Wenchang CHAI(He/His)

BSc (Hons) Computer Science
Hong Kong Polytechnic University

For Ph.D. Application

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EDUCATION

◆ **The Hong Kong Polytechnic University, Hong Kong**   *Sep 2022 - Now*
BSc (Hons) Computer Science. Minor in Artificial Intelligence & Information Engineering

◆ **University of Cambridge, UK.**   *Jun 2023*
Summer Programme of Mathematics for Engineering
(GPA 4/4, Awarded Study Abroad Fund and Summer Program Sponsorship)

◆ **Sun Yat-sen University, Mainland China.**   *Jun 2025*
"Knowledge & Action - AI in Practice 2025" Summer School

ACADEMIC RECORDS

◆ **CGPA:** 3.72/4.3, **WGPA:** 3.74/4.3, First Class Honor & Dean's Honours List (2023/24, 2024/25)

◆ **Core CS:** Software Engineering (A+) , Computer System Security (A+) , Computer Networking (A)

◆ **AI Specialization:** Machine Learning (A), Computer Vision (A), Big Data Analytics (A), AIoT (A-)

◆ **TOEFL:** Overall 106/101 (Reading 28/25, Listening 28/29, Speaking 30/23, Writing 20/24)

RESEARCH OUTPUT (**6** papers, **4** patents, **2** proposal drafts. *See at my Home Page for full texts*)

▶▶ <u>First- or Co-First- Author Publications</u>   (2 papers)

[C1] **W. Chai**, J. Liu, Z. Zhang, X. Xia, Y. Zheng, N. Hou, Q. Yang, W. Chen, T. Gu. Satellite IoT in Practice: A First Measurement Study on Network Availability, Performance, and Costs. ACM IMC'25, October 2025, Madison, Wisconsin, USA. (*Core-A, Accepted and oral presentation*)

[J1] S. Jiang, **W. Chai**, M. Zhang, J. Cao, S. Xuan, J. Shen. Verifying Energy Generation via Edge LLM for Web3-based Decentralized Clean Energy Networks. Information Fusion. (*IF:15.5, published, Co-first author*)

▶▶ <u>Co-Author Publications</u>   (4 papers)

[C2] R. Li, Z. Zhang, X. Xia, N. Hou, **W. Chai**, S. Yu, Y. Zheng, T. Gu. From Interference Mitigation to Toleration: Pathway to Practical Spatial Reuse in LPWANs. ACM MobiCom'25, Nov 2025, HK, China. (*Core-A, Accepted*)

[C3] C. Liu, **W. Chai**, H. Wu, Y. Pan, P. Wei, L. Lin. Thinking before You Speak: Proactive Test-time Scaling for LLMs. EMNLP 2025, Nov 2025, Suzhou, China. (*Core-A*, Accepted*)

[J2] Y. Qian, **W. Chai**, H. Wang, Z. Mai, L. Zhou, H. Wu. LitchiInst: Instance Segmentation of the Main Fruit-Bearing Branch via Fruit-Branch Association for Robotic Litchi Harvesting. Engineering Applications of Artificial Intelligence. (*IF:8.0, Submitted*)

[J3] Y. Ma, H. Qu, H. Xu, **W. Chai**, Z. Luo, Y. Zhang, W. Kang, J. Liu. A Large Language Model-based Framework for Generalizable and Unified Physiological Signal Analysis. Nature Communications. (*IF:15.7, Submitted*)

▶▶ <u>Patents</u> (see my Home Page)

[*P1*] Y. Liu, **W. Chai**, Tencent Technology (Shenzhen) Co. Ltd. Task execution method, device, and system based on multiple container orchestration clusters. Invention Patent Publication No. CN119512688A, China.

[*P2*] Y. Liu, **W. Chai**, Tencent Technology (Shenzhen) Co. Ltd. Task processing method, device, equipment, and storage medium. Invention Patent Application No. 202411284603.9, China.

[*P3*] **W. Chai,** Guangzhou Zhixin Middle School Co. Ltd. A detection system based on mandatory helmet wearing. Utility Patent No. ZL202121723998.X. China.

[*P4*] **W. Chai,** Guangzhou Zhixin Middle School Co. Ltd. A helmet based traffic accident detection system. Utility Patent No. ZL202121724412.1. China.

⏩ Research Proposal (*my Drafts, see at my Home Page*)

[draft.1] AI-Enabled Intelligent Perioperative Management Platform — Development Proposal on Multi-Modal Collaborative Edge AI-Enabled Intelligent Perioperative Management Platform. (Sep 2025)

[draft.2] Design of a Differential Privacy and Time-Series Data Analysis Framework Based on Edge Computing: Enhancing IoT Data Analytics Efficiency Under Privacy Protection. (July 2025)

⏬ RESEARCH EXPERIENCES (see at my Home Page for full papers)

⏩ **Research Assistant:** Internet & Mobile Computing Lab (IMCL). PolyU, HK   Mar 2024-Now

- **Project : Decentralized Clean Energy Verification Framework via Edge LLMs.**

  Advisor: *Chair prof. Jiannong Cao & Prof. Jiang Shan, PolyU, HK*

  Abstract: Proposed the DeCEN architecture (integrating edge computing, blockchain, and AI-driven verification) to advance the reliability, trust, and efficiency of decentralized clean energy networks, which offers a scalable pathway toward global renewable energy targets.

  My work: Framework development and evaluation, data analysis (Analyzed the performance of DeepSeek-R1 models for edge deployment and identified 14B outperforms 70B model), paper writing. *(1 paper published)*

⏩ **Research Assistant:** Next-Generation IoT Networking Infrastructure Research Group. PolyU, HK.   Mar 2023-Now

- **Project 1: Optimization of Direct-to-Satellite (DtS) Connectivity in Low Earth Orbit (LEO) Satellite IoT.**

  Advisor: *Prof. Xia Xianjin, PolyU, HK.*

  Abstract: Conducted in-depth investigations with 27 tiny ground stations across 8 locations on 4 continents to evaluate the network availability, reliability, cost, and energy performance of Satellite IoT, to optimize the system's performance.

  My work: Designed and assembled the Tiny Ground Station devices; Developed TLE-based scheduling algorithms with real-time Doppler compensation and LoRa duplex protocols; Data collection and analysis; Paper writing.*(1 paper accepted)*

- **Project 2: Spatial Reuse Improvement and Spectrum Efficiency Optimization in LPWANs.**   *Dec 2023-Now*

  Advisor: *Prof. Xia Xianjin, PolyU, HK.*

  Abstract: Developed a novel framework *HydraNet*, which leverages the capture effect of LPWAN radios to enable robust concurrent transmissions, and achieved a higher spectrum utilization over the state-of-the-art.

  My work: Hardware setup, System synchronization, Data collection. (*1 paper accepted*)

⏩ **Team Member: Multimodal Foundation Models for Generalizable Physiological Signal Analysis.**   Jan 2025-Jun 2025

  Advisor: *Prof. Wenxiong Kang, SCUT, China Mainland.*

  Abstract: Proposed a unified LLM framework for cross-modal physiological signal analysis (ECG/EOG/EEG/EMG).

  My work: Co-designed cross-modal attention mechanisms enabling LLMs to interpret bioelectric signals. Dataset selection and data preprocessing. (*1 paper submitted*)

⏩ **Team Member: Natural Language Processing Research.**   Dec 2024-Mar 2025

  Advisor: *Prof. Hejun Wu, SYSU, China Mainland.*

  Abstract: Proposed a novel prompting paradigm *Proactive Prompting*, which allow LLMs to generate prompts to steer its reasoning steps. Developed a reasoning framework *Think Before You Speak* with proactive test-time scaling ability.

  My work: Deploy Qwen2.5-7B-Instruction model; Analyzed TBYS and SC accuracy on MATH-500 and AIME; Coding and paper writing. *(1 paper accepted)*

⏩ **Team Member: Research on Litchi Harvesting Robots.**   Oct 2024-Jul 2025

  Advisor: *Prof. Hejun Wu, SYSU, China Mainland.*

  Abstract: A litchi detection framework with 31.06% AP improvement and 92.3% recognition accuracy in orchards.

  My work: Created AIA-guided queries and EFPN with four modules for accurate MFBB detection in complex branches; Constructed LitchiMFBB dataset through comprehensive annotation of litchi clusters and MFBBs. (*1 paper submitted*)

⏩ **Team Member: TA-GPT: AI-Powered Campus Q&A System Using RAG.**   Jan 2023-May 2023

Advisor: *Prof. Wu Jibin, PolyU, HK.*

Abstract: Teaching Assistant- GPT, an RAG system providing accurate information for students on academic programs, course syllabus, and services.

My work: Designed Generator module using Langchain with query reformulation; Achieved 4.4/5.0 user satisfaction in study with 50 students; Outperformed Qwen/Gemini models inaccuracy. *(URIS Research Proposal)*

Team Member: Mathion: AR-Enhanced Mathematical Input System for disabled learners. Feb 2025-Mar 2025

Advisor: *Prof. Chan Chun Bun Henry, PolyU, HK.*

Abstract: Vision Pro-based accessibility system enabling disabled learners to input formulas via multimodal interfaces.

My work: Designed 3 assistive modes for students with mobility impairments, upper-limb dysfunction, or hearing limitations; Implemented Swift frontend featuring multimodal keyboard and teacher dashboard for assignment management. (***Award, planning a startup***)

SUMMER INTERNSHIP

Company: Tencent (Shenzhen) AI Lab (AI for Science Team) *Jul 2024-Sep 2024*

- **Job:** Intern of AI 4 Med Project Group
- **Dept. Leader:** Dr. Liu Wei; Group Advisor: Dr. Liu Yuyi

Work Performance

- Designed dynamic Pod selection algorithm on K8S cluster with over 1 million CPUs, reducing network traffic by 70% through intelligent data volume caching and supporting complex task topologies (chain/parallel); Built cross-cluster batch system handling 200k+ daily tasks via multi-dimensional scheduling.

- **Filed 2 patents** on distributed AI systems. [see my Home Page]

COMPETITION & AWARD

- Au Bak Ling Charity Trust Scholarship - **HKD 30,000** *HK, 2025*
- Dean's Honours List (2023/2024; 2024/2025) *PolyU, 2024, 2025*
- Dr Winnie SM Tang-PolyU Student Innovation & Entrepreneurship Scholarship- **HKD 5,000** *PolyU, 2023*
- Sponsorship for Summer Program - **HKD12,000** *PolyU, 2023*
- PolyU Programming Competition 2023/24 Junior Stream- **Second-Runner** *PolyU, 2023*
- Freshman Python Programming Contest - **Merit** *PolyU, 2022*
- 7th China International Internet Plus Competition-**Innovation Potential Award (Top 1%)** *China, 2021*
- 36th GD Sci-Tech Innovation Competition - **Third Prize** (Provincial) *China, 2021*
- 36th GZ Sci-Tech Innovation Competition - **First Prize** (Municipal) *China, 2021*
- 18th GD Children & Youth Invention Award - **Provincial Gold Medal** (Top 3%) *China, 2020*
- Robot Soccer-Guangzhou Municipal School Robot Contest 2014 - **First Prize** *China, 2014*

TECHNICAL SKILLS

- ☑ **Languages:** Native Mandarin, Fluent English, Conversational Cantonese

- ☑ **Programming:** Python, C/C++, Java, Matlab, Bash
- ☑ **AI & LLM:** PyTorch, Transformer, LangChain, RAG

- ☑ **Edge:** NVIDIA Jetson, Raspberry Pi, ESP-IDF
- ☑ **LLM Tools:** llama.cpp, Ollama, lm-studio

- ☑ **Frontend:** Vue, React, HTML/CSS/JS, Swift
- ☑ **Backend:** Flask