Faster Downloads for Smartphones

Tired of waiting around for your smartphone to play that video? NC State computer scientists have good news: Faster downloads are coming soon. Dr. Injong Rhee, a professor of computer science, has helped develop a new algorithm that significantly reduces data retrieval time for the software programs that power smartphones and tablets.

These mobile devices use “transmission control protocol (TCP) stacks,” programs that send and receive packets of data between the device and the network. With help from Dr. Kyunghan Lee, a former senior research associate at NC State who is now an assistant professor at the Ulsan National Institute of Science and Technology in South Korea, Rhee demonstrated that the new algorithm makes the stacks more efficient. That greatly improves the user experience.

The researchers plan to use support from the Chancellor’s Innovation Fund (CIF) to quantify that improved efficiency on various network providers using several smartphone and tablet brands. They’re also creating a business strategy for US markets. Eventually they want to expand to Asia.

“This technology will help make the smartphone and tablet experience much more enjoyable for users,” Rhee said. “And the CIF funding will help convince network providers that it really works.”

Research Highlights

The NC State Department of Computer Science is one of the oldest and largest producers of computer science talent in the nation. With a curriculum and research portfolio focused on solving the grand challenges of the future, our graduates are highly valued and sought after by the most innovative and respected companies in the world. Our department is a national leader in gaming, educational informatics, healthcare IT, cybersecurity, cloud computing and analytics, and we benefit from being located on NC State’s Centennial Campus within the shadows of the award-winning Hunt Library. With a strong focus on industry collaboration, our ePartners corporate relations program is a model revered nationwide. Whether it is identifying the latest security threats or improving the effectiveness of K-12 education or designing the future of the Internet, our faculty and students are making a real difference in the world, every day!

Research is central to the success of the department, and our research productivity continues to grow with annual research expenditures in the range of $14M. We now have an all time high of over $46M in active research grants, which ranks us well within the top departments for sponsored research funding among computer science departments in colleges of engineering. Faculty research interests range from theory and algorithms, bioinformatics, high-performance and power-aware systems, to advanced analytics research, to artificial intelligence, serious games, graphics and visualization, networks, security, software engineering, and educational informatics. A list of select representative research projects appears on page three of this newsletter.

Over the last year, our department has continued to experience exciting growth. We have received numerous accolades and professional recognitions, and we have welcomed two new faculty (assistant professors, Dr. Min Chi and Dr. Blair Sullivan). Our enrollments continue to increase (now over 1,400 students), as does our research productivity and funding (>-$46M in active research). We are particularly grateful for the generous financial support from our alumni, friends and corporate partners (~$800K in total unrestricted cash contributions from all sources).
In the 2012-2013 academic year, faculty as a group produced about 300 publications, and faculty gave about 200 professional talks related to their research and educational activities. A number of our faculty serve as editors and on editorial boards of leading professional publications, and as members and officers in the most prestigious professional societies and organizations in their areas of specialty. Our faculty continued the tradition of being both organizers and participants in a number of prestigious professional events and flagship computer science conferences, as well as delivering services and functions to the university, the state, professional societies, and the nation.

In our undergraduate program, we awarded 170 BS degrees, an upward trend expected to continue for several more years. In the fall of 2013, we had 817 undergraduate students, including 58 who are double majors. Demand for our undergraduates has surged as the economy has improved. Many of our graduates received multiple employment offers, and average starting salaries were over $65K, among the highest in the NC State College of Engineering. For a number of years, we have been one of the top suppliers of new graduates to IBM, Cisco, SAS, NetApp, and other industry giants. However, a large number of students have pursued careers with smaller companies or other entrepreneurial opportunities. Our Undergraduate Concentration in Game Development has been recognized as one of the top in the nation for three consecutive years by the Princeton Review.

Our graduate program continues to thrive! Applications for admission continue to increase year-over-year. We enrolled 612 graduate students; 179 of these were PhD students – both record highs for the department. Similarly, we awarded a record number of graduate degrees (224), including 24 PhDs. As with our undergrads, demand for our graduate students is extremely high, with starting salaries for our master’s degree students averaging approximately $93K, while starting salaries for our PhD students are starting around $120K. Some of the top consumers of our graduate talent include Amazon, Cisco, IBM, Microsoft, EMC, SAS and NetApp.

In 2012-2013 our faculty received a number of prestigious awards and honors: Dr. Donald Bitzer, Distinguished University Research Professor in the NC State Computer Science Department, has been inducted into the National Inventors Hall of Fame. (Bitzer co-invented the flat plasma display panel in 1964!); Drs. William Enck and Emerson Murphy-Hill received NSF CAREER Awards (the department’s 23rd and 24th NSF CAREER Award winners – 21 currently on faculty), one of the highest concentrations of any department in the nation; Dr. Robert Fornaro was selected to receive the IEEE Computer Society’s 2013 Computer Science and Engineering Undergraduate Teaching Award; Dr. Carla Savage was named to the inaugural class of Fellows of the American Mathematical Society (AMS) and was later appointed to AMS Secretary; Dr. R. Michael Young was recently awarded senior member status of the Association for the Advancement of Artificial Intelligence (AAAI); Dr. Rada Chirkova was named a senior member of the ACM; and Dr. James Lester has been named Distinguished Professor in Computer Science at NC State.

Our students received numerous honors and awards as well: undergraduate students Joseph Arthur and Neil Shah have been chosen to participate in the Google Computer Science Teaching Fellows Practicum. His area of focus is K-12 computer science education; and Stephen Cossa and Sean Mealin were awarded the Donald L. Bitzer Creativity Awards for 2012-2013.

Mladen A. Vouk
Professor and Department Head
Selected Research Projects

Complete list with abstracts is at http://www.csc.ncsu.edu/research/

Secure Open Systems Initiative, Dennis Kekas, Peng Ning, Mladen Vouk, Rudra Dutta. $3,336,000 by Army Research Office.


North Carolina Bio-Preparedness Collaboration (NCB-Prepared), Marc Hoit (OIT), Laurie Williams. $1,760,486 by US Dept. of Homeland Security via UNC-CH.

ENGAGE: Immersive Game-Based Learning for Middle Grade Computational Fluency, James Lester, Kristy Boyer, Bradford Mott, Eric Wiebe. $1,015,996 by National Science Foundation.

Scalable Data Management, Analysis, and Visualization (SDAV) Institute, Nagiza Samatova, Anatoliy Melechko. $750,000 by US Department of Energy.

NetSE: Large: Collaborative Research: Platys: From Position to Place in Next Generation Networks, Injong Rhee, Munindar Singh. $706,167 by National Science Foundation.

Quality of Information-Aware Networks for Tactical Applications (QUANTA), Munindar Singh. $669,029 by Pennsylvania State University (Army Research Laboratory).

Co-Design of Hardware/Software for Predicting MAV Aerodynamics, Frank Mueller. $666,666 by Virginia Polytechnic Institute and State University (US Air Force).


Comprehens...
Senior Faculty Profiles

Dr. Laurie Williams, a professor of Computer Science, is one of the foremost researchers in agile software development, the science of cybersecurity, and the security of healthcare applications. She is the co-director of the NSA-sponsored NC State Science of Security Lab. She leads the Software Engineering Realsearch group, and is the Senior Research Director of the Institute of Next Generation Systems (ITnG). Additionally, she is the software engineering area representative for the Secure Open Systems Initiative.

Her research focuses on software security, particularly in relation to healthcare IT, agile software development practices and processes; software reliability, software testing and analysis; open source software development; and broadening participation and increasing retention in computer science. Williams has more than 175 refereed publications. In January 2009, her 2000 IEEE Software paper titled, “Strengthening the Case for Pair Programming,” was chosen as a IEEE Software 25th Anniversary Top Pick Paper and was on the list of the Most Cited IEEE Software articles for a 25-year period.

Williams has received many awards including an NSF CAREER Award (2003), and several IBM Faculty Awards. She was named an ACM Distinguished Scientist (2011), received the inaugural ACM SIGSOFT Influential Educator Award (2009), and was inducted into NC State’s Academy of Outstanding Teachers (2006).

She received her PhD in Computer Science from the University of Utah in 2000, her MBA from Duke University Fuqua School of Business in 1990, and her BS in Industrial Engineering from Lehigh University in 1984. She worked for IBM for nine years before returning to academia.

Dr. R. Michael Young, a professor of Computer Science, is founder and executive director of the NC State Digital Games Research Initiative. He also directs the Liquid Narrative research group, and he developed and directs the department’s undergraduate concentration in game development, which was recognized as one of the top 20 game design programs in the United States and Canada in 2011 and 2012 by The Princeton Review. He earned his PhD in Intelligent Systems from the University of Pittsburgh in 1997, his MS in Computer Science from Stanford University in 1987, and his BS in Computer Science from California State University, Sacramento in 1984.

His research interests include artificial intelligence; digital humanities; advanced learning experiences; graphics and human computer interaction; computer and video games; health care information technology; and cloud computing. Young and his students work to develop computational models of interactive narrative with applications to computer games, educational and training systems and virtual environments.

His research group is internationally known as a leading center for work on games and entertainment, with over 200 refereed publications. Young is a senior member of the Association for the Advancement of Artificial Intelligence, and serves as vice president and a founding board member of the Society for the Advancement the Science of Digital Games. He has won a number of awards including an NSF CAREER Award, an IBM Faculty Award and NC State Awards for outstanding teaching, extension and engagement. He was a GlaxoSmithKline Faculty Fellow in Public Policy and Public Engagement in 2010, and his work with North Carolina games companies and state policy makers to strengthen the state’s games ecosystem has been widely recognized.

New Faculty Profiles

Dr. Min Chi joined the faculty as assistant professor in the Digital Transformation of Education cluster (part of the Chancellor’s Faculty Excellence Program) in August 2013. She received her MS and PhD degree from the Intelligent Systems Program at the University of Pittsburgh in 2006 and 2009, respectively. Her specialty is machine learning. Her research interests include artificial intelligence, applying computer science to learning, cognitive science and learning science, and math and science education.

Dr. Blair Sullivan joined the faculty as assistant professor in August, 2013. She received her BS degrees in Mathematics and Computer Science in 2003 from Georgia Tech. She received her MA and PhD degrees in Mathematics from Princeton University in 2005 and 2008, respectively. Her research interests include algorithm design, high performance graph analysis, parallel computing, combinatorial scientific computing, and graph theory. Recent work has focused on integrating tools and techniques from structural graph theory into tools for scalable network analysis.