# XUSHENG LUO

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## WORK EXPERIENCE

**Carnegie Mellon University** *April 2023 – Present*
Postdoctoral Fellow, with Dr. Changliu Liu Pittsburgh, USA

**Dajiang Software Technology Co., Ltd** *Jan. 2021 – Feb. 2023*
Autonomous Driving Research Engineer Shenzhen, China

## EDUCATION

**Duke University**, USA
Ph.D. in Mechanical Engineering & Materials Science *Aug. 2017 – Dec. 2020*
M.S. in Mechanical Engineering & Materials Science *Aug. 2017 – May 2020*
Advisor: Dr. Michael M. Zavlanos
Thesis: Scalable Control Synthesis for Multi-Robot Systems under Temporal Logic Specifications

**Harbin Institute of Technology**, China
M.S. in Aeronautical and Astronautical Science and Technology *Aug. 2015 – June 2017*
B.S. in Flight Vehicle Design and Engineering *Sep. 2011 – June 2015*

## PUBLICATIONS

* indicates equal contribution.

### Refereed Journal Publications

[1] **Xusheng Luo**, Shaojun Xu, Ruixuan Liu and Changliu Liu. "Decomposition-based Hierarchical Task Allocation and Planning for Multi-Robots under Hierarchical Temporal Logic Specifications". *IEEE Robotics and Automation Letters*, 2024.

[2] **Xusheng Luo**, Yiannis Kantaros, and Michael M Zavlanos. "An Abstraction-Free Method for Multirobot Temporal Logic Optimal Control Synthesis". *IEEE Transactions on Robotics*, 37(5):1487–1507, 2021.

[3] **Xusheng Luo** and Michael M Zavlanos. "Temporal Logic Task Allocation in Heterogeneous Multi-robot Systems". *IEEE Transactions on Robotics*, 38(6):3602-3621, 2022.

[4] **Xusheng Luo**, Miroslav Pajic, and Michael M. Zavlanos. "An Optimal Graph-Search Method for Secure State Estimation". *Automatica* 123 (2021): 109323.

### Refereed Conference Proceedings

[5] Shiqi Sun, Yan Zhang, **Xusheng Luo**, Panagiotis Vlantis, Miroslav Pajic, and Michael M. Zavlanos. "Formal Verification of Stochastic Systems with ReLU Neural Network Controller". *IEEE 39th International Conference on Robotics and Automation (ICRA)*, Philadelphia, USA, 2022.

[6] Yijie Zhou, Yan Zhang, **Xusheng Luo**, and Michael M. Zavlanos. "Human-in-the-loop Robot Planning with Non-Contextual Bandit Feedback". In *2021 60th IEEE Conference on Decision and Control (CDC)*, pp. 2848-2853. IEEE, 2021

[7] **Xusheng Luo***, Yan Zhang*, and Michael M. Zavlanos. "Socially-aware Robot Planning via Bandit Human Feedback". In *2020 ACM/IEEE 11th International Conference on Cyber-Physical Systems (ICCPS)*, pp. 216-225. IEEE, 2020.

[8] Le, Duc M., **Xusheng Luo**, Leila J. Bridgeman, Michael M. Zavlanos, and Warren E. Dixon. "Single-Agent Indirect Herding of Multiple Targets using Metric Temporal Logic Switching". In *2020 59th IEEE Conference on Decision and Control (CDC)*, pp. 1398-1403. IEEE, 2020.

[9] **Xusheng Luo**, and Michael M. Zavlanos. "Transfer Planning for Temporal Logic Tasks". In *2019 IEEE 58th Conference on Decision and Control (CDC)*, pp. 5306-5311. IEEE, 2019.

### Refereed Workshop Publications

[10] **Xusheng Luo***, Shaojun Xu* and Changliu Liu. "Obtaining Hierarchy from Human Instructions: an LLMs-based Approach". Workshop on *Learning Effective Abstractions for Planning (LEAP), Conference on Robot Learning (CoRL)*, 2023.

[11] **Xusheng Luo**, Shaojun Xu, Ruixuan Liu and Changliu Liu. "Robotic Planning under Hierarchical Temporal Logic Specifications". Workshop on *Formal Methods Techniques in Robotics Systems: Design and Control, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2023.

### Preprints

[12] **Xusheng Luo**, Changliu Liu, "Simultaneous Task Allocation and Planning for Multi-Robots under Hierarchical Temporal Logic Specifications". *arXiv:2401.04003*, 2024 (*IEEE Transactions on Robotics*, revise and resubmit).

[13] **Xusheng Luo**, Tianhao Wei, Simin Liu, Ziwei Wang, Luis Mattei-Mendez, Taylor Loper, Joshua Neighbor, Casidhe Hutchison, Changliu Liu, "Certifying Robustness of Learning-Based Keypoint Detection and Pose Estimation Methods". *arXiv:2408.00117*, 2024 (*ACM Transaction on Cyber-Physical Systems*, under review).

[14] Shaojun Xu*, **Xusheng Luo***, Yutong Huang, Letian Leng, Ruixuan Liu, Changliu Liu, "Scaling Up Natural Language Understanding for Multi-Robots Through the Lens of Hierarchy". *arXiv:2408.08188*, 2024 (*IEEE Robotics and Automation Letters*, under review).

[15] Tianhao Wei, Luca Marzari, Kai Yun, Hanjiang Hu, Peizhi Niu, **Xusheng Luo** and Changliu Liu. "ModelVerification.jl: a Comprehensive Toolbox for Formally Verifying Deep Neural Networks". *arXiv:2407.01639*, 2024.

[16] Ruixuan Liu, Alan Chen, **Xusheng Luo** and Changliu Liu. "Simulation-aided Learning from Demonstration for Robotic LEGO Construction". *arXiv:2309.11010*, 2023.

## AWARDS AND HONORS

- Cyber-Physical System (CPS) Rising Stars (45/220) *2024*
- Student Travel Grant for the IEEE 59th Conference on Decision and Control *2020*
- Outstanding Graduate of Harbin Institute of Technology *2015, 2017*
- The Samsung Scholarship *2016*
- Summer School Scholarship at Technion in Israel *2016*
- National Endeavor Fellowship *2012, 2014*

## TALKS

### Refereed Conference and Workshop Presentations

- Integrating Autonomy with Formal Methods
  – Workshop on *2024 CPS Rising Stars* *May. 2024*

- Obtaining Hierarchy from Human Instructions: an LLMs-based Approach
  – Workshop on *Learning Effective Abstractions for Planning, Conference on Robot Learning (CoRL)* *Nov. 2023*
- Robotic Planning under Hierarchical Temporal Logic Specifications
  – Workshop on *Formal Methods Techniques in Robotics Systems: Design and Control, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* *Oct. 2023*
- Socially-aware Robot Planning via Bandit Human Feedback.
  – In *2020 ACM/IEEE 11th International Conference on Cyber-Physical Systems (ICCPS)* *April 2020*
- Transfer Planning for Temporal Logic Tasks.
  – In *2019 IEEE 58th Conference on Decision and Control (CDC)* *Dec. 2019*

**Invited Talks**

- Scalable Control Synthesis for Multi-Robot Systems under Temporal Logic Specifications
  – *Intelligent Control Lab* at CMU *Nov. 2022*
  – *Reliable Autonomous System Lab* at MIT *Aug. 2021*

## PROFESSIONAL SERVICE

**Paper Review**

- *Journals:*
  – IEEE Transactions on Robotics (T-RO) *2022, 2023, 2024*
  – IEEE Control Systems Letters (L-CSS) *2024*
  – IEEE Transactions on Automation Science and Engineering (T-ASE) *2021*
  – IEEE Transactions on Control of Network Systems (T-CNS) *2019, 2021*
- *Conferences:*
  – Robotics: Science and Systems *2024*
  – IEEE International Conference on Robotics and Automation (ICRA) *2024*
  – AACC/IFAC Conference on Modeling, Estimation and Control Conference (MECC) *2024*
  – IEEE International Conference on Intelligent Robots and Systems (IROS) *2022*
  – IEEE American Control Conference (ACC) *2022*
  – IEEE International Conference on Ubiquitous Robots (UR) *2021*
  – ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS) *2019, 2020*

## TEACHING EXPERIENCE

**Teaching Assisant**, *Harbin Institute of Technology*

- MATLAB in Engineering. *Fall 2016*

**Guest Lecturer**, *Carnegie Mellon University*

- On the Application of Formal Methods to Robotics.
  – In Course "Provably Safe Robotics" taught by Dr. Changliu Liu *Spring 2024*

## MENTORING

- Zhongqi Wei, Ph.D. student in Mechanical Engineering at CMU
- Yutong Huang, Master in Mechanical Engineering at CMU
- Letian Leng, Master in Mechanical Engineering at CMU
- Alan Chan, Highschool Student at Westlake Highschool
- Shaojun Xu, visiting undergrad at Zhejiang University. Next: Ph.D. student at Tsinghua University

- Shiqi Sun, Master in Mechanical Engineering at Duke. Next: Ph.D. student at the Chinese University of Hong Kong
- Yijie Zhou, Master in Mechanical Engineering at Duke. Next: Ph.D. student at Northwestern Polytechnical University
- Shuo Yang, visiting undergrad at Shanghai Jiao Tong University. Next: Ph.D. student at University of Pennsylvania

## REFERENCES


- Michael M. Zavlanos
  Yoh Family Professor, Dept. of Mechanical Engineering and Materials Science, Duke University
  417 Wilkinson Building, Pratt School of Engineering, 534 Research Dr, Durham, NC 27708
  mz61@duke.edu

- Changliu Liu
  Assistant professor, Robotics Institute, Carnegie Mellon University
  4525 Newell-Simon Hall, 5000 Forbes Avenue, Pittsburgh, PA 15213
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- Ioannis (Yiannis) Kantaros
  Assistant Professor, Dept. of Electrical and Systems Engineering, Washington University in St. Louis (WashU)
  3039 McKelvey School of Engineering, One Brookings Drive, St. Louis, MO, 63130
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