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

JOURNAL & CONFERENCE PAPERS

Fang, C., Stachenfeld, K. Predictive auxiliary objectives in deep RL mimic learning in the brain. *arXiv*, 2023.

Fang, C., Aronov, D., Abbott, L. F., Mackevicius, E. Neural learning rules for generating flexible predictions and computing the successor representation. *eLife*, 2023.

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. *NeurIPS SVRHM Workshop*, 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).

POSTERS

Fang, C., Stachenfeld, K., "Connecting hippocampal representations to predictive auxiliary tasks in deep reinforcement learning". *Cognitive Computational Neuroscience (CCN)*, 2023.

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". *Computational and Systems Neuroscience (COSYNE)*, 2023.

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

TALKS

Flatiron Institute Junior Theoretical Neuroscientists Workshop
"Connecting auxiliary tasks in deep RL with hippocampal representations" *NY, June 2023*

National Institute of Neurological Disorders and Stroke T32 Meeting
"Predictive auxiliary tasks for transfer learning in RL" *Philadelphia, June 2023*

DeepMind NeuroLab Workshop
"Predictive auxiliary tasks for transfer learning in RL" *London, Feb 2023*

Max Planck UCL Centre for Computational Psychiatry
"Connecting auxiliary tasks in deep RL with hippocampal representations" *London, Feb 2023*

NeurIPS SVRHM Workshop (Shared Visual Representations in Humans and Machines)
"Predictive dynamics improve noise robustness in a deep network model of the human auditory system" *New Orleans, Dec 2022*

Cognitive Computational Neuroscience (CCN)
"Predictive dynamics improve noise robustness in a deep network model of the human auditory system"' *San Francisco, Aug 2022*

Flatiron Institute Center for Computational Neuroscience
"Neural learning rules for generating flexible predictions and computing the successor representation" *New York, Aug 2022*

International Conference in Machine Learning (ICML), Beyond Bayes Workshop
"Biological mechanisms for learning predictive models of the world" *Baltimore, July 2022*

Gatsby Tri-Center Meeting for Theoretical Neuroscience
"Neural learning rules for generating flexible predictions and computing the successor representation" *Jerusalem, June 2022*

Columbia Hippocampus Club Seminar
"A neural circuit model of the successor representation" *New York, April 2022*

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

Research assistant. Topic: building models of neural population tuning in somatosensory cortex.

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

Research assistant. Topic: hierarchical reinforcement learning in human decision making.

TEACHING

TA, *Intro to Theoretical Neuroscience* at Columbia University Aug 2023 - present

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

TA, *Reinforcement Learning Workshop* at COSYNE conference March 2023

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

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

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

MENTORING, OUTREACH, & ORGANIZATION

Zuckerman Institute Climbing Group (founder), Columbia Access Neuroscience, Zuckerman Institute Gender Inclusion Group, Leadership Alliance Summer Research Mentor, Columbia Neuroscience Outreach's *Scientist on the Subway*