Scaling the Power of the Astronaut via Workload-aware Robotic Apprenticeship and Explainable Autonomy

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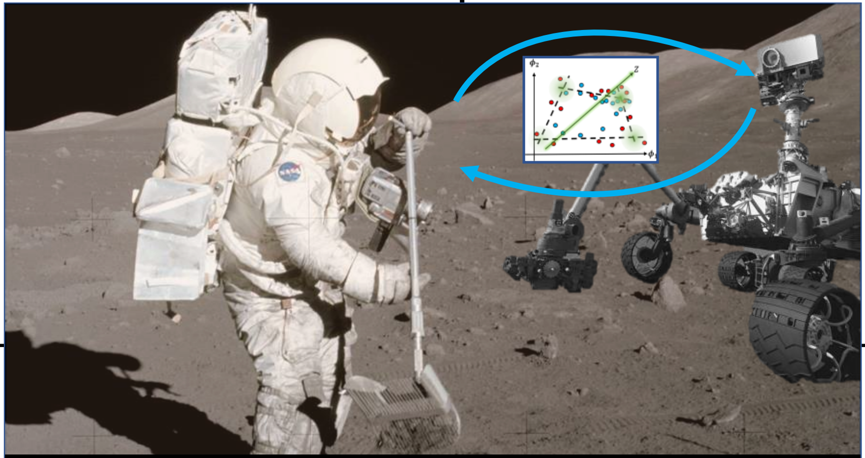
Research Objectives

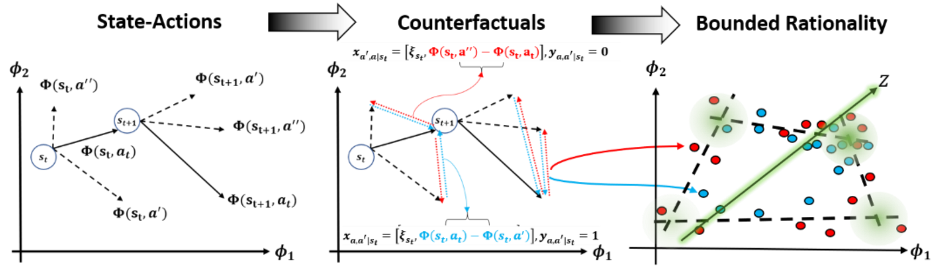
- *Goal:* Enable robots to support human activity in space by understanding humans' decision-making and workload needs
- *Innovation:* Computational methods and human factors insight into how robots can be effective teammates for humans in space and beyond
- *SOA:* While space robots exhibit basic functionality, exploration is primarily human-in-the-loop
- *TRL:* Research will leverage PI's prior work to start at TRL 2, building through formulation, iterative refinement, and demonstration at TRL 3



Robot observes astronaut conducting geology on order to refine its understanding of how to collect specimens and monitor astronaut workload

Approach

- LfD in bounded rationality for robot model of human decision-making
- Model formulation enables:
  1. More robot *autonomy*
  2. Human *workload* inference
  3. *Explainability* in autonomy
- Test, refine, demonstrate in human-robot interaction studies



Potential Impact

- Unlock latent scientific yield of robotic platforms in deep space by enabling machines to understand human goals and act with some autonomy
- Increased robot autonomy in some areas of decision-making can free up astronauts to focus on mission-level objectives, scientific inquiry, and monitoring safety-critical systems
- *Workload Metrics:* Develop novel workload metrics that infer workload through observation rather than intrusive monitoring
- *Benefits:* Students will engage in outreach activities, online tutorials of research methods, and further NASA's mission