

Haoyu Chen

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Education

Carnegie Mellon University

Pittsburgh, PA

Master of Science in Electrical and Computer Engineering, Applied Program; GPA: 3.79/4.0

Sep. 2022 - Dec. 2023

Relevant Coursework: Intro to DL & Pattern Recognition, Big Data Science, Data Analysis, Inference Statistics & Applied Machine Learning

Rensselaer Polytechnic Institute

Troy, NY

Bachelor of Science in Computer Science and Mathematics (Minor: Economics); GPA: 3.93/4.0

Sep. 2018 - May 2022

Relevant Coursework: Introduction to Algorithm, Data Structure, Machine Learning From Data, Linear Algebra

Publication

- Yizhou Zhao, **Haoyu Chen**, Chunjiang Liu, Zhenyang Li, Charles Herrmann, Junhwa Hur, Yinxiao Li, Ming-Hsuan Yang, Bhiksha Baj, Min Xu, "Toward Material-Agnostic System Identification from Videos", Accepted at ICCV 2025
- Wufei Ma, **Haoyu Chen**, Guofeng Zhang, Celso Mde Melo, Jieneng Chen, Alan Yuille, "3DSRBench: A Comprehensive 3D Spatial Reasoning Benchmark", Accepted at ICCV 2025
- Yizhou Zhao, Chunjiang Liu, **Haoyu Chen**, Bhiksha Raj, Min Xu, Tadas Baltrusaitis, Mitch Rundle, HsiangTao Wu, Kamaran Ghasedi, "Total Editing: Head Avatar with Writable Appearance, Motion, and Lighting", Accepted at ICCV 2025 Workshop E2E3D

Research Experience

4D Physical Plausible Reconstruction (Accepted at ICCV 2025)

Pittsburgh, PA

Supervised by Prof. Min Xu at Carnegie Mellon University

May 2024 - Mar. 2025

- Introduced the first material-agnostic system identification framework from videos, eliminating the need for predefined material priors.
- Utilized **MLS-MPM** accompany with Neural Networks to estimate the intrinsic physical properties.
- Reached state-of-the-art performance among all recent geometry reconstruction models and future state prediction methods across diverse materials.

Weakly-Supervised Learning For Lab Automation

Pittsburgh, PA

Supervised by Prof. Min Xu at Carnegie Mellon University

Feb. 2024 - Mar. 2025

- Fine-tuned the **YOLOv5** implementation pre-trained on the COCO to our dataset, to segment regions of pipettes in real-time video streams, enhancing the precision of the subsequent anomaly detection.
- Employed a **lightweight transformer encoder** for dynamic anomaly scoring, integrated with a binary cross-entropy (BCE) loss function to optimize detection accuracy.
- Optimized the video anomaly detection system, achieving an AUC of 98.79%, which outperformed existing state-of-the-art methods by over 11%.

Head Avatar with Editable Appearance, Motion, and Lighting (Accepted at ICCV 2025 Workshop)

Pittsburgh, PA

Supervised by Prof. Min Xu at Carnegie Mellon University

July 2024 - Nov. 2024

- Introduced "Total-Editing," a unified framework combining face reenactment and portrait relighting to generate 3D portraits with specified appearance, motion, and lighting conditions.
- Developed a tri-plane decoder and deformation field to improve perceptual quality, spatiotemporal coherence, and realistic shading effects.
- Enabled flexible applications, such as animatable portraits with customizable backgrounds, through a multi-source formulation.

3D spatial reasoning benchmark (Accepted at ICCV 2025)

Baltimore, MD

Supervised by Prof. Alan Yuille at Johns Hopkins University

July 2024 - Nov. 2024

- Developed a comprehensive benchmark for 3D spatial reasoning, comprising 2,772 manually annotated visual question-answer pairs across 12 distinct question types.
- Co-designed and implemented a novel FlipEval strategy to evaluate 3D spatial reasoning capabilities.

- Uncovered key limitations in large multi-modal models (LMMs) regarding 3D awareness, particularly in height, orientation, and location-based reasoning.

Synthetic Dataset Generation For Video Datasets

Baltimore, MD

Supervised by Prof. Alan Yuille at Johns Hopkins University

May 2024 – Aug. 2024

- Utilized Ctrl-adapter to generate diverse sythetic in-door data based on projectaria datasets.
- Applied sythetic data for several robot learning tasks and enhanced the performance with 4.2 units lower in FID and 3 units lower in KID compared with the benchmark: HSSD-200 datasets.

Predicting crop yield based on remote-sensing data and Deep Learning Models

Pittsburgh, PA

Project leader, Supervised by Prof. Marios Savvides at Carnegie Mellon University

Sept. 2023 – Dec. 2023

- Developed a script for extracting and preprocessing remote-sensing data from Google Earth Engine, applying advanced feature engineering techniques for deep learning model inputs.
- Engineered and optimized a specialized **Convolutional Neural Network (CNN)** for US Corn yield prediction, achieving a 12% reduction in RMSE for the 2022 forecast compared to **Ridge Regression** and **Decision Tree** models, and achieving 5% reduction compared to **Long short-term memory Network (LSTM)** models.

Pipeline for real-time analyzing professional players' in-game performance

Pittsburgh, PA

Summer Research Intern, Supervised by Prof. Priya Narasimhan at Carnegie Mellon University

May 2023 – Aug. 2023

- Developed complex algorithms for emotion detection, gaze tracking, and posture analysis using **CV2**, **FER**, **DLIB**, and **MediaPipe** libraries.
- Implemented a Python-based keyboard and mouse logger to enhance data collection and capture detailed user input and interaction patterns.
- Performed data cleaning, feature selection, and analysis with Python libraries, uncovering meaningful trends and correlations, such as the impact of individual behavioral patterns on in-game performance in FPS games.

Learning Ethical Principles using Lexicographic Preference Models

Troy, NY

Supervised by Prof. Lirong Xia at Rensselaer Polytechnic Institute

Mar. 2021 – May 2022

- Designed a Python-based lexicographic preference model to optimize survival decisions in simulated scenarios.
- Corporated to optimize the model performance and improved prediction accuracy by 18% compared to the **Decision Tree** model and 14% compared to 1&2 hidden layer **Deep Neural Network (DNN)**.

Teaching Experience

Carnegie Mellon University

Pittsburgh, PA

Research Mentor

May 2024 – Jan. 2025

- Lab: Joint En Cai/ Min Xu Laboratory
- Brainstorming with research ideas, providing technical support and research directions, and giving advice for results.

Rensselaer Polytechnic Insitute

Troy, NY

Teaching Mentor

May 2020 – Dec. 2021

- Course: CSCI 1100, CSCI 2200, CSCI 2300
- Led students to review important knowledge in lecture materials, provided guidance for students to do exercises, and solved students' questions during weekly office hours.

Skills

Programming Languages: Proficient in Python; Knowledgeable in C/C++, MATLAB, Java, R

Tools & Technologies: Skilled in PyTorch, Sklearn; Familiar with MySQL, Pandas, Azure, AWS

Soft Skills: Project Management, Communication, Leadership