Chang Liu

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Education

School of Computer Science

Carnegie Mellon University, Ph.D. Student in Machine Learning 08/2023 - 05/2028(est.)

- Advisor: Prof. Artur Dubrawski.
- QPA: **4.21**.
- Research Interests: Machine learning in healthcare, deep learning.
- Courses: Advanced Introduction to Machine Learning, Intermediate Statistics, Advanced Machine Learning: Theory and Methods, Advanced Deep Learning, Machine Learning for Large Datasets.

Institute for Interdisciplinary Information Sciences (IIIS) Yao Class, established by Prof. Andrew C. Yao

Tsinghua University, B.Eng. in Computer Science 08/2019 – 06/2023

- GPA: **3.91/4.00**.
- TOEFL: **120/120**. Reading: 30, Listening: 30, Speaking: 30, Writing: 30.
- GRE: **340/340**. Quant: 170, Verbal: 170, Writing: 5.
- Mathematics Courses: Calculus, Linear Algebra, Abstract Algebra, Mathematics for Computer Science, Mathematics for Artificial Intelligence, Probability and Statistics.
- Computer Science Courses: Machine Learning, Reinforcement Learning, Computational Biology, Computer Vision, Deep Learning, Natural Language Processing, Introduction to Databases, Data Mining, Quantum Computer Science, Introduction to Robotics, Algorithm Design, Theory of Computation.

Research Experience

Agentic AI for Clinical Time Series 11/2024 – Now

Advised by Prof. Artur Dubrawski. Carnegie Mellon University

- Develop an agentic AI framework for solving machine learning tasks in clinical time series.

Effieicnt Compression of LLMs 11/2024 – Now

Advised by Prof. Artur Dubrawski. Carnegie Mellon University

- Explore depth-based pruning methodologies of LLMs.
- Compare with baselines (e.g., WandaWanda, SparseGPT, Bonsai) on benchmarks such as Open-LLM Leaderboard

Structure-preservation representation learning for MALDI-tof 10/2023 – Now

Advised by Prof. Artur Dubrawski. Carnegie Mellon University

- Developed a semi-supervised pretraining and finetuning framework with a UNet-based autoencoder for MALDI data.
- Developed a novel method of learning MALDI representations that respect external whole genome sequencing/antimicrobial resistance structure.

Identifying Disease Targets through a Probabilistic Knowledge Graph 09/2021 – 05/2023

Advised by Prof. Jianyang Zeng. Tsinghua University

- Developed a novel method of augmenting biological networks with literature evidence to construct a probabilistic knowledge graph.
- Developed a graph neural network to predict target candidates from the knowledge graph, achieving superior performance to state-of-the-art models in terms of accuracy (esp. on sparse data) and literature support for top novel predictions.
- Conducted bioinformatics analyses and cooperated with experimental validation of the identified colorectal cancer and melanoma targets.

Reconstructing the Allele-specific Genome Structure from Hi-C Contacts 03/2022 – 03/2023

Advised by Prof. Jian Ma. Carnegie Mellon University

- Developed an improved particle dynamics framework (based on *hickit*) that iterates between inferring chromosome contact phases and 3D genomic coordinates to fully exploit their common information.
- Developed a new graph neural network to implicitly impute the phases of the Hi-C contacts and reconstruct the allele-specific 3D genome structure.

Discovering Competitive Binding of Transcription Factors 05/2021 - 02/2023

Advised by Prof. Jianyang Zeng. Tsinghua University

- Developed a framework to infer in-vivo competitive TF binding (the binding of one TF removes that of the other), consisting of a deep neural network, several motif analyses, and statistical tests.
- Cooperated with experimental validation of the predicted competing TF pairs (in progress).

Predicting Antigen Binding Sites through Graph Neural Networks 06/2021 - 08/2021

Advised by Prof. Boxue Tian. Tsinghua University

- Developed a graph neural network to predict antigen binding residues using antigen-antibody compound data in the SAbDAb database based on *GraphBind*, a DNA/RNA-Protein binding site prediction model.
- Utilized the model to validate lab-generated compounds.

Intelligent Diabetes Management 12/2020 - 02/2021

Advised by Prof. Yang Yuan. Tsinghua University

- Cooperated with Shanghai Zhongshan Hospital to investigate the needs of the endocrinology department and its patients.
- Developed a deep learning framework for predicting future patient blood sugar levels from patient records for pre-emptive alerts.
- Developed a deep learning framework for predicting the proper dosage of insulin to be administered to alleviate the demand for expert consultation.

Publications

1. **Liu Chang**; Jieshi Chen; Lee H. Harrison; Artur Dubrawski*. “Multimodal Structure Preservation Learning," *arXiv preprint*, October 2024.
2. **Liu Chang**†; Xiao Kaimin†; Yu Cuinan†; Lei Yipin†;...; Zhao Dan*; Zhou Fengfeng*; Tang Haidong*; Zeng Jianyang*. “A Probabilistic Knowledge Graph Approach for Target Identification,” *PLOS Computational Biology*, April 2024.
3. **Liu Chang**†; Yu Cuinan†; Lei Yipin†;...; Zhao Dan*; Zhou Fengfeng*; Zeng Jianyang*. “Improving Target-disease Association Prediction through a Graph Neural Network with Credibility Information,” proceedings of the *Pacific Symposium on Biocomputing*, January 2023.

Honors & Awards

- **Comprehensive Merit Award (7/32)**, *Tsinghua University* 2022
- **Comprehensive Merit Award (6/32)**, *Tsinghua University* 2021
- **Excellence Award for Volunteering Services**, *Tsinghua University* 2020
- **Freshmen Scholarship**, *Tsinghua University* 2019
- **University Full Scholarship for Future Scholars**, *Tsinghua University* 2019