MAJOR UVA ENGINEERING INITIATIVE TO FOCUS ON INTERSECTION OF CYBER, PHYSICAL SYSTEMS

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The University of Virginia School of Engineering and Applied Science will launch a multi-million dollar initiative to drive innovation in cyber-physical systems, an area of research that explores both the promise and risks of the worldwide technology explosion.

The initiative includes an international search for eight faculty members who will join more than a dozen U.Va. researchers already making significant contributions to this field.

Cyber-physical systems refers to cyber systems that interact with and help control the human environment. The breakthroughs driven by the Engineering School's investment will benefit humanity, improve quality of life and expand the knowledge base. Examples are devices that monitor human activities and health, unmanned aerial vehicles, automated vehicles and infrastructure systems, and smart buildings.

Cyber-physical systems research has been a strength at the Engineering School. Projects underway include a body monitor that could warn an asthma sufferer of an impending attack, a system to prevent cyber attacks on police cars and other emergency vehicles, and crash test dummies explicitly designed for study of vehicle rollovers, which are a major cause of traffic fatalities.

As part of the new initiative, the school is launching a new cross-disciplinary lab to strengthen connections between cyber-engineering and physical-engineering research.

The initiative reflects Engineering Dean Craig Benson's strategy of leveraging the school's established research strengths to better address society's most pressing challenges and make the school more competitive in attracting research funding and top graduate students. The initiative will connect engineering, architecture, medicine and potentially many other fields.

"U.Va. is one of the best comprehensive universities in the world, which gives us an excellent opportunity to target our resources, drive innovation and make a positive impact on society,"
said Benson, who became dean in July. "This initiative is an example of our determination to bring faculty members together, across disciplines, to collaborate and accelerate discovery."

Pamela Norris, the Engineering School's executive associate dean for research, said the initiative also represents a paradigm shift in the way the School of Engineering hires faculty and conducts research - aligning with U.Va.'s Grounds-wide emphasis on faculty collegiality across schools, departments and centers.

"We are committed to leading the nation in cyber-physical systems research," she said.

BP America Computer Science Professor John Stankovic, who is the recipient of a National Science Foundation grant announced in September to develop novel approaches for cyber-physical systems that can transform communities, said, "In my opinion, cyber-physical systems is the future of engineering education and research. It breaks the artificial boundaries between departments, and its impact on the world will be profound."

The critical importance of such research has been highlighted this week during the "Commonwealth of Virginia Cyber Security - Unmanned Systems Technology Showcase," held in Chesterfield County. Munster Professor Barry Horowitz, chair of U.Va.'s Systems and Information Engineering Department and member of Gov. Terry McAuliffe's Virginia Cyber Security Commission, demonstrated the group's work with the Virginia State Police to assess the potential risk of cyber attacks on automobiles, specifically those used by emergency first responders. The outcome of the research will be to help law enforcement agencies and other first responders establish training protocols and explore low-cost technology to assist public safety agencies with reducing the risk of cyber attacks against their vehicles, according to a release from the governor's office.

U.Va. Professor John Lach's work in the area of cyber-physical systems also was accomplished with strong collaborations. Lach, chair of the Charles L. Brown Department of Electrical and Computer Engineering and co-director of the U.Va. Center for Wireless Health, leads the research team developing body monitors for asthma and other health applications in partnership with U.Va.'s schools of Medicine and Nursing.

"This initiative will bring together researchers from diverse backgrounds and application expertise, leading to new synergies and applications that can better address societal grand challenges," Lach said.
One thrust of the research will be to address the potential risks created by dependency on cyber-physical systems. "The challenge is to achieve the benefits of the technology while maintaining human control, privacy and safety," said Professor Kevin Skadron, chair of the Department of Computer Science, one of several departments that will have a role in fully developing the cyber-physical systems initiative. "We have to manage design flaws and software vulnerabilities that could hurt the user or compromise security."

Brian Smith, chair of the Department of Civil and Environmental Engineering and director of its Center for Transportation Studies, leads a research team supporting federal and state government efforts to develop "connected" technologies and applications that allow vehicles and the infrastructure to work together to make travel safer and more efficient.

"Our work in connected vehicles has brought to the forefront the need to address cyber-security issues. These issues are complicated, requiring teams with expertise across a wide range of engineering disciplines," Smith said.

Commonwealth Associate Professor Kamin Whitehouse, whose research includes smart home technologies and who is expected to be involved with the new center, said, "We anticipate a strong pool of international candidates who will be attracted by the opportunity to conduct groundbreaking research for the greater good."

The initiative is an opportunity to increase diversity among the faculty, including the representation of women. The University has a National Science Foundation ADVANCE grant to boost the participation of women faculty in science and engineering.

More information about the initiative can be found here. The search process will begin this month, and the jobs will be listed on the University’s employment site. The new faculty and the lab are expected to be in place beginning late spring, Whitehouse said.

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