

# Yi-Chen Zhang

## Contact Information

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## Work Experience

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### Isuzu Technical Center of America, Inc. (ITCA)

Lead Engineer, Autonomous & Artificial Intelligence – Advanced Engineering

Jan 2021 – Present

Jun 2024 – Present

- Deployment of perception components on TensorRT:  
FCOS object detection, FCOS segmentation, SORT tracker, and SCNN lane detection.
- Research on Transformer-based perception architectures.
- Research on manifold (matrix Lie group) methods for autonomous vehicle localization.

Sr. Engineer, Autonomous & Artificial Intelligence – Advanced Engineering

Jan 2022 – May 2024

- Led development of perception components: object detection, tracking, and visualization.  
Implemented ROS visualization for MVXNet: MVXNet demo.
- Developed structure-aware single-stage 3D object detection.
- Developed LiDAR object detection and tracking: 3D-LiDAR multi-object tracking.
- Developed multi-object tracking: Multi-object tracking demo.
- Developed localization components: wheel odometry, GNSS/IMU processing, and Fast-LOAM.  
Developed Visual SLAM: Visual SLAM demo.
- Acting scrum master; contributed to software architecture design and stack integration.
- Provided technical mentorship and supervised interns.

Autonomous Driving Engineer – Powertrain and Vehicle R&D

Jan 2021 – Dec 2021

- Developed core sensor components for centralized sensor fusion (cameras and LiDARs).
- Curb detection using 3D LiDAR point clouds: Moriyama dataset demo.
- Object detection using 3D LiDAR point clouds: Moriyama dataset demo.
- Point cloud 3D map construction using Fast LOAM and OctoMap: Moriyama dataset demo.
- Software stack management with release tags and version control via git submodules.
- Component integration and testing in simulation and on the real truck.

### APTIV

Algorithm Engineer – Scene Perception Algorithm Team

Jul 2018 – Jan 2021

Oct 2020 – Jan 2021

- Developed unit test cases in vectorCAST for perception components.

Algorithm Engineer – Fused Road Model (FRM) Team

Sep 2018 – Sep 2020

- Developed fusion algorithms for object trail processing:  
Road shape estimation and lane centerline prediction.
- Designed FRM state machine and mode manager.
- Implemented error handling for vision, object fusion, and vehicle state inputs.
- Developed FRM analysis pipeline and dashboard.
- Coverity static analysis (AUTOSAR and MISRA C++); developed unit tests in Google Test.

Algorithm Engineer – Autonomous Driving Behavior Team

Jul 2018 – Aug 2018

- Developed prediction and cost function algorithm for cooperative social behavior.
- Contributed to Ottomatika code migration from urban pilot to highway pilot.

## Technical Skills

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- **Programming Languages:** C++ (advanced), Python (advanced)
- **Robotics & Middleware:** ROS 2 (custom packages, ament/CMake, rviz, rosbag workflows)
- **Model Deployment & Acceleration:** TensorRT (engine build, ONNX import, C++/Python inference), CUDA

- **Computer Vision & 3D Perception:** OpenCV, Point Cloud Library (PCL), Ceres Solver, g2o
- **Machine Learning Frameworks:** PyTorch, ONNX ecosystem
- **Operating Systems:** Linux/Unix (extensive experience with Ubuntu, shell and system commands)
- **Software Quality & Standards:** AUTOSAR C++, MISRA C++, CERT C++ static analysis and compliance
- **Testing & Benchmarking:** Google Test, pytest, Google Benchmark
- **High-Performance Computing:** HPC clusters using SLURM
- **Documentation:** L<sup>A</sup>T<sub>E</sub>X, TikZ
- **Build & Tooling:** CMake, colcon, git

## Publications

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1. **Zhang, Y.-C.** (2025+) *Error State Kalman Filter on Matrix Lie Group*. preprint.
2. Zhang, W., Yu, W., Jia, Q., and **Zhang, Y.-C.** (2022) *Exploration and Sweeping for Autonomous Sweeper Truck*. Isuzu Technical Journal **134**, 42-51.
3. **Zhang, Y.-C.** (2021) *Road Geometry Estimation Using Vehicle Trails: A Linear Mixed Model Approach*. Journal of Intelligent Transportation Systems **27**, 127-144.
4. **Zhang, Y.-C.** and Sakhnenko, L. (2019) *The Naive Bayes Classifier for Functional Data*. Statistics & Probability Letters **152**, 137-146.
5. Chiou, J.-M., **Zhang, Y.-C.**, Chen, W.-H., and Chang, C.-W. (2014) *A Functional Data Approach to Missing Value Imputation and Outlier Detection for Traffic Flow Data*. Transportmetrica B: Transport Dynamics **2**, 106-129.
6. Fan, T.-H., Wang, Y.-F., and **Zhang, Y.-C.** (2014) *Bayesian Model Selection in Linear Mixed Effects Models with Autoregressive( $p$ ) Errors Using Mixture Priors*. Journal of Applied Statistics **41**, 1814-1829.

## Research Talks

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- Matrix Lie Theory for the Roboticist (slides)  
National Central University, Taiwan, February 2025  
National Taiwan University, Taiwan, February 2025
- Road Geometry Estimation Using Vehicle Trails: A Linear Mixed Model Approach (slides)  
National Central University, Taiwan, April 2022

## Education

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|   |                     |
|---|---------------------|
| <b>Ph.D., Department of Statistics and Probability</b>                            | Aug 2013 – Jun 2018 |
| Michigan State University, East Lansing, MI                                       |                     |
| Advisor: Dr. Lyudmila Sakhnenko   |                     |
| Dissertation: Functional Data Analysis with Application to Traffic Flow Data      |                     |
| <br>  |                     |
| <b>M.S., Graduate Institute of Statistics</b>                                     | Sep 2007 – Jun 2009 |
| National Central University, Taiwan   |                     |
| Advisor: Dr. Tsai-Hung Fan  |                     |
| Thesis: Bayesian Model Selection in Linear Mixed Effects Models with AR(1) Errors |                     |
| <br>  |                     |
| <b>B.S., Department of Mathematics</b>  | Sep 2003 – Jun 2007 |
| National Central University, Taiwan   |                     |

## Teaching

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Teaching Assistant & Instructor, Michigan State University, USA (2013–2018)

## Honors

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- College of Natural Science Dissertation Completion Fellowship, Summer 2018, Michigan State University.
- College of Natural Science Dissertation Continuation Fellowship, Summer 2017, Michigan State University.