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Game Time! NC State is Fueling Big Time Growth in North Carolina's Games Industry

With help from NC State and its engineering and computer science alumni, the Triangle games industry has exploded over the past decade. Drove of companies have relocated, expanded or started up in the area, and today about 40 games companies employing as many as 1,500 people have operations in the region. NC State is driving industry growth by making important research advances, graduating talented, well-rounded students and creating programs that foster innovation in the field.

The growth has come amidst unprecedented change in an industry that was once associated with teenagers punching away at Nintendo and Sega consoles in their parents' basements. Today, the industry has expanded into serious games that range from military simulations to surgical training to children's educational software.

The Triangle, and NC State in particular, have been quick to capitalize on gaming's growing popularity, and **Dr. Michael Young** (pictured at right), associate professor of computer science and co-director of the proposed Digital Games Research Center (DGRC) at NC State, has been at the forefront of those efforts.

The growth in gaming, and serious gaming in particular, has come about because video games are essentially learning machines, Young said. To succeed in Halo, Donkey Kong or any other game, players must learn rules, solve problems, reach goals, and understand how their actions affect the gaming environment. That's why schools, businesses and government agencies are increasingly incorporating games into their lessons and training programs.

"We engage with educational games the same way," Young said, "and so they have the same compelling learning potential as when you're playing a traditional game and learning how Mario jumps."

These serious games need skilled developers, and NC State faculty and students are filling those roles. Through a new game development concentration in computer science, which was recently ranked among the **top 15 undergraduate video game design and development programs in the US and Canada** by the *Princeton Review*, students can tailor their academic careers around gaming courses.

Another big push from NC State's serious games research efforts is in K-12 education. Attitudes towards games in the classroom have changed, and teachers have recognized that since students enjoy games so much outside school, they'll likely enjoy them in the classroom as well. Together with collaborators in NC State's College of Education and the Friday Institute for Educational Innovation, computer scientists are working to enhance learning through gaming.

"There's a recognition that students will spend their time on what's enjoyable," said **Dr. James Lester**, professor of computer science. "So if you create a learning environment that's engaging, then it's much more likely to hold their attention."

"We would never want these technologies to replace the teacher," Lester said, "but instead they can act in this augmenting capacity in which the teacher becomes more of an orchestrator of learning activities rather than a lecturer standing at the front of the room." ■



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Impact Bytes

Dr. Mladen Vouk (pictured below), has been reappointed to his second five-year term as head of the Department of Computer Science. He also has been presented with an **IEEE Distinguished Service Award**, and was named a member of the **IEEE Computer Society's Golden Core**.



Dr. Annie Antón, professor of computer science and director of ThePrivacyPlace.org at NC State, testified in April before the **Subcommittee on Social Security of the U.S. House of Representatives Committee on Ways and Means** concerning the Social Security Administration's role in verifying employment eligibility.

Eight faculty members: **Drs. Rada Chirkova, Patrick Dreher, Xiaohui (Helen) Gue, Christopher Healey, Michael Rappa, Mladen Vouk, Laurie Williams** and **Tao Xie**, received **2010 IBM Faculty Awards** totalling \$203,500.

Dr. Tao Xie, associate professor, has been appointed to the **ACM History Committee**, and was also named an **ACM Distinguished Speaker**. Xie was also named an **IEEE Computer Society Distinguished Visitor** for 2011-2013.

Dr. Laurie Williams, professor, received a **2010 IBM Smarter Planet Innovation Faculty Award**.

Drs. Xiaohui (Helen) Gu, and **Emerson Murphy-Hill** each received **Google Research Awards** in the amount of \$61,000.

NC State has been designated an **NVIDIA CUDA Research Center**, and an **NVIDIA CUDA Teaching Center**.

Predicting the Effects of Climate Change

NC State researchers are part of a major new research initiative from the National Science Foundation (NSF) aiming at improving climate scientists' ability to predict potential consequences of climate change. The work being done at NC State will focus on improving our ability to predict hurricanes and precipitation patterns.

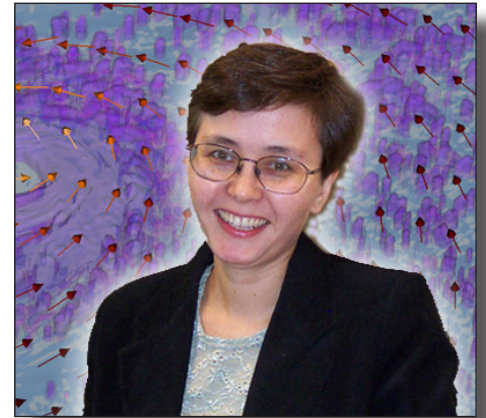
At issue is a five-year, \$10 million NSF Expedition grant, "*Understanding Climate Change: A Data Driven Approach*," which aims to advance climate science by taking advantage of the wealth of climate data collected by satellites, ground-based sensors and physics-based climate simulations. The grant, which is being led by Professor Vipin Kumar from the University of Minnesota, includes \$1.8 million in funding for work that will be performed at NC State by **Drs. Fred Semazzi** and **Nagiza Samatova** (pictured here).

Semazzi, a professor of marine, earth and atmospheric sciences at NC State, will be working to improve the prediction of Atlantic hurricanes by significantly advancing computational techniques used to analyze climate datasets.

Semazzi's goal is to develop a new, more sophisticated, approach to Atlantic hurricane prediction. The new approach "will be based on a combination of the application of highly efficient high-performance computer algorithms, data-mining methods, data fusion and signal detection processing techniques to isolate the triggers for the development of Atlantic hurricanes," Semazzi explains.

Samatova, an associate professor of computer science at NC State and joint faculty appointee at Oak Ridge National

Laboratory, will be developing high performance data analytics algorithms and tools that will ideally be able to improve the accuracy and detail of climate forecasts. This is important, Samatova says, "because much of the existing climate forecast data is on a large scale – addressing global trends for time scales of 100 years."



Specifically, Samatova will be developing software that can be used to model the climate system as a complex and dynamic network. Samatova's goal is for the software to use observational data and physics-based simulations to improve our ability to predict precipitation and hurricane activity on a regional level and over 10-year time periods.

"We also hope to tap into high-performance computing technologies to improve the response time for these climate models," says Samatova. "This should allow climate researchers to analyze data, and explore more hypotheses, much more quickly."

The other institutions affiliated with the grant include North Carolina A&T, the University of Tennessee and Northwestern. ■

NC State To Create Video Game to Boost Science Literacy

North Carolina State University has landed a \$500,000 grant to boost science literacy by developing a narrative video game that uses adventure to help middle school students develop their literacy skills – particularly their ability to read and understand scientific and technical language. The grant, from the Next Generation Learning Challenges program (NGLC), began July 1 – with the goal of creating and disseminating the educational game by September 2012. NGLC is overseen by the nonprofit group EDUCAUSE, and funded by the Bill & Melinda Gates Foundation and the William and Flora Hewlett Foundation. ■

Virtual Tutors: NC State Receives \$3.5M Grant to Study Artificial Intelligence in the Classroom

NC State recently received a four-year, \$3.5 million grant to explore using artificial intelligence as a learning tool inside fourth- and fifth-grade science classrooms.

The project includes creating “CyberPads” – computer notebooks with artificial intelligence-based software that allows the user to create graphical representations that model different scientific phenomena they learn in the classroom.

“Fourth- and fifth-grade science classes have a particular focus on physical and earth sciences. The CyberPads will support interactive scientific modeling for topics such as electricity, landforms, weather and climate,” explains **Dr. James Lester**, NC State professor of computer science and the project’s principal investigator. “Students will actually be able to sketch out these different concepts using the program, and then see the models come to life with animation, sound and narration.”

Assisting the students in using the CyberPads will be “PadMates” – or intelligent virtual tutors that support science learning through interactive scientific modeling. The PadMates will be able to recognize the understanding of the student using the CyberPad and interact with them accordingly.



The program will initially be rolled out in 16 fourth- and fifth-grade science classrooms in North Carolina, to be followed by an additional 44 classrooms in Texas and California. Researchers will study the students’ problem solving skills – such as strategy, thinking and collaboration – as well as the level of engagement in learning the science concepts before and after the use of CyberPads to see if, and how, the tools impact learning.

The project is funded by the National Science Foundation’s Discovery Research K-12 program. In addition to Lester, the NC State project team includes **Dr. Eric Wiebe**, NC State associate professor of math, science and technology education, and co-principal investigator on the project, **Dr. Mike Carter**, associate dean of the graduate school, and **Dr. Bradford Mott**, computer research scientist. ■

New IBM Cloud Offerings for Virtual Computing Lab

As part of the new IBM SmartCloud for Education, the IBM Virtual Computing Lab Cloud solutions for Education will provide enhanced services and tools to enable a cloud computing environment as an on-campus private cloud or a ‘hybrid’ cloud connected to the IBM SmartCloud.

Beginning with a collaborative project with NC State in 2002, IBM has worked with institutions around the world to enable the award-winning Virtual Computing Lab (VCL) open source software platform that was built by and for education. Today over a half million students and educators have access to this cloud platform on IBM hardware servers.

“At NC State, the VCL cloud serves more than 40,000 users and delivers 250,000 resource reservations and over 11 million HPC CPU hours per year and our partnership with IBM has been the key to its development and success. VCL has transformed the way we deliver computational and educational services to our students,” said Dr. Mladen Vouk, professor and head of the Department of Computer Science at NC State. ■

Computer Science Department Launches New “Future Students” Campaign and Website

Thanks to the generous support of numerous corporate sponsors, the Department of Computer Science recently launched a comprehensive “Future Students” campaign, designed to show how computer science graduates are making a real difference in the world in a socially relevant way.

Print and email collateral complement a dynamic new Future Students web site, (www.csc.ncsu.edu/future-students) which contains a variety of profile stories and videos designed to answer the questions “Why Computer Science?” and “Why at NC State?” in a compelling way.

Posters and promotional materials have been distributed to over 10,000 middle and high school advisors, counselors, and science & math teachers. “First and foremost, this is a campaign to dispel the misconception of computer science as simply coding and programming,” says Ken Tate, director of development and external relations for the department.

Feedback from advisors and teachers has been overwhelmingly positive. The collateral is helping teachers show students (and potential recruits into the computer science discipline) real world applications demonstrating the importance of science and math.

This initial launch was made possible by the generous support of corporate partners **Duke Energy, Cisco, EMC, Harris, I-Cubed, AT&T, Red Hat, SAS, Tekelec, NetApp, Northrop Grumman & Progress Energy**, as well as the **ePartners Program** and the **NC State Engineering Foundation**. ■



NC State Computer Science

Department Head - Dr. Mladen Vouk

Director of Graduate Programs -
Dr. Douglas Reeves

Director of Undergraduate Programs -
Dr. Dennis Bahler

**Editor / Director of Development &
External Relations** - Ken Tate

Associate Editor - Tammy Coates

Contributing Writers

Caroline Barnhill, Tammy Coates,
Nate DeGraff, Matt Shipman

Photographers & Graphics

Becky Kirkland, Roger Winstead

NC State University

Department of Computer Science

Campus Box 8206

Raleigh, NC 27695

Phone: 919-515-2858

Web: www.csc.ncsu.edu

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Computer Science

NC STATE UNIVERSITY

NC State's Game Design Program One of *The Princeton Review's* Top 15

NC State has been recognized as one of the top undergraduate programs to teach video game design and development on *The Princeton Review's* second annual list saluting the best schools in the U.S and Canada. The list, "**Top Schools for Video Game Design Study for 2011**," salutes 30 institutions in all (15 undergraduate and 15 graduate) for their outstanding game design education programs. ■



New 'GoldDream' Malware Targets Android

NC State computer science researchers have discovered yet another variety of malware targeting Android. The new malware, called "GoldDream," collects data on text messages and phone calls – and may also be used to install new apps on Android smartphones or to upload files stored on Android to a remote server.

The NC State team, led by **Dr. Xuxian Jiang**, has previously discovered DroidKungFu, Plankton and YZHCSMS – as well as variations on DroidKungFu uncovered recently, and a data-stealing vulnerability in Android 2.3 (Gingerbread) that was revealed in January, 2011.

GoldDream piggybacks on infected apps and sets up a background service on the Android user's smartphone without the user's knowledge. GoldDream then collects the user's device and subscriber IDs and sends that information to a remote server.

When an infected phone receives a text message (also known as an SMS mes-

sage), GoldDream will store the content of the message, when it was received and who sent it. It does the same for outgoing messages. GoldDream also collects timestamp information and phone numbers for incoming and outgoing phone calls. All of this information is stored in local files, and can be retrieved via a remote server using a bot command (which effectively takes control of part of the phone).

GoldDream exhibits bot-like behavior by receiving and executing commands from a remote server. The investigation from Jiang's team shows that this malware could also be used to attempt to install or uninstall apps, or to steal other files stored on the smartphone. Jiang's technical analysis of GoldDream can be found here.

So far, GoldDream has only been found in a few alternative Android markets and forums targeting Chinese-speaking users. ■

NC State Home to the Most Powerful Academic HPC in North Carolina

NC State is the home of an extremely powerful educational HPC (high performance computing) cluster made up of 1728 processor cores and 36 NVIDIA Tesla C2050 GPUs on 108 computer nodes (32GB RAM each) with QDR Infiniband. According to **Dr. Frank Mueller**, this cluster is currently the most powerful academic HPC cluster in North Carolina.

This cluster was made possible in part by a National Science Foundation (NSF) grant in the amount of \$549,999 supporting the research project of **Dr. Mueller** (PI), and his collaborators: **Drs. Vince Freeh** and **Xiaosong Ma**, associate professors of computer science, and **Drs. Xiaohui (Helen) Gu** and **Xuxian Jiang**, assistant professors of computer science. GPUs were purchased in part with funds from NC State University and donations from **NVIDIA**. ■