

**CONTACT INFORMATION**

**School of Computing,**  
**The University of Georgia**  
 Athens, Georgia, U.S.

 Email: [ypan24@uga.edu](mailto:ypan24@uga.edu)  
 Personal Website  
 Mobile: +1(706)614-8093

**SUMMARY**

Second-year Ph.D. candidate at the University of Georgia focusing on the multi-modal LLMs, multi-agent systems, and quantum AI. My research aims to advance **intelligent agentic workflows** and **quantum-enhanced machine learning** with a dedicated focus on transforming healthcare intelligence. I specialize in **large-scale foundation model adaptation (SFT/RLHF/DPO)**, **cross-modal alignment mechanisms**, and **scalable AI systems** to solve complex clinical challenges. I seek to contribute to **multi-agent workflows**, **multi-modal LLMs**, **quantum AI**, and their **applications on medical AI**. I have co-authored over 30 papers (including IEEE TBME, TNNLS, QAI, AAAI QIML, EMNLP, and ICLR) with 1700+ citations.

**RESEARCH INTERESTS**

- **Core Areas:** Multi-agent Systems, Quantum AI, Multi-modal LLMs, Medical AI, Efficient and Trustworthy AI
- **LLM & MLLM Techniques:** Vision-Language Alignment, Instruction Tuning, Parameter-Efficient Fine-Tuning (PEFT), Long-context Modeling, and Reinforcement Learning from Human Feedback (RLHF)
- **System Methods:** Agentic Workflow Orchestration, Quantum Machine Learning, Distributed Large-scale Training, Multimodal Representation, and Scalable Infrastructure

**EDUCATION**

**School of Computing,**  
**The University of Georgia, Athens**  
 Georgia, U.S.  
*Ph.D.*  
 Computer Science  
 GPA: 4.00/4.00

2024 - Now

**James Watt School of Engineering,**  
**University of Glasgow**  
 Glasgow, UK  
*Bachelor of Engineering (First Class Honours)*  
 Electronics and Electrical Engineering  
 GPA: 3.87/4.00 (**TOP 10%**)

2020 - 2024

**Glasgow College,**  
**University of Electronic Science and Technology of China**  
 Chengdu, China  
*Bachelor of Engineering*  
 Electronic Information Engineering  
 GPA: 3.87/4.00 (**TOP 10%**)

2020 - 2024

**SELECTED PROJECT EXPERIENCES**

- **Biomedical Multi-agent Systems via Foundation Model Adaptation** May 2025 – Present  
*Project Lead*  
*Massachusetts General Hospital (MGH) and Harvard Medical School (HMS)*  
**My Role:** Led the development of an **agentic AI system** that leverages **BiomedGPT** as a foundational model for biomedical knowledge acquisition, domain-specific adaptation, and autonomous fine-tuning.

- Designed an **automated fine-tuning pipeline** that enables the foundation model to self-adapt across multiple biomedical subdomains (e.g., radiology, genomics, pharmacology) using public benchmark datasets.
- Implemented a modular **agent orchestration framework** for dynamically spawning domain-specific agents capable of continual learning, evaluation, and integration into a larger biomedical reasoning system.
- Developed **cross-domain coordination protocols** among agents, allowing for inter-agent communication and knowledge transfer via shared latent representations.
- Established large-scale experimental infrastructure, integrating **distributed fine-tuning, multi-agent communication, and automatic evaluation workflows**.
- Collaborating with clinicians and computational scientists at MGH/HMS to align model objectives with biomedical reasoning and hypothesis testing needs.

**Outcome:** Building a scalable **biomedical multi-agent system** capable of autonomous adaptation and cross-domain generalization, grounded in physics- and biology-informed foundation models. The system aims to advance the next generation of **AI for Science** in biomedical discovery.

• **LLM-Driven Discovery of Energy-Efficient and Scalable Neuromorphic Designs**

Mar. 2025 – Present

*Project Lead*

**My Role:** Led a project that integrates large language models with **neuromorphic hardware design** and scientific computing to accelerate the discovery of energy-efficient architectures.

- Designed a structured **evaluation framework** assessing neuromorphic devices on energy efficiency and scalability metrics to construct a comprehensive performance dataset.
- Developed an **LLM-based reasoning agent** that autonomously proposes design combinations by synthesizing strengths across existing device architectures.
- Implemented iterative feedback loops allowing the agent to refine hypotheses based on performance trade-offs, aligning with physics-informed optimization principles.
- Collaborating with cross-disciplinary teams to integrate domain knowledge from materials science, microelectronics, and AI modeling for interpretable and reproducible results.

**Outcome:** Established an AI-guided scientific workflow for **neuromorphic device design discovery**, advancing energy-efficient computing through foundation-model-assisted reasoning.

• **Diffusion Brain: Multi-Agent System with Integrated Memory for Scientific Reasoning**

Mar. 2025 – Present

*Major Contributor*

**My Role:** Developed a biologically inspired **multi-agent system** with integrated long-term memory and auto-regressive sequencing to simulate intelligent reasoning processes.

- Designed the system architecture that coordinates multiple agents through shared memory and dynamic context updating, inspired by cognitive diffusion in human brains.
- Implemented a modular **agent coordination layer** enabling each agent to query, reason, and contribute insights collaboratively to solve domain-specific problems.
- Proposed and prototyped a “**diffusion brain**” mechanism capable of generalizing to broader scientific and engineering tasks through autonomous knowledge retrieval.
- Leading ongoing experiments to apply this architecture to structured scientific design queries, demonstrating cross-domain adaptability and reasoning coherence.

**Outcome:** Formulated a scalable cognitive-inspired agentic framework that bridges **LLM-driven reasoning and scientific computing**, providing a prototype for AI-augmented scientific exploration.

• **AQCF: Adaptive Quantum–Classical Fusion Transformer for Next-Generation Language Models** Mar. 2025 – May 2025

*Project Lead*

*School of Computing, The University of Georgia*

**My Role:** Led the development of **AQCF**, a hybrid Transformer architecture integrating classical and quantum computation for adaptive, entropy-aware language modeling.

- Proposed an **entropy-driven adaptive circuit** to dynamically adjust quantum depth and gate configuration, mitigating barren plateaus.
- Designed **quantum memory banks** for unified quantum–classical attention and efficient information retrieval.
- Built a **fusion controller** enabling stable training and 35–40% quantum utilization under NISQ constraints.

**Outcome:** Introduced a scalable framework toward **Quantum-Enhanced LLMs**, accepted at *AAAI Quantum Intelligence in Machine Learning (QIML 2025)*.

• **MolQAE: Quantum–Classical Hybrid Autoencoder for Molecular Representation Learning** Mar. 2025 – May 2025

*Project Lead*

*School of Computing, University of Georgia*

**My Role:** Led the development of **MolQAE**, the first quantum autoencoder to process complete molecular structures for representation learning, integrating principles from quantum mechanics, chemistry, and machine learning.

- Designed a **quantum encoding framework** mapping SMILES molecular sequences directly into parameterized quantum states, preserving structural and chemical semantics.
- Constructed a **hybrid quantum–classical architecture** with encoder–decoder circuits and trainable latent–ancillary qubits, enabling scalable molecular compression and reconstruction under NISQ-era constraints.
- Developed a dual-objective **hybrid optimization strategy** combining fidelity maximization with quantum coherence preservation to achieve stable convergence and high reconstruction fidelity (up to 96.8%).
- Conducted extensive experiments on the QM9 molecular dataset, analyzing compression–fidelity trade-offs and establishing the first **sublinear quantum scaling law** for molecular representation depth.
- Implemented the end-to-end system with TorchQuantum, Qiskit, and PyTorch, ensuring full reproducibility across hybrid simulation environments and GPU–QPU co-training pipelines.

**Outcome:** Demonstrated the first quantum autoencoder capable of high-fidelity molecular reconstruction and quantum-efficient compression, published in *IEEE QAI 2025*. This work establishes a foundation for **physics- and chemistry-informed AI for scientific discovery** in molecular and biomedical modeling.

• **ChatRadio-Valuer: A Chat Large Language Model for Generalizable Radiology Report Generation** Feb. 2023 – Aug. 2025

*Data & System Engineering Lead*

*Collaborating Institutions: UESTC, NWPU, UGA, and multi-center hospitals*

**My Role:** Led the design and implementation of a scalable **supervised fine-tuning (SFT)** framework for large language models in biomedical domains.

- Conducted extensive **data curation, cleaning, and normalization** across multi-institution and multi-system radiology report datasets to ensure domain and device generalizability.
- Designed the overall **experimental framework and evaluation strategy**, specifying training schedules, ablation protocols, and model selection criteria for multi-institutional data scenarios.
- Implemented a unified **distributed training and evaluation pipeline** in PyTorch, allowing collaborators to reproduce and extend large-scale SFT experiments under heterogeneous environments.
- Executed the majority of large-scale **training and inference experiments**, managing compute scheduling, logging, and model performance tracking across multiple GPUs.
- Collaborated with radiologists to align annotation and diagnostic objectives with model training targets, ensuring clinical relevance and interpretability.
- Contributed to the TBME paper's experimental methodology and result analysis sections, emphasizing **cross-domain robustness, reproducibility, and model scalability**.

**Outcome:** Developed a multi-institution, multi-system **foundation model** for radiology text generation demonstrating superior generalization and transferability, published in *IEEE Transactions on Biomedical Engineering (TBME), 2025*.

## SELECTED PUBLICATIONS

- Pan, Y., Jiang, H., Chen, J., Li, Y., Zhao, H., Zhao, L., Abate, Y., Wang, Y. and Liu, T., Bridging Classical and Quantum Computing for Next-Generation Language Models.  
[First AAAI Symposium on QIML](#). 2025
- Jahin, A., Pan, Y., Wang, Y., Liu, T., and Zhang W., Quantum-Classical Hybrid Molecular Autoencoder for Advancing Classical Decoding.  
[First AAAI Symposium on QIML](#). 2025
- Pan, Y., Jiang, H., Ruan, W., Zhu, D., Li, X., Abate, Y., Wang, Y. and Liu, T., *MolQAE: Quantum Autoencoder for Molecular Representation Learning*.  
[IEEE QAI](#). 2025
- Zhao, H., Li, J., Pan, Y., Liang, S., Yang, X., Dou, F., Liu, T., and Lu, J., HELENE: Hessian Layer-wise Clipping and Gradient Annealing for Accelerating Fine-Tuning LLM with Zeroth-Order Optimization.  
[EMNLP Main Conference](#). 2025
- Zhong, T., Zhao, W., Zhang, Y., Pan, Y., Dong, P., Jiang, Z., Jiang, H., Zhou, Y., Kui, X., Shang, Y., et al., *ChatRadio-Valuer: A Chat Large Language Model for Generalizable Radiology Report Generation Based on Multi-institution and Multi-system Data*.  
[IEEE TBME](#). 2025
- Liu, Z., Li, Y., Shu, P., Zhong, A., Jiang, H., Pan, Y., Yang, L., Ju, C., Wu, Z., Ma, C., et al., *Radiology-GPT: a large language model for radiology*.  
[Meta-Radiology](#). 2025
- Zhong, T., Pan Y., Zhang, Y., Wei, Y., Yang, L., Wu, Z., Liu, Z., Wei, X., Li, W., Yao, J., Ma, C., Han, Y., Li, X., Zhu, D., Jiang, X., Shen, D., Han, J., and Zhang, T., *ChatABL: Abductive Learning via Natural Language Interaction with ChatGPT*.  
[IEEE TNNLS](#). 2025
- Ruan, W., Lyu, Y., Zhang, J., Cai, J., Shu, P., Ge, Y., Lu, Y., Gao, S., Wang,

Y., Wang, P., Zhao, L., Wang, T., Liu, Y., Fang, L., Liu, Z., Liu, Z., Li, Y., Wu, Z., Chen, J., Jiang, H., **Pan, Y.**, Yang, Z., Chen, J., et al., *Large Language Models for Bioinformatics*.

[Quantitative Biology](#).

2025

• **Pan, Y.**, Jiang, H., Chen, J., Li, Y., Zhao, H., Zhou, Y., Shu, P., Wu, Z., Liu, Z., Zhu, D., Li, X., Abate Y., and Liu T., *EG-SpikeFormer: Eye-Gaze Guided Transformer on Spiking Neural Networks for Medical Image Analysis*.

[IEEE ISBI \(Oral Presentation\)](#).

2025

• Li, Y., Kim, S., Wu, Z., Jiang, H., **Pan, Y.**, Jin, P., Song, S., Shi, Y., Liu, T., Li, Q. and Li, X., *ECHOPulse: ECG Controlled Echocardiogram Video Generation*.

[ICLR](#).

2025

• Zhong, T., Liu, Z., **Pan, Y.**, Zhang, Y., Zhou, Y., Liang, S., Wu, Z., Lyu, Y., Shu, P., Yu, X., et al., *Evaluation of OpenAI o1: Opportunities and Challenges of AGI*.

[Arxiv](#). **Co-first Author**

2024

• Zhang, Y., **Pan, Y.**, Zhong, T., Dong, P., Xie, K., Liu, Y., Jiang, H., Liu, Z., Zhao, S., Zhang, T., Jiang, X., Shen D., Liu T., and Zhang X., *Potential of Multimodal Large Language Models for Data Mining of Medical Images and Free-text Reports*.

[Meta-Radiology](#). **Co-first Author**

2024

• Chen, Y., Xiao, Z., **Pan, Y.**, Zhao, L., Dai, H., Wu, Z., Li, C., Zhang, T., Li, C., Zhu, D. and Liu, T., Mask-Guided Vision Transformer for Few-Shot Learning.

[IEEE TNNLS](#).

2024

• Xiao, Z., Chen, Y., Yao, J., Zhang, L., Liu, Z., Wu, Z., Yu, X., **Pan, Y.**, Zhao, L., Ma, C., Liu, X., Liu, W., Li, X., Yuan, Y., Shen, D., Zhu, D., Yao, D., Liu, T., and Jiang, X., Instruction-ViT: Multi-modal prompts for instruction learning in vision transformer.

[Information Fusion](#).

2024

• Liu Y., He H., Han T., Zhang X., Liu M., Tian J., Zhang Y., Wang J., Gao X., Zhong T., **Pan Y.**, Xu S., Wu Z., Liu Z., Zhang X., Zhang S., Hu X., Zhang T., Qiang N., Liu T., and Ge B., Understanding LLMs: A Comprehensive Overview from Training to Inference.

[Neurocomputing](#).

2024

• Wang, J., Liu, Z., Zhao, L., Wu, Z., Ma, C., Yu, S., Dai, H., Yang, Q., Liu, Y., Zhang, S., Shi, E., **Pan, Y.**, Zhang, T., Zhu, D., Li, X., Jiang, X., Ge, B., Yuan, Y., Shen, D., Liu, T., and Zhang, S., Review of large vision models and visual prompt engineering.

[Meta-Radiology](#).

2023

• Zhao, H., Ling, Q., **Pan, Y.**, Zhong, T., Hu, J.Y., Yao, J., Xiao, F., Xiao, Z., Zhang, Y., Xu, S.H., Wu, S.N., Kang, M., Wu, Z., Liu, Z., Jiang, X., Liu, T., and Shao Y., Ophtha-LLaMA2: A Large Language Model for Ophthalmology.

[Arxiv](#). **Co-first Author**

2023

• Wang, J., Shi, E., Yu, S., Wu, Z., Ma, C., Dai, H., Yang, Q., Kang, Y., Wu, J., Hu, H., Yue, C., Zhang, H., Liu, Y., **Pan, Y.**, Li, X., Ge, B., Zhu, D., Yuan, Y., Shen, D., Liu, T., Zhang, S., Prompt engineering for healthcare: Methodologies and applications.

[Arxiv](#).

2023

## HONORS & AWARDS

- NSF Student Travel Award, AAAI FSS25 (QIML) Nation-level
- Outstanding Graduate (**Ratio: 10%**), UESTC University-level
- **First Prize** Scholarship for Academic Excellence in Academic Year 2021-2022 (**Ra-**

- tio: 8%), UESTC** University-level
- Scholarship for English Proficiency in Academic Year 2021-2022 (**Ratio: 6.25%**), Glasgow College, UESTC College-level
  - **First Prize** Scholarship for Academic Excellence in Academic Year 2020-2021 (**Ratio: 8%**), UESTC University-level
  - Academic Scholarship in Academic Year 2020-2021 (Ratio: 5%, 30,000RMB), Glasgow College, UESTC College-level
  - **Second Prize** in "NECCS" (National English Competition for College Students) in Academic Year 2020-2021 Nation-level
  - **Second Prize** in "FLTRP (Foreign Language Teaching and Research Press)—National Talent Cup"—English Writing Contest, Sichuan Division (ranked 32<sup>nd</sup> in Sichuan Province & the sole Second Prize from UESTC) Province-level
  - **First Prize** in "FLTRP—National Talent Cup"—Preliminary Contest at School Level, National English Writing Contest (one of the two selected for participating in following contests as the representative of UESTC) University-level

## ACADEMIC SERVICE

### Professional Memberships:

- IEEE Student Member
- AAAI Student Member

### Journal and Conference Reviewer:

#### • Journals

- IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
- ACM Transactions on Quantum Computing (TQC)
- IEEE Transactions on Artificial Intelligence (TAI)
- Frontiers in Oncology
- European Journal of Radiology Artificial Intelligence (EJRAI)
- Artificial Intelligence in Medicine (AIIM)

#### • Conferences

- International Conference on Learning Representations (ICLR) 2026
- International Conference on Machine Learning (ICML) 2025

## SKILLS

**Programming:** Python, C/C++, MATLAB, Bash, SQL

**LLM & MLLM:** PyTorch (*DDP/FSDP*), DeepSpeed, Transformers, PEFT, Vision-Language Alignment, SFT/RLHF/DPO, vLLM

**Agents & Systems:** Multi-agent Orchestration (LangGraph/AutoGPT), Agentic RAG, Tool-use Integration, Distributed System Design

**Quantum AI:** CUDA-Q, PennyLane, Qiskit, TorchQuantum, Quantum-Classical Hybrid Learning

**Informatics:** NumPy, SciPy, RDKit (Cheminformatics), Medical Imaging (DICOM/ITK), Bio-Linkers

**Focus:** Multi-modal Foundation Models, Multi-agent Workflows, Quantum ML, Medical Intelligence

## INTERNSHIP

### Graduate Research Intern

May 2025. - Aug. 2025

Massachusetts General Hospital and

Harvard Medical School  
Boston, U.S.

<b>TEACHING EXPERIENCE</b>	<ul style="list-style-type: none"><li>• <b>Teaching Assistant</b> Aug. 2025. - Now</li></ul>	School of Computing, UGA Athens, U.S.
----------------------------	--	--

<ul style="list-style-type: none"><li>• <b>Teaching Assistant</b> Sep 2023. - Jun. 2024</li></ul>	Glasgow College, UESTC Chengdu, China
---	--

<b>RELEVANT PROGRAMME</b>	<ul style="list-style-type: none"><li>• <b>Artificial Intelligence Internship Programme</b> Distinction Grade</li><li>• <b>Artificial Intelligence and Public Health</b> Project-based Learning</li><li>• <b>Introduction to Data Analytics</b> Coursera Online Certificate</li><li>• <b>Introduction to Programming with MATLAB</b> Coursera Online Certificate</li></ul>	<i>Business AI Lab</i> NTU	<i>UCLA</i>	<i>IBM</i>	<i>Vanderbilt University</i>
---------------------------	--	-------------------------------	-------------	------------	------------------------------