

2018 SAIC Integrated Security Colloquium

Human-Centered Aspects of Integrated Security

Hosted by

Virginia Tech Integrated Security Destination Area and the
Hume Center for National Security and Technology



HUME CENTER FOR NATIONAL
SECURITY AND TECHNOLOGY
VIRGINIA TECH.

SAIC

April 18, 2018

The Inn at Virginia Tech and Skelton Conference Center
Blacksburg, Virginia

About the Hume Center & the Integrated Security Destination Area

The Hume Center leads Virginia Tech's research, education, and outreach programs focused on the challenges of cybersecurity, autonomy, and resilience in the context of national and homeland security. Education programs provide mentorship, internships, scholarships, and seek to address key challenges in qualified US citizens entering federal service. Current research initiatives include cyber-physical system security, orchestrated missions, and the convergence of cyber warfare and electronic warfare.



**HUME CENTER FOR NATIONAL
SECURITY AND TECHNOLOGY**
VIRGINIA TECH™

The mission of the Ted and Karyn Hume Center for National Security and Technology is to cultivate the next generation of national security leaders by developing and executing curricular, extracurricular, and research opportunities to engage students. Education programs engage principally undergraduates through curriculum development, extracurricular programs, internship and career opportunities in the national security sector, and scholarships.

It is important to recognize that the core mission of the Hume Center is student-focused. Research activities support the student ecosystem, and as such all research activities include student participation.



The Integrated Security Destination Area focuses on understanding and fostering a world in which individuals, institutions, and nations are secured by technology and social systems that follow ethical principles and promote values of social justice.

Faculty working together in this area are bringing a transdisciplinary approach to the complex range of human and systems security challenges. Work in this area also embraces equity in the human condition by seeking the equitable distribution and availability of physical safety and well-being, psychological well-being, respect for human dignity, and access to crucial material and social resources throughout the world's diverse communities.

This Destination Area further addresses policymaking and policy analysis, collaborating at the intersection of scientific evidence, governance, and analyses to translate scholarship into practice.

**All Sessions in Latham Ballroom A except where noted

9:00 a.m.	Welcome, Hume Center Director, Dr. Charles Clancy
9:15 a.m.	Industry Panel Session
	<p>Dr. Ramin Baseri, CACI (Moderator)</p> <p>Alex Briceño, CACI</p> <p>Mark Nelson, Lockheed Martin</p> <p>Steven Stone, MITRE</p> <p>Paul Welch, SAIC</p>
10:15 a.m.	Hume Center Academic Affiliates Program Student Team Presentation
10:35 a.m.	Networking Break and Refreshments
11:00 a.m.	Integrated Security Destination Area Panel Session
	<p>Caroline Frampton, SAIC (Moderator)</p> <p>Aaron F. Brantly, Ph.D., Department of Political Science</p> <p>Sonja D. Schmid, Ph.D., Department of Science, Technology and Society</p> <p>David Simpson, RADM (ret.), Pamplin School of Business</p> <p>Daphne Yao, Ph.D., Department of Computer Science</p>
12:00 p.m.	Integrated Security Destination Area Student Presentations
12:30 p.m.	Lunch (Latham Ballroom B)
1:30 p.m.	Government Panel Session
	<p>Major General Randal D. Fullhart (Ret.), Commandant of Cadets (Moderator)</p> <p>Roni Modica, Department of Defense</p> <p>Dana M., Central Intelligence Agency</p> <p>Michael M., National Security Agency</p> <p>Matt L., Federal Bureau of Investigation</p> <p>Jesse S., Federal Bureau of Investigation</p>
2:30 p.m.	Networking Break
2:45 p.m.	Hume Center Academic Affiliates Program Student Team Presentations
3:25 p.m.	Integrated Security Education and Research Center (ISERC) Overview
	ISERC Interim Director Patrick Huber
3:40 p.m.	Concluding Remarks, Associate Director of Education & Outreach, Kira Gantt
4:00 p.m.	Student Poster Session and Reception (Latham Ballroom B)
6:00 p.m.	Keynote Address, General Keith Alexander (Former Director of the National Security Agency and Commander of the United States Cyber Command)
7:00 p.m.	Hume Center Academic Affiliates Program and Student Meet and Greet

Student Research Poster Titles

<i>A Case Study on APT10 and APT28</i>	<i>An Autonomous Control System for Satellites Engaged in Directed Electronic Warfare</i>
<i>Analysis of Data Movement</i>	<i>Applying Linguistic, Semantic, Geospatial, and Temporal Features to the Identification of Disinformation Agents</i>
<i>Architecting IoT-Enabled Smart Building Testbed</i>	<i>Architecture of Convolutional Neural Net: Filter Distribution</i>
<i>Autonomous Space Domain Sensor Tasking</i>	<i>Autonomous Vehicle AI Analysis</i>
<i>Chaotic Sequence-Based Frequency Shift Keying</i>	<i>Clustering Learned CNN Features from Raw IQ Data for Emitter Identification</i>
<i>Cognitive Cybersecurity: Protecting Our Neural Data</i>	<i>Compiler Tools for Critical Program Information (CPI) Protection</i>
<i>Design and Development of the Virginia Tech CubeSat Attitude Control Simulator</i>	<i>Diaspora Influx Effects on National Security</i>
<i>Economic Security</i>	<i>Effects of Keratin Biomaterial Therapeutics on Cellular and Inflammatory Mechanisms in Injury and Disease Models</i>
<i>Electromagnetic Induction Attacks on Actuators</i>	<i>Energy Efficient Security Functions of IoT</i>
<i>Enhanced Neural Network Training Using Selective Backpropagation and Forward Propagation</i>	<i>Evaluating Risks in an IoT Enabled World</i>
<i>Exploratory High-Dimensional Data Analysis for the Intelligence Community</i>	<i>Exploring the Vulnerabilities and Security of IoT Devices</i>
<i>Fingerprinting Cognitive Radio Devices</i>	<i>Fingerprinting GPS Satellites to detect GPS Spoofing</i>
<i>High-Altitude Balloon Sensor Payload Design</i>	<i>Investigating Neural Network Training Consistency</i>

Student Research Poster Titles

<i>IoT Device Vulnerabilities and Security</i>	<i>Lunar Habitat - Stepping Stone to Mars and Beyond</i>
<i>Machine-Learning Approaches for Automated Detection of Cyberviolence</i>	<i>Multiobjective Optimization of Heterogeneous Spacecraft Constellations</i>
<i>NASA's Deep Space Gateway Project</i>	<i>National Security Concerns Impacting Buying/Saving Habits of Consumers</i>
<i>National Security Through the Lenses of International Engagement</i>	<i>Physical Layer Identification of ECUs for Intrusion Detection</i>
<i>Receiver-Assigned CDMA in Wireless Sensor Networks</i>	<i>Relative Sensing for Multi-Robot Teams</i>
<i>Remote SDR Experiments Utilizing CRTS & CORNET/CORNET3D</i>	<i>Robust Blind Spectral Estimation in the Presence of Non-Gaussian Noise</i>
<i>Robustness of Modern Deep Learning Architectures</i>	<i>Satellite Constellation Design for Surveillance</i>
<i>Secure Embedded Software Radio Architectures</i>	<i>Signal detection effects on deep neural networks utilizing raw IQ for modulation classification</i>
<i>Signal Identification with Machine Learning</i>	<i>Student Interest in the IC: Predictors, Facilitators, and Barriers</i>
<i>Terrorist Group Leadership Decapitation</i>	<i>The Fiscal Resilience of American Cities</i>
<i>The Phoney App</i>	<i>The Russian Mafia As A Legitimate Government?</i>
<i>The SAE International AutoDrive Challenge</i>	<i>The WPA Trilogy</i>
<i>Time-Resolved Doppler Global Velocimetry in a Subsonic Benchtop Jet</i>	<i>Traffic Infrastructure Vulnerabilities</i>
<i>UnTracer: Fuzzing Black-Box Binaries as Fast as White-Box Binaries</i>	

KEYNOTE ADDRESS

General (Ret) Keith Alexander is a four-star general with an impressive 40-year military career, culminating in role of the Director of the National Security Agency (NSA) and Chief of the Central Security Service (CSS) from 2005-2014. He holds the distinction of serving in this role longer than any other director. While serving as the NSA Director, he was appointed by Congress to be the first Commander to lead the U.S. Cyber Command (USCYBERCOM). He held this role from 2010-2014, establishing and defining how our nation is protected against cyber attacks.

As Commander, USCYBERCOM, General Alexander was responsible for planning, coordinating and conducting operations, and defending Department of Defense (DoD) computer networks—as well as the defense of the nation—from cyber threats. As the Director of NSA, he was responsible for national foreign intelligence requirements, military combat support, and the protection of U.S. national security information systems.



Prior to leading USCYBERCOM and the NSA/CSS, General Alexander served as the Deputy Chief of Staff, Intelligence, Department of the Army; Commanding General of the U.S. Army Intelligence and Security Command at Fort Belvoir, VA; and the Director of Intelligence, United States Central Command, MacDill Air Force Base, FL., and the Deputy Director for Requirements, Capabilities, Assessments and Doctrine, J-2, on the Joint Chiefs of Staff.

Currently, CEO and President at IronNet Cybersecurity, General Alexander provides strategic vision to corporate leaders on cybersecurity issues through development of cutting-edge technology, consulting and education/training. He is reinventing how industries mitigate cybersecurity threats with IronDefense, a patented solution designed to detect and alert on anomalous enterprise network behaviors through fine-tuned analytics. His goal is to bridge communication systems between private and government sectors to create the next level of intelligence sharing and protect the nation against cyber threats on a global stage.

Industry Panel

Dr. Ramin Baseri is a Technical Executive Director in the National and Cyber Solutions (NCS) Business Group of CACI, Inc. He is currently responsible for leading innovation and technology development within the Digital Signal Processing (DSP) group of NCS in support of U.S. Intelligence, Homeland Security and Defense communities. For 20 years, Dr. Baseri has been supporting the Department of Defense and Intelligence Communities in various positions, including: Software Engineer, System Engineer, Chief Engineer, Chief Scientist, and Program Manager. Dr. Baseri received his Bachelor and Masters of Science Degrees in Electrical Engineering from the University of Utah in 1989 and 1991, respectively. He received his PhD in Electrical Engineering from Rensselaer Polytechnic Institute (RPI) in 1997, with a focus in Digital Signal Processing and Communication Systems.

Alejandro “Alex” Briceño has worked in the cyber security field for over 17 years starting off as a network administrator at Galveston College in Texas and quickly assumed all cyber security duties for the college. Since then, he has worked on numerous security projects for the Department of Defense, various federal and state agencies, as well as overseas for commercial clients in Canada, the Caribbean, and Israel. In his military career, Alex has been a commissioned officer in the US Marine Corps for over 26 years and has served primarily in the Infantry and Reconnaissance community. Alex has been a Certified Information System Security Professional since 2001 but he has also achieved certifications and training from Microsoft, CISCO, Netware, SANS, and CompTIA. Alex is a graduate of The Citadel Military College of South Carolina and has a Master’s of Science from the Marine Corps University. In addition, Alex has published articles on Cyber Security and anthropology as they relate to military operations in the Marine Corps Gazette, the Marine Corps University press, and Special Operations Magazine.

Mark Nelson joined Lockheed Martin in September of 2001 and currently serves as the Chief Engineer at Lockheed Martin’s Center for Innovation. The Center for Innovation, located in Suffolk, Virginia, is a beacon for innovation and horizontal integration across the Lockheed Martin lines of business. The Center is purpose-built for advanced concept development and rigorous experimentation within Lockheed Martin and with government and industry partners. The Center is at the core of Lockheed Martin’s Global Research and Development arm, acting as a “supernode” with connections to research and development facilities across the globe. Mark is responsible for the modeling, simulation, and visualization environment resident at the Center for Innovation; the strategy and implementation of Business Area technology integration into the Center for Innovation; global integration of Lockheed Martin research and development centers; and the overall technical infrastructure of the Center including Engineering, IT and audio/visual. Mr. Nelson holds dual B.S. degrees in Aerospace and Ocean Engineering as well as a M.S. in Aerospace Engineering with a concentration in controls and dynamics from Virginia Polytechnic Institute and State University.

Dr. Steve Stone is a Senior Principal Cyberspace Operations Engineer and the Department Head for the Defense Technology Department at the MITRE Corporation. Retired from the United States Army in 2006 as a Functional Area 24 Information Systems Engineer. His last assignment was at the Joint Task Force for Global Network Operations where he was the principal author of the United States Strategic Command Joint Concept of Operations for Global Information Grid NetOps. He received his bachelor’s degree in aerospace engineering from the United States Military Academy, West Point, New York. He completed a master of science in computer science at the Naval Postgraduate School, Monterey, California and a master of education at Old Dominion University, Norfolk, Virginia. He earned his doctorate in informationsystems and communications from Robert Morris University, Pittsburgh, Pennsylvania where he completed initial research into a model for agile command and control of DOD cyberspace operations.

Paul Welch, Vice President for Cyber Solutions at SAIC, who happens to be a retired Brigadier General from the US Air Force. Welch earned a bachelor’s degree in Electrical Engineering from the United States Air Force Academy. He also holds master’s degrees in Engineering Management from Old Dominion University, Operational Art and Science from the Air Force’s Air Command and Staff College, Airpower Art and Science from the Air Force’s School of Advanced Air and Space Studies, and National Security Strategy from the National War College.

Integrated Security Destination Area Panel

Caroline S. Frampton is the Vice President of Engineering and Integration at SAIC and has more than 28 years of experience working in the Intelligence Community as a government employee and consultant. She has held various technical and engineering positions with the Central Intelligence Agency (CIA), National Reconnaissance

sance Office (NRO), and the National Geospatial-Intelligence Agency (NGA).

As the VP of Engineering and Integration, she manages SAIC's workforce that provides a full range of engineering and scientific offerings to various agencies across the civilian sector, Intelligence Community and Department of Defense. Members of her organization contribute to programs that include, but are not limited to satellite system development and operations, space control, unmanned aerial system development, identity intelligence and biometrics sensor development and collection, and chemical, biological, radiological, and nuclear (cBRN) programs.

Prior to her current position, Ms. Frampton managed engineering and analytic contracts across multiple government agencies. Ms. Frampton has served in leadership positions on programs that delivered some of our nation's most advanced technologies in support of national security objectives. She has also had the opportunity to work with key stakeholders from Congress, the Office of the Director of National Intelligence, and Department of Defense in the planning of future capabilities.

Dr. Aaron F. Brantly is Assistant Professor in the Department of Political Science and Hume Center for National Security and Technology Affiliated Faculty at Virginia Tech, Cyber Policy Fellow at the Army Cyber Institute and non-resident Cyber Fellow at the Combating Terrorism Center at West Point. He holds a Ph.D. in Political Science from the University of Georgia and a Master's of Public Policy from American University. His research focuses on national security policy issues in cyberspace including big data, terrorism, intelligence, decision-making and human rights. His books include: *The Decision to Attack: Military and Intelligence Cyber Decision-Making* (2016 UGA Press) and *US National Cybersecurity: International Politics, Concepts and Organization* (2017 Routledge).

Dr. Sonja Schmid is an Associate Professor in the Department of Science, Technology, and Society (STS). She teaches courses in social studies of technology, science and technology policy, socio-cultural studies of risk, energy policy, and nuclear nonproliferation. She is particularly interested in examining the interface of national energy policies, technological choices, and nonproliferation concerns. For her current research project on the challenges of globalizing nuclear emergency response. Dr. Schmid is the co-director of the STS Graduate Program in Northern Virginia, and serves on the stakeholder committee for the university's Policy Strategic Growth Area. She is a core member of Virginia Tech's Nuclear Science and Engineering Laboratory (NSEL) in Arlington, VA

David Simpson, Rear Admiral (ret.), Visiting Professor for Pamplin School of Business, Cybersecurity Graduate Programs. Former Chief of the FCC's Public Safety and Homeland Security Bureau. Currently leading Pelorus Consulting Services, specializing in public safety, telecommunications, and Cybersecurity. He is also a Professor at Virginia Tech, integrating Cybersecurity Risk studies into Pamplin College of Business graduate degree programs. He previously served as Chief of the Federal Communications Commission's Public Safety and Homeland Security Bureau from 2013 to 2017.

Dr. Daphne Yao is an associate professor of computer science at Virginia Tech. In the past decade, she has been working on designing and developing data-driven anomaly detection techniques for securing networked systems against stealthy exploits and attacks. Her current research focus is on software security, specifically on producing automatic tools for vulnerability screening and code repair. Her expertise also includes data loss prevention, program analysis for security, and Android malware detection. Dr. Yao received her Ph.D. in Computer Science from Brown University. Dr. Yao is an Elizabeth and James E. Turner Jr. '56 Faculty Fellow and L-3 Faculty Fellow. She received the NSF CAREER Award in 2010 for her work on human-behavior driven malware detection, and the ARO Young Investigator Award for her semantic reasoning for mission-oriented security work in 2014. She has several Best Paper Awards. She held multiple U.S. patents for her anomaly detection technologies.

Government Panel

Major General Randal D. Fullhart (Ret.) is Commandant of Cadets. Maj Gen Fullhart received his commission in 1979 as a graduate of the U.S. Air Force Academy. He commanded at the squadron, group, and wing levels and commanded two expeditionary flying squadrons, an expeditionary operations group in Operation Allied Force, and an expeditionary wing in Operation Iraqi Freedom. In addition, he has served as the commandant of the Air Command and Staff College. Maj Gen Fullhart has held staff assignments that include experience in operations, safety, acquisition, and government affairs at the major command and Headquarters U.S. Air Force levels. He served as the assistant director of operations, Headquarters U.S. Air Forces in Europe, and has joint experience at U.S. Transportation Command, as well as joint, interagency experience as deputy chief, Central Security Service, National Security Agency. Maj Gen Fullhart is a command pilot and has major awards and decorations including the Air Force Distinguished Service Medal, Legion of Merit with two oak leaf clusters, the Bronze Star with oak leaf cluster, the Defense Meritorious Service Medal, Meritorious Service Medal with four oak leaf clusters, the Aerial Achievement Medal, Joint Meritorious Unit Award with two oak leaf clusters, the Air Force Outstanding Unit Award with "V" device and three oak leaf clusters, the Air Force Organizational Excellence Award with oak leaf cluster, and the Combat Readiness Medal.

Ms. Roni Modica is a Defense Intelligence Senior Leader, currently detailed from the Office of the Under Secretary of Defense for Intelligence (OUSDI) to serve as the Director, Special Program for Missile Defeat (SPMD). SPMD is part of the Department's Defense Innovation Initiative and Advanced Capability and Deterrence Panel (ACDP) effort associated with countering mobile missile threats. Ms. Modica is a Special Technical Advisor for space and missile defense activities supporting the Battlespace Awareness and Program Assessment Directorate for the Director for Defense Intelligence for Intelligence Strategy, Programs and Resources. Prior to Ms. Modica's current position in DoD, from 2012-2014 she was a Technical Intelligence Officer in the Office of Global Access in the Directorate for Science and Technology (DS&T) at the Central Intelligence Agency. She was the program manager for one of the CIA DS&T's largest development efforts. Ms. Modica holds a Bachelor of Science Degree in Aerospace Engineering received from Virginia Polytechnic Institute and State University in 1989. She is also a member of the Defense Acquisition Corps.

Dana M. currently leads an all-source analytic program at the CIA and is a member of the CIA's Senior Analytic Service. He has a broad understanding of the range of cyber-related geopolitical, policy, and technical issues informed by nearly 20 years of US government and military cyber experience gained in a spectrum of contexts. He holds a doctoral degree in electrical engineering from Cornell University.

Michael M. graduated from Virginia Tech in 2006 with a Bachelors in Computer Science. He subsequently received a Masters in Computer Science from Johns Hopkins University and a Masters in Strategic Intelligence from the National Intelligence University. Michael has worked for the National Security Agency for 15 years and started his career as a Cooperative Education student in 2003.

Integrated Security Education and Research Center (ISERC)

Patrick Huber is currently a professor of physics at Virginia Tech. His applied research interests focus on uses of nuclear and particle physics in nuclear non-proliferation safeguards. He obtained his Ph.D in theoretical particle physics from the Technical University in Munich, Germany in 2003. He is a recipient of the 2003 Otto Hahn medal of the Max-Planck Society, of a 2010 U.S. DOE Early Career Research Award and of the 2016 Breakthrough Prize in Fundamental Physics. He has an appointment as Fermilab Distinguished Scholar. In 2017 he became ISERC director.

SAIC

Redefining Ingenuity™

**NORTHROP
GRUMMAN**

CACI

EVER VIGILANT

LOCKHEED MARTIN



MITRE

 **Cimarron**

PARSONS

CYBER

Orbital ATK



 **ZETA
ASSOCIATES**