

# Human Dimension of Network Science and Cyber-Security



**S&T Campaign: Human Sciences**  
*Human-System Integration*

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## Research Objective

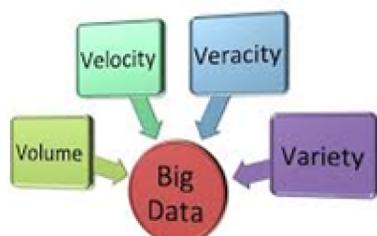
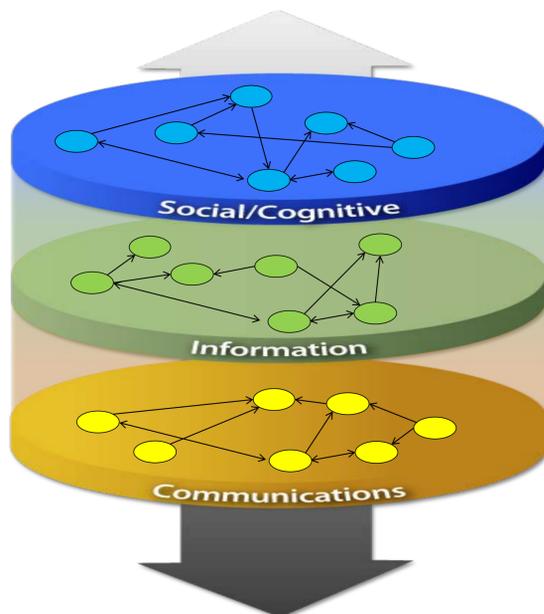
Focused on socio-technical network operations and human cognition with the goal of improving distributed collaboration and decision-making in complex operational environments and fostering the alignment of Soldier-system capabilities.

- **DISCOVER:** Understand and exploit fundamental principles of human-in-the-loop systems and dynamics of networked organizations
- **NETWORK METRICS:** Unobtrusively monitor, aggregate, and model real-time performance of Soldier team systems in operational contexts
- **TEAM PERFORMANCE:** Define and model team processes and collaborative decision-making in dynamic environments
- **DECISION-SUPPORT:** Address “data-to-decision” requirements using agent-based decision-support technology to improve Soldier performance

Data → Information → Knowledge → Decision Making → Action

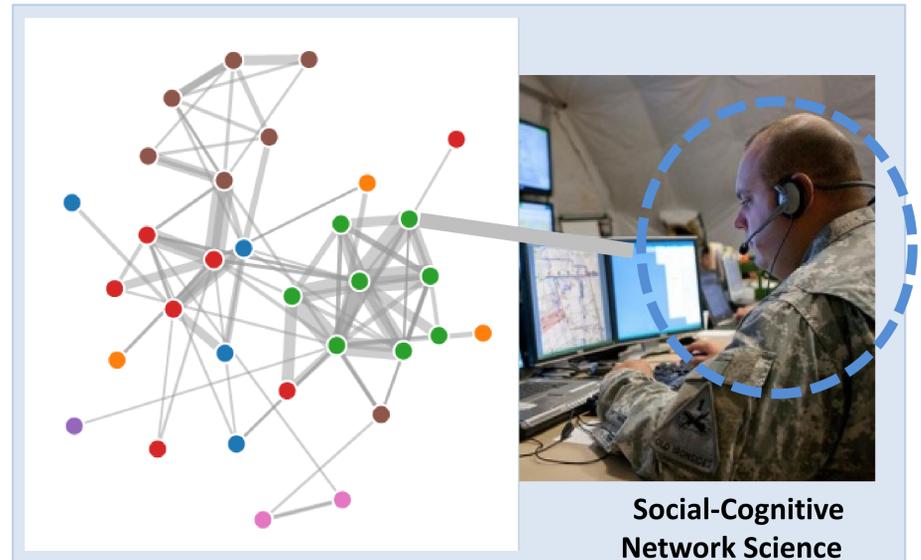
## Network Science Challenges

- Rise of networked forms of organization
- Increasing complexity of the operational environment
- Alignment of Soldier-systems to operational workflows



Human Cognition is increasingly challenged by the “4 Vs” of Big Data

Human Dimension encompasses the top layer of Multi-Genre Networks

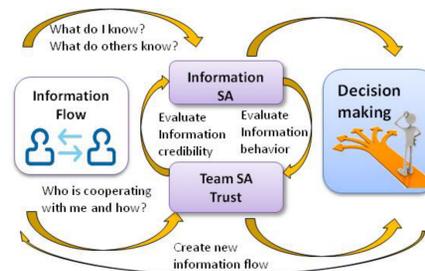


Social-Cognitive Network Science

## ARL Collaborative Research Facilities

**Cognitive Assessment, Simulation, and Engineering Laboratory (CASEL) at APG, MD**

- Networked team experimentation facilities
- Simulated Tactical Operations Center
- Virtual Immersive 300 ° environment w/ weapons-fire system



### Techniques:

- ✧ lab experimentation
- ✧ cognitive modeling
- ✧ field studies
- ✧ games/micro-worlds
- ✧ development & validation of agent-based decision support tools
- ✧ task network modeling & discrete event simulation

### Current Collaborative Alliances:

- Network Science Collaborative Technology Alliance
- Cyber-Security Collaborative Research Alliance
- International Technology Alliance

## Cyber-Security Challenges

Human Analyst is a key link in Army cyber security strategy. Yet:

- Defender disadvantaged
- Cyberspace actions are instantaneous and in parallel, whereas reactions happen at human speeds in serial
- Fundamentally adversarial involving :  
*attacker / defender / end-user* interactions
- Human behavior is exploitable (signatures, insider threat)
- Deception as cyberspace is a malleable domain

## Complementary Capabilities Sought in Collaboration

- Social Network Analysis
- Behavioral Game Theory
- Cognitive Modeling
- Multi-Agent Modeling
- Small Groups Research
- Unobtrusive measures (wearables) and processes