

Yuhan Zhao

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EDUCATION

New York University

New York, NY

Ph.D. Candidate in Electrical and Computer Engineering (ECE)

Sept. 2019 - Jun. 2024 (Expected)

Advisor: Quanyan Zhu | GPA: 3.95/4.00

University of Pennsylvania

Philadelphia, PA

Robotics Master of Science in Engineering (GRASP Lab)

Sept. 2017 - Jun. 2019

Advisor: Michael Posa | GPA: 3.95/4.00

Beijing Institute of Technology

Beijing, China

Bachelor of Science in Automation

Sept 2013 - Jun. 2017

Advisor: Hongbin Ma | GPA: 3.93/4.00

Research Interests: Game-theoretic control and learning in robotics, control and optimization in autonomous and multi-agent systems, human-robot interaction

PUBLICATIONS

- [1] **Y. Zhao**, B. Huang, J. Yu, and Q. Zhu, "Stackelberg Strategic Guidance for Heterogeneous Robots Collaboration," *2022 International Conference on Robotics and Automation (ICRA)*, 2022.
- [2] T. Li, **Y. Zhao**, and Q. Zhu, "The Role of Information Structures in Game-Theoretic Multi-Agent Learning," *Annual Reviews in Control*, 2022.
- [3] **Y. Zhao** and Q. Zhu, "Distributed and Resilient Planning-Control for Optimal LEO Satellite Constellation Coverage," *American Control Conference (ACC)*, 2022.
- [4] S. Liu, **Y. Zhao**, and Q. Zhu, "Understanding the Interplay Between Herd Behaviors and Epidemic Spreading Using Federated Evolutionary Games," *American Control Conference (ACC)*, 2022.
- [5] S. Liu, **Y. Zhao**, and Q. Zhu, "Herd Behaviors in Epidemics: A Dynamics-Coupled Evolutionary Games Approach," *Dynamic Games and Applications*, 2022.
- [6] **Y. Zhao**, Y. Ge, and Q. Zhu, "Combating Ransomware in Internet of Things: A Games-in-Games Approach for Cross-Layer Cyber Defense and Security Investment," *International Conference on Decision and Game Theory for Security (GameSec)*, 2021.
- [7] **Y. Zhao** and Q. Zhu, "Combating Online Counterfeits: A Game-Theoretic Analysis of Cyber Supply Chain Ecosystem," *International Conference on Decision and Game Theory for Security (GameSec)*, 2020.

RESEARCH EXPERIENCE

Meta-Learning for Multi-Robot Collaboration with Stackelberg Games

New York University

Laboratory for Agile and Resilient Complex Systems, Prof. Quanyan Zhu

Jul. 2022 - Present

- Developed a leader-follower type of collaboration framework in multi-robot teaming and trajectory guidance problems based on dynamic Stackelberg games
- Leveraged Meta-learning to achieve customized adaptive control strategy design for collaboration between different heterogeneous robots
- Improved online adaptation performance and model transferability compared to supervised learning approaches
- Two submissions under review for ICRA 2023 and IFAC World Congress 2023

Heterogeneous Robots Collaboration with Stackelberg Games [1]

New York University

Laboratory for Agile and Resilient Complex Systems, Prof. Quanyan Zhu

Jul. 2021 – Sept. 2021

- Developed a collaboration framework for robot-assistive multi-object rearrangement tasks in smart warehouses using stochastic Stackelberg games
- Leveraged dynamic programming and mixed integer linear programming to determine object rearrangement strategies for two heterogeneous robotic arms
- Evaluated the framework using simulations (PyBullet) that proved robust to external and internal disturbances

Distributed Multi-Satellite Coverage Control in Adversarial Environments [3]

Laboratory for Agile and Resilient Complex Systems, Prof. Quanyan Zhu

New York University

Jul. 2021 - Feb. 2022

- Established a multi-satellite coverage control framework using relative motion dynamics and potential games
- Developed distributed planning algorithms and MPC control strategies to achieve resilient coverage control in different adversarial space environments
- One submission under review for IEEE Transactions on Control Systems Technology

Security Games in Industrial IoT and Cyber Supply Chains [6,7]

Laboratory for Agile and Resilient Complex Systems, Prof. Quanyan Zhu

New York University

Jan. 2020 - Sept. 2021

- Simulated and assessed adversarial ransomware attacks in industrial IoT networks using Markov games
- Developed ransom-payment strategy to mitigate existing attack loss and security-investment strategy to prevent potential cyber attacks
- Modeled counterfeit attacks in the cyber supply chain ecosystem with nested Stackelberg games
- Analyzed market loss under counterfeit attacks and other factors that exacerbate counterfeits including consumers' tolerance of counterfeits and belief in the market

Local Optimization Methods on Robot Contact Problems

Dynamic Autonomy and Intelligent Robotics Lab, Prof. Michael Posa

University of Pennsylvania

May. 2018 - Apr. 2019

- Investigated planning problems with contact in robotics such as bipedal robot gait planning using optimization
- Established an optimal control based model for planning with contact using time-stepping methods
- Implemented ADMM and penalty interior-point methods in C++/MATLAB to determine local optimal planning solutions that outperform brute-force solutions (globally optimal) in computational time

HONORS AND AWARDS

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| • ACC 2022 Student Travel Grant | National Science Foundation, 2022 |
| • Dean's Scholarship | New York University, 2019-2020 |
| • Outstanding Graduate Representative | Beijing Institute of Technology, 2017 |
| • Scholarship for Academic Excellence (Top 5%) | Beijing Institute of Technology, 2017 |

INDUSTRY EXPERIENCE

Software Engineer

Kuangbaobao Network Technology Co. Ltd.

Beijing, China

Jul. 2016 - Sept. 2016

- Designed user interface of "Kuangbaobao" App with Java in Eclipse
- Realized data transmission functionality between mobile phones and servers with C++

PROFESSIONAL ACTIVITIES

Conference/Journal Peer Reviewer

- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE Conference on Decision and Control (CDC)
- IEEE Conference on Control Technology and Applications (CCTA)
- IEEE Transactions on Aerospace and Electronic Systems
- Annual Reviews in Control

TECHNICAL SKILLS

Programming: Python, MATLAB, C/C++, Julia

Research Software: PyTorch, ROS, Gurobi, IPOPT, YALMIP, CVX, LaTeX, Linux