Center Overview
Dr. Paulo C. G. Costa – Director
Mason is the largest public research university in Virginia

- Located in Fairfax, Va., 15 miles from Washington, D.C.
- 39,000 students
- Students from 130 countries, 50 states
- 78 undergraduate programs, 95 master’s, 38 doctoral, law
- *Times Higher Education*: Best U.S. university under 50 years old
- A *Money* “best value” college
National public university rankings

#8 – Most diverse (*best in Virginia*)

#13 – Most innovative (*best in Virginia*)

#65 – Public university ranking

Best among Virginia public universities

• First-generation student performance
• Earnings performance
• Social Mobility
• Voting Engagement
Mason earns the highest research classification

- Top research distinction from Carnegie Classification of Institutions of Higher Education
- $220M in research grants in 2020, up 32% since 2018
- Leading research in biomedicine, computer science, cybersecurity, climate change, transnational crime, and more
- National Science Federation: 10th among U.S. public universities in research growth over the past decade
Agenda

About the C4I & Cyber Center

Our Team

Project Highlights
Mission

To perform advanced research in defense, intelligence, and security-related applications in IT and Cyber; bridging cultural gaps and aligning requirements between government, industry, and academia.
Vision

Serve as a multi-disciplinary hub connecting faculty and researchers wanting to work on areas related to the Center’s mission and be widely recognized as a premier source of knowledge and innovation to military and civilian authorities.
C4I & Cyber Goals

- Provide an intellectual base for the C4I & Cyber area
- Integrate theories and results across disciplines for more understanding at the systems level
- Impact the synthesis and analysis of C4I & Cyber systems
- Bridge cultural gaps among government, industry and academia in C4I & Cyber
Research Focus

Sensing & Fusion

Command Support

C4ISR & Cyber (civilian and dual use)

Modeling and Simulation

Communications and Signal Processing

Information System Architectures

C4I & Cyber Center Overview
Our Team
Leadership Team

Dr. Paulo C. G. Costa
Director

Dr. Michael Hieb
Associate Director

Dr. Ali K. Raz
Assistant Director for Intelligent Sys. Integration

Dr. J. Mark Pullen
Director Emeritus

Dr. Linton Wells II
Executive Advisor
Chair of Advisory Group

C4I & CYBER CENTER’S ADVISORY GROUP
Advisory Group

Dr. Linton Wells II
Executive Advisor
Chair of Advisory Group

Dr. J. Mark Pullen
Director Emeriti

Lt. Gen. Robert Elder
USAF (ret), Mason

RADM (ret) Jan Hamby
National Defense University

Dr. Daniel T. Maxwell
KaDSci, US Army (ret)

RADM (ret) Willie Metts
National Security All. Exec.

Capt. Leslie (Jake) Schaffner
USN (ret)

Maj. Gen. Eric W Vollmecke
GMU RPRC, US Army (ret)

Strategic Consulting, LLC

Dean Worley
MITRE, USAF (ret)
Affiliated GMU Faculty

- Dr. Leonard Adelman
- Dr. James Baldo
- Dr. Peggy Brouse
- Dr. Kuo-Chu Chang
- Dr. Thomas Clemons
- Dr. Kenneth Comer
- Dr. Zoran Duric
- Dr. Jair Ferrari
- Dr. Isaac Gang
- Dr. Michael Hieb
- Dr. Karla Hoffman
- Dr. Edward Huang
- Dr. Liling Huang
- Dr. Shou Matsumoto
- Dr. Arthur Pyster
- Dr. Ali Raz
- Dr. Sanjeev Setia
- Dr. Robert Simon
- Dr. Girum Urgessa
- Maj.-Gen. Robert Wheeler
- Dr. Liz White
- Dr. Duminda Wijesekera
- Dr. Ziyu Yao
- Dr. Bo Yu
- Dr. Abbas Zaidi
Project Investigators

- Dr. Peggy Brouse
- Dr. Paulo Costa
- Dr. Zoran Duric
- Dr. Michael Hieb
- Dr. Kathryn Blackmond Laskey
- Dr. Shou Matsumoto
- Dr. Robert Simon
- Dr. Linton Wells, II
- Dr. Elizabeth White
- Dr. Duminda Wijesekera
- Dr. Ziyu Yao
- Dr. Bo Yu
- Dr. Ali Raz
Affiliate Centers and Laboratories

Center for Air Transportation Systems Research

Rapid Prototyping Research Center

RARE Lab

GMU Center for Resilient & Sustainable Communities

5G Innovation Laboratory

EClab

Dr. Kenneth De Jong

Dr. Sean Luke

Learning Agents Center
Project Highlights
C4I & Cyber Center Overview

Current Projects

Cybersecurity Manufacturing Innovation Institute (CyManII)
DOE will provide CyManII with $70M in 5 years to create economically viable, pervasive, and inconspicuous cybersecurity in American manufacturing to secure the digital supply chain and energy automation. The Institute is composed of 23 leading universities, 3 National Labs, and 50+ industry partners including CISCO, Schneider Electric, GE, and others. The projected budget is $120M for the 5 years. Mason is a Managing Partner (highest tier) and responsible for the East Cost Satellite Facility of the Institute.

DARPA SAFE-SIM Program – Applying Analytical Process with Multiple Methods
The project is developing an integrated analytical process that ties multiple technical methods for analysis and evaluation of complex system and systems of systems. The team is investigating how to build a consistent logical notation for complex systems and tie to technical methods (e.g., graph theory, deep learning etc.) to help with closing feasible and infeasible paths and help answer analyst questions.
ODNI/ARLIS: Recombinant AI: Exploiting Heterogeneous Data Fusion with Ontological Frameworks and NLP

This project is focused on developing analytical frameworks (e.g., ontological framework) to enable heterogeneous data exploitation and fusion in support of Recombinant AI objectives. It builds on the outcomes of Natural Language Processing (NLP) applied to various documents in a given domain (e.g., data extraction, indexing, and translation etc.), an ontology framework, for example, will identify key entities of interest in that domain and how these entities are interlinked towards inferring root causes or potential future courses of action. It set foundations for exploiting and fusing heterogeneous data to overcome limitations of missing data and/or extract new information from disparate and siloed data sets.

CUAS: Standardized High Level Data Fusion (HLDF) System Architecture for Counter Unmanned Aerial Systems (CUAS)

This project delivers innovative engineering and cost-effective technical implementation capabilities to address DoD's critical High Level Data Fusion (HLDF) system architecture needs in the Counter Unmanned Aerial Systems (CUAS) mission area. Our objective in this project is to create a flexible HLDF system architecture that provides system-of-systems interoperability between existing sensors and Command & Control (C2) systems, maximizes reusability of key technical resources including software modules, and supports future innovation and evolution of HLDF, C2 and sensing systems.
Recent Projects

ARAKNID / ACK Program
The goal of the Adapting Cross-Domain Kill-Webs (ACK) program is to provide a decision aid for mission commanders to assist them with rapidly identifying and selecting options for tasking – and retasking – assets within and across organizational boundaries.

Sandia: Novel Hypersonic Vehicle Maneuvers via Reinforcement Learning Techniques
This project is exploring the use of Reinforcement Learning (RL) in Hypersonic vehicles to provide guidance and navigation commands. RL provides an ability to train an artificial intelligent agent in dynamic and uncertain environments but its application in Hypersonic is not investigated and particularly test and evaluation approaches of RL in aerospace systems is significantly lacking. This project is developing Systems Engineering methods for RL implementation in Hypersonic systems and is also investigating robustness testing and explainable AI techniques for adoption of RL in real-time systems.
Online Learning Techniques for Space Situational Awareness
The project was sponsored by the Griffiss Institute / AFRL and applied deep reinforcement learning (DRL) to sensor allocation for space situational awareness. It developed demonstration-guided DRL algorithm for imitation learning from heuristic solution. Two academic papers were published.

Cyber Disaster Resilience: Assessment Framework for Cyber Impacts During Natural Disasters
VA-CCI funded this project to develop metrics, assessment framework, and models for assessing impact of cyber-attack during natural disaster. The C4I & Cyber team implemented ransomware scenario in patient-based hospital simulation model; analyzed response strategies and developed annotation system and machine learning models for recognizing misinformation in social media. Two papers were published.
Recent Projects

Support for MITRE SIMEX™ Live Action Simulations

MITRE Corporation and DHS placed several contracts for the C4I & Cyber to assist in the design, execution, and analysis of live-action virtual reality simulations. School security: active shooter incident in high school, Law enforcement use of force. The project provided data-driven recommendations for important policy questions.

Creating Digital Opportunities in Native American Communities through Tribal Resource Center

The project combines social science and technology to work with Tribal communities to identify ways to expand digital opportunity in ways that meet community needs. It supports formation of Tribal Resource Center to support digital opportunities enabled by broadband connectivity on Tribal lands. A library of case studies on introducing digital technology in Tribal Nations was developed, as well as a series of micro-courses on community engagement, digital leadership, decision-making, governance, and planning. Whitepaper: Emerging Digital Governance Models in Tribal Communities incorporating stories and lessons learned from ~ 5 Tribes.
Focus on UAS Research

C4I & Cyber Center has a growing expertise in UAS Analysis

- Counter UAS Expertise applied to Navy Projects
- CCI Project developing UAS Sensor Testbed in MATLAB
- Emerging area of working with GMU Police & Public Safety

Drones as First Responders (DFR)

The Center is developing a unique collaboration with the GMU Police & CATSR to develop a DFR program based in the GMU Fairfax Campus. This would involve launching UAS to respond to incidents via remote Part 107 pilots. The GMU Police are a leader in using UAS for Public Safety in Northern Virginia.
Questions?