Yudong Hu

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Yudong (Shawn) Hu | abdn-hyd

Guangzhou, Guangdong - 510380, China

Education

- **South China Normal University (Dual-Degree Program)** *Sep. 2021 - Jun. 2025*
  - *Bachelor of Engineering*
  - Major: Artificial Intelligence
  - GPA: 3.8/5.0, 88.0/100.0
- **University of Aberdeen** *Sep. 2021 - Jun. 2025*
  - *Bachelor of Science (First-Class Honours)*
  - Major: Artificial Intelligence
  - GPA: 20.05/23.00

Publications

C=Conference, J=Journal, S=In Submission

[C.1] **Yudong Hu**, Yueju Han, Rui Sun and Jinke Ren. (2025). MSPCaps: A Multi-Scale Patchify Capsule Network with Cross-Agreement Routing for Visual Recognition. ***AAAI 2026***.

[J.1] Huijun Xing, Rui Sun, Jinke Ren, Jun Wei, Chun-Mei Feng, Xuan Ding, Zilu Guo, Yu Wang, **Yudong Hu**, Wei Wei, Xiaohua Ban, Chuanlong Xie, Yu Tan, Xian Liu, Shuguang Cui, Xiaohui Duan and Zhen Li. (2025). FlexFair: Achieving Flexible Fairness Metrics in Federated Learning for Medical Image Analysis. ***Nature Communications***, vol. 16, pp. 3342. DOI: https://doi.org/10.1038/s41467-025-58549-0.

Research Projects

- **Hessian-Aware Sparse & Low-Rank LLM Compression** *Sep 2025 - Present*
  Research Assistant; The Chinese University of Hong Kong, Shenzhen
  Supervisor: Prof. Jinke Ren
  - Developed a hybrid framework to factorize LLM weight into sparse and low-rank components, which efficiently isolates outliers from structural redundancies.
  - Implemented a Hessian-weighted objective function to minimize the impact in terms of layer-wise output loss by prioritizing weights with high sensitivity.
  - Designed an iterative alternating-minimization algorithm to find the optimal parameter allocation between the k-rank and s-sparse factors.
- **Multi-Scale Based Patchify Capsule Network for Visual Recognition** *May 2025 - Nov 2025*
  Research Assistant; The Chinese University of Hong Kong, Shenzhen
  Supervisor: Dr. Rui Sun and Prof. Jinke Ren
  - Developed a novel framework that generates part-whole capsules via uniform patchify operations.
  - Proposed an advanced Cross-Agreement Routing to match optimal part-to-whole pairs for better voting process.
  - Achieved state-of-the-art performance on multiple public image classification benchmarks, and demonstrated exceptional robustness against adversarial attacks (FGSM & BIM attacks).
  - Finished a paper which is accepted by the Top-tier conference ***AAAI 2026***.
- **Medical Image Segmentation and Multimodal Prediction** *Dec 2023 - April 2025*
  Research Assistant; The Chinese University of Hong Kong, Shenzhen
  Supervisor: Dr. Rui Sun and Prof. Jinke Ren
  - Standardized irregular 3D MRI data by applying multiple resampling techniques (Lanczos, Bilinear, etc.), and processed regions of interest (ROIs) to improve data quality for lesion identification.
  - Developed a multimodal medical model by fusing features from a pre-trained BERT and a 3D Vision Transformer using cross-attention mechanism.
  - Researched the role of federated learning and fairness metrics in protecting data privacy. The research work has been published in ***Nature Communications***.

Course Projects

- **Implementation and Analysis of Denoising Diffusion Probabilistic Models (DDPM)** *May. 2025 - Jun. 2025*
  Individual Project [GitHub]
  - Implemented the DDPM framework from scratch, and systematically evaluated the performance of various beta schedulers, including linear, quadratic, constant, and warmup schedules.

- Investigated the paradigm shift from predicting the original image to predicting noise, and compared the performance of a baseline U-Net against a U-Net enhanced with a spatial attention mechanism.
- Achieved high-quality image generation successfully on both the CIFAR-10 and CelebA datasets.

- **Autonomous Vehicle Navigation Simulation** *Mar. 2024 - Jun. 2024*
  Group Project [GitHub]
  - Developed a comprehensive robotics system in which the vehicle can operate autonomously using sensor data and perform simultaneous localization and mapping (SLAM).
  - Employed Gazebo for environment simulation and RViz for robot and sensor data visualizations.
  - Facilitated robot navigation by implementing path planning and obstacle avoidance algorithm with LiDAR data.

- **Turtlesim Simulation Based on ROS2** *Mar. 2024 - Jun. 2024*
  Individual Project [GitHub]
  - Generated a dynamic simulation environment by spawning turtles with random positions and orientations, and published each turtle's position to relevant topics for effective position tracking.
  - Developed a path-planning algorithm that allowed the master turtle to navigate towards and catch the nearest turtle autonomously, and achieved precise control by adjusting linear and angular velocities.
  - Programmed the caught turtles to follow the master turtle in a coherence chain formation.

- **Fine-Tuning LLMs for Chinese Wordplay with RuozhiBa Dataset** *Oct. 2024 - Nov. 2024*
  Group Project
  - Performed comprehensive data annotations and data argumentation on RuozhiBa dataset to enhance data diversity using synonym replacement.
  - Conducted comparison experiments of multiple baseline models (GLM, Llama3-8B, and Qwen2.5-7B), and applied fine-tuning techniques (LLaMA Factory & LoRA) to optimize model performance.

- **Word Explorer: An AI-Driven Text Adventure Odyssey Based on NLP** *Mar. 2024 - Jun. 2024*
  Group Project
  - Designed a text adventure game capable of providing accessible mental support and a secure emotional outlet.
  - Leveraged prompt engineering techniques to craft specific prompts and guide the production of storylines.
  - Mainly responsible for the fine-tuning of GPT-3.5 Turbo model and data splitting for model's robustness.

- **A Simple FCNN from Scratch** *Mar. 2024 - Apr. 2024*
  Individual Project
  - Constructed a fully connected ANN from the ground up, and implemented forward/backward propagation to reach 97.22% accuracy without using any machine learning libraries.
  - Built and analyzed the performance of SGD, Adam, and AdamW optimizers to evaluate their impact.

Working Experience

- **Guangzhou Xiaopeng Motors Technology Co., Ltd.[Web]** *Jun. 2024 - Aug. 2024*
  Big Data Analytics Intern Guangzhou, China
  - Fulfilled data collection and image screening duties for an autonomous parking project (AVM-BEV-FSD), and established corner cases for parking scenarios to satisfy the daily data requirements.
  - Executed view stitching of parking scenarios using the IPS model, and utilized the Redash platform to monitor daily data collection, identify data anomalies, and analyze their root causes.
  - Reported image quality issues such as scene repetition and IPS inconsistencies, and monitored various data collection metrics to inform potential risks to adjust volumes for different parking scenarios.

- **Sun Yat-Sen Memorial Hospital, Sun Yat-Sen University[Web]** *Jan. 2024 - Feb. 2024*
  Data Analytics Intern Guangzhou, China
  - Applied custom masks to 2D image slices to extract specific Regions of Interest (ROIs) for analysis.
  - Performed data compression and content extraction on neuroimaging informatics technology initiative files.

Skills

- **Programming Languages:** Python, MATLAB, JavaScript, Java, C++
- **Data Science & Machine Learning:** PyTorch, Numpy, Scikit-learn, Pandas, OpenCV, Eigen
- **Specialized Area:** Computer Vision, Multi-Modal, LLM Quantization
- **Research Skills:** Literature Review, Experiment Design, Scientific Communication.

Additional Information

Languages: English (Fluent, **IELTS 7.0**)
Interests: Snooker, Football.