

FENG WU

T: +86 15859180765 | e: wufeng@mit.edu / meiyoufeng116@gmail.com | web: meiyoufeng116.github.io

EDUCATION & EXPERIENCE

National University of Singapore

Research Assistant

Singapore

Oct. 2024 – Mar. 2025

- Advisers: Assistant Prof. Mornin Feng
- Research on Enhancing ECG understanding using MLLM.
- Assist in organizing the IMAGE AI 2024 conference and Datathon.

Massachusetts Institute of Technology

Visiting Researcher

Cambridge, US

Jun. 2023 – Nov. 2023

- Advisers: Research Scientist Li-wei H. Lehman
- Research on identification of false alarms in ICU and prediction of treatment effectiveness.

Xi'an Jiaotong University

Master of Electronic Information

Xi'an, China

Sep. 2021 – Jun. 2024

- Advisers: Prof. Guoshuai Zhao
- Research on dialogue recommendation systems and sequence recommendation.

Beijing University of Chemical Technology

Bachelor of Management in Information Management and Information System

Beijing, China

Sep. 2017 – Jun. 2021

- Advisers: Prof. Qingliang Zhao
- Research on traffic planning and operation.

RESEARCH INTERESTS

AI for Healthcare & Foundation Model in Health

My interest lies in understanding how deep learning can provide predictions for disease progression and treatment plans, as well as support decision-making for clinical staff. My previous research projects include:

- Time Series Modeling. Mining features from multivariate time series (Self-supervised learning) and using deep learning methods (RNN, Transformer, Diffusion) for prediction of subsequent series.
- Treatment Effect Prediction. Use causal inference models/counterfactual prediction methods to predict patient outcomes under different treatment plans.
- Uncertainty Quantification on Treatment Effect. Develop robust deep learning models for healthcare issues, informing clinicals of the credibility of the model.
- Diffusion Model on Clinical Sequence. Generate treatment/outcome trajectories under different scenarios using the diffusion model and provide decision-making support.
- Foundation Model on Healthcare. Integrating EHR data to establish Foundation Models from a multimodal perspective including text and images.

PUBLICATIONS * indicates equal contribution.

- **Wu, F.**, Zhao, G., Qian, X., Lehman, L. W. H., *A Diffusion Model with Contrastive Learning for ICU False Arrhythmia Alarm Reduction*, **IJCAI 2023**, Aug. 2023.
- Lehman, L. W. H., Moody B. E., Deep, H., **Wu, F.**, Saeed, H., McCullum, L., Perry D., Struja, T., Li, Q., Clifford, G., Mark R., *VTaC: A Benchmark Dataset of Ventricular Tachycardia Alarms from ICU Monitors*, **NeurIPS Dataset and Benchmark Track 2023**, Dec. 2023.
- **Wu, F.**, Zhao, G., Zhou, Y., Lehman, L. W. H., *Forecasting Treatment and Td Response Over Time Using Alternating Sequential Models*, **IEEE Trans on Biomedical Engineering**, Dec. 2023.
- **Wu, F.**, Zhao, G., Li, T., Shen, J., Qian, X., *Improving Conversation Recommendation System Through Personalized Preference Modeling and Knowledge Graph*, **IEEE Transactions on Knowledge and Data Engineering**, Jun. 2024.
- Xiong, H. *, **Wu, F. ***, Deng L., Su, M., Lehman, L. W. H., *G-Transformer: Counterfactual Outcome Prediction under Dynamic and Time-varying Treatment Regimes*, **Machine Learning for Healthcare Conference 2024**, Aug 2024.
- Deng L. *, Xiong, H. *, **Wu, F. ***, Sanyam K., Zach S., Lehman, L. W. H., *Uncertainty Quantification for Conditional Treatment Effect Estimation under Dynamic Treatment Regimes*, **Machine Learning for Health (ML4H) 2024**.
- Lan, X., **Wu, F.**, He, K., Zhao, Q., Hong, S., & Feng, M. Gem: Empowering mllm for grounded ecg understanding with time series and images. ArXiv, March 2025.
- **Wu, F.**, Deep, H., Zhao, G., Gari C., Lehman, L. W. H., *Self-Supervised State Space Modeling for Clinical Time Series with Long-Range Dependency*, **TMLR**, Submitting.

RESEARCH EXPERIENCES

National University of Singapore, Mornin Lab

Singapore

Empowering MLLM for grounded ECG understanding with time series and images

Oct. 2024 – Jan. 2025

Supervisor: Assistant Professor Mornin Feng

- Enhance the understanding of LLM for ECG sub-tasks through time series and image forms of ECG.
- Fine-tune LLama and QWEN, integrate image information extracted by ECG-CoCa for feature fusion, and design a framework that integrates traditional ECG information with images and time series features.

Massachusetts Institute of Technology, Laboratory for Computational Physiology

Cambridge, US

Uncertainty Quantification in G-Computation based on Counterfactual Outcomes predictions

Supervisor: Research Scientist Li-wei H. Lehman

May. 2024 – Nov. 2024

- Used uncertain quantification algorithms such as **MC Dropout** and **Deep ensemble** to calculate the reliability of counterfactual prediction results;
- The algorithm can provide confidence basis for clinical personnel decision-making.

Using Transformer Models and G-Computation to Predict Counterfactual Outcomes of Dynamic Treatment Strategies

Supervisor: Research Scientist Li-wei H. Lehman

Nov. 2023 – Jun. 2024

- Estimated outcomes under dynamic and time-varying treatment strategies using a Transformer model, that is, **G-Transformer**;
- Applied the model to estimate the conditional distribution of relevant covariates given covariate and treatment history at each time point using an encoder architecture, and then produce Monte Carlo estimates of counterfactual outcomes by simulating forward patient trajectories under treatment strategies of interest;

Using Structure State Space Model and Self-Supervised Learning to Model Clinical Signals

Supervisor: Research Scientist Li-wei H. Lehman

Jul. 2023 – Aug. 2024

- Leveraged the capability of **Structured State Space Models** to capture features in long medical time series sequences;
- Combined **self-supervised learning** to model medical time series such as **ECG** and other vital physiological signals;
- Effectively extracted features from unlabeled data and enhanced the performance of downstream tasks through pre-training.

Using the Diffusion Model to Generate True Alarm Waveforms and Evaluate the Alarm

Supervisor: Research Scientist Li-wei H. Lehman

Jun. 2022 – Mar. 2023

- Used **Diffusion models** to generate the patient ECG trajectories to determine if a false alarm has occurred or not;
- Used the residual linking and attention mechanism to make the data after adding noise close to the normal distribution used in sampling for the function to be used in the denoising process for sampling;
- Determined the alarm by calculating the difference between the generated and original curves.

Xi'an Jiaotong University, Smiles Laboratory

Xi'an, China

Improving Conversation Recommendation System Through Personalized Preference Modeling and Knowledge Graph

Supervisor: Associate Professor Guoshuai Zhao

Sep. 2021 - Jun. 2022

- Modeled user's historical preferences, and integrated **Knowledge Graphs** with **Graph Neural Networks**;
- Achieved more efficient item embeddings, thereby enhancing the performance of the recommendation dialogue system.

AL-Transformer: Forecasting Treatment and Response Over Time Using Alternating Sequential Models

Supervisor: Associate Professor Guoshuai Zhao

May. 2022 - Oct. 2022

- Participated in the development of an alternating sequential model to predict patients' future treatment and response trajectories jointly;
- Leveraged causal convolution and self-attention mechanism to model the sparse treatment sequence, enhancing the model's ability to capture local contextual information of the time sequence.

SERVICE EXPERIENCE

AI and Data Science for Healthcare (KDD 2024 Workshop), Conference Reviewer

Jun. 2024

ACM Transactions on Intelligent Systems and Technology, Journal Reviewer

Jun. 2024

Journal of Biomedical and Health Informatics, Journal Reviewer

Nov. 2024

IMAGE AI Conference and ODHSI workshop 2024, Conference Organizer

Dec. 2024

AHLI Conference on Health, Inference, and Learning (CHIL) 2024, Conference Reviewer

Feb. 2025

AWARDS

2nd runner-up by 2024 IMAGE AI Datathon, \$2000.	Dec. 2024
Excellent Graduate Student by Xi'an Jiaotong University, 5% in Graduate students.	Jan. 2024
First Prize Scholarship by Xi'an Jiaotong University for Academic Excellent	Jun. 2021
Finalist Prize by Mathematical Contest in Modeling, Finalist among 10000+ teams.	Mar. 2020
Third Prize by Asia and Pacific Mathematical Contest in Modeling	Jun. 2019
Second Prize by China Undergraduate Mathematical Contest in Modeling	Sep. 2018

ADDITIONAL INFORMATION

- **Computer Languages and Skills:** Python, Pytorch, MATLAB, C++, Java. Linux.
- **Languages:** Chinese (native), English (fluent).
- **Sport:** Swimming