## S&T Campaign: Information Sciences
Human and Information Interaction

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Commanders' must respond to the complex, diverse, and dynamic nature of current and future operational environments. To exploit asymmetric views and accelerate decision making in Army operations, Soldiers will rely on agents and enabling technologies such as complex systems-of-systems that integrate intelligent sensor networks and autonomous systems. These systems-of-systems will be driven by machine learning enabled artificial intelligence (ML/AI) algorithms, forming teams with human warfighters, where both must act as one unit. However, these ML/AI-based agent systems are not without vulnerabilities given embed uncertainty in underlying computational reasoning functions. Lack of rational explanation in intelligent systems is needed to provide information on reasoning behind results and why these systems exhibit their (seemingly) intelligent behavior.
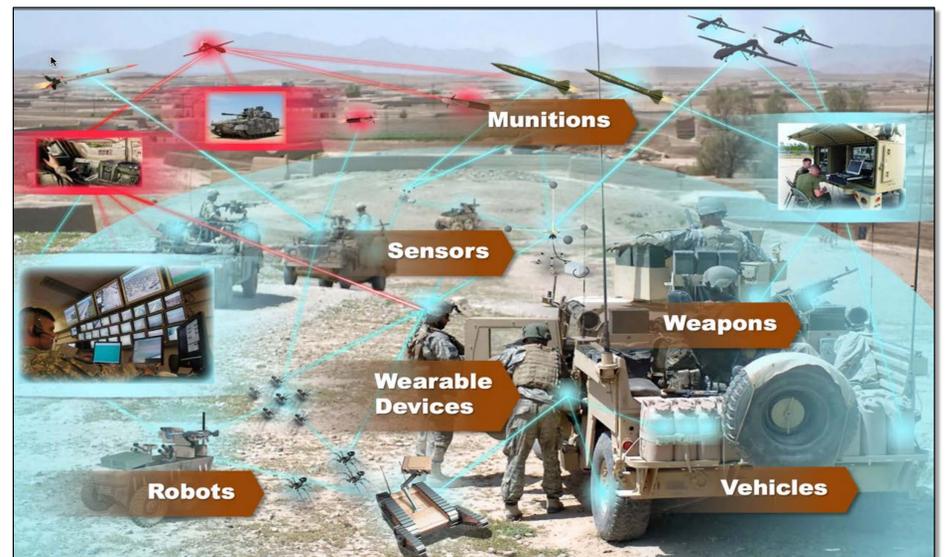
Research Objective

- Investigate new techniques for alignment and explanation of reasoning in artificial intelligence.

- Enhance Commanders ability to analyze scenes and understand potential vulnerable points and threats.

- Creating computationally-derived explanations of uncertainty quantification and artificial intelligence reasoning.

Challenges

- Investigate, understand, and characterize computational approaches that exploit uncertainty quantification (and propagation) to enhance explanations of ML/AI reasoning

- Understand the fundamental links between uncertainty, risk, ambiguities, and errors to provide information for improved decision

- Formulate computational tractable approaches for generating knowledge bases and natural language text

- Investigate and develop reasoning and mathematical methods for integrating uncertainty information into explanations

- Incorporate multiple reasoning approaches to improve knowledge base, such as vector space reasoning

ARL Facilities and Capabilities Available to Support Collaborative Research

- Campus Sensor Network Testbed with live data feeds from a variety of sensors
- Emulated Experimentation Environment with large scale military-realistic scenarios
- Research datasets for experimentation and algorithm evaluation
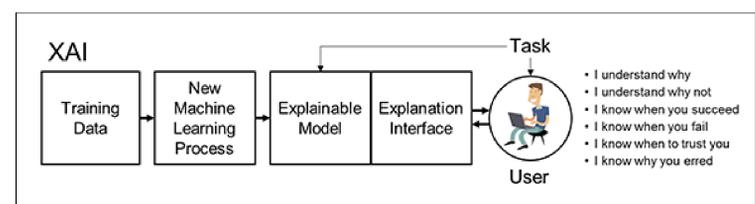

Knowledge   Learning   Explanation

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- Algorithms and novel approaches for uncertainty quantification
- Techniques and methods for knowledge based, reasoning algorithms and explanations