

Joshua(Yuchen) Cao

📍 Pittsburgh, PA 📞 (412) 954-8151 ✉ caoyuchen.joshua@gmail.com 🌐 Github in LinkedIn

🎓 EDUCATION

Carnegie Mellon University

MS. in Computational Design

Sep 2021 - now

Pittsburgh, PA

- **System Courses:** Computer System, Distributed System, Parallel Computing, Cloud Computing
- **Research Courses:** Computer Graphics, Learning-based Image Synthesis & Recognition, Computer Photography, PBR

University of Chinese Academy of Sciences & ShanghaiTech University

MS. in Computer Science

Sep 2016 - July 2020

Shanghai, China

- **System Courses:** Operating System, Control Theory, Algorithm and Data Structure
- **Research Courses:** SLAM, Computer Vision, Machine Learning, Deep Learning, Convex Optimization, Robotics

🧰 EXPERIENCE

EzPT

Internship of Computer Vision Engineer & iOS Developer

July 2022 - Aug 2022

Remote, USA

- Used Google MediaPipe and TensorFlow network & OpenCV for real-time Pose Estimation and Classification, to assist Physical Therapist exercise. App development includes SwiftUI for iOS, backend with Firebase BaaS with Cloud Function.

Technologies Used: Swift, Python, Google MediaPipe, OpenCV, Tensorflow, Firebase, Google Cloud

Carnegie Mellon University

Research Assistant

Sep 2021 - Aug 2022

Pittsburgh, PA

- Researched RGBD-based SLAM for Surface Defect 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*, DWA

ShanghaiTech University

Research & Teaching Assistant

Oct 2016 - Dec 2020

Shanghai, China

- Researched Object Detection, DJI SDK, Reinforcement Learning on UAV with Prof. Xiaopei Liu.
- Researched Multi-Sensor SLAM, Object Segmentation, 3D Reconstruction, Synthesized Dataset with Prof. Laurent Kneip.
- Assisted teaching Linear Algebra and SLAM course.

Technologies Used: C++, Python, Matlab, Pytorch, SLAM, Reinforcement Learning, MASK-RCNN, Auto-Encoder, ROS, DJI SDK

EF Education First

Internship of Full Stack Engineer

Jan 2019 - Dec 2020

Remote, China

- Independently designed & developed a children-oriented English education webpage: IWB book series by React.js and Node.js.
- 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

⚙️ SKILLS

Theory Knowledge

Deep Learning, SLAM, Media Generation, 3D vision, Computer Graphics

Programming

C++ == C# == Python == JavaScript == Swift > Matlab > PHP

Develop Tools

Pytorch, TensorFlow, OpenCV, OpenGL, Cuda, SwiftUI, ROS, React, AWS, GCP, WebGL, threeJS, p5

Design Tools

Blender, Unity, Ableton Live, PS, C4D, Figma, WebFlow, Miro, Jira, Unreal, Rhino, LR, Ai, Premiere

Communication

Chinese (Native), English (proficient), Japanese (listening and speaking)

📖 PUBLICATIONS

Representations and Benchmarking of Modern Visual SLAM Systems

First Author <https://www.mdpi.com/1424-8220/20/9/2572>

Sensors Journal

Mar 2020

- Synthesized Realistic dataset and groundTruth for SLAM task, Benchmark for Evaluation.

Dense object reconstruction from RGBD images with embedded deep shape representations

Second Author <https://arxiv.org/abs/1810.04891>

ACCV Workshop

Oct 2018

- AutoEncoder-based 3D reconstruction from partial SLAM mapping.

💡 PROJECTS

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

SLAM systems & Robotics

Multi-Sensor SLAM algorithm

- A fundamental SLAM system with tracking, mapping and pose optimization in Matlab. It includes SIFT & Harris feature extraction, 78 points, homography method, and LevenBerg-Marquardt average error for pose optimization. [Github: SLAM-basicframe](#)
- Benchmark for semantic SLAM algorithm, including dataset, ground truth, and evaluation methods. [Github: SSS-dataset](#)
- Probability estimation method based on particle filter for top-view 2D road scenario and MaskRCNN, used for re-localization
- Lidar-based LOAM with Pedestrian detection and tracking, path planning system.
- Auto-Encoder based 3D Reconstruction

Technologies Used: ORB-SLAM, KinectFusion, C++, ROS, Matlab, Pytorch, LOAM, AutoEncoder, MaskRCNN

3D vision, Robotics, VR/AR

- 2D Incision with Schunk Arm Robot. Used PyCAM and ROS RVIZ to adjust joints and links coordination. [Web: RobArm Project](#)
- Path Planning with DJI SDK. Built TX1 and Raspberry Pi3 as an intermediate system for DJI M600.
- Flight VR project. Configured 720 degrees 8 GoPro on Drone, and stitched the synced stream into VR via AutoPano.
- SIST building 3D reconstruction. Used Faro to capture dense point cloud, with CloudCompare to alignment and merging.

Technologies Used: ROS, C++, DJI SDK, AutoPano, VR

Computer Vision & Graphics

GAN, NeRF, Deep Learning

- Traditional CV methods of gradient SSD for RGB channel alignment and image trimming; CycleGAN in content-aware image synthesis; Poisson Blending in image blending; StyleGAN in style transfer. [Github: Learning-based Image Synthesis](#)
- NeRF-based 3D architecture reconstruction, with sparse input of raw image and 5D camera ray parameters, generate consistent video frames and 3D models. [Github: NeRF-based-3D](#)

Technologies Used: Pytorch, GAN, NeRF

Pose Estimation and Tracking

- Combined Google MediaPipe and KNN into iOS app, to real-time track and classify different exercise, and count the repetitions.

Technologies Used: Python, TensorFlow, OpenCV, MediaPipe, Swift

CG, ray-tracing, rendering

- CMU 15662 projects: Draw SVG, MeshEdit, RayTracing, Animation: [Github: Scotty3D](#).

Technologies Used: C++, OpenGL

Computer System & Architecture

computer system

- CMU 15213 projects, Stack & Disassemble, Malloc(heap) implementation, Cache Simulator, I/O redirection, Web Proxy: [Github: CMU15513](#).

Technologies Used: C++, GDB

Game & Web Development

game, interactive media

- 48 hours GGJ 2D puzzle game based on Unity3D: [Dr.Dox Quest for Time](#).
- Advanced Game Studio project, asymmetric split-screen multi-players game. Cooperation, Puzzle Solving, Surviving: [Penumbra](#).
- Website development for interactive teaching tools: [IWB](#).
- 3D animated webs by three.js and WebGL: [Dreamatic](#).

Technologies Used: Unity3D, Blender, Ableton Live 11, Jira, Miro

🎮 HOBBIES

🎬 Photography & Screenwriting & Cinematography

- Instagram: https://www.instagram.com/joshua_cyc 500px: <https://500px.me/caoyuchen>
- Certificate Of Screenwriting from USC(1.5 years). Pieces: "Golden Sun & Silver Moon", "Batman: The Great Normal", "The Trace".

🎵 Digital Music & 3D Art

- SoundCloud: <https://soundcloud.com/joshua-rain-24806913> Personal Portfolio: <https://caoyuchen.github.io/portfolio/>