Joshua(Yuchen) Cao

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Skills

Programming	**C++**, **C#**, **Python**, **JavaScript**, **HTML/CSS**, Matlab, Swift, PHP, SQL
Key Knowledge	**Deep Learning**, **SLAM**, **Generative AI**, **NeRF**, **3D Vision**, **Distributed System**, **Database**, CG
Develop Tools	**Pytorch**, **TensorFlow**,**OpenCV**, **OpenGL**, **AWS**, **ROS**, **SwiftUI**, **React.js**, CUDA, Docker, Git, Spark

Education

Carnegie Mellon University Sep 2021 - now
MS. in Computational Design(Computer Vision Track) *Pittsburgh, PA*

University of Chinese Academy of Sciences Sep 2016 - July 2020
MS. in Computer Science, advised by Prof. Laurent Kneip *Shanghai, China*

Experience

APEX(EzPT) July 2022 - Aug 2022
Computer Vision Engineer & iOS Developer, Intern *Remote, USA*

- Developed Pose Estimation with **OpenPose** and **Google MediaPipe**, Pose Classification and Rep Counting with **KNN** in **Colab**.
- Replanted algorithms in iOS app, configured with **Firebase** and **Google Function**, to work in real-time with 30 FPS camera.
- Built dataset and groundTruth pipeline with **OpenCV** and **Tensorflow**, simplified process for producing new exercises.

CodeLab, Carnegie Mellon University Sep 2021 - Dec 2022
Research Assistant, Advisor: Prof. Daniel Cardoso Llach *Pittsburgh, PA*

- Constructed simulating environment with **Nvidia Isaac Sim**, for **Reinforcement Learning** to optimize path planning.
- Built **Husky ground-robot** system with Velodyne-16, Xsens-IMU; Configured with **AMCL**, **Gmapping**, **Dijkstra*** and **DWA** for 2D-lidar SLAM and path planning, navigation while avoiding dynamic obstacles.
- Implemented **Lego-LOAM**, **LIO-SAM** in ROS, a pipeline for real-time pedestrian detection and navigation with 3D map.

EF Education First Jan 2019 - Jan 2020, June 2021 - Aug 2021
Full Stack Engineer, Contractor *Remote, China*

- IWB book series: Designed & developed an interactive web for kid education with **React.js**, **JavaScript** and **WebGL**.
- GoalMap: Developed a questionnaire for data collection and market strategy with **Salesforce**, **Bootstrap**, **Node.js** and **MySQL**.

Mobile Perception Lab, ShanghaiTech University Sep 2016 - Dec 2020
Research Assistant, Advisor: Prof. Laurent Kneip *Shanghai, China*

- Developed an On-board ROS-like intermediate **OS** between **UAV SDK** and RGB sensor, to run computer vision algorithm.
- Built a SLAM system with **SIFT & Harris Feature Extraction**, **7/8 Points Matching**, and **LevenBerg-Marquardt Optimization**.
- Revised **Particle & Kalman filter** and **MaskRCNN** to relocate pose with semantic information under a robot hijack case.
- Modelled **Camera Optical Algorithm** to synthesize realistic and semantic SLAM dataset with ground truth and criterion benchmark.
- Developed a **Variational Auto-Encoder** with **RGBD SLAM** to generate complete models from partial continuous observation.

Selected Projects

Computer Science projects website: https://caoyuchen.github.io/cs/

NeRF-based 3D Style Transfer / *Computer Vision & Graphics, Deep Learning* April 2022 - Now

- Revised the architecture of **NeRF-W**, train with less GPU memory on RTX2080-Super, remove pedestrian and tune color temperature.
- Built **Poisson Blending** and **Neural Style Transfer** to stylize image, Revised **CycleGAN** & **StyleGAN** to synthesize content-aware image.
- Used CUDA-based **Instant-ngp** to get faster training and removed artifacts, researched **Artistic Radiance Fields** for 3D style transfer.
- Developed APP with **OpenCV** to upload camera video to server for NeRF training and stylizing and send back rendering.

Scotty3D / *Computer Graphics, Software Development* Sep 2021 - Dec 2021

- Contributed to the software development with **ImGui** and **OpenGL**. Developed Half-Edge to enable 3D vertex, edge and face editing.
- Coded the **BVH** to speed up **Path Tracing**, **BSDF** for material, **Skinning** to align mesh with skeleton, **Inverse Kinematics** for animation.

Publications

Incremental Semantic Localization using Hierarchical Clustering of Object Association Sets **ACCV 2022**
4th Author *https://arxiv.org/abs/2208.13210* *Sep 2022*

Representations and Benchmarking of Modern Visual SLAM Systems **Sensors Journal**
1st Author *https://www.mdpi.com/1424-8220/20/9/2572* *Mar 2020*

Dense Object Reconstruction from RGBD Images with Embedded Deep Shape Representations **ACCV Workshop**
2nd Author *https://arxiv.org/abs/1810.04891* *Oct 2018*