
# Center Overview

Dr. Paulo C. G. Costa – Director

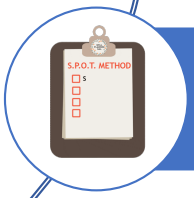
VOLGENAU SCHOOL MASON ENGINEERING

*Where Innovation Is Tradition*

# Agenda


About the C4I & Cyber Center

Our Team




Project Highlights


GEORGE MASON UNIVERSITY
CENTER OF EXCELLENCE IN
COMMAND, CONTROL, COMMUNICATIONS, COMPUTING, INTELLIGENCE, AND CYBER
C4I & CYBER CENTER
About the C4I & Cyber Center of Excellence

# 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.*

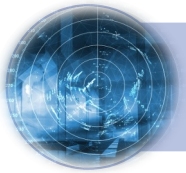
# Vision

*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

Communications and Signal Processing

Information System Architectures

Modeling and Simulation

Distributed Education and Training

C4ISR & Cyber (civilian and dual use)

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C4I & CYBER CENTER

# 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. Harry L. Van Trees**
*Director Emeritus*

**Dr. J. Mark Pullen**
*Director Emeritus*

**Dr. Linton Wells II**
*Executive Advisor*
*Chair of Advisory Group*

**C4I & CYBER CENTER'S ADVISORY GROUP**

# 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. Andrew Loerch
- 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

# Affiliate Centers and Laboratories

**Center for Air Transportation Systems Research**

**Rapid Prototyping Research Center**

RARE Lab
*The Radar and Radio Engineering Lab ..*

**5G Innovation Laboratory**

EClab

Dr. Kenneth De Jong

Dr. Sean Luke

**GMU Center for Resilient & Sustainable Communities**

Learning Agents Center
I can be taught to help you!
MASON

**Learning Agents Center**



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# Project Highlights

# Recent Projects

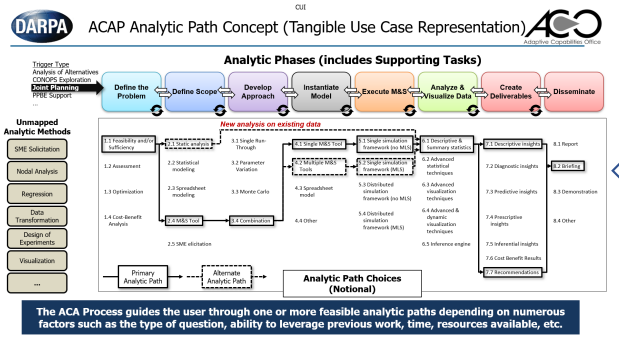
CYMANII
the cybersecurity manufacturing innovation institute

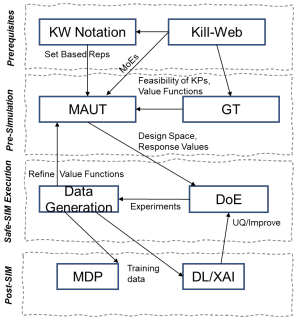

## Cybersecurity Manufacturing Innovation Institute (CyManII)

DOE will provide CyManII with $70M in 5 years to create economically viable, and inconspicuous cybersecurity in American manufacturing to secure the chain and energy automation. The Institute is composed of 23 leading National Labs, and 50+ industry partners including CISCO, Schneider Electric, GE, 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.

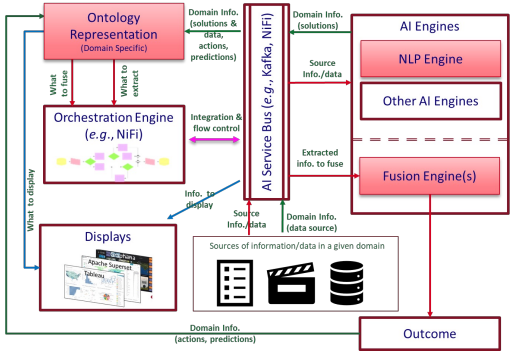


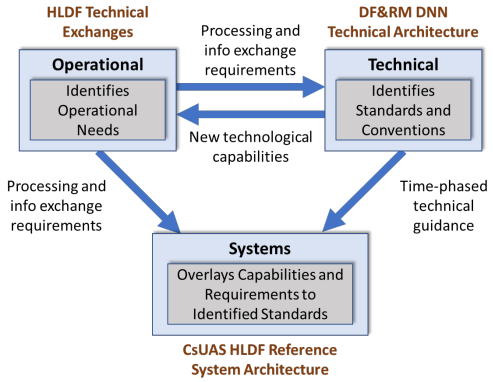



# Recent Projects

## 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 heterogenous 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.



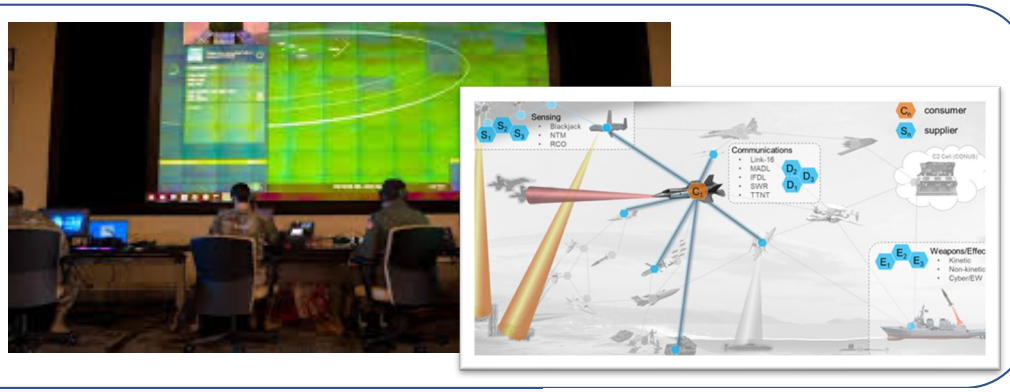

## CUAS: Standardized High Level Data Fusion (HLDF) System Architecture for Counter Unmanned Aerial Systems (CUAS)

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

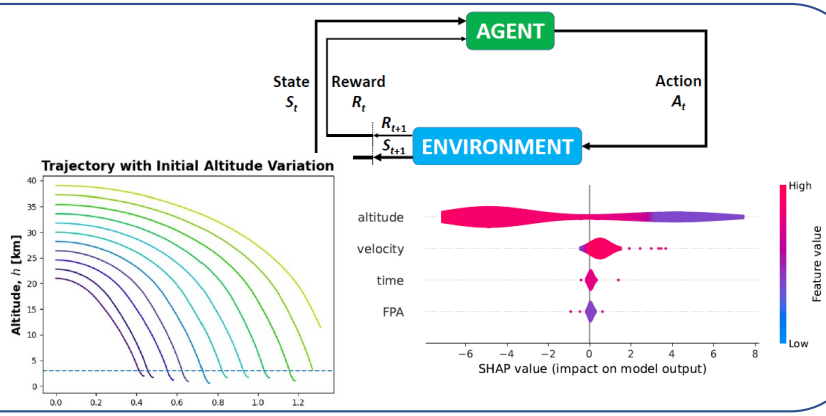
**ARAKNID / ACK Program**

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**

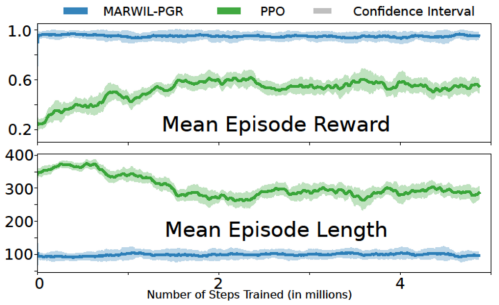
This project is exploring the use of Reinforcement Learning (RL) in Hypersonic vehicles to provide guidance and navigation commands. RL provides an ability to train an artificial intelligent agent in dynamic and uncertain environments but its application in Hypersonic is not investigated and particularly 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.

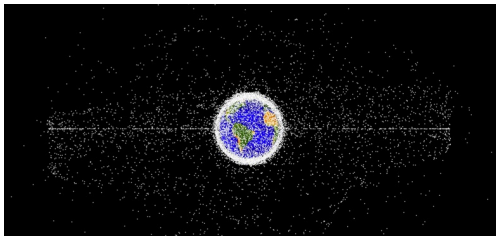


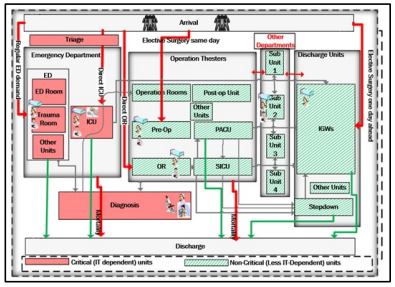
# Recent Projects

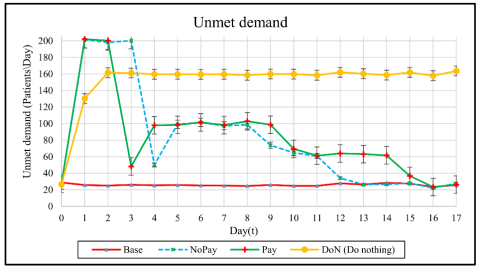
## Online Learning Techniques for Space Situational Awareness

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.





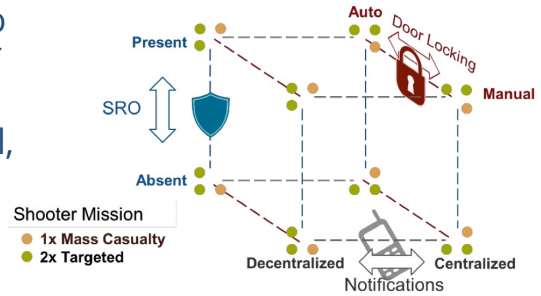



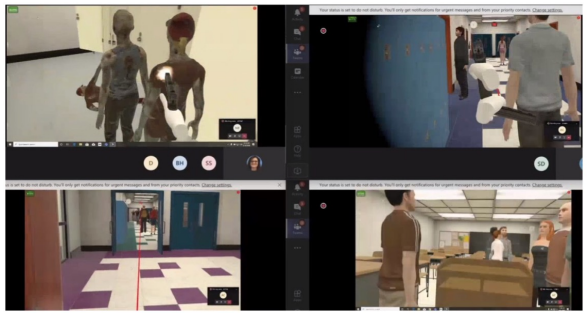

## Cyber Disaster Resilience: Assessment Framework for Cyber Impacts During Natural Disasters

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

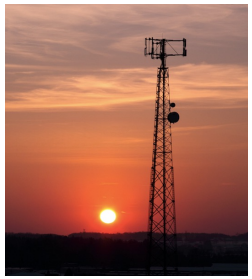
# Recent Projects

**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



# Questions?

# Advisory Group

**Dr. Linton Wells II**
*Executive Advisor*
*Chair of Advisory Group*

**Ms. Deborah Dunie**
*BDD Insights*

**RADM (ret) Jan Hamby**
*National Defense University*

**Dr. Harry L. Van Trees**
*Director Emeriti*

**Capt. Leslie (Jake) Schaffner**
*USN (ret)*

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

**Dr. J. Mark Pullen**
*Director Emeriti*

**Maj. Gen. Robert Wheeler**
*Strategic Consulting, LLC*

**Mr. James L. Griggs, Jr.**
*AFCEA International*

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

**Dr. Gilliam Duvall**
*Data Security Strategies, LLC*

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