

Joshua(Yuchen) Cao

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

🎯 INTERESTS

Research: Learning-based media synthesis (GAN, NeRF, Transformer). CV+CG, 3D Reconstruction, Mobile Perception.

Engineer: Front/back-end, data visualization, app/game development, ML/research engineering.

🎓 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:** CG, 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, CV, ML, Deep Learning, Convex Optimization, Robotics

💼 EXPERIENCE

Carnegie Mellon University

Research Assistant

Sep 2021 - now

Pittsburgh, PA

- Research of Robotic Arm, SLAM, Surface Defect Detection in Dfab with Prof. Joshua Bard.
- Research of Reinforcement Learning, Pedestrian Detection in CodeLab with Prof. Daniel Cardoso.

ShanghaiTech University

Research & Teaching Assistant

Oct 2016 - Dec 2020

Shanghai, China

- Research of drone, Object Detection, DJI SDK, Reinforcement Learning in UAV-LAB with Prof. Xiaopei Liu.
- Research of SLAM, Computer Vision, DL in MPL lab with Prof. Laurent Kneip.
- Assist teaching Linear Algebra and SLAM course.

EF Education First

Full Stack Engineer Internship

Jan 2019 - Dec 2020

Remote

- Independently design & develop a children-oriented English education webpage: IWB book series.
- Web-based full stack project of interactive questionnaire for data collection and market strategy: GoalMap.

⚙️ SKILLS

Theory Knowledge

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

Programming

C++ == C# == Python == JS > Java == Matlab > PHP

Develop Tools

Pytorch, OpenCV, OpenGL, Cuda, mistuba, ROS; React, JQuery, WebGL, threeJS, p5, MySQL

Design Tools

Blender, Unity, Ableton Live, PS, C4D, 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(Simultaneous Localization and Mapping) systems

Traditional 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.
<https://github.com/CaoYuchen/SLAM-basicframe>
- Benchmark for semantic SLAM algorithm, including dataset, ground truth, and evaluation methods.
<https://github.com/CaoYuchen/SSS-dataset>
- Probability estimation method based on particle filter for top-view 2D road scenario and MaskRCNN, used for re-localization

Learning-based Image Synthesis

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. <https://github.com/CaoYuchen/16726>
- NeRF-based 3D architecture reconstruction, with sparse input of raw image and 5D camera ray parameters, generate consistent video frames and 3D models. <https://github.com/CaoYuchen/NeRF-based-3D>

Robotics Development

3D vision, ROS, VR/AR

- 2D Incision with Schunk Arm Robot. Use PyCAM and ROS RVIZ to adjust joints and links coordination. <https://robotics.shanghaitech.edu.cn/node/114>
- Path Planning with DJI SDK. Building TX1 and Raspberry Pi3 as an intermediate system for DJI M600.
- Flight VR project. Configuring 720 degrees of 8 GoPro on Drone, and stitching the synced stream into one Omni-direction file for VR presentation via AutoPano.
- SIST building 3D reconstruction. Using Faro to capture dense point cloud, using CloudCompare to alignment and merging.

Computer Graphics

CG, ray-tracing, rendering

- CMU 15662 projects: Draw SVG, MeshEdit, RayTracing, Animation: <https://github.com/CaoYuchen/Scotty3D>.

Computer System & Architecture

computer system

- CMU 15213 projects, Stack & Disassemble, Malloc(heap) implementation, Cache Simulator, I/O redirection, Web Proxy: <https://github.com/CaoYuchen/CMU15513>.

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](#).

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/>