Yun Zhang

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EDUCATION

University of California, Los Angeles (UCLA) ***Starting Sept. 2025***
Ph.D. Candidate in ***Mobility Lab*****,** advised by Professor Jiaqi Ma

University of California, Los Angeles (UCLA) ***Sep. 2021 – Expected Jun. 2025***
B.S. in ***Mathematics of Computer Science*** *and B.S. in* ***Statistics and Data Science*** Cumulative GPA: **3.823/4.0**
Honors:
- Dean's Honors List for Fall 2021/Winter/Spring/Fall 2022, Winter/Spring 2023
- Member of Upsilon Pi Epsilon, the International Honor Society for the Computing and Information Disciplines

PUBLICATION

InSPE: Rapid Evaluation of Heterogeneous Multi-Modal Infrastructure Sensor Placement
- Zhaoliang Zheng, Yun Zhang, Zonglin Meng, Johnson Liu, Xin Xia, Jiaqi Ma
- Submitted to International Conference on Computer Vision on Mar. 9th, 2025.

AgentAlign: Misalignment-Adapted Multi-Agent Perception for Resilient Inter-Agent Sensor Correlations
- Zonglin Meng, Yun Zhang, Zhaoliang Zheng, Seth Z. Zhao, Jiaqi Ma
- Submitted to International Conference on Computer Vision on Mar. 9th, 2025.

RelMap: Enhancing Online Map Construction with Class-Aware Spatial Relation and Semantic Priors
- Tianhui Cai, Yun Zhang, Zewei Zhou, Zhiyu Huang, Jiaqi Ma
- Submitted to International Conference on Computer Vision on Mar. 9th, 2025.

V2XPnP: Vehicle-to-Everything Spatio-Temporal Fusion for Multi-Agent Perception and Prediction
- Zewei Zhou, Hao Xiang, Zhaoliang Zheng, Seth Z. Zhao, Mingyue Lei, Yun Zhang, Tianhui Cai, Xinyi Liu, Johnson Liu, Maheswari Bajji, Xin Xia, Zhiyu Huang, Bolei Zhou, Jiaqi M
- Submitted to International Conference on Computer Vision on Mar. 9th, 2025.

V2X-ReaLO: An Open Online Framework and Dataset for Cooperative Perception in Reality
- Hao Xiang, Zhaoliang Zheng, Xin Xia, Seth Z. Zhao, Letian Gao, Zewei Zhou, Tianhui Cai, Yun Zhang, Jiaqi Ma
- Submitted to International Conference on Computer Vision on Mar. 9th, 2025.

RESEARCH EXPERIENCE

Mobility Lab, UCLA | Incoming PhD, *advised by Prof. Jiaqi Ma* *Mar. 2023 – Present*
- Led database creation, scenario design, and comprehensive analysis of multi-camera sensor configurations at smart intersections using **CARLA, OPENCDA,** and **ScenarioRunner** to simulate and evaluate performance in diverse environments.
- Evaluated sensor configurations for benchmarking models under various conditions, utilizing models such as **BEVFormer, SparseBEV,** and **SOLOFusion** for enhanced object detection and tracking accuracy.
- Developed a **ROS package** with detailed documentation, improving sensor system integration and functionality.
- Participated in the **U.S. DOT Intersection Safety Challenge**, developed and tested a **trajectory UI tool** to improve the accuracy of real-time vehicle and road user trajectory predictions, contributing to safer and smarter transportation solutions.

Vwani Roychowdhury's Lab, UCLA | Research Assistant, *Feb. 2023 – Dec. 2025*
- Contributed to the development of deep learning models using VGG (Visual Geometry Group) for PyHFO, a multi-window desktop application designed to provide **efficient neuro biomarkers detection** for artifact and spike classification.
- Developed and integrated the **Hilbert (HIL) detector** for HFO detection and the **Latent State (LS) detector** for spindle detection into PyHFO.

- **Enhanced detection run-time** performance by reducing processing time **50-fold** compared to state-of-the-art solutions, ensuring comparable accuracy through comprehensive validation.
- **Led model testing and benchmarking**, refining detection processes and ensuring that PyHFO's algorithms achieved optimal performance against existing solutions.

HKU Summer Research Program| Researcher*, advised by Professor Liangqiong Qu* *2024 Summer*
- Selected from over 1,800 candidates for a program with an acceptance rate of only **5.7%** (104 accepted).
- Conducted cutting-edge research on **brain tumor segmentation** using MiniGPT-4, applying Large Language Models (LLMs) to integrate MRI modalities (T1c, T1w, T2c, and FLAIR) for improved segmentation accuracy in medical imaging.
- Awarded **Best Presenter** and invited to shoot next year's **campaign video** for outstanding contributions.
- Received a **PhD offer** with a Presidential Scholarship for exceptional performance and research potential.

PROJECTS

Large-Scale CARLA Scenario Design | Sole Designer *Feb. 2024 – Mar. 2025*
- Built a **flexible data-generation tool** that allows **configurable sensor positions and parameters**, enabling scalable benchmarking for **Infrastructure-to-Infrastructure (I2I) perception**.
- **Designed and developed Infra-Set**, a large-scale dataset covering **10 intersections** with diverse **geometries, traffic densities, and environmental conditions** to evaluate **multi-modal sensor placement** in autonomous driving.
- Created a **simulation pipeline in CARLA** to test **centralized, semi-distributed, and fully distributed** sensor configurations under diverse environmental and traffic conditions.
- Simulated **heterogeneous sensor configurations** (camera & LiDAR) using the **CARLA simulator**, generating **144,000 scenario frames (2.6TB of data)** for **sensor coverage, occlusion, and object detection analysis**.

Benchmarking Infrastructure-Based Sensor Placement | Sole Developer *Sept. 2024 – Mar. 2025*
- Designed and implemented a **scalable benchmarking framework** to evaluate **multi-modal infrastructure sensor placement** in autonomous driving scenarios.
- Developed a **flexible Infrastructure Unit (IU) formulation** to systematically model sensor placements across heterogeneous urban environments.
- Integrated **LiDAR and camera sensor fusion** into a **Heterogeneous Multi-Modal (HM) Perception Framework**, improving detection accuracy in occluded environments.
- Conducted benchmarking experiments using state-of-the-art (SOTA) infrastructure-based multi-modal perceptional algorithms, resulting in a **comprehensive evaluation of infrastructure-aware perception models**.

Surrogate Metrics for Perception Evaluation | Research Assistant *Sept. 2024 – Mar. 2025*
- Assisted in **designing and implementing surrogate metrics** to quantify **sensor effectiveness** for infrastructure-based perception.
- Contributed to refining the **occlusion probability metric**, ensuring **accurate estimation of blind spots** in complex urban environments.
- Developed and tested a **ray-cast sensing model** using the **Bresenham algorithm**, improving **sensor visibility calculations**.

Multi-Agent Multi-Modal Fusion on V2X Real Dataset | Developer *Sep. 2024*
- Implemented a multi-agent multi-modal fusion framework for the V2X-Real dataset in a Vehicle-to-Vehicle (V2V) context, enhancing simulations and real-time communication for **Vehicle-to-Everything (V2X) technologies.**
- Integrated **camera data** into the existing fusion model, independently modifying critical components such as the **dataloader, loss function, and internal modules** to ensure seamless multi-modal data inclusion.
- Tested and evaluated **benchmark models** for object detection and tracking algorithms, showing significant performance improvements from the fusion of camera and LiDAR data.

- Worked on using **camera data** solely for **3D car detection**, advancing the model's capability for 3D object detection with only camera inputs.
- Introduced **noise simulation** on both **camera and LiDAR data** to enhance the model's robustness, improving its ability to handle sensor misalignment and real-world noise variability.

Multi-Modality Brain Tumor Segmentation | Independent Developer Jun. – *Aug. 2024*

- Designed and implemented an advanced brain tumor segmentation framework using **MiniGPT-4**, integrating four MRI modalities (T1c, T1n, T2, and FLAIR) to achieve a **212.3% increase in segmentation precision**.
- Adapted a **Large Language Model (LLM) for medical imaging** by integrating **BioMedClip** as a specialized visual encoder, resolving architecture conflicts and enabling synchronized bounding box generation across modalities.
- Developed a **cross-modality synchronization method** for consistent and accurate bounding box predictions across all four MRI inputs.
- Simplified the segmentation process with a **user-friendly interface**, making the framework accessible to medical professionals without machine learning expertise.

Model Design & Training Optimization for Map Generation | Research Contributor *Jan. 2025 – Mar. 2025*

- Assisted in designing **RelMap's Transformer-based architecture**, optimizing **relation-aware learning** for **online map generation**.
- Developed a **feature extraction pipeline** integrating **LiDAR, camera, and radar** data to improve spatial reasoning.
- Designed **custom loss functions** to penalize **spatial inconsistencies** and improve mapping accuracy.
- Optimized training with **data augmentation**, **contrastive learning**, and **adaptive learning rates** for convergence.
- Conducted **hyperparameter tuning** and **cross-validation** to refine the model, leading to **SOTA results on benchmark datasets**. Developed **automated training and evaluation scripts**, streamlining the benchmarking process and ensuring **reproducible experiments**.

Data Generation & Trajectory Correction for V2XPnP | Research Contributor *Sept. 2024 – Dec. 2025*

- Automated the **data generation pipeline** for the V2XPnP dataset, ensuring efficient multi-agent perception and prediction. Developed scripts to generate CSV files containing **all detected trajectory** combinations.
- Utilized **localization techniques** and worked on obtaining LiDAR pose estimation within the V2X-PnP dataset.
- Corrected **problematic scenarios** in the V2X-PnP dataset, and resolved **incorrect detection coordinates** during vehicle turns, minimizing pose estimation errors and enhancing trajectory accuracy.
- Implemented **trajectory modifications** to align multi-agent vehicle movements with real-world driving dynamics.
- Ensured **consistent IDs** for detected objects across different agents, improving tracking stability and multi-frame association.

Personalized Campaign Emails | Main Developer *Sep. – Dec. 2023*

- Developed an AI-driven system using **Large Language Models (LLMs)** to automate and personalize campaign emails, tailoring messages to voter concerns and preferences based on behavioral analysis.
- Implemented data-driven strategies by analyzing voter information from **social media,** HubSpot, and public records, leading to more targeted and efficient campaign outreach.
- Evaluated the impact of AI-generated communication in political campaigns, comparing its effectiveness to traditional methods in a published paper.

WhiteMatterWiki: **Carmichael Lab, Neurology Department, UCLA** | Main Developer *Jun. – Dec. 2023*

- Developed a web application using **Node.js, React, AWS,** and **MongoDB**, enabling detailed search and filter functionalities within the lab's complex biological database.
- Utilized **Java** and **R** to create advanced visualizations, including **animations and circus graphs**, to represent intricate biological relationships in an intuitive and user-friendly manner.

- Deployed the application on **AWS**, ensuring scalability, reliability, and smooth operation for lab researchers and external collaborators.

MatchU: A Dating app focuses on all UC students | Main Developer *Jan. – Mar. 2023*

- Developed a user-friendly dating app with secure **authentication protocols**, **profile management systems**, and robust **data handling** practices.
- Designed and implemented an **algorithm-based recommendation system** to efficiently match users based on shared interests and preferences.
- Integrated features such as **user comments**, **personalized search filters**, and tailored **matching algorithms** specifically for UC students.

Face Clustering with PCA and K-Medoids | Independent Developer Mar. – *Apr. 2023*

- Applied **Principal Component Analysis (PCA)** for dimensionality reduction on the **LFW dataset**, visualizing top eigenfaces and reconstructing images with varying numbers of components.
- Conducted face clustering using **K-Means** and **K-Medoids**, evaluating their effectiveness through **purity scores** and execution times.
- Analyzed the impact of dimensionality reduction on clustering performance, identifying the most and least discriminative face image pairs with **K-Medoids**.

Peach Party: 2D Arcade Mario Party-Inspired Game | Independent Developer Aug. – *Sep. 2022*

- Designed a fast-paced, two-player arcade game where **Peach and Yoshi** compete to collect stars and coins on dynamic, obstacle-filled game boards.
- Developed interactive gameplay mechanics, including **rolling dice**, **navigating forks**, **firing projectiles**, and using **power-ups** across nine unique boards.
- Integrated strategic elements with **multiple paths** and competitive gameplay, offering a balanced mix of **luck and strategy** to enhance player engagement.

WORK

Office of Palo Alto Councilmember Greg Tanaka | AI/Data Analyst Intern *Jun. – Dec. 2023*

- Analyzed voter data from multiple sources, including **social media**, HubSpot, and public records, to detect trends and develop predictive models for voter behavior in California's congressional district.
- Applied **LLMs** to personalize campaign emails, improving engagement and enhancing campaign efficiency through targeted outreach.
- Led the development of AI-based tools to streamline campaign services, optimizing outreach strategies and decision-making processes for the campaign team.

Uber, Hong Kong | Data Analysis Intern *Dec. 2022 – Mar. 2023*

- Participated in Uber's COVID-19 **facial mask recognition project**, ensuring the backend infrastructure and utility functions were optimized for performance.
- Conducted comprehensive **analysis and forecasting**, evaluating factors like weather conditions, time of day, and demand fluctuations in regional operations, helping Uber refine its service strategies.
- Built predictive models to **analyze customer behavior** and optimize driver allocation during peak hours, resulting in improved efficiency and customer satisfaction.

TECHNICAL SKILLS

Programming Languages: Python, C++, JavaScript, C#, R, LaTeX, Bash/Shell Scripting
Machine Learning & Data Science: Pytorch, TensorFlow, Scikit-learn, Pandas, NumPy, MATLAB, Jupyter Notebooks
Autonomous Systems & Simulation: CARLA, OpenCDAScenario Runner, ROS
Medical Imaging & Biomedical Analysis: Segment Anything Model (SAM), nnUNet, BraTS, Image Segmentation
DevOps & Cloud Computing: Docker, AWS, Git, GitKraken
Web Development & Frontend Technologies: React, Node.jsm HTML, CSS, JavaScript, Tableau