

# YANYU ZHANG

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## EDUCATION

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- University of California, Riverside** Sep. 2021 - Present  
Ph.D. in Electrical Engineering, Mentor: Wei Ren  
**Research Interests:** Visual-Inertial Navigation, SLAM, State Estimation
- Boston University** Sep. 2019 - May 2021  
M.S. in Electrical and Computer Engineering
- University of Detroit Mercy + Beijing University of Chemistry Technology** Sep. 2015 - Jun. 2019  
B.S. in Robotics

## EXPERIENCE

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- Research Assistant** Sep. 2021 – Present  
*Cooperative Vehicle Networks Laboratory (COVEN), Mentor: Wei Ren*
- Visual-Inertial Odometry, SLAM, State estimation
- Estimation and Sensor Fusion for Autonomous Vehicles Internship** Jan. 2023 – Apr. 2023  
*Mitsubishi Electric Research Laboratories (MERL), Mentor: Karl Berntorp*
- Sensor Fusion, SLAM, State estimation
- Research Assistant** Jan. 2020 - May 2021  
*Boston University Robotics Laboratory, Mentor: John Baillieul*
- Motion planning, SLAM

## RESEARCH PROJECTS

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- NeRF-VIO: Visual-Inertial Odometry with Initialization Leveraging Neural Radiance Fields**
- Propose a novel pose estimation model to initialize the first IMU state of VINS from a prior map.
  - Define a novel loss function as the geodesic errors on  $SE(3)$  and prove the left-invariant property.
  - Propose a dual-update pipeline based on MSCKF, both captured and rendered images are used to update.
- PLK-Calib: Single-shot and Target-less LiDAR-Camera Extrinsic Calibration using Plucker Lines**
- Propose a single-shot and target-less LC calibration algorithm only using three line pairs.
  - Decouple the rotation and translation constraint, leading to a more accurate estimate.
  - Collect a LC calibration dataset with varying extrinsic parameters through the use of a mechanical arm.
- CooperSLAM: Infrastructure-less Cooperative SLAM for Interactive Multi-user AR**
- Propose a novel feature-based map alignment to minimize data transmission size between users.
  - Propose a progressive map refinement that continuously refines the map with new area explorations.
  - Decouple features with robots' state and execute a distributed pose graph optimization using GTSAM.
- Cooperative Lane Mapping using Fixed-Lag Smoothing**
- Propose a novel road-map model using Bezier curve and an adaptive map points combination algorithm.
  - Propose a loosely-coupled fixed-lag smoothing algorithm for kinematic and dynamic single track models.
  - Extend single-vehicle smoothing to a fully distributed road-map monitoring system.
- PL-CVIO: Point-Line Cooperative Visual-Inertial Odometry**
- Leverage common points-line features to improve accuracy, especially in low-textured environments.
  - Leverage neighbor's observations to bound long-term drifts of VIO.
  - IMU-to-camera intrinsic/extrinsic online calibrations, closest point line representation.

## SKILLS

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- Languages: C++, Python, MATLAB
- Frameworks/Technologies: Git, OpenCV, ROS, G2O, Ceres Solver, GTSAM, OpenVINS

## **PUBLICATIONS**

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- [1] **Y. Zhang**, J. Xu, and W. Ren, "PLK-Calib: Single-shot and Target-less LiDAR-Camera Extrinsic Calibration using Plucker Lines", 2025 IEEE International Conference on Robotics and Automation (ICRA 2025). [Submitted]
- [2] **Y. Zhang**, D. Wang, J. Xu, M. Liu, P. Zhu, and W. Ren, "NeRF-VIO: Map-based Visual-Inertial Odometry with Initialization Leveraging Neural Radiance Fields", 2025 IEEE International Conference on Robotics and Automation (ICRA 2025). [Submitted]
- [3] **Y. Zhang**, H. Zhou, Y. Tsai, W. Ren, J. Chen, S. Krishnamurthy, and H. Qiu, "CooperSLAM: Infrastructure-less Cooperative SLAM for Interactive Multi-agent Augmented Reality", The 22<sup>nd</sup> USENIX Symposium on Networked Systems Design and Implementation (NSDI 2025). [Submitted]
- [4] **Y. Zhang**, B. Wu, A. Elidrissi, C. Wei, H. Zhou, J. Nguyen, J. Li, J. Xu, N. Asavisanu, R. Mo, X. Zhao, Z. Tan, G. Wu, D. Bharadia, and H. Qiu, "PUSH: Portable Universal Sensing Hub", The 18<sup>th</sup> ACM Workshop on Wireless Network Testbeds, Experimental evaluation & Characterization (WiNTECH 2024). [Submitted]
- [5] **Y. Zhang**, M. Greiff, W. Ren, and K. Berntorp, "Distributed Road-Map Monitoring Using Onboard Sensors", 2024 American Control Conference (ACC 2024).
- [6] J. Xu, P. Zhu, **Y. Zhang**, and W. Ren, "Cooperative 3-D Target State Estimation and Active Tracking", 2023 IEEE Conference on Decision and Control (CDC 2023).
- [7] **Y. Zhang**, P. Zhu, and W. Ren, "PL-CVIO: Point-Line Cooperative Visual-Inertial Odometry", 2023 IEEE Conference on Control Technology and Applications (CCTA 2023).
- [8] C. Boretti, P. Bich, **Y. Zhang** and J. Baillieul, "Visual Navigation Using Sparse Optical Flow and Time-to-Transit", 2022 IEEE International Conference on Robotics and Automation (ICRA 2022).
- [9] **Y. Zhang**, J Song, and S Li, "3D Object Detection and Tracking Using Monocular Camera in CARLA", 2021 IEEE International Conference on Electro Information Technology (EIT 2021).
- [10] **Y. Zhang** and O. Alshaykh, "5G Utility Pole Planner Using Google Street View and Mask R-CNN", 2020 IEEE International Conference on Electro Information Technology (EIT 2020).
- [11] **Y. Zhang**, X. Wang, X. Wu, W. Zhang, M. Jiang and M. Al-Khassaweneh, "Intelligent Hotel ROS-based Service Robot", 2019 IEEE International Conference on Electro Information Technology (EIT 2019).