2021 - 2022 ANNUAL REVIEW

VCU Engineering

UNCOMMON ENGINEERING

VCU College of Engineering

COMPUTER SCIENCE

Image illustrating ICLN protein and disordered regions at the bottom and in the top-right corner.

Researchers develop award-winning method to predict intrinsic disorder in proteins

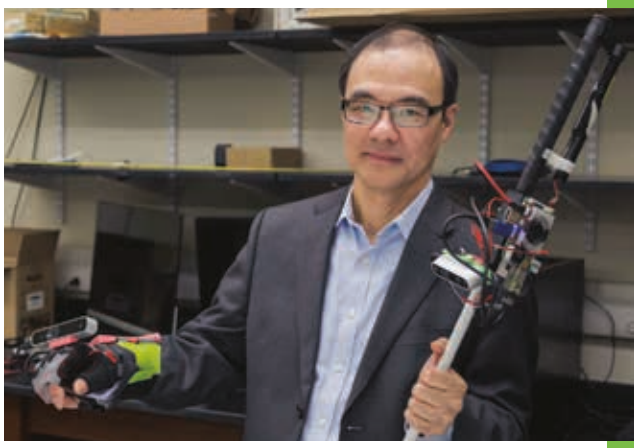
Lukasz Kurgan, Ph.D., the Robert J. Mattauch Professor and vice chair of CS, and a team of his doctoral students and collaborators won first place in Critical Assessment of Protein Intrinsic Disorder Prediction (CAID). This worldwide challenge was established to identify the most accurate methods that predict unstructured protein regions, which have been found to be associated with cancers, cardiovascular and neurodegenerative diseases.

The Kurgan team's entry, called fIDPnn, outperformed a record-breaking pool of 32 methods developed across the world. The results were published in the Nature Methods journal.

CS doctoral students **Akila Katuwawala** and **Sina Ghadermarzi**, along with collaborators from Nankai University in China, contributed to the development of fIDPnn. It predicts intrinsic disorder using a deep neural network that relies on a sophisticated approach to encode network inputs derived from protein sequences.

This method is the culmination of more than a decade of research, most recently sponsored by the National Science Foundation. It has since been featured in the journal Nature Communications.

SOLVING COMPLEX PROBLEMS



Computer science professor wins funding to help secure nuclear energy infrastructure

Milos Manic, Ph.D., CS professor, has been named president-elect of the Institute of Electrical and Electronics Engineers Industrial Electronics Society. As director of the VCU Cybersecurity Center, Manic recently received $200,000 from the Idaho National Laboratory (INL) to develop technologies to integrate and secure critical systems for nuclear power.

Manic and his collaborators are working on a digital engineering approach using computer and mathematical sciences to integrate systems with asset engineering, design and operations. The VCU team is working on statistical and AI-based systems analysis. Their goal is to provide advanced automation and analytics for more secure nuclear energy infrastructures.

This multi-institution project is expected to deliver $1 billion in reduction of anticipated costs and a 25% productivity increase using virtual design and construction, reducing errors and risk in the design of complex systems.

Computer science major helps create app for caregivers of children with Down syndrome

Jeffrey Duah, a CS graduate, had the opportunity to experience the iterative process of software development through projects from the VCU Isosceles Lab run by Department of Information Systems Associate Professor **Elizabeth Baker, Ph.D.**

One project came from the University of North Carolina Chapel Hill School of Nursing (UNC), where it was observed families who have children with Down syndrome often see multiple medical providers. The families can have a difficult time keeping track of doctors, medical records and appointments.

Duah's team worked with UNC to build an app for keeping this important information organized. User testing app functionality with the families alongside general usability testing made sure the platform was robust yet simple to operate.

Scan the QR code to learn more about Computer Science at VCU.

Robotic cane with a 3D camera brings navigation assistance to the 21st century

Equipped with a color 3D camera, an inertial measurement sensor and its own on-board computer, a robotic cane could offer blind and visually impaired users a new way to navigate indoors. When paired with a building's architectural drawing, the device can accurately guide a user to a desired location with sensory and auditory cues, while also helping the user avoid obstacles like boxes, furniture and overhangs.

Cang Ye, Ph.D., CS professor, wants to optimize assisted navigation. Over long distances, location inaccuracies could leave the user at the wrong place. Ye and colleagues added a color depth camera to help correct this. The system determines the distance between the cane and other physical objects. This technology allows the onboard computer to map the user's precise location.

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