Jian Li

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Education

Master of Applied Statistics, University of Science and Technology of China (USTC) *Sep. 2016 - Jun. 2019*

- GPA: overall 4.05/4.3 or 93.30/100 (ranked 1st among 11 students majoring in Applied Statistics)

Bachelor of Science in Biological Science (Neurobiology and Biophysics), USTC *Sep. 2012 - Jun. 2016*

- Honored Program: Shitsan Pai Talent Program in Life Sciences (ranked 1st among 28 students in the program)
- GPA: overall 3.99/4.3 or 92.26/100 (ranked 1st among 76 students majoring in Life Sciences)

Bachelor of Engineering in Computer Science and Technology (Dual), USTC *Mar. 2015 - Feb. 2016*

- GPA: overall 92.64/100

Research Interests

- Computational Neuroscience/Computational Cognitive Science

Research Experiences

Hefei National Laboratory for Physical Sciences at the Microscale, USTC

Research Assistant (Advisor: Prof. Xiaochu Zhang) *Sep. 2015 - present*

Project: Quantum Reinforcement Learning during Human Decision Making

- Showed that quantum reinforcement learning, a mathematical formalism inspired by quantum probability theory, can model human value-based decision making. Discovered the representation of unique quantum-like variables in the medial frontal gyrus with model-based fMRI analysis. (Graduate thesis; paper accepted by *Nature Human Behaviour*, as the first author)

Project: Computational Models for the Iowa Gambling Task with Hierarchical Bayesian Analysis

- Undergraduate thesis for Bachelor of Science in Biological Science (awarded Outstanding Undergraduate Thesis of USTC).

Project: EEG-based Neurofeedback for Addiction Treatment

- Undergraduate thesis for Bachelor of Engineering in Computer Science and Technology.

Zuckerman Institute, Columbia University

Assistant Research Scientist (Advisor: Prof. Stefano Fusi and Dr. Guangyu Robert Yang) *Jul. 2018 - Mar. 2019*

Project: Face Familiarity Detection with Complex Synapses

- Developed a modular face familiarity detection neural system with plastic complex synapses, serving as a feasible biological model for the brain's hippocampo-cortical circuits. (Paper targeted to *the Journal of Neuroscience*, as the first author)

Project: Understanding the Functional and Structural Differences across Excitatory and Inhibitory Neurons

- Developed the convolutional recurrent neural networks equipped with excitatory and inhibitory neurons, serving as a model for the visual cortex. Explored the necessary conditions for the networks to develop distinct selectivity and connectivity across cell types. (Paper submitted to *the ICLR 2020*, as the co-first author)

Center for Neural Science, New York University

Assistant Research Scientist (Advisor: Prof. Xiao-Jing Wang) *Jun. 2017 - Sep. 2017*

Project: Mechanisms of Recurrent Neural Networks with Interneurons and Dendrites Performing Decision Making

- Developed a neuronal circuit model of three types of interneurons and multi-compartmental pyramidal cells using recurrent neural networks. Studied the sensory gating mechanisms of the network performing a context-dependent decision-making task. (Presented at *SfN Neuroscience 2018*, as the first author)

Selected Publications

- L Ji-An, D Dong, Z Wei, Y Liu, Y Pan, F Nori, X Zhang. (in press). Quantum Reinforcement Learning during Human Decision Making. *Nature Human Behaviour*.
- L Ji-An, F Stefanini, MK Benna, S Fusi. (2019). Face Familiarity Detection with Complex Synapses. *bioRxiv*, 854059.
- S Minni*, L Ji-An*, T Moskovitz, G Lindsay, K Miller, M Dipoppa, GR Yang. (2019). Understanding the Functional and Structural Differences across Excitatory and Inhibitory Neurons. *bioRxiv*, 680439. (*=equal contributions)

Selected Talks

- Brain Science Institute, RIKEN, Japan *Aug. 2018*
- Center for Neural Science, New York University, New York, NY *Sep. 2017*

Selected Conference Presentations

- JA Li, F Stefanini, MK Benna, S Fusi. A Face Familiarity Detection System with Complex Synapses. *Cosyne* *Feb. 2019*
- JA Li, Z Wei, X Zhang. Behavioral and neural evidence for quantum reinforcement learning during decision making. *Society for Neuroscience* *Nov. 2018*
- JA Li, GR Yang, XJ Wang. Neural Mechanisms of Recurrent Neural Networks with Interneurons and Dendrites Performing Context-dependent Decision Making. *Society for Neuroscience* *Nov. 2018*

Selected Awards

- Graduate Scholarship, Grade 1, USTC *Sep. 2017 & Sep. 2018*
- Outstanding Undergraduate Thesis, USTC *Jun. 2016*
- Guo Moruo Scholarship, USTC (**Highest Honor**) *Dec. 2015*
- National Scholarship, Chinese Ministry of Education (**Top 1%** nationwide) *Nov. 2014*
- Outstanding Student Scholarship, Gold Medal, USTC *Dec. 2013*
- China High School Biology Olympiad, Nationwide, Silver Medal (ranked 30th in China) *Aug. 2011*
- China High School Biology Olympiad, Anhui Province, First Prize (ranked 1st in Anhui Province) *Sep. 2011*
- National Olympiad in Informatics in Provinces, Anhui Province, First Prize *Dec. 2010*

Teaching Experiences

Regression Analysis, USTC

Teaching Assistant (Lecturer: Prof. Yaning Yang) *Feb. 2018 - Jun. 2018*

- Held weekly office hour, taught in review sessions and lab sessions, worked out the detailed solution for homework, graded the assignments, and contributed to the design of final exams. (Excellent Teaching Assistant Honor)

Selected Courses

- **Math & Statistics**: Mathematical Analysis I & II & III, Linear Algebra I & II, Function of Complex Variable, Real Analysis, Differential Equation, Probability Theory, Advanced Probability Theory, Applied Stochastic Processes, Equations of Mathematical Physics, Computational Methods, Mathematical Statistics, Advanced Mathematical Statistics, Linear Statistical Models, Bayesian Analysis, Network Data, Statistics Computation, Statistical Learning and Data Mining, Categorical Data Analysis, Nonparametric Statistics
- **Physics**: Mechanics, Thermal Physics, Electromagnetism, Optics, Atomic Physics, Theoretical Mechanics, Quantum Mechanics, Thermodynamics and Statistical Physics
- **Computer Science**: Discrete Mathematics I & II, Computer Programs Design, C++, Data Structure, Introduction to Database Systems, Electronic Circuits, Principles of Artificial Intelligence, Informatics Theory, Parallel Computing, Neural Networks and Its Applications
- **Neuroscience**: Fundamentals of Neuroscience, Computational Neuroscience, Cognitive Neuroscience

Leadership

- **Vice President**, Nature Protection Association, USTC *Nov. 2015 - Jun. 2016*
- **Publicity Coordinator**, School of Life Sciences, USTC *Nov. 2012 - Jun. 2016*

Computer Skills

- Programming Languages: Python, MATLAB, R, LaTeX, C++, Bash, C, HTML, SQL
- Frameworks: TensorFlow, PyTorch, Scikit-learn, NumPy, AFNI, Git

Academic Activities

- **Translator**, *A Concise Handbook of TensorFlow*, supported by Google Developer Relations Team *Aug. 2018*
- **Summer Communication Student**, Japanese & Asian Youth Science Exchange Project *Jul. 2015*
- **Summer Intern**, Institute of Biophysics (Beijing), CAS *Jul. 2013*
- **Lecturer,** China High School Biology Olympiad, High School Affiliated to Anhui Normal University *Feb. 2013*