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 US working on what they call the Smart Emergency Response System (SERS).

NC State researchers, Drs. David Roberts (pictured here with Diesel) and Alper Bozkurt, have developed a high-tech dog harness equipped with sensors and other devices that will make dogs more effective at collecting information and incorporate the dogs into the larger network of coordinated disaster response.

The harness 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.

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.

Dogs, Technology and the Future of Disaster Response

Welcome to another issue of Research, our annual synopsis of the status of research in the NC State Computer Science Department. Research is crucial to the success of our department, and we are pleased to report that research productivity continues to grow, with annual expenditures reaching a record of more than $14M. And, we currently have more than $53M in active research grants. This ranks us in the top ten departments for sponsored research funding among computer science departments in colleges of engineering in the United States. Some research highlights are below (A list of select representative research projects appears on page three of this newsletter):

- NC State is partnering with the National Security Agency (NSA) to create the Laboratory for Analytic Sciences (LAS). The $60 million lab will bring together some of the brightest minds from government, academia and industry to address the most challenging big-data problems; Additionally, the NSA funding for the Science of Security Lablet (SoSL) has been extended three years;
- NC State is one of three Triangle universities that have received cybersecurity research awards totaling $3 million from the National Science Foundation (NSF). NC State will be working with Duke University and UNC-Chapel Hill to develop new solutions to bolster the security of our digital infrastructure;
- Dr. James Lester and other researchers in the Computer Science Department are developing interactive software aimed at helping teens reduce alcohol use and the risks associated with drinking alcohol;
- Dr. Nagiza Samatova is one of nine faculty members in six departments spanning three colleges that are involved in a five-year, $25 million grant by the National Nuclear Security Administration’s (NNSA) Office of Defense Nuclear Nonproliferation Research and Development. The goal of the project is to develop the next generation of leaders with practical experience in technical fields related to nuclear nonproliferation;
- Dr. William Enck and other researchers have developed a modification to the core Android operating system that allows developers and users to take advantage of new security tools.

(Continued on page 2)
This fall we welcomed four new faculty: Dr. Tim Menzies, professor of computer science, whose area of specialty is software engineering; Dr. Chris Parmin, assistant professor, whose specialty is also software engineering; Dr. Xipeng Shen, associate professor in the Chancellor’s Faculty Excellence Data Driven Sciences Cluster, whose area of specialty is systems and extreme-scale data-intensive computing; and Dr. Ranga Raju Vatsavai, associate professor in the Chancellor’s Faculty Excellence Geospatial Analytics Cluster, and Associate Director for Computational Methods in the new NC State Center for Geospatial Analytics. Vatsavai’s areas of specialty are advanced data sciences and geospatial analytics.

Our faculty continue to represent the department well with their involvement in prestigious professional events, and by publishing papers in flagship journals and conferences. Many serve in various professional roles at the university, state, and national levels. A number have received prestigious awards and professional recognitions in 2013-2014: Dr. Douglas Reeves was named Interim Assistant Dean for the College of Engineering Graduate Program; Dr. George Rouskas was named Director of Graduate Programs for the Computer Science Department; Dr. James Lester was elected Fellow of the Association for the Advancement of Artificial Intelligence (AAAI); Dr. Michael Young was awarded Senior Member Status of the AAAI. He was also named a 2013 Distinguished Scientist by the Association for Computing Machinery (ACM); Dr. Miladen Vouk received the 2013 MCNC Robyn Render Endeavor Award; Dr. Nagiza Samatova received a 2013 Distinguished Contributions to Public Service in a Pre-College Environment Award from the IEEE Computer Society; Dr. Blair Sullivan was named a 2014 National Consortium for Data Sciences (NCDS) Data Science Faculty Fellow; Dr. Laurie Williams was named a 2013-2014 NC State University Faculty Fellow; and Drs. Rada Chirkova, Vince Freeth, David Thuente, Miladen Vouk and Mr. John Streck all received prestigious IBM Faculty Awards.

Evaluating our students and preparing them to succeed professionally is another key component of the department’s mission. In fall 2013, we enrolled 1,515 students – 895 undergraduates and 620 graduate students (182 PhDs). In 2013-2014 we awarded 161 undergraduate degrees, and 212 graduate degrees. Demand for our graduates continues to be extremely high with many receiving multiple job offers. Starting salaries for those graduating with a BS degree averaged $64K. Students graduating with an MS or PhD fared well too – the average starting salary for our master’s degree students was $94K, while starting salaries for our PhD students was closer to $120K. Our students began employment with companies like Amazon, IBM, Cisco, Microsoft, EMC, SAS and NetApp.

The Computer Science Department and students received numerous awards and honors this year: the Engineering Online Computer Science and Networking program at NC State has been ranked fourth nationally in the US News and World Report’s 2014 list of the Best Online Graduate Computer Information Technology programs; Engineering Online was ranked ninth nationally on the magazine’s list of the Best Online Graduate Programs; NC State’s Video Game Design Program has been recognized as one of the Top 25 Undergraduate Schools to Study Game Design for 2014 in the US and Canada on The Princeton Review’s Top Schools to Study Video Game Design for 2014 list. (This is the fourth consecutive year that NC State’s program has been recognized.) PhD student Sean Mealin was selected to receive a prestigious and highly competitive NSF Graduate Research Fellowship; Zhe Zhang was awarded the IBM PhD Fellowship Award for the third consecutive year; Pat Morrison was awarded an IBM PhD Fellowship Award for the second year; and Andy Smith was awarded a Presidential Service Award for Volunteerism (Gold Level) for his work with the STARS Leadership Corps.

Finally, we are especially grateful for the generous financial support from our alumni, friends and corporate partners (~$800K in total unrestricted cash contributions from all sources.) This unrestricted funding allows the department to continue to grow in emerging areas of computer science while providing the highest quality educational experience for our students.

Mladen A. Vouk
Professor and Department Head
Complete list with abstracts is at http://www.csc.ncsu.edu/research/
Dr. Druda Dutta, a professor of Computer Science, joined NC State in 2001. He received a B.E. in Electrical Engineering from Jadavpur University, Kolkata, India, in 1991, an ME in Systems Science and Automation from Indian Institute of Science, Bangalore, India in 1993, and a PhD in Computer Science from NC State University in 2001. From 1993-1997, Dutta worked for IBM as a software developer and programmer in various networking related projects. His current research interests focus on design and performance optimization of large networking systems, Internet architecture, wireless networks, and network analytics. His research is supported currently by grants from the National Science Foundation, the National Security Agency, and industry, including a recent GENI grant and a FIA grant from NSF. He has served as a reviewer for many premium journals, on NSF, DOE, ARO, and NSERC (Canada) review panels, as well as the organizing committee of many premium conferences, including Program Co-chair for the Second International Workshop on Traffic Grooming. Most recently, he has served as Program Chair for the Optical Networking Symposium at IEEE Globecom 2008, General Chair of IEEE ANTS 2010, on the Steering Committee of IEEE ANTS 2013, and as guest editor of a special issue on Green Networking and Communications of the Elsevier Journal of Optical Switching and Networking. Currently, he is serving on the editorial board of the Elsevier Journal of Optical Switching and Networking.

Dr. Nagiza Samatova, a professor of Computer Science, specializes in computational biology and high-performance data mining, knowledge discovery, and statistical data analysis. A senior research scientist in the Computational Biology Institute at Oak Ridge National Laboratory, Samatova is the author of more than 200 publications, two patents, and the book "Practical Graph Mining with R." She received her BS degree in Applied Mathematics in 1991 from Tashkent State University, Uzbekistan; a PhD in Mathematics from the Russian Academy of Sciences, Moscow in 1993; and an MS in Computer Science from the University of Tennessee, Knoxville in 1998. She joined the NC State Computer Science Department in 2007. Samatova has supervised dozens of young researchers, and three high school teams she mentored were national finalists in the Siemens Competition in Math, Science and Technology. She was recently honored by the IEEE Computer Society with a 2013 Distinguished Contributions to Public Service in a Pre-College Environment Award.

Dr. Tim Menzies joined the department as a full professor of Computer Science in fall 2014. His general area of expertise is software engineering. He received his BS in Computer Science and PhD in AI and Advanced Modeling at the University of New South Wales, Australia in 1984 and 1985 respectively. Most recently, Menzies was a full professor in the Lane Department of Computer Science and Electrical Engineering, West Virginia University.

Dr. Chris Parmin joined the department as an assistant professor of Computer Science in fall 2014. His general area of specialty is software engineering. He received his BS, MS, and PhD from Georgia Tech in 2003, 2006, and 2014 respectively. Most recently, Parmin was a software engineer at the Georgia Research Institute.

Dr. Xipeng Shen joined the department as an associate professor in the Chancellor’s Data Driven Sciences Cluster in fall 2014. His general area of specialty is systems and extreme-scale data-intensive computing. He received his BS in Industry Automation from the North China University of Technology in 1988; his MS in Pattern Recognition and Intelligent Systems from the Chinese Academy of Sciences in 2001; and his MS and PhD in Computer Science from the University of Rochester in 2003 and 2006, respectively.

Dr. Ranga Raju Vatsavai joined the department as an associate professor in the Chancellor’s Faculty Excellence Geospatial Analytics Cluster, and an associate professor for Computational Methods in the new NC State Center for Geospatial Analytics. Vatsavai’s general areas of specialty are Advanced Data Sciences and Geospatial Analytics. He received his MS in Computer and Information Science in 2003, and his PhD in Computer Science in 2008, both from the University of Minnesota.