

Yifei Liu

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Website: <https://kaikai23.github.io>

Github: [kaikai23](https://github.com/kaikai23)

EDUCATION

University of Zurich

MSc in Informatics: Data Science (grade:5.89/6.0, top 1%)

Zurich, Switzerland

Sept 2020 - Oct 2023

ETH Zürich

Special/Guest student (grade: 5.83 / 6.0)

Zurich, Switzerland

March 2021 - Jun 2023

University of Science and Technology of China

BSc in Mathematics and Applied Mathematics

Anhui, China

Sept 2016 - Sept 2020

PUBLICATIONS

- Yifei Liu, Mathias Gehrig, Nico Messikommer, Marco Cannici, Davide Scaramuzza. "Revisiting Token Pruning for Object Detection and Instance Segmentation". *arXiv preprint arXiv:2306.07050*.
- Alexey Gavryushin, Yifei Liu, Daoji Huang, Yen-Ling Kuo, Julien Valentin, Luc Van Gool, Otmar Hilliges, Xi Wang. "ROMEO: Revisiting Optimization Methods for Reconstructing 3D Human-Object Interaction Models from Images". (*3DV 2024 under review*)

RESEARCH EXPERIENCES

Research Assistant

ETH Zürich

May 2023 - Sept 2023

Advanced Interactive Technologies Lab (ETH AIT Lab)

Theme: Human-Object Interaction Reconstruction from Wild Images

- This project reconstructs interactions between humans and object categories which are NOT seen during training from a single image. First, a neural mesh renderer is employed to minimize the projected 2D silhouettes loss, and an estimated depth map is used to supervise the relative depth between human and objects. This does not only resolve the object scale uncertainty in a single image, but also avoids the need for class-specific segmentation annotation on object meshes or the need for contact estimation for determining the relative position. The model is designed such that users can choose the object class they want to reconstruct by picking the object mesh but does not have to annotate the part labels otherwise. It demonstrates superior performance over previous art optimization-based models on common human-object interaction datasets.
- This work is under review at *International Conference on 3D Vision 2024 (3DV) 2024*.
- Supervisors: Prof. Otmar Hilliges, Dr. Xi Wang
- Group website: <https://ait.ethz.ch/>

Master's Thesis

University of Zurich & ETH

Sept 2022 - Apr 2023

Robotics and Perception Group (RPG at UZHÐ)

Theme: Sparse Tokens for Faster ViTs on Dense Predictions

- This project aims to accelerate Vision Transformers via pruning redundant tokens on dense tasks such as object detection. Token pruning is a method to accelerate ViTs on classification but hard for dense tasks. We extend it to dense tasks by first preserving pruned tokens to retain a complete feature map, and then reactivating inactive tokens to distribute computation power according to per-layer attention needs. Finally, we introduce a sparse ViT backbone that is 46% faster than the dense ViT-Adapter with 0.3 lower mAP. This work is under review at *IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) 2024*.
- Supervisors: Prof. Davide Scaramuzza, Mathias Gehrig
- Group website: <https://rpg.ifi.uzh.ch/>
- Github Code: <https://github.com/uzh-rpg/svit>
- Project Link: <https://kaikai23.github.io/SViT-project-page/index.html>

Course Project	ETH Zürich	March 2022 - Jun 2022
Computer Vision and Geometry Group (CVG at ETH)		
<ul style="list-style-type: none"> I worked on building a python SLAM system from scratch by using COLMAP python-bindings. The aim was to build a python interface that can easily substitute traditional SLAM components via deep learning, like feature detection (SuperPoint), feature matching (SuperGlue), and loop detection (NetVLAD), etc. The system contains a complete functioning pipeline including keyframe selection, covisibility graph, bundle adjustment and loop closure, and can reconstruct high-quality maps. My code contribution was most of the three parts: covisibility graph (100%), bundle adjustment (70%), and loop detection/closure (100%). 		
<ul style="list-style-type: none"> Supervisors: Prof. Marc Pollefeys, Paul Sarlin 	<ul style="list-style-type: none"> Group website: https://cvg.ethz.ch/ 	
<ul style="list-style-type: none"> Demo & Project Link: https://kaikai23.github.io/3dv.html 		

Master's Project	University of Zurich & ETH	Sept 2021 - Feb 2022
Robotics and Perception Group (RPG at UZHÐ)		
<ul style="list-style-type: none"> This was my first research project, where I worked on exploring suitable representations for a novel sensor: event camera. Unlike traditional cameras, an event camera generates events with x, y coordinates plus a microsecond-level temporal t coordinate. We explored using three types of neural networks for processing the spatial-temporal information: point-based models, voxel-based models, and point-voxel interchanging models. We found that voxel-based representation was more suited because there are too many events for point models to process, and 2D CNN with temporal information treated as channels worked better than 3D CNN, due to the efficiency of decoupling spatial and temporal information. 		
<ul style="list-style-type: none"> Supervisors: Prof. Davide Scaramuzza, Mathias Gehrig 	<ul style="list-style-type: none"> Group website: https://rpg.ifi.uzh.ch/ 	
<ul style="list-style-type: none"> Project Link: https://kaikai23.github.io/pvcnn.html 		

COURSE PROJECTS

Model Predictive Control for Spacecraft Rendezvous	ETH Zürich
In Course: Model Predictive Control	Apr 2022 - May 2022
<ul style="list-style-type: none"> Implemented the system modeling of a spacecraft, an unconstrained optimal controller (LQR), a model predictive controller with theoretical closed-loop guarantees, soft constraints, and a robust MPC controller under model mismatch and unmodeled disturbances. 	
Reinforcement Learning for a Lunar Lander	ETH Zürich
In Course: Probabilistic Artificial Intelligence	Nov 2021 - Dec 2021
<ul style="list-style-type: none"> Implemented vanilla policy gradients REINFORCE with rewards-to-go, replay buffer and generalized advantage estimation (GAE) to optimize scores in a lunar lander game. Demo Video: https://www.youtube.com/watch?v=n-0CC3j3QgA&t=2s 	
Multi-task Learning for Autonomous Driving	ETH Zürich
In Course: Deep Learning for Autonomous Driving	Mar 2021 - July 2021
<ul style="list-style-type: none"> Adapted DeepLabv3+ model and ablated three architectures for multi-task learning (MTL) models to predict semantic segmentation and monocular depth jointly, and ablated a shared head, split heads and split heads with cross-attention. Built a 2-stage 3D object detector to detect vehicles in autonomous driving scenes based on lidar points, and won the 2nd place in the course's lidar 3D object detection competition. Project Link: https://kaikai23.github.io/dlad.html Rank: https://competitions.codalab.org/competitions/31727#results 	

TEACHING EXPERIENCES

Teaching Assistant

University of Science and Technology of China

Computer Programming A

Sept 2019 - Jan 2020

- My main responsibility was to organize weekly computer lab sessions to help students learn basic concepts about programming and computers and answer programming questions.

AWARDS

Outstanding Student Scholarship of USTC

Oct 2019, Oct 2018

Advancement Scholarship of USTC

Nov 2018

Outstanding Freshman of USTC

Oct 2016

SKILLS

Languages Python, Pytorch, C/C++, MATLAB

Others Latex, Github, Markdown