

HAORAN ZHANG

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Google Scholar ◇ Github ◇ LinkedIn

EDUCATION

Carnegie Mellon University (CMU)

May 2025 (expected)

M.S. in Electrical and Computer Engineering (Advanced Study)

GPA: 4.0/4.0

Related courses: Introduction to Deep Learning (18-786), Information Theory Measures for Artificial and Natural Intelligence Systems (18-753), Machine Learning for Signal Processing (18-797).

Huazhong University of Science and Technology (HUST)

June 2023

B.E. in Automation (Advanced Class)

GPA: 3.9/4.0 GRE: 327+3.5

Related courses and scores: Pattern Recognition and Machine Learning (93/100), Control Theory (I, 97/100) and (II, 95/100), Game Theory (85/100), Computational Methods (99/100).

The Technical University of Munich (TUM)

April 2023 - August 2023

Exchange student in Electrical Engineering Department

RESEARCH INTERESTS

My current project involves federated learning, resource allocation, and optimization. I am happy to continue researching these areas. I am also open to exploring new fields.

RESEARCH EXPERIENCE

Client-Task Sampling in Multiple Models Federated Learning [1]

Jan 2024 - Present

Supervisors: Dr. Marie Siew, Prof. Carlee Joe-Wong, and Prof. Rachid El-Azouzi

CMU

- Proposed a client sampling method (gradient-norm based) in multiple models federated learning (MMFL), achieving a **30%** higher accuracy than the baselines.
- Found that loss based sampling method performs even better than gradient-norm based one, **which is counter-intuitive at first**. Proposed an explanation to illustrate this.
- Completed the **convergence proof** for the proposed algorithm.
- Modified the above client sampling algorithm to enhance the task fairness in MMFL.
- Our work is the first to extend MMFL to a multi-processor level and accept some clients cannot handle all training tasks.

Task Fairness in Multiple Models Federated Learning [2]

Dec 2023 - Feb 2024

Supervisors: Dr. Marie Siew and Prof. Carlee Joe-Wong

CMU

- Ran experiments for the proposed algorithm (FedFairMMFL) in various settings.
- Organized the original code to make it more efficient and clear.
- Explored an improved method using the Bayesian rule to model the sampling probability of each client.

Efficient Segmentation and Domain-adversarial Learning [3]

Feb - Nov 2022

Supervisor: Prof. Hao Chen

The Hong Kong University of Science & Technology (HKUST)

- Proposed a pyramidally downsampled 3D Transformer, improving the model's accuracy by 1.72% and efficiency by 12% on brain stroke lesion and prostate segmentation tasks.
- Proposed a cluster-based domain-adversarial learning method to exploit domains at a fine-grained level, improving generalization ability by 2.61% on multi-domains segmentation tasks.
- Finished the code and manuscript independently.

4D Artery Reconstruction and Motion Magnification

Apr - Aug 2023

Supervisor: Dr. Zhongliang Jiang

TUM

- Implemented motion magnification algorithm to enhance the motion of the artery, facilitating the detection of potential diseases of arteries (demo: tinyurl.com/m-Magnification).
- Implemented a method based on the Transformer and Siamese-like network for tracking 2D arteries from ultrasound videos (demo: tinyurl.com/arterytrack).
- Designed an algorithm to reconstruct the 4D artery model from ultrasound videos, showing the motion of the artery in 3D (demo: tinyurl.com/4dartery).

DNA Computing and Molecular Circuits Design (Undergrad Thesis) Sept 2022 - June 2023

Supervisor: Prof. Linqiang Pan

HUST

- Studied the principles and applications of DNA computing and built molecular circuits.
- Designed DNA switching circuits to simulate the computational devices made of DNA.
- Simulated and synthesized multiple 3D nanostructures using DNA origami.
- Further verified the reliability and efficiency of the polymerase DNA kirigami by constructing even more complex 3D nanostructures.

PUBLICATIONS

- [1] **H. Zhang**, Z. Li, Z. Gong, M. Siew, C. Joe-Wong, and R. El-Azouzi, "Poster: Optimal variance-reduced client sampling for multiple models federated learning," in *2024 IEEE 44th International Conference on Distributed Computing Systems (ICDCS)*, **Best Poster Award**, IEEE, 2024.
- [2] M. Siew, **H. Zhang**, J.-I. Park, *et al.*, "Fair concurrent training of multiple models in federated learning," *arXiv preprint arXiv:2404.13841*, 2024.
- [3] **H. Zhang** and H. Chen, "Efficient 3d transformer with cluster-based domain-adversarial learning for 3d medical image segmentation," in *2023 IEEE 20th International Symposium on Biomedical Imaging (ISBI)*, IEEE, 2023, pp. 1–5.

ACHIEVEMENTS

Outstanding Graduate, HUST

Summer 2023

Scholarship for Scientific and Technological Innovation, HUST

Fall 2022

Honorable Mention in Mathematical Contest In Modeling 2022, COMAP

Summer 2022

Scholarship for Extracurricular Activities and Sports, HUST

Fall 2019

SKILLS/HOBBIES

Programming Languages

Python, C/C++, MATLAB, HTML

Machine Learning Tools

Pytorch, Tensorflow, Sklearn, Pandas, Numpy

Hobbies

birding and hiking