ZEHUI LU

Email: lu846@purdue.edu **GitHub:** github.com/zehuilu **LinkedIn:** linkedin.com/in/zehui-lu-15905b209
Personal Website: https://zehuilu.github.io/
Google Scholar: https://scholar.google.com/citations?user=j73ZnVYAAAAJ&hl=en&oi=ao

EDUCATION

Purdue University West Lafayette, IN, USA
Ph.D. in Aeronautical and Astronautical Engineering 08/2020 – 08/2024
Advisor: Dr. Shaoshuai Mou
GPA: 3.97/4

University of Michigan Ann Arbor, MI, USA
M.S.E. in Mechanical Engineering 09/2018 – 12/2019
Advisor: Dr. Ram Vasudevan
GPA: 3.88/4

University of Wales Trinity Saint David Swansea, Wales, UK
B.E. in Automotive Engineering 09/2015 – 08/2018
GPA: 4/4 (First Class Honours)

Wuhan University of Technology Wuhan, Hubei Province, China
B.S.E in Automotive Engineering 09/2014 – 06/2018
GPA: 3.8/4

EMPLOYMENT

Staff Motion Planning & Controls Engineer, Autonomous Driving
Lucid Motors, San Francisco Bay Area, CA, USA 01/2026 – Present

Visiting Faculty
Mitsubishi Electric Research Laboratories, Cambridge, MA, USA 05/2025 – 08/2025
- Robust real-time motion planning, control, and system design for servo motion systems under uncertainty
- Program C/C++ code for high-level motion planning and low-level field-oriented control/vector current control in Simulink/dSPACE and conduct hardware validation with dSPACE SCALEXIO
- Research on automatic motor design optimization via electromagnetic finite element analysis
- Data analysis and machine learning-based surrogate model for computational electromagnetics
- Develop robust path planning, motion planning, and control algorithm for truck autonomous docking with perception uncertainty

Visiting Assistant Professor
Purdue University, School of Aeronautics and Astronautics, West Lafayette, IN, USA 08/2024 – 12/2025
- Proposal writing
- Mentor PhD students
- Perform research on Li-ion battery fast charging, control-theoretic learning, robot motion planning, etc.
- Instructor, AAE 364: Control Systems Analysis, AAE 203: Aeromechanics I

Technical Consultant
Mitsubishi Electric Research Laboratories, Cambridge, MA, USA 08/2024 – 03/2025, 08/2025 – 03/2026

Research Intern
Mitsubishi Electric Research Laboratories, Cambridge, MA, USA 08/2023 – 05/2024
Supervisor: Dr. Yebin Wang
- Real-time constrained servo motion planning and control for motors
- Mobile manipulator robust motion planning and low-level motor control given perception uncertainty
- Differentiable dynamics modeling of mobile manipulators for integrated motion planning and motor design

- Published one conference and two journal papers as first author; filed two US patent applications

Research Engineer
UM Ford Center for Autonomous Vehicles, University of Michigan, Ann Arbor, MI, USA 01/2020 – 07/2020
Supervisor: Dr. Ram Vasudevan
- Proposed a fast collision-aware inverse kinematic solver for manipulators (ROS, C++)
- Built a communication pipeline for a bipedal walking robot Agility Cassie (UDP, Simulink)
- Designed a controller for safe and aggressive quadrotor flights (Python, MATLAB, TCP/IP) YouTube
- Developed a trajectory tracking controller and an interface for a quadrotor Parrot Mambo (Python, asyncio, customized UDP protocol) GitHub

AWARDS & COMPETITIONS

Best Student Paper, "Multi-Robot Formation Control with Human-on-the-loop
IEEE International Conference on Industrial Cyber-Physical Systems (ICPS), 2024
- As research mentor to the first author Tianyu Zhou; Tianyu Zhou's first-ever paper

Second place, Quanser's Self-Driving Competition
American Control Conference, 2023
- As team manager, led the design and implementation of a self-driving car framework using ROS, integrating SLAM, traffic sign detection, road segmentation, navigation, path planning, and motion planning; deployed the system on a Quanser car with NVIDIA Jetson TX2

Hsu Lo Fellowship
Purdue University, 2023
- Awarded for Ph.D. students with Chinese heritage who have passed qualifying exams and demonstrate outstanding research and academic performance

Third runner-up, DoD's challenge "AI Tracks at Sea"
The Naval Information Warfare Center Pacific, Office of Naval Research, U.S. Department of Defense, 2021
- As team manager, led the design of a CNN-based machine learning algorithm to automatically generate georeferenced tracks of maritime vessel traffic based on a monocular camera mounted on the ego vessel

Ross Fellowship
Purdue University, 2020
- Awarded for academic excellence, including four years of salary and tuition coverage

RESEARCH INTEREST

- Control-informed learning and learning-enhanced control
- Dynamics modeling, motion planning, and control for mechatronics and servo motion systems
- Differentiable dynamics modeling and robust motion planning for mobile manipulators
- Real-time, distributed optimization, control, planning, and scheduling for multi-robot systems
- Multidisciplinary system control and co-design for motors, mobile manipulators, EV, eVTOL aircraft
- Trust-aware human-multi-robot interaction and teaming
- Battery energy management
- Robust high C-rate lithium-ion battery fast charging and active thermal management
- AI-chip energy-efficient cooling control and thermal management

PUBLICATIONS & PATENTS

***: As corresponding author or research mentor (as faculty at Purdue)**

Journal

[01] Tianyu Zhou, Zihao Liang, **Zehui Lu***, and Shaoshuai Mou. "Safe Online Control-Informed Learning." IEEE Control Systems Letters, 2025.

[02] Jose D. Hoyos, Tianyu Zhou, **Zehui Lu***, and Shaoshuai Mou. "Reward-Based Collision-Free Algorithm for Trajectory Planning of Autonomous Robots." IEEE Transactions on Automation Science and Engineering, 2025. YouTube

[03] Zihao Liang, Tianyu Zhou, **Zehui Lu***, and Shaoshuai Mou. "Online Control-Informed Learning." Transactions on Machine Learning Research, 2025.

[04] **Zehui Lu**, and Yebin Wang. "A Differentiable Dynamic Modeling Approach to Integrated Motion Planning and Actuator Physical Design for Mobile Manipulators." Journal of Field Robotics, 2024. Video

[05] **Zehui Lu**, Hao Tu, Huazhen Fang, Yebin Wang, and Shaoshuai Mou. "Integrated Optimal Fast Charging and Active Thermal Management of Lithium-Ion Batteries in Extreme Ambient Temperatures." IEEE Transactions on Control Systems Technology, 2024.

[06] **Zehui Lu**, Tianpeng Zhang, and Yebin Wang. "Torque Constraint Modeling and Reference Shaping for Servo Systems." IEEE Control Systems Letters, 2024.

[07] **Zehui Lu**, Tianyu Zhou, and Shaoshuai Mou. "Real-time Multi-Robot Mission Planning in Cluttered Environment." Robotics, 2024. YouTube

[08] **Zehui Lu***, and Shaoshuai Mou. "Distributed optimization under edge agreements: A continuous-time algorithm." Systems & Control Letters, 2024.

[09] Wanxin Jin, Todd D. Murphey, **Zehui Lu**, and Shaoshuai Mou. "Learning from human directional corrections." IEEE Transactions on Robotics, 2022. YouTube

Conference

[10] Tianyu Zhou, Zihao Liang, **Zehui Lu***, and Shaoshuai Mou. "Online Intention Prediction via Control-Informed Learning." Accepted, 2026 American Control Conference.

[11] Wenjian Hao, **Zehui Lu***, Devesh Upadhyay, and Shaoshuai Mou. "Distributed Koopman Learning using Partial Trajectories for Control." Accepted, 2026 American Control Conference.

[12] **Zehui Lu**, Hao Tu, Huazhen Fang, Yebin Wang, and Shaoshuai Mou. "A Real-time High C-rate Lithium-ion Battery Fast Charging Strategy." In 2025 IEEE Conference on Control Technology and Applications (CCTA).

[13] Sidhdharth D. Sikka, **Zehui Lu***, Ayush Rai, Daniel DeLaurentis, and Shaoshuai Mou. "On Orbit Object Transportation with Spacecraft Swarms." In 2025 AIAA SciTech Forum.

[14] Min Dai, **Zehui Lu**, Na Li, and Yebin Wang. "Enhanced Agility and Safety in Mobile Manipulators through Centroidal Momentum-Based Motion Planning." In 2025 European Control Conference (ECC). Video

[15] **Zehui Lu**, Yebin Wang, Yusuke Sakamoto, and Shaoshuai Mou. "Distributed Co-Design of Motors and Motions for Robotic Manipulators." In 2024 European Control Conference (ECC).

[16] Tianyu Zhou, **Zehui Lu***, and Shaoshuai Mou. "Multi-Robot Formation Control with Human-on-the-loop." In 2024 IEEE International Conference on Industrial Cyber-Physical Systems (ICPS), **Best Student Paper**. YouTube

[17] **Zehui Lu**, and Shaoshuai Mou. "Variable Sampling MPC via Differentiable Time-Warping Function." In 2023 American Control Conference (ACC).

[18] **Zehui Lu**, Wanxin Jin, Shaoshuai Mou, and Brian DO Anderson. "Cooperative Tuning of Multi-Agent

Optimal Control Systems." In 2022 IEEE Conference on Decision and Control (CDC).

Under Review

[19] Ruixiang Wang, Wenxi Chen, **Zehui Lu***, Yan Gu, and Shaoshuai Mou. "Grounded Vision-Language Motion Planning Framework for Interactive Robot Inscription." Under Review, IEEE Transactions on Automation Science and Engineering, 2026.

[20] Tianyuan Zheng, Min Dai, **Zehui Lu**, Jingang Yi, and Yebin Wang. "Enhanced Agility and Safety in Mobile Manipulators through Uncertainty-Aware Centroidal Momentum-Based Motion Planning." Under Review, IEEE Transactions on Control Systems Technology, 2026.

[21] Jui-Te Lin, **Zehui Lu**, and Yebin Wang. "Closing the Robot Co-Design Loop: A Framework for Motors, Motions and Feedback Controller Design under Disturbances." Under Review, Journal of Artificial Intelligence for Automation, 2026.

[22] Wenjian Hao, **Zehui Lu***, Nicolas Miguel, and Shaoshuai Mou. "Control-Barrier-Function-Based Policy Adaptation in Reinforcement Learning." Under Review, IEEE Transactions on Automation Science and Engineering, 2026.

[23] Shunan Yin, **Zehui Lu***, and Shaoshuai Mou. "Trajectory Prediction via Bayesian Intention Inference under Unknown Goals and Kinematics." Under Review, IEEE Transactions on Robotics, 2025.

[24] Jose D. Hoyos, **Zehui Lu***, and Shaoshuai Mou. " Lyapunov Control of Nonlinear Systems via Taylor Series and Sum-of-Squares Optimization." Under Review, IEEE Transactions on Automatic Control, 2025.

Preprint

[25] **Zehui Lu***, and Shaoshuai Mou. "Distributed Optimization under Edge Agreement with Application in Battery Network Management." Available on arXiv.

Patent

[26] U.S. patent application filed, Systems and Methods for Joint Design of Actuators and Control for Robots

[27] U.S. patent application filed, Systems and Methods for Controlling a Motor with Dynamically Parameterized Trajectory Estimation

MENTORING EXPERIENCE

[1] Tianyu Zhou, PhD student at Purdue; won the Best Student Paper award at 2024 ICPS for his first-ever paper; papers published on IEEE L-CSS and ACC; research on control-informed learning solution for vision-based end-to-end autonomous driving

[2] Zihao Liang, PhD at Purdue; paper published on Transactions on Machine Learning Research; research on physics-informed efficient deep learning for autonomous driving

[3] Wenjian Hao, PhD student at Purdue; papers published and under review on ACC and IEEE T-ASE; research on computationally efficient robust motion planning and control

[4] Jose D. Hoyos, PhD student at Purdue; paper published in IEEE T-ASE; research on human-guided robot motion planning; paper under review by IEEE TAC and ECC

[5] Sidhdharth D. Sikka, PhD student at Purdue; research on space robotics with spacecraft swarms; first paper (as a PhD student) presented in 2025 AIAA SciTech Forum; preparing two papers for IEEE T-RO

[6] Shunan Yin, PhD student at Purdue; research on model-free Bayesian-based intention prediction; paper under review by IEEE T-RO

[7] Yuxuan Fang, PhD student at Purdue; research on learning-based human-multi-robot interaction; preparing a paper for IEEE T-RO

[8] Lan Shi, PhD student at Purdue; research on distributed algorithms and residential solar battery energy management

[9] Nicolas I. Miguel, PhD student at Purdue; research on safe learning-based control

[10] Ruixiang Wang, MS student at Purdue; research on AI-human-robot interaction; paper under review by IEEE T-ASE

TEACHING EXPERIENCE

Detailed teaching evaluation reports can be provided upon request.
Student comments are available on teaching evaluation reports or on personal website
https://zehuilu.github.io/Teaching/

Instructor, *Purdue University*
- AAE 203: Aeromechanics I 2025 Fall
- AAE 203: Aeromechanics I 2025 Spring

Teaching Evaluation: Median (4/5), Mean (3.51/5), Response Rate (83/91, 91.21%)
- AAE 364: Control Systems Analysis 2025 Spring

Teaching Evaluation: Median (4/5), Mean (3.67/5), Response Rate (58/62, 93.55%)
- AAE 364: Control Systems Analysis 2024 Fall

Teaching Evaluation: Median (4/5), Mean (3.57/5), Std (1.15), Response Rate (51/59, 86.44%)

Teaching Assistant, *Purdue University*
- AAE 666: Nonlinear Dynamics, Systems, And Control 2023 Spring

Robotics Open-Source Tutorials
[1] A tutorial on CasADi with CPP (C++, CMake) GitHub
[2] A tutorial on TCP/IP and UDP communications (Python, MATLAB) GitHub
[3] A tutorial on Qualisys Motion Capture System (Python, MATLAB) GitHub
[4] An implementation of Consensus-Based Bundle Algorithm for multi-robot scheduling (Python) GitHub
[5] A genetic algorithm to solve collision-aware traveling salesman problems (C++) GitHub
[6] A quadrotor trajectory tracking controller and interface to motion capture systems (Python) GitHub
[7] A path-finding algorithm implementation for Lazy Theta* (C++, Python) GitHub
[8] A path-finding algorithm implementation for A* (C++, Python) GitHub
[9] Solution to Quanser's Self-Driving Competition: a self-driving car framework using ROS, integrating SLAM, traffic sign detection, road segmentation, navigation, path planning, and motion planning (working on public release)

PROFESSIONAL SERVICE

- **Session Chair:** ICPS Engineering I, 2021 IEEE International Conference on Industrial Cyber-Physical Systems
- **Session Co-Chair:** Reinforcement Learning II (RI Session), 2022 American Control Conference
- **Moderator:** 2021 ICON Outstanding Student Research Symposium, Purdue University
- **Session Host & Student Volunteer:** 2021 American Control Conference (online)
- **Stenographer:** The Summit on Trusted Autonomy Research & Technology, Purdue University & Office of the Undersecretary of Defense for Research and Engineering, U.S. Department of Defense, 2022.
- **Reviewer**
  Journal (78 reviews in total)
  - IEEE Transactions on Robotics
  - IEEE Robotics and Automation Letters
  - IEEE Transactions on Control Systems Technology

- IEEE Transactions on Control of Network Systems
- IEEE Transactions on Automation Science and Engineering
- IEEE Control Systems Letters
- IEEE Transactions on Power Electronics
- IEEE Transactions on Components, Packaging and Manufacturing Technology
- IEEE Transactions on Aerospace and Electronic Systems
- IEEE Transactions on Vehicular Technology
- IEEE Transactions on Human-Machine Systems
- Elsevier Systems & Control Letters
- Springer Autonomous Robots
- ASME Journal of Dynamic Systems, Measurement, and Control
- ASME Letters in Dynamic Systems and Control
- ASME Journal of Autonomous Vehicles and Systems
- AIAA Journal of Aerospace Information Systems
- Nature Communications Engineering

Conference (70 reviews in total)

- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE Conference on Decision and Control (CDC)
- American Control Conference (ACC)
- European Control Conference (ECC)
- IEEE Conference on Control Technology and Applications (CCTA)
- IEEE International Conference on Automation Science and Engineering (CASE)
- IEEE International Conference on Control & Automation (ICCA)
- IEEE International Conference on Industrial Cyber-Physical Systems (ICPS)
- IEEE International Conference on Human-Machine Systems (ICHMS)
- The International Symposium on Distributed Autonomous Robotic Systems (DARS)

FUNDING

[01] Submitted an NSF STTR proposal
[02] Submitted an internal proposal about AI for robot swarm
[03] Submitted an internal proposal for space robotics
[04] Submitted an internal proposal for Li-ion battery fast charging
[05] Contributed to a proposal for Air Force Research Laboratory M-FAT initiative
[06] Preparing an NSF DCSD proposal
[07] Contributed to a funded proposal ($13M USD in total) for a congressional task managed by Office of Naval Research, collaboration with Saab Inc., 05/2024 – Present
[08] Contributed to a funded proposal ($550K USD in total) for DEVCOM Analysis Center, Army Research Laboratory, DoD, 01/2023 – 08/2023
[09] Contributed to a funded proposal ($8M USD in total) for NASA University Leadership Initiative (ULI), 08/2020 – 11/2021
[10] Contributed to a funded proposal for Saab, Inc., 12/2021 – 12/2022
[11] Graduate Research Assistantship, funded by Northrop Grumman Corporation, 08/2020 – 11/2021
[12] Hsu Lo Fellowship, Purdue University, 06/2023 – 08/2023
[13] 2023 American Control Conference (ACC) Student Travel Grant, 03/2023

[14] Ross Fellowship, Purdue University, 08/2020

ACADEMIC PRESENTATIONS

[01] Poster presentation, “Online Control-Informed Learning”, The 11th Midwest Workshop on Control and Game Theory, University of Illinois Urbana-Champaign, 2025.

[02] Poster presentation, “Torque Constraint Modeling and Reference Shaping for Servo Systems”, The 11th Midwest Workshop on Control and Game Theory, University of Illinois Urbana-Champaign, 2025.

[03] Teaching seminar, “A Fundamental Principle in Kinematics: Basic Kinematic Equation”, School of Aeronautics and Astronautics, Purdue University, 2024.

[04] Technical talk, “Variable Sampling MPC via Differentiable Time-Warping Function”, In 2023 American Control Conference, San Diego, CA, USA.

[05] Technical talk, “Distributed Real-time Multi-Agent Mission Planning in Cluttered Environment”, Inaugural ICON Student Conference, Purdue University, 2023.

[06] Invited technical talk, “Distributed Real-time Multi-Agent Mission Planning in Cluttered Environment”, Autonomous Control & Information Technology Institute, North Carolina A & T State University, 2022.

[07] Technical talk, “Cooperative Tuning of Optimal Control Systems”, In 2022 IEEE Conference on Decision and Control, Cancún, Mexico.

[08] Technical talk, “Experiments on Learning from Human Directional Corrections”, Second Workshop on Human-Autonomy Interaction and Integration, 2022 American Control Conference, Atlanta, GA, USA.

[09] Technical talk, “Distributed Real-time Multi-Agent Mission Planning in Cluttered Environment”, Secure and Safe Assured Autonomy 2022 Annual Meeting, NASA University Leadership Initiative.

[10] Technical poster, “Distributed Real-time Multi-Agent Mission Planning in Cluttered Environment”, 2022 Innovation Tech Showcase and Smart Cities Event, Purdue Research Foundation & College of Engineering.

[11] Technical talk & experiment demo, “Distributed Real-time Multi-Agent Mission Planning in Cluttered Environment”, 2021 Northrop Grumman Corporation University Research Symposium.

FEATURED SKILLS

- **Programming Languages:** C/C++, Python, MATLAB, Julia
- **Operating Systems:** ROS, Linux
- **Motion Capture System:** layout setup, calibration, real-time data-streaming (PhaseSpace, Qualisys, Vicon)
- **Others:** CMake, Git, Bash, Simulink, Gazebo, Numba, Eigen, LAPACK, IPOPT, CasADi, dSPACE, C code auto-generation, multithreading, concurrent