Shanshan Qin

✆ (857) 999 6760
✉ ssqin@seas.harvard.edu
🖥 qinshsh.com

Education

2012–2019 **Ph.D. in Condensed Matter Physics**, *Peking University*, China.
Thesis: Theoretical study on odor coding in peripheral olfactory systems.
Advisor: Chao Tang and Yuhai Tu

2008–2012 **B.S. in Physics**, *Central China Normal University*, China.
Advisor: Jinping Liu.

Professional Appointments

2019–Present **Postdoctoral Researcher**, *School of Engineering and Applied Sciences*, Harvard University, Cambridge, MA.
Faculty mentor: Cengiz Pehlevan.
- Biologically plausible learning algorithms.
- Investigating long-term dynamics of memories, representational drift and its underlying mechanisms and implications.
- Characterizing the odor coding properties in C. *elegans*, olfactory information processing in fly larvae (in collaboration with Aravinthan Samuel lab).

2012–2019 **Research Assistant**, *Center for Quantitative Biology*, Peking University, Beijing, China.
Faculty mentor: Chao Tang and Yuhai Tu
- Information processing in the peripheral olfactory systems.
- Early warning signals in nonlinear complex systems.
- Elucidating the nonlinear dynamics of the intrinsic apoptosis signaling pathway.

2016 **Graduate Visiting Scholar**, *Hernan Garcia Lab, Department of Molecular and Cell Biology*, The University of California, Berkeley, CA.
Designed and performed experimental study on the temperature-dependent speed of embryogenesis in *Drosophila Melanogaster.*

2009-2011 **Research Assistant**, *Jinping Liu Lab, School of Physics*, Central China Normal University, China.
Successfully prepared the hematite nanorods array, and studied its electrochemical properties as an anode material and reversible lithium storage.

Publications

See also Google Scholar or ORCID. ∗ Equal contribution; † Corresponding author.

Selected Publications

1. **S. Qin**, S. Farashahi, D. Lipshutz, A. M. Sengupta, D. B. Chklovskii, and C. Pehlevan. "Coordinated drift of receptive fields during noisy representation learning". Nature Neuroscience (accepted in principle), (2022).

2. P. Masset∗, **S. Qin**∗, J. Zavatone-Veth∗. "Drifting Neuronal Representations: Bug or Feature?", *Biological Cybernetics*, 116, 253–266 (2022).

3. Y. Liu, Q. Li, C. Tang, **S. Qin**†, and Y. Tu†. "Short-Term Plasticity Regulates Both Divisive Normalization and Adaptive Responses in Drosophila Olfactory System". *Frontiers in Computational Neuroscience* 15, 730431 (2021).

4. **S. Qin**, N. Mudur, C. Pehlevan, "Supervised Deep Similarity Matching", *Neural Computation* 33(5), 1300 (2021).

5. **S. Qin***, Q. Li*, C. Tang and Y. Tu, "Optimal compressed sensing strategies for an array of nonlinear olfactory receptor neurons with and without spontaneous activity", *Proc. Natl. Acad. Sci. U.S.A.*, 116, 20286 (2019).

6. **S. Qin** and C. Tang, "Early-warning signals of critical transition: Effect of extrinsic noise", *Physical Review E*, 97, 032406 (2018).

Additional Published Research

7. Y. Yuan, H. Ren, Y. Li, **S. Qin**, X. Yang, and C. Tang. "Cell-to-cell variability in inducible Caspase9-mediated cell death". *Cell Death & Disease* 13(1) (2022)

8. K. Vogt, D. Zimmerman, M. Schlichting, L. A. H. Nunez, **S. Qin**, K. Malacon, M. Rosbash, C. Pehlevan, A. Cardona, A. D. T. Samuel, "Internal state configures olfactory behavior and early sensory processing in Drosophila larva", *Science advances* 7(1), eabd6900 (2021).

9. Z. Gao, H. Sun, **S. Qin**, X. Yang and C. Tang, "A systematic study of the determinants of protein abundance memory in cell lineage", *Science Bulletin*, 63, 1051 (2018).

10. Z. Gao, S. Chen, **S. Qin** and C. Tang, "Network Motifs Capable of Decoding Transcription Factor Dynamics", *Scientific Reports*, 8, 3594 (2018).

11. L. Cao, D. Yang, W. Wu, X. Zeng, B. Jing, M. Li, **S. Qin**, C. Tang, Y. Tu, D. Luo, Odor-evoked inhibition of olfactory sensory neurons drives olfactory perception in Drosophila, *Nature Communications*, 8, 1357 (2017).

12. Y. Song, **S. Qin**, Y. Zhang, W. Gao, and J. Liu, "Large-Scale Porous Hematite Nanorod Arrays: Direct Growth on Titanium Foil and Reversible Lithium Storage", *the Journal of Physical Chemistry C*, 114, 21158 (2010).

Manuscript under Review

A. Lin, **S. Qin**, H. Casademunt, M. Wu, W. Hung, G. Cain, N. Z. Tan, R. Valenzuela, L Lesanpezeshki, C. Pehlevan, V. Venkatachalam, M. Zhen, A. D. T. Samuel, "Functional imaging and quantification of multi-neuronal olfactory responses in C. elegans". *bioRxiv* (2022). doi: 10.1101/2022.05.27.493772.

Talks and Seminars

2022 Mar	Harvard Applied Mathematics Food For Thought Hour, *Unveiling the dynamics and structure of drifting neural representations*, Cambridge, MA.
2022 Mar	APS March Meeting, *Unveiling the dynamics and structure of drifting neural representations*, Chicago, IL.
2021 Oct	Gordon Research Conference on stochastic physics in biology, *Dynamics of drifting receptive fields during noisy representation Learning*, Ventura, CA.
2021 Oct	Rutgers Center for Quantitative Biology Seminar, Unveiling the dynamics and structure of drifting neural representations (virtual).
2021 June	MIT/Harvard Computational and Theoretical Neuroscience Journal Club, *Representational drift: experiments, models, and implications* (virtual).
2020 Oct	The online Neuromatch Conference 2.0, *Dynamics of drifting receptive fields during noisy representation learning* (virtual).
2020 Mar	The online Neuromatch Conference 1.0, *Biologically plausible supervised learning* (virtual).

2019 Dec	Sensing Chemical Spaces, Princeton, Princeton University, *Optimal compressed sensing strategies for an array of nonlinear olfactory receptor neurons*, Princeton, NJ.
2019 Mar	American Physical Society March Meeting, *Nonlinear compressed sensing in olfactory systems*, Boston, MA.
2018 Nov	Postdoctoral fellow interview symposium of the Center for the Physics of Biological Functions,*Statistical properties of the optimal sensitivity matrix for compressed sensing with nonlinear sensors.* Princeton, NJ.
2018 July	Quantitative Biology: Neuroscience and Artificial Intelligence – Where Do We Meet, *An information-theoretic model for odor coding*, Beijing, China.

Poster presentations

2022 July	14th Harvard-LMU young scientists' forum. *Coordinated drift of receptive fields during noisy representation learning*, Cambridge, MA.
2021 Sept	Bernstein Conference, *Coordinated drift of receptive fields during noisy representation learning* (virtual).
2021 Feb	Computational and Systems Neuroscience (Cosyne), *Dynamics of drifting receptive fields during noisy representation learning* (virtual).
2020 Nov	From Neuroscience to Artificially Intelligent Systems (NAISys) , *Contrastive Similarity Matching for Supervised Learning* (virtual).
2020 Sept	Bernstein conference, *Stable representational similarity despite drifting neural activity in noisy representation learning*, (virtual).
2020 Feb	Computational and Systems Neuroscience (Cosyne), *Supervised Deep Similarity Matching*, Denver, CO.
2019 June	Dynamic signaling in cells and embryos, *Nonlinear Compressed Sensing in Olfactory Systems*, Yantai, China. (Best poster award)
2019 Jan	Annual symposium of Center for Quantitative Biology, *An Information-theoretic model for odor coding*, Beijing, China. (Best poster award)
2018 Aug	*An Information-theoretic model for odor coding*, Beijing, China.
2017 Jan	Center for Quantitative Biology annual symposium, *Impact of extrinsic noise on the signals of critical transitions*, Beijing, China.
2016 Jan	Center for Quantitative Biology annual symposium, *Anticipating critical transition- effect of extrinsic noise*, Beijing, China.
2014 Sept	Workshop on Systems Biology, BICMR. *Correlation of gene expression noise during cell fate transition*, Beijing, China.
2013 Sept	Fall Meeting of Chinese Physical Society, *Modeling metaphase to anaphase transition of budding yeast cell cycle*, Xiamen, China. (Best poster award)

Teaching and Advising Experience

Teaching Assistant

Responsibilities included developing new class materials, leading class discussions, supervising labs, grading all assignments, and meeting with students individually.

2022	Introduction to applied mathematics (AM50), Harvard University.
	33 undergraduates.
2020	Neural Computation (AM226), Harvard University.

30 graduate students.

2014 Critical reading of systems biology, Peking University.

10 undergraduates and 20 graduates.

Advisor

2021 Advised 4 students from the online Neuromatch Academy.

2019 Advised a rotation PhD student in the Harvard physics program.

2019 Honors thesis advisor of an undergraduate student of Peking University.

2013-2019 Advised 3 undergraduates of Peking University.

2013-2017 Advised 6 rotational graduates at Peking University.

2015 Honors thesis advisor of an undergraduate student of Tsinghua University.

Selected Awards and Honors

2020 *Distinguished teaching assistant*, Harvard University.

2020 Harvard MBB young investigator awards.

2019 Quantitative Biology research scholarship, Peking University.

2017 Huirong Li scholarship, Peking University.

2014 Quantitative Biology research scholarship, Peking University.

2012 Pacemaker to merit student, Central China Normal University.

2011 Second-class prize of *Challenge Cup* national college students extracurricular academic work competition.

2011 National scholarship, Central China Normal University.

2010 National Encouragement scholarship, Central China Normal University.

Reviewer

Ad hoc reviewer for Nature Communications, Physical Review E, PLoS Computational Biology, eLife, PNAS.

University/Departmental Service

2022 Aug Co-organizer of "Workshop on Reinforcement Learning at Harvard".

2019 - 2022 Co-organizer of "Harvard Neuro Theory journal club".

2018 Jan Co-organizer of "Brain Storm" at Center for Quantitative Biology together with Prof. Ping Wei.

2015 May Co-organizer, The first Young Scholars Frontier Symposium on Quantitative Biology Development.

2014 July Co-organizer, 2014 Center for Quantitative Biology Annual Symposium.

Computing skills

Proficient MATLAB, Python, R