9th Annual
IC CAE & NATIONAL SECURITY EDUCATION PROGRAM COLLOQUIUM

Tuesday, April 12, 2022
9:00AM - 6:30PM

V⊤ HUME CENTER FOR NATIONAL
SECURITY AND TECHNOLOGY
VIRGINIA TECH

The Ted and Karyn Hume Center for National Security and Technology and the Virginia Tech National Security Institute welcome you to the 9th annual National Security Education Program (NSEP) 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 "The Future of National Security" and will showcase our students' continued endeavors to become the next generation of national security leaders. Additionally, the colloquium includes a panel discussion on "Required Skills for Future Graduates Interested in National Security Careers".

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. 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. We look forward to having you join us for this exciting event.

HUME CENTER FOR NATIONAL SECURITY & TECHNOLOGY

8:55 AM	**Welcome**
	• Dr. Eric Paterson

9:00 AM	**Workforce Development Student Team Presentations**

9:50 AM	**Panel: Required Skills for Future Graduates Interested in National Security Careers**
	• Moderator: Dr. Gretchen Matthews
	• Panelists: Stephanie Beard, Nazaret Berhane, Mike Burns, Kevin Keating, Robert Kurtz, Gordon LoPresti

10:50 AM	**Break**

11:00 AM	**Hume IC CAE Research Fellowship Team Presentations**

12:30 PM	**Lunch**

1:30 PM	**Experiential Learning Research Team Presentations**

4:00 PM	**Concluding Remarks**
	• Ehren Hill

4:00 PM	**Student Poster Session & Reception**

5:30 PM	**Introduction of Keynote Speaker**
	• Glenn Kurowski

5:35 PM - 6:30 PM	**Keynote Address: "National Security in a Digital World"**
	• Sue Gordon, *Former Principal Deputy Director of National Intelligence at the Office of the Director of National Intelligence (DNI) and current Director at CACI International*

As chairman of the Senate's Select Committee on Intelligence, I am pleased that Virginia Tech is strategically organizing and prioritizing its national security research and workforce efforts. Given the university's nearly $50 million Department of Defense research portfolio, and its strategic locations in Northern Virginia near key national intelligence agencies and the Pentagon, this purposeful focusing of Virginia Tech's efforts in national security is welcome news. Virginia Tech's new National Security Institute will help our nation develop new security-related technological advancements while helping train the future generations of intelligence leaders.

-Senator Mark Warner
(in a 2021 article about the formation of the NSI)

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

9:00 AM	**Workforce Development Program Presentations**
	60 GHz Pulse-Doppler Radar for High Resolution Tracking
	• CACI sponsored Undergraduate Workforce Development Program
	   ○ *Faculty Mentors: Thomas Krauss, Chris Henshaw*
	   ○ *Students: Maria B., Brandon B., Colin F., Samantha F., Michael H., Robert Ki., Jenny L., Allison P., Tyler R., Juan S., Connor W.*

9:15 AM	**Workforce Development Program Presentations**
	A Reinforcement Learning Approach to Enemy Containment via Autonomous Swarms
	• The MITRE Corporation sponsored Undergraduate Workforce Development Program
	   ○ *Faculty Mentors: Dr. Justin Kauffman, Dr. Justin Krometis*
	   ○ *Students: Beyonce A., Austin B., Mark C., Jai D., Aydin G., Eashan G., Maryum K., Kevin L., Aram M., David P., Thomas S., Ashvita V.*

9:30 AM	**Workforce Development Program Presentations**
	Use & Abuse of Personal Information - Data Processing
	• Raytheon Technologies sponsored Undergraduate Workforce Development Program
	   ○ *Faculty Mentors: Dr. Alan Michaels, Bill Clark, Derek Jenkins*
	   ○ *Students: Jordan B., Mia B., Olivia F., Nicholas H., Ethan H., Milen J., Skylar K., Emma L., Bryan M., Elizabeth M., Emily N., Wyatt O., Madeline R., Pranav T., Maleehah Z.*

9:50 AM	**Panel - Required Skills for Future Graduates Interested in National Security Careers** **Moderator:** • *Gretchen Matthews, Ph.D.: Professor, Department of Mathematics; Director, Commonwealth Cyber Initiative (CCI) Southwest Virginia, Virginia Tech* **Panelists:** • *Stephanie Beard, Engineering Manager, CACI* • *Nazaret Berhane, Program Manager, IC Center for Academic Excellence, Office of the Director for National Intelligence (ODNI)* • *Mike Burns, Associate Director for Talent, Central Intelligence Agency,* • *Kevin Keating, Senior Advisor to the Deputy Director of CIA for Science and Technology, Central Intelligence Agency* • *Robert Kurtz, Engineering Fellow, Raytheon Technologies* • *Gordon LoPresti, Director of Hardware Engineering, Northrop Grumman*

10:50 AM	**Break**

11:00 AM	**Hume IC CAE Research Fellowship Team Presentations**
	Dataset Classifiers Feature Extraction (Leidos)
	• Leidos sponsored Research Team
	    ○ *Mentors: Hanna Witzgall, Mark Clark, William Arliss, Clayton Carson*
	    ○ *Students: Anisha T., Kaitlyn Y.*

11:15 AM	**Hume IC CAE Research Fellowship Team Presentations**
	High-Speed AUV Systems with Wideband Acoustic Communications (HAWC) (BAE Systems)
	• BAE Systems sponsored Research Team
	    ○ *Mentor: John Goddemote*
	    ○ *Students: John N., Tony T., Mehir V.*

11:30 AM	**Hume IC CAE Research Fellowship Team Presentations**
	An Exploration of Quantum Computing Applications and Resources (ManTech)
	• ManTech sponsored Research Team
	    ○ *Mentors: Philip Egert, Srini Iyer, Gianluca Longoni, Kelly Deich, Charlotte Wright*
	    ○ *Students: Ryan B., Ellen G., Cora M.*

11:45 AM	**Hume IC CAE Research Fellowship Team Presentations**
	Security issues in the coastal zone: Insights from the literature
	• Virginia Tech Department of Geography sponsored Research Team
	    ○ *Faculty Mentor: Dr. Anamaria Bukvic*
	    ○ *Students: Margaret L., Lauren M.*

12:00 PM	**Hume IC CAE Research Fellowship Team Presentations**
	Chinese Process of BRI and Debt Trap Diplomacy
	• Virginia Tech Diplomacy Lab sponsored Research Team
	    ○ *Faculty Mentor: Robert Hodges*
	    ○ *Students: Alaina B., Sebastian B., Omar H., Marcus L.., Hannah N.*

12:15 PM	**Hume IC CAE Research Fellowship Team Presentations**
	A Novel Approach to Modular Cubesat Concept and Design
	• Northrop Grumman sponsored Research Team
	    ○ *Faculty Mentor: Dr. Leon Harding*
	    ○ *Students: Grant H., Austin M., Alexander M., Joshua "Clint" V., Sami Q.*

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

1:30 PM	**A Radio Frequency Machine Learning focused AI Software 'Gym' for Jamming/Anti-Jamming Applications**
	IC CAE Multi-College Collaborative Research in Radio Frequency Machine Learning (RFML)
	• *Faculty Mentors: Dr. Chris Headley (Virginia Tech), Dr. Amos Johnson (Morehouse)*
	• *Virginia Tech Students: Ellen G., Spencer F., Alicia H., Ryan H., Will I., Theodore N., Penelope O., Samuel P., Illa R., Daniel R., Namita S., Jean-Paul T., Aleysha V., Sydney W., Caroline S.*
	• *Morehouse Students: Zavier H., Zavion H., Kairo J., Calvin G., Brandon J., Gerry S., Kayla T.*

1:45 PM	**Use & Abuse of Personal Information – Collection**
	Use & Abuse of Personal Information
	• *Faculty Mentor: Dr. Alan Michaels*
	• *Students: Joe H., Jack K., Jaden L., Eli L., Mary N., Justin P., Michelle T., Maggie Y.*

2:00 PM	**Materials and Structures for Embedded Antennas in Airborne Vehicles**
	MEEP: Materials & Advanced Manufacturing in Applied Electromagnetics
	• *Faculty Mentor: Dr. Bradley Davis*
	• *Students: Kyle A., Salih B., Gabe B., Anthony B., Laura D., Daniel D., Spencer M., Parker M.,*
	• *Julia P., Aditya R., Anna S.*

2:15 PM	**OSINT-in-a-Box: Combating Disinformation in Communities of Color**
	• *Faculty Mentor: Dr. Aaron Brantly*
	• *Students: Vaishnavi A., Priuyankaa B., Laya B., Krish G., Alexi G., Esheka G., Vineet M., Kyle M., Devika M., David O., Jonathan P., Kritika P., Ella R., Kirti S., Adrian Z., Matthew B., Bhargava E., Krish G., Dong K., Vicky L., Ethan M., Gunhaar P., Grace R., Anna S.*

2:30 PM	**Automated Detection and Mitigation of Cyber-Attacks**
	• *Faculty Mentor: Dr. Stephen Adams*
	• *Students: Krish G., Jay K., Fardin K., Katie K., D., Samuel R., Yunis S., Sean S., Abigail S.*

2:45 PM	**What's the problem? An NLP approach to examining U.S. Cybersecurity Topics**
	• *Faculty Mentor: Dr. Joseph Simpson*
	• *Students: Amrita B., Priya B., Venn B., Sidant D., Burton L., Darren Y., Mohamed Y.*

3:00 PM	**Development and Validation of Efficient Design Tools for Hypersonic, Air-Breathing Engines**
	• *Faculty Mentor: Dr. John Gilbert*
	• *Students: Giavanna A., Madelyn B., Amogh N., Daniel P., Jack R., M. Farooq Z.*

3:15 PM	**Development of an EMCCD space camera for UV spectroscopy: probing Nitric Oxide in the polar night**
	• *Faculty Mentor: Dr. Leon Harding*
	• *Students: Neha C., Nicholas J., Thomas K., Michael P.*

3:30 PM	**Development of an EMCCD space camera for a 6U CubeSat spacecraft**
	• *Faculty Mentor: Dr. Leon Harding*
	• *Students: Nick A., Ronit B., Richard G., Finn D., Nicholas J., Willie S.*

4:00 PM	**Concluding Remarks** *Ehren Hill, Associate Director for Education and Outreach, Virginia Tech National Security Institute*
4:00 PM	**Student Poster Session and Reception** - Commonwealth Ballroom A
5:30 PM	**Introduction of Keynote Speaker** *Glenn Kurowski, CACI Senior Vice President and Chief Technology Officer*
5:35 PM - 6:30 PM	**Keynote Address** "National Security in a Digital World" *Sue Gordon, Former Principal Deputy Director of National Intelligence at the Office of the Director of National Intelligence (DNI) and current Director at CACI International*

4:00 PM – 5:30 PM

Combustion Dynamics in Lean Direct Injection
Yogesh A.

Middle Powers and Their Use of Hybrid Warfare
Jonathan L.

Advancing & Accelerating Vetting of the Closed-source Ecosystem
Stefan N.

The 'Other' Threat: Analyzing the Threat of Domestic Terrorism to U.S National Security
Kourtney P.

Undernet: Gaming with an Underwater Infrastructure
James F., Quentin F., Mason G., Kavin S.

Far-Right Violent Extremist Women: Threats and Security Considerations
Sarah S.

Countering Russian Disinformation Campaigns in Eastern Germany
Erica M., Jacob R., Carter B., Alden C., David F., Kendall F., Alexi G., Cara H., Samantha M., Mason M., Betsabeth O., Sam P., Catherine R., Grant J., Kaitlyn L., Andrew P., Kieran T., Emma W., Jack T.

Real-Time Implementation of Reinforcement Learning in GNU Radio for Anti-Jamming
Alyse J.

Neyman-Pearson Detection of Rare Signals with Neural Networks
Megan M.

Capturing Your Data: Moving from Simulated to Real-World Data Collection in SAR Imagery
Thomas K., Cassidy H., Luis P.

Improving on PQC Microsoft for Fun & Games: Implementing a Parallel Collision Attack on SIKE
Tori M., Sarah O., Aaditya P.

Geometric Sensitivity Study of a Recently-Maneuvered Satellite
Dylan P., Cameron H.

Channelizer Adaptive Multi-Sensor Processing for Blind Signal Recovery in the Presence of Multiple Interferers
Lauren L.

Analysis of Hierarchical latent spaces in Variational Auto Encoders
Cameron K.

Securing IoT devices through Power Auditing and Privacy-preserving CNN
Woosub J., Yizhou F., Sabbir K., Chunsheng X., Danella Z., Gang Z.

Modeling and Simulation of Blast-Related Threats
Anna W., Aditya S., Evan L.

Integration of Reinforcement Learning and Unreal Engine for Enemy Containment via Autonomous Swarms
Maryum K., David P., Thomas S., Beyonce A., Austin B., Mark C., Jai D., Aydin G., Eashan G., Kevin L., Aram M., Ashvita V.

Information Theory Enabled Autoencoders for Robust Anomaly Detection in Communication Signals
Padmaksha R.

Prototype Analysis of a Helix NVIS Antenna for HF Communication
Sterling B., Zac H., Matt K., David L., Jacob M.

Waveguide Electromagnetics with 2D FDTD Simulations
William P., Zach W.

Algorithms for Telerobotic Cameras View-Frame Placement Problem
Sunghoon P.

Distributionally Risk-Receptive and Risk-Averse Network Interdiction Problems with General Ambiguity Set
Sumin K.

Sniffing and Spoofing in Electric Vehicle Charging
Max F., Grant H., Alex L., Jared M., Vincent T., Minh V., Eric W., Chengpei W.

Gamification of Cybersecurity Learning
Travis M.

Developing an Inverter-Based Microgrid Testbed with Cybersecure 5G Communication
Ardavan M.

Network Testbed for Small Satellites (NeTSat) - A Global Simulated Satellite Network
Bruce B., Richard G., Joseph L.

Cyber Security for the Underwater IoT
Zachary S., Connor M., Raphael R., Jamie S., Nolan D.

Cybersecurity Collection And Analysis
David H., Luke T., Tukhang T., Rohan K., Ritika A.

Defend the Republic (99+ Luft Balloons)
Matthew R., Michael B., Andrew C., Nathan H., Arum H., Elena A., Brianna D., Stephen K., Virginia S.

Cost-adjusted Model Selection
Erica P.

4:00 PM - 5:30 PM

Keynote Speaker

Sue Gordon

Sue is currently the Director at CACI International which provides the unique expertise and distinctive technology that address customers' greatest enterprise and mission challenges.

She was the fifth Principal Deputy Director of National Intelligence at the Office of the Director of National Intelligence (DNI) from August 2017 to August 2019. As PDDNI, Sue was a key advisor to the President and National Security Council and led the 17-member Intelligence Community. With more than three decades of experience in the IC, Sue has served in a variety of leadership roles spanning numerous intelligence organizations and disciplines. Prior to the DNI, Sue served as the Deputy Director of the National Geospatial-Intelligence Agency from 2015 to 2017, helping the director lead the agency and manage the National System of Geospatial Intelligence.

Before joining the NGA, she served for 27 years at the Central Intelligence Agency, rising to senior executive positions in each of the Agency's four directorates: operations, analysis, science and technology, and support. In 1998, she designed and drove the formation of In-Q-Tel, a private, non-profit company whose primary purpose is to deliver innovative technology solutions for the agency and the IC. She is the recipient of numerous government and industry awards, including the Distinguished Intelligence Medal and the Distinguished Presidential Rank Award. Sue earned a Bachelor of Science from Duke University. A trusted authority on strategy, innovation and leadership, Sue is currently a consultant on global risk, technology, cyber and space issues and a member of the Board at Pallas Advisors, a Washington D.C.-based consultancy.

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