

Cheng-Yen (Wesley) Hsieh

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EDUCATION

Carnegie Mellon University (CMU), School of Computer Science	Pittsburgh, PA
Master of Science in Computer Vision (MSCV)	Dec. 2023
National Taiwan University (NTU)	Taipei, Taiwan
Bachelor of Science in Electrical Engineering	Feb. 2022

RESEARCH PROJECTS

Tracking Any Object Amodally (Project Page)	Pittsburgh, PA
CMU Graduate Researcher MSCV Capstone Project	Jan. 2023 — Present

- Developed TAO-Amodal dataset to enhance amodal tracking, tracking complete object structures from partial visibility, by including 17k objects spanning 880 categories and adapted evaluation metrics.
- Presented a light-weight plug-in module, amodal expander, to amodalize any existing detector and tracker with limited training data; Introduced PasteNOcclude data augmentation technique to craft occlusion scenarios.
- Achieved significant 3.3% mAP and 1.6% mAP improvements on the detection and tracking of occluded objects, along with a >30% detection mAP boost for occluded people on the TAO-Amodal validation set.

Visual Question Answering with Vision Language Multi-Agent Debate	Pittsburgh, PA
MIT Research Assistant (Remote Collaboration)	Jul. 2023 — Present

- Integrated vision language model agents into a collaborative debate setting to improve language responses through the synthesis of reasoning processes from multiple agents;
- Enhanced > 2% accuracy across diverse tasks such as instance counting, object attributes, and relation analysis.

Self-Supervised Representation Learning for Multi-Label Visual Tasks (Paper, Github)	Taipei, Taiwan
NTU Undergraduate Researcher	Aug. 2020 — Feb. 2022

- Designed an unsupervised visual pretext task for downstream multi-label classification tasks.
- Utilized multi-scale pyramid and patch-level correlation learning to leverage information across distinct scales.
- Outperformed the strongest and SOTA methods by 3.3% mAP and 2.5% mAP on COCO and VOC, respectively.

Split Learning for Efficient Image Recognition (Paper, Github)	Taipei, Taiwan
NTU Undergraduate Researcher	Jul. 2021 — Feb. 2022

- Developed new resource-efficient batch-wise compression in SL to lower heavy burden on computation/memory resources caused by DNN en/decoder training for dimensional compression.
- Exploited quasi-orthogonality of features in high-dimensional space and circular convolution operations to reduce the information loss caused by batch-wise compression.
- Reduced memory and computational overheads by 1,152 and 2.25 times respectively while maintaining competitive accuracy with SOTA dimensional compression method.

Federated Learning for Efficient Image Recognition (Paper, Github)	Taipei, Taiwan
NTU Undergraduate Researcher	Jan. 2020 — Jun. 2021

- Designed computation-efficient FL-hyperdimensional computing (FL-HDC) to address high computation and communication burdens from previously training deep neural networks (DNN)s.
- Utilized bipolarization on model weights to cut communication costs, compensating for the precision loss of numerical values post-bipolarization by proposing an adaptive learning-based retraining mechanism.
- Reduced communication costs by 23 times with comparable accuracy to previous works.

PUBLICATIONS

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- [1] **Cheng-Yen Hsieh**, Tarasha Khurana, Achal Dave, Deva Ramanan, "Tracking Any Object Amodally", submitted to *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2024.
 - [2] **Cheng-Yen Hsieh**, Chih-Jung Chang, Fu-En Yang, Yu-Chiang Frank Wang, "Self-Supervised Pyramid Representation Learning for Multi-Label Visual Analysis and Beyond", in *IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)*, 2023.
 - [3] **Cheng-Yen Hsieh**, Yu-Chuan Chuang, An-Yeu Wu, "C3-SL: Circular Convolution-Based Batch-Wise Compression for Communication-Efficient Split Learning", in *2022 IEEE 32nd International Workshop on Machine Learning for Signal Processing (MLSP)*, 2022.
 - [4] **Cheng-Yen Hsieh**, Yu-Chuan Chuang and An-Yeu Andy Wu, "FL-HDC: Hyperdimensional Computing Design for the Application of Federated Learning," in *2021 IEEE 3rd International Conference on Artificial Intelligence Circuits and Systems (AICAS)*, 2021, pp. 1-5, doi: 10.1109/AICAS51828.2021.9458526.

TECHNICAL SKILLS

Programming: C/C++, Python, Javascript, Solidity, C#, MATLAB, Latex, Verilog

Frameworks, Tools, and Systems: Pytorch, Tensorflow, Pyspark, Git, Docker, Linux, Windows, MacOS

WORK EXPERIENCE

Waymo

Mountain View, CA

Software Engineer, Machine Learning Infrastructure, Intern.

May. 2023 — Aug. 2023

- Proposed a differential learning rate (DLR) API that automatically divides model groups based on variable names, specified in the configuration files like proto, textproto, and dataclass.
- Created a modularized DLR training pipeline compatible with mainstream deep learning frameworks such as Tensorflow; Achieved a greater than 1.5% accuracy improvement across multiple tasks within the perception team.

ASUS Intelligent Cloud Services (AICS)

Taipei, Taiwan

Software/Machine Learning Engineer Intern, Software Research Development Dept.

Jul. 2021 — Sept. 2021

- Operated Spark database to process and analyze more than 1,000,000 advertisements (Ads) and customer data logs, building an advertisement recommendation system to predict user browsing preferences with decision trees.
- Added over 300 features to solve model underfitting by organizing narrative categorization into multi-levels, improving the system's CTR (Click Through Rate) to 110% compared to previous performance.

Arrow Electronics, Inc.,

Taipei, Taiwan

Field Application Engineer Intern, Engineering Dept.

Jul. 2020 — Sept. 2020

- Utilized C to execute system-level circuit designs on customized microcontroller units (MCUs) and embedded systems for industrial clients.
- Assisted in hardware failure analysis by generating over 3 technical solutions with corresponding presentations or demonstration videos for each.

SELECTED PROJECTS

Multi-Label Classification of Medical Cerebral Hemorrhage

Taipei, Taiwan

Deep Learning for Computer Vision (CV)

Sept. 2020 — Jan. 2021

- Applied CV techniques to classify 5 kinds of cerebral hemorrhage based on Computer Tomography (CT) images.
- Conducted a comprehensive study on combining medical knowledge with CV techniques like CNN and RNN for medical imaging processing and capture of slice dependency between CT images from the same patients.
- Reduced the bias caused by unbalanced medical data distribution by devising Differentiable F1 Loss with a differentiable format, improving the F1 score of cerebral hemorrhage prediction by 10%.

Hand Gesture Recognition

Taipei, Taiwan

Undergraduate Researcher, Advanced Control Laboratory

Sept. 2019 — Feb. 2020

- Implemented CNN-based SOTA methods and utilized OpenCV to build a real-time gesture recognition model capable of predicting three types of hand gestures; applied Gaussian filters to remove image noise.
- Achieved 92% prediction accuracy with negligible time delay.

Food No-Covid — Food Delivery Dapp on Ethereum ([Github](#))

Taipei, Taiwan

Electrical Engineering Lab (networking and Multimedia)

Feb. 2020 — Jun. 2020

- Developed a Dapp (Decentralized APPlication) to record, trace, monitor, and analyze delivery history and health of delivery drivers, minimizing health concerns in food delivery during the COVID-19 pandemic.
- Utilized Solidity, a smart contract programming language, to create contracts and transfer food delivery processing data to Ethereum, resolving concerns regarding non-disclosure of information due to centralized servers; introduced Google Geolocation API to process detailed real-world coordinates with designed queues; project ranked within top 3 by vote.

TEACHING EXPERIENCE

Programming for Business Computing in Python (PBC) at NTU

Sept. 2020 — Feb. 2022

- Taught a 2-hour course twice weekly with original tutorials and hands-on work to 800+ students, the largest university Python course in Taiwan; held individual office hours for 20+ students 3 hours per week.
- Selected as the best teaching assistant lecturer in PBC for Fall 2021.

Signals and Systems at NTU

Feb. 2021 — Jul. 2021

- Developed supplementary learning materials for homework; held weekly problem-solving sessions, answering questions ranging from signal processing to communication systems for ~180 students over 15 weeks.

HONORS AND AWARDS

Academic Excellence Award for Top 5% of Students, National Taiwan University, Taipei, Taiwan (2020 Fall)

EXTRACURRICULAR ACTIVITIES

National Taiwan University, Taipei, Taiwan

Oct. 2014 — Sept. 2019

Baseball Varsity (since high school)

- Volunteered to lead a ten-member team each semester in teaching 40+ kids in the countryside how to play baseball by introducing a computer vision-based camera-tracking system to capture and analyze their movements and gait.