Qinghao (Leo) Liang

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EDUCATION

Yale University, New Haven, CT   *Expected Dec, 2024*
Ph.D., Engineering and Applied Science (Specialty in Biomedical Engineering)
Selected Courses: Data Mining and Machine Learning, Object-Oriented Programming, Optimization and Computation, Deep Learning Theory and Applications, Unsupervised Learning of Big Data, Mathematical Methods of Physics
Awards: Best Paper Award of the fourth international workshop on Graphs in biomedical image analysis, MICCAI 2022

University of Science and Technology of China, Hefei, China
B.S, Physics   *June 2018*
Selected Courses: Probability and Statistics, Equations of Mathematical Physics, Computational Physics

TECHNICAL SKILLS

- Programming Languages: Python, R, MATLAB, C++, SQL
- Machine Learning Frameworks: Scikit-learn, PyTorch
- Areas of Expertise: Medical Imaging Analysis, Statistical Learning, Missing Data Imputation, Optimal Transport

RESEARCH EXPERIENCE

Yale School of Medicine, *Graduate Researcher*, New Haven, CT   *Mar 2019 - Present*
Department of Biomedical Engineering, Advisor: Dustin Scheinost, PhD
- Developed a robust predictive modeling pipeline with advanced data imputation techniques, doubling the complete case sample size and achieving a 45% increase in explained variance.
- Created an innovative domain adaptation method using graph matching and optimal transport for connectomes, reducing computation costs and complexities while promoting data sharing in neuroimaging research.
- Designed a novel federated learning method for heterogeneous connectome data across multiple silos, improving prediction accuracy and preserving privacy for collaborative research in neuroimaging studies.
- Developed a meta-learning method for translating predictive models across heterogeneous domains, enhancing robustness and prediction performance, particularly with limited samples.
- Collaborated with psychiatrists to develop predictive models of alcohol addiction scores using connectomes, providing valuable insights into the neuro-mechanisms of alcohol dependence.
- Delivered an oral presentation to a global audience of 50+ attendees at MICCAI 2022 in Singapore.
- Presented research findings at poster sessions held at the 26th, 27th, and 29th OHBM conferences, the 37th ICML workshop, and the IEEE ISBI 2021.

Yale School of Engineering & Applied Science, *Research Assistant*, New Haven, CT   *Sept 2018 - Mar 2019*
- Applied PLUMED, a Metadynamics library, with LAMMPS software to accelerate Molecular Dynamics simulations of bulk metallic glass crystallization.
- Modified GROMACS to simulate protein folding under customized repulsive forces.

School of Physical Science, *Research Assistant*, Hefei, China   *Sept 2017 – May 2018*
- Created a comprehensive simulation toolbox for granular material using C++, integrating self-defined functions for shearing, quenching, and accelerating the simulation process using conjugate gradient descent.
- Developed a novel dimension reduction method customized for analyzing nucleation data of granular material, allowing users to visualize and interpret kinetic pathways of nucleation under different physical conditions effectively.

SELECTED PROJECTS

Yale Department of Radiology & Biomedical Imaging, *Graduate Researcher*, New Haven   *Mar 2019 – Sept 2021*
- Implemented and optimized matrix completion methods to address diverse noise patterns in high-dimensional data, ensuring exceptional imputation accuracy and fast computational performance.
- Managed large-scale simulations on Yale's high-performance computing clusters, leveraging a Linux-based workload system for efficient and parallelized processing.

Yale Department of Radiology & Biomedical Imaging, *Graduate Researcher*, New Haven   *Sept 2021 – Present*

- Design Developed and implemented a graph transformation framework, integrating spectral embedding and graph-matching techniques utilizing the Gromov-Wasserstein discrepancy.
- Implemented a privacy-preserving, decentralized approach using PyTorch to train a multi-layer perceptron model for classification and regression tasks.
- Devised a transfer-learning methodology that leveraged pre-trained model weights from a different domain, employing a heterogenous domain alignment strategy with optimal transport techniques.

LEADERSHIP EXPERIENCE

Yale Graduate & Professional Student Senate (GPSS), *Senator*, New Haven, CT   *Sept 2020 - May 2022*
- Collaborated with GPSS leadership team to evaluate and vote on proposals affecting graduate student life and professional development, maintaining regular communication with the dean of the graduate school.
- Partnered with the Yale Alumni Association to organize and execute career-focused networking events, attracting an attendance of 100+ participants.

Yale School of Engineering and Applied Science, *Teaching Fellow*, New Haven, CT   *Jan 2021 - Dec 2021*
Courses: Introduction to Engineering; Medical Software Design
- Supervised and provided guidance to 16+ students in the completion of their final projects and demonstrations.
- Facilitated and led weekly group discussions of 10+ students on technology-related topics, promoting active participation and knowledge exchange among students.

SELECTED PUBLICATIONS

- **Qinghao Liang,** Brendan D.Adkinson, Rongtao Jiang, Dustin Scheinost. Overcoming Atlas Heterogeneity in Federated Learning for Cross-site Connectome-based Predictive Modeling, International Conference on Medical Image Computing and Computer-Assisted Intervention, 2024
- **Qinghao Liang,** Rongtao Jiang, Brendan D.Adkinson, Sahand Negahban, Harrison H. Zhou, Joseph Chang, Dustin Scheinost. Rescuing missing data in connectome-based predictive modeling, Imaging Neuroscience, 2024
- **Qinghao Liang**, Javid Dadashkarimi, Wei Dai, Amin Karbasi, Joseph Chang, Harrison H. Zhou, Dustin Scheinost. Transforming connectomes to "any" parcellation via graph matching. 4th Workshop on Graphs in Biomedical Image Analysis, International Conference on Medical Image Computing and Computer-Assisted Intervention, 2022
- **Qinghao Liang**, Sahand Negahban, Harrison H. Zhou, Dustin Scheinost. Connectome-based Predictive Modeling with Missing Connectivity Data Using Robust Matrix Completion. International Symposium on Biomedical Imaging, 2021
- Sarah W. Yip, Sarah D. Lichenstein, **Qinghao Liang**, et al. Brain networks and adolescent alcohol use. JAMA psychiatry, 2023