



- Volgenau School of
Engineering
- C⁴I Center

Charles Twardy, Ph.D. (C⁴I Center) ctwardy@gmu.edu

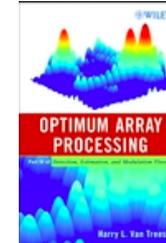
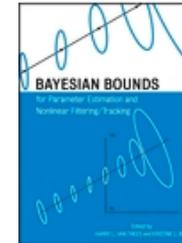
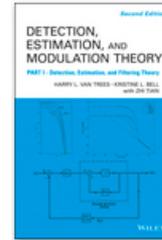
Huzefa Rangwalla, Ph.D. (Computer Science)

rangwalla@cs.gmu.edu



Volgenau School of Engineering

- 6 Research Centers:
 - C⁴I Center (unique in a civil institution)
 - Center for Air Transportation Systems Research
 - Center for Assurance Research & Engineering
 - Center for Configuration Analytics and Automation
 - Center for Secure Info Systems (1st in the US; NSA CAE)
 - Learning Agents Center
- 7 Laboratories Including:
 - Sensor Fusion Laboratory
 - Communications and Network Laboratory
 - Systems Architectures Laboratory
- 7 PhD Programs Including:
 - Computer Science
 - Electrical & Computer Engineering
 - Information Technology (1st in the US)
 - Systems Engineering & Operations Research
- 17 Masters' Degrees Including:
 - Computer Forensics
 - Information Security & Assurance
 - Operations Research
- 10 Bachelors' Degrees Including:
 - Cyber Security Engineering (1st in the US)
- >75 patents



- Relevant strengths in:
 - Signals processing
 - Sensor Fusion
 - Machine Learning
 - Crowdsourcing
- Looking for partners with:
 - TS/SCI facility clearance
 - Established ingest infrastructure similar to existing OSI teams
 - Sensors (broadly conceived) needing fusion.
 - SMEs for advance crowdsourcing and distributed model-building
 - SIGINT expertise



Center of Excellence in Command, Control, Communications, Computing & Intelligence

Capabilities and Numbers

- Bridge gaps among government, industry, and academia in C⁴I
- ~20 academic faculty from across Engineering
- ~20 research faculty
- ~10 administrative & technical support staff
- ~30 graduate students
 - including research faculty
- 1-2 visiting researchers
- Most hold clearances, several SCI
- Classified computing & storage
- Can prime or sub
 - ~12 Government Sponsors
 - ~11 Industry Partners

Relevant Focus Areas:

- Sensing & Fusion
- Communications & Signal Processing
- Information System Architectures
- Command Support
- Modeling & Simulation

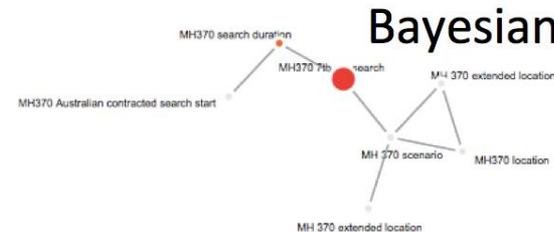
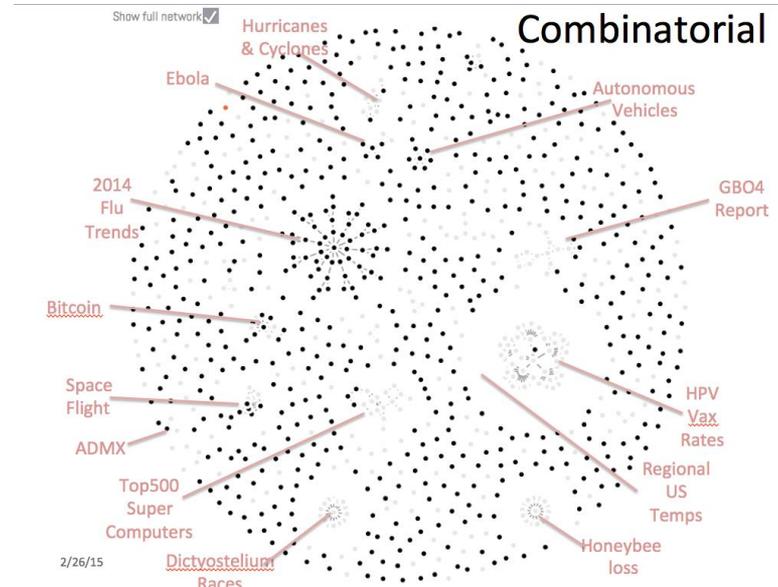
Select Projects

- SciCast (IARPA)
- Academic Plugfesting (Defense Intelligence Information Enterprise)
- Battle Management Language (Army Geospatial Center, Army SIMCI, DMSO, JFCOM, NATO RTO, AMSO, Saab)
- International C2/Simulation Testbed (Saab)



Combinatorial Prediction Market

- IARPA ACE/ForeST technology
 - Bayesian Networks
 - LMSR Markets
 - Government Purpose License
- 118K forecasts, 10K users
- Market beats average $\frac{3}{4}$ times
- Overall Brier ~ 0.3
- Incentivized Brier ~ 0.15
- Forecasts can be *conditional*
- Forecasters can *create links*
- Spark crowdsourced question-writing platform



Information Fusion

- Forecasts must fuse information
 - from many sources
 - using diverse modalities
 - with differing semantics
 - subject to uncertainty
- Our strengths
 - Integration of semantic technology with uncertainty management
 - Efficient algorithms for probabilistic inference and learning
 - Statistical relational learning
 - Improving generalization through multi-task learning
 - Online learning
 - Spanning multiple levels of JDM fusion hierarchy
- Application to a wide variety of defense and intelligence problems

