
BIOGRAPHICAL SKETCH

NAME: Kanhao Zhao

eRA COMMONS USER NAME (credential, e.g., agency login): Alex Zhao

POSITION TITLE: Postdoctoral Fellow

EDUCATION/TRAINING:

INSTITUTION AND LOCATION	DEGREE	Start Date	Completion Date	FIELD OF STUDY
Henan University	BS	09/2014	06/2018	Biology science
University of Buffalo	Master	01/2019	06/2020	Biomedical engineering
Lehigh University	PhD	09/2021	06/2025	Bioengineering
University of California, Los Angeles	Postdoctoral Fellow	07/2025		Medicine

A. Personal Statement

My academic training and research experience have provided me with a strong foundation across multiple biological and computational disciplines, including data science, machine learning, statistics, biochemistry, and genetics. As an undergraduate, I conducted research with Dr. Jianshe Wei investigating the role of the protein TREM2 in Alzheimer's disease (AD) development in mice.

During my master's studies with Dr. Leslie Ying, my research focused on classifying patients with and without myocardial scarring, where I gained expertise in applying machine learning and deep learning to MRI reconstruction, registration, and segmentation. This work led to my first publication in an academic journal, an experience that deepened my understanding of how to propose, design, and refine a research project from conception to completion.

For my PhD training at Lehigh University under the supervision of Prof. Yu Zhang, I have focused on developing novel machine learning methods and applying established models to identify neuroimaging biomarkers for various brain disorders. This work includes diagnosing patients versus healthy controls, as well as predicting symptom severity and treatment outcomes.

In my postdoctoral research, I have expanded my focus to investigating the complex relationships between the gut microbiome, brain structure and function, and their interaction in cognitive decline. This work integrates multi-modal neuroimaging, microbiome profiling, and advanced machine learning approaches to uncover how metabolic and microbial pathways influence brain aging and resilience. By bridging microbiome science with neuroscience, I aim to identify novel biomarkers and mechanistic pathways that could inform early detection and intervention strategies for age-related cognitive disorders. Building on my prior expertise, this postdoctoral work positions me to lead interdisciplinary research at the intersection of systems neuroscience, microbiome biology, and precision medicine.

Together, my academic training and research trajectory provide a strong foundation for achieving my long-term goal: to become an independent investigator dedicated to understanding key developmental pathways and how alterations in central and peripheral markers contribute to human disease. I am confident that the proposed research and training will significantly enhance my scientific portfolio and strengthen my capacity to make meaningful contributions to the study of various brain diseases in humans.

1. **Zhao, K.**, Duka, B., Xie, H., Oathes, D. J., Calhoun, V., & Zhang, Y. (2022). A dynamic graph convolutional neural network framework reveals new insights into connectome dysfunctions in ADHD. *NeuroImage*, 246, 118774.
2. **Zhao, K.**, Xie, H., Fonzo, G. A., Tong, X., Carlisle, N., Chidharom, M., ... & Zhang, Y. (2023). Individualized fMRI connectivity defines signatures of antidepressant and placebo responses in major depression. *Molecular psychiatry*, 28(6), 2490-2499.
3. **Zhao, K.**, Fonzo, G. A., Xie, H., Oathes, D. J., Keller, C. J., Carlisle, N. B., ... & Zhang, Y. (2024). Discriminative functional connectivity signature of cocaine use disorder links to rTMS treatment response. *Nature Mental Health*, 2(4), 388-400.
4. **Zhao, K.**, Xie, H., Fonzo, G. A., Carlisle, N. B., Osorio, R. S., & Zhang, Y. (2024). Dementia subtypes defined through neuropsychiatric symptom-associated brain connectivity patterns. *JAMA Network Open*, 7(7), e2420479-e2420479.

B. Positions, Scientific Appointments, and Honors

Positions and Scientific Appointments

2025 – Present Postdoctoral Researcher, University of California, Los Angeles
Peering

C. Contributions to Science

1. **Early Career:** My early career contributions were focused on integrating biological research with computational methods to investigate disease mechanisms and improve diagnostic tools. As an undergraduate, I gained foundational knowledge in molecular biology and conducted experiments using an Alzheimer's disease mouse model to study the role of the TREM2 protein in neurodegeneration. Building on this experience, during my master's program I expanded my expertise into machine learning and deep learning, applying these techniques to classify MRI scans from patients with and without myocardial scarring. My particular role in this work was to develop classification algorithms, optimize their performance, and assess their accuracy in distinguishing pathological from non-pathological cases.
 - a. Sharma, U. C., **Zhao, K.**, Mentkowski, K., Sonkawade, S. D., Karthikeyan, B., Lang, J. K., & Ying, L. (2021). Modified GAN augmentation algorithms for the MRI-classification of myocardial scar tissue in ischemic cardiomyopathy. *Frontiers in cardiovascular medicine*, 8, 726943.
2. **PhD Career:** My doctoral research contributions focused on applying machine learning and deep learning approaches to the analysis of neuroimaging data from individuals with various brain disorders. The results from my research were significant as they provided new insights into the neural signatures underlying these conditions and demonstrated the potential of advanced computational models for improving diagnosis and disease subtyping. I developed and optimized algorithms capable of extracting latent features from multimodal neuroimaging datasets, enabling more accurate classification of patient groups and the identification of clinically relevant biomarkers. A subsequent publication, in which I applied these methods to large-scale datasets, advanced understanding of how structural and functional brain changes relate to disease progression and was recognized in the field for its methodological innovation.
 - a. **Zhao, K.**, Duka, B., Xie, H., Oathes, D. J., Calhoun, V., & Zhang, Y. (2022). A dynamic graph convolutional neural network framework reveals new insights into connectome dysfunctions in ADHD. *NeuroImage*, 246, 118774.
 - b. **Zhao, K.**, Xie, H., Fonzo, G. A., Tong, X., Carlisle, N., Chidharom, M., ... & Zhang, Y. (2023). Individualized fMRI connectivity defines signatures of antidepressant and placebo responses in major depression. *Molecular psychiatry*, 28(6), 2490-2499.
 - c. **Zhao, K.**, Fonzo, G. A., Xie, H., Oathes, D. J., Keller, C. J., Carlisle, N. B., ... & Zhang, Y. (2024). Discriminative functional connectivity signature of cocaine use disorder links to rTMS treatment response. *Nature Mental Health*, 2(4), 388-400.

- d. **Zhao, K.**, Xie, H., Fonzo, G. A., Carlisle, N. B., Osorio, R. S., & Zhang, Y. (2024). Dementia subtypes defined through neuropsychiatric symptom–associated brain connectivity patterns. *JAMA Network Open*, 7(7), e2420479-e2420479.

Complete List of Published Work in My Bibliography:

<https://pubmed.ncbi.nlm.nih.gov/?term=kanhao+zhao&sort=date>