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 — *Sept2013 - Jun. 2017*
Advisor: Hongbin Ma | GPA: 3.93/4.00

Research Interests: Game-theoretic control and learning in robotics, multi-agent control and optimization, 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 in Cooperative Stackelberg Games — New York University
Laboratory for Agile and Resilient Complex Systems, Prof. Quanyan Zhu — *Jul. 2022 - Present*

- Developed leader-follower type of collaboration framework in multi-robot teaming and trajectory guidance problems based on dynamic Stackelberg games
- Leveraged Meta-learning to design online adaptative control strategies for collaboration between different heterogeneous robots
- Achieved better data efficiency 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. 2022 - Present*

- Developed collaboration framework for robot-assistive warehouse multi-object rearrangement tasks using stochastic Stackelberg games
- Leveraged dynamic programming and mixed integer linear programming to determine object rearrangement instructions for two heterogeneous robotic arms
- Evaluated the framework using simulations (PyBullet) that proven to be robust to external/internal disturbances

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

Laboratory for Agile and Resilient Complex Systems, Prof. Quanyan Zhu *Jul. 2021 - Feb. 2022*

- Formulated multi-satellite coverage control problem using the framework of 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] New York University

Laboratory for Agile and Resilient Complex Systems, Prof. Quanyan Zhu *Jan. 2020 - Sept.2021*

- 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 cyber supply chain ecosystem with nested Stackelberg games
- Analyzed market loss under counterfeit attacks and other factors that exacerbate counterfeits including consumers' tolerance on counterfeits and belief on the market

Local Optimization Methods on Robot Contact Problems University of Pennsylvania

Dynamic Autonomy and Intelligent Robotics Lab, Prof. Michael Posa *May. 2018 - May. 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

- 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 Beijing, China

Kuangbaobao Network Technology Co. Ltd. *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 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