

# NRI: FND: Knowledge-based Robot Sequential Decision Making under Uncertainty (NRI #1925044)

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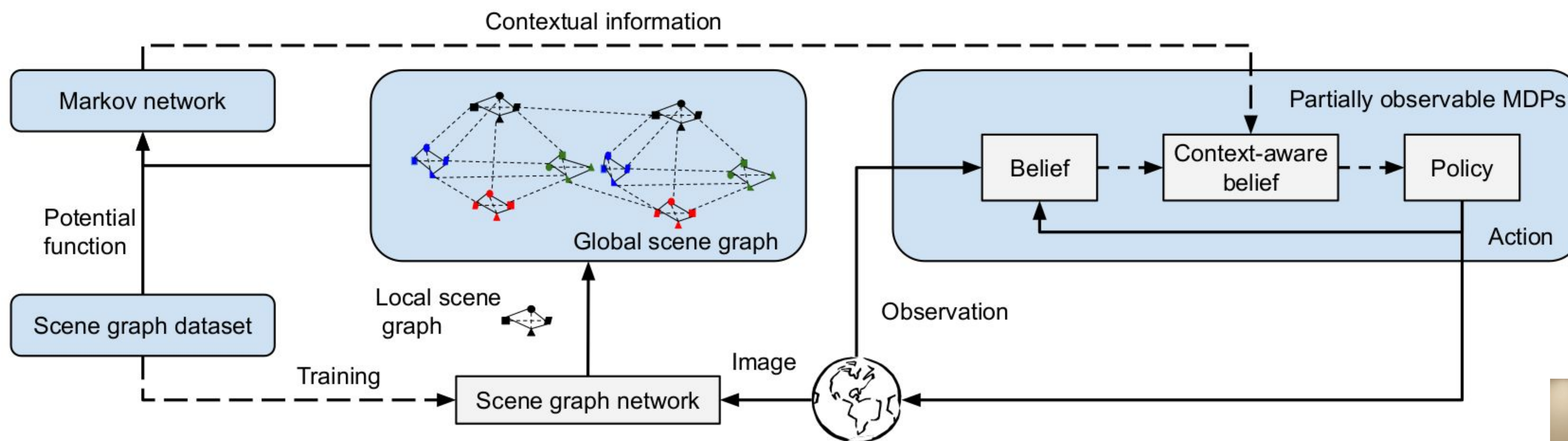
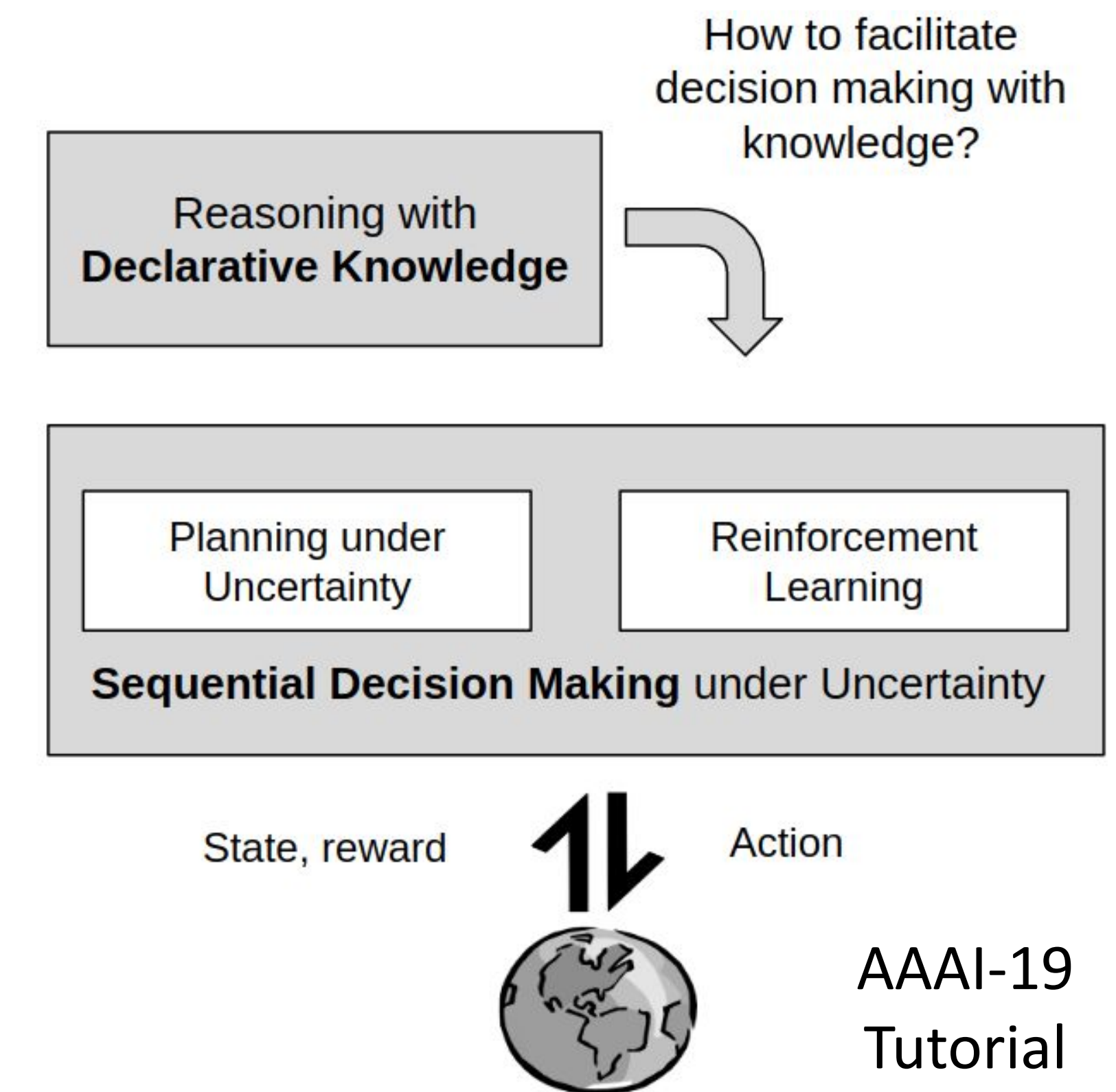
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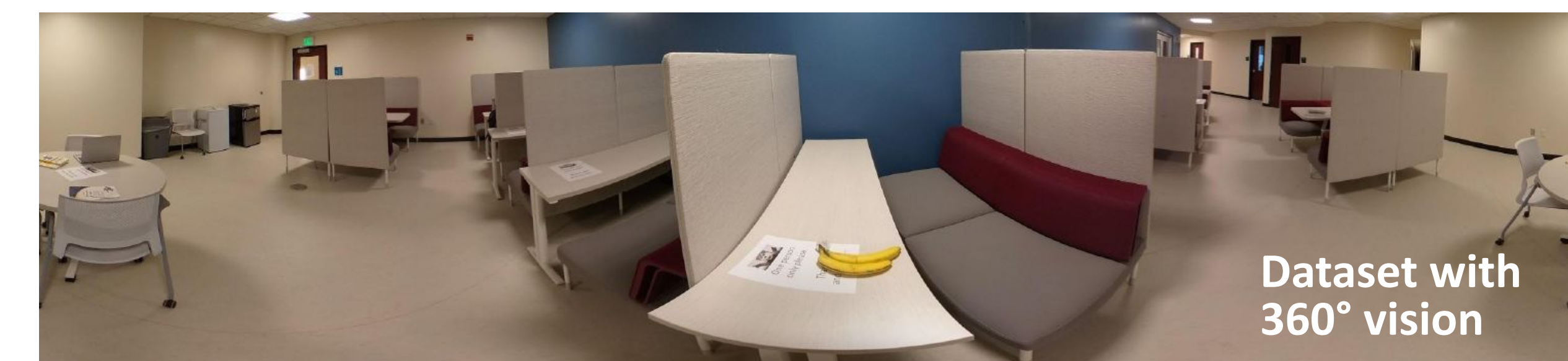
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**Background:** Reasoning with declarative knowledge and sequential decision-making are two key areas in AI and Robotics. Both classes of methods reason in the presence of uncertainty. Despite the rich literature in these two areas, researchers have not fully explored their complementary strengths.

- **Challenge:** How to leverage declarative knowledge in sequential decision-making methods (model-based, data-driven, or both), given their very different representation and computational paradigms?
- **Approach:** 1) Unified representation for reasoning and planning under uncertainty, and 2) Reasoning for state estimation to guide planning and reinforcement learning
- **Scientific Impact:** Bridging the representation gap between knowledge-based reasoning methods, and data-driven sequential decision-making methods



- **Scene Analysis for Robot Planning (SARP)** for robot sequential decision-making
- Uses images from different positions to construct global **scene graphs** to facilitate state estimation
- Enables context-aware, object-centric decision making while avoiding state explosion



## Reasoning with Scene Graphs for Robot Planning under Partial Observability

Saeid Amiri, Kishan Chandan, and Shiqi Zhang, RA-L 2022 (To be presented at ICRA 2022)