Pengcen Jiang

p5jiang@ucsd.edu | +1-858-666-7389 | github.com/pc-Jiang | linkedin/pengcen-jiang

Education

Ph.D. Data Science, University of California, San Diego (UCSD) Sep. 2022 – Present, expected June 2027
B.S. Physics, University of Science and Technology of China (USTC) Sep. 2017 – June 2022

- School of the Gifted Young, 5-year Interdisciplinary Talent Program, **double major in Stats & Applied Maths**.

Technical Skills

Programming Languages: 6+ years of experience in Python and MATLAB; proficient in R, C/C++, and Mathematica.
Engineering Skills: PyTorch/PyTorch Lightning, TensorFlow, Weights & Biases, NumPy, Pandas, SciPy, scikit-learn, Matplotlib, Seaborn, Scanpy; Large-scale experiment automation, parallel/multi-threaded/multi-process computing and programming, version control (Git/GitHub), Linux, Bash, Kubernetes, Hugging Face, SQL.
Machine Learning & Data Science: Deep learning (RNN/LSTM/GRU, CNN, attention, Bayesian NN), classification, clustering, representation learning, continual learning, linear algebra, probability, supervised/unsupervised learning, model interpretability, dimensionality reduction, regression analysis, manifold learning, control theory, (non)linear dynamical systems, model selection, hypothesis testing, multiple hypothesis testing, statistical inference, statistical modeling, signal processing, time series analysis.
Other: Excellent scientific writing, visualization, presentation skills for audience with diverse backgrounds; proficient in LaTeX.

Research Experiences

Graduate Student Researcher (Advisor: Dr Mikio Aoi, UCSD) Sep. 2022 – Present
Topic: Teacher-student evaluation of Recurrent Neural Networks (RNNs) as brain surrogate models

- Trained students with **multi-modal** data of **multi-task** teachers (synthetic, linear dynamical system/task-trained RNN) that aligned sensory, neural, and behavioral signals with **continual learning** and **regularization**.
- **Led a four-member research team**, coordinating analysis and ensuring fast, high-quality results.
- Managed **large-scale experimentation** (>1000 models) with **automated** sweeping, training, and evaluation.
- **Accelerated open-source** packages: dynamical similarity analysis (DSA) and FixedPointFinder by **parallelizing computation** (days → < 1 hour).
- Evaluated representational similarity via task selectivity, latent dimensionality, connectivity, and dynamics using PCA, participation ratio, DSA, reduced-rank regression, Wasserstein distance, silhouette scores, and control-theoretic metrics, visualized the results with Multidimensional Scaling (MDS).
- Identified that low MSE is necessary but not sufficient for recovering a teacher's internal structure (parameters, latent geometry, fixed points, controllability/observability).
- Demonstrated limits of data-driven RNNs as brain surrogates and proposed new similarity metrics and selection criteria to better guide neuroscience experimental design utilizing ML/AI, both in silico and in vivo.

Undergraduate Research Assistant (Advisor: Dr Quan Wen, USTC) Jan. 2022 – June 2022
Topic: Statistical inference of connectome from zebrafish whole-brain calcium imaging

- Applied **generalized linear model (GLM)** to learn and predict the spike train data extracted from whole-brain calcium imaging data of lava zebrafish, and inferred the functional connectivity.
- Achieved high similarity between model-based predicted connectivity motif distribution and 1) benchmark measurements from empirical animal data; 2) benchmark measurements from Wen-group-trained RNN with FORCE learning.

Undergraduate Summer Research Intern (Advisor: Dr Guangyu Robert Yang, MIT) July 2021 – Dec. 2021
Topic: Design and analysis of flexible working memory models processing naturalistic inputs

- Designed **multi-regional** models combining convolutional neural network (CNN), RNN, and attention mechanism to study attention and working memory simultaneously.
- Designed computer simulation of cognitive tasks requiring both working memory and attention to train models.
- Achieved high similarity in behaviors and neural state spaces between task-trained model and experimental animal/subjects. Highlighted a new method to utilize artificial neural networks as surrogate of the brain for future neuroscience research.

Selected Publications

- (in prep) **P. Jiang**, H. Giaffar, Z. Jin, Y. Yuan, A. Charles, M. Aoi, Indoctrinating students is harder than you think: highly constraining RNNs is no guarantee of their quality as surrogates for the brain. (2025)
- Yudi Xie, Yu Duan, Aohua Cheng, **Pengcen Jiang**, Christopher J. Cueva, and Guangyu Robert Yang. Natural constraints explain working memory capacity limitations in sensory-cognitive models. bioRxiv (2023)
- **Pengcen Jiang**, Yu Hu, Quan Wen. Inferring Connectome Based on Whole-Brain Calcium Fluorescence Imaging Data of Zebrafish. University of Science and Technology of China Undergraduate Thesis (2022)
- Fengchao Wang, **Pengcen Jiang**, Qiong Fan. Capillary condensation under nano-confinement: A supplement to the 150-year-old Kelvin equation. Chinese Science Bulletin (2021)

Conference Presentations

- (submitted) **P. Jiang**, et al., Indoctrination is harder than you think: On the use and misuse of RNNs as surrogates for the brain. 2026 Conference on Computational and Systems Neuroscience (COSYNE)
- **P. Jiang**, et al., Indoctrinating students is harder than you think: highly constraining RNNs is no guarantee of their quality as surrogates for the brain. 2025 Conference on Society for Neuroscience (SfN)
- H. Giaffar, **P. Jiang**, et al., Neural connectivity constrains computation in the insect Lateral Horn. 2025 Conference on Society for Neuroscience (SfN)
- **P. Jiang**, et al., Indoctrinating students is harder than you think: highly constraining RNNs is no guarantee of their quality as surrogates for the brain. 2025 Statistical Analysis of Neural Data Workshop
- H. Giaffar, **P. Jiang**, et al., How does connectivity constrain computation in the insect Lateral Horn? 2025 Statistical Analysis of Neural Data Workshop
- **P. Jiang**, et al., Indoctrinating students is harder than you think: highly constraining RNNs is no guarantee of their quality as surrogates for the brain. 2025 Statistical Analysis of Neural Data Workshop
- **Pengcen Jiang**, Adam Charles, Mikio Aoi. Recurrent Neural Networks Utilize Different Mechanisms when Learning Kalman Systems. 2024 Conference on Society for Neuroscience (SfN)
- Y. Xie, ..., **P. Jiang**, C. Cueva, G. R. Yang. Human-like capacity limits in working memory models result from naturalistic sensory constraints. 2023 Conference on Computational and Systems Neuroscience (COSYNE).
- Y., Xie, Y. Duan, A. Cheng, **P. Jiang**, C. Cueva, G. R. Yang. Human-like capacity limitation in multi-system models of working memory. 2022 Conference on Cognitive Computational Neuroscience (CCN).

Selected Honors and Awards

Graduate & Professional Student Association (GPSA) Fall Travel Grant Award, UCSD 2025
Yearly English News Reporter, USTC 2020
Grand Prize (top 14 teams out of 100+ teams) in the 15th Competition of Physical Research Experiments, USTC 2019
Excellent Student Scholarship-Silver, USTC 2019
Cyrus Tang Foundation Moral Education Scholarship, USTC 2017 – 2021
Four-Star Volunteer of Chinese Youth Volunteer Service (300 hrs+ volunteer service), USTC 2019
Outstanding Freshman Scholarship, USTC 2017

Teaching Experiences

DSC 257R Unsupervised Learning, UCSD FA 2025
- Assist in teaching topics such as descriptive statistics, clustering, dimensional reduction, spectral embedding, probability distributions, density estimation, graphical models, sparse coding, autoencoders, and self-supervised learning.

DSC 212 Probability and Statistics for Data Science, UCSD SP 2025
- Assist in teaching topics such as probability space, conditional probability, distribution, covariance, generating function, statistical estimation (moment method, max likelihood estimation, EM algorithm), Bootstrap, hypothesis testing.

Introduction to Computational Neuroscience, USTC FA 2021
- Assist in teaching topics such as Hodgkin-Huxley Model, receptive fields, information theory and efficient coding, nonlinear dynamical system, feedforward/convolutional/recurrent neural network, ring attractors, fixed points, learning and memory.

Academic Activities

Reviewer, 2026 Conference on Computational and Systems Neuroscience (COSYNE) 2025
Invited speaker, Research Experiences for Undergraduates, California State University, Northridge July 2025
Volunteer, Brain Machine Interface Workshop for Undergrads, UCSD Sep. 2023
Student, CNeuro Summer School, Tsinghua University 2020

Outreach & Leadership

Mentor at Graduate Women in Computing (GradWIC), UCSD 2023 – Present
Leader of Feiyue, a student-run platform providing information for students to study abroad, USTC 2022
Assistant editor and scientific research journalist at English News Center, USTC 2019 – 2022
Leader of a student scientific expedition group to Maowusu Desert, investigating desert control, USTC 2019
Leader of Special Education Service Group at Fang Cao Young Volunteers Association, USTC 2018 – 2019