Zhuo-Cheng Xiao

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Employment

Courant Institute of Mathematical Sciences, New York University
Courant Instructor — 09/2021 – 08/2023 expected
Swartz Fellow — 09/2020 – 09/2021
Working with Prof. Lai-Sang Young

Education

Program in Applied Mathematics, The University of Arizona — 08/2016 – 08/2020
Ph.D., Applied Mathematics, August 2020
Co-Advised by Professors Kevin Lin and Jean-Marc Fellous

School of Life Sciences, Peking University, China — 09/2012 – 07/2016
Bachelor of Biological Science, July 2016
Dual Bachelor of Mathematical Science, 2016
Advised by Prof. Louis Tao

Research Interests

The principles of neural computation in brain functions like memory and spatial navigation; theoretical and computational methods for statistical dynamics in neural network models; Data-driven modeling in neuroscience.

Specific Research Items

- Neural computation in the hippocampus: The coding, storage, and retrieval of episodic memory; The representation of different information in spatial navigation.
- Information processing in neural networks: Information transfer in feed-forward networks.
- Non-equilibrium statistical mechanics in neural network models: theory; computational methods.

Peer-Reviewed Papers

- Cai, Y.; Wu, T.; Tao, L.; **Xiao, Z.*** *Low-Dimensional Manifolds Capture Gamma Oscillations with Model Reduction Methods.* To appear on Frontiers in Computational Neuroscience. arXiv:2101.01699. (2020)

- **Xiao, Z.**; Lin, K.K.; Fellous, JM. *Conjunctive Reward-Place Coding Properties of Dorsal Distal CA1 Hippocampus Cells.* Biological cybernetics. 2020 Apr;114:285-301.
- **Xiao, Z.**; Wang, B.; Sornborger, A.; Tao, L. *Mutual Information and Information Gating in Synfire Chains.* Entropy. 2018, 20(2), 102.
- **Xiao, Z.**; Zhang, J.; Sornborger, A.; Tao, L. *Cusps enable line attractors for neural computation.* Physical Review E. 2017, 96, 052308.

Manuscripts In-Preparation

- **Xiao, Z.**; Lin, K.K; Young, LS. *A data-informed mean-field approach for large scale cortical dynamics.* In preparation. (2021)
- Wu, T.; Cai, Y.; Tao, L.; **Xiao, Z.*** *Multi-band neuronal oscillations arise from a Rossler attractor.* In preparation
- **Xiao, Z.**; Lin, K.K; Young, LS. *A data-informed mean-field approach to mapping cortical landscapes.* In preparation. (2021)
- **Xiao, Z.**; Lin, K.K.; Fellous, JM. *The Dynamics and Reconsolidations of Spatial Representations of Reward in Brain.* In Preparation.
- **Xiao, Z.**; Lin, K.K. *Multilevel Monte Carlo for Spiking Networks.* Submitted. (2020)
- **Xiao, Z.**; Lin, K.K. *Efficiency of Direct and Multilevel Monte Carlo for Spiking Neuron Networks.* Submitted. (2020)

Permanent Manuscripts

- Wang, C.; **Xiao, Z.**; Wang, Z.; Sornborger, A.; Tao, L.*A Fokker-Planck approach to graded information propagation in pulse-gated feed-forward neuronal networks.* arXiv:1512.00520. (2015)

Presentations

Conference Talks

- *"A data-informed mean-field approach to mapping cortical landscapes",* Society for Mathematical Biology 2021 06/2021
- *"A data-informed mean-field approach to mapping cortical landscapes",* A Bio Dynamics Days 2021, LMAH-Le Havre Normandie - NYU 06/2021

Seminar Talks

- *"Model Reduction of Gamma Oscillations",* Modeling and Simulation Group Meeting, NYU 04/2021
- *"Computational Strategies in Analysis of Hippocampal Data",* Analysis and Its Applications Seminar, University of Arizona 03/2019
- *"Multi-Level Monte Carlo Methods for Spiking Networks",* Modeling and Computation Seminar, University of Arizona 02/2018

Posters

- *"Continuous Reward-Place Coding Properties of Dorsal Distal CA1 Hippocampus Cells",* Society for Neuroscience 2019 10/2019
- *"Multi-Level Monte Carlo Methods for Spiking Networks",* SIAM Conference on Applications of Dynamical Systems (DS19) 05/2019
- *"Multi-Level Monte Carlo Methods for Spiking Networks",* and *"Cusps Enable Faithful Information Transfer in Feed-Forward Networks",* 27th Annual Computational Neuroscience Meeting (CNS 2018) 07/2018

Teaching Experiences

At New York University:

- Calculus II, Instructor 2021 Fa – 2022 Sp

At The University of Arizona:

- Math 583 *Principles and Methods of Applied Mathematics*, Super TA 2018 Fa – 2020 Sp
- Math 254 *Ordinary Differential Equations*, TA 2017 Fa – 2018 Fa
- Math 112 *College Algebra*, Instructor 2016 Fa – 2017 Sp

Good teaching review in Spring and Fall 2018 for Math 254.

At Peking University:

- *Mathematical Modeling in the Life Sciences*, TA 2014 Sp; 2015 Sp
- *Advanced Mathematics*, TA 2015 Sp
- *Journal Club of the Frontier for Life Sciences*, TA 2014 Fa

Review Services Plos One

AWARDS AND HONORS

Selected Presentation, 3rd Annual Symposium of Undergraduate Research Honor Program in Biology 2015

Best Poster, 2nd Annual Symposium of Undergraduate Research Honor Program in Biology 2014

Admitted into Undergraduate Research Honor Program in Biology of Peking University 2013

Gold Medal (ranking 5th), 10th Chinese Western Mathematical Olympiad 2010

SKILLS AND INTERESTS

Coding Skills for:

- Matlab, C, R