# Yifei(Francis) Zhang

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#### Education

University of North Carolina at Chapel Hill M.S. Statistics and Operations Research

University of Liverpool

B.S. Applied Mathematics

# Coursework

**Courses:** Deep Learning (Ph.D. level), Applied Statistics (Ph.D. level), Stochastic Modeling (Ph.D. level), Foundations of Optimization (Ph.D. level), Machine Learning, Optimization for Machine Learning and Neural Networks, Abstract Algebra, Real Analysis, Complex Functions, Measure Theory and Probability, Applied Stochastic Models

# RESEARCH INTERESTS

High-dimensional data analysis, Computational Neuroscience, Bayesian data analysis, Network analysis, Brain Connectomics, Machine Learning

# PAPERS AND THESIS

Yifei Zhang and Zhengwu Zhang<sup>\*</sup>, "SurfConnect: A Toolbox and Database for Continuous Surface-Based Connectivity Integration and Analysis" manuscript in preparation.

Yifei Zhang, "Brain Image Preprocessing and Analysis for Human Trait Prediction" Master's Thesis, University of North Carolina at Chapel Hill, Advisor: Prof. Zhengwu Zhang.

Yifei Zhang, "Analyze and Predict the 2022 World Happiness Report Based on the Past Year's Dataset" *Journal of Computer Science*, Vol. 19, No. 4, 2023, pp. 483–492.

# RESEARCH EXPERIENCE

# Multimodal Disentangled Network Variational Auto-Encoder

Supervised by: Prof. Meimei Liu & Prof. Zhengwu Zhang

- Proposed two Variational Autoencoder (VAE) models based on graph auto-encoding applied on Functional and Structural brain data.
- Modifying neural network encoding and decoding layers to implement an unsupervised MDE-VAE for discovering shared components of functional connectivity (FC) and structural connectivity (SC) through latent space.
- Generating SC and FC matrices, and a supervised MDE-VAE for predicting traits from connectivity matrices.
- Implemented, trained, and fine-tuned MDE-VAE models in PyTorch to generate SC and FC connectivity matrices and predict traits.

# SBCI application on Human Connected Program

#### Supervised by: Prof. Zhengwu Zhang

- Preprocessed HCP-Aging and HCP-Development datasets, including Diffusion MRI, T1, and resting-state fMRI data. Utilized FSL and MRtrix3 to merge dir98 and dir99 Diffusion MRI data, extracted AP and PA b0 images, performed distortion correction with topup, and conducted eddy correction on rfMRI and dMRI image data.
- Ran the SBCI Pipeline to generate functional connectivity matrices and structural connectivity data using dMRI, rfMRI, and T1 images, enhancing the applicability of SBCI on different datasets.
- Improved the SBCI toolkit by optimizing image generation and creating connectivity matrices with different atlases, updated the SBCI pipeline on the GitHub.

Aug 2023- Present

Aug 2019 - June 2023 GPA: 3.95/4.0

Jun. 2024 - Present

Sept. 2024 - Present

# EPIC- Advanced Prediction Model for Child Behavior Checklist Scores

Supervised by: Prof. Guorong Wu & Prof. Zhengwu Zhang

- Integrated state-of-the-art techniques to classify Child Behavior Checklist (CBCL) labels, enhancing diagnostic accuracy for pediatric behavioral issues using data from the ABCD study.
- Applied novel feature extraction methods like CoCoNest and node2vec to brain adjacency matrices, and utilized robust dimension reduction tools such as , Joint and Individual Variation Explained(JIVE) to integrate structural and functional brain connectome data.
- Implemented the XGBoost machine learning model with Shapley values for feature selection, advancing prediction accuracy and interpretability over traditional methods.

### Assessing Structural Connectomes for Trait Classification in Adolescents

 $Supervised \ by: \ Prof. \ Zhengwu \ Zhang$ 

- Employed PCA for effective dimensionality reduction, preparing the data for advanced analysis.
- Implemented multiple machine learning methods including SVM with RBF kernel, Logistic Regression, and Stacking to enhance trait prediction accuracy.
- Discovered significant improvements in predicting traits such as BMI when including structural connectome (SC) matrices, while some traits like sleep duration showed no similar enhancement.

## TEACHING EXPERIENCE

# STOR 445 Stochastic Processing

Graduate Instructor Assistant | Supervised by: Prof.Ziya Serhan

- Responsible for grading all assignments, midterms, and final exams, ensuring fair and consistent evaluation of student performances according to established rubrics.
- Maintained accurate records of student grades and provided timely feedback to enhance their learning experience.

# STOR 113 Decision Models for Busi & Econ

 $Graduate \ Teaching \ Assistant \ | \ Supervised \ by: \ Prof. Quoc \ Tran-Dinh$ 

- Conducted regular office hours and tutorials to support undergraduate students with homework and course material.
- Assisted in grading exams and assignments.

# **DATA120** Ethics of AI and Data Science

 $Graduate \ Teaching \ Assistant \ | \ Supervised \ by: \ Prof. Neil \ Gaikward$ 

- Facilitated office hours to assist undergraduate students with queries related to homework and course content.
- Maintained the course management system (Canvas) to ensure smooth operation of course activities, including uploading materials and managing submissions.
- Designed and reviewed reading reflections and problem sets to reinforce course concepts and provided feedback.
- Mentored 10 groups on their projects, providing advice and theoretical guidance on fairness in Machine Learning.

# Awards & Honors

First Honor Class Graduated in Applied Mathematics	University of Liverpool, UK
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SDSS Departmental and Instate Tuition Award (Fully Funded MS student)

Best Buddy in XJTLU Buddy Program

#### TALKS

"Connecting Questions to Questions: How to Translate Real-World Questions Into Deductible Insights", TCM Conference, Durham, NC, 2024

#### Skills

 $\mathbf{Programming \ Languages: \ R, \ Python, \ MATLAB, \ \texttt{LAT}_{E}\!X, \ JAVA, }$ 

Tools: Git/GitHub, VS Code, FreeSurfer, Linux, MRtrix3, FSL

Languages: Chinese (Native), English (IELTS 7, GRE 331)

Interests: Travel around the world 22/195 countries; Hiking; Fitness

May. 2024 - Aug. 2024

Feb. 2024 - Jun. 2024 alysis.

Jan. 2024 – Jun. 2024

Aug. 2024 – Present

Aug. 2023 - Dec. 2023

UNC, US

Xian-Jiaotong Liverpool University, CN