streeter's research was focused on using a gesture-driven interface to teach basic programming concepts to non-traditional programmers (primarily school-age children), using a Microsoft XBox 360 Kinect and the user's hands to interact with the computer instead of the conventional mouse-and-keyboard setup.

OutstandingSeniors

Computer Science

OLIVIA DEGNER

Outstanding Senior in Computer Science 2019

Olivia has already found success in the classroom, the research lab, and in the business world. She had an excellent 3.94 GPA, is an honors student and graduated with a minor in mathematics in addition to her bachelor's in computer science. Her research experience includes work with Dr. Qinghua Li developing an image processing program to detect patterns in stoplight changes and improve safety in autonomous vehicles. She has also worked on campus in the Tesseract Center as a game designer. She completed two internships – one at Cerner designing software for the medical field, and one at ConocoPhillips. Her success in these varied endeavors is a great example of her intelligence and dedication. Olivia also served as a peer mentor, participated in the University's Japanese program and volunteered with the Special Olympics. She plans to teach abroad through the Japanese Exchange and Teaching program.

Computer Engineering

COLE SHERRILL

Outstanding Senior in Computer Engineering 2019

Cole has distinguished himself through his excellent academic credentials, notably a 4.0 GPA with honors. He graduated with minors in both mathematics and physics, and will continue his studies in the University of Arkansas Computer Engineering Ph.D. program. During his time at the U of A, Cole has conducted significant research in Dr. Jia Di's TruLogic laboratory. As an undergraduate assistant, Cole designed asynchronous integrated circuits using NULL Convention Logic and Multi-Threshold NULL Convention Logic. Most significantly, he designed and verified an asynchronous convolutional neural network, an impressive achievement at the undergraduate level.

High School Programmers Compete at U of A

High school students from across Arkansas gathered at the University of Arkansas in March during the annual High School Programming Competition, hosted by the Computer Science and Computer Engineering Department.

More than 40 teams of students from 18 schools squared off in a test of programming and problem-solving skills in the event, which is sponsored by Walmart, ACM and J.B Hunt. Judges for the contest included department alumni Adam Higgins, Paul Martin, Tyler Moore, Matthew Luther, and John Shell.

More than 40 teams of students from 18 schools squared off in a test of programming and problem-solving skills in the event, which is sponsored by Walmart, ACM and J.B Hunt. Judges for the contest included department alumni Adam Higgins, Paul Martin, Tyler Moore, Matthew Luther, and John Shell.
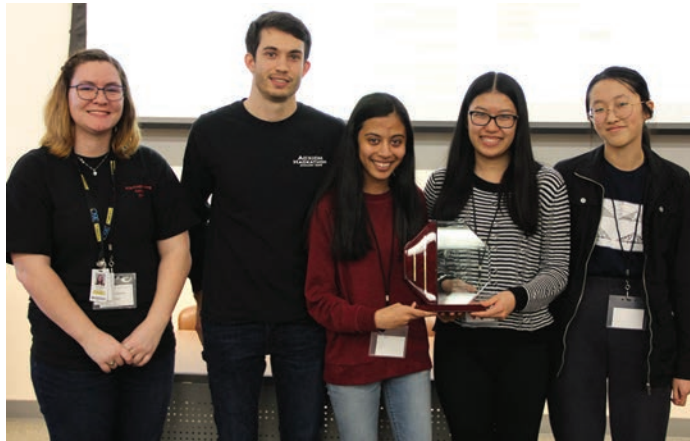
Little Rock Central High School team "She++" took top honors at the competition – the first all-female team to win in the 20-plus year history of the competition. Congratulations to Anne Li, Hetyi Shah and Zhaoying Li, and their coach, Stephany Alhajjaj!

ALUMNI NEWS
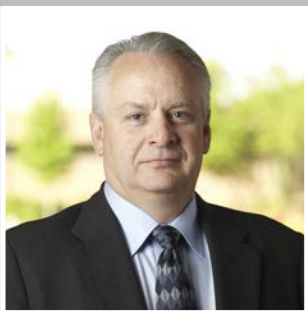
DISTINGUISHED ALUMNI AWARD
Michael Elmore, BSCS '86

Michael Elmore is an influential senior business leader and IT executive with extensive experience growing enterprise value and transforming organizations and operations through technology-enabled business innovation. He served as Chief Information Officer in major corporations such as Ace Hardware and Pep Boys, and was a vice president for MIS Operations, Information Resource Management and Distributed System Operations in the Lowe's Corporation. He has been inducted into both the Arkansas Academy of Computing and University of Arkansas Academy of Computer Science and Computer Engineering.

Selected Academic Publications

S., X. Shi, and **David Andrews**, "Parallelizing maximum likelihood classification (MLC) for Supervised Image Classification by Pipelined Thread Approach through High-level Synthesis (HLS) on FPGA Cluster," Big Earth Data, 2(2), 2018

T. Hansmeier, M. Platzner, and **David Andrews**, "An FPGA/HMC-based Accelerator for Resolution Proof Checking", Int. Symposium on Applied Reconfigurable Computing (ARC), May 2018

T. Meade, K. Shamsi, T. Le, **Jia Di**, S. Zhang, and Y. Jin, "The Old Frontier of Reverse Engineering: Netlist Partitioning", J. of Hardware and Systems Security, 2(3), Sept. 2018

Y. Bai, R. Demara, **Jia Di**, and M. Lin, "Clockless Spintronic Logic: A Robust and Ultra-Low Power Computing Paradigm," IEEE Trans. on Computers, 67(5), May 2018

L. Streeter and **John Gauch**, "Teaching Introductory Programming Concepts Through a Gesture-Based Interface," Int. Conf. on Human Computer Interaction (HCI Int.), July 2018

L. Evalyn, **Susan Gauch**, and M. Shukla, "Analyzing Social Networks of XML Plays: Exploring Shakespeare's Genres," Digital Humanities 2018 (DH2018), June 2018

M. Shukla, **Susan Gauch,** and L. Evalyn, "Theatrical Genre Prediction Using Social Network Metrics," Int. Conf. on Knowledge Discovery and Information Retrieval (KDIR), Sept. 2018

C. Lai, Y. Chen, X. Shi, **Miaoqing Huang**, and G. Chen, "Performance Improvement on Heterogeneous Platforms: A Machine Learning Based Approach," Proc. of 5th Annual Conf. on Computational Science & Computational Intelligence (CSCI'18), Dec. 2018

C. Lai, X. Shi, and **Miaoqing Huang**, "Performance Optimization on Intel Xeon Phi Through Load Balancing," Proc. of 24th Int. Conf. on Parallel and Distributed Processing Techniques and Applications (PDPTA'18), July 2018

A. Jevtic, F. Zhang, **Qinghua Li**, and M. Ilic, "Physics- and Learning-based Detection and Localization of False Data Injections in Automatic Generation Control," IFAC Symposium on Control of Power and Energy Systems (CPES), 2018 (Young Author Paper Award)

W. Du, A. Li, and **Qinghua Li**, "Privacy-Preserving Multiparty Learning for Logistic Regression," Int. Conf. on Security and Privacy in Communication Networks (SecureComm), 2018

M. Nahian Al Sunny, **Xiaoqing "Frank" Liu** and Md Rakib Shahriar, "Communication method for manufacturing services in a cyber– physical manufacturing cloud," International Journal of Computer Integrated Manufacturing, Volume 31, No. 7, 2018, Pages 636-652, Taylor & Francis.

continued

C. N. Duong, **Khoa Luu**, K. G. Quach and T. D. Bui, "Deep Appearance Models: A Deep Boltzmann Machine Approach for Face Modeling," Int. J. of Computer Vision (IJCV), Aug. 2018

C. Zhu, Y. Ran, **Khoa Luu** and M. Savvides, "Seeing Small Faces from Robust Anchor's Perspective," IEEE Conf. on Computer Vision and Pattern Recognition (CVPR), 2018

Alexander Nelson, S. McCombe Waller, R. Robucci, C. Patel, and N. Banerjee. "Evaluating Touchless Capacitive Gesture Recognition as an Assistive Device for Upper Extremity Mobility Impairment," J. of Rehabilitation and Assistive Technologies Engineering, 5, 2018

H. Liu, J. **Pat Parkerson**, and **Alexander Nelson**, "Connected Capacitive Sensor Array for Upper-extremity Motor Rehabilitation," IEEE/ACM Int. Conf. on Connected Health:Applications, Systems and Engineering Technologies (CHASE), 2018

Brajendra Panda and V. Fuentes Tello, "A Thin Client Model to Querying Encrypted Databases in Cloud," WSDS Workshop, IEEE Conf. on Dependable and Security Computing (DSC), Dec. 2018

E. Demaine, J. Hendricks, M. Olsen, **Matthew J. Patitz**, T. A. Rogers, N. Schabanel, S. Seki, and H. Thomas, "Know When to Fold 'Em: Self-Assembly of Shapes by Folding in Oritatami," Int. Conf. on DNA Computing and Molecular Programming (DNA), Oct. 2018

Matthew J. Patitz, J. Hendricks, M. Sharp, J. Durand-Lose and I, Perkins, "Self-Assembly of 3-D Structures Using 2-D Folding Tiles," Proc. of the 24th Int. Conf. on DNA Computing and Molecular Programming (DNA 24), Oct. 2018

Yarui Peng, D. Petranovic, K. Samadi, P. Kamal, Y. Du, and S. Kyu Lim, "Interdie Coupling Extraction and Physical Design Optimization for Face-to-Face 3-D ICs," IEEE Trans. on Nanotechnology, 17(4), July 2018

Dale R. Thompson, C. Rainwater, **Jia Di** and S. C. Ricke, "Student cross-training opportunities for combining food, transportation, and critical infrastructure cybersecurity into an academic food systems education program," Food and Feed Safety Systems and Analysis, Ch. 20, 2018

D. Xu, S. Yuan, **Lu Zhang**, and **Xintao Wu**, "FairGAN: Fairness-aware Generative Adversarial Networks," IEEE Big Data, Dec. 2018

S. Yuan, **Xintao Wu**, and Y. Xiao, "Incorporating Pre-Training in Long Short-Term Memory Networks for Tweets Classification," Social Network Analysis and Mining, 8(1), 2018

Lu Zhang, Y. Wu. and **Xintao Wu**, "Causal Modeling-Based Discrimination Discovery and Removal: Criteria, Bounds, and Algorithms," IEEE Trans. on Knowledge Discovery and Data Engineering, DOI: 10.1109/TKDE.20182872988

Y. Wu, **Lu Zhang**, and **Xintao Wu**, "On Discrimination Discovery and Removal in Ranked Data using Causal Graph," Proc. of the 24th ACM SIGKDD Int. Conf. on Knowledge Discovery and Data Mining (KDD), Aug. 2018

UNIVERSITY OF ARKANSAS

College of Engineering
Computer Science & Computer Engineering

504 J. B. Hunt Building
1 University of Arkansas
Fayetteville, AR 72701