Criminal Investigations and Network Analysis
A DHS CENTER OF EXCELLENCE

GEORGE MASON UNIVERSITY

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THOUGHTS FROM THE DIRECTOR



Brook Hefright

Summer has arrived in northern Virginia, and in May CINA joined George Mason University in congratulating our 2024 graduates.

Graduation marked the end of a busy spring semester for CINA, capped off by our first annual Cyber-Enabled Human Crime (CEHC) Workshop, April 29-30. CINA partnered with **The Knoble**, a non-profit based in Chattanooga, TN, that brings together the financial services sector, government, and civil society to counter human trafficking, child sexual exploitation, elder financial abuse, and other forms of exploitation. Many thanks to The Knoble's Executive Director David Worland, Founder and Board Chair Ian Mitchell, and Director of Program Delivery Emma Campbell for all their work to make this joint event a success.

Members of CINA's academic consortium, including keynote speaker **Cassandra Cross** of Queensland University of Technology, provided insights from their research and facilitated working sessions between industry and law enforcement subject matter experts. CINA's partners in DHS' Homeland Security Investigations (HSI) Cross Border Financial Crime Center (CBFCC) lent invaluable support for the event, including welcoming remarks from HSI Executive Associate Director **Katrina Berger**, expert facilitation by CBFCC Acting Deputy Assistant Director Steven Schrank, and robust participation from HSI, DHS, and other relevant agencies.

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NEWS

CINA student research prize winners pursue anti-counterfeiting startup Legitima

By Marzana Afroz, George Mason University



Two ambitious computer science students from George Mason University, Salem Abdul-Bak, and Krishna Purohit, have developed an innovative technology known as Legitima to ensure that consumers can confidently verify the authenticity of their purchases, significantly reducing the risk of buying counterfeit goods. Their journey began at the Bring Down **Counterfeiting Hackathon 2023** and has been supported by experts from CINA.

Team Legitima employs a unique approach that uses serialized tokens to track the entire journey of a product from its creation to the final purchase. This method allows consumers to easily verify if their purchases are genuine, helping to maintain trust in the products they buy.

During the **Commonwealth Cyber Initiative** 2024 Symposium in Richmond, Virginia, Abdul-Bak shared insights into the motivation behind developing Legitima, "We wanted to make an approach basically that gives the consumer a lot of information, so it makes it a very secure approach to counterfeiting, but at the same time, it's also easy to use." This dual focus on security and user-friendliness is central to their vision for enhancing consumer confidence.

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RESEARCH

‘Tiny Crime Fighters With Wings’: Bees Go to Work on a Virginia ‘Body Farm’

By Christine Hauser, as seen in The New York Times



Deep in the woods in Northern Virginia last month, two human bodies were carried to a remote spot among the trees and left to decompose. As nature takes its course, the bodies will exude organic compounds into the air and soil. Flowers growing nearby will absorb traces of the decay, which pollinating bees will carry to hives.

Forensics researchers at George Mason University plan to study the bees, their honey and the hives near the burial site, a new “body farm” in Manassas, Va., about 25 miles southwest of Washington, D.C. Because bees forage within a close range of their hives, the researchers hope to draw up a formula for human decomposition that investigators can use when searching wide expanses of land for the hidden dead.

“Bees are going to be bringing back whatever chemical signals they have encountered in a decomposing human,” said Brian A. Eckenrode, an associate professor in the forensics program at George Mason’s College of Science. “It could be really helpful for large search areas.”

Or as **Mary Ellen O’Toole**, CINA Science Committee member and the director of **George Mason’s forensic science program**, put it, the bees “are tiny crime fighters with wings.”

Read the full New York Times article



CINA Sponsored Research Spotlight: Cutting-Edge Biometric Innovations and Scholarly Excellence

CINA is excited to share news of our state-of-the-art latent fingerprint recognition algorithm, developed with invaluable support from DHS and led by Arun Ross, Anil Jain, and Xiaoming Liu from the **Computer Science and Engineering Department at Michigan State University**.

This innovative algorithm, **now published in top-tier journal, IEEE *Xplore*** and licensed by the leading biometric vendor Thales, represents a significant milestone in biometric research. Michigan State University's former Ph.D. student, Steven Grosz, who was instrumental in this project and has recently completed his degree, will continue his pioneering work in biometrics at Rank One Computing in Denver. Additionally, a patent for this innovative technology has been filed, further underscoring its importance in the field. We are proud of the team's accomplishments and eagerly anticipate the impact of their work.

In other exciting news, CINA is pleased to announce that **Partha Banerjee** (University of Dayton) and **Akhlesh Lakhtakia** (Penn State University)'s latest invited paper has been distinguished as an "Editor's Pick" by Optica Publishing Group. The paper, entitled "**Transport of Intensity and Phase: Applications to Digital Holography,**" was published in the renowned journal *Applied Optics*. This prestigious recognition is awarded to articles demonstrating exceptional scientific quality and representing significant advancements in their respective fields. You can read the full paper **here**. We extend our gratitude to Partha Banerjee and Akhlesh Lakhtakia for their invaluable contributions to the field of optics and photonics, and we look forward to more groundbreaking work from their research.



This section highlights projects within CINA's research portfolio that support and protect communities across the Commonwealth of Virginia.

VCU College of Engineering hosts HSI Cyber Crimes Center and CINA, a DHS Center of Excellence to advance security research

By Rebecca Antler, Virginia Commonwealth University

On June 13, 2024, the **VCU College of Engineering** hosted representatives from the Homeland Security Investigations (HSI) Cyber Crimes Center and Department of Homeland Security (DHS) Center of Excellence, the **Criminal Investigations and Network Analysis (CINA) center.**

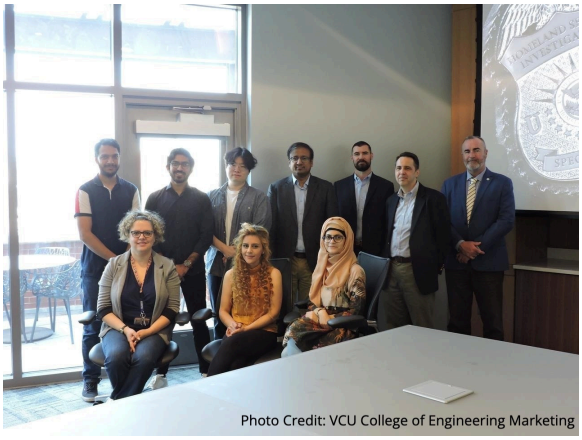
Photo Credit: VCU College of Engineering Marketing

During the visit, **Irfan Ahmed, Ph.D.**, associate professor in VCU Engineering's **Department of Computer Science**, presented his research currently administered under CINA and funded by the DHS. From utilizing modern data science tools to streamline analysis of forensic data, to improving security measures in industrial tools systems, Ahmed's research highlights the important work being done to support the mission of the DHS.

The Department of Homeland Security funds Centers of Excellence led by universities across the United States, conducting research on target areas to support the mission of the DHS. As part of this network, the CINA Center at George Mason University partners with VCU and other universities and researchers to pursue multidisciplinary approaches that address the disruption of criminal activities across physical and cyber spaces.

"CINA awards principal investigators, such as Ahmed, to advance cutting edge research, addressing DHS mission capability gaps," Elizabeth Newman, M.A., CINA center project manager, said. "We believe Ahmed's research will be useful in providing real-world solutions to the challenges faced by DHS component, Homeland Security Investigations."

In addition to Ahmed's research, there were presentations given by HSI Cyber Crimes Center Section Chief Daniel Donahue and CINA Center Director, Brook Hefright, Ph.D.

The visit concluded with a discussion led by CINA Center Transition Manager, Stephen Self, on identifying capability gaps. This dialogue emphasized potential collaborations where CINA and VCU Engineering could better support HSI's operational needs.

The VCU College of Engineering offers innovative **undergraduate** and **graduate** degree programs tailored to meet the demands of the rapidly evolving engineering field. As part of a premier research university, students are given the opportunity to **perform real-world research** in our state-of-the-art facilities as soon as they enroll. Browse videos and recent news to discover how the **College of**

Engineering at Virginia Commonwealth University prepares the next generation of scientists and engineers for the challenges of the future.



CINA Distinguished Speaker Series Recap

In case you missed it, watch the recent CINA Distinguished Speaker Series events with **Christian Meissner** and **Robert Simon**.





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