

# Junyi Cao

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## Education

### Shanghai Jiao Tong University

Sep. 2021 – Mar. 2024 (Expected)

M.Eng. in Computer Science and Technology

GPA: 3.85/4

Core courses: Neural Network Theory and Application (A+), Image Processing and Machine Vision (A+), Optimization Method (A+), Machine Learning (A), Game Theory and the Internet Application (A), Big Data Processing Technologies (A).

### University of California, Berkeley

Aug. 2019 – Dec. 2019

Exchange Student

GPA: 3.81/4

Courses: CS 61B Data Structures (A+), CS 189 Introduction to Machine Learning (A)

### South China University of Technology

Sep. 2017 – Jun. 2021

B.Eng. in Software Engineering

Rank: 6/273 | GPA: 3.87/4

Core courses: Parallel Programming (96), Operating System (95), Computer Organization and Architecture (94), Artificial Intelligence (93), Digital Circuits and Logic Design (93), Principle of Compiler (92), Linear Algebra & Analytic Geometry (92), Probability & Mathematical Statistics (92), Program Design in C++ (90).

## Publications (\* stands for equal contribution)

- ▶ **Lightning NeRF: Efficient Hybrid Scene Representation for Autonomous Driving**  
[Junyi Cao](#), Zhichao Li, Naiyan Wang, Chao Ma. Submitted to *ICRA 2024*. [LINK].
- ▶ **Towards Unified Defense for Face Forgery and Spoofing Attacks via Dual Space Reconstruction Learning**  
[Junyi Cao](#), Ke-Yue Zhang, Taiping Yao, Shouhong Ding, Xiaokang Yang, Chao Ma. Submitted to *IJCV*. [LINK].
- ▶ **End-to-End Reconstruction-Classification Learning for Face Forgery Detection**  
[Junyi Cao](#), Chao Ma, Taiping Yao, Shen Chen, Shouhong Ding, Xiaokang Yang. In *CVPR 2022*. [LINK].
- ▶ **Structure Destruction and Content Combination for Generalizable Anti-Spoofing**  
Chengyang Hu, [Junyi Cao](#), Ke-Yue Zhang, Taiping Yao, Shouhong Ding, Lizhuang Ma. *IEEE TBIOM*, 2022. [LINK].
- ▶ **Co-attention Network with Label Embedding for Text Classification**  
Minqian Liu\*, Lizhao Liu\*, [Junyi Cao](#), Qing Du. *Neurocomputing*, 2022. [LINK].
- ▶ **Dynamic Extension Nets for Few-shot Semantic Segmentation**  
Lizhao Liu\*, [Junyi Cao](#)\*, Minqian Liu\*, Yong Guo\*, Qi Chen\*, Mingkui Tan. In *ACM MM 2020*. [LINK].

## Research Experience

### 3D Reconstruction for Autonomous Driving with Efficient Hybrid Scene Representation

Jan. 2023 – Sep. 2023

TuSimple, Beijing | Research Intern | Advisor: Mr. Zhichao Li & Dr. Naiyan Wang

- Proposed an efficient hybrid scene representation that reduced time complexity for querying deep density MLP.
- Incorporated LiDAR data for geometry initialization, enabling informative sampling around surfaces and reducing the number of sampling points for faster rendering.
- Solidified the use of Color Decomposition, decoupling view-dependent factor and view-independent factor as specular color and diffuse color, improving the rendering quality given large perspective shifts (*e.g.*, extrapolation).
- Conducted extensive experiments on KITTI-360, Argoverse2, and a private dataset. Achieved a 5- and 10-fold acceleration in training and rendering speed with a better rendering quality compared to existing works.
- Contributed to a first-author paper submitted to ICRA 2024.

### Unified Defense against Face Forgery and Spoofing Attacks

Dec. 2022 – Aug. 2023

Shanghai Jiao Tong University | Research Assistant | Advisor: Prof. Chao Ma

- Put forward a dual space reconstruction learning framework that focused on the commonalities of real faces in both spatial and frequency domains to learn the comprehensive difference between real faces and diverse attacks.
- Set up a novel benchmark consisting of both face forgery attacks and face spoofing attacks to evaluate models' competence against diverse attack data.
- Achieved consistent improvements in terms of accuracy and generalization ability on benchmark datasets for both face forgery detection and face anti-spoofing.
- Contributed to a first-author paper submitted to IJCV.

YouTu Lab, Tencent | Research Intern | Advisor: Mr. Taiping Yao

- Addressed general spoof detection including the recognition of both face spoof attacks and generic-object spoof attacks.
- Recommended a structure destruction and content combination framework to direct the model's attention to the fine-grained spoofing clues rather than information irrelevant to spoof detection (*e.g.*, object structure).
- Procured consistent improvements over existing competitors on both face anti-spoofing and generic-object anti-spoofing benchmarks.
- Contributed to a second-author paper accepted by IEEE TBIOM.

Reconstruction-Classification Learning for Face Forgery Detection

Mar. 2021 – Nov. 2021

Shanghai Jiao Tong University | Research Assistant | Advisor: Prof. Chao Ma

- Considered the problem of face forgery detection from the inverse perspective of genuine faces, which emphasized common characteristics of genuine faces to learn the key disparity between real faces and various fake samples.
- Secured distinct improvements in terms of accuracy, generalization ability, robustness, and interpretability on commonly-used datasets, *e.g.*, FaceForensics++, WildDeepfake, and DFDC.
- Contributed to a first-author paper accepted by CVPR 2022.

Dynamic Extension Nets for Few-shot Semantic Segmentation

Jan. 2020 – May. 2020

South China University of Technology | Research Assistant | Advisor: Prof. Mingkui Tan

- Addressed two issues of few-shot semantic segmentation. First, extracting class-relevant features from the scarce image-level labels of the novel categories is non-trivial. Second, it remained a question of exploiting knowledge from the base classifier to build a promising classifier for novel categories.
- Presented a guided attention module to enforce the model to attend to class-relevant contents and introduced a dynamic extension training method that estimated and incorporated novel classifiers based on the learned base classifiers in an adaptive way.
- Achieved superior performance over other competitors on PASCAL-5<sup>i</sup> and COCO-20<sup>i</sup> benchmark datasets.
- Contributed to a co-first-author paper accepted by ACM MM 2020.

Honors and Awards

▶ First-class Academic Scholarship of Shanghai Jiao Tong University	2022–2023
▶ HyperGryph Scholarship (Top 5%)	2022
▶ First place in Artificial Intelligence Security Competition 2022 (Deepfake Track)   Tech Report	2022
▶ National Scholarship (Top 1%)	2019
▶ Outstanding Student Leader	2018–2019
▶ First-class Scholarship of South China University of Technology (Top 5%)	2018

Skills

Programming Languages:

Python, Java, R, C++.

Technologies & Tools:

PyTorch, Tensorflow, Git, Linux, SQL.

Sports Activities:

Swimming, Cycling, Table Tennis, Badminton.

Language Skills:

TOEFL: Total 109 (Reading 29 + Listening 30 + Speaking 23 + Writing 27).

GRE: Verbal 161 + Quantitative 170 + Writing 3.5.