

# Tianchen Ji

📧 tianchenji.github.io | ✉ tj12@illinois.edu | ☎ 217-898-8562 | 📍 CSL 268, Urbana, IL 61801

**Research interest:** Robot Perception; Sensor Fusion; Safe Autonomy; Machine Learning; Automated Cars

## EDUCATION

---

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

## PUBLICATIONS

---

- 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.
- Combining Model-Based Controllers and Generative Adversarial Imitation Learning for Traffic Simulation**  
Haonan Chen, **Tianchen Ji**, Shuijing Liu, Katherine Driggs-Campbell  
IEEE International Conference on Intelligent Transportation Systems (**ITSC**), 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.
- Examining Audio Communication Mechanisms for Supervising Fleets of Agricultural Robots**  
Abhi Kamboj, **Tianchen Ji**, Katherine Driggs-Campbell  
IEEE International Conference on Robot and Human Interactive Communication (**RO-MAN**), 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.

## RESEARCH PROJECTS

---

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

## 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.

## Hybrid Rule-Based and Data-Driven Driver Behavior Modeling

2021–2022

- Proposed a hybrid model that combines a neural network and rule-based controllers for driver modeling.
- Adopted the Reward Augmented Generative Adversarial Imitation Learning to train the model end to end.
- The proposed model produces safer driving behaviors than pure data-driven methods and more realistic driving behaviors than pure rule-based methods.

## 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

---

### SenseTime

San Jose, CA

Research Intern

Summer 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

Summer 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<sup>A</sup>T<sub>E</sub>X
- **Packages:** PyTorch, OpenCV, NumPy, SciPy
- **Tools:** ROS, Gazebo, Git, WordPress

## SERVICE

---

- **Journal and Conference Reviewer:** TNNLS, ITSC'22, ITSC'21, ITSC'20, IROS'20, CDC'20
- **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, Pattern Recognition, Computer Vision, MDPs and Reinforcement Learning, Random Processes, Optimization, Control System Theory and Design