10th Annual
HUME CENTER & IC CAE
COLLOQUIUM

Wednesday, April 12, 2023
9:00AM – 6:30PM

VT | HUME CENTER FOR NATIONAL SECURITY AND TECHNOLOGY VIRGINIA TECH.

The Ted & Karyn Hume Center for National Security, part of the Virginia Tech National Security Institute, welcomes you to the 10th annual Hume Center & IC CAE Colloquium! This event is made possible through our Intelligence Community Centers for Academic Excellence (IC CAE) grant and our Academic Affiliates Program (AAP). This year's event will be full of exciting student presentations related to ongoing research and experiential learning programs from across multiple departments and colleges at Virginia Tech.

The theme of this year's colloquium is "Critical and Emerging Technology" and will showcase our students' continued endeavors to become the next generation of national security leaders. Additionally, the colloquium includes a panel discussion on "The Importance of Collaboration Between Academia, Industry, and Government in National Security".

The mission of the National Security Institute's Hume Center is to cultivate the next generation of national security leaders by developing and executing research and experiential learning opportunities to engage students. Education programs engage students through experiential learning, scholarships, graduate research, and internship and career opportunities in the national security sector. We are proud of the accomplishments of our students, and believe they will make exceptional employees in the national security workforce. Thank you very much for your investment in these students through your time and partnerships with the Hume Center.

8:55 AM	**Welcome**
	• Dr. Eric Paterson, *Executive Director, Virginia Tech National Security Institute*
9:00 AM	**Workforce Development Student Team Presentations**
10:20 AM	**Panel: The Importance of Collaboration Between Academia, Industry, and Government National Security**
	• Chris Jones, Associate Deputy Director of CIA for Science & Technology
	• Patrick Cantwell, PhD, Director of Technology Transfer and Engagement, NSWC Dahlgren
	• Aaron Brantly, PhD, Associate Professor, Department of PolySci and Director, Tech4Humanity lab
	• Tracee Gilbert, PhD, System Innovation, CEO
	• Timothy Barton, PhD, Leidos Senior Vice President and Dynetics Group CTO
	• Greg Simer, Chief Technology & Strategy, Defense Systems Sector, Northop Grumman
11:05 AM	**Break/Catch-up**
11:15 AM	**Hume IC CAE Research Fellowship Team Presentations**
12:30 PM	**Lunch**
1:30 PM	**Experiential Learning Research Team Presentations**
3:55 PM	**Concluding Remarks**
	• Colleen Bartos, *Project Manager, Virginia Tech National Security Institute*
4:00 PM - 5:30 PM	**Student Poster Session & Reception**
5:30 PM	**Keynote Address**
	• **Dr. Stacey Dixon,** *Principal Deputy Director of National Intelligence, Office of the Director of National Intelligence*

8:55 AM	**Welcome**
	Dr. Eric Paterson, Executive Director, Virginia Tech National Security Institute

9:00 AM	**Workforce Development Program Presentations**
	LoRa waveform - Software, Hardware, and Direction Finding
	• CACI Inc. sponsored Undergraduate Workforce Development Program
	○ *Faculty Mentor: Thomas Krauss*
	○ *Students: Gabriel A., Afreen A., Maria B., Brandon B., Paul B., Albert E., Daniel F., Samantha F., Michael, H., Robert K., Jenny L., Tyler R.*

9:15 AM	**Workforce Development Program Presentations**
	Integration of Reinforcement Learning and Unreal Engine for Enemy Containment via Autonomous Swarms
	• The MITRE Corporation sponsored Undergraduate Workforce Development Program
	○ *Faculty Mentors: Dr. Justin Kauffman, Dr. Justin Krometis, Dr. Don Engel*
	○ *VT Students: Beyonce A., Jai D., Sejal G., Kevin L., Andrew N., Giang N., Kelechi O., David P., Thomas S., Hayley W.*
	○ *UMBC Students: Kenny B., Will D., Madison M., Babatunde O.*

9:30 AM	**Workforce Development Program Presentations**
	Use and Abuse of Personal Information Open Source Intelligence Engine Automation
	• Raytheon Technologies sponsored Undergraduate Workforce Development Program
	○ *Faculty Mentors: Dr. Alan Michaels, Chris Henshaw, Elliott Rheault, Madison Boswell, Tiasha Khan, Casey Hines, Ehren Hill*
	○ *Students: Jordan B., Ethan H., Skylar K., Seshadri K., Elizabeth M.*

9:45 AM	**Workforce Development Program Presentations**
	Use and Abuse of Personal Information Interaction Engine Design
	• Raytheon Technologies sponsored Undergraduate Workforce Development Program
	○ *Faculty Mentors: Dr. Alan Michaels, Chris Henshaw, Elliott Rheault, Madison Boswell, Tiasha Khan, Casey Hines, Ehren Hill*
	○ *Students: Nicholas H., Rajat N., Wyatt O., Pranav T.*

10:00 AM	**Workforce Development Program Presentations**
	RFRL Gym: A Testbed for Training and Evaluating Reinforcement Learning for Cognitive Radio Systems
	• IC CAE Multi-College Collaborative Research in Radio Frequency Machine Learning (RFML)
	○ *Faculty Mentors: Dr., Chris Headley, Alyse Jones, Dr. Amos Johnson*
	○ *Virginia Tech Students: Kevin D., Nhan H., Will I., Vanessa J., Josh L., Caleb M., Daniel R., Illa R., Samuel P., Ramzy S., Max W.*
	○ *Morehouse Students: Zayden C., Zavier H., Zavion H.*

10:20 AM	**Panel - The Importance of Collaboration Between Academia, Industry, and Government in National Security** **Moderator:** • Peter Beling, *PhD, Director, Intelligent Systems Division at the Virginia Tech National Security Institute* **Panelists:** • Chris Jones, *Associate Deputy Director of CIA for Science & Technology* • Patrick Cantwell, PhD, *Director of Technology Transfer and Engagement, NSWC Dahlgren* • Aaron Brantly, PhD, *Associate Professor, Department of Political Science and Director, Tech4Humanity Lab* • Tracee Gilbert, PhD, *System Innovation, CEO* • Timothy Barton, PhD, *Leidos Senior Vice President and Dynetics Group CTO* • Greg Simer, *Chief Technology & Strategy, Defense Systems Sector, Northop Grumman*
11:05 AM	**Break/Catch-up**

11:15 AM	**Hume IC CAE Research Fellowship Team Presentations**
	Coastal Risks and Vulnerability at the Civilian-Military Interface
	• VT Geography Department sponsored Research Team
	   ◦ *Mentor: Dr. Anamaria Bukvic*
	   ◦ *Students: Torian C., Luke W.*

11:30AM	**Hume IC CAE Research Fellowship Team Presentations**
	The National Security Risk of TikTok in the US: A Comprehensive Assessment of Data Privacy and Collection
	• Microsoft sponsored Research Team
	   ◦ *Industry Mentors: Husna Ali-Khan, Sartaj Singh Dhami, Luis Fernandez, Joe Mansour, Henry Parks, Kevin Rogers, Robert Toupin,*
	   ◦ *Students: Cameron A., Benjamin P., Ian R., Katelyn Y.*

11:45 AM	**Hume IC CAE Research Fellowship Team Presentations**
	A Security Threat?: A Framing Analysis of New York Times' Coverage of Refugees, Migrants, and Asylum Seekers
	• VT Communication Department sponsored Research Team
	   ◦ *Mentors: Dr. John Tedesco*
	   ◦ *Students: Madison C., Nicolas F., Stefanie T.*

12:00 PM	**Hume IC CAE Research Fellowship Team Presentations**
	Using OpenAI for Software Vulnerability Analysis and Remediation
	• ManTech sponsored Research Team
	  ○ *Industry Mentors: Kelly Deich, Ellen Guo, Paul Klinker, Michael Smith*
	  ○ *Students: Owen H., Domenic M., Ashwanth S., Pranav S*

12:15 PM	**Hume IC CAE Research Fellowship Team Presentations**
	Project METEOR
	• Northrop Grumman sponsored Research Team
	  ○ *Faculty Mentors: Dr. Leon Harding, Dr. Austin Phoenix*
	  ○ *Students: Harish B., Grant C., Xander F., Kevin M., Michael P., Sami Q., Tejas V., Piper W.*

12:30 PM	**Lunch** - Commonwealth Ballroom B

1:30 PM	**Experiential Learning Research Teams**
	VICEROY: Adversarial Machine Learning in IOT Networks
	  ○ *Faculty Mentor: Dr. Peter Beling, Dr. Tugba Erpek, Dr.Yalin Sagduyu*
	  ○ *Students: De'naria F., Andrew H., Joey S.*

1:45 PM	**Experiential Learning Research Teams**
	NEEC: Model Based Cyber Mission Engineering
	  ○ *Faculty Mentors: Dr. Peter Beling, Dr. Tyler Cody, Dr. Paul Wach*
	  ○ *Students: Brady J., John L., Sanaz S.*

2:00 PM	**Experiential Learning Research Teams**
	NEEC Logistics for Quantum Computers Quadratic Assignment Problem
	  ○ *Faculty Mentor: Tom Krauss*
	  ○ *Students: Atif A., Hailey E., Fardin K., Shalini P., Julia S., Key X.*

2:15 PM	**Experiential Learning Research Teams**
	Embedded Antennas for Airborne Vehicles
	• MEEP: Materials & Advanced Manufacturing in Applied Electromagnetics
	  ○ *Faculty Mentor: Dr. Brad Davis*
	  ○ *Students: Gabe B., Justin D., Matt F., Elise G., Angel H., Jacob M., Joey M., Spencer M., William P., Aditya R., Anna S., Jess S., Andrew T., Charles V.*

2:30 PM	**Experiential Learning Research Teams**
	A Bayesian Approach Towards Balanced Probability Calibration and Boldness
	  ○ *Faculty Mentor: Dr. Chris Franck*
	  ○ *Student: Adeline G.*

2:45 PM	**Experiential Learning Research Teams**
	Boeing IoT Device Characterization
	   ○ *Faculty Mentors: Thomas Coulon, Dr. Daniel Jakubisin*
	   ○ *Students: Benji A., Ehite A., Calvin B., Jace D., Nolan D., Prakash J., Nicholas V.*

3:00 PM	**Experiential Learning Research Teams**
	Misinformation Identification with Natural Language Processing in the Russo-Ukrainian War
	  • Natural Language Processing (NLP) Research
	   ○ *Faculty Mentor: Dr. Joseph Simpson*
	   ○ *Students: William B., Yelebe D., Zaria K.*

3:15 PM	**Experiential Learning Research Teams**
	Development of an EMCCD Space Camera for UV Spectroscopy
	  • *Faculty Mentors: Dr. Leon Harding, Dr. Samantha Kenyon*
	  • *Students: Jessica B., Neha C., Michael P.*

3:30 PM	**Experiential Learning Research Teams**
	Deploying an EMCCD Camera in a CubeSat Platform
	  • *Faculty Mentor: Dr. Jon Black, Dr. Leon Harding*
	  • *Student: Nick A.*

4:00 PM	**Concluding Remarks** *Colleen Bartos, Project Manager, Virginia Tech National Security Institute*
4:00 PM	**Student Poster Session and Reception** - Commonwealth Ballroom A
5:30 PM	**Introduction of Keynote Speaker** *Laura Freeman, Ph.D., Deputy Director, National Security Institute*
5:35 PM	**Keynote Address** "Intelligence Community Priorities, Critical Technology, and You" Dr. Stacey Dixon*, Principal Deputy Director of National Intelligence at the Office of the Director of National Intelligence (DNI)*

4:00 PM - 5:30 PM

100,000 Fake IDs Database Generation and Validation
Jazzlyn C., Priya C., Jack G., Ethan H., Amirah J., Omama M., Omar N.

A Case for Including Human Factors in Cyber Threat Modeling for Security Decision Making
Stephanie T.

Adversarial Machine Learning for IoT Networks
De'Naria F., Andrew H., Joey S.

Analyzing Anti-Cheating Gaze-Tracking Software & Programs
Sebastian B., Charles Z.

Building a Software-Defined Underwater Communications Prototype
David L., Valeria P., Raphael R.

Building Resilience: The Impact of Interior Walls and Windows on Survivability in Internal Blasts
Anna W.

Center of Gravity Analysis on Chinese Cyber Networks
Rami G.

Combinatorial Testing to Measure Machine Learning Dataset Differences
Brian L., Luis P., Anika T.

Commercial Enablers of China's Cyberspace Operations and Intelligence Oversight
Ethan M., Victor M.

Development of a Signup Engine With Two Factor Authentication
Lizzie B., Jack K., Jaden L., Lynn P., Ben T.

Finding a Needle in the Haystack: Predicting the Location of Lost People Using Agent-Based Modeling and Behavioral Inertia
Caroline J., John N., Bailey R.

Flexible Cost-penalized Model Selection for Linear Models
Erica P.

Fox and the Hound: Direction Finding with the LoRa Waveform
Gabriel A., Afreen A., Maria B., Brandon B., Paul B., Albert E., Daniel F., Samantha F., Michael H., Robert K., Jenny L., Tyler R

High Performance Material Modeling with Coarse-Grained Molecular Dynamics
Giavanna A.

Incentive Mechanism for Privacy-Preserving Vertical Federated Learning
Quinn A., H. Ali, Adrian C., Ashley C., J.H. Cho, A. Khan

Integration of Reinforcement Learning and Unreal Engine for Enemy Containment via Autonomous Swarms
Beyonce A., Kenny B., Jai D., Will D., David P., Sejal G., Kevin L., Madison M., Giang N., Andrew N., Babatunde O., Kelechi O., Thomas S., Hayley W.

Intelligent Interception: Machine Learning Algorithms for Hypersonic Vehicle Tracking and Trajectory Optimization
Daniel P., Avni S.

LEO PNT Systems
Megan M.

Multifidelity Ship Wakes and Radon Transforms
Cassidy H.

Multinational Sentiment Analysis of Tank Donations to Ukraine
Aidan L.

NEEC Logistics for Quantum Computers Quadratic Assignment Problem
Atif A., Hailey E., Fardin K., Shalini P., Julia S., Key X.

Network Testbed for Small Satellites (NeTSat): Distributed Space Adaptive Communications and Security for Multi-Constellation Networks
Bruce B., Alex K., Thomas W.

Online Organization Generation & Research Question Adaptation
Vrishank B., Sorina C., Ahad K., Shivani K., David O.

Project METEOR
Harish B., Grant C., Xander F., Kevin M., Michael P., Sami Q., Tejas V., Piper W.

RAID: Digital Phased-Array Tracking of Aircraft
Christopher B. Adaline L., Naman S.

Resilient Federated Learning for Wireless Communication Network
Amit. D.

RFRL Gym: A Testbed for Training and Evaluating Reinforcement Learning for Cognitive Radio Systems
Zayden C., Kevin D., Nhan H., Zavier H., Zavion H., Will I., Vanessa J., Joshua L., Caleb M., Sam P., Daniel R., Illa R., Ramzy S., Max W.

Russian Cyber-Information Operations from Georgia to Ukraine
Zachary H., Mia L.

Secure Route Discovery for the Underwater IoT
Carly L., James S.

4:00 PM - 5:30 PM

4:00 PM - 5:30 PM

Signing up Fake IDs to Answer Research Questions
Nicholas D., Jennine F., Allyson F.

Simulating Noisy Quantum Circuits
Sanil J., Caleb M., Harshvardhan S., Ngoc T.

Space Object Tracking Using Action Masked DRL
Dylan P.

Tactical Applications of OSINT Looking at Ukraine
Daniel G.

Target Position and Velocity Determination from Ground Based Observations
Stephen M., Gavin S., Conner T.

The Disinformation Surrounding Human Rights Violations in Russian Occupied Areas in Ukraine
Mollie U.

Thermal Management During Space Environmental Tests of a Non-Heritage Radio Payload
Nathan H., Pramil P.

To Catch A Scammer - Development of Honeypot Website
Eli L., Nana O., Dhruvil S., Sam W., Elizabeth Y.

Towards the Accelerating Key Generation in FALCON
William M.

Towards the Quantification of Uncertainty in a Data Fusion Classifier
Ria G.

Uncalibrated Digital Phased Array Processing for Blind Interference Removal in Congested Spectral Bands
Lauren L.

Using OpenAI for Vulnerability Testing - ManTech
Owen H., Domenic M., Ashwanth S., Pranav S.

VICEROY: Decoys in Blockchain Security
Bobby A.

Waves Physics Workspace
Winnie C., Vasu G., Charlotte U.

Keynote Speaker
Dr. Stacey Dixon

Dr. Stacey A. Dixon was sworn in as the Principal Deputy Director of National Intelligence (PDDNI) on Aug. 4, 2021. She currently serves as the sixth Senate-confirmed PDDNI.

Possessing over 18 years of intelligence experience, Dr. Dixon has led the Intelligence Community at the highest ranks. Dr. Dixon joined ODNI after serving as the eighth Deputy Director of the National Geospatial-Intelligence Agency (NGA) from 2019-2021, where she assisted the Director both in leading the agency and managing the National System for Geospatial Intelligence.

From 2018 to 2019, she was the fourth Director of the Intelligence Advanced Research Projects Activity (IARPA), after serving as its Deputy Director from 2016 to 2018. Before joining IARPA, Dr. Dixon served as the Deputy Director of NGA's research directorate, where she oversaw geospatial intelligence research and development. She held additional leadership roles at NGA as the Chief of Congressional and Intergovernmental Affairs and Deputy Director of the Corporate Communications Office.

Prior to serving at NGA, Dr. Dixon was a staff member for the House Permanent Select Committee on Intelligence. She first started her intelligence career at the Central Intelligence Agency (CIA) in 2003, where she was assigned to the National Reconnaissance Office's advanced systems and technology directorate.

An accomplished leader, Dr. Dixon holds both a doctorate and master's degree in mechanical engineering from the Georgia Institute of Technology and a bachelor's degree in mechanical engineering from Stanford University. She was also a chemical engineer postdoctoral fellow at the University of Minnesota. Dr. Dixon serves as a presidentially nominated member of the Board of Visitors to the U.S. Coast Guard Academy and is ODNI's liaison to Spelman College's Center for Excellence for Minority Women in STEM. Dr. Dixon is a native of the District of Columbia, where she currently resides.

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