12th Annual

HUME CENTER NATIONAL SECURITY COLLOQUIUM

Wednesday, April 9, 2025
10:30AM - 7:00PM

HUME CENTER FOR NATIONAL SECURITY AND TECHNOLOGY
VIRGINIA TECH

WELCOME

NATIONAL SECURITY INSTITUTE
VIRGINIA TECH

The Ted & Karyn Hume Center for National Security and Technology, part of the Virginia Tech National Security Institute, welcomes you to the 12th annual Hume Center National Security Colloquium! This event is made possible through our Intelligence Community Centers for Academic Excellence (IC CAE) grant and our Academic Affiliates Program (AAP). We are excited to host Dr. Aaron Weiner, the Director for Advanced Systems & Technology (AS&T) at the National Reconnaissance Office (NRO) for our keynote where he will discuss opportunities and challenges for the agency.

As in past years, the colloquium will highlight our student's research and experiential learning programs, and will include presentations and posters from students across multiple departments and colleges at Virginia Tech. In addition to highlighting the achievements of our outstanding students and their faculty mentors, we will be hosting a series of roundtables so that students have an opportunity to engage directly with some of our industry and government sponsors.

The mission of the Hume Center is to cultivate the next generation of national security leaders by developing and executing research and experiential learning opportunities to engage students. We strongly believe that this event will highlight these future leaders and their successful collaborations with our academic, industry, and government sponsors. We are very 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.

Sincerely,
Ehren Hill
Director, Education and Outreach
Ted & Karyn Hume Center for National Security and Technology
Virginia Tech National Security Institute

Intelligence Community Centers for Academic Excellence
Diversity. Knowledge. Excellence.

PROGRAM OVERVIEW

10:30 AM	**Welcome** Dr. Eric Paterson, *Executive Director, Virginia Tech National Security Institute*
10:45 AM	**Research/Experiential Learning Team Presentations**
12:30 PM	**Break**
12:45 PM	**Research/Experiential Learning Team Presentations**
2:30 PM	**Break**
2:45 PM	**Research/Experiential Learning Team Presentations**
4:15 PM	**Poster Session/Networking**
6:15 PM	**Keynote Fireside Chat** **Moderator:** • **Dr. Laura Freeman,** *Deputy Director, Virginia Tech National Security Institute* **Keynote Speaker:** • **Dr. Aaron M. Weiner,** *Director, Advanced Systems & Technology (AS&T), National Reconnaissance Office (NRO)*

> I've seen the critical need for national security evolve tremendously over the course of my lifetime. To be prepared to handle the changing landscape of threats to the United States, I knew we needed to invest in our students – they're our future defenders.
>
> TED HUME

PRESENTATION SCHEDULE

10:30 AM	**Welcome** Dr. Eric Paterson, *Executive Director, Virginia Tech National Security Institute*
10:45 AM	**Use and Abuse - Analyzing Political Emails** Sponsored by: RTX (RTX Fellowship Program) • Faculty Mentor(s): *Dr. Alan Michaels, Jared Byers* • Student Researcher(s): *Daniel H, Alexis H, Aditya K*
11:00 AM	**Communication Relay System** Sponsored by: CACI International Inc. • Faculty Mentor(s): *Dr. Brad Davis* • Student Researcher(s): *Ivin B, Kidus M, Noah D, Samuel A, Sean M, Brooke S, Jiyoon P, Logan C, Neha B, Albert E, Spencer L, Tiffany W, Christian C*
11:15 AM	**SPA Hypersonics Alternate Navigation** Sponsored by: Systems Planning and Analysis (SPA) • Faculty Mentor(s): *Dr. Austin Phoenix, Brett Lovell* • Student Researcher(s): *William T, Kasey B, Sean W, Danny C, Joanna H, Jack J, Nicholas D, Nathan H*
11:30 AM	**CLOUD-based Distributed Radio Frequency Spectrum Sensing and its Application to RF Fingerprinting** Sponsored by: Amazon Web Services (AWS), Commonwealth Cyber Initiative (CCI) • Faculty Mentor(s): *Dr. Alyse Jones, Dr. Maymoonah Toubeh, Dr. Chris Headley, Dr. Stephen Adams* • Student Researcher(s): *Srihan B, Abigail D, Rami G, Akshay P, River T, Dylan G*
11:45 AM	**Is NATO More Than Article V?: Furthering Understanding of Civilian Opportunities** Sponsored by: Department of State • Faculty Mentor(s): *Robert Hodges* • Student Researcher(s): *Jess G, Thomas Q, Cameron U, Melanie G, Will H, Caroline H, Miabella W, Natalie S, Logan K, Sean K, Eric L, Haleigh H, Marlaina G, Matthew Q, Matthew S, Dori V, Alex A, Elena R*
12:00 PM	**GenAI and Digital Transformation** Sponsored by: Naval Surface Warfare Center - Dahlgren Division, SEC, Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E) • Faculty Mentor(s): *Dr. Paul Wach, Mary Nerayo* • Student Researcher(s): *Brady J, Cat P, Adithya I, Bhargav A, Bhavya S, Cameron C*

PRESENTATION SCHEDULE

12:15 PM	**Night's Watch: A Virtual C-UAS Testbed** Sponsored by: Virginia Tech National Security Institute • Faculty Mentor(s): *Dr. John Gilbert, Dr. Austin Phoenix, Collin Phillips* • Student Researcher(s): *Aayan A, Ryan A, Alexander B, Ethan D, Kaiden D, Vincent F, Gautam I, Utsav M, Matthew M, Ronit M, Sunjeet N, Sanjay S, Nico T, Garrett W*
12:30 PM	**Break**
12:45 PM	**Operation Safe Passage, Digital Engineering for T&E** Sponsored by: Director, Operational Test & Evaluation (DOT&E) • Faculty Mentor(s): *Dr. Paul Wach* • Student Researcher(s): *Emanuel O, Austin L, Trevor I, Walter L, Winston M, Allegra O, Robert S, Liam S, Brandt S*
1:00 PM	**ContentCube - The $5,000 Satellite** Sponsored by: Voyager, Astranis • Faculty Mentor(s): *Dr. Kevin Schroeder, Dr. Samantha Kenyon* • Student Researcher(s): *Julia E, Michael E, Nate H, Gracie P, Larsen V*
1:15 PM	**Commercialization Strategy for Mobile Distributed Multi-Input/Multi-Output 5G/6G Technology** Sponsored by: Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E) • Faculty Mentor(s): *Dr. Daniel Jakubisin, Geoff Kerr* • Student Researcher(s): *Ahad K, Marlaina G, Sean K, Andrew K, Cynthia N, Joshua O, Krishna V*
1:30 PM	**Leveraging OSINT to Map PRC University Partnerships Globally** Sponsored by: Department of State • Faculty Mentor(s): Robert Hodges • Student Researcher(s): *Sri G, Arya N, Justin V, John NAlly S, Amanda G, Asher M, Ashley W, Avery T, Breanna W, Caleb F, Dante P, Emery M, Emil M, Emily C, Ethan D, Grace J, Harper C, Kyle H, Laura L, Lily B, Lily T, Luke P, Michael W, Noah K, Rabihah W, Rachel W, Sydney D, Taylor B, Will E, Supervisors: Cameron P, Liz M*
1:45 PM	**Phased Array & Visualization** Sponsored by: Naval Surface Warfare Center Dahlgren Division • Faculty Mentor(s): *Dr. Brad Davis* • Student Researcher(s): *Nick B, Abraham T, Sam S, Ian B, Vanessa B, Joseph N, Alexander J, Kyle W, Zachary V, Reve M*

PRESENTATION SCHEDULE

2:00PM	**Integration of High-Altitude Balloon Dynamics into AFSIM** Sponsored by: The Aerospace Corporation • Faculty Mentor(s): *Dr. Kevin Schroeder* • Student Researcher(s): *Ashtyn F, Brian V, Ginny S*
2:15 PM	**Converting SysMLv1 to SysMLv2 using GenAI** • Sponsored by: Naval Engineering Education Consortium (NEEC) • Faculty Mentor(s): *Dr. Paul Wach, Mary Nerayo* • Student Researcher(s): *Gordon M, Kelechi E, Junior B, Rohan A, Grant R, Alex Brown, Nate W*
2:30PM	**Break**
2:45 PM	**Russia's Use of Gendered Disinformation As a Tool of Hybrid Warfare Against the United States** Sponsored by: RTX • Faculty Mentor(s): *Trevor Wilson* • Student Researcher(s): *Samantha B, Nicole E*
3:00 PM	**Optimized Digital Engineering Transformation** Sponsored by: Department of Energy (DoE), National Nuclear Security Administration (NNSA) • Faculty Mentor(s): *Dr. Paul Wach, Dr. Taylan Topcu, Dr. Nicole Hutchison, Dr. Peter Beling, Dr. Kelli Esser, Carson Sandman* • Student Researcher(s): *Nicholas J, Natalie H, Sydney E*
3:15 PM	**Hydrodynamic Analysis of the Feasibility of Various Control Surface Configurations** Sponsored by: Office of Naval Research • Faculty Mentor(s): *Dr. Lakshmi Miller, Dr. Craig Woolsey* • Student Researcher(s): *Jaden N*
3:30 PM	**Few-Shot Transfer Learning for Spectrum Sensing** Sponsored by: Virginia Tech National Security Institute • Faculty Mentor(s): *Dr. Chris Headley, Dr. Maymoonah Toubeh* • Student Researcher(s): *Caleb M*

PRESENTATION SCHEDULE

3:45 PM	**2D Analysis of Forward Facing Step in Hypersonic Flow Using STARCCM+** Sponsored by: Northrop Grumman • Faculty Mentor(s): *Dr. Liselle Joseph* • Student Researcher(s): *Jeffrey F*
4:00 PM	**Spectral Warrior | Learning RF through VR Gamification** Sponsored by: Naval Surface Warfare Center - Dahlgren Division • Faculty Mentor(s): *Dr. William Headley, Dr. Brad Davis, Elliott Rheault* • Student Researcher(s): Hannah B, Clarence B, Brianna D, Madeline D, Kaden E, Laura J, Jayden K, Espen L, Tobechi O, Casie P, Dillon R, Aditi S, Isaac T, Aditi S.
4:15 PM	**Poster Session/Networking**
6:15 PM	**Keynote Fireside Chat** ***Dr. Aaron M. Weiner*** *Director,* Advanced Systems & Technology (AS&T), National Reconnaissance Office (NRO)

4:15 PM - 6:15 PM

2D Analysis of Forward Facing Step in Hypersonic Flow Using STARCCM+
Jeffrey F

AI/LLMs for Government Contract Automation
Bradley F, Andrew N

Alternative Navigation Methods for GPS Denied Environments
William T, Kasey B, Sean W, Danny C, Joanna H, Jack J, Nicholas D, Nathan H

An Exploratory Analysis of Chinese Malware
Ethan D

Atomic Physics Controllers
Jack F, James P, Jeb S

Automated Tools for Bayesian Integrated Testing
Jessica M

Autonomous Multisensor Scanning and 3D Model Generation for Ship Configuration Management
Nick A, Nathan R, Leanne L

Can Humans Trust What Machine Learning Sees? Multicategory Recalibration Approaches for Image Classification
Amy V

CLOUD-D RF: CLOUD-based Distributed Radio Frequency Spectrum Sensing
Srihan B, Abigail D, Rami G, Akshay P, River T, Dylan G

Commercialization Strategy for Mobile dMIMO
Ahad K, Marlaina G, Sean K, Andrew K, Cynthia N, Joshua O, Krishna V

Communication Relay System
Ivin B, Kidus M, Noah D, Samuel A, Sean M, Brooke S, Jiyoon P, Logan C, Neha B, Albert E, Spencer L, Tiffany W, Christian C

Computational Electromagnetic Simulations in Virtual Reality
Junior B, Robert V, Ethan M, Sam P, Matthew G

Computer Experiments for Meta-learning of Machine Learning Models
Anna F

ContentCube
Julia E, Michael E, Nate H, Gracie P, Larsen V

4:15 PM - 6:15 PM

Continuously Adaptive Autonomous Systems (RL)
Sahaj S, Rohan V

Converting SysMLv1 to SysMLv2 using GenAI
Nate W, Alex B, Grant R, Rohan A, Kelechi E, Junior B, Gordon M

Cyber PIVOTT in Action? Addressing AI Hiring Bias and Skills-Based Gaps in Cybersecurity
Jada-Ane L

Data Guardian: Advanced Monitoring for Third-Party Access Points
Siddharth R, Sri G, Brandon N, Mahin A

Demonstration of 5G DCI Obfuscation with a Spread Underlay
Connor M, Kumar S

Design Analysis of a Morphing Aerial/Underwater Craft
Rudra P, Krish S, Sebastian R

Developing a Spectrum of Gendered Surveillance-Facilitated Targeting
Brook S

Development of an Underwater Acoustic Research Testbed
Nadeem H, Carson L, Sully M, Mridula T, Shayan R

Enhancing Global Security: Ethiopia & Bhutan
Megan I, Joshua C, Daniel S, Luis S, Micaela W, Lucas B, Vy H, Ella W, Tiphany P, Milo S

Establishing a Wargaming and Crisis Simulations Capability at Virginia Tech
Jeremy C, Corey C, Xander E, Michael M, Mahima S

Estimating Asymptotic Mixing Rate of Random Walks and Security of Isogeny Protocols
William M

European Perspectives on Drones: Laws, Regulations, Ethics, & Use
Carolyn A, Kat P, Nina L

Fast ROMs for Complex Shock Structures in Scramjets
Roy G, Aaron P

Federated Learning in Heart Disease Detection
Pranay J, Farhan H, Julia M, Abdul S

Few-Shot Transfer Learning for Spectrum Sensing
Caleb M

FluxSat
Arijeet B, Jacob D, Hadley F, Cristian J, Michael K, Nicholas L, Brandon Y

4:15 PM - 6:15 PM

Forward-Learning Communications
Joshua E, Andy L, Anthony M, Declan R, Shreya T, Martin W, Caleb M

GenAI and Digital Transformation
Brady J, Caleb A, Cat P, Adithya I, Bhargav A, Bhavya S, Cameron C

Generative MBSE Assistant
Adi I, Cameron C, Bhargav A, Bhavya S

GPS Spoofing Detection
Devin M, Randy F, Joelle A, Jandra T, Previous U

Graph vs. Relational Databases for RAG in Systems Engineering
Cat P, Kelechi E

How will AI affect the Cybersecurity Job Market?
Tania L, Jada-Ane L, Hanna T

Hydrodynamic Analysis of the Feasibility of Various Control Surface Configurations
Jaden N

Integration of High-Altitude Balloon Dynamics into AFSIM
Ashtyn F, Brian V, Ginny S

IntelBuddy: Designing An AI Agent to Perform OSINT Discovery and Verification Tasks
Sutton M, Fernando B

Interpretable AI for Animal Behavior
Dian C, Raj K, Angelie N

Is NATO More Than Article V? - Furthering Understanding of Civilian Opportunities Through Distributed Survey Analysis
Elena R, Patrick L, Abby J, Haleigh H, Will H, Marlaina G, Olivia P, Christian R

Is NATO More Than Article V?: Furthering Understanding of Civilian Opportunities
Jess G, Thomas Q, Cameron U, Melanie G, Will H, Caroline H, Miabella W, Natalie S, Logan K, Sean K, Eric L, Haleigh H, Marlaina G, Matthew Q, Matthew S, Dori V, Alex A, Elena R

Islamic Violent Extremism in Latin America and the Caribbean: An Examination of Foreign Terrorist Organization in the Region
Kyle S, Haleigh H

Kessler Run
Sean R, Kareem B, Tyler O, Rishi N, Dom C

4:15 PM - 6:15 PM

Leveraging OSINT to Map PRC University Partnerships Globally
Ally S, Amanda G, Asher M, Ashley W, Avery T, Breanna W, Caleb F, Dante P, Emery M, Emil M, Emily C, Ethan D, Grace J, Harper C, Kyle H, Laura L, Lily B, Lily T, Luke P, Michael W, Noah K, Rabihah W, Rachel W, Sydney D, Taylor B, Will E, Supervisors: Cameron P, Liz M

LLMs for Modeling Cyber Resilient Offshore Wind Farms
Grant R, Rohan A, Kelechi E, Junior B, Gordon M

Machine Learning for Radar Clutter Differentiation
William D

Maneuver Detection
Herwen X

MASTIFF: Malicious Adversarial Sensing Techniques for Isolating Friend and Foe
Joey C

Mobile Reverse Engineering and Vulnerability Detection
Alexander K, Cameron M

Modernizing Vue: Upgrading from Vue 2 to Vue 3 with Vite
Emily V, Aashish A

Navigating the Cybersecurity Job Market: The Impact on Career Opportunities for New Graduate Women of Color
Hanna T

NetGen-AgentGen: LLM-enabled Bootstrapping Tool for RL-enabled Network Pen-testing
Connor N, William B, Justin J, Hemansh A, Colleen P

Night's Watch: A Virtual C-UAS Testbed
Aayan A, Ryan A, Alexander B, Ethan D, Kaiden D, Vincent F, Gautam I, Utsav M, Matthew M, Ronit M, Sunjeet N, Sanjay S, Nico T, Garrett W

Open-Source Analyst Methodologies: Russia/Ukraine Conflict
Jordan B, Jake F

Operation Safe Passage, Digital Engineering for T&E
Emanuel O, Austin L, Trevor I, Walter L, Winston M, Allegra O, Robert S, Liam S, Brandt S

Optimized Digital Engineering Transformation
Nicholas J, Natalie H, Sydney E

Phased Array & Visualization
Nick B, Abraham T, Sam S, Ian B, Vanessa B, Joseph N, Alexander J, Kyle W, Zachary V, Reve M,

4:15 PM - 6:15 PM

Project IRIS: Intelligent RF Identification System
Dylan G, Justin R, Brady F, Cora W, Miles T

Project Management Innovation Projects
Mahima S, Colleen P, Ahad K, Muhammad (Shayan) R, Emmanuel O, Gordon M

Quantum Approaches to the Quadratic Assignment Problem
Nathan D, Julia S

Rapid Mission-Driven UAVs – Customizable and Trustworthy through COTS and Control Co-Design
Andrea G, Micaela R, Ethan C, Marc S, Maguire M

Resilience of AI-Enabled Systems using FAIREST Principals
Danielle K, Rishika B, Jessica L

RTX Autonomous Vehicle Competition
Max A, Shray G, Nicholas H, Sneha M, Sreeauditya M, Ella R, Andrew V, Gregory W

Russia's Use of Gendered Disinformation As a Tool of Hybrid Warfare Against the United States
Samantha B, Nicole E

SCVI: Bridging Social & Cyber Dimensions
Shutonu M, Thomas N, Hyungmin K, Chen-Wei C

Securing the Pacific: U.S. Strategies to Counter China and Strengthen Disaster Resilience in the Pacific Island Countries
Paris A, Abigail B, Lily B, Alex D, Nicole E, Zoe F, Jack F, Kelsey G, Parker G, Michael G, Ben H, Shannon H, Alden K, Fiona W, Franziska W

Spectral Warrior | Learning RF through Gamification
Hannah B, Clarence B, Brianna D, Madeline D, Kaden E, Laura J, Jayden K, Espen L, Tobechi O, Casie P, Dillon R, Aditi S, Isaac T

Strategic Operations Center (SOC): Threat Intelligence for Adversary & Host Attribution
Marlyn N, Connor B, Miles Z

Subnational Diplomacy: Purpose, Models, and Implementation
Jason B, Lindsay L, Colten R, Camila B, Matthew C, Rachael C, Mya K, Martin O, Reina R, Ardenne S

Thirty Years After Normalization: A Celebration of the U.S.-Vietnam Relationship
Maysem A, Olivia B, Carter E, Zoe G, Morgan H, Amy H, Maddy I, Ajax L, Brian L, Lucia M, Seth M, Kiley M, Sophia R, Kate T, Madigan V, Will C, Mahima S

4:15 PM - 6:15 PM

Uncertainty Quantification Framework for Digital Twins
Brandon F

Use and Abuse - Analyzing Political Emails
Daniel H, Alexis H, Aditya K

Using AI for Software Test Generation
Wesley F, Sam P, Qais S

Using Intelligent Conversational Agents to Empower Adolescents to be Resilient Against Cybergrooming
Arav S

Utilizing OSINT to Identify Russian High-Value Targets
Patrick L, Logan K, Cameron U, Dori V

VT UTProSat-1 and HERMES: a Satellite Surrogate Communication Testbed for Ground-Station validation using Software Defined Radio and OpenC3 COSMOS
Luiz B

Fireside Chat with Dr. Aaron M. Weiner

Dr. Weiner currently serves as the Director of the Advanced Systems and Technology Directorate (AS&T) and the Chief Technology Officer and Chief Artificial Intelligence Officer for the National Reconnaissance Office (NRO). In these roles, he leads AS&T and the NRO Technical Enterprise in supporting the mission of the NRO by identifying, developing and demonstrating technologies that maintain the nation's intelligence advantage from space.

Dr. Aaron M. Weiner

DIRECTOR, ADVANCED SYSTEMS & TECHNOLOGY (AS&T), National Reconnaissance Office (NRO)

Dr. Weiner has held multiple leadership positions across the NRO. Recently, he was the Principal Deputy Director of the Geospatial Intelligence Directorate (GEOINT); he developed program and acquisition strategies, directorate roadmaps, and guided the execution and enterprise integration for seven major system acquisitions, a pathfinder satellite, and engineering and research demonstration systems. Before that, he was the Deputy Director of the Integrated Intelligence System Program Office in the Ground Enterprise Directorate (GED), delivering collection orchestration systems, cloud-based frameworks, and situational awareness programs driven by multi-INT fusion-based tipping and alerting, reducing sensor to shooter timelines. He also led the Payload Division in the GEOINT Electro-Optical System Program Office to develop and deliver telescopes and sensors for NRO's flagship EO program.

Dr. Weiner served over 23 years in the U.S. Air Force, retiring as a Colonel, before joining the NRO Cadre. He served in multiple space-related intelligence and acquisition assignments in his career: teaching at the Air Force Academy as a Military Assistant to the Assistant Secretary of the Air Force for Acquisition at the National Air and Space Intelligence Center, Air Force Research Laboratory Sensors Directorate, and as Deputy Director of Space Programs and Operations in the Office of the Under Secretary of Defense for Intelligence and Security at the Pentagon.

Dr. Weiner holds a Bachelor of Science in Chemistry from the U.S. Air Force Academy, a Master of Science in Chemistry from Wright State University/AF Institute of Technology, a Master of Science in National Resource Strategy from the Eisenhower School, and a Doctorate in Imaging Science from the Rochester Institute of Technology.

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