CHING FANG

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EDUCATION

Columbia University Aug 2019-present
PhD candidate in Neuroscience, at the Theoretical Neuroscience Center
Advisors: Larry Abbott, Dmitriy Aronov

University of California, Berkeley December 2018
B.A. in Computer Science, B.A. in Molecular & Cell Biology (Honors)

AWARDS

2019 National Science Foundation Graduate Research Fellow
2018 IL Chaikoff Award for excellence in U.C. Berkeley's neuroscience program
2018 Best presentation award at Molecular & Cell Biology undergraduate symposium
2018 Dean's Honors List in recognition of academic performance

PAPERS

Fang, C., Aronov, D., Abbott, L. F., Mackevicius, E. Neural learning rules for generating flexible predictions and computing the successor representation. *accepted at eLife*, 2022.

Fang, C.*, Shook, E.*, Buck, J.*, and Horga, G. Predictive Coding Dynamics Improve Noise Robustness in A Deep Neural Network of the Human Auditory System. *Cognitive Computational Neuroscience*, 2022 (* equal contribution).

Fang, C., Aronov, D., Abbott, L., and Mackevicius, E. Biological Mechanisms for Learning Predictive Models of the World and Generating Flexible Predictions. *ICML Beyond Bayes Workshop*, 2022.

Vendrell-Llopis, N., **Fang, C.**, Qu, A., Costa, R., Carmena, J. Diverse operant control of different motor cortex populations. *Current Biology*, 2022.

Tyulmankov, D.*, **Fang, C.***, Vadaparty, A., and Yang, G.R. Biological key-value memory networks. *NeurIPS*, 2021 (* equal contribution).

TALKS

NeurIPS SVRHM Workshop (Shared Visual Representations in Humans and Machines)
New Orleans, Dec 2022 *(contributed)*

Cognitive Computational Neuroscience (CCN)
San Francisco, Aug 2022 *(contributed)*

Flatiron Institute Center for Computational Neuroscience
New York, Aug 2022 *(invited)*

International Conference in Machine Learning (ICML), Beyond Bayes Workshop
Baltimore, July 2022 *(contributed)*

Gatsby Tri-Center Meeting for Theoretical Neuroscience
Jerusalem, June 2022 *(invited)*

Columbia Hippocampus Club seminars
New York, April 2022 *(invited)*

POSTERS

Shook, E., **Fang, C.**, Buck, J., and Horga, G., "Predictive Coding Dynamics Improve Noise Robustness in A Deep Neural Network of the Human Auditory System". *Advances and Perspectives in Auditory Neuroscience (APAN)*, 2022.

Mackevicius, E., **Fang, C.**, Chettih, S., Hale, S., and Aronov, D., "Representations of one-shot and consistent information in the hippocampus of memory-expert birds". *Society for Neuroscience Annual Meeting (SfN)*, 2022.

Tyulmankov, D., **Fang, C.**, Dong, Ling L., Vadaparty, A., and Yang, G.R., "Biological learning in key-value memory networks". *Computational and Systems Neuroscience (CoSyNe)*, 2022.

Das, A., ..., **Fang, C.**, ... "A three-pronged initiative for enhancing diversity in Columbia's neuroscience training programs". *Brain Initiative Investigator's Meeting*, 2021.

Vendrell-Llopis, N., **Fang, C.**, Qu, A., Kitano, M., Costa, R., Carmena, J. "Isolating cell-type specific subpopulations of motor cortex neurons during neuroprosthetic learning". *Society for Neuroscience Annual Meeting (SfN)*, 2019.

Fang, C., Laboy-Juarez, K., Feldman, D. Neural Coding of Whisker Timing in Multi-Whisker Sensation. *California Cognitive Science Conference*, 2018

RESEARCH GROUPS

Collaborators:

- Guangyu Robert Yang (MIT Brain & Cognitive Science). Topic: biological learning in transformer neural networks.
- Guillermo Horga (Columbia Department of Psychiatry). Topic: deep convolutional neural network models of auditory/speech comprehension.
- Kim Stachenfeld (DeepMind). Topic: auxiliary tasks in deep reinforcement learning as models of brain representations.

Advisors:

Larry Abbott | Columbia Theoretical Neuro. Center Jan 2020 - present

PhD student. Topic: biological learning algorithms, predictive coding in deep learning models.

Dmitriy Aronov | Columbia University Jan 2020 - present

PhD student. Topic: reinforcement learning models of neural activity, neural network models of long-term memory in hippocampus.

Liam Paninski | Columbia Theoretical Neuro. Center Aug 2019 - Dec 2019

PhD rotation student. Topic: probabilistic graphical models to identify latent behavioral states in animal decision making.

Jose Carmena | UC Berkeley Electrical Engineering May 2018 - Aug 2019

Research technician. Topic: motor learning in brain-machine interfaces (BMI), interpretable machine learning models to explain learning performance in BMI.

Dan Feldman | Helen Wills Neuroscience Institute Jan 2015 - May 2018

Undergraduate researcher. Topic: building models of neural population tuning in somatosensory cortex.

Anne Collins | UC Berkeley Cognitive Science June 2016 - Aug 2016

Undergraduate researcher. Topic: hierarchical reinforcement learning in human decision making.

TEACHING

Lecturer, *Math Tools for Neuroscience* at Columbia University Jan 2022 - May 2022

· Taught linear algebra for a course on fundamental math topics for PhD students in neuroscience.

TA, *Synthetic Biology* at UC Berkeley Aug 2018 - Dec 2018

· Managed a hybrid online/in-person class between UC Berkeley & MIT and led discussion sections.
· Topic: metabolic engineering, genome engineering, protein and RNA circuits.

TA, *Algorithms & Intractable Problems* at UC Berkeley Aug 2017 - Dec 2017

· Developed new course project for 700+ students on approximate solutions to NP-hard problems.
· Led discussion sessions for 60+ students.
· Topic: asymptotics, graph theory, linear and dynamic programming, approximation algorithms.

TA, *Data Structures* at UC Berkeley Aug 2016 - Aug 2017

· Developed course materials and tests, managed 300+ student course, ran discussion sessions.
· Topic: Java programming, data search structures, graph algorithms, etc.

MENTORING, OUTREACH, & ORGANIZATION

Zuckerman Institute Climbing Group Aug 2022 - present
Co-founded a rock climbing group for the Columbia neuroscience institute.

Columbia Access Neuroscience Aug 2020 - present
Co-organized diversity initiatives for underrepresented minorities on the undergraduate level. Received an internal department award for service in diversity, equity, and inclusion.

Zuckerman Institute Gender Inclusion (ZIGI) Group June 2021 - present
Co-organized a seminar series on topics related to gender inclusivity in science.

Leadership Alliance Summer Research Mentor June 2021 - Aug 2021
Mentored an undergraduate student (Desiree Ramirez) on a summer research project.

Columbia Neuroscience Outreach's *Scientist on the Subway* Aug 2020 - Dec 2020