Ji-An Li

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Research Interests

Computational Neuroscience, Large Language Model Interpretability

Education

University of California, San Diego — California, USA
Doctoral Study in Neurosciences — 2020 – Present
Advisor: Marcelo Mattar, Marcus Benna

University of Science and Technology of China — Anhui, China
M.S. in Applied Statistics — 2016 – 2019
Advisor: Xiaochu Zhang

B.S. in Biological Science — 2012 – 2016
Advisor: Xiaochu Zhang
Shitsan Pai Talent Program in Life Sciences (Honor)

B.E. in Computer Science and Technology (Dual) — 2012 - 2016
Advisor: Shangfei Wang

Honors

Interpretability Hackathon 3.0, First Place — 2023
Innovative Research Grants Award (Kavli Institute, UCSD) — 2022
Outstanding Research Paper Award (USTC) — 2020
Graduate Scholarship, Grade 1 (USTC) — 2018
Suzhou Industrial Park Scholarship (USTC) — 2017
Outstanding Undergraduate Thesis (USTC) — 2016
Guo Moruo Scholarship (USTC, Highest Honor) — 2015
National Scholarship (Chinese Ministry of Education) — 2014
Outstanding Student Scholarship, Gold Medal (USTC) — 2013
Outstanding Freshman Scholarship (USTC) — 2012
China High School Biology Olympiad, Nationwide, Silver Medal — 2011
China High School Biology Olympiad, Anhui Province, First Prize — 2011
National Olympiad in Informatics, Anhui Province, First Prize — 2010

Publications

L Ji-An, MK Benna. Deep Learning without Weight Symmetry. *arXiv.* 2024

L Ji-An*, C Zhou*, MK Benna†, MG Mattar†. Linking In-context Learning in Transformers to Human Episodic Memory. *arXiv.* 2024

L Ji-An, MK Benna, MG Mattar. Automatic Discovery of Cognitive Strategies with Tiny Recurrent Neural Networks. *bioRxiv.* 2023

L Ji-An, F Stefanini, MK Benna, S Fusi. Face familiarity detection with complex synapses. *iScience.* 2023

M Molano-Mazón, J Barbosa, J Pastor-Ciurana, M Fradera, RY Zhang, J Forest, J Pozo, L Ji-An, CJ Cueva, J Rocha, D Narain, GR Yang. NeuroGym: An open resource for developing and sharing neuroscience tasks. *PsyArXiv, aqc9n.* 2022

JA Li, D Dong, Z Wei, Y Liu, Y Pan, F Nori, X Zhang. Quantum Reinforcement Learning during Human Decision Making. *Nature Human Behaviour.* 2020

Y Cheng, J Bu, N Li, JA Li, H Gou, S Sun, C Liu, Z Jin, C He, C Fan, C Liu, X Zhang. Dysfunctional resting-state EEG microstate correlated with the severity of cigarette exposure in nicotine addiction. *Science China Information Sciences.* 2020

S Minni*, L Ji-An*, T Moskovitz, G Lindsay, K Miller, M Dipoppa, GR Yang. Understanding the Functional and Structural Differences across Excitatory and Inhibitory Neurons. *bioRxiv, 680439.* 2019

R Zha, J Bu, Z Wei, L Han, P Zhang, J Ren, JA Li, Y Wang, L Yang, S Vollstädt-Klein, X Zhang. Transforming brain signals related to value evaluation and self-control into behavioral choices. *Human brain mapping.* 2019

* = equal contributions

Conference papers

J Zida*, L Ji-An*, MG Mattar. Understanding atypical decision making behavior with recurrent neural networks. **Contributed Talk**. *Cosyne 2024*

HD Xiong*, L Ji-An*, MG Mattar, RC Wilson. Distilling decision-making dynamics with low-dimensional architectures. Poster. *Cosyne 2024*

L Ji-An, MK Benna. Biologically plausible credit assignment without weight symmetry. Poster. *Cosyne 2024*

HD Xiong*, L Ji-An*, MG Mattar, RC Wilson. Distilling human decision-making dynamics: a comparative analysis of low-dimensional architectures. Poster. *NeurIPS Workshop AI4Science 2023*

HD Xiong*, L Ji-An*, MG Mattar, R Wilson. Neural network modeling reveals diverse human exploration behaviors via state space analysis. **Contributed talk**. *Cognitive Computational Neuroscience 2023*

L Ji-An, MG Mattar. What do meta-reinforcement learning networks learn in two-stage decision-making? Poster. *Cosyne 2022*

GR Yang, J Pastor-Ciurana, M Fradera, RY Zhang, J Forest, J Pozo, J Barbosa, L Ji-An, CJ Cueva, A Compte, J Rocha, M Molano-Mazon. Neurogym: An open resource to developing and sharing neuroscience tasks. Poster. *Cosyne 2021*

S Minni*, L Ji-An*, T Moskovitz, G Lindsay, K Miller, M Dipoppa, GR Yang. Understanding the functional and structural differences across excitatory and inhibitory neurons. Poster. *Cosyne 2020*

JA Li, F Stefanini, MK Benna, S Fusi. A Face Familiarity Detection System with Complex Synapses. Poster. *Cosyne 2019*

JA Li, Z Wei, X Zhang. Behavioral and neural evidence for quantum reinforcement learning during decision making. Poster. *Society for Neuroscience 2018*

JA Li, GR Yang, XJ Wang. Neural Mechanisms of Recurrent Neural Networks with Interneurons and Dendrites Performing Context-dependent Decision Making. Poster. *Society for Neuroscience 2018*

* = equal contributions

Submitted papers

L Ji-An, MK Benna, MG Mattar. Automatic Discovery of Cognitive Strategies with Tiny Recurrent Neural Networks. *Nature* (under revision)

L Ji-An, MK Benna. Deep Learning without Weight Symmetry. *NeurIPS 2024* (under review)

L Ji-An*, C Zhou*, MK Benna†, MG Mattar†. Linking In-context Learning in Transformers to Human Episodic Memory. *NeurIPS 2024* (under review)

* = equal contributions

Research experience

Graduate student researcher. Department of Neurosciences, UC San Diego
Advisor: Marcelo Mattar, Marcus Benna 2020 – Present

Undergraduate & graduate student researcher. School of Life Sciences, USTC
Advisor: Xiaochu Zhang 2015 – 2020

Student intern. Zuckerman Institute, Columbia University
Advisor: Stefano Fusi 2018 – 2020

Student intern. Center for Neural Science, New York University
Advisor: Xiao-Jing Wang 2017

Talks

Contributed talk, Cosyne 2024
AI for Brain Science, Tianqiao and Chrissy Chen Institute 2023
Neurodinner, Neurosciences Graduate Program, UCSD 2023
KIBM Symposium on Innovative Research, UCSD 2023
Computational Psychiatry Seminar, Chinese Computational Psychiatry Network 2021
Brain Science Institute, RIKEN, Japan 2018

Research Mentorship

Ruicheng Li, master student at UCSD, in the group of Marcelo Mattar 2022
Huixing Gou, graduate student at USTC, in the group of Xiaochu Zhang 2020

Reviewer

eLife, Science Advances, CCN (Conference on Cognitive Computational Neuroscience)

Teaching

Instructor, Department of Neurosciences, UCSD 2023
NEU200C Cognitive Neuroscience
Teaching assistant, Department of Statistics and Finance, USTC 2018
Regression Analysis, *Excellent Teaching Assistant Honor*

Academic Activities

Co-organizer, Neurotheory Journal Club 2024
Volunteer, Neuromatch Academy 2023
Volunteer, Neuromatch Academy 2022
Student, Computational & Cognitive Neuroscience Summer School, Cold Spring Harbor Asia 2021
Interactive-track student, Neuromatch Academy 2020
Translator, *A Concise Handbook of TensorFlow*, supported by Google Developer Relations Team 2018
Student, Japanese and Asian Youth Science Exchange Project 2015
Intern student, Institute of Biophysics (Beijing), CAS 2013

Leadership

President, Computational Neuroscience Committee, UCSD 2023 – Present
Vice President, Nature Protection Association, USTC 2015 – 2016

Programming

Python (TensorFlow, PyTorch), MATLAB, R, C++, Bash, SQL, AFNI