Chen Liu

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EDUCATION

University of Southern California, Los Angeles, United States — Jan. 2021-Dec. 2023
Master of Science in Computer Science, advised by Prof. Laurent Itti — GPA: 3.6

University of Western Ontario, London, Ontario, Canada — Sep.2016-Dec. 2020
Bachelor of Science Honors in Computer Science (Dual Degree), Dean's List — GPA: 90%

Central South University, Changsha, China — Sep.2016-Sep. 2020
Bachelor of Science in Computer Science — GPA: 86%

RESEARCH

Facilitating Diverse Manipulation with Vision-Language Model (*in-progress*) *Supervised by Prof. Daniel Seita*

- Introduce a multi-task robotic system that empowers robots to perform long-horizon manipulation tasks by mimicking a human demonstration video, facilitated by the VLM's strengths in handling multi-modal information and LLM's capability to generate code or reward signals for reinforcement learning.

Language to Plans for Hierarchical Multi-Agent Path Finding (*in-progress)* *Supervised by Prof. Satish Kumar*

- Use a Large Language Model (LLM) to convert natural language instructions into high-level constraints for HMAPF problems, subsequently parameterizing low-level regional planners for effective problem-solving.

World model-based Sim2Real Transfer for Robot Visual Navigation (*preprint*) *USC iLab,* May. 2023 - Aug. 2023

- Proposed a robust system that integrates a **control policy**, trained within a simulator, with an internal **LSTM**-based world model and an external visual perception model, facilitating seamless application of the policy in real-world scenarios.
- Trained a Perception model through a **contrastive learning** approach to predict Bird's Eye View (BEV) embeddings given First Person View (FPV) images. Deployed the trained models on **differential-drive robot** for **real-world testing** and effectively addressed **point-to-point visual navigation** tasks.

Real-world Robot Visual Navigation in a Simulator: A New Benchmark (*preprint*) *USC iLab,* Apr. 2023 - Present

- Collected a large augmented dataset comprising panoramic RGB images annotated with pose stamps and developed a simulator that allows for seamless evaluation of reinforcement learning methods on robot visual navigation tasks. Responsible for employing **LeGO-LOAM LiDAR SLAM** for data annotation.

PROJECTS

Schoomatic - A Differential-Drive Robot Simulator *USC iLab,* Feb. 2023 - Mar. 2023

- Built a **differential-drive robot simulator** based on the **CARLA** framework and produced a large-scale BEV-FPV simulation dataset with the simulator. This involved developing dynamics, collisions and **C++** plugins in **Unreal Engine 4**, enabling client-server communication via **remote procedure call (RPC)**, and packaging/releasing the simulator as a **Docker** image. Implemented a **ROS**-based end-to-end robot navigation system in **Python** and **C++** including **A*** global path planning, **Gmapping** SLAM, **LiDAR**-based occupancy grid mapping, **Timed-Elastic-Band** obstacle avoidance, and **PD** motion control.

Deep Learning-based Image Bad Weather Removal *USC*, Sep. 2021-Dec. 2021

- Improved the state-of-the-art transformer-based model, TransWeather, to restore images degraded by different bad weathers. Implemented and compared CBMA, LeFF, Coordinate Attention and Global-Enhanced Transformer to adapt the model to heavy rain scenarios. Designed cascaded model to improve the restoration performance.

Deep Feature Representation Learning in Multi-modal Ophthalmic *UWO, Canada*, Aug. 2020-Dec. 2020

- Built a **stacked auto-encoder** which automatically extracts image-based biological representations from OCT images for patients with dry age-related macular degeneration. Used SIFT, RANSAC and affine transformation for image preprocessing, and chose ANOVA for feature selection. The diagnosis accuracy successfully achieved 82.27%.

Image Processsing Algorithm Library

- Built a computer vision library written in **C++**. Implemented features including: a template Matrix class with reference counting, matrix operations, image filters (linear, nonlinear, morphological, and Gabor), image pyramids, etc.

INTERNSHIP

Software Engineer Intern, *Spotlist Inc.* *New York, United States,* May. 2022-Aug.2022

- Built Web **RESTful APIs** with **Django REST framework** to handle HTTP requests and tested them in **Postman**.
- Normalized existing tables to **3NF** and mapped out new **schemas** in the **PostgreSQL database**. Developed **controllers** that allow users to **upload** and **modify** their basic information and preferences. Implemented search functionality based on users' preferences, acceptable price ranges, GPS locations, distances, etc.

TECHNICAL SKILLS

- Python, C++, Java, PyTorch, OpenCV, Ray, RLlib, Linux, ROS, Bash, Git