Yucheng Mao

Beijing, China — yucheng.mao.cs@gmail.com — (+1) 734-450-2194 — Personal Webpage

EDUCATION

University of Science and Technology Beijing, Beijing, China — Enrolled: 09 2020 — 06 2024
Bachelor
Overall GPA: 3.35/4 (Major: GPA 3.44/4)

University of California, Berkeley, Berkeley, US — Enrolled: 09 2023 — 12 2023
Visiting Student GPA: 3.5/4

RESEARCH EXPERIENCES

Unviersity of Michigan — Supervised by Prof. Jeong Joon Park
Research Assistant — April 2024 - Present

- **Project 1: Sparse View 3D reconstruction**
  - Finetune a Stable Diffusion model for consistent depth estimation and sparse view reconstruction. Estimate the depth maps of multiple images jointly so that they are consistent with each other. The output system will be useful for computer graphics in rendering the target scene from new viewpoints not captured in the original input images.
- **Project 2: 3D reconstruction with degraded observation.**
  - This work addresses image restoration by leveraging information from multiple degraded photographs of the same scene, a novel approach compared to traditional single-view methods. By hypothesizing that multi-view images contain complementary information, a powerful multi-view diffusion model is implemented to jointly denoise and enhance the views. The model achieves superior performance in tasks like image deblurring and super-resolution while ensuring 3D consistency, making it particularly valuable for applications such as 3D reconstruction and image correspondence.

MARS Lab in Tsinghua University — Supervised by Prof. Hang Zhao
Research Assistant — 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 multh-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.

PUPLICATIONS

Sparse Image Sets Restoration with Multi-View Diffusion Model. — CVPR 2025
***Y Mao**, B Wang, N Kulkarni, J Park*

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

- Reporduce 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
- **National Undergraduate Statistical Modeling Competition (Top 10%)** 05/2022
- **University of Science and Technology Beijing People's Third Class Scholarship (Top 25%)** 09/2023