

DAGSI Research Topic

1. **Research Title:** Collaborative Cognitive AI Agents for Semantic World Modeling and Intent Prediction

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level**

Computer, electrical, industrial, mechanical, and related engineering disciplines (MS or PhD level)

Computer science and related disciplines (MS or PhD level)

Mathematics, statistics, and related disciplines (MS or PhD level)

4. **Objectives:** The objective of this research is to develop a collaborative ecosystem of heterogeneous AI agents that collectively reason about dynamic environments to estimate and predict the hidden intent of red agents. Unlike conventional multi-agent surveillance systems that primarily coordinate sensing resources, the proposed framework models each AI agent as an autonomous cognitive entity with specialized capabilities, complementary knowledge, and distinct mission responsibilities. Through semantic communication, knowledge sharing, and distributed reasoning, the agents cooperate to build a common understanding of the operational environment while dynamically adapting their roles and behaviors to changing mission conditions. Advanced sensing agents provide high-value semantic observations but are treated as strategic assets whose deployment and protection must be intelligently managed. At the same time, scout, guardian, and other support agents contribute complementary observations and mission-specific functions that enhance situational awareness, resilience, and overall mission effectiveness.
 5. **Description:** The proposed framework enables heterogeneous AI agents to collectively construct and continuously refine a shared semantic world model that captures the evolving relationships among observed entities and environmental context. Building on this shared representation, the agents jointly infer target intent, anticipate future behaviors, and autonomously adapt their sensing, reasoning, and coordination strategies in response to evolving situations. By unifying semantic world modeling, collaborative cognitive reasoning, adaptive task allocation, active information gathering, and long-horizon intent prediction within a single multi-agent architecture, this research seeks to establish a new paradigm for autonomous surveillance in which heterogeneous AI agents function as an intelligent cognitive team capable of proactive, context-aware, and goal-directed decision-making in complex, uncertain, and adversarial environments.
 6. **Research Classification/Restrictions:** Unclassified
 7. **Eligible Research Institutions:** Any university in the State of Ohio
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