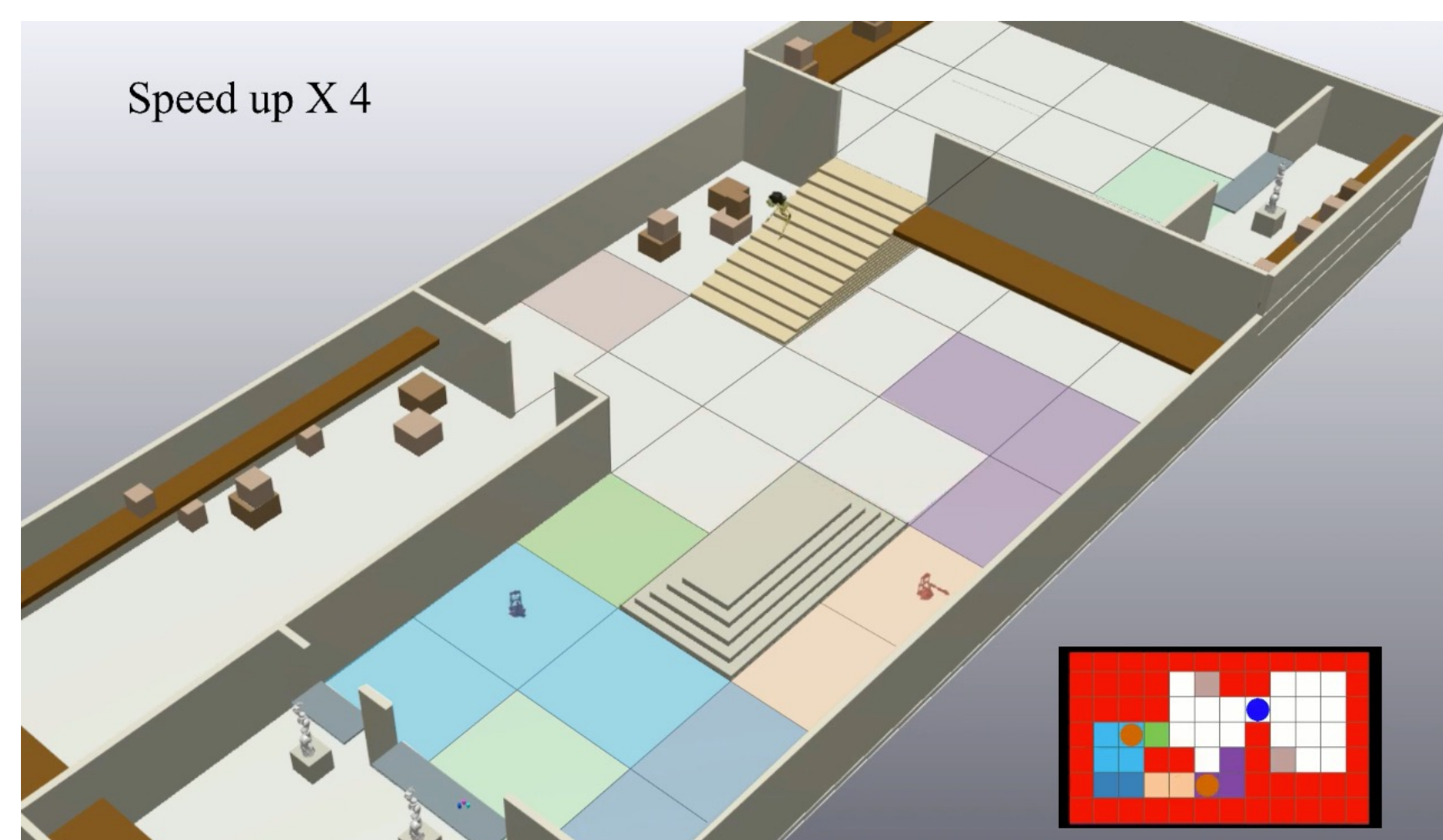


# NRI: FND: Robust and Scalable Planning for Agile and Collaborative Robot Teammates in Complex Environments

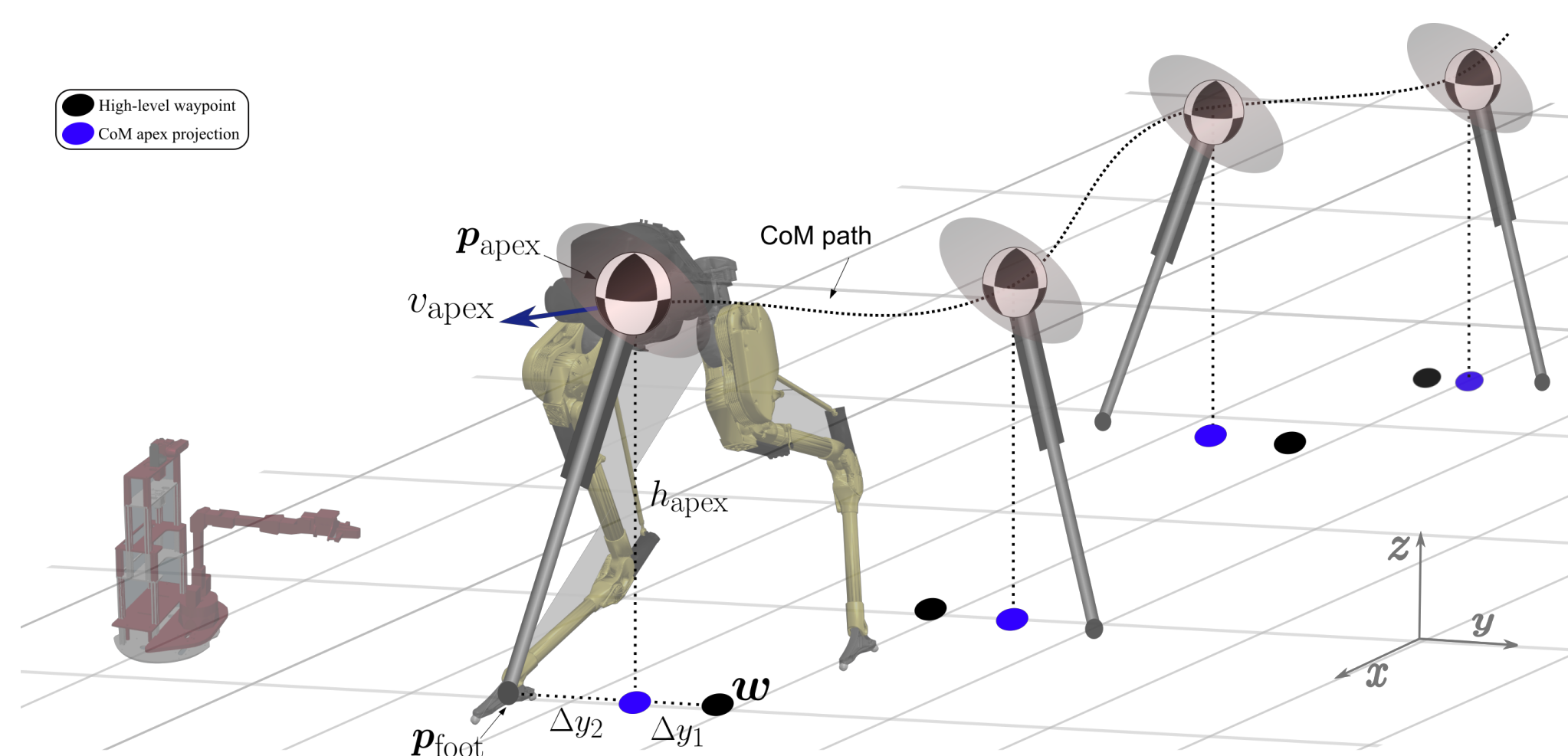
Ye Zhao (PI, Georgia Tech), Sam Coogan (co-PI, Georgia Tech)  
<http://lab-idar.gatech.edu/planning-collaborative-robots/>

Project goal: “Whole-System Decision and Planning” of heterogeneous and ubiquitous co-robots with robustness and safety guarantees

## Thrust 1: Safe locomotion in partially observable environments with dynamic obstacles

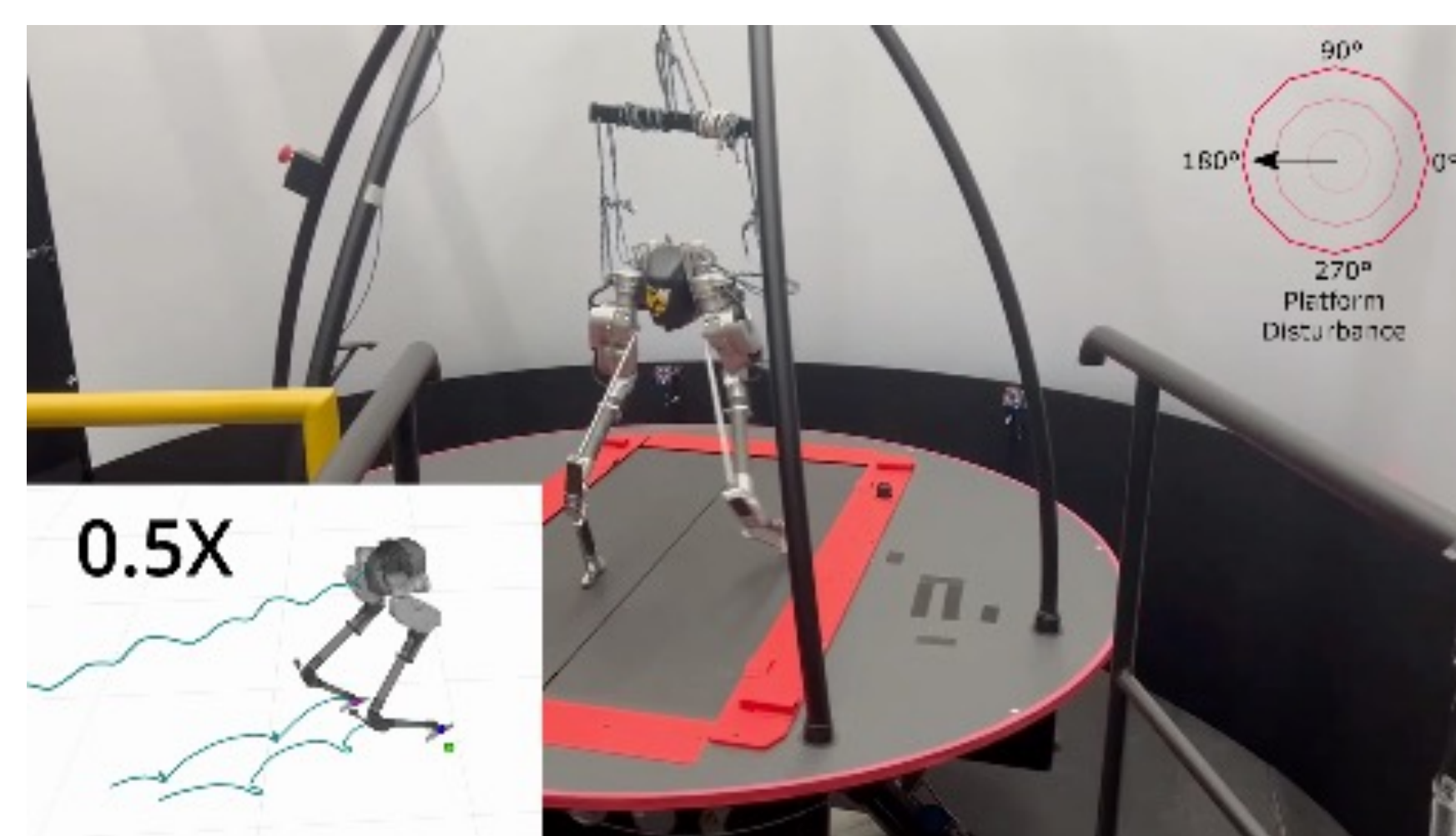


- Two-stage environment abstraction: fine and coarse level
- Belief tracking of dynamic obstacles [CDC 2020]
- Sequential composition of template models via game-based reactive synthesis [IJRR 2022]



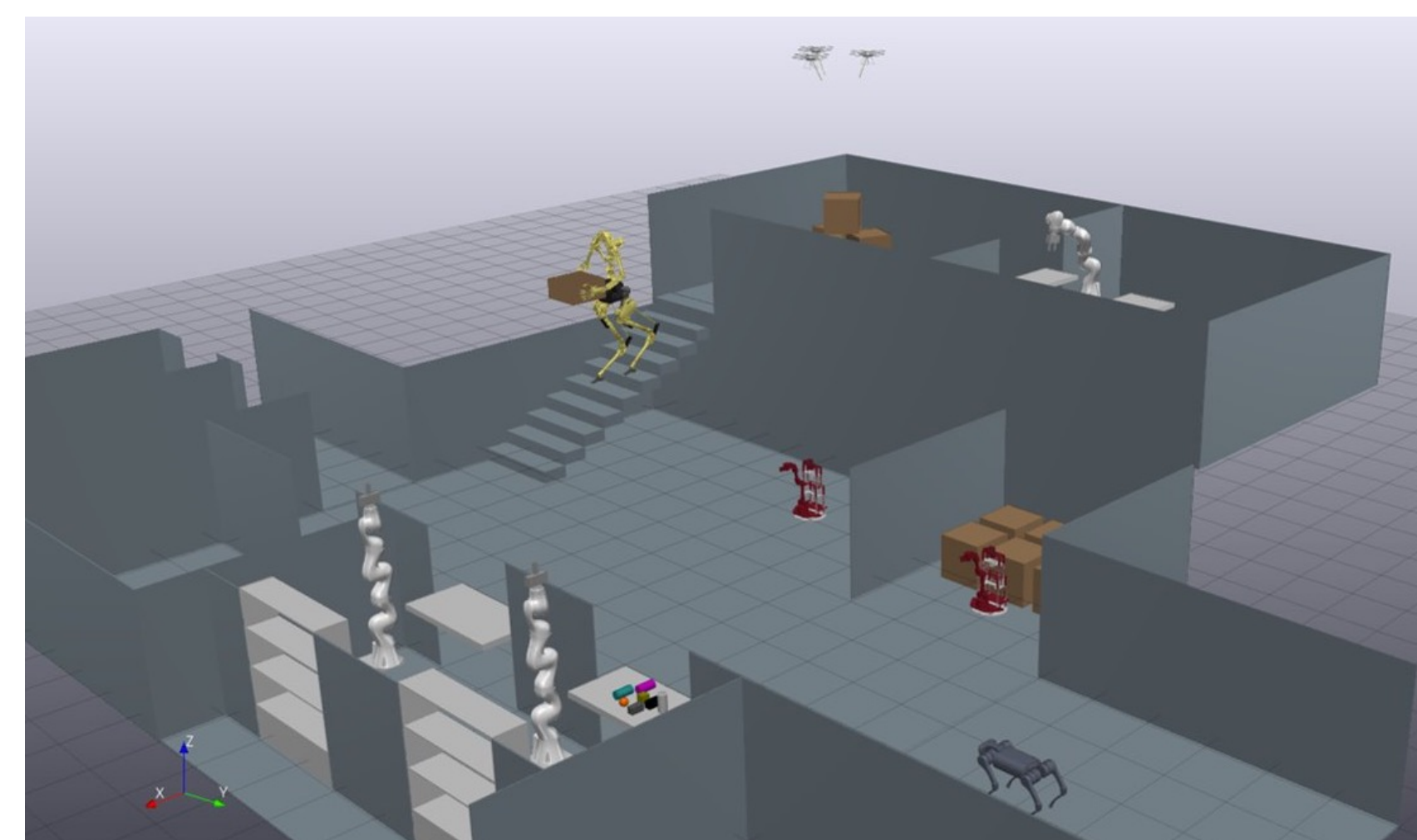
- Reachability region computation for robust locomotion in the presence of external perturbations
- Simultaneous balancing and navigation safety

## Thrust 2: Real-time planning resilient to anytime perturbations



- Real-time push recovery planning resilient to Anytime perturbations through behavior-tree-based modification
- Safe leg crossing motion with collision-free guarantee

## Thrust 3: Scalable and safe mission and task planning of heterogeneous robot teaming



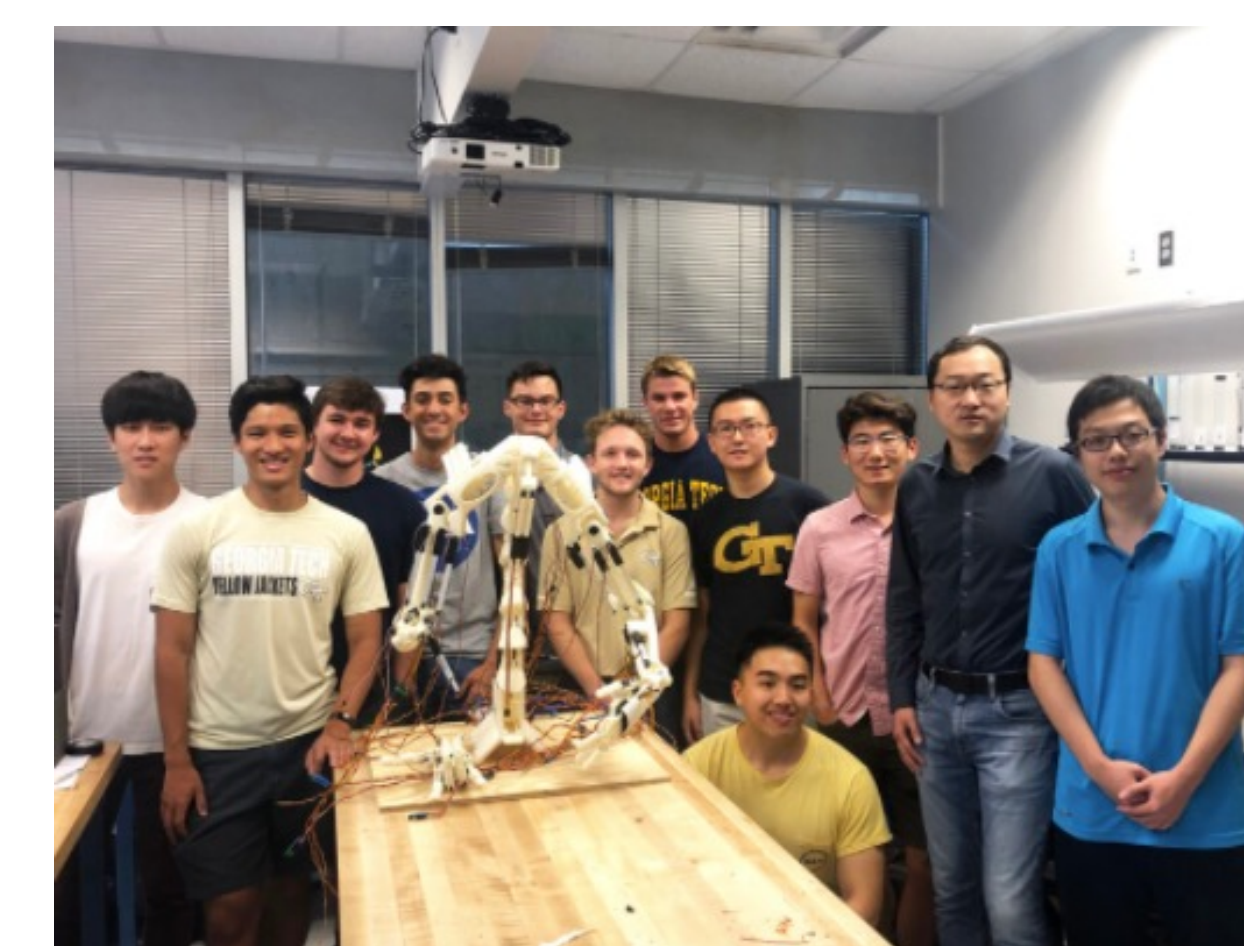
- Collision avoidance + contact-rich tasks
- Multi-robot decision-making with formal guarantees

## Thrust 4: Terrestrial and aerial coordination for environmental conflict resolution



- An agent may encounter unmodeled failures that are often ignored by traditional offline synthesis approaches
- Resolve unexpected failures through other agent's assistance

## Scientific and Broader Impact



- Our Vertically Integrated Project (VIP) team at Georgia Tech won **2020 AIM Best Late Breaking Results Poster Award**.
- The VIP team won **2021 First place in the Hardware, Devices & Robotics Track of the GaTech VIP Innovation Competition**.
- ENGAGES students won **Outstanding Exhibit Award in STEM** at the YSEA Science Fair.