Zili Wang

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Education

Boston University *Boston*
Ph.D. in Systems Engineering, GPA: 3.76/4.0 Expected Dec 2024

Columbia University *New York*
MS in Mechanical Engineering, GPA: 3.78/4.0 Sep 2017 - Dec 2018

University of Southampton *Southampton, UK*
B.Eng. in Electromechanical Engineering, GPA: 3.83/4.0 Sep 2013 - Jun 2016

Selected Research Projects

Controller Synthesis with Neural Network Verification *Boston University*
Advisors: Prof. Roberto Tron and Prof. Sean Andersson Oct 2022 - Present

- Constructed a monotonic neural network to represent Lyapunov function in PyTorch
- Synthesized controllers with stability guarantee using Mixed Integer Linear Program
- Demonstrated 75% shorter training time than an existing method, ongoing work includes concurrent region of attraction search

Task-Driven Robot Navigation in Structured Environments *Boston University*
Advisors: Prof. Roberto Tron and Prof. Sean Andersson Jun 2021 - Present

- Trained a deep neural network to predict multi-task semantic information from non-semantic measurements in TensorFlow
- Provided a complete and novel search strategy that combines data-driven estimation and traditional motion planning
- Compared with a frontier-based exploration baseline, mean travelled path length could be shortened by 60%
- Mentored a Master student to run Gazebo simulation and experiments using Robotic Operation System (ROS)

Simultaneous Localization and Mapping (SLAM) for Resource Constrained Robots *Boston University*
Advisors: Prof. Roberto Tron and Prof. Sean Andersson Jan 2021 - May 2021

- Evaluated a 2D LiDAR reconstruction algorithm in ROS
- Trained a deep neural network to predict relative pose and detect loop closure given two keyframe measurements in TensorFlow, where the dataset was collected from ROS
- Applied Pose Graph Optimization (from GTSAM, a factor graph library) to correct pose estimation

Bearing-based Formation Control *Boston University*
Advisors: Prof. Roberto Tron and Prof. Sean Andersson Sep 2020 - Jan 2021

- Simplified sufficient conditions on global convergence of a bearing-based formation controller
- Formulated an optimization problem to automatically tune the controller to minimize trajectory lengths
- Generalized the new optimizer to new initial conditions and topologies
- Compared with cases before optimization, travelled path could be straightened by 16% (bearing-only case) and 66% (bearing+range case)

Multi-point Tracking for Rehabilitative Trunk Support Trainer *Columbia University*
Advisor: Prof. Sunil Agrawal Feb 2018 - Aug 2018

- Designed and implemented a cheaper and more portable trunk movement tracking system with HTC Vive Tracker, showed reasonably low translation and rotation tracking errors
- Applied object detection deep model YOLO with depth camera images to localize cable attachment points on the trunk trainer

Semi-automatic Micropipette Aspiration of Single Biological Cells *Nanyang Technological University*
Advisor: Prof. Justin Dauwels Oct 2016 - Apr 2017

- Validated a setup to analyze mechanical properties of white blood cells
- Built a XY translation stage for the micropipette aspiration process and developed a GUI control monitor in MATLAB
- Applied image processing techniques, K-means and Kalman filter to detect, segment and track deformed cells

Teaching Experience

Teaching Assistant: ME302 Engineering Mechanics II *Boston University*
Instructor: Prof. Nagem Raymond Spring 2022

- Held weekly discussion sections (group of 20 students) and office hours
- Worked with the other teaching assistants to design and hold labs (groups of 90 students), grade lab reports and exams

Teaching Assistant: EK381 Probability, Statistics, and Data Science for Engineers *Boston University*
Instructor: Prof. Vivek Goyal Spring 2021

- Held weekly discussion sections (group of 20 students) and office hours
- Worked with the other teaching assistants to proctor and grade exams

Industrial Experience

Automation and Robotics Researcher/Engineer Intern *Siemens Corporation*
Group: Automation Runtime Systems Aug 2018 - Dec 2018

- Completed a study in edge computing technologies
- Collected sensor data to cloud system, and test motion planning algorithms in the agricultural robot system
- Worked in a group of five people

Vision, Learning and Control Group Research Intern *University of Southampton*
Advisor: Prof. Bing Chu Jun 2015 - Sep 2015

- Designed a prototype Cascaded H-Bridge inverter in EAGLE and constructed the inverter hardware
- Built the mathematical model of inverter dynamics in Simulink
- Collaborated with two faculty, a visiting scholar and a Ph.D. student

Publications & Posters

[1] **Z. Wang**, D. Threatt, S. B. Andersson, and R. Tron. "Do More with Less: Single-Model, Multi-Goal Architectures for Resource-Constrained Robots." *2023 International Conference on Intelligent Robots (IROS)*, 2023 (submitted).

[2] **Z. Wang**, S. B. Andersson and R. Tron. "Bearing-Based Formation Control with Optimal Motion Trajectory." In *2022 American control conference (ACC).*, pp. 486-493, Jun 2022. [Link]

[3] **Z. Wang**, S. B. Andersson, and R. Tron. "Task-Driven Navigation: Leveraging Experience using Deep Learning." In *2022 ICRA Workshop on Robotic Perception and Mapping: Emerging Techniques*, May 2022. [Link]

Honors & Awards

Grace Hopper Celebration Travel Award, Boston University Apr 2023
Grace Hopper Celebration Remote Award, Boston University Apr 2022
Travel Award, American Control Conference Apr 2022
Distinguished Fellowship, Boston University Sep 2019
First Class Honor, University of Southampton Jun 2016
Zepler Award (Top Student in Electromechanical Engineering), University of Southampton Sep 2015

Leadership

Robotics Lab Social Lead, Boston University Sep 2022 - present
CISE Seminar Student Host, Boston University Sep 2021 - present
Robotics Lab Order Manager, Boston University May 2021 - Sep 2022
Mentor, Greater Boston Research Opportunities for Young Women Program Jun 2022 - Aug 2022
Reviewer, IEEE ICRA/ACC/IROS/CDC April 2022 - May 2023
Course (ME570 Robot Motion Planning) Mentor, Boston University Sep 2020 - Dec 2022
Mentor, Research in Science & Engineering Program (RISE) Program Jun 2021 - Aug 2021

Skills

Technical MATLAB, C/C++, Python, TensorFlow, PyTorch, ROS, Simulink, Multisim, LabVIEW
Languages Chinese (Native), English (Fluent), French (Beginner)
Hobbies Painting, Reading, Chinese traditional instrument Guqin, Photography and Ice skating