Robust, scalable, distributed semantic mapping for co-robots

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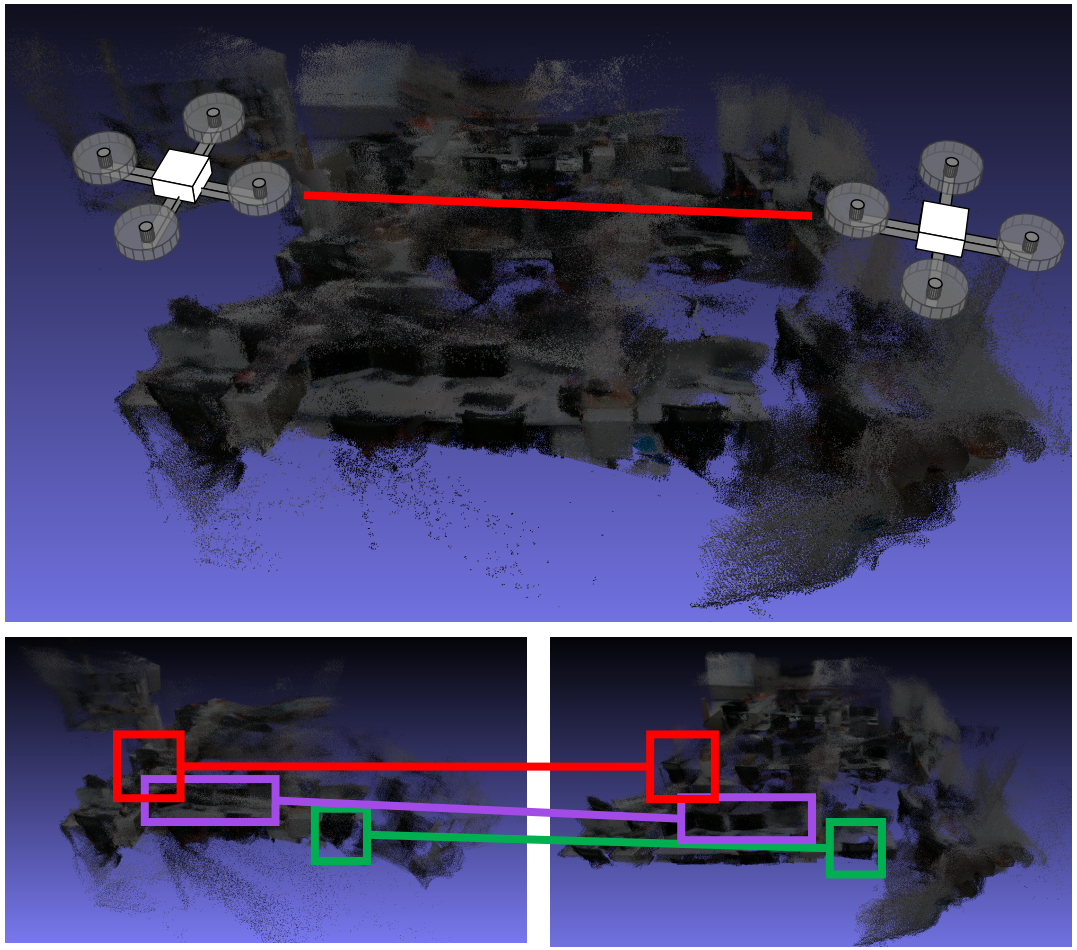
Challenge & Solution

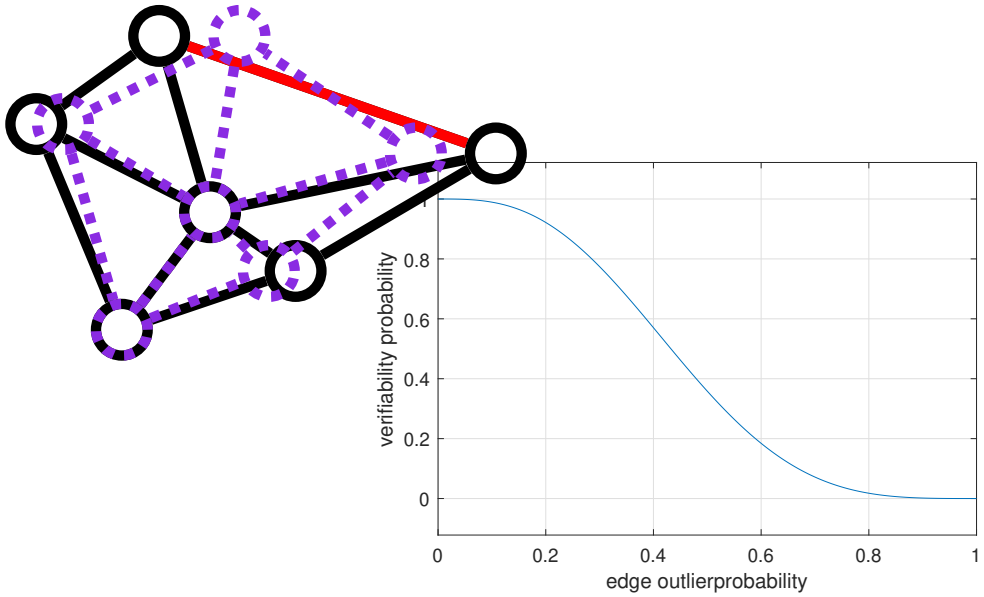


Goal: robust and efficient multi-robot mapping and semantic understanding

1. Incorporate semantic information (object detections)
2. Use redundancy from cycles to detect and correct inconsistencies
3. Make intelligent use of resources through approximate computing
4. Reinforcement learning for exploration

Scientific impact

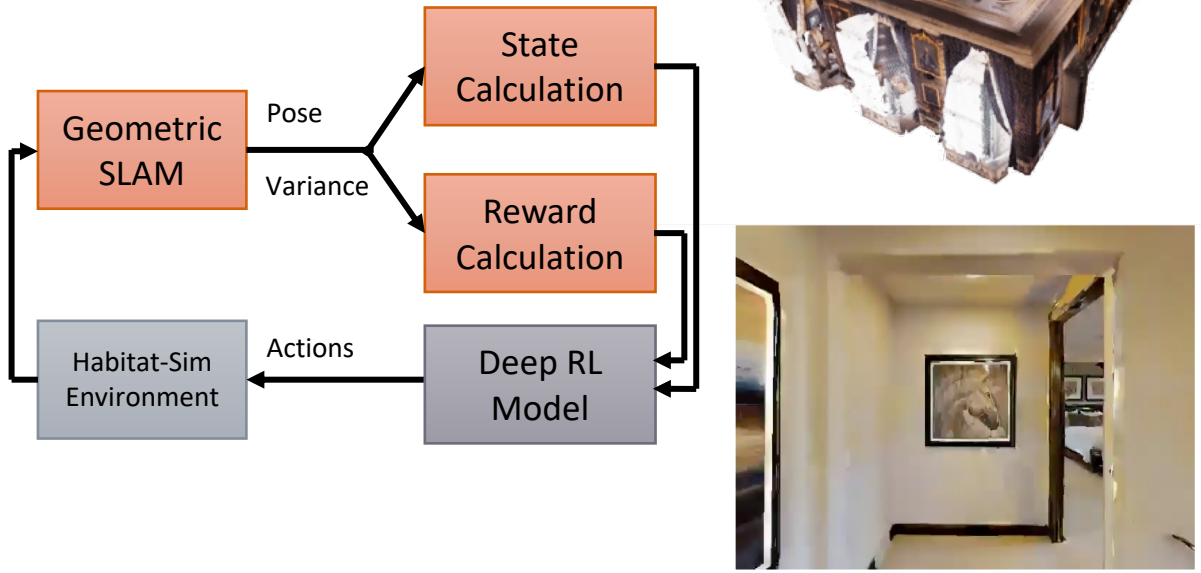
Algorithms and theory for outlier detection



Verifiability theory for estimation

ADMM loopy graph inference

RL+SLAM-based exploration



Learn exploration policy to trade off accuracy vs coverage [WIP]

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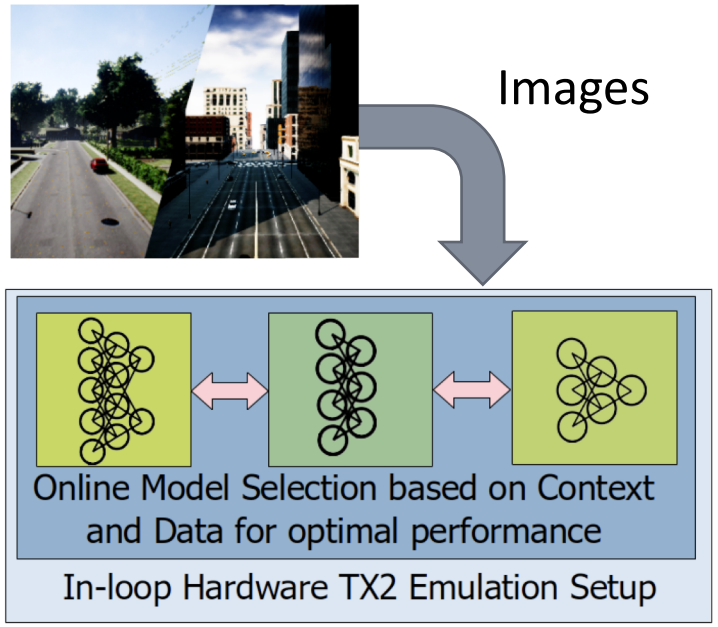
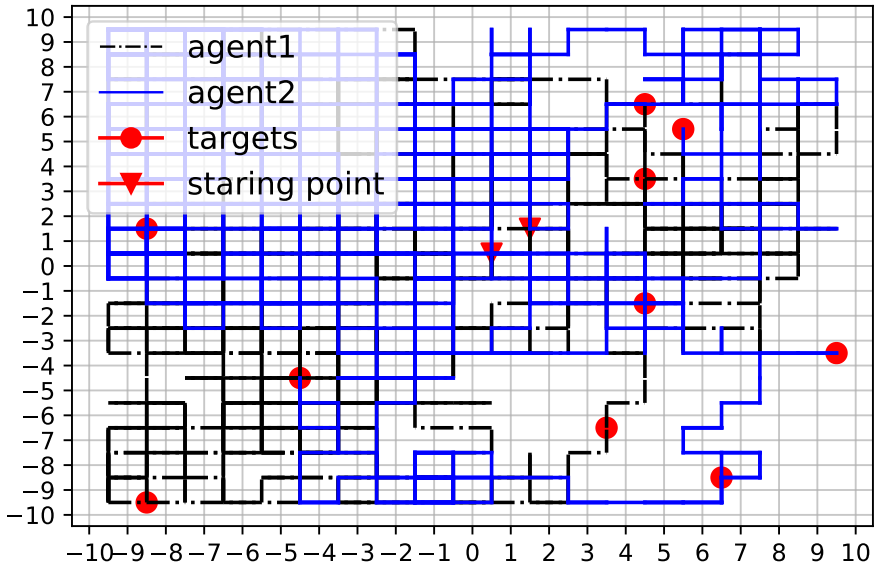
Scientific impact

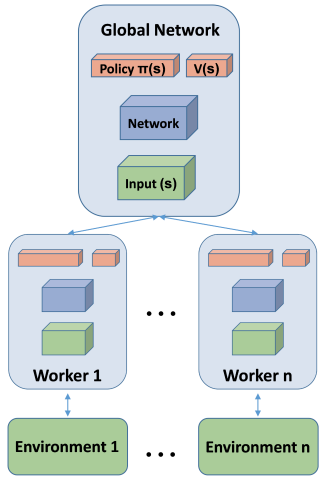
Approximate computing



Online MDP-based adaptation of object recognition

RL-based multiagent search





Centrally learn distributed policy for coordinated search

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Broader impact

New class, BU ME416 Introduction to Robotics

- Basics of ROS, kinematics, machine learning, controls
- Undegraduate seniors

New workshop for the BU Upward Bound Science and Math Program

- One-day workshop using Python to control small drones
- High-school students from underprivileged areas

SLAM for RL

- Python SLAM pipeline for easy integration with PyTorch, Habitat-Sim

https://github.com/armandok/pySLAM-D