Hao-Yu **Hsu**

maxsyu88@gmail.com | haoyuhsu.github.io/ | haoyuhsu | haoyuhsu | haoyuhsu88

Research Interests

3D Computer Vision, Neural Rendering, Robotics

Education

National Tsing Hua University (NTHU) *Sep. 2017 - Jun. 2021*

B.S. in Electrical Engineering *Hsinchu, Taiwan*

- **GPA:** overall: **4.23/4.3**, rank: **1/102 (1%)**
- **Honors:** Dean's List * 4 (Fall '17, Fall '18, Fall '20, Spring '21)
- **Selected Courses:** Data Structures (**A+**), Algorithms (**A+**), Computer Architectures (**A+**), Operating Systems (**A+**), Computer Networks (**A+**), Game Programming (**A+**), Digital Signal Processing (**A+**), Digital Signal Processing Laboratory (**A+**), Linear Algebra (**A+**), Probability (**A+**), Discrete Mathematics (**A+**), Machine Learning (**A+**), Deep Learning (**A+**), Parallel Computing (**A+**)

University of British Columbia (UBC) *Jul. 2019 - Aug. 2019*

Summer Session Student *Vancouver, Canada*

- Learn web programming & algorithm in UBC ECE department

Publications († indicates equal contribution)

[1] Sheng-Yu Huang†, **Hao-Yu Hsu**†, Yu-Chiang Frank Wang, "SPoVT: Semantic-Prototype Variational Transformer for Dense Point Cloud Semantic Completion", *Accepted by* ***NeurIPS 2022***

[2] Zhi-Hao Lin, Wei-Chiu Ma†, **Hao-Yu Hsu**†, Yu-Chiang Frank Wang, Shenlong Wang, "NeurMiPs: Neural Mixture of Planar Experts for Novel View Synthesis", *Accepted by* ***CVPR 2022*** [paper] [project] [code] [video]

[3] Yu-Shan Huang, Sheng-Yu Huang, **Hao-Yu Hsu**, Yu-Chiang Frank Wang, "Interpreting Latent Representation in Neural Radiance Fields for Manipulating Object Semantics", *In submission to* ***AAAI 2023***

Research Experience

Vision & Learning Lab, National Taiwan University *Sep. 2021 - Present*

Advisor: Prof. Yu-Chiang Frank Wang

Research Assistant

- Researched on **3D point cloud semantic completion** by learning to complete partial point clouds guided by both geometry and semantic cues. [1]
- Researched on **3D novel view synthesis**, with focus on representing a scene with multiple learnable planes. Implemented custom CUDA kernel for scene rendering. Achieved **60x** speedup on rendering indoor scenes. [2]
- Researched on **3D object manipulation**. Achieved editing of specific part attributes of a 3D object represented by semantic-aware generative NeRF. [3]
- Resulted in two publications at CVPR 2022 and NeurIPS 2022.

Vision & Science Lab, National Tsing Hua University *Sep. 2019 - Jun. 2020*

Advisor: Prof. Min Sun

Undergraduate Researcher

- Researched on image super-resolution on recovering low-resolution facial images by learning an image downsampler.
- Studied papers in fields of computer vision, natural language processing and reinforcement learning.

Honors & Awards

2021	**Phi Tau Phi Scholastic Honor Society Honorary Membership**, - Graduated top 1% in NTHU EE Department	*NTHU*
2017-2021	**Dean's List Award (4 times)**, - Top 5% GPA in each semester	*NTHU*
2020	**Honorable Mention**, Innovation Game Design Competition	*Taipei, Taiwan*
2020	**First Place**, Kaggle Competition in CS5656 Deep Learning	*NTHU*
2019	**Summer Oversea Experience Scholarship**, - Only 10 students in NTHU EE Department	*EE Dept., NTHU*

Working Experience

Industrial Technology Research Institute (ITRI) Big Data R&D Center *Jul. 2020 - Sep. 2020*

Software Engineer Intern *Hsinchu, Taiwan*

- Worked on optical character recognition for scanned documents of client receipts.
- Implemented traditional image processing algorithm in **OpenCV** and deep learning-based method in **Tensorflow & PyTorch**.
- Reached **88%** mAP in **text localization** task on client testing data by pretraining on synthetic dataset and finetuning on client training data.

Teaching Experience

Embedded System Laboratory 2020 Fall *Feb. 2020 - Jun. 2020*

Teaching Assistant

- Improved quality and impact of course materials with real-world examples such as vision on microcontroller.
- Co-designed assignment, exam, and final project, and provided one-on-one instructions for over 70 students.

Selected Projects

Parallel Low-Poly Image Generation [project page] *Jun. 2021*

Final Project of "**Parallel Computing**" [C++, CUDA, OpenCV]

- Developed low-poly image processing pipelines in C++.
- Employed **CUDA** library for parallelization on GPU, and achieve **20x** speedup compared to sequential version running on CPU.

Automatic Dart Score Solver [project page] *Jan. 2021*

Final Project of "**Digital Signal Processing Laboratory**" [MATLAB]

- Developed a MATLAB program for dart score estimation on captured dartboard images.
- Utilized **digital image processing** techniques for score region segmentation and dart location estimation.

Image in Audio Steganography [project page] *Jun. 2020*

Outstanding Final Project of "**Digital Signal Processing**" [MATLAB]

- Developed a novel method on concealing an image within a non-secret audio source.
- Reached **35 PSNR** on recovered test image and the **minimal size** of audio source **required**.

AniBall - A Multiplayer Party Game [project page] *Jan. 2020*

Honorable Mentioned Project of "**Game Programming**" [Unity, C#, Blender]

- Led 5 people team to develop a multi-player party game in Unity.
- Built up locomotion mechanism of players and multiple game effects (ex: particle effects, mesh deformation during collision).
- Crafted 3D models of animals from scratch in Blender.
- Awarded **Honorable Mention Project** at Innovation Game Design Competition.

Real-Time Face Recognition Application [project page] *Dec. 2019*

Outstanding Final Project of "**Machine Learning**" [OpenCV, Keras, Scikit-learn]

- Developed an application supporting real-time face recognition. Deployed on webcam of a laptop.
- Utilized OpenCV for **face detection** and CNN architecture (i.e. **FaceNet**) for face feature extraction.
- Trained a **SVM** classifier on extracted face features on self-collected facial dataset.

Extracurricular Activity

Basketball Team, Department of EE *Sep. 2017 - Aug. 2020*

Vice Captain

- Led and coached a basketball team of more than 20 student players two times per week.
- Won 1st place twice in interscholastic basketball tournament of EE department.

Skills

Programming Languages	Python, C++, C#, CUDA, OpenMP, MATLAB, MySQL, HTML/CSS, JavaScript
	Mandarin (native), English (TOEFL: 100, GRE: 328)
Libraries/Tools	PyTorch, Tensorflow, Scikit-learn, OpenCV, Git, Unity, LaTeX