

Curriculum Vitae of Han Zhang

(+86) 15921542336 ◇ zhanghan_tc@sjtu.edu.cn ◇ <https://zhanghan-tc.github.io/>

Research Interest

Include but not limited to:

Inverse optimal control (Inverse reinforcement learning), Data-driven modeling methods, System identification, Optimal control, Game theory, Robust perception in robotics, Multi-agent cooperative control

Education

KTH Royal Institute of Technology, Sweden

2014.9 ~ 2019.3

Ph.D., Applied and computational mathematics, specialized in Optimization and Systems theory

Supervised by: Prof. Xiaoming Hu

Co-supervised by: Prof. Elias Jarlebring

Shanghai Jiao Tong University

2011.9 ~ 2014.3

Msc. Eng., Control theory and engineering

Shanghai Jiao Tong University

2007.9 ~ 2011.6

Ba. Eng., Automation

Working Experience

Shanghai Jiao Tong University

2021.2 ~ Present

Assistant Professor in Autonomous Robotics Lab, Dept. of Automation

(In China, universities do not explicitly require the percentage of time for teaching and research)

Teaching duties:

- Robotics practice (Undergraduate, given to two separate classes, 32+16 class hours)
- Nonlinear control theory (Master and Ph.D. level, 32 class hours, **taught in English**)
- Scientific writing, integrity and ethics (Master level, given to two separate classes, 8+8 class hours)

Zenuity Software Technology (Shanghai) Co., Ltd

2020.2 ~ 2021.2

Senior Algorithm Engineer

Zenuity is a sub-company of *Volvo Cars AB*, and focus on for **autonomous driving**. Responsible for the development of the localization algorithm and related tools.

Shanghai West Hongqiao Navigation Technology Co. Ltd

2019.3 ~ 2020.1

Lab head of R&D department

Responsible for project management and algorithm development for autonomous logistic robots' control, localization, navigation and task planning.

Awards

- The Honorable Mention of Guan Zhao-Zhi Award, the 41st Chinese Control Conference.

Selected Publications

Journal papers:

- **Han Zhang**, Axel Ringh, Inverse optimal control for averaged cost per stage linear quadratic regulators, *Systems & Control Letters*, Volume 183: 105658, 2024
- **Han Zhang**, Axel Ringh, Inverse linear-quadratic discrete-time finite-horizon optimal control for indistinguishable homogeneous agents: a convex optimization approach, *Automatica*, Volume 148: 110758, 2023.
- Xingyi Li, **Han Zhang**, Weidong Chen, 4D radar-based pose graph SLAM with ego-velocity pre-integration factor, *IEEE Robotics and Automation Letters*, Volume. 8, Issue. 8, August 2023.
- Kai Li, Fan Xu, **Han Zhang**, Hesheng Wang, Visual servoing of flexible manipulators with unknown camera intrinsic parameters and vibration states, *IEEE/ASME Transactions on Mechatronics*, 2023. (Early access)
- **Han Zhang**, Yibei Li, Xiaoming Hu, Discrete-time inverse linear quadratic optimal control over finite time-horizon under noisy output measurements, *Control Theory and Technology*, Volume 19, Number 4, Pages 563-572, November 2021
- **Han Zhang**, Jack Umenberger, Xiaoming Hu, Inverse optimal control for discrete-time finite-horizon Linear Quadratic Regulators, *Automatica*, Volume 110, 2019, 108593.
- **Han Zhang**, Jieqiang Wei, Peng Yi, Xiaoming Hu, Projected primal-dual gradient flow of augmented Lagrangian with application to distributed maximization of the algebraic connectivity of a network, *Automatica*, Volume 98, Pages 34-41, December 2018.
- **Han Zhang**, Xiaoming Hu, Consensus control for linear systems with optimal energy cost, *Automatica*, Volume 93, Pages 83-91, July 2018.

Preprints:

- **Han Zhang**, Axel Ringh, Statistically consistent inverse optimal control for discrete-time indefinite linear-quadratic systems, arXiv preprint arXiv:2212.08426, 2022. (Submitted to Automatica)

Conference papers:

- **Han Zhang**, Axel Ringh, Weihang Jiang, Shaoyuan Li, Xiaoming Hu, Statistically Consistent Inverse Optimal Control for Linear-Quadratic Tracking with Random Time Horizon. *2022 41st Chinese Control Conference (CCC)*. (The Honorable Mention of Guan Zhao-Zhi Award)
- **Han Zhang**, Yibei Li, Xiaoming Hu, Inverse Optimal Control for Finite-Horizon Discrete-time Linear Quadratic Regulator Under Noisy Output. *2019 58th IEEE Conference on Decision and Control (CDC)*.
- Yibei Li, **Han Zhang**, Yu Yao, Xiaoming Hu, A Convex Optimization Approach to Inverse Optimal Control. *2018 37th Chinese Control Conference (CCC)*.
- **Han Zhang**, Xiaoming Hu, Optimal energy consensus control for linear multi-agent systems. *2017 36th Chinese Control Conference (CCC)*.

Projects and fundings

Principle Investigator (PI):

1. 2022 – Present Amount: 300,000 RMB
Research on Linear Quadratic Inverse Dynamic Game for Indistinguishable Agents

Grant No. 62103276, supported by Youth Funding, *National Natural Science Foundation of China*.

2. 2022 – Present Amount: 1.2 million RMB
Millimeter Wave Radar Based SLAM and Ego-Vehicle State Estimation

Supported by *ZF (China) Investment Co., Ltd.* (the legal entity of **ZF Friedrichshafen AG** in China).

3. 2022 – Present Amount: 500,000 RMB
Pedestrian Behavior Prediction Algorithm Based on Dynamic Game

Supported by *ZF (China) Investment Co., Ltd.* (the legal entity of **ZF Friedrichshafen AG** in China).

Co-Principle Investigator (Co-PI):

1. 2023 – Present My shares: 450,000 RMB
Intelligent Out-of-Bed Nursing Robot Technology and Product Development

Responsible for the R&D of navigation and SLAM algorithm, Grant No. 2022YFC3601403, supported by *National Key Research and Development Plan*, from Ministry of Science and Technology, China.

2. 2021 – Present My shares: 100,000 RMB
Research and development of Multi-Modal Intelligent Mobility Aiding Device

Responsible for the R&D of navigation and SLAM algorithm, Grant No. 2020YFC2007500, supported by *National Key Research and Development Plan*, from Ministry of Science and Technology, China.

3. 2022 – Present My shares: 800,000 RMB
Path Planning Algorithm for Heavy Commercial Vehicles

Responsible for the R&D of the path planning algorithm, supported by *ZF (China) Investment Co., Ltd.* (the legal entity of **ZF Friedrichshafen AG** in China).

Teaching experience

Bachelor level course:

- Lecturer (and co-lecturer), developer and examiner, *Robotics Practice*, given to two separate cohorts annually, 32 class hours and 16 class hours to each, respectively.

Master & Ph.D. level courses:

- Lecturer, developer and examiner, *Nonlinear Control Theory*, 32 class hours, **taught in English** annually.
- Co-lecturer, co-developer and examiner, *Scientific Writing, Integrity and Ethics*, given to two separate cohorts annually, 8 class hours each.

Supervision:

Bachelor theses:

(Co-supervisions during Ph.D. study)

- Hanna Gustavsson, Linnea Thorstensson, *Improving the Robustness of Stockholm's Metro System*, 2017.
- Jacob Friman, Rosmarie Helena Leijel, *Quadcopter formation simulated in a choreographed dance music*, 2017.
- Jessica Krange Sjölander, Lovisa Böthas, *Multiple quadcopters exploring an unknown environment*, 2017.
- Jeremi Grosz, Michael Schrab, *Optimal Motion Control of a Mobile Manipulator by learning*, 2018.

(Principle supervisions in Shanghai Jiao Tong University)

- Yuyou Zhang, **Shanghai Outstanding Graduates**, *Vision-based manipulation of flexible objects*, 2022.
- Yifan Zhan, *Indoor Dense Semantic Mapping Based on RGB-D Camera*, 2022.
- Jianwei Gou, *Human Pointing Target Prediction Via Inverse Optimal Control*, 2023.
- Zitong Jin, *Pedestrian Trajectory Prediction Via Inverse Optimal Control*, 2023.
- Yuanhang Zhang, *Quadrotor non-positioning flight control based on visual servoing and NMPC*, 2023.

On-going Master & Ph.D. supervisions in Shanghai Jiao Tong University:

- **Modelling human behaviours** using Inverse Optimal Control
 - Modelling human tracking pattern in rehabilitation and rehabilitation robot design, Weihai Jiang, *master student*, expected graduation date: 2024.03. (Principle supervisor)
 - Lili Wu, *master student*, expected graduation date: 2025.03. (Principle supervisor)
 - Pedestrian trajectory prediction and mobile robot navigation, Ting Zhang, *Ph.D. student*, expected graduation date: 2028.06. (Principle supervisor)
 - Guanfeng Yu, *master student*, expected graduation data: 2024.03. (Principle supervisor)
- 4D Radar-based SLAM (one master student and one Ph.D. student)
 - Guanyu Cai, *Ph.D. student*, expected graduation date: 2029.06. (Principle supervisor)
 - Xingyi Li, *master student*, expected graduation data: 2024.03. (Co-supervisor)

Student's contests:

(Co-supervision)

- Zheng Li, Yifei Yao, Liuyu Huang, Chentai Gao, Jiahao Wang, **First Prize**, *Smart Car Challenge - 1:5 Model Competition*, 2021 Chinese Robocup
- Wenhua Wu, Mingyang Jiang, Chentai Gao, Changsheng Hao, Zheng Li, Hanwen Yang, **First Prize**, *Smart Car Challenge - 1:12 Model Competition*, 2021 Chinese Robocup

(Principle supervision)

- Yang Luo, Yinlin Li, Shihao Zhao, **Third Prize**, *2023 Shanghai Jiao Tong University Med+X Innovation & Fusion Bachelor Student Competition*

Board participation

- Ph.D. thesis defense committee member:
 - Wenrui Zhao, Dept. of Automation, Shanghai Jiao Tong University, 2022.
 - Hongle Xie, Dept. of Automation, Shanghai Jiao Tong University, 2023.
- Master thesis defense committee member of Dept. of Automation, Shanghai Jiao Tong University 2021(as an industrial expert), 2022, 2023
- Bachelor thesis defense committee member of Dept. of Automation, Shanghai Jiao Tong University 2022, 2023

Presentations and talks

Invited talks at conferences:

- The 7th Chinese Human Factor Engineering summit, 2023
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Invited seminars in universities & research institutes:

- Shanghai University, China, 2021
- Academy of Mathematics and Systems Science, Chinese Academy of Sciences, 2022 (Online)
- Academy of Mathematics and Systems Science, Chinese Academy of Sciences, 2023 (1.5-hour long talk)