NEWS/RESEARCH

Fighting disease with data

Winning the war against COVID-19 requires data — and plenty of it. To fortify Central Virginia's arsenal, **Preetam Ghosh, Ph.D.**, professor of computer science, worked with VCU health care experts to build a data model to better understand and track the spread of the disease across Central Virginia. It comprises region-specific hospitalization data as well as epidemiological models that chart characteristics of the disease such as the incubation period, transmissibility and its ability to present without symptoms.

GROWTH

New Engineering Research Building topped off

The college marked a milestone in the construction of its new $93 million, 133,000-square-foot Engineering Research Building with a topping-off ceremony Oct. 15, 2019. Approximately 150 spectators cheered as a final beam — signed by students, faculty and members of the community — was hoisted into the air and placed atop the building, which is set to open in late 2020.

Barbara D. Boyan, Ph.D., the Alice T. and William H. Goodwin, Jr. Dean of the college, said that the future of engineering was built into the design of the state-of-the-art research hub.

"This building speaks to the future," she said. "It's full of modern concepts, with a first-floor makerspace, labs for the way computer science is going to be, and for advanced, collaborative engineering."

Krzysztof (Krys) Cios, Ph.D., D.Sc., M.B.A.

Professor and Chair
Department of Computer Science

FROM THE CHAIR

VCU's Department of Computer Science provides leadership in the digital economy.

With substantial funding from federal agencies and industry, our faculty are making their research excellence known by publishing in the top academic journals and presenting at conferences.

Our undergraduate and graduate students regularly participate in computational events and often bring home top honors.

We have had remarkable growth in our data science, cybersecurity and software engineering specializations for computer science majors. We are also teaching fundamentals of digital fluency to all VCU students, including those with no computational background, to prepare them to be successful in the new economy.

UNDERGRADUATE SPECIALIZATIONS:

Cybersecurity
Data science
Software engineering

40 ACTIVE RESEARCH GRANTS

17 INVENTION DISCLOSURES SINCE 2018

AREAS OF RESEARCH

Cybersecurity
Data science
Bioinformatics
Cryptography
Natural language processing
Machine learning
Mobile and edge computing
Quantum machine learning
Robotics
Software engineering
Wireless networks

4 GRADUATE PROGRAMS

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Computer science professor named Commonwealth Cyber Initiative Fellow

The Commonwealth Cyber Initiative (CCI) has named **Milos Manic, Ph.D.**, a CCI Fellow. Manic is a professor of computer science in the VCU College of Engineering and director of VCU's Cybersecurity Center.

The CCI was established in 2018 to advance cyber innovation and ensure Virginia is a global leader in the digital economy. CCI Fellows support research and experiential learning excellence across the commonwealth. A total of nine CCI Fellows represent the top echelons of cyber and artificial intelligence (AI) research in universities across Virginia.

Manic, a noted specialist in cybersecurity and AI, is widely published in cybersecurity/resilience, trust in AI and deep learning and energy/critical infrastructures. Manic's research is funded by the National Science Foundation, the U.S. Departments of Energy and Homeland Security and the Idaho National Laboratory, where he holds a dual appointment. He is the recipient of numerous awards including an international R&D 100 Award and the IEEE Industrial Electronics Society Service Award.

## Assessing risk of premature birth

Tomasz Arodz, Ph.D., associate professor and director of graduate programs in computer science, is part of an interdisciplinary team that produced two major studies published May 29, 2019, in Nature Medicine. These studies provide a comprehensive profile of the vaginal microbiome during pregnancy, including correlations between microbiome composition and premature birth — groundbreaking research that may help assess the risk of preterm delivery, particularly among African American women. Nature Medicine is the highest-cited journal in preclinical medicine.

Digital forensics for national security

Irfan Ahmed, Ph.D., assistant professor of computer science, received a 2019 Ralph E. Powe Junior Faculty Enhancement Award presented by the Oak Ridge Associated Universities. These competitive research awards provide seed money for junior faculty members and often attract additional funding from other sources. Ahmed's award supports his research to develop digital forensic techniques for industrial control systems used to monitor and control pipelines, water systems, the power grid and other critical infrastructure essential to national security. He will work with the Oak Ridge National Laboratory on this project.
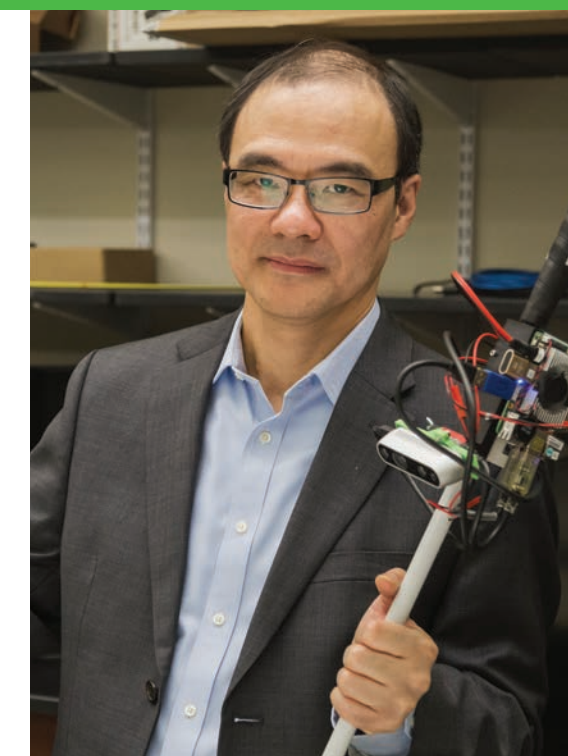
A cane that steers, a glove that finds things

Cang Ye, Ph.D., professor of computer science, is an internationally recognized inventor of assistive robotics for people with visual impairments. His RoboCane device gives the traditional white cane the ability to function as an interactive "steering wheel" that guides users where they want to go. His newest project is a wearable device that uses a tiny camera and object detection technology to guide the user's hand to help locate and manipulate objects. "The cane can get you to the door," Ye said. "The new wearable can help you find the doorknob and open it."

LORD Best Paper Award at IROS

A paper by **He Zhang, Ph.D.**, a postdoctoral researcher in the Department of Computer Science, and **Lingqiu Jin**, a computer science Ph.D. student, received the LORD Best Paper Award at the Visual-Inertial Navigation workshop of the International Conference on Intelligent Robots and Systems (IROS) held Nov. 4-8, 2019, in Macau, China. Zhang and Jin's adviser is **Cang Ye, Ph.D.**, professor of computer science.

Their paper proposes a design for a new robotic navigation system to help people with visual impairments travel safely through indoor and outdoor spaces. The design uses an RGB-D camera, which adds depth information to a conventional image. It also has an inertial measurement unit, which measures and reports the body's specific force and angular velocity.

Photos courtesy of He Zhang, Ph.D., and Lingqiu Jin
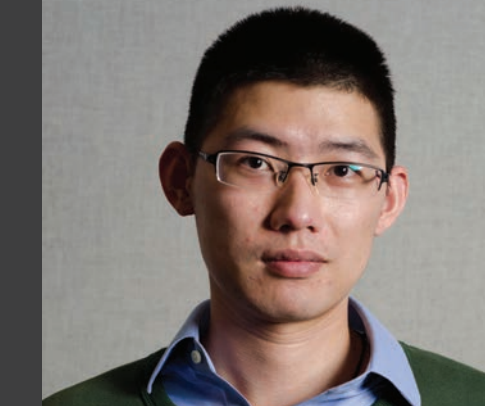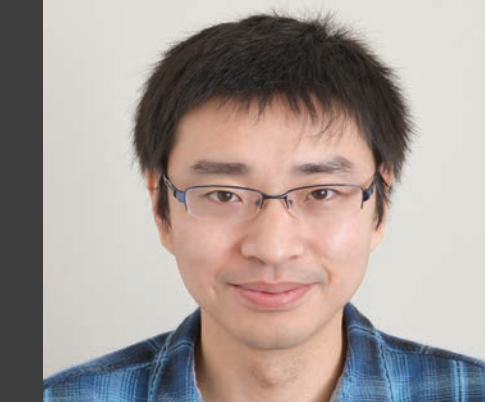
Undergraduates research natural language processing

Rachel Dorn, a post-baccalaureate certificate student in computer science, and **Andriy Mulyar**, a senior in the computer science department, participated in Research Experience for Undergraduates programs at Johns Hopkins University in 2019. Both students worked with Mark Dredze, Ph.D., the John C. Malone Associate Professor of computer science at Johns Hopkins.

Dorn collected and analyzed social media data from mental health patients to build a dashboard to help their therapists provide effective treatment. Mulyar collaborated on the construction of automated neural systems to map unstructured text in clinical notes and electronic health records to medical knowledge bases. This is part of a larger effort to harness unstructured medical databases to improve patient care and automate clinical trial planning. Dorn and Mulyar are advisees of **Bridget McInnes, Ph.D.**, assistant professor of computer science at VCU.

Top photo courtesy of Rachel Dorn

A new approach to identity recognition cameras

Doctoral student **Hannaneh Barahouei Pasandi** received grants from VCU, the College of Engineering and the Association for Computing Machinery to present her research at the 2019 ACM Conference on Embedded Networked Sensor Systems. **Tamer Nadeem, Ph.D.**, associate professor of computer science, is her adviser. Pasandi's research uses machine learning to automate communications protocols design. She is developing a collaborative intelligent video analytics system that runs more efficiently by using time-space correlations between cameras to eliminate redundancies. Her method can also improve privacy by programming cameras that capture sensitive information to perform parts of the process locally so sensitive information is not shared with third-party servers.

Undergraduate presents her work at 2019 Grace Hopper Celebration

Undergraduate **Gabrielle Gurdin** was selected to present at the 2019 Grace Hopper Celebration, the world's largest gathering of women in computing. Her poster, titled "Quantifying the Sentiment of Online Drug Reviews," explored natural language processing methods for determining reviews' sentiment, which could be used for post-marketing surveillance of medications. She presented a dataset of 123,152 WebMD.com reviews and evaluated the effectiveness of five supervised learning models for the sentiment analysis of this dataset. Gurdin's adviser is **Bridget McInnes, Ph.D.**, assistant professor of computer science.

Photo courtesy of Gabrielle Gurdin