

Yuhong Cao

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*I am a **Research Fellow** in Department of Mechanical Engineering, National University of Singapore. I am interested in deep reinforcement learning for robotics, especially path planning. My work aims to develop advanced learning-based approaches with solid engineering implementation, for bringing intelligent robots to real-life applications.*

Education

National University of Singapore (NUS)

DOCTOR OF PHILOSOPHY (MECHANICAL ENGINEERING)

- Advisor: Prof. Guillaume Sartoretti
- Aug. 2020 - Feb. 2024, Singapore

Beihang University (BUAA)

BACHELOR OF ENGINEERING (MECHANICAL ENGINEERING)

- GPA: 83/100
- Sept. 2016 - June. 2020, Beijing, China

Research Experience

Decentralized Search of Evasive Agents.

FUNDED BY TEMASEK LAB@NUS.

Aug. 2022 - current

- Develop deep reinforcement learning-based planner for multi-robot exploration and evasive search in urban area.
- Manage the research team and help supervise graduate/intern students.
- Develop test platforms based on unmanned aerial/ground vehicles.

Distributed Traffic Signal Control for Optimized Urban Mobility.

FUNDED BY ST ENGINEERING.

Nov. 2021 - Aug. 2022

- Develop deep reinforcement learning-based planner for traffic signal control.

Learning Based Approaches for Advanced Multi-Agent Search Problems.

FUNDED BY TEMASEK LAB@NUS.

Oct. 2020 - June. 2022

- Develop deep reinforcement learning-based planner for multi-agent search and coverage.

Publications

- **Yuhong Cao**, Zhanhong Sun, Guillaume Sartoretti. DAN: Decentralized Attention-based Neural Network to Solve the MinMax Multiple Traveling Salesman Problem. International Symposium on Distributed Autonomous Robotic Systems (DARS 2022). (**Best student paper award**)
- **Yuhong Cao**, Yizhuo Wang, Apoorva Vashisth, Haolin Fan, Guillaume Sartoretti. CATNIPP: Context-Aware Attention-based Network for Informative Path Planning. Conference on Robot Learning (CORL 2022).
- **Yuhong Cao**, Tianxiang Hou, Yizhuo Wang, Xian Yi, Guillaume Sartoretti. ARIADNE: A Reinforcement learning approach using Attention-based Deep Networks for Exploration. IEEE International Conference on Robotics and Automation (ICRA 2023).
- **Yuhong Cao**, Rui Zhao, Yizhuo Wang, Bairan Xiang, Guillaume Sartoretti. Deep Reinforcement Learning for Large-scale Robot Exploration. IEEE Robotics and Automation Letters.
- Yizhuo Wang*, **Yuhong Cao***, Jimmy Chiun, Subhadeep Koley, Mandy Pham, Guillaume Sartoretti. ViPER: Visibility-based Pursuit-Evasion via Reinforcement Learning. Conference on Robot Learning (CORL 2024).
- Jingsong Liang, **Yuhong Cao**, Yixiao Ma, Hanqi Zhao, Guillaume Sartoretti. HDPlanner: Hierarchical Decision Making via Contrastive and Imitation-based Deep Reinforcement Learning. IEEE Robotics and Automation Letters.
- Jingsong Liang*, Zhicheng Wang*, **Yuhong Cao***, Jimmy Chuin, Mengqi Zhang, Guillaume Sartoretti. Context-Aware Deep Reinforcement Learning for Autonomous Robotic Navigation in Unknown Area. Conference on Robot Learning (CORL 2023).
- Tianze Yang, **Yuhong Cao**, Guillaume Sartoretti. Intent-based Deep Reinforcement Learning for Multi-agent Informative Path Planning. IEEE International Symposium on Multi-Robot&Multi-Agent Systems (MRS 2023).
- Yizhuo Wang, Yutong Wang, **Yuhong Cao**, Guillaume Sartoretti. Spatio-Temporal Attention Network for Persistent Monitoring of Multiple Mobile Targets. IEEE International Conference on Intelligent Robots and Systems (IROS 2023).
- Derek Ming Siang Tan, Yixiao Ma, Jingsong Liang, Yi Cheng Chng, **Yuhong Cao**, Guillaume Sartoretti. **IR²**: Implicit Rendezvous for Robotic Exploration Teams under Sparse Intermittent Connectivity. IEEE International Conference on Intelligent Robots and Systems (IROS 2024).
- Yixiao Ma, Jingsong Liang, **Yuhong Cao**, Derek Ming Siang Tan, Guillaume Sartoretti. Privileged Reinforcement and Communication Learning for Distributed, Bandwidth-limited Multi-Robot Exploration. International Symposium on Distributed Autonomous Robotic Systems (DARS 2024).
- Jimmy Chiun, Yan Rui Tan, **Yuhong Cao**, John Tan, Guillaume Sartoretti. STAR: Swarm Technology for Aerial Robotics Research. The International Conference on Control, Automation, and Systems (ICCAS 2024)
- Yutong Wang, Mehul Damani, Pamela Wang, **Yuhong Cao**, Guillaume Sartoretti. Distributed Reinforcement Learning for Robot Teams: A Review. Springer's Current Robotics Reports.
- Weiheng Dai, Utkarsh Rai, Jimmy Chiun, **Yuhong Cao**, Guillaume Sartoretti. Heterogeneous Multi-robot Task Allocation and Scheduling via Reinforcement Learning. Submitted to IEEE Robotics and Automation Letters.
- **Yuhong Cao***, Jeric Lew*, Jingsong Liang, Jin Cheng, Guillaume Sartoretti. DARE: Diffusion Policy for Autonomous Robot Exploration. Submitted to IEEE International Conference on Robotics and Automation (ICRA 2025).

- Shuhao Liao, Weihang Xia, **Yuhong Cao**, Weiheng Dai, Chengyang He, Wenjun Wu, Guillaume Sartoretti. SIGMA: Sheaf-Informed Geometric Multi-Agent Pathfinding. Submitted to IEEE International Conference on Robotics and Automation (ICRA 2025).
- Jimmy Chiun, Shizhe Zhang, Yizhuo Wang, **Yuhong Cao**, Guillaume Sartoretti. MARVEL: Multi-Agent Reinforcement Learning for constrained field-of-View multi-robot Exploration in Large-scale environments. Submitted to IEEE International Conference on Robotics and Automation (ICRA 2025).

Honors & Awards

- 2022 **Golden Prize (team leader)**, China International 'Internet+' Innovation and Entrepreneurship Competition
- 2020 **Outstanding Graduate**, Beihang University
- 2019 **the Merit Student of Beihang University**, Beihang University
- 2018 **Scholarship for Outstanding Performance (in study)**, Beihang University
- 2018 **Scholarship for Outstanding Performance (in academic competition)**, Beihang University
- 2018 **scholarship for Outstanding Performance (in social practice)**, Beihang University
- 2018 **the Merit Student of Beihang University**, Beihang University

Other Experience

- Teaching Assistant** Microprocessor Application (ME3241), Deep Learning for Robotics (ME5406), Machine Learning for Robotics (ME5418)
- Conference Reviewer** ICRA, IROS, CoRL
- Journal Reviewer** RA-L, T-ASE, Autonomous Robots, RAS

Supervised Students

- Tianze Yang, 2021-2023, Master of Engineering → PhD in University of Georgia.
- Apoorva Vashisth, 2021-2024, Intern Student → PhD in Purdue University.
- Haolin Fan, 2021-2022, Master of Engineering → PhD in National University of Singapore.
- Tianxiang Hou, 2021-2022, Master of Science → BYD Company.
- Rui Zhao, 2022-2023, Master of Science → BYD Company.
- Bairan Xiang, 2022-2023, Master of Science → BYD Company.
- Xian Yi, 2022-2023, Master of Science → Xiaomi Company.
- Hanqi Zhao, 2023-2024, Undergraduate Student → Master in Georgia Institute of Technology.
- Peizhuo Li, 2023-2024, Undergraduate Student → PhD in National University of Singapore.