Junxing Xian

M.Sc. Student
Cognitive Neuroscience,
Beijing Normal University
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EDUCATION

2024 — present **Center for Excellence in Brain Science and Intelligence Technology**, Shanghai, China
Research Assistant, Represent the lab as a top student in an external collaboration, **Danqian Liu lab, Bing Liu Lab**

- Mice Calcium Imaging, Machine Learning.

2022 — present **Beijing Normal University**, Beijing, China
Master of Science: Cognitive Neuroscience, **Bing Liu lab**

- Human fMRI, Contrastive Machine Learning.

2020 — 2022 **Zou Chenglu Elite Class, Jointly trained students - only 10 students per year**
Institute of Biophysics, Chinese Academy of Sciences, Beijing, China
Undergraduate Research Assistant, **Ang Li lab**

- Human fMRI, Topological Data Analysis.

2018 — 2022 **Nankai University**, Tianjin, China
Bachelor of Science: Biotechnology
Minor in Physics: Mechanics,Thermodynamics,Optics,Electromagnetism and Graph Theory

PROJECTS

Topological Dynamics of Individual Differences in Naturalistic Brain Dynamics
First Author (2021.10 — present)
Pioneered this research direction in the lab

- Contributed to the Conception & Question: Naturalistic stimuli serve as neural "probes".
- Responsible for coding (90% +): TDA-Mapper, Graph theory, HMMs, Dimensional reduction (PCA, UMAP, t-SNE, VAE, t-PHATE, Cebra), Change point detection (PELT), Machine learning (Linear Regression, PSLR), Statistics, Data processing.
- Responsible for the manuscript draft (90%+): figures and Writing.
- Pre-print in : https://www.biorxiv.org/content/10.1101/2024.06.20.599966v2

Application of Topological Data Analysis in Brain Network
Corresponding Author, First Author (2021.4 — 2021.10)

- Responsible for the Conception & Question: Functional fingerprints exist in the topological shape of resting fMRI.
- Responsible for coding (90% +): Persistent homology, Machine Learning (SVM,Linear regression), Statistics, Data processing.
- Contributed to manuscript writing and figures
- ***Frontiers in Human Neuroscience*****: Accept**

Contrastive Machine Learning for Inherent Spatiotemporal Representations in Resting fMRI
Leadership (2023.6 — present)
Independently proposed the research question and experimental design

- Responsible for the Conception & Question (Independent): Is there a functional core in the population?
- Solely Responsible for the Coding (90%+): VAE, Contrastive Learning, Neural receptors gradient, Statistics, Data processing.

Pairing Facial Microstates with Topological Features of Neural Activity in Mice
Co-Researcher (2024.9 — present)

- Contributed to the Conception & Question: How do the topological properties of brain connectivity change in relation to facial movements during REM sleep?
- Contributed to Experiments (Assistance) : Calcium imaging, EEG.
- Responsible for Coding (Main): Data processing, Deep learning, Graph Theory, Statistics.

PUBLICATIONS

Corresponding Author

- Y. Wang, **J.X Xian**, Y.Y.Chen, Y. Y. Topological Signatures of Brain Dynamics: Persistent Homology Reveals Individuality and Brain-Behavior Links. Accept in Frontiers in Human Neuroscience. **(also First Author)**

First Author

- **J.X. Xian**, Y.N. He, et al., Probing Individual Differences in the Topological Landscape of Naturalistic Brain Dynamics, bioRxiv, 2024. doi: 10.1101/2024.06.20.599966.

Co-Author

- B. Liu, X.H. Tian, Y.J. Peng, M. Wang, Y.Q. Sun, J. Lou, **J.X. Xian**, Y.N. He, K. Hu, Q. Wang, S.Z. Huang, A. Li. Deciphering complex brain spatiotemporal dynamics shaping diverse human behavior, bioRxiv, 2023. DOI:10.21203/rs.3.rs-3344208/v1
- Y.N. He, J. Xiao, K. Hu, T. Gao, Y. Yan, L. Wang, K.X. Li, W.K. Lei, K. Zhao, C.S. Dong, X.H. Tian, C.Y. Ding, Y.J. Peng, **J.X. Xian**, S.Z. Huang, X.Y. Liu, L. Li, P. Zhang, Z.J. Zhang, S. He, A. Li, B. Liu. Longevity or Well-being? A Dual-Dimension Structure of Neuroticism, bioRxiv, 2024. doi: 10.1101/2024.07.23.604876.

SKILLS

- **Programming:** Python, MATLAB, Linux, C++.
- **Computation:** Topological Data Analysis (Mapper and Persistent homology), Nonlinear Dynamics, Machine Learning, Deep Learning,...
- **Experiment:** Functional MRI (fMRI), Calcium Imaging, EEG,...