



# 2016 Annual Review of the AFOSR DDDAS Program

**Dr. Frederica Darema | January 27-29, 2016 | Arlington, VA**

Basic Research Innovation and Collaboration Center (BRICC)  
4075 Wilson Blvd., Suite 350 – Liberty Room  
Arlington, VA 22203

Agenda Day 1 – January 27, 2016

Time	Title	Speaker
7:30-8:00	<b>Registration</b>	
8:00-8:30	Introduction to the Program	Frederica Darema
8:30-10:00	<b>Air Vehicle Structural Health Monitoring – Environment Cognizant</b>	
	<ul style="list-style-type: none"> <li>➤ Advanced Simulation, Optimization, and Health Monitoring of Large Scale Structural Systems <ul style="list-style-type: none"> <li>○ <i>PI: Yuri Bazilevs (UCSD), and Team</i></li> </ul> </li> <li>➤ Dynamic Data-Driven Methods for Self-Aware Aerospace Vehicles <ul style="list-style-type: none"> <li>○ <i>PI: Karen Willcox (MIT), and Team</i></li> </ul> </li> <li>➤ Progressive Fault Identification and Prognosis in Aircraft Structure Based on Dynamic Data Driven Adaptive Sensing and Simulation <ul style="list-style-type: none"> <li>○ <i>Shiyu Zhou (U. Wisconsin)</i></li> </ul> </li> </ul>	
10:00-10:15	<b>BREAK</b>	
10:15-11:00	<ul style="list-style-type: none"> <li>➤ Robust Data-Driven Aero-elastic Flight Envelope Tailoring <ul style="list-style-type: none"> <li>○ <i>Balachandran, University of Maryland</i></li> </ul> </li> <li>➤ Dynamic Data-driven Prediction, Measurement Adaptation, and Active Control of Combustion Instabilities in Aircraft Gas Turbine Engines <ul style="list-style-type: none"> <li>○ <i>Asok Poy, PennState</i></li> </ul> </li> </ul>	
11:15-12:15	<ul style="list-style-type: none"> <li>➤ An Integrated Approach to the Space Situational Awareness Problem <ul style="list-style-type: none"> <li>○ <i>PI: Suman Chakravorty (TAMU), and Team</i></li> </ul> </li> <li>➤ Cloud Computing Based Robust Space Situational Awareness <ul style="list-style-type: none"> <li>○ <i>Raktim Bhattacharya, TexasA&amp;M</i></li> </ul> </li> </ul>	
12:15-12:45	<b>LUNCH (Pick-up Lunches)</b>	
12:45-3:00	<b>Spatial Situational Awareness (UAV Swarms + Ground Systems Coordination)</b>	
	<ul style="list-style-type: none"> <li>➤ EAGER- Real-time Discovery and Timely Event Detection from Dynamic and Multi-Modal Data Streams <ul style="list-style-type: none"> <li>○ <i>Schaar, UCLA</i></li> </ul> </li> <li>➤ Dynamic Data-Driven Motion Planning and Control for Pervasive Situational Awareness Application Systems <ul style="list-style-type: none"> <li>○ <i>PI: Sertac Karaman (MIT), and Team</i></li> </ul> </li> <li>➤ An Adaptive Distributed Approach to DDAS for Surveillance Missions with UAV Swarms <ul style="list-style-type: none"> <li>○ <i>Gupta, U of NotreDame</i></li> </ul> </li> </ul>	

	<ul style="list-style-type: none"> <li>➤ EAGER- Novel Approaches for Optimization, Control, and Learning in Distributed Multi-Agent Networks <ul style="list-style-type: none"> <li>○ <i>Yin(Wotao), UCLA</i></li> </ul> </li> <li>➤ EAGER-DynamicData: Generative Statistical Modeling for Dynamic and Distributed Data <ul style="list-style-type: none"> <li>○ <i>Li(Jia), Pennsylvania State Univ</i></li> </ul> </li> <li>➤ EAGER- Adaptive Ensemble-Based Uncertainty Prediction for Satellite Collision Avoidance <ul style="list-style-type: none"> <li>○ <i>Ridley, University of Michigan Ann Arbor</i></li> </ul> </li> </ul>
<b>3:00-3:15</b>	<b>BREAK</b>
<b>3:15-4:14</b>	<p><b>(UAV Swarms + Ground Systems Coordination)</b></p> <ul style="list-style-type: none"> <li>➤ Dynamic Data Driven Adaptation via Embedded Software Agents for Border Control Scenario <ul style="list-style-type: none"> <li>○ <i>PI: Shashi Phoha (Penn State), and Team</i></li> </ul> </li> <li>➤ Multiscale Analysis of Multimodal Imagery for Cooperative Sensing <ul style="list-style-type: none"> <li>○ <i>PIs: Erik Blasch, Guna Seetharaman, RI Directorate, AFRL</i></li> </ul> </li> <li>➤ Energy-Aware Time Change Detection using Synthetic Aperture Radar on High-Performance Heterogeneous Architectures: A DDDAS Approach <ul style="list-style-type: none"> <li>○ <i>Ranka, UofFlorida</i></li> </ul> </li> </ul>
<b>4:15-5:00</b>	<ul style="list-style-type: none"> <li>➤ EAGER - Dynamic Data-Driven Random Sampling and Consensus for Large-Scale Learning Algorithms <ul style="list-style-type: none"> <li>○ <i>Giannakis, University of Minnesota</i></li> </ul> </li> <li>➤ EAGER- Management of Dynamic Big Sensory Data <ul style="list-style-type: none"> <li>○ <i>Cai, Georgia State University</i></li> </ul> </li> <li>➤ EAGER- Subspace Learning From Binary Sensing <ul style="list-style-type: none"> <li>○ <i>Chi, Ohio State University</i></li> </ul> </li> </ul>
<b>5:00-6:00</b>	Discussion of all Projects Discussed in Day 1
<b>6:00</b>	<b>MEETING ADJOURNED FOR THE DAY</b>

Agenda Day 2 – January 28, 2016		
Time	Title	Speaker
7:30-10:00	<ul style="list-style-type: none"> <li>➤ Dynamic Data Driven Information Fusion For Situational Awareness <ul style="list-style-type: none"> <li>○ <i>Biao Chen, Syracuse University</i></li> </ul> </li> <li>➤ Collaborative Image Processing in Vehicle Ensembles via Probabilistic Graphical Models and a Self-optimizing Support System <ul style="list-style-type: none"> <li>○ <i>Jose Martinez, Cornell U.</i></li> </ul> </li> <li>➤ Dynamic Modality Switching Aided Object Tracking using an Adaptive Sensor <ul style="list-style-type: none"> <li>○ <i>Matthew Hoffman, RIT</i></li> </ul> </li> <li>➤ Software for Data Streaming Analytics and its Application to Safer Flight Systems <ul style="list-style-type: none"> <li>○ <i>Varela, RPI</i></li> </ul> </li> <li>➤ DDDAMS-based Urban Surveillance and Crowd Control via Aerostats &amp; UAVs and UGVs <ul style="list-style-type: none"> <li>○ <i>PI: Young-Jun Son ( University of Arizona), and Team</i></li> </ul> </li> </ul>	
10:00-10:15	<b>BREAK</b>	
10:15-12:15	<b>Energy Efficiencies</b>	
	<ul style="list-style-type: none"> <li>➤ (YIP ) DDDAMS-based Real-time Assessment and Control of Electric-Microgrids <ul style="list-style-type: none"> <li>○ <i>PI: Nurcin Celik (University of Miami)</i></li> </ul> </li> <li>➤ EAGER- A Scalable Framework for Data-Driven real-Time Event Detection in Power Systems <ul style="list-style-type: none"> <li>○ <i>Dominguez-Garcia, UIUC</i></li> </ul> </li> <li>➤ EAGER- A Hierarchical Approach to Dynamic Big Data Analysis in Power Infrastructure Security <ul style="list-style-type: none"> <li>○ <i>Mohsenian-Rad, UCRiverside</i></li> </ul> </li> <li>➤ EAGER- Data-Driven Operation and Maintenance of Wind Energy Systems under Uncertainty <ul style="list-style-type: none"> <li>○ <i>Perez, Texas State University - San Marcos</i></li> </ul> </li> <li>➤ EAGER- Collaborative Research: Dynamically Data-driven Morphing of Reduced Order Models and the Prediction of Transients <ul style="list-style-type: none"> <li>○ <i>Sapsis, Massachusetts Institute of Technology</i></li> </ul> </li> <li>➤ EAGER- Machine Intelligence for Dynamic Data-Driven Morphing of Nodal Demand in Smart Energy Systems <ul style="list-style-type: none"> <li>○ <i>Tsoukalas, Purdue U.</i></li> </ul> </li> <li>➤ EAGER- Power Aware Data Driven Distributed Simulation on Micro-Cluster Platforms <ul style="list-style-type: none"> <li>○ <i>Fujimoto</i></li> </ul> </li> </ul>	
12:15-1:00	<b>LUNCH</b>	
1:00-3:00	<b>Space Weather and Atmospheric Events – Modeling/Observations</b>	
	<ul style="list-style-type: none"> <li>➤ Guna Seetharaman</li> <li>➤ Fluid SLAM and the Robotic Reconstruction of Localized Atmospheric Phenomena <ul style="list-style-type: none"> <li>○ <i>PI: Sai Ravela (MIT)</i></li> </ul> </li> <li>➤ Retrospective Cost Model Refinement and State Estimation for Space Weather Modeling and Prediction <ul style="list-style-type: none"> <li>○ <i>Dennis Bernstein, UMich</i></li> </ul> </li> <li>➤ Dynamic Data-Driven UAV Network for Plume Characterization <ul style="list-style-type: none"> <li>○ <i>PI: Kamran Mohseni (U. of Florida)</i></li> </ul> </li> </ul>	

	<ul style="list-style-type: none"> <li>➤ EAGER- Transforming Wildfire Detection and Growth Forecasting with Smart Sensing <ul style="list-style-type: none"> <li>○ Coen, NCAR</li> </ul> </li> </ul>
<b>3:15-3:30</b>	<b>BREAK</b>
<b>3:30-4:30</b>	<b>Sensing&amp;Tracking</b> <ul style="list-style-type: none"> <li>➤ Optimized Routing of Intelligent, Mobile Sensors for Dynamic, Data-Driven Sampling <ul style="list-style-type: none"> <li>○ PI: Derek Paley (UMD)</li> </ul> </li> <li>➤ A Distributed Dynamic Data Driven Applications System (DDDAS) for Multi-Threat Tracking <ul style="list-style-type: none"> <li>○ Schizas, UT Arlington</li> </ul> </li> </ul>
<b>4:30-5:15</b>	<b>Materials Modeling</b>
	<ul style="list-style-type: none"> <li>➤ Dynamic, Data-Driven Modeling of Nanoparticle Self Assembly Processes <ul style="list-style-type: none"> <li>○ Y. Ding (TAMU), and Team</li> </ul> </li> <li>➤ EAGER- A New Scalable Paradigm for Optimal resource Allocation in Dynamic Data Systems via Multi-Scale and Multi-Fidelity Simulation and Optimization <ul style="list-style-type: none"> <li>○ Xu(Jie), George Mason U.</li> </ul> </li> </ul>
<b>5:15-6:00</b>	Discussion of all Projects Discussed in Day 2
<b>6:00</b>	<b>MEETING ADJOURNED FOR THE DAY</b>

Agenda Day 3 – January 29, 2016		
Time	Title	Speaker
8:00-10:00	<ul style="list-style-type: none"> <li>➤ Dynamic Integration of Motion and Neural Data to Capture Human Behavior <ul style="list-style-type: none"> <li>○ <i>PI: Dimitri Metaxas (Rutgers U), and Team inadvertently</i></li> </ul> </li> <li>➤ Stateless Networking: Principles, Architectures, and Codes <ul style="list-style-type: none"> <li>○ <i>Wornell, MIT</i></li> </ul> </li> <li>➤ Stateless Networking: Principles, Architectures, and Codes, <ul style="list-style-type: none"> <li>○ <i>Parrilo, MIT</i></li> </ul> </li> <li>➤ Universal Laws and Architectures <ul style="list-style-type: none"> <li>○ <i>John Doyle, CalTech</i></li> </ul> </li> </ul>	
10:00-10:15	<b>BREAK</b>	
10:15-12:15	<ul style="list-style-type: none"> <li>➤ Using Trajectory Sensor Data Stream Cleaning to Ensure the Survivability of Mobile Wireless Sensor Networks in Cyberspace <ul style="list-style-type: none"> <li>○ <i>PI: Niki Pissinou, Florida International University</i></li> </ul> </li> <li>➤ Adaptive Stream Mining: A Novel Dynamic Computing Paradigm for Knowledge Extraction <ul style="list-style-type: none"> <li>○ <i>PI: Shuvra Bhattacharyya (U. Of Maryland) and Team</i></li> </ul> </li> <li>➤ Data-Adaptable Modeling and Optimization for Runtime Adaptable Systems <ul style="list-style-type: none"> <li>○ <i>Roman Lycesky</i></li> </ul> </li> <li>➤ Cloud support for Surveillance <ul style="list-style-type: none"> <li>○ <i>Alex Aved, AFR:/RI</i></li> </ul> </li> </ul>	
12:15-1:00	<b>LUNCH (Pick-up Lunches) Discussion of all Projects Discussed in Morning of Day 3</b>	
1:00-2:00	<b>Systems Software CyberSecurity</b>	
	<ul style="list-style-type: none"> <li>➤ Data-Driven and Real-Time Verification for Industrial Control System Security <ul style="list-style-type: none"> <li>○ <i>Kevin Jin (Illinois Institute of Technology)</i></li> </ul> </li> <li>➤ DDDAS-based Resilient Cyberspace (DRCS) <ul style="list-style-type: none"> <li>○ <i>PI: Salim Hariri (University of Arizona. Tucson), and Team</i></li> </ul> </li> </ul>	
2:00-3:00	<b>Systems Software</b>	
	<ul style="list-style-type: none"> <li>➤ Performance Analysis and Diagnosis of Cloud-based DDDAS Applications <ul style="list-style-type: none"> <li>○ <i>Mohammad Khan, UConn</i></li> </ul> </li> <li>➤ (YIP) From Sensor Data to High-value Information: ultra-low-energy platforms for deriving inferences from complex embedded signals <ul style="list-style-type: none"> <li>○ <i>Naveen Verma (Princeton U.)</i></li> </ul> </li> </ul>	
3:00-3:15	<b>BREAK</b>	
	<b>Systems Software (cont'd)</b>	

<p><b>3:15-4:15</b></p>	<ul style="list-style-type: none"> <li>➤ Amorphous Polyhedral Model for Stochastic Control of Autonomous UAVs <ul style="list-style-type: none"> <li>○ <i>PI: Sanjay Rajopadhye</i> (Colorado State)</li> </ul> </li> <li>➤ Architecture and Programming Models for High Performance Interactive Computation <ul style="list-style-type: none"> <li>○ <i>PI: XiaoMing Li and Guang Gao</i> (U of Delaware) ; Jack Dennis and Arvind (MIT)</li> </ul> </li> <li>➤ Hybrid Systems Modeling and Middleware-enabled DDDAS for Next-generation US Air Force Systems <ul style="list-style-type: none"> <li>○ <i>PI: Aniruddha Gokhale (Vanderbilt U.), and Team</i></li> </ul> </li> </ul>
<p><b>4:15-6:00</b></p>	<p><b>Discussion of all Projects – Collaborations, Directions in the Program</b></p>
<p><b>6:00</b></p>	<p><b>MEETING ADJOURNED</b></p>