

Yucheng Mao

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EDUCATION

University of Science and Technology Beijing, Beijing, China
Bachelor

Enrolled: 09 2020 — Expected: 07 2024

University of California, Berkeley, Berkeley, US
Visiting Student GPA: 3.5/4

Enrolled: 09 2023 — 12 2023

RESEARCH EXPERIENCES

MARS Lab in Tsinghua University
Research Assistant

Supervised by Prof. Hang Zhao
October 2022 - March 2024

- **Project 1: LiDAR Point Cloud Generation**

- Based on unconditional LiDAR point cloud generation, we propose a conditional LiDAR point cloud generation paradigm based on BEV layout.
- Our goal is to use generated LiDAR point cloud to replace sensor data collected on real-world data. This work is still in progress.

- **Project 2: BEVScope: Enhancing Self-Supervised Depth Estimation Leveraging Bird's-Eye-View in Dynamic Scenarios**

- Based on the high cost of existing depth sensing functions of the sensors of self-driving vehicles, determined the research direction to explore the use of cheaper sensors to obtain depth information; took the self-supervised paradigm as the solution.
- Improved depth estimation of dynamic objects by redesigning an adaptive photometric loss function; analyzed the issue of pose estimation and mutual consistency in multi-view depth maps using constraint conditions such as the adaptive photometric loss function and the camera pose consistency loss function.
- Accomplished multi-view information utilization by the proposal of the BEVScope, demonstrating competitive performance on datasets for multi-camera depth estimation.

- **Project 3: Occ3D: A large-scale 3d occupancy prediction benchmark for autonomous driving**

- Developed a collection of pipelines with automated labeling capabilities to represent detailed 3D geometric information; addressed the limitations of existing approaches in robotics and autonomous driving perception systems, such as overlooking significant geometric details and the lack perception of out-of-vocabulary objects.
- Assessed the validity and dependability of the auto-label system by a comparison between the automatically labeled data and the existing manually data; specifically, projecting the labeled occupancy data with semantic tags back to each perspective view and computing iou with its already labeled semantic segmentation tags.

- **Project 4: PreSight: Enhancing Autonomous Vehicle Perception with City-Scale NeRF Priors**

- Leverages historical traversal data to create static prior memories that enhance online perception during subsequent navigations.
- The experimental results on the nuScenes dataset demonstrate PreSight's high compatibility with various online perception models, showing significant improvements in tasks such as high-definition map construction and occupancy prediction. Especially for static components in self-driving scene.

University of Michigan
Research Assistant

Supervised by Prof. Jeong Joon Park
April 2024 - Present

- **Project 1: 3D Scene generation**

- Using a pre-trained Stable Diffusion Model to do consistent scene-level image-to-3D generation.

PUBLICATIONS

BEVScope: Enhancing Self-Supervised Depth Estimation Leveraging Bird's-Eye-View in Dynamic Scenarios. RA-L (in Sub)

Y Mao, R Zhao, T Zhang, H Zhao

Occ3D: A large-scale 3d occupancy prediction benchmark for autonomous driving. NeurIPS 2023

X Tian, T Jiang, L Yun, Y Mao, Y Wang, Y Wang, H Zhao

PreSight: Enhancing Autonomous Vehicle Perception with City-Scale NeRF Priors. ECCV 2024

T Yuan, Y Mao, J Yang, Y Liu, Y Wang, H Zhao

PROJECTS

Unofficial implementation of **UltraLiDAR**

https://github.com/myc634/UltraLiDAR_nusc_waymo

- Reproduce the CVPR 2023 paper UltraLiDAR on LiDAR point cloud generation, and add the experiment on nuScenes and Waymo dataset

Merging **DETR3D** into **MMDetection3D Framework**

<https://github.com/open-mmlab/mmdetection3d/tree/main/projects/DETR3D>

- Refactored and trained the deep learning model to work with the new framework version, and integrated the 3D target detection model(DETR3D) into the open source MMDetection3D framework

Honors and Awards

- **University of Science and Technology Beijing People's Third Class Scholarship (Top 25%)** 09/2021
- **University of Science and Technology Beijing People's Third Class Scholarship (Top 25%)** 09/2023