Hao-Yu Hsu

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Research Interests

3D Computer Vision, Neural Rendering, Robotics

Education

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

Bachelor of Science in Electrical Engineering
Hsinchu, Taiwan

- GPA: overall: **4.23/4.3, 3.97/4.0**, rank: **1/102 (1%)**
- Honors: Academic Achievement Awards * 4 (Fall '17, Fall '18, Fall '20, Spring '21)
- Key Courseworks: Algorithms (**A+**), Computer Architectures (**A+**), Operating Systems (**A+**), Game Programming (**A+**), Digital Signal Processing Laboratory (**A+**), Machine Learning (**A+**), Deep Learning (**A+**), Parallel Computing (**A+**)

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

Summer Session Student in ECE
Vancouver, Canada

Publications (* indicates equal contribution)

[1] **Hao-Yu Hsu***, Sheng-Yu Huang*, Yu-Chiang Frank Wang. *"SPoVT: Semantic-Prototype Variational Transformer for Dense Point Cloud Semantic Completion"*. **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 View Synthesis"*. **CVPR 2022**. zhihao-lin/neurmips

[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"*. Under submission.

Research Experience

Robot Learning Lab, National Taiwan University
Jun. 2022 - Present

Research Assistant, Advisor: Prof. Shao-Hua Sun
Taipei, Taiwan

- Researched in robot learning, program synthesis and symbolic AI.
- Implemented **robot manipulation** on object assembly tasks. Utilized multi-view observation on doing tangram puzzles and stacking blocks.

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

Research Assistant, Advisor: Prof. Yu-Chiang Frank Wang
Taipei, Taiwan

- Researched in 3D computer vision and neural rendering.
- Proposed a **point cloud semantic completion** framework complete partial point clouds of 3D objects using both geometry and semantic cues. Outperformed other methods 13% on chamfer distance and 11% on mIoU scores. [1]
- Boosted indoor scene rendering time by **60x** with novely designed 3D representation. Outperformed NeRF and MPI methods in extreme view extrapolation and **novel view sysnthesis** with multiple learnable planes. [2]
- Added attribute **manipulation** feature on **3D objects** represented by semantic-aware generative NeRF. [3]
- First co-author at NeurIPS 2022 and second co-author at CVPR 2022.

Working Experience

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

Software Intern on Text Mining
Hsinchu, Taiwan

- Worked on optical character recognition for scanned documents of client receipts.
- Reached **88%** mAP in **text localization** task on client testing data by pretraining and finetuning techniques.

Honors & Awards

2021 **Phi Tau Phi Scholastic Honor Society Honorary Membership**, - Graduated top 1% in NTHU EE *NTHU*

2017-2021 **Academic Achievement Award**, - Top 5% GPA in each semester *NTHU*

2020 **Honorable Mention**, Innovation Game Design Competition *Taipei, Taiwan*

Teaching Experience

Embedded System Laboratory 2020 Fall, NTHU
Feb. 2020 - Jun. 2020

Teaching Assistant *Hsinchu, Taiwan*

- Improved course materials with computer vision tasks on microcontroller.
- Co-designed assignment, exam, and final project, and hosted TA session for over 70 students.

Selected Projects

Parallel Low-Poly Image Generation
Jun. 2021

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

- Designed a low-poly image processing pipeline in C++.
- Achieved **20x** speedup compared to sequential version running on CPU by employing **CUDA** library for parallelization on GPU.

Automatic Dart Score Solver
Jan. 2021

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

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

Image in Audio Steganography
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 with the **minimal size** of audio source **required** compared to other methods.

AniBall - A Multiplayer Party Game
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 game characters from scratch in Blender.
- Awarded **Honorable Mention Project** at Innovation Game Design Competition.

Real-Time Face Recognition Application
Dec. 2019

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

- Designed an application supporting real-time face recognition. Deployed on the 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 facial 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	Python, C++, C#, CUDA, OpenMP, MATLAB, MySQL, HTML/CSS, JavaScript, Verilog
Libraries/Tools	PyTorch, Tensorflow, Scikit-learn, OpenCV, Git, Unity, LaTeX
Languages	Mandarin (native), English (fluent, TOEFL: 108)