Joshua(Yuchen) Cao

Pittsburgh, PA (412) 954-8151 caoyuchen.joshua@gmail.com Github LinkedIn

Skills

Theory Knowledge	**Deep Learning**, **SLAM**, **GAN**, **NeRF**, **3D vision**, **Distributed System**, **Database**, CG
Programming	**C++** == **C#** == **Python** == **JavaScript** > Matlab == Swift > PHP
Develop Tools	**Pytorch**, **TensorFlow**,**OpenCV**, **OpenGL**, **SwiftUI**, **ROS**, **React**, **AWS**, Cuda, Docker, Git
Communication	Chinese (Native), **English** (proficient), Japanese (listening and speaking)

Education

Carnegie Mellon University / *MS. in Computational Design* — Sep 2021 - now, Pittsburgh, PA
- **Key Courses**: Computer System, Distributed System, Parallel Computing, CG, Learning-based CV

University of Chinese Academy of Sciences / *MS. in Computer Science* — Sep 2016 - July 2020, Shanghai, China
- **Key Courses**: SLAM, Machine & Deep Learning, Convex Optimization, Robotics, Algorithms, OS

Experience

APEX(EzPT) — July 2022 - Aug 2022, *Remote, USA*
Internship of Computer Vision Engineer & iOS Developer
- Independently implemented a real-time Pose Estimation and Classification in Colab and SwiftUI, to assist Physical Therapist treatment.
- The computer vision solution and dataset training code is still being used to generate new exercises for patients.
  Technologies Used: Swift, Python, Google MediaPipe, OpenCV, Tensorflow, Firebase, Google Cloud, Github

ReAC Lab, Carnegie Mellon University — Sep 2021 - Dec 2022, *Pittsburgh, PA*
Part-time Research Assistant
- Researched RGBD-based SLAM for Surface Defact Detection on Robotic Arm with Prof. Joshua Bard.
- Researched Path Planning, Pedestrian Detection and Tracking, 3D LOAM on Ground Robotics with Prof. Daniel Cardoso.
  Technologies Used: C++, ROS, Linux, Lego-LOAM, LIO-SAM, RGBD-SLAM, A*, Djikstra*, Nvidia Isaac Sim

Mobile Perception Lab, ShanghaiTech University — Sep 2016 - Dec 2020, *Shanghai, China*
Full-time Research Assistant
- Researched Object Detection, DJI SDK, intermediate Operating System Development for UAV with Prof. Xiaopei Liu.
- Researched Multi-Sensor SLAM, Object Segmentation, 3D Reconstruction, Synthesized Dataset with Prof. Laurent Kneip.
  Technologies Used: C++, Python, Matlab, Pytorch, SLAM, MASK-RCNN, Auto-Encoder, ROS, DJI SDK

EF Education First — Jan 2019 - Jan 2020, June 2021 - Aug 2021, *Remote, China*
Part-time Contractor of Full Stack Engineer
- Independently designed & developed a children-oriented English education webpage: IWB book series, used by **80%** of courses.
- Full stack project based on Salesforce, an interactive questionnaire for data collection and market strategy: GoalMap.
  Technologies Used: jQuery, JavaScript, Bootstrap, React.js, Node.js, HTML, CSS, Salesforce, GitLab, Docker, Spark

Projects

Personal CS projects website: https://caoyuchen.github.io/cs/

Learning-based Generation / *Computer Vision & Graphics, Deep Learning*
- Gradient SSD for RGB channel alignment; CycleGAN & StyleGAN for content-aware image synthesis; Poisson Blending; Neural Style Transfer.
- Authentic 3D rendering project: NeRF-W & Instant-ngp memory shot for construction site, combined with video-based style transfer.
- Scotty3D: Alpha blending, supersampling; HalfEdge-based mesh editing; Path tracing, BVH 3D shape Intersection; Kinematics, skinning.
- CMU-16824: Weakly supervised object detection built on AlexNet with SSP and NMS; LSGAN and W-GAN; Transformer-based VQA.

Multi-Sensor SLAM algorithm / *SLAM, Robotics*
- A SLAM system includes SIFT & Harris feature extraction, 7/8 points matching, and LevenBerg-Marquardt optimization.
- Benchmark for semantic SLAM algorithm, including synthetic dataset generation, ground truth, and evaluation methods.
- A Re-localization project implemented by Particle & Kalman filter for top-view 2D road scenario and MaskRCNN.
- Ground-robot Husky: Lidar-based LOAM with Pedestrian detection and tracking, path planning system.
- Auto-Encoder and SLAM for 3D partial observation Reconstruction.

Publications

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

Dense object reconstruction from RGBD images with embedded deep shape representations — **ACCV Workshop**, *Oct 2018*
2nd Author *https://arxiv.org/abs/1810.04891*

Incremental Semantic Localization using Hierarchical Clustering of Object Association Sets — **ACCV 2022**, *Sep 2022*
2nd Author *https://arxiv.org/abs/1810.04891*