IAN LIU

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RESEARCH INTERESTS

Develop and apply **interpretable deep learning** including **graph neural networks** (GNNs) to integrate/model multi-modal/omics biological data (e.g., **spatial omics, medical imaging**) for predictive insights.

EDUCATION

Brown University - M.S., Biostatistics (GPA: 3.8) Aug 2024—Present

- **Thesis**: A Deep Learning Framework for Gene Expression Prediction from Histology Images (Advisor: Prof. Ying Ma)
- **Relevant Courses**: Statistical & AI-Powered Methods for Genomics, Longitudinal Data Analysis & Multilevel Modeling, Generalized Linear Models, Causal Inference, Computer Vision, Deep Learning

Fei Tian College Middletown - B.S., Data Science (GPA: 3.8) Aug 2020—May 2024

- **Thesis**: Causality in Transitional Care: A Qualitative Comparative Analysis & Coincidence Analysis of Transitional Care Strategies from Project ACHIEVE (Advisor: Prof. Jing Li)
- **Relevant Courses**: Cloud Computing & Big Data, Machine Learning & AI, Data Structures & Algorithms, Database Management, Front-End & Back-End Web Development, Survival Analysis, Calculus (I, II, III)

PUBLICATIONS

1. **Liu, I.**, & Ma, D. (2026). *Explainable harmonized cortical graph neural networks for risk prediction of Alzheimer's disease.* Paper to be presented at SPIE Medical Imaging: Computer-Aided Diagnosis.
2. Llibre-Guerra, J., Lu, R., Clarens, M. F., **Liu, I.**, . . . & Bateman, R. (2026). *Cognitive reserve influences symptom onset and longitudinal decline in Dominantly Inherited Alzheimer's Disease.* Neurology. (Accepted).
3. **Liu, I.**, Guo, E., . . . & Ma, D. (2025). *Optimizing harmonized cortical morphometric graph neural networks (GNN) for identifying risk of Alzheimer's disease.* Poster presented at the Alzheimer's Association International Conference (AAIC).

AWARDS & FELLOWSHIPS

- Best Presentation Award, AI & ML in Biomedical Applications Section, Wake Forest University (2025)
- AI Business Fellowship, Perplexity AI, Inc. (2025)
- Todd '87 & Christine Fisher P'17 Graduate Fellowship in Public Health, Brown University (2024–2025)
- Distinguished College Achievement Award, Fei Tian College Middletown (2024)
- Academic Excellence Award, Fei Tian College Middletown (2023, 2024)
- Provost's Outstanding Student's Award, Fei Tian College Middletown (2023)

RESEARCH EXPERIENCE

AI Research Intern, **Center for Artificial Intelligence Research - Wake Forest University** 2025—Current

- Developed 5 explainable GNN architectures for Alzheimer's disease prediction, achieving 96.8% AUC on test subjects with graphs of 320K+ vertices, ~500K edges (Publications 1, 3; with Prof. Da Ma)
- Fitted ~1M normative regression models to harmonize multi-site data, generating >1 billion residuals
- Diagnosed & resolved a Python pipeline bottleneck, reducing runtime from 6+ hours to ~30 sec. (>700x)

Research Assistant, **Ma Lab - Brown University** 2025—Current

- Built a deep learning model consisting of joint autoencoders, multilayer perceptrons, and convolutional models to predict spatial gene expression from 8000+ paired samples

Research Assistant, **Northern Research Institute of Health** 2023—2025

- Trained 15+ AutoML models with group K-fold cross-validation for brain atrophy prediction on radiomics data extracted from 136 PET images, achieving 0.92 accuracy and 0.94 F1 on heldout test data

Statistical & ML Research Intern, **Institute of Statistical Science - Academia Sinica** 2024

- Developed an extension of Locally Interpretable Model-Agnostic Explanations (LIME) to explain individual GNN node influence of 135 fatty liver patients via ElasticNet classifier and an adaptive class-balanced graph sampling algorithm (Poster Link, GitHub, with Prof. Tso-Jung Yen)

Bioinformatics & Data Science Research Intern, **Washington University in St. Louis** 2023

- Conducted confirmatory factor analysis (3 latent factors) to quantify cognitive reserve in dominantly inherited Alzheimer's Disease patients (Poster, Report, manuscript accepte, with Prof. Ruijin Lu)
- Modeled the effect of cognitive reserve on Clinical Dementia Rating using a zero-adjusted log-normal hurdle mixed-effects model, identifying a significant interaction with pathology
- Applied qualitative comparative analysis and coincidence analysis on 11 transitional care strategies to derive 29 combinations of strategies for optimizing patient satisfaction and patient-reported outcomes (Bachelor Thesis, with Prof. Jing Li)

Research Associate Intern, **Northern Horizon (Trillium Learning)** 2021

- Served as full-stack developer and database manager for “COVID Toolkit,” an interactive visualizer of COVID and vaccination data (JS, jQuery, HTML/CSS, MySQL, NodeJS).
- Tripled page load speed and reduced memory usage 4× via lazy loading, database redesign, and SQL optimization, enabling responsive access to 1.2M+ rows of public health data.

TECHNICAL SKILLS

Programming Languages: Python (PyTorch), R, SQL, JavaScript, HTML, CSS, Stata, Bash

Bioinformatics & Neuroimaging: Scanpy, FreeSurfer, PETSurfer, Pyradiomics, Nilearn, MNE, MONAI

INDUSTRY EXPERIENCE

Hosta.AI, Data Science Intern 2022—2023

- Optimized a computer vision quality assurance script, reducing processing time by ~5 seconds per image
- Created QA training for annotation team (40+ people) & evaluated annotation quality of 1000+ samples

Cisco Systems, Technical Intern 2022

- Programmed in full-stack Blast Radius Fork, a Terraform infrastructure visualizer (50 GitHub ☆)
- Enhanced app accessibility by building 8 multi-CPU architecture Docker images (1000+ Docker pulls)
- Designed & implemented 3 new full-stack features; deployed app on AWS EC2 and Kubernetes clusters

Sound of Hope Media, Data Engineer Intern 2021—2022

- Accelerated data analysis workflow via Extract, Transform, Load (ETL) data pipelines integrating YouTube APIs to process 1000+ rows of data monthly from 4 YouTube channels
- Automated uploads of 300+ podcasts to 11 platforms (e.g. Patreon, Spotify), saving 8+ hours