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NC State and SAS Partner to Tackle Major Analytics Challenges

NC State University Chancellor **Randy Woodson** and SAS CEO **Jim Goodnight** recently announced the signing of an innovative new partnership that will better enable collaborative research in the areas of computer science and data analysis.

SAS sponsorships will support academic opportunities for NC State professors and students and bolster the university's reputation as a top research institution.

"NC State is grateful to have a partner like SAS that has long supported our vision to build the preeminent research enterprise in higher education where business, industry and government come together to address the grand challenges of society," Woodson said. "This agreement expands our ability to drive research, share technology and enhance academic opportunities for our students for many years to come."

While specific projects have not been named, the partnership is expected to address the areas of cyber security, big data, text analytics, data visualization and sensors and health-monitoring technologies.

This agreement is the latest in a long relationship between two of the largest employers in North Carolina. The master research agreement simplifies sponsored research by setting terms regarding intellectual property, cost and scope of work.

SAS, one of the world's largest privately held software companies, emerged from NC State's Department of Statistics in the 1970s. Since then, SAS has provided support for education and research at NC State through student scholarships and endowed professorships.

"NC State has been a vital source of talent and innovation for SAS since our beginning," said Goodnight. "We are investing in new

areas of research by supporting some of the brightest talent in academia, and accelerating innovation in the analytics space."

SAS funded the nation's first Master of Science in Analytics (MSA) degree at NC State, and has provided significant support for the William and Ida Friday Institute in the College of Education. NC State's math and statistics building, SAS Hall, is named in honor of SAS' founders, Goodnight and Executive Vice President **John Sall**.



"Both organizations are now better positioned to benefit from the fruits of their research more quickly," said **Terri Lomax**, NC State vice chancellor for research, innovation and economic development. "This agreement further establishes NC State as a leader in industry partnerships focused on results-driven research and providing students with relevant opportunities to put learning into practice."

While SAS is used at more than 3,000 institutions worldwide for teaching, research and administration, this is the first master research agreement the company has entered into with a university.

Editor's Note - The first faculty awards associated with this agreement were recently awarded to Dr. Christopher Healey to support his project titled *Modeling Context and Sentiment to Visualize Narrative Threads in Large Document Collections*; and to Drs. James Lester and Brad Mott to support their project titled *Using Deep Learning to Build Context-Sensitive Language Models*. ■



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Fall 2014 Issue

Computer Science



NC State's Online Computer Science Programs Rank Fourth Nationally

The **Engineering Online Computer Science and Networking programs at NC State** have been ranked **fourth nationally** in the U.S. News & World Report's 2014 list of the **Best Online Graduate Computer Information Technology programs**.

Engineering Online at NC State has again been recognized as **one of the top ten online engineering programs in the United States** coming in **ninth nationally** on the magazine's list of **Best Online Graduate Engineering Programs**.

The College of Engineering at NC State established what is now known as **Engineering Online** in 1978. The program, designed for working professionals, allows students to earn master's degrees in engineering without coming to campus. Courses offered by **Engineering Online** are identical to on-campus courses in terms of content, requirements and academic rigor.

Engineering Online offers master's degree programs in aerospace engineering, civil engineering, chemical engineering, computer engineering, computer networking, computer science, electrical engineering, environmental engineering, industrial engineering, integrated manufacturing systems engineering, materials science and engineering, mechanical engineering, nanoengineering, and nuclear engineering. The program also offers a master of engineering degree.

In 2013, U.S. News and World Report ranked **Engineering Online** at NC State as the nation's best online graduate engineering program for veterans and active-duty military personnel. ■

NC State Partners With National Security Agency on Big-Data Lab

NC State University **Chancellor Randy Woodson** recently announced a new partnership with the National Security Agency (NSA) to create the Laboratory for Analytic Sciences (LAS) on NC State's Centennial Campus. The lab will bring together some of the brightest minds from government, academia and industry to address the most challenging big-data problems and will be a cornerstone of the emerging advanced data innovation hub at NC State.

At the time, the \$60 million NSA grant funding of the LAS was the largest sponsored research contract in the university's history. The new enterprise is expected to directly bring 100 new jobs to the Triangle over the next several years, and to attract new government and industry partners.

"NC State is committed to developing partnerships that solve the grand challenges facing society and promote innovative products and solutions that improve lives around the globe," Woodson said.

"We appreciate the confidence of the National Security Agency to select NC State for this groundbreaking endeavor. Not only will it enhance the academic experience for our students and faculty, it will also add to the economic prosperity of our community through new jobs, new industry and new partnerships."

A key goal of the LAS is to promote new advances in the science of analysis through innovative collaborations between industry, academia and government.

Through a highly competitive selection process, NSA chose NC State for this partnership due in large part to the university's national leadership and expertise in data analysis along with its strong existing partnerships with industry, universities and government agencies. The geographic proximity of the Research Triangle and NC State's strong connections to national industry leaders, local businesses and other leading research universities, including Duke University and the University of North Carolina-Chapel Hill, solidified NC State as the ideal host for the LAS.

NC State researchers will assist NSA scientists in establishing priorities and conducting research for the LAS. A key goal of the LAS is to promote new advances in the science of

analysis through innovative collaborations between industry, academia and government.

NC State's expertise in big data ranges from its Institute for Advanced Analytics, which offers an intensive 10-month Master of Science in Analytics degree – the first program of its kind – that boasts before-graduation



job-placement rates of more than 90 percent, to its Center for Innovative Management Studies, which examines the trends and technologies surrounding big data. The university also has traditional strengths in computer science, mathematics and statistics – all disciplines in which understanding large sets of data is paramount – and is currently hiring four faculty members for its new data-driven science "cluster."

Besides a major collaborative project on cybersecurity with the NSA, NC State also has multiple existing partnerships with the NSA's parent agency, the Department of Defense. Research projects include technology that can best help soldiers identify improvised explosive devices from a distance, as well as a study of the best dog breeds that can sniff out these IEDs; fire-protection research to help soldiers and first responders; research into "wrinkled layers" that can be added to ships' coatings to help barnacles from forming, saving fuel and cleaning costs; and a language training center that works to improve the language skills, regional expertise and intercultural communication skills of military personnel.

"No single academic discipline can solve 21st century problems," said **Dr. Terri Lomax**, NC State's vice chancellor for research, innovation and economic development. "Answers come by probing the intersection of a variety of disciplines and from dissecting mounds of data. These are some of the things that NC State does best, along with innovative partnerships with government, industry, and non-profits."

Due to the high degree of confidentiality required for the LAS work, personnel numbers and facility details cannot be provided. Although physical access to the lab itself will be restricted to individuals who have been issued a security clearance by the U.S. government, a portion of the fundamental research will be conducted at the unclassified level in existing faculty labs. ■

Dogs, Technology and the Future of Disaster Response

Imagine a team of humans, dogs, robots and drones swooping onto the scene in the aftermath of a disaster and working together to find and rescue anyone trapped in collapsed buildings. That's the goal of a team of researchers from around the United States working on what they call the Smart Emergency Response System (SERS).

The team is part of the Smart America Challenge, which kicked off in late 2013 to highlight state-of-the-art, practical innovations stemming from U.S. research. The SERS team is one of more than 20 research groups that presented projects as part of the challenge.

The SERS project's goal is to use cyber-physical systems to share information and coordinate emergency and disaster response and recovery. These systems are designed to work in real-time via a variety of wireless network technologies. In addition to NC State, the SERS team includes researchers from MathWorks, the University of Washington, MIT, BluHaptics, National Instruments, the University of North Texas, Boeing and Worcester Polytechnic Institute.

The NC State researchers, **Drs. Alper Bozkurt** and **David Roberts** (pictured below with Diesel), are focused on a very specific aspect of the SERS equation: dogs.

Bozkurt and Roberts have developed a high-tech harness equipped with sensors and other devices that will both make the dogs more effective at collecting information and incorporate the dogs into the larger network of a coordinated disaster response.

"We're using a range of technologies to modify off-the-shelf harnesses," Bozkurt says. "And of course, all of the tech is supplemented by training for the dogs and their handlers."

"We're not trying to replace dog handlers – we're trying to open the door to new possibilities," says Roberts, who is also an experienced amateur dog trainer.

The SERS dog harnesses include three kinds of technologies: environmental monitoring, dog monitoring and active communication.

The dogs will be equipped with passive environmental monitoring devices – such as microphones, cameras and gas sensors – that allow the dogs to retrieve and transmit data from the field in real time.



"We're developing a platform for sensors that is designed to be plug-and-play, allowing emergency responders to further customize the harness," Bozkurt says. "For example, if there's the possibility of a natural gas leak, you could attach a natural gas sensor. Or if there's the possibility of radiation, you could attach a Geiger counter." Using wireless communications, the sensors can be monitored remotely at a command center or by dog handlers on a handheld device nearby.

The harness also includes new sensors developed by Bozkurt and Roberts that monitor a dog's behavior and physiology, such as heart rate. These sensors will allow both dog handlers and the emergency response command center to remotely track a dog's well-being and to determine if the animal has picked up a scent or found a specific object or area of interest.

The active communication technologies on the harness will allow handlers to relay commands to a dog remotely. Bozkurt and Roberts have incorporated audio communication, via speakers, into the vest. However, they think the more reliable remote communication will come via "tactile inputs" – they're training dogs to respond to gentle "nudges" that come from within the electronic harness itself.

"I want to be clear that these are not aversive punishments, but slight, tactile nudges from motors in the vest – like a vibrating cell phone. We're using exclusively reward-based training techniques," Roberts says.

Bozkurt, Roberts and the rest of the SERS team participated in the Smart America Challenge event in Washington, D.C., this summer.

Roberts and Bozkurt's work with their collaborator, **Dr. Barbara Sherman**, is supported by a grant from the National Science Foundation. ■

Video Game Design Program at NC State in Top 25 Again

The **Video Game Design Program** at NC State has been recognized as one of the **"Top 25 Undergraduate Schools to Study Game Design for 2014."** NC State ranks 23rd on The Princeton Review's fifth annual list which salutes the best schools in the U.S. and Canada. This is the fourth consecutive year that NC State's program has been recognized.

The Princeton Review selected the schools based on a survey it conducted in 2013-2014 of 150 institutions in the U.S., Canada and abroad offering video game design coursework and/or degrees.



Dr. R. Michael Young, professor of computer science and director of the NC State Digital Game Research Center said, "This is the fourth year in a row that NC State has been ranked among the top game development programs in North America by Princeton Review. Being ranked #23 in such a strong field of schools is a reflection of the outstanding academic programs we have in games here at NCSU and of the impact that our graduates are having at leading games companies like **Epic Games**, **Red Storm Entertainment** and many others.

"NC State's unique program blends games courses taught in world-class engineering and design colleges with courses that leverage game studies, psychology and educational theories. We look to games industry leaders like **Epic Games**, **Virtual Heroes**, **Microsoft Game Studios** and others to provide input to our instructors, and we design our classes to teach real-world best practices. As a result, our graduates are trained as excellent software developers or designers with all the tools they need to hit the ground running at a game company. Our graduates have been placed at large, international companies like **Ubisoft** and **Epic Games**, dynamic North Carolina game studios like **Spark Plug Games** or start-ups that they found themselves, like **Mighty Rabbit Studios.**" ■



Researchers Design Interactive Software to Target Teen Alcohol Use

If you want teens to avoid risky behavior, you can't just give teenagers the facts – you have to get them to engage with the information, feel motivated to change, and have the confidence and skills to keep themselves safe.

That's the idea behind a project underway at NC State and the University of California, San Francisco (UCSF), to develop interactive software aimed at helping teens reduce alcohol use and the risks associated with drinking alcohol.

"Our goal is to help adolescents make informed decisions about alcohol use," says **Dr. James Lester**, distinguished professor of Computer Science at NC State and one of two leaders of the project. Specifically, Lester's team will be creating software that engages adolescents aged 15-17 in role-playing scenarios about alcohol use and understanding the results of the various paths that they choose.

NC State is taking the lead on software development, while researchers at UCSF will be focusing on the behavior change associated with reducing risky behavior in adolescents. "We are excited about applying what we know from theories of behavior change to this cutting-edge technology for adolescents," says **Elizabeth Ozer**, a psychologist and professor of pediatrics at UCSF, and the other leader of the project.

The NC State team plans to make the software "adaptive," allowing it to customize the scenarios that adolescents face based on each user's choices and preferences.

"This personalized approach will, we hope, be a more effective means of changing behaviors in a positive way," says **Dr. Brad Mott**, a research scientist at NC State who is working on the project. ■

Scaling Up Personalized Query Results for Next Generation of Search Engines

NC State researchers have developed a way for search engines to provide users with more accurate, personalized search results. The challenge in the past has been how to scale this approach up so that it doesn't consume massive computer resources. Now the researchers have devised a technique for implementing personalized searches that is more than 100 times more efficient than previous approaches.

At issue is how search engines handle complex or confusing queries. For example, if a user is searching for faculty members who do research on financial informatics, that user wants a list of relevant webpages from faculty, not the pages of graduate students mentioning faculty or news stories that use those terms. That's a complex search.

"Similarly, when searches are ambiguous with multiple possible interpretations, traditional search engines use impersonal techniques. For example, if a user searches for the term 'jaguar speed,' the user could be looking for information on the Jaguar supercomputer, the jungle cat or the car," says **Dr. Kemafor Anyanwu Ogan**, an associate professor of Computer Science at NC State and senior author of a paper on the research. "At any given time, the same person may want information on any of those things, so profiling the user isn't necessarily very helpful."

Researchers have devised a technique for implementing personalized searches that is more than 100 times more efficient than previous approaches.

Anyanwu Ogan's team has come up with a way to address the personalized search problem by looking at a user's "ambient query context," meaning they look at a user's most recent searches to help interpret the current search. Specifically, they look beyond the words used in a search to associated concepts to determine the context of a search. So, if a user's previous search contained the word "conservation" it would be associated with concepts like "animals" or "wildlife" and even "zoos." Then, a subsequent search for "jaguar speed" would push results about the jungle cat higher up in the results – and not the automobile or supercomputer. And the more recently a concept has been associated with a search, the more weight it is given when ranking results of a new search.

Search engines have also tried to identify patterns in user clicking behavior on search

results to identify the most probable user intent for a search. However, such techniques are impersonal and are applied on a global basis. So, if the most frequent click pattern for a set of keywords is in a particular context, then that context becomes the context associated with queries for most or all users – even if your recent search history indicates that your query context is about jungle cats.



"What we are doing is different," Anyanwu Ogan says. "We are identifying the context of search terms for individual users in real time and using that to determine a user's intention for a specific query at a specific time. This allows us to deal more effectively with more complex searches than traditional search engines. Such searches are becoming more prevalent as people now use the Web as a key knowledge base supporting different types of tasks."

While Anyanwu Ogan and her team developed a context-aware personalized search technique over a year ago, the challenge has been how to scale this approach up. "Because running an ambient context program for every user would take an enormous amount of computing resources, and that is not feasible," Anyanwu Ogan says.

However, Anyanwu Ogan's research team has now come up with a technique that includes new ways to represent data, new ways to index that data so that it can be accessed efficiently, and a new computing architecture for organizing those indexes. The new technique makes a significant difference.

"Our new indexing and search computing architecture allows us to support personalized search for about 2,900 concurrent users using an 8GB machine, whereas an earlier approach supported only 17 concurrent users. This makes the concept more practical, and moves us closer to the next generation of search engines," Anyanwu Ogan says.

The paper, *Personalizing Search: A Case for Scaling Concurrency in Multi-Tenant Semantic Web Search Systems*, was presented at the 2013 IEEE International Conference on Big Data held on Oct. 6-9 in Santa Clara, Calif. Lead author of the paper is **Dr. Haizhou Fu**, a former Ph.D. student at NC State. The paper was co-authored by **Hyeongsik Kim**, a Ph.D. student at NC State. The research was supported by the National Science Foundation. ■

Six New Members Join Department's SAB

The NC State Computer Science Department is pleased to welcome six new members to our Strategic Advisory Board (SAB), a cornerstone of the Department's strategic planning efforts. Dr. Mladen Vouk, head of the Department, recently announced the addition of the new members, including two alumni:

- **Laurie Blackman**, Senior Director of Software Engineering at Oracle
- **Tracy Gregory (M.S. 2012)**, Software Developer at SAS
- **Katherine Lagana**, Vice President of Global Technology Integration at LexisNexis
- **Geoffrey Lang**, Vice President and General Manager at MetLife
- **Monique Morrow**, Chief Technology Officer of Cisco Services
- **Chris Olinger (B.S. 1989)**, Chief Technology Officer of d-Wise Technologies

This dynamic group of industry executives and academic leaders provide input and guidance, which is critical to helping shape the department's strategic focus. The SAB meets annually on campus and functions as a virtual working team throughout the year through member involvement on subcommittees, executive panels and other engagement opportunities. Membership terms are for three years and may be renewed for a second term.

Troy Tolle, Vice President and Chief Technology Officer of Infinity Learning Solutions, is currently the chair of the SAB, and **Loren Harrell**, Chief Executive Officer and Founder of Memberhub.com, is vice-chairperson. ■

Many Android Vulnerabilities Can Be Traced to Manufacturer Modifications

Computer security researchers have found that Android smartphone manufacturers are inadvertently incorporating new vulnerabilities into their products when they customize the phones before sale, according to a recent study. On average, the researchers found that 60 percent of the vulnerabilities found in the smartphone models they evaluated were due to such "vendor customizations."

Although Google creates the base Android platform that all Android smartphones use to operate, vendors – such as Samsung, Sony, and HTC – customize that platform to integrate their hardware. These vendors also incorporate applications they or their partners have developed.

A team led by NC State computer security researcher **Xuxian Jiang** sought to determine whether these customizations posed a security threat. Jiang is senior author of a paper describing the study.

The researchers looked at 10 representative Android smartphone models. They looked at an older model (version 2.x) and a newer model (version 4.x) from each of five manufacturers: Samsung, HTC, LG, Sony and Google. For those 10 models, vendor customizations were responsible for an average of 80 percent of the apps that came preloaded onto the phones.



"All 10 devices were vulnerable, based purely on the preloaded apps," Jiang says. "The older versions had an average of 22.4 vulnerabilities per device, while the newer versions had an average of 18.4 vulnerabilities per device. And the newer versions weren't always more secure. Some of the more recent models were actually less secure than their predecessors." Of the 10 models evaluated, the most recent Google device they looked at, the Nexus 4, had the fewest vulnerabilities.

Jiang's team discovered vulnerabilities including the ability to record audio without the user's permission, the ability to make phone calls without the user's permission, and the ability to wipe out the user's data.

Lei Wu, a Ph.D. student at NC State, is lead author of the paper, "The Impact of Vendor Customizations on Android Security." Co-authors are NC State Ph.D. students **Michael Grace**, **Yajin Zhou**, and **Chiachih Wu**. The paper was presented last fall at the ACM Conference on Computer and Communications Security in Berlin, Germany. ■

Game Developers Say Success Hinges On More Than Programming Skills

A study from NC State and Microsoft Research finds that game developers need a suite of non-programming skills – including communication skills – that are considered less important in other fields of software development.

"We wanted to evaluate which skills are important to game developers versus other fields of software development," says **Dr. Emerson Murphy-Hill**, an assistant professor of computer science and lead author of a paper on the work. "These findings could influence how we teach aspiring game developers."

Murphy-Hill and two co-authors from Microsoft Research conducted in-depth interviews of 14 experienced developers, including some not employed at Microsoft. The researchers used information from these interviews to create a survey that asked programmers about various aspects of their jobs, including which skills they found to be most valuable in their careers.

The research team then surveyed 364 Microsoft developers: 145 game developers, 100 developers who worked on Microsoft Office, and 119 developers who worked on other Microsoft products.

Game developers said that their work required a "more diverse team," drawing on expertise from artists, writers, and other non-engineers. Not surprisingly, game developers were more likely to value creativity on their teams.

"One of the ideas that came out of this work is to include non-programmers in computer science group projects, so that students can get used to that dynamic," Murphy-Hill says. "Similarly, these findings highlight the importance of helping students develop their interpersonal communication skills, since that would be valuable for them professionally."

The paper, *Cowboys, Ankle Sprains, and Keepers of Quality: How Is Video Game Development Different from Software Development?*, was co-authored by **Thomas Zimmermann** and **Nachiappan Nagappan** of Microsoft Research. The research was supported by Microsoft Research. ■

Impact Bytes

Dr. Douglas Reeves has been named **Interim Assistant Dean** for the **NC State College of Engineering Graduate Programs**.

Dr. George Rouskas has been named the **Director of Graduate Programs** for the **NC State Computer Science Department**.



Dr. James Lester was recently elected a **Fellow of the Association for the Advancement of Artificial Intelligence (AAAI)**. The **AAAI Fellows** program was started

in 1990 to recognize individuals who have made significant, sustained contributions - usually over a 10-year period - to the field of artificial intelligence.

Dr. Blair Sullivan was named a **2014 National Consortium for Data Sciences (NCDS) Data Science Faculty Fellow**. She received \$30,000 in support of her project **Tracking Community Evolution in Dynamic Graph Data Using Tree-like Structure**.

Dr. Tiffany Barnes is using the **FRAB-JOUS CS project (Framing a Rigorous Approach to Beauty and Joy for Outreach to Underrepresented Students in Computing at Scale)** to help prepare 60 high school teachers to teach the **Beauty and Joy of Computing (BJC) Computer Science Principles** curriculum.



The **BJC** course is a rigorous introductory computing course that highlights the meaning and applications of computing, while introducing low-threshold programming languages **Snap-Scratch, GameMaker** and **Appinventor**.

New Framework Would Facilitate Use of New Android Security Modules

Computer security researchers from NC State and Technische Universität Darmstadt/CASED in Germany have developed a modification to the core Android operating system that allows developers and users to plug in new security enhancements. The new Android Security Modules (ASM) framework aims to eliminate the bottleneck that prevents developers and users from taking advantage of new security tools.

"In the ongoing arms race between white hats and black hats, researchers and developers are constantly coming up with new security extensions," says **Dr. William Enck**, an assistant professor of computer science at NC State and a senior author of a paper describing the new framework. "But these new tools aren't getting into the hands of users because every new extension requires users to change their device's firmware, or operating system (OS).

"The ASM framework allows users to implement these new extensions without overhauling their firmware," Enck says. "The framework is available now for security enthusiasts. But for widespread adoption, either Google or one of the Android phone manufacturers will need to adopt the framework and incorporate it into the OS."

The ASM framework allows the creation of custom security control modules that better protect phones owned by consumers and businesses. The custom security modules

receive "callbacks" for every security-sensitive operation in the Android OS. In this context, a callback means that Android is contacting the security module to determine whether an operation should proceed.

"Our ASM framework can be used in various personal and enterprise scenarios. For instance, security modules can implement dual persona: i.e., enable users to securely use their smartphones and tablets at home and at work while strictly separating private and enterprise data," says Enck.

The researchers also went to great lengths to ensure that the ASM framework complies with the security guarantees Google and others make with app developers. For example, the framework can only make data access more restrictive.

Co-lead authors of the paper, *ASM: A Programmable Interface for Extending Android Security*, are **Adwait Nadkarni**, a Ph.D. student at NC State, and **Stephan Heuser**, a Ph.D. student at TU Darmstadt/CASED. Co-authors include Enck and **Dr. Ahmad-Reza Sadeghi**, of TU Darmstadt/CASED. ■



Triangle Universities Awarded \$3 Million Grant for Cybersecurity Research

U.S. Senator Kay Hagan recently announced that UNC-Chapel Hill, North Carolina State University and Duke University have received cybersecurity research awards totaling more than \$3 million from the National Science Foundation (NSF).

"As Chair of the Emerging Threats and Capabilities Subcommittee, I know that cybersecurity is one of the most pressing issues we should be focused on when it comes to national security in the digital age," said Hagan. "I'm pleased that these three outstanding North Carolina universities will be working together to develop new solutions to bolster the security of our digital infrastructure."

This five-year award entitled, *Rethinking Security in the Era of Cloud Computing*, was competitively awarded through the Foundation's merit-review process and will be supported by the NSF's Secure and Trustworthy



Cyberspace (SaTC) program. The award supports collaborative, multi-university research and education activities that will help protect the nation's vast, critical, digital infrastructure and enable a more secure information society.

Dr. Peng Ning, professor of Computer Science at NC State, is the principal investigator for NC State's portion of the project. ■

NC State Awarded \$25 Million NNSA Grant to Develop Leaders, Improve Technological Capabilities for Detecting Nuclear Proliferation

NC State was awarded a five-year, \$25 million grant by the National Nuclear Security Administration's (NNSA) Office of Defense Nuclear Nonproliferation Research and Development to develop the next generation of leaders with practical experience in technical fields relevant to nuclear nonproliferation. NC State was selected by NNSA over 22 other proposals following a competitive process that began in May 2013.

The vision of the new Consortium for Nonproliferation Enabling Capabilities, or CNEC, is to be the pre-eminent research and education hub dedicated to the development of enabling technologies and technical talent for meeting the grand challenges of nuclear nonproliferation in the next decade.

"For NC State to be selected to lead this vital national effort is a testament to our great faculty and strong leadership in nuclear engineering," said NC State **Chancellor Randy Woodson**. "NC State is increasingly recognized as the university of choice for government and industry partners who want to collaborate with world-leading faculty and students to solve some of our nation's biggest challenges."

This announcement follows NC State's selection by the Department of Energy in January to lead a \$140 million manufacturing innovation institute to develop next-generation power electronics. In August 2013, NC State was chosen by the National Security Agency to create the \$60 million Laboratory for Analytic Sciences to advance the science of big data.

The NC State-led CNEC will implement educational activities with the goal to develop a pool of future nuclear nonproliferation and other nuclear security professionals and researchers. In addition, the consortium will provide the U.S. government with cutting-edge research and development to identify and address multidisciplinary and cross-functional technology and research needs that are critical to detecting foreign nuclear weapon proliferation activities.

Specifically, the research projects pursued by the consortium will include technologies to enhance simulation capabilities, algorithms and modeling; new test and evaluation models for detection sensors; new remote-sensing capabilities; and applications of data analytics and data fusion to better characterize and detect special nuclear materials.

"This grant will link students with world-class researchers and introduce them to career possibilities at the national labs while providing education in areas of great

importance for the non-proliferation mission," said NNSA Deputy Administrator for Defense Nuclear Nonproliferation Anne Harrington.

Robin Gardner, NC State

professor of Nuclear and Chemical Engineering and Director of the Center for Engineering Applications of Radioisotopes, or CEAR, will lead the consortium; **John Mattingly**, associate professor of Nuclear Engineering, is co-principal investigator on the project. Other CNEC partners include the University of Michigan, Purdue University, the University of Illinois at Urbana-Champaign, Kansas State, Georgia Tech and North Carolina Agricultural and Technical State University, as well as several national laboratories, including Los Alamos, Oak Ridge and Pacific Northwest.

At NC State, CNEC will engage nine faculty members in six departments spanning three colleges. It will annually involve two undergraduates, 13 graduate students as well as five post-doctoral fellows. Additionally, CNEC will establish a competitive graduate fellowship program that will sponsor six fellows per year. It is designed to attract top talent to the research and development areas critical for nuclear non-proliferation missions.

NC State houses the only nuclear engineering program in North Carolina – one of the premier departments in the United States – and is recognized as a global leader in nuclear engineering research and education. Home to the world's first university-based nongovernmental nuclear reactor for teaching and research, NC State is the lead university in the unique Department of Energy-funded Consortium for Advanced Simulation of Light Water Reactors initiative, which uses advanced computer simulations to create safer, most cost-effective nuclear power plants.

Established by Congress in 2000, NNSA is a semi-autonomous agency within the U.S. Department of Energy responsible for enhancing national security through the military application of nuclear science. ■



Dr. Nagiza Samatova, professor of Computer Science at NC State, is one of nine faculty in six departments spanning three colleges that will be involved in the research efforts.

Impact Bytes

Dr. R. Michael Young was awarded **Senior Member Status of the Association for the Advancement of Artificial Intelligence (AAAI)**. He was also named a **2013 Distinguished Scientist by the ACM**.



Dr. Nagiza Samatova received a **2013 Distinguished Contributions to Public Service in a Pre-College Environment Award from the IEEE Computer Society** for her work with pre-college education.



Dr. Laurie Williams was named a **2013-14 University Faculty Scholar**. Scholars are top faculty members who receive \$10,000 in donated funds for each

of the next five years to support their academic endeavors.

Dr. Mladen Vouk is the recipient of the **2013 MCNC Robyn Render Endeavor Award**. The award is presented each year to at least one person who continually champions leadership, engagement and support of MCNC.

Dr. Rudra Dutta and **Dr. Mihail Sichitiu (ECE)** organized the **CentMesh Drones Challenge** in April. The programming challenge took place on airborne computing and networking nodes, and required teams to fly drones using the **Centennial Mesh (CentMesh) wireless network** that covers NC State's Centennial Campus.



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Computer Science
NC STATE UNIVERSITY

Helping Kids Bring Their Stories to Life

Thushan Amarasiwardena loved Legos as a kid. He also loved taking pictures, making videos and creating stories. In his most formative years, the Internet served as a catalyst for bringing all those creative outlets to life for him. Now, as an adult, an NC State computer science graduate, an entrepreneur and a visionary, he is taking his childhood experiences and integrating them for a generation of technology savvy children by creating a crossroads between traditional play and today's technology.

"Today, kids are running to devices like the iPad and the iTouch," Amarasiwardena said. "Play is always going to happen and touch is a natural device to make play happen, so we have created an app that merges the two together in a meaningful and creative way."

The "we" is the creation of **Launchpad Toys**, a company by Amarasiwardena and his good friend, **Andy Russell**, where the mission is to create digital toys and tools that empower kids to create, learn and share their ideas through play. The two men had always collaborated on ideas for such a company as they worked in their then-current jobs, Amarasiwardena at the Boston Globe and Russell at Hasbro Toys.

"We always wanted to find the intersection between play and technology and when the iPad came out, we knew this was the time for us to start our business," he said. "Our first app was **Toontastic**, a creative learning tool for the iPad that teaches storytelling skills by enabling them to create their own cartoons and post them online."

On day two of Toontastic's launch in 2011, it was rated number two by Apple as one of the best new apps on the market. In quick follow up to that strong accolade, the *New York Times* named Toontastic to the **iTunes Hall of Fame**.

"Toontastic is a way to digitize action figures and create amazing stories, capturing all of it in real time," said Amarasiwardena. "Think about how often kids come up with these great stories when they are playing, only to be lost the minute they move onto something else. Toontastic allows them to create even better stories, complete with characters, settings and music, so they have this amazing creation that they can post online, share with Grandma or their friends, or go back and change if they decide they want a different ending to the story."

Referring to his love of Legos, Toontastic follows a Lego set approach, where the app contains about 30 different characters and settings. Players pick the characters they want to make a story about and digitize them, so they can move them around, move their arms and legs, change their costumes or colors, based on their own personal preference.



Once their story is complete, it can be uploaded and viewed by children from around the world. The site hosts cartoons from every state in the union and hundreds of countries around the world. Currently, there are more than 600,000 users on Toontastic and over two million cartoons posted.

Launchpad Toys isn't just focusing on the younger users either, Amarasiwardena said. For teens, Monkeygram is available on the iPhone, and Toontastic Jr., for ages two to five, is available on the iPhone and iPad.

"We want to be the Adobe Creative Suite for kids, so they can create stories, make up wacky news reports, make music, produce video and animation," he said. "We have had great mentorship throughout the development of Launchpad Toys. Back in the day, it took forever to create things and now we can change things on an hourly basis. There is instant gratification for developing things on the web and for it to be used on such a mass scale. We want to push the boundaries because there is a lot to do in this field and the coolest part is when we get it in front of the user."

From computer science graduate to self-professed "toy maker," Amarasiwardena credits his experience at NC State for giving him his own launchpad for creativity.

"I was learning from professors that were actively inventing things in their fields, like **Donald Bitzer** who invented the plasma screen," he said. "There are so many talented professors at NC State and they showed that we could excel at so many things. With access to real world professors as well as exposure to all the real world possibilities, if you can mix that knowledge and experience with something you are passionate about, then it gives you the gamut to succeed at what you want to do." ■