University of Georgia • Spring 2016

Computer Science News

Message from the Head

Dear friends and alumni,

Greetings from UGA's Computer Science Department! Last year was an exciting year for our department. The number of our undergraduate enrollments increased from 614 in fall 2014 to 751 in fall 2015 (an increase of 22%). Also, the department has close to 137 minors. At the graduate level, enrollment exceeded 140 graduate students. The number of CS generated credit hours has increased by 3000 hours in fall 2015 compared to the number of credit hours in fall 2014 (an increase of 23%).

In fall 2015, two of our Ph.D. students: Michael Cotterell and Karen Aguar joined our faculty as full time limited term instructors. Dr. Brad Barnes was appointed as our undergraduate coordinator starting fall 2015. He replaced Dr. Chris Plaue who accepted a position at another institution. Speaking of faculty ranks, congratulations go to Dr. Tianming Liu who was promoted to professor, and to Dr. Roberto Perdisci, who was promoted to associate professor.

We are in the midst of five new faculty hiring campaigns to fill two lecturer positions and two tenure-track assistant professor positions. The fifth position is a joint assistant professor position with the College of Engineering. Two of the assistant professor positions are funded from UGA's Presidential Informatics hiring initiative. A total of only nine positions were funded from this initiative across the entire campus. This is a big achievement for our department.

I also would like to acknowledge the gracious generosity shown to our department by our Advisory Board. We are especially grateful for the exceptional support, and advice provided to our department by the board. We are counting on the board for continued support to help us move to the next level of academic excellence. Special thanks go to Anne Albright for establishing The Lynn C. and Audrey O. Albright Endowment Fund; to Marty Hahn for establishing The Hahn Family Scholarship Fund; and to Lori Kittle for the Lori Kittle Scholarship Fund.

Dear friends and alumni: Our department needs your support, and input to advance our mission in teaching and research. You are welcome to visit and share your work experience with us. For more information and updates on our department, please visit our website: http://www.cs.uga.edu.

Warm Regards,

Thiab Taha, Professor and Head

Academic Programs

The Department of Computer Science is strongly committed to providing a top flight educational experience to undergraduate students at the University of Georgia that combines an appropriate mix of foundations with modern technology and informatics. The former enabling students to stay current in their careers or seek further education and the latter giving them competitive advantages in today's outstanding job market.

At the undergraduate level, the Department of Computer Science offers the Bachelor of Science (B.S.) degree in computer science, a minor in computer science, a certificate in computer science, and a certificate in applied data science to start in fall 2016. More details about these programs may be found on the department's website: http://www.cs.uga.edu/students/undergraduate-degree-programs.

In the most recent three-year cycle (fall 2013 to spring 2016), fall semester undergraduate enrollments (in terms of declared majors) have increased from 358 in the fall 2012 to 751 in the fall of 2015, a remarkable 110% increase. Currently, computer science is listed in the 2015 UGA Fact Book as the fourth (of 143) most popular major at the University of Georgia, only behind biology (comprised of six departments), psychology and finance.

	Fall 2009	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014	Fall 2015
Under-graduate	236	244	297	358	441	614	751
Graduate	124	125	116	130	126	128	141
Total	360	369	413	488	567	742	892

As evidence of the quality of our degree, the B.S. in computer science program has been accredited by the Computing Accreditation Commission of ABET (www.abet.org). The department's students are sought after by top companies across the country, with several putting on recruiting seminars/workshops, including Four Athens, Fast Enterprises, Microsoft, Enrst and Young, Deloitte, Home Depot, Google, CTS Atlanta, Goldman Sachs, UGAHacks, HP, Caterpillar Financial and Peak Solutions. Recent graduates from the B.S. program have accepted employment at outstanding companies such as Microsoft, Amazon.com, General Motors, Manhattan Associates, Epic Systems, and Home Depot to name a few. Other academic programs in the department are also seeing increasing enrollment, including the minor in computer science (137 minors) and the certificate of computing. Combining undergraduate majors and minors with graduate students, the department has 1029 students.

Our student chapter of the Association for Computing Machinery (ACM) is very active and organizes regular, well-attended events, e.g., Tech Talks, interview workshops, coding events, and social events. See the chapter web page for examples: http://www.ugaacm.com/. The chapter also has subgroups that do competitive programming, iOS development (they have an app in the app store), web development, cybersecurity, and a video game development.

Improvement in the size and quality of graduate programs in the department has been steady. The department offers three graduate degrees with varying emphases such as preparing students for professional employment by imparting practical skills, providing foundational knowledge for future study, research and professional enhancement and building expertise in a specific area of computer science for careers in research and academia: Master in Applied Mathematical Sciences (M.A.M.S.), Master of Science (M.S.) in Computer Science and Doctor of Philosophy (Ph.D.) in Computer Science. For more information about our graduate programs, please go to the website: http://cs.uga.edu/graduate-degree-programs.

Outstanding graduate students in computer science are nominated for university-wide assistantships funded by the Graduate School. Qualified students are offered Graduate Teaching Assistantship (GTA) and Graduate Research Assistantship (GRA) awards, enabling them to assist faculty in the instructional and research missions of the department. In fall 2015, the department funded more than 60% of the enrolled graduate students, it offered 45 GRAs and 41 GTAs. In addition, a number of graduate students receive GRAs from other units on campus. Graduate student thesis and dissertation research appears in peer-reviewed journals and conference proceedings, and graduate students engage in real-world professional and research training through internships in industry and research laboratories during the summers. The graduate program has been very successful in placing students in the software development industry, government research laboratories, and industrial research and development laboratories. Graduate students have opportunities for social interaction with each other and with the faculty through the social hour held monthly and the annual graduate student picnic held during the fall semester.

Research Highlights

Along within the progress in the Computer Science Department's academic programs, research activities continue to improve and expand. Research areas within the department include Algorithms and Theory, Artificial Intelligence, Bioinformatics, Brain Imaging and Neuroscience, Data-Intensive Computing, Big Data Analytics and Data Science, Computational Intelligence, Computational Science, Computer Vision and Image Processing, Databases and Distributed Information Systems, Modeling and Simulation, Cybersecurity, Parallel and Distributed Computing, Real-Time Systems, Robotics, and Semantic Web and Web Services.

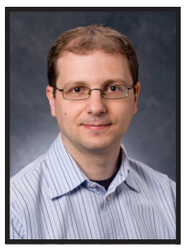
Success in obtaining external research grant funding has made a significant upturn in recent years. In the most recent three-year cycle (fall 2013 to spring 2016), fall semester research expenditures have increased from $1,938,760 in the fall 2012 to $3,042,611 in the fall of 2015, a substantial 57% increase.

Fall 2009	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014	Fall 2015
1,730,114	2,083,688	2,181,661	1,938,760	2,131,539	2,523,276	3,042,611

Research within the Computer Science Department is strong in all the areas listed above. Furthermore, those with the highest levels of recent funding include Artificial Intelligence, Bioinformatics, Brain Imaging and Neuroscience, and Cybersecurity. The department is also particularly strong in collaborative and interdisciplinary research with other departments, institutes and centers, including genetics, geography, physics, biochemistry and molecular biology, plant biology, cellular biology, psychology, statistics, College of Education, College of Engineering, Institute of Bioinformatics (IOB), and Institute for Artificial Intelligence (IAI).

The improvement in the productivity and impact of research in the Computer Science Department is evidenced by increasing levels of research grants, publications, citations, memberships in program committees, editorial boards and funding agency panels. A large number of papers written by members of the department are very influential and highly cited (e.g., 90 papers have at least 100 citations each). The faculty in the department serve on numerous editorial boards for academic journals and organizing committees for major research conferences. Members have given keynote addresses, received best paper awards, obtained patents on their research, and served on standardization committees (e.g., W3C). The reputation and impact of the department's research continues to grow stronger. Each newsletter will feature the work and accomplishments of one outstanding researcher within the department. This year it is Dr. Roberto Perdisci, an internationally recognized expert in cybersecurity.

Research Profile



Dr. Roberto Perdisci, Director of the Network Intelligence and Security Lab.

The Network Intelligence and Security Lab (NIS) focuses on fundamentally improving the security of networked systems. The long term goals are to build network security systems that can (1) efficiently detect and record sophisticated in the wild security incidents; (2) automatically reconstruct and replay attacks in an isolated environment to study their effects; (3) assist human investigators in understanding the inner-workings of modern attacks; and (4) automatically derive security mechanisms and models that can be used to defend network-connected devices and applications from future attacks.

The NIS Lab's research is multi-disciplinary, in that it often bridges advanced cybersecurity research with machine learning and big data mining. Specifically, the lab is currently focusing on building robust defenses against malicious software (or malware). The following are the main research themes currently pursued by the NIS Lab: (1) real-time fine-grained detection of new malware download attacks via an efficient analysis of all network traffic crossing the boundaries of enterprise-grade networks (e.g., academic or corporate networks), which aims to detect and block new malware infections using deep packet inspection of full traffic traces; (2) highly efficient detection of malware-infected machines in very large networks (e.g., internet service provider networks) based on an analysis of DNS traffic characteristics, which aims to discover the existence of machines that have already been compromised and need to be remediated; and (3) reconstruction of web-based attacks via record-and-replay of browser-generated system and network events, which aims to automatically reconstruct and explain how users reach attack pages on the web, including malicious pages that trigger malware download attacks.

For example, the NIS Lab has developed AMICO, an advanced behavior-based malware defense system. AMICO is designed to efficiently monitor all web traffic at the edge of a network, and to automatically learn to detect malware download events. This system is now deployed at the main UGA campus network, and is being actively used by the UGA Information Security Office to defend UGA's computer network from malware infections.

Recently, the NIS Lab's research has also been focusing on telephony security, with particular emphasis on cross-channel attacks enabled by the convergence between telephony and the internet. Specifically, the lab is studying ways to leverage detection approaches developed for detecting attacks launched via the internet (e.g., social media spam) to track scams performed by attackers over the telephony channel. To accomplish these goals, the lab is making use of large-scale data mining techniques, for example to detect cross-channel attacks that rely on luring telephone victims via Twitter spam.

Dr. Perdisci has received multiple grants for his research on advanced malware defense. For example, he has received a 2012 NSF CAREER award for a project titled "Automatic Learning of Advanced Network-Centric Malware Detection Models." He has also received a grant from the U.S. Department of Homeland Security to support the transition to market of AMICO. More recently, Dr. Perdisci has also received new funding from the U.S. National Science Foundation to study telephone-based fraudulent activities and their intersections with internet-based attacks.

News Items

Dr. Kyu Lee and his collaborators at SRI International, Purdue University and University of Wisconsin received a four-year grant from DARPA transparent computing to explore dynamic information flow technology in complex distributed computing environments towards exposing and stopping advanced cyber adversaries (also referred to as Advanced Persistent Threats, or APTs).

Dr. Prashant Doshi is the PI of a recent grant from Toyota Motor Company for machine learning research with application to self-driving car technology.

Dr. Liming Cai is the PI of a recent three year NIH grant, with Co-PIs: Russell Malmberg (plant biology) and Cory Momany (pharmacy). The project is to tackle the grand challenge in RNA tertiary structure prediction by a novel graph model of k-trees and algorithms development that will enable accuracy and scalability for the prediction.

Dr. Shannon Quinn is Co-PI on a recent NSF grant with the title "Collaborative Research ABI Innovation: Large-scale Analysis of Organellar Network Evolution."

Dr. Don Potter is Co-PI on a recent Georgia Power funded grant with Co-PIs David Gattie (engineering) and Fred Maier (artificial intelligence). The main focus of the project is accurate and timely solar radiation prediction.

Dr. Lakshmish Ramaswamy is the PI of a recent grant from Accenture Research Labs for big data virtualization and harmoninzation.

Congratulations to Dr. Roberto Perdisci who has received the 2015 Fred C. Davidson Early Career Scholar in Sciences Award.

Dr. Hamid Arabnia has been selected as a CTL Senior Teaching Fellow for 2015-2016. Drs. Brad Barnes and Shelby Funk have been selected in 2015 as CTL Fellows for Innovative Teaching! Two CS classes will be offered in scale-up class rooms in fall 2016.

Dr. Khaled Rasheed was selected by the Center of Teaching and Learning (CTL) to be recognized as "Teacher of the Week" in spring 2016 as recognition of his excellence in teaching.

UGA is preparing to establish the Georgia Informatics Institute for Research & Education. Dr. Thiab Taha was appointed by the provost to co-chair the Planning Committee.

UGA is a partner with the BigData South Hub which was funded recently by NSF. Our own Dr. Lakshmish Ramaswamy is the UGA representative. This is an acknowledgment of the important role of the Computer Science Department in data science at UGA.

UNIVERSITY OF GEORGIA®
COMPUTER SCIENCE
FRANKLIN COLLEGE