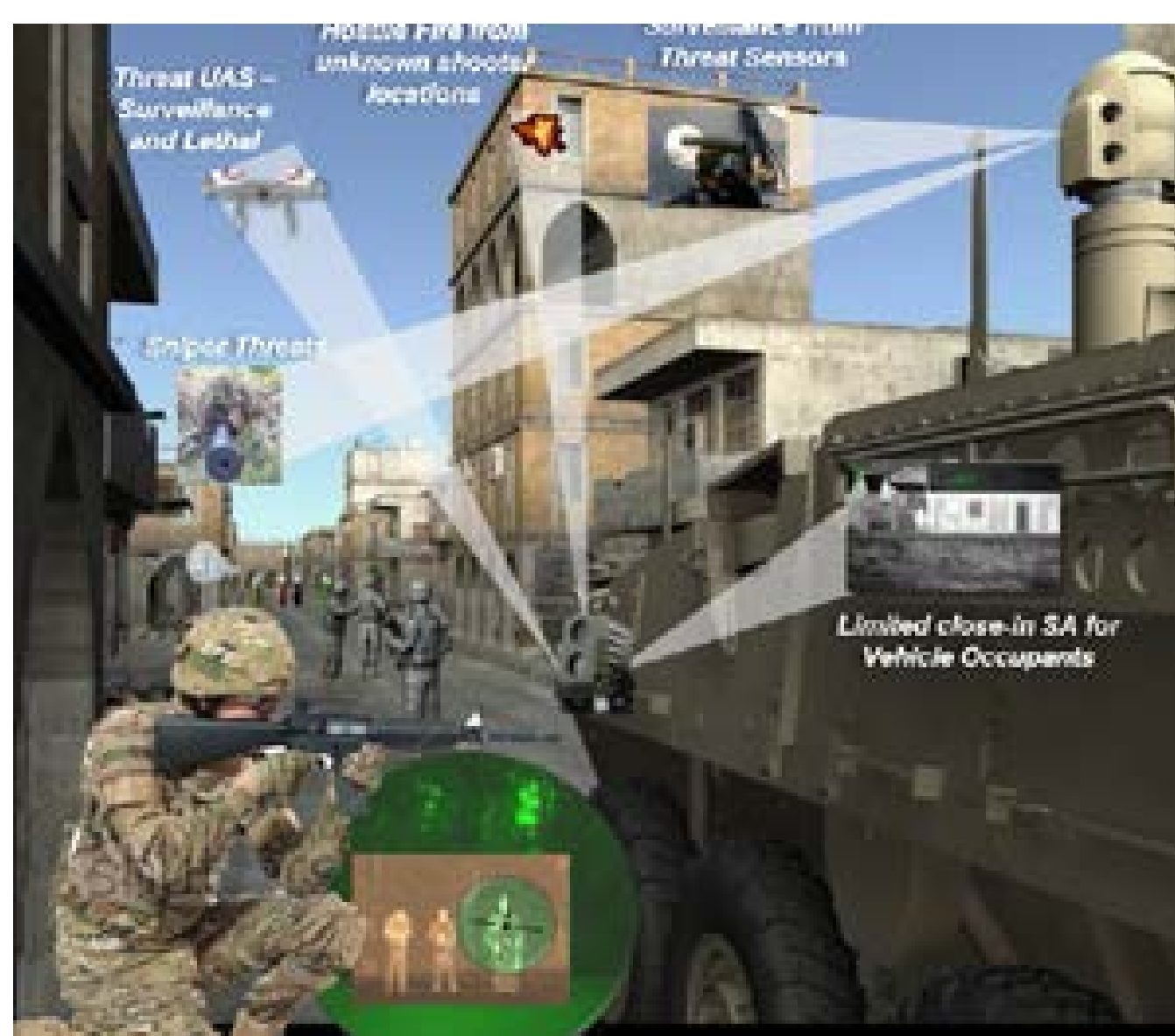


## S&T Campaign: Human Sciences Integration of Humans and Systems Humans in Multi-Agent Systems

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## Research Objective

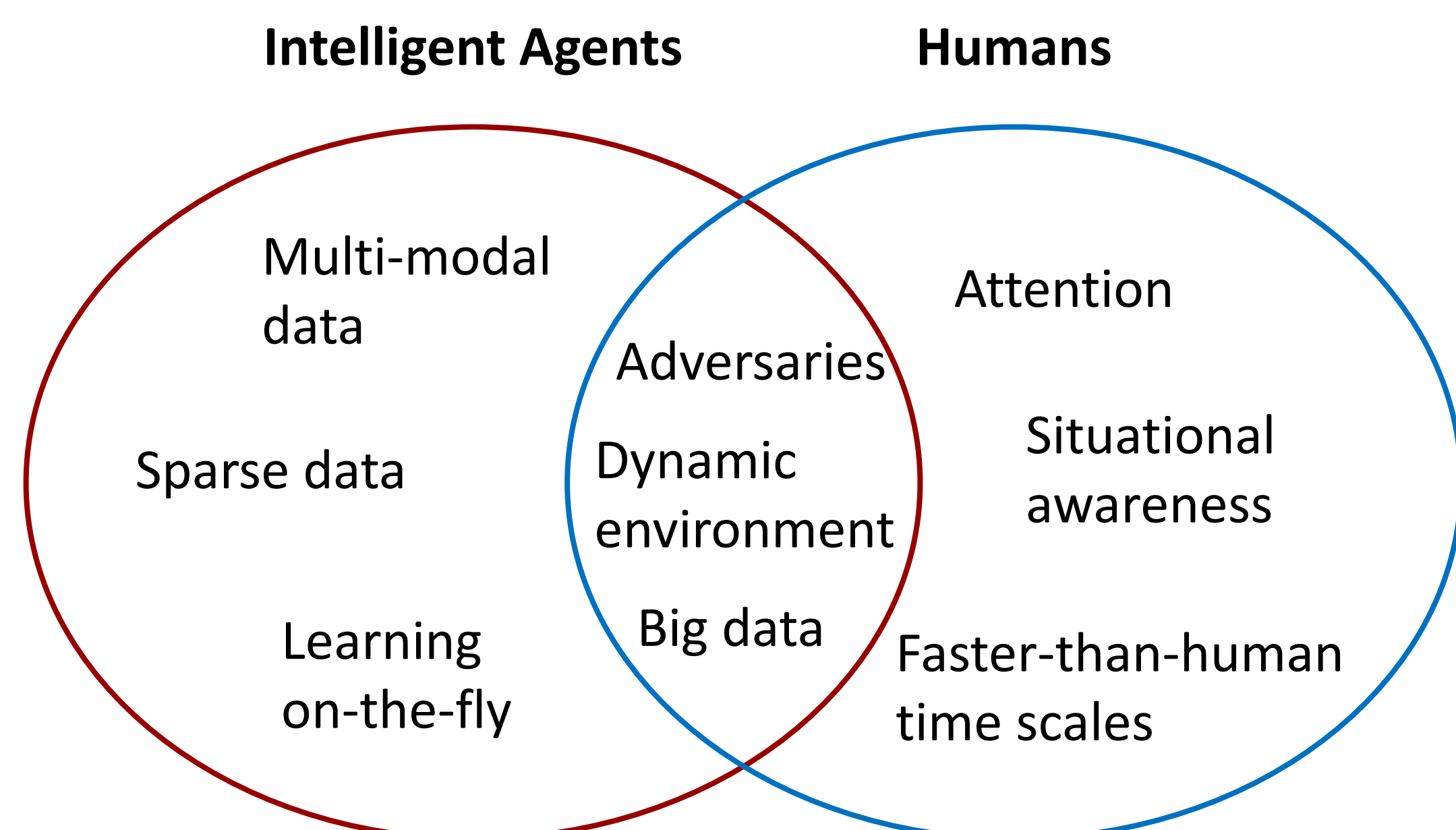
- Fuse advancements in human computation and artificial intelligence to support joint decision-making in teams of Soldiers and intelligent agents
- Achieve performance superior to that of humans or intelligent agents alone



The future Soldier will be networked with sensors, robots, knowledge bases, and other Warfighters

## Challenges

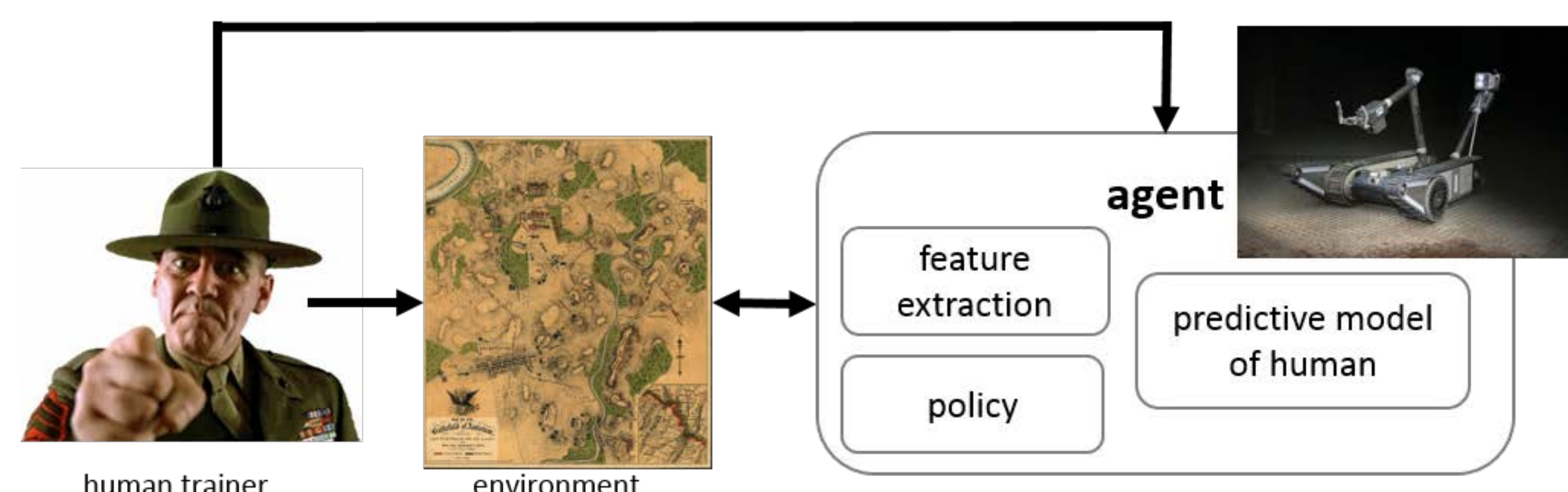
- Humans cannot act as the sole decision-maker; problems must be decomposed and allocated within the team
- Teams will operate in a dynamic and adversarial environment
- Prior to missions, only sparse data may be available; intelligent agents will have to learn on-the-fly



Challenges for the intelligent agents, humans, and the team

## ARL Facilities and Capabilities Available to Support Collaborative Research

- World-class research facilities and resources
  - Mission Impact through Neuro-technology Design Lab (EEG, eye-tracking)
  - High-performance computing resources
  - Innovation Commons (maker-space)
- Multi-disciplinary research team with ongoing projects in:
  - Human-agent teaming for large-scale image processing (Bohannon, et al., Collaborative image triage with Humans and Computer Vision, *IEEE SMC*, 2016)
  - Human-in-the loop reinforcement learning (Waytowich, et al., *in preparation*)
  - Machine learning and signal processing for brain-computer interfaces (Lawhern, et al., EEGNet: A compact convolutional network for EEG-based brain-computer interfaces, *ArXiv*, 2016; Waytowich, et al., Spectral transfer learning using information geometry for a user-independent brain-computer interface, *FiN*, 2016)



Human-in-the-loop reinforcement learning paradigm

## Complementary Expertise / Facilities / Capabilities Sought in Collaboration

- Expertise in network control, reinforcement learning, and multi-modal deep learning
- Novel application domains and proof-of-concept problems