# Hao Luan

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https://edmundluan.github.io/

## Education

**National University of Singapore** — Singapore, SG
*Doctor of Philosophy (Ph.D.) in Computer Science* — *Aug. 2023 –*

- NUS Research Scholarship

**Harbin Institute of Technology** — Shenzhen, CHN
*Bachelor of Engineering (B.Eng.), Automation* — *Sep. 2017 – Jun. 2021*

- Overall GPA: 90.1/100, 3.8/4.0
- Thesis: "Distributed Consensus of Multi-Agent Systems with State Constraints under Switching Directed Graphs." Abstract available: edmundluan.github.io/files/abstr-Luan_Thesis.pdf

***Remarks***:

- Admitted with full fellowship first to the *Master of Applied Science* (research-based) program in 2022 and then the *Direct Entry PhD* program in 2023 at the Edward S. Rogers Sr. Department of Electrical and Computer Engineering, University of Toronto.

## Research Experience

**Robotics Perception & Intelligence Lab – SUSTech & CUHK** — Aug. 2021 – Jul. 2022
Full-time Research Assistant — Shenzhen, CHN
*Advisors: Prof. Max Q.-H. Meng, Prof. Jiankun Wang* — *Electronic & Electrical Eng.*

- Developed intelligent decision-making modules for the robotic autonomous trolley collection and transportation at airports.
- In charge of researching multi-robot collaborative manipulation for trolley transportation.
- Proposed a safety-critical motion planner for obstacle avoidance and perception-aware planning.
- Conducted hardware experiments and tests to validate the prototype.

**Multi-Agent Systems Lab – Harbin Inst. Tech. Shenzhen** — Oct. 2019 – Jun. 2021
Undergraduate Research Assistant — Shenzhen, CHN
*Advisor: Prof. Jie Mei* — *Mech. Eng. & Automation*

- Conducted theoretical research on multi-agent systems control over directed networks.
- Proposed a control framework addressing the distributed consensus problem for multi-agent systems with constraints, uncertainties, and time-varying directed topologies.
- Presented distributed consensus algorithms, theoretical proof of convergence, numerical simulations, and physical experiments for validation.

**Robot. Automat. Percep. & Decis. Lab – Sun Yat-sen Univ.** — Nov. 2015 – May 2016
Visiting Research Student — Guangzhou, CHN
*Advisor: Prof. Hui Cheng* — *Comp. Sci. & Eng.*

- Optimized and implemented a centralized offline task-allocation algorithm for multi-robot systems based on the Ant Colony System.
- Performed simulations to test the proposed algorithm and presented results at the concluding report.

## Professional Experience

**Peng Bo Technology (Shenzhen) Co. Ltd.** — Mar. 2021 – Apr. 2021
Software Development Intern — Shenzhen, CHN
*Supervisor: Dr. Shixin Mao*

- Developed drivers for the vehicle chassis of the company's autonomous robotic cleaning products.

## Publications & Preprints

* indicates co-first authorship.

- X. Gao, **H. Luan**, B. Xia, Z. Zhao, J. Wang, and M. Q.-H. Meng, "A divide-and-conquer control strategy with decentralized control barrier function for luggage trolley transportation by collaborative robots," *Robotica*, 2023. ***Accepted***. [Video]
- B. Xia*, **H. Luan***, Z. Zhao*, X. Gao, P. Xie, A. Xiao, J. Wang, and M. Q.-H. Meng, "Collaborative trolley transportation system with autonomous nonholonomic robots," *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2023. ***Accepted***. [arXiv] [Video]
- **H. Luan**, J. Mei, A.-G. Wu, and G. Ma, "Distributed constrained consensus of multi-agent systems with uncertainties and disturbances under switching directed graphs," *IEEE Transactions on Control of Network Systems*, to be published, doi: 10.1109/TCNS.2023.3272848. [Page] [PDF]
- A. Xiao*, **H. Luan***, Z. Zhao*, Y. Hong, J. Zhao, W. Chen, J. Wang, and M. Q.-H. Meng, "Robotic autonomous trolley collection with progressive perception and nonlinear model predictive control," *2022 International Conference on Robotics and Automation (ICRA)*, 2022, pp. 4480–4486, doi: 10.1109/ICRA46639.2022.9812455. [Page] [arXiv] [PDF] [Video]

## Awards & Fellowships

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|---|---|
| NUS Research Scholarship, *National University of Singapore* | 2023 – |
| Outstanding Bachelor's Thesis (top 4%), *HIT Shenzhen* | 2021 |
| Mathematical Contest In Modeling (MCM) Honorable Mention | 2020 |
| Undergraduate Academic Merit Scholarship, *HIT Shenzhen* | 2018, 2019, 2020 |

## Academic Services

### Conference Reviewing

- IEEE International Conference on Robotics and Automation (ICRA 2022, 2023)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2022)
- IEEE International Conference on Robotics and Biomimetics (ROBIO 20/21)

### Journal Reviewing

- IEEE Robotics and Automation Letters (RA-L)

## Skills

**Languages**: Mandarin (native), Cantonese (native), English (Fluent)

**Programming**: C/C++, Python, Julia, Pascal

**Tools**: CasADi, Git, LCM, MATLAB/Simulink, Wolfram Mathematica, ROS, LaTeX