Chonghao Qiu

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Pittsburgh, PA | Department of Computer Science | University of Pittsburgh

Biography

I am currently a second-year master's student in the Department of Computer Science at the University of Pittsburgh, advised by Prof. Xiaowei Jia. Prior to that, I got my B.S. from the National Taipei University of Technology. My research interests are in data mining and machine learning, with a focus on applying knowledge-based methods to solve real-world problems that have great social and ecological impacts.
Currently applying for PhD programs for Fall 2025

Education

- **University of Pittsburgh** *Aug 2023 - May 2025*
  Master of Science in Computer Science Pittsburgh, US
  - GPA: 3.80/4.00
  - Supervisor: Prof. Xiaowei Jia and Dr. Runlong Yu
  - Relevant Courses: Data Mining, AI 4 Social Good(PhD level), Foundations of AI, NLP, Algorithm Design, Compiler Design, Wide Area Networks.
- **National Taipei University of Technology** *Sep 2019 - Jun 2023*
  Bachelor of Science in Electronic Engineering Taipei, Taiwan
  - GPA: 3.91/4.00
  - Dean's List Award for Fall 2019, Fall 2020, Spring 2021, and Spring 2022(Ranked in the top 1%)
  - Outstanding Graduate Award 2023(Top 1 in class)
  - Supervisor: Prof. Lih-Jen Kau
  - Relevant Courses: Database System, Software Security & Reverse Engineering, OS, Image and Video Compression, Digital Image Processing, Computer Networks, Machine Learning, Signals and Systems, Electromagnetics, Electronics, Engineering Mathematics, Probability, Linear Algebra.

Publications

(1) **In Submission**: Runlong Yu, **Chonghao Qiu**(**first** student author), Robert Ladwig, Paul Hanson, Yiqun Xie, Xiaowei Jia (2024).
Physics-Guided Foundation Model for Scientific Discovery: An Application to Aquatic Science

(2) Runlong Yu, **Chonghao Qiu**(**first** student author), Robert Ladwig, Paul Hanson, Yiqun Xie, Yanhua Li, and Xiaowei Jia (2024).
Adaptive Process-Guided Learning: An Application in Predicting Lake DO Concentrations
ICDM 2024, Abu Dhabi, December 2024

(3) Tao Chen, Yongjie Yang, **Chonghao Qiu**, Xiaoran Fan, Xiuzhen Guo, Longfei Shangguan (2024).
Enabling Hands-Free Voice Assistant Activation on Earphones
MobiSys 2024 , Tokyo, Japan, June 2024

Professional Experience

- **Research Assistant - University of Pittsburgh** *Jun 2024 - Present*
  Advisor: Prof. Xiaowei Jia and Dr. Runlong Yu Pittsburgh, US
  ◦ Built algorithms for integrating physics-guided relation into machine learning and deep learning models for simulating dynamical systems.
- **Research Assistant - University of Pittsburgh** *Jan 2024 - Jun 2024*
  Advisor: Prof. Longfei Shangguan Pittsburgh, US
  ◦ Worked on the software and hardware development of earable mobile devices related to health applications.
- **National Taipei University of Technology** *May 2022 - Feb 2023*
  Advisor: Prof. Lih-Jen Kau Taipei, Taiwan
  ◦ Developed a smart mouse that can measure physiological parameters such as body temperature and heart rate.
- **China United Network Communications Group** *Jul 2021 - Aug 2021*
  Software Engineering Intern Jiaxing, China
  ◦ Composed APIs and conducted corresponding online unit testing. Developed and maintained the user management system of the security center and the backend management platform. for streaming

Selected Projects

- **Physics-Guided Foundation Model for Scientific Discovery: An Application to Aquatic Science** *May 2024 - Aug 2024*
  Index Terms: foundation model, feature interaction, physics-guided learning, knowledge integration, ecosystem modeling
  - Proposed a Physics-Guided Foundation Model (PGFM) that combines pre-trained ML models and physics-based models and leverages their complementary strengths to improve the modeling of multiple coupled processes.
  - Constructed a simulated environmental system in the pre-training phase that encompasses a wide range of influencing features and various simulated variables generated by physics-based models. The model is pre-trained in this system to adaptively select important feature interactions guided by multi-task objectives.
  - Utilized an embedding layer to convert input phenological features into a series of multifield feature embeddings to facilitate the process of feature interactions. Using these embeddings, the aim of evolution-based feature selection can be formally described as identifying the most informative feature interactions to improve the prediction of target objectives.
- **Adaptive Process-Guided Learning: An Application in Predicting Lake DO Concentrations** *Jan 2024 - Jun 2024*
  Index Terms: physics-guided learning, knowledge integration, adaptive learning, ecosystem modeling [GitHub]
  - Proposed a Process-Guided Learning (Pril) framework that integrates physical models with recurrent neural networks (RNNs) to enhance the prediction of dissolved oxygen (DO) concentrations in lakes, which is crucial for sustaining water quality and ecosystem health.
  - Developed a physics-based loss function that incorporates daily oxygen mass variance for both well-mixed and stratified lake conditions, integrating domain-specific constraints from aquatic ecosystem dynamics into the model.
  - Designed a generator-discriminator framework with adaptive timestep adjustments to address large day-to-day fluctuations in stratified conditions. The generator captures rapid variations, while the discriminator ensures predictions align with physical characteristics, improving stability and accuracy.
- **Enabling Hands-Free Voice Assistant Activation on Earphones** *Aug 2023 - Apr 2024*
  Index Terms: ubiquitous and mobile devices, emerging technologies.
  - Designed and implemented EarVoice, a lightweight mobile service that enables hands-free voice assistant activation on commodity earphones.
  - Conducted and designed extensive experiments with 23 participants in both controlled and uncontrolled scenarios.
  - Developed firmware for a 4-layer PCB using the low-power ESP32 MCU, achieving low power consumption and high-speed performance to meet design requirements.
- **Physiological Monitoring Intelligent Computer Mouse** *May 2022 - Sep 2022*
  Index Terms: mobile devices, embedded system, health. [YouTube]
  - Designed a smart mouse that can measure physiological parameters such as body temperature and heart rate and developed its supporting Windows desktop software system using Windows Presentation Foundation (WPF).
  - Developed a sensor board equipped with MAX30205, BME280, and MAXM81616. Sensors are responsible for retrieving raw physiological parameters and communicating with the main board via the I2C protocol.
  - Conducted filtering and standardization on the original Photoplethysmography (PPG) signal with Butterworth IIR filter, Moving Average to calculate blood oxygen saturation and heart rate.

Skills and Others

- **Programming Languages:** Python, JavaSE, C, C#, SQL, MATLAB, JavaScript.
- **Tools:** Pytorch, TensorFlow, Linux, AWS, Keil5, SpringBoot, Windows Presentation Foundation, Vue.js, Git.
- **Volunteer Work:** I am a registered volunteer in Taipei city, teaching primary and secondary school students basic subjects, organizing companionship activities for left-behind children, and providing services at elderly care centers in community welfare organizations.