

Tianchen Ji

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Research interest: Robot Perception; Sensor Fusion; Machine Learning; Motion Tracking; Safe Autonomy

EDUCATION

Ph.D., University of Illinois at Urbana-Champaign Electrical and Computer Engineering, Advisor: Katherine Driggs-Campbell	2019–2024
B.S., Xi'an Jiaotong University Electrical Engineering, GPA: 92.7/100	2015–2019
Visiting Student, University of California, Berkeley Electrical Engineering and Computer Sciences, GPA: 3.95/4.00	2017–2018

SELECTED PUBLICATIONS

- An Attentional Recurrent Neural Network for Occlusion-Aware Proactive Anomaly Detection in Field Robot Navigation**
Andre Schreiber, **Tianchen Ji**, D. Livingston McPherson, Katherine Driggs-Campbell
IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), 2023.
- Structural Attention-based Recurrent Variational Autoencoder for Highway Vehicle Anomaly Detection**
Neeloy Chakraborty, Aamir Hasan*, Shuijing Liu*, **Tianchen Ji***, Weihang Liang, D. Livingston McPherson, Katherine Driggs-Campbell
International Conference on Autonomous Agents and Multiagent Systems (**AAMAS**), 2023.
- Proactive Anomaly Detection for Robot Navigation with Multi-Sensor Fusion**
Tianchen Ji, Arun Narenthiran Sivakumar, Girish Chowdhary, Katherine Driggs-Campbell
IEEE Robotics and Automation Letters (**RA-L**), 2022.
- Traversing Supervisor Problem: An Approximately Optimal Approach to Multi-Robot Assistance**
Tianchen Ji, Roy Dong, Katherine Driggs-Campbell
Robotics: Science and Systems (**RSS**), 2022.
- Robust Output Feedback MPC with Reduced Conservatism under Ellipsoidal Uncertainty**
Tianchen Ji, Junyi Geng, Katherine Driggs-Campbell
IEEE Conference on Decision and Control (**CDC**), 2022.
- Multi-Modal Anomaly Detection for Unstructured and Uncertain Environments**
Tianchen Ji, Sri Theja Vuppala, Girish Chowdhary, Katherine Driggs-Campbell
Conference on Robot Learning (**CoRL**), 2020.
- Online Monitoring for Safe Pedestrian-Vehicle Interactions**
Peter Du, Zhe Huang*, Tianqi Liu*, **Tianchen Ji***, Ke Xu*, Qichao Gao*, Hussein Sibai, Katherine Driggs-Campbell, Sayan Mitra
IEEE International Conference on Intelligent Transportation Systems (**ITSC**), 2020.

SELECTED RESEARCH PROJECTS

Deep Anomaly Detection for Robot Navigation	2020–Now
<ul style="list-style-type: none">– Proposed a deep camera-lidar fusion approach for real time failure detection of mobile robots.– Proposed a novel discriminative model for pattern recognition, termed Supervised Variational Autoencoder.– Validated the effectiveness of the network in both offline dataset and online operation of field robots.– The proposed network is able to predict future robot failures with higher accuracy than existing approaches in highly uncertain environments.	

Multi-Robot Assistance in Uncertain Environments

2021–2022

- Formulated the human supervision of a multi-robot system as a graph traversal problem.
- Provided an approximately optimal solution to the assistance problem based on the traveling salesman problem.
- The task completion time of the human-robot team decreased by $\sim 5\%$ compared to the baselines.

Online Monitoring for Safe Pedestrian-Vehicle Interactions

2019–2020

- Designed a real time monitoring system to provide safety guarantees for autonomous vehicles among pedestrians.
- Implemented the system in both simulation and real world on a Polaris Gem electric vehicle.

WORK EXPERIENCE

Meta

Redmond, WA

Research Scientist Intern

05/2023–12/2023

- Designed and built a recurrent neural network for hand motion tracking on Meta Quest 3, which achieved more than 2X improvement over the initial heuristic-based Plan of Record in terms of the tracking accuracy.
- Created and landed the machine learning pipeline, including dataset generation, model training, and evaluation.
- Optimized and deployed the trained TorchScript model on VR headsets for real-time execution at 100 Hz.

SenseTime

San Jose, CA

Research Intern

05/2022–08/2022

- Designed and built deep learning models for image enhancement in raw image pipelines.
- Designed and built lightweight models based on RAISR with comparable image enhancement performance to deep neural networks on mobile devices.

Autowise.ai

Shanghai, China

Software Engineer Intern

06/2019–08/2019

- Optimized and benchmarked the control module of autonomous vehicles, focusing on model predictive control.
- The run time efficiency of the improved control module increased by 400% compared to the previous version.

TEACHING

- **Head Teaching Assistant** at University of Illinois at Urbana-Champaign Spring 2022
Principles of Safe Autonomy (ECE 484)
- **Teaching Assistant** at University of Illinois at Urbana-Champaign Fall 2021
Control System Theory and Design (ECE 515)

SKILLS

- **Languages:** Python, C++, Matlab, HTML, L^AT_EX
- **Packages & Tools:** PyTorch, OpenCV, NumPy, SciPy, Pandas, ROS, Gazebo, Git, WordPress

SERVICE

- **Journal and Conference Reviewer:** TNNLS, RA-L, IROS, ITSC, CDC
- **Web and Media Chair:** Coordinated Science Laboratory Student Conference (CSLSC), 2021

SELECTED AWARDS AND SCHOLARSHIPS

- Conference Presentation Award, University of Illinois at Urbana-Champaign 2020
- National Scholarship, Xi'an Jiaotong University 2016–2017

SELECTED COURSES

Machine Perception, Learning-based Robotics, Meta-learning, Pattern Recognition, Computer Vision, IoT Algorithms, MDPs and Reinforcement Learning, Random Processes, Optimization, Control System Theory and Design