Xianghao Zhan 展祥皓

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My Stanford Profile; My LinkedIn

Executive Summary

Xianghao Zhan is a postdoc researcher at Stanford University focusing on multi-modal multi-omics data fusion and spatial transcriptomics foundation models. He obtained Ph.D. in Bioengineering (Minor: Biomedical Data Science) at Stanford in 2024 and earned M.S. in Bioengineering (2021) and Statistics (2023) alongside his doctorate. With an extensive background in multimodal biomedical data analysis, involving wearable sensors, imaging, omics, and clinical NLP, he published 21 peer-reviewed first-author papers in journals (IF:144) and is under review for 5 in fields of AI4Science, multi-modal biomedical data mining and trustworthy AI. He also has publications in top-tier conferences including *ISMRM 2019* and *IEEE ICASSP 2025* and has given 14 conferences presentations and written 6 grants with $411,000 funded. His contribution is recognized with global awards such as the Siebel Scholar Class of 2024, IET Outstanding Postgraduate Research Award, Stanford Interdisciplinary Graduate Fellowship. He is also dedicated to mentoring underrepresented students and thrives as a successful team-sport leader and volleyball team captain with 15 intramural championships at Stanford University.

Education

Stanford University

Ph.D., Bioengineering (Minor: Biomedical Data Science) | 19-24 | GPA:4.0
M.S., Statistics (alongside Ph.D.) | 22-23 | GPA:4.0
M.S., Bioengineering (alongside Ph.D.) | 19-21 | GPA:3.9
Certificate, Ignite Business Program | Graduate School of Business | 23-24

Zhejiang University

B.Eng. Automation, College of Control Science and Engineering 控制学院| 15-19 | GPA:4.0 | 1/131
B.Eng. Honors Degree | Chu Kochen Honors College 竺可桢学院 | 15-19 | 1/151
B.A., English Language and Literature | School of International Study | 15-19

Employment and Internship

1. **Stanford University. Postdoctoral Researcher.** Oct. 2024-
   Spatial multi-omics foundation model, multi-omics analysis on ALS and cell therapy optimization. Advisor: Olivier Gevaert
   Key technical skills: GNN, Self-supervised learning, MLM, MOFA, Multi-modal fusion, DEG analysis.
   Highlights: Developed ML models for ALS diagnosis, prognosis and biomarker discovery with iPSC-derive motor neurons multi-omics; developing spatial transcriptomics foundation model with GNN
2. **Samsung Research America. Digital Health Technology Intern**. Sum'2024
   Multi-modal multi-sensor fusion for digital health monitoring. Managers: Jilong Kuang, Nafiul Rashid.
   Key technical skills: Wearables, human behavioral modeling, Robust ML, MCMC, Hierarchical ML model
   Highlights: 1 first-author paper accepted (*IEEE ICASSP 2025*), 1 first-author paper submitted to *IEEE IoT J.*
3. **Genentech. Biomedical Imaging Data Science Intern.** Sum'2023
   Using preclinical MRI data to optimize drug development models. Managers: ManKin Choy, Luke Xie.
   Key technical skills: Radiological biomarker, Statistical learning, Variance decomposition, Mixed models
   Highlights: successfully drove changes of pre-clinical experiment protocols in Genentech Neuroscience department; 1 first-author paper in preparation for *NeuroImaging*.
4. **Foothill College. Foothill College SLI Internship.** Manager: Sophia Kim Win'2022-Sum'2023
   Key technical skills: Explained Variance Decomposition, Statistical ML
5. **Stanford Athletic Academic Resource Center. CS109 Tutor.** 2023-2024

Key technical skills: Probability theories, Statistical distributions, Bayesian statistics, MLE, ML

6. **Stanford Summer Research Program. Program Management Internship.** May'2021-Sept.2021
7. **University of Cambridge. Research Internship.** Win'2018
   Acoustic particle trapping. Mentor: Adrian Carl Stevenson
   Key technical skills: MEMS, electronics, sensors and actuators, signal processing, nanoparticle control
8. **UCLA. Research Internship.** Sum'2018
   Fast T1, T2 characterization with deep learning. Mentor: Peng Hu.
   Key technical skills: DL, XGBoost, Signal processing, Bloch equation, MRI, Data Augmentation
   Recognition: 1 first-author abstract orally presented at *ISMSM 2019*.

Key Courses and Skills

1. **CS271: AI for Healthcare** Instructor: Serena Yeung

UNet 2D/3D lung segmentation, nnUnet, DeepSea, BPNet, ResNet, CLIP, Fast RCNN, BERT/LSTM on EHR and clinical event prediction, MobileNet image classification, Image Registration, Self-supervised Learning

2. **CS224N: NLP with Deep Learning** Instructor: Christopher Manning

Bi-LSTM Neural Machine Translation, BERT, Transformer-XL, GloVe, NMT, Word2Vec, GPT, MLM

3. **EE269: Signal Processing for ML** Instructor: Mert Pilanci

SVM, LDA, DWT, DCT, STFT, PCA, DRCA, NMF, LSTM, 1D-CNN, human activity recognition, VOC gas sensor, Semi-supervised Learning, Dictionary Learning, Digital Signal Processing, Inertial Measurement Units

4. **CS236: Deep Generative Models** Instructor: Stephano Ermon

Autoregressive Model, Flow, VAE/SSVAE on MNIST, GAN, DIVA, Diffusion models, Energy-based models

5. **Other related courses**

CS229: ML; **CS230**: DL; **CS279**: Computational Biology; **BIOMEDIN 260**: Biomedical Image Processing; Coursera: Generative AI & LLMs; STATS315A Statistical Learning; STATS305A: Applied Statistics; STATS200: Statistical Inference; **CME364A**: Convex Optimization; **CS236G**: GAN; BIOMEDIN221: Biomedical Data Fusion; STATS 217/218: Stochastic Processes; **CS274 & BIOMEDIN 217**: Bioinformatics & Multi-omics.

Featured Research Contributions

1. **Machine Learning Head Models of Impact Brain Biomechanics** **2019-2024**

The first in the world to develop a series of machine learning head models to **rapidly compute brain strain and strain rate** to detect dangerous head impacts from head kinematics signals measured by IMU sensors. The first in the world to **denoise head kinematics with AI system** to accurately measure head motion. Replace the finite element modeling with quasi-real-time deep learning models (99.9% time reduction). Optimization of model generalizability with **transfer learning and unsupervised domain adaptation** (DRCA, cycle-GAN, shift-GAN).
Recognition: IET Postgraduate Scholarship for an Outstanding Researcher (£10,000; 1 awardee globally; first-ever Chinese winner); IET Healthcare Technologies William James Award (£500; 1 awardee globally); 2022/2024 National Neurotrauma Society Trainee Travel Award (the only Chinese scholar awarded in 2022); IET PresentIn10 Global Finalist (Top 3; first-ever Chinese winner).
Publications & Talks: *IEEE TBME 2021-2024; IEEE Sens. J. 2023; JSHS 2023; ABME 2021,2022 & IRCOBI 2021; SB3C 2020-2023; NNS 2022; IMECE 2021,2022*

2. **COVID-19 Patient Triage System based on CT radiomics and EHR** **2020-2024**

Developed a series of **COVID-19 patient triage system** based on outcome predictions of ICU admission, mechanical ventilation requirements and potential death within 28 days of hospital admission. Model input: CT-radiomics, clinical symptoms, lab test values from electronic health records. Models: LR, LightGBM, SVM, MLP, conformal prediction. Model validation on Huoshenshan Field Hospitals and **Delta and Omicron variants**.
Recognition: Models widely used in hospitals across many provinces in mainland China, Hong Kong, Taiwan. Hong Kong media coverage (Mentors: Prof. Olivier Gevaert and Prof. Guangming Lu).
Publications: *NPJ Dig. Med. 2021; Eur. J. Rad. Open 2024*

3. **Robust ML and Conformal-prediction-based Semi-supervised Learning Algorithms** **2020-2025**

Developed a series of conformal-prediction frameworks for **semi-supervised unlabeled data augmentation and noisy training data cleaning algorithms**. Validated on sensors, mutli-omics, clinical NLP tasks.
Publications & Talks: *IEEE Sens. J. 2021; IEEE TIM 2022; IEEE TIM 2023; PLoS Comp. Bio. 2025*

4. A Porcine Impact Model of mTBI Radiology and Pathology **2022-2025**

Developed a large animal model with linear impactor and MRI to link biomechanics, imaging and pathology of impact-induced traumatic axonal injury and blood-brain barrier disruption.
Grants & Publications & Talks: *NIH R01 2024; Stanford PHIND 2022; Wu Tsai Human Performance 2022; DoD 2021 & COBME 2022, GRC 2022, NNS 2024*

Publications

Google Scholar, ORCID, Citation: 708, h-index: 16, i10-index: 24, Cumulative Impact Factor: 144.1
First-author/corresponding-author journal articles: 21 (published/accepted), 5 (under review)

1. **Zhan X.** et al. Reliably Filter Drug-induced Liver Injury Literature with Natural Language Processing and Conformal Prediction. *IEEE J-BHI* (2022). ***NLP, Information Retrieval & Trustworthy AI***
2. **Zhan X.** et al. Rapid Estimation of Entire Brain Strain Using Deep Learning Models. *IEEE TBME* (2021). ***Wearable Signals & DL & Finite Element Modeling for Computational Brain Biomechanics***
3. **Zhan X.** et al. Reliability-Enhanced Data Cleaning in Biomedical Machine Learning Using Inductive Conformal Prediction. *PLoS Computational Biology* (2025). ***Robust ML & Semi-supervised Learning***
4. Xu Q., **Zhan X.** et al. AI-based analysis of CT images for Rapid Triage of COVID-19 Patients. *NPJ Dig. Med* (2021). Co-first author. ***Multi-modal Biomedical Data Fusion & Medical Image Processing***
5. **Zhan X.** et al. Adaptive machine learning head model across different head impact types using unsupervised domain adaptation and generative adversarial network. *IEEE Sens. J.* (2024). ***Domain Adaptation & GAN***
6. **Zhan X.** et al. AI-based denoising of head impact kinematics measurements with convolutional neural network for traumatic brain injury risk monitoring. *IEEE TBME* (2024). ***Wearable Signals & CNN***
7. **Zhan X.** et al. Finding the spatial co-variation of brain deformation with principal component analysis. *IEEE TBME* (2022). ***Unsupervised Learning, Pattern Discovery & Dimensionality Reduction***
8. **Zhan X.** et al. Structuring clinical text with AI: old vs. new natural language processing techniques evaluated on eight common cardiovascular diseases. *Patterns* (2021). ***NLP & Mining Large Datasets***
9. **Zhan X.** et al. Earbuds Orientation Alignment Based on Markov Chain Monte Carlo Sampling. *IEEE ICASSP* (2025). ***Optimization & Wearable Signals Alignment & Human Behavioral Modeling***
10. **Zhan X.**, et al. Machine-learning-based head impact subtyping based on the spectral densities of the measurable head kinematics. *Journal of Sport and Health Science*. (2023) ***Wearable Signals & ML***
11. Liu L., **Zhan X.** et al. CPSC: Conformal prediction with shrunken centroids for efficient prediction reliability quantification and data augmentation, a case in alternative herbal medicine classification with electronic nose. *IEEE Transactions on Instrumentation and Measurements.* 2022. Co-first author. ***Semi-supervised Learning & Data Augmentation***
12. **Zhan X.** et al. MAD-Fusion: Modality-aware Dynamic Fusion in Identification of Activities of Daily Living. *IEEE Internet of Things Journal*. Under review. ***Multi-modal Fusion & Trustworthy AI***
13. Lin J., **Zhan X.** Drift Compensation in Electronic-Nose-Based Gas Recognition with Knowledge Distillation. *IEEE Trans. Ind. Inf.* Under review. Corresponding Author. ***Knowledge distillation***

Conference Presentations

1. Clean Noisy Training Labels with Inductive Conformal Prediction in Multi-modal Biomedical Data Mining. *AMIA IS: American Medical Informatics Association Informatics Summit 2024*
2. Filter Drug-induced Liver Injury (DILI) Literature with Natural Language Processing and Ensemble Learning. *AMIA IS 2023; ISMB/ECCB 2022 Best Talk Award; ISMB/ECCB 2021 Best Talk Award*
3. Denoising Instrumented Mouthguards for Accurate Traumatic Brain Injury Detection with Convolutional Neural Network. *ASME IMECE 2022; SB3C 2022.*

4. Rapidly Estimate Brain Strain and Strain Rate on Various Types of Head Impacts with Transfer Learning and Data Fusion on Deep Neural Network. *ASME IMECE 2021. NHTSA 2021.*

Honors and Awards

1. ***Informatics* Best PhD Thesis Award** (Feb'25). 1 awardee across the globe each year (800 CHF).
2. **Siebel Scholar Class of 2024** (Sept'23) Siebel Scholar recognizes the most talented students at the world's most prestigious bioengineering, business, and computer science schools ($35,000).
3. **AMIA IS23 LEAD Trainee and Early Career Meeting Scholarship** (Feb'23) Six awardees each year in US.
4. **2022 IET Postgraduate Scholarship for an Outstanding Researcher** (Oct'22) 1 awardee each year across the globe. The highest level of IET Postgraduate Scholarship (£10,000). First Chinese researcher awarded.
5. **2022 IET Healthcare Technologies William James Award** (Sept'22) 1 awardee each year across the globe.
6. **2021 Chinese Government Award for Outstanding Self-financed Students Abroad** (Jul'22) The highest governmental award to Chinese graduate students studying abroad ($6,000); 600 PhD students and postdocs.
7. **2024/2022 National Neurotrauma Society Trainee Travel Award** (Jun'22, Jun'24) 20 awardees each year. The only Chinese researcher awarded in both 2022 and 2024.
8. **2022 Stanford Interdisciplinary Graduate Fellowship** (May'22) 34 awardees. Highest honor for Stanford doctoral student pursuing interdisciplinary research. Tuition and stipend for 3 years. ($300,000).
9. **Category Winner of IET Presentin10** (Oct'21) Top 3 International Grand Finalists. 1st Chinese in the final.
10. **The James Clark Graduate Fellowship, Stanford University** (Sep'20) ($100,000).
11. **Ten Most Outstanding Students, Zhejiang University** 浙江大学十佳大学生 (Dec'17) 10 awardees. The only junior undergraduate awarded in 2017 & Summa Cum Laude in Zhejiang University
12. **Chu Kochen Scholarship, Zhejiang University** 浙江大学竺可桢奖学金 (Dec'18) 12 undergraduate awardees. The highest-level scholarship in Zhejiang University (¥20,000)
13. **Chinese National Scholarship, Ministry of Education of PRC** 国家奖学金 (Dec'16) Top 0.2% (¥8,000)
14. **First-level Fellowship of CICS** (Jan'19) 12 awardees. Chinese Instrument and Control Society Scholarship
15. **Cambridge Trust International Scholarship** (Feb'19) Top 80 international awardees
16. **Excellent Graduate of Zhejiang Province** 浙江省优秀毕业生 (Jul'19) Top 2%

Skills (AI4Science, AI4Healthcare, Biomedical Engineering, Computational Biology)

Programming: Python, MATLAB, R, C

Statistical Learning: Semi-supervised Learning, Conformal Prediction, Stochastic Processes, Statistical Inference, Explained Variance Decomposition, Linear Mixed-effects Models, Bootstrapping, Classification (SVM, LDA, RF, LR, DT, Bayesian), Unsupervised Learning (K-Means, PCA, GMM, NMF, EM, tSNE)

Deep Learning: Basics (DNN, CNN, RNN, Transformers, Optimization, Regularization, Augmentation), Deep Generative Models (VAE, GAN, Flow, Energy-based), NLP (Transformer, BERT, word2vec, TF-IDF), Medical Informatics (Image Classification/Segmentation, Electronic Health Records, Omics, Sensor Data), Contrastive Learning (CLIP, SIMCLR), Self-supervised Learning, LLM (Prompt Engineering, Fine-tuning, PEFT), Domain Adaptation, Data Fusion, Ensemble Learning, GNN, Knowledge Distillation, Trustworthy AI, Robust ML

Biomedical Engineering: Signal and System, Biomechanics, Physiology, sEMG, IMU, Artificial Olfaction System, Control Theory, Embedding Systems, Large Animal Experiment, DEG/DEP Analysis, GSEA, MOFA.

Other: Sensors and Instrumentation, Leadership, Good communication skills, Scientific Presentation and Writing

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Major Grants Funded

Wu Tsai Performance Alliance Agility Project Grant. Funded. $200k. Blood-brain-barrier disruption and axonal injury in traumatic brain injury: linking neuroimaging and biomechanics with pathologies.

Stanford Precision Health and Integrated Diagnostics Center Seeding Grant. Funded. $200k. Linking neuroimaging and biomechanics with TBI pathologies caused by repetitive head impacts in a large animal model.

Peer Reviewer: 24 Journals and 1 Conference. *IEEE Trans. Ind. Inf., IEEE J-BHI, Nat. Com. Med., Nat. Com. Eng., Biomed. Sig. Proc. and Contr., Measurement, Sci. Rep., J. Neurotrauma, ABME, J. Biomechanics, AMIA IS 2024.*