Mingzhu Liu

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Education

Carnegie Mellon University *08/2023 – 08/2025*
Master of Science in Robotics
QPA: 3.92/4.33

University of Michigan – Ann Arbor *09/2019 – 04/2023*
Bachelor of Science with High Distinction in Computer Science, Bachelor of Science in Data Science
Minor in Mathematics and Minor in Physics
GPA: 3.96/4.00
Major GPA: 4.00/4.00

Core Courses: Machine Learning, Deep Learning, Computer Vision, Natural Language Processing, Convex Optimization, Probability, (Bio)statistics, Calculus, Linear Algebra, Combinatorics

Publications & Preprints

1. **Mingzhu Liu**, Angela H. Chen, George H. Chen. Generalized Prompt Tuning: Adapting Frozen Univariate Time Series Foundation Models for Multivariate Healthcare Time Series.
    - In *Proceedings of the 4th Machine Learning for Health Symposium (ML4H) 2024*
    - In *Workshop on Time Series in the Age of Large Models at Neural Information Processing Systems (NeurIPS) 2024*
2. Keith Dufendach, **Mingzhu Liu**, Willa Potosnak, Michel Pompeu Sá, Xander Jacquemyn, David Kaczorowski, Artur Dubrawski, Ibrahim Sultan. Machine learning identifies patients who derive survival benefit from coronary revascularization. Abstract accepted for poster presentation at the 61st *Society of Thoracic Surgeons (STS)* Annual Meeting.
3. **Mingzhu Liu**, Chirag Nagpal, Artur Dubrawski. Deep Survival Models Can Improve Long-Term Mortality Risk Estimates from Chest Radiographs. In *Forecasting* 6, no. 2: 404-417.

Research Experience

Auton Lab, School of Computer Science, Carnegie Mellon University Pittsburgh, PA
Master's Student | *Advisor: Prof. Artur Dubrawski* *08/2022 – Present*

Survival Analysis on Patient Data

- Developed a logistic regression model to predict 60-day mortality and recovery outcomes for dialysis patients, leveraging tabular data such as demographics, lab results, and medications. Focused on a recovery context not extensively studied in previous research.
- Validated model robustness using external datasets from two hospitals to ensure generalizability.
- Preparing a manuscript for submission to *Critical Care Explorations*.

Distributed AI

- Implemented distributed collaborative learning by introducing function-space regularization, enabling local models to maintain diverse structures while achieving collaborative training.
- Utilized importance sampling with Hamiltonian Monte Carlo to efficiently estimate complex functions, enhancing the scalability of the approach.

Heterogeneous Treatment Effects in Failed Clinical Trials

- Applied deep survival models to identify phenogroups with heterogeneous treatment effects, revealing significant gender disparities in treatment responses.
- Uncovered a group with significantly higher STS-predicted risk yet similar survival rates compared to others, highlighting potential limitations in STS risk prediction.
- Abstract accepted for presentation at the 61st Society of Thoracic Surgeons (STS) Annual Meeting.

Deep-Learning-Based Survival Analysis on Chest Radiographs

- Developed deep survival models to predict risk scores by integrating chest radiographs with patient demographic data.
- Achieved outstanding performance in both discrimination and calibration metrics.
- Published a paper in *Forecasting*.

Heinz College, Carnegie Mellon University Pittsburgh, PA
Master's Student | *Advisor: Prof. George H. Chen* *08/2024 – Present*

- Designed a parameter-efficient method based on prompt tuning for time series foundation models, applied to public healthcare datasets for forecasting and classification tasks.
- First to benchmark various fine-tuning strategies on different time series foundation models.
- Papers accepted for presentation at the Machine Learning for Health Symposium and NeurIPS Workshop on Time Series in the Age of Large Models.

Weil Institute, Michigan Medicine, University of Michigan Ann Arbor, MI
Research Assistant | *Advisor: Prof. Sardar Ansari* *03/2022 – 05/2023*

- Developed an algorithm to determine the optimal time window for calculating heart rate variability (HRV) features, encompassing time-domain, frequency-domain, and non-linear parameters.
- Evaluated candidate window lengths against a baseline using the Mann–Whitney U test.
- Reimplemented the HRV calculation codebase from MATLAB to Python, enhancing accessibility and usability.

Min Research Lab, Chemical Engineering, University of Michigan Ann Arbor, MI
Research Assistant | *Advisor: Prof. Jouha Min* *09/2021 – 05/2023*

- Detected cervical cancer DNA indicators in patients' holographic images by identifying microparticles using maximally stable extremal regions.
- Automated microparticle identification with a convolutional neural network, reducing human error and data collection time, achieving 96% classification accuracy—surpassing human performance.

Xu Lab, Computational Biology Department, Carnegie Mellon University Remote
Intern | *Advisor: Prof. Min Xu* *08/2020 – 09/2022*

- Developed an algorithm to detect saliency in 3D cryo-electron tomography images, incorporating attention mechanisms (3D squeeze-and-excitation and cross-level fusion) and iterative pseudo-labeling.
- Demonstrated superior performance in particle picking, achieving high F-measure scores across all threshold ranges and excellent recall through extensive testing.

ATLAS Group, University of Michigan, and European Organization for Nuclear Research (CERN) Ann Arbor, MI
Member | *Advisor: Prof. Jianming Qian* *09/2020 – 06/2021*

- Utilized the ROOT framework (C++-based, developed by CERN) for data analysis, leveraging its advanced capabilities for visualizing experimental physics data.

Work Experience

Math 316 – Differential Equations Ann Arbor, MI
Grader *05/2022 – 06/2022*

Skills

Programming Languages: Python, C/++, MATLAB, Java, R
Tools: Pytorch, MySQL, LaTeX, Excel
Languages: Chinese (Native), English (Fluent), French (Beginner)