Northeastern University

Security Research

Northeastern researchers are doing groundbreaking work in such areas as cyber defense and robotics, blazing the trail to a stronger, safer nation. The University’s use-inspired approach to research is particularly powerful when it comes to addressing issues of national security—arguably the most daunting challenge of our generation.

Making the world safer is part of the University’s focus on research that aligns with three national imperatives: health, security, and sustainability.

Northeastern’s Leading Security Researchers

Spotlight

Northeastern University recently received a $12 million grant from one of its alumni, George J. Kostas, to build a secure, state-of-the-art homeland security research facility on the University’s Burlington campus.

Opening in September 2011, the new George J. Kostas Research Institute for Homeland Security, a multi-story building, designed in accordance with Department of Defense standards, will give Northeastern the capacity and clearances to conduct restricted-area research in areas critical to national security, including cryptography, data security, information assurance, detection of explosives, and energy harvesting.

Northeastern has a strong portfolio of recent efforts built around security. In 2008, the Department of Homeland Security selected Northeastern as one of 11 universities nationwide for a DHS Center of Excellence. The $10 million grant established the Awareness and Localization of Explosives-Related Threats (ALERT) center at Northeastern. And Northeastern’s Marine Research Center in Nahant—which just secured $1.8 million from the National Science Foundation to upgrade its facility—is working on robotic technology to detect underwater mines.

The research conducted by the new Kostas Institute will build on a federally funded research portfolio of Northeastern’s College of Engineering, the College of Engineering and the College of Computer and Information Science also have programs in cybersecurity and in the wireless and wired networks and algorithms that form the backbone of robust command and control systems.

Recent grants: $1.9 million from the National Science Foundation (NSF)/Scholarship for Service; $100,000 from the NSF/Computer & Information Science & Engineering; $170,000 from the Department of Defense/Information Assurance Scholarship Program.

Carey Rappaport, professor of electrical and computer engineering, deputy director for Awareness and Localization of Explosives-Related Threats (ALERT), associate director of the Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems (Gordon-CenSSIS)

Research focus: Rappaport is investigating the use of radar waves to detect suicide bombers from a distance and through airport security terminals. The high-frequency radar would detect man-made objects that are attached to the skin and covered by clothing.

Recent grants: $35.6 million Gordon-CenSSIS and $16 million ALERT grants; $4.9 million from the Department of Homeland Security Advanced Spectrographic Radiation Portal Monitor for special radioactive materials. $4.85 million from an ARO-sponsored multidisciplinary university research initiative in humanitarian demining; $400,000 from the Omnibus Task Order with the U.S. Army Night Vision and the Electronic Sensors Directorate.

Northeastern University recently received $1.2 million from two of its alumni, George J. Kostas, to build a secure, state-of-the-art homeland security research facility on the University’s Burlington campus.

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Agnes Chan, professor and associate dean in the College of Computer and Information Science, former codirector of Northeastern’s Institute for Information Assurance

Research focus: Chan is working with other computer scientists and electrical engineers on protocol-hopping algorithms to thwart “jamming” and other denial-of-service attacks on our nation’s computer networks. She played a lead role in the University’s successful efforts to be named a National Center of Academic Excellence in Information Assurance Education and a National Center of Academic Excellence in Information Assurance Research by the National Security Agency and the U.S. Department of Homeland Security.

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Mario Sznaier, Dennis Picard Trustee Professor of Computer and Electrical Engineering, (above), and Octavia Camps, professor of computer and electrical engineering

Research focus: Smaier and Camps are collaborating on an innovative unmanned aerial vehicle for the military. The team hopes to transfer the technology used to run a low-cost blimp capable of following a moving target or locating a stationary target to a miniature, swifter unmanned helicopter. Applications include surveillance for public safety, environmental safety, disaster mitigation, and infrastructure inspection.

Recent grants: Nearly $1 million over six years from the United States Air Force; $407,000 through various grants from the National Science Foundation, nearly $150,000 per year through the Department of Homeland Security–funded ALERT (Awareness and Localization of Explosives-Related Threats) center at Northeastern.

Ming Wang, professor of civil and environmental engineering

Research focus: Wang—the principal investigator for VOTERS (Versatile Onboard Traffic-Enabled Roaming Sensors)—is using vehicle-mounted sensor systems to collect a continuous stream of up-to-date information on the state of roadways and bridge decks. This system will also eliminate the dangerous work zones where this critical data has traditionally been gathered.

Recent grants: $16 million from the Department of Homeland Security (DHS) over four years for ALERT research and education program focused on characterization, detection, mitigation, and response to explosives-related threats around the world; $1.6 million in funding from the Massachusetts Technology Collaborative’s John Adams Innovation Institute to foster collaboration between ALERT and industry companies; $1.6 million in funding from DHS to develop ALERT datasets and metrics to evaluate advanced CT-based algorithms for lugg- gage screening.

Research focus: Silevitch is focused on making our nation more secure from terrorist threats through the development of cutting-edge detector and imaging technologies. One involves the use of radar to find hidden metallic objects under clothing; another uses video tech- niques on crowd motion to distinguish abnormal behavior among individuals.

Recent grants: $9 million over five years from the National Institute of Standards and Technology’s Technology Innovation Program for other research on the development of sensors to detect abnormalities in highways and bridge decks; $600,000 over four years from the National Science Foundation for the development of nanosensors for TNT and DNT detection.

Research focus: Silevitch and his team of researchers are exploring a variety of novel solutions. Engineering and chemistry researchers are collaborating on new construction methods that would make buildings and ships less vulnerable to explosions. Electrical engineers are working with their counterparts at Germany’s Fraunhofer Institute on remote sensing technology to identify potential suicide bombers from a distance. Another international partnership, with Technion-Israel Institute of Technology, promises to expand the reach and effectiveness of Silevitch’s team.

A SECURITY CENTER FOCUSED ON CREATIVE SOLUTIONS

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Applying the predictability of moving water to moving crowds may teach us how to spot behavior that indicates a person is up to no good, says Michael Silevitch, the Robert D. Black Professor of Electrical and Computer Engineering and codirector of Awareness and Localization of Explosives-Related Threats (ALERT), a Department of Homeland Security Center of Excellence.

The linkage of water behavior—fluid dynamics—with crowd behavior is typical of the creative thinking that Northeastern researchers bring to issues of global security.

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In a recent meeting with U.S. Homeland Security Secretary Janet Napolitano at the DHS University Network Summit in Washington, D.C., Silevitch detailed the ALERT center’s ongoing work in developing technologies and tools to aid first responders and other security personnel.

For more information, contact Tim Leshan, vice president for government relations, 617.373.8528, t.leshan@neu.edu.

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Research focus: Silevitch and Camps are collaborating on an innovative unmanned aerial vehicle for the military. The team hopes to transfer the technology used to run a low-cost blimp capable of following a moving target or locating a stationary target to a miniature, swifter unmanned helicopter. Applications include surveillance for public safety, environmental safety, disaster mitigation, and infrastructure inspection.

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