Cybersecurity and Forensics Work
Makes National Impact

Groundbreaking Research on the Vulnerabilities of Virtual Reality

Imagine you've got your virtual reality headset on; you're playing a game and suddenly you are no longer controlling it – a hacker is. Or the hacker has taken hold of the VR camera and can see into the room where you are playing or found a way to take down the "chaperones" or virtual protections that keep you from bumping into a wall.

Just as cybercriminals are at work on the Internet and the Internet of Things (IoT), gaining access to networks through connected smart devices, the worlds of virtual reality (VR), augmented reality (AR) and mixed reality (MR) are

This fall they plan to research an AR system, Microsoft's Hololens, "which is a bit di□erent from the tethered immersive VR systems," said Rebecca Lindsay-Decusati, a computer science graduate student, who joined the team last spring.

In a 2017 piece in r , Paul Lamkin reported that International Data Corporation predicted 81.2 million headsets would ship in 2021, up from 13 million in 2017, "representing an annual growth rate of 56.1 percent." Earlier this year ran a tech forecast piece that explored "Why 2018 Will Be the Year of VR 2.0" focusing on the arrival of "standalone virtual reality systems."

With that expected growth, the time for this research is now, Lindsay-Decusati said.

Baggili is quick to point out that VR, MR and AR have very positive uses in education, in business, in the military and in the area of psychology. According to , dozens of studies have been done focusing on using VR "to treat anxiety disorders and particularly phobias, social anxiety, and PTSD. The results have been encouraging—VR is a proven means of delivering rapid, lasting improvements."

Making the world of virtual reality safe is key, Baggili said. "The developers of the internet got it wrong," he said. "They invented the web and then they created security for it. With virtual reality, we want to develop security at the same time."

What it Takes to Become One of the Nation's Best Cyberforensics Teams: Grit, Innovative Problem Solving and Collaboration

The TCoE's Cyberforensics Team competes against universities with programs two, three, even five times their size and they continually find a way to win or become finalists in national competitions.

The team members – graduate students Justin Grannis, Trevor Haigh and Peter Casey and undergraduate Tyler Balon – are gritty and they don't back down, said Ibrahim (Abe) Baggili, Elder Family endowed chair and associate professor of computer science.

After learning how people construct phishing emails containing links to websites made to look real "but are actually designed to steal information," Sandor shared that with senior citizens at the Madison Library's Teen Tech support program where she volunteers.

She also shared what she had learned with members of her high school's Hacking Club. The club was able to identify and alert school o□cials to a potential vulnerability in one of the school's learning management systems, which the IT department was able to quickly remedy, said David Buller, a Daniel Hand math and computer science teacher and advisor to the Hacking Club.

"Programs such as the GenCyber Academy give high school students a chance to develop their critical thinking and problem solving skills in an authentic, engaging, real-world setting, while also exploring potential career paths," Buller said. "And when students bring that experiential learning back to the high school classroom, it enriches our discussions and brings our curriculum to life."

This past summer, Sandor returned to the camp as a special agent/counselor, excited "to learn new techniques and skills as well as share what I learned last summer with new participants," she said. "The camp encouraged diversity and inclusion, which I loved because I got to meet so many new people and make new friends."

TCoE Launches MS in Data Science - One of the Fastest Growing Jobs in the U.S.

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Having a strong MS program will, in turn, "attract more students to the undergraduate Chemistry program, especially if we eventually are able to o□er a 4+1 BS/MS program," Saliby said. "We also expect that the integrative approach to research will attract funding for both graduate and undergraduate research.

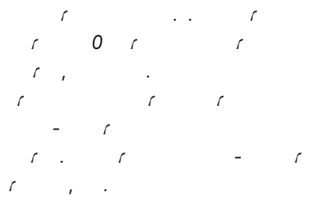
Xiao said that chemistry plays a vital role in so many industries. "When you have chemistry knowledge, you have the freedom to create novel functional chemicals needed in the world. For example, you can create new molecular drugs to cure diseases; you can create new polymers for biomedical applications," Xiao said. "You can work in the pharmaceutical industryttre

Daniel Delgado `17, now an associate engineer at Metro-North Railroad, said the UIF program taught him how important it is to "take innovative approaches to solve problems and how, in project management, stakeholder buy-in and acceptance is critical. I've learned that it never hurts to suggest a new way to conduct business."

The University's first Fellow, Jonathan Spiegel `17, organized the first 3

giving up, the whole team worked hard to have a functional robot while meeting the size limit," he said. "Most new teams would just give up and go home, but the students on the team were passionate and wanted to solve the problem. One core value every engineer should have is working

Keith Dillon



Q. Can you share some details about your research work?

A. My industry work and my research are essentially the same, making computational methods for new kinds of sensor data. I actually started out in reconnaissance imaging; it was really cool. We developed technology to spy on people from very far away without using light (and that's all I'm allowed to tell you).

I decided the area I most wanted to make an impact in was healthcare. So since then I've been developing new algorithms for finding disease from medical sensor data, particularly in imaging the brain. It's a really hard problem because there's so much bone and tissue between us and the brain cells we need to look at. It's like reconnaissance imaging from an extreme distance, but even harder because we aren't even sure what to look for. So we have to use all the info we can get. At Tulane I combined both brain imaging data as well as genetic testing to diagnose mental illness.

Q. What will you be researching at the University of New Haven?

A. Today, I'm still working on brain data. It's been said that the 20th century was the century of the gene and the 21st century will be the century of the brain. There's so much left that we don't understand about mental illness, and the societal impacts are so large. As many as half the people su□ering from these diseases aren't receiving treatment, and collectively they're the biggest cause of disability. One of the first things we hope to achieve is technological ways to automate much of the diagnoses, to help bring costs down and allow treatment to be provided to more people.

Q. What are you looking forward to about teaching and researching

The research hones in on aerosols – tiny particles suspended in the air, with sizes ranging from a few nanometers to a few micrometers. "These are very important to us, without them we wouldn't have precipitation but, on the other hand, having too much in the atmosphere can be toxic," he said.

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