Mengting Fang

PhD Candidate | Theoretical & Computational Neuroscience

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Education

University of Pennsylvania, Philadelphia, PA, USA — May 2021 – Present

Ph.D. Candidate in Psychology (Advisor: Alan A. Stocker, Ph.D.)

Beijing Normal University, Beijing, China — Sept 2013 – July 2018

B.S. in Mathematics and Applied Mathematics (Advisor: Yunchuan Sun, Ph.D.)

Research Summary

I study perceptual decision-making through a normative lens, aiming to uncover the computational principles that govern how the brain integrates sensory information. My work bridges behavior and cortical dynamics using theoretical frameworks from cognitive neuroscience and biophysically informed computational models, supported by Bayesian modeling, information theory, and neural data analysis.

Skills

Programming: Python, MATLAB, JavaScript, C++, R, HTML, CSS, Linux, HPC

Data Analysis & Modeling: statistical modeling, neural signal processing, information-theoretic methods

Computational Methods: Bayesian inference, dynamical systems, machine learning, deep learning

Experimental Methods: Psychophysics design, eye-tracking, behavioral data collection and analysis

Research Experience

Computational Perception & Cognition Lab, University of Pennsylvania — Philadelphia, PA
Graduate Researcher (Advisor: Alan A. Stocker, Ph.D.) — May 2021 – Present

- Collaborate on four research projects exploring computational mechanisms of visual inference in humans;
- Designed and conducted a series of psychophysical experiments using Psychtoolbox, MGL, EyeLink 1000 Plus to study various aspects that affect how humans perceive, process, and integrate low-level visual stimuli;
- Developed a novel resource-rational model within the Bayesian framework that effectively captured key characteristics of humans' evidence accumulation process, which existing models (e.g., bump attractor networks, hierarchical Bayesian models) fail to explain.

Donner Lab, University Medical Center Hamburg-Eppendorf (UKE) — Hamburg, Germany
Guest Scientist (Advisor: Tobias H. Donner, M.D., Ph.D.) — May 2025 – Aug 2025

- Preprocessed human MEG data and reconstructed cortical population activity using FieldTrip, FreeSurfer, and custom MATLAB/Python scripts to study distributed neural dynamics underlying visual evidence integration;
- Conducted information-theoretic analysis on behavioral and source-level neural data to characterize information flow during sequential sensory integration along the human cortical hierarchy;
- Developing a normative Bayesian model of evidence accumulation to uncover computational principles of decision-making that bridge neural computation with cortical biophysics.

Social & Cognitive Computational Neuroscience Lab, Boston College — Boston, MA
Research Assistant (Advisor: Stefano Anzellotti, Ph.D.) — Aug 2018 – Apr 2021

- Developed Multivariate Pattern Dependence Network (MVPN) and created PyMVPD, a Python-based toolbox, to model the multivariate interactions between different brain regions using fMRI movie data;
- Designed and conducted an online agent-based navigation experiment in a grid-world setting to study how environmental factors shape human observers' understanding of others and further influence action prediction;
- Developed deep neural network models that incorporate Bayesian inference to study how people make

predictions about the actions of others in social context from complex real-life-like stimuli.

Parallel Distributed Processing (PDP) lab, Stanford University — Palo Alto, CA
Research Intern (Advisor: James L. McClelland, Ph.D.) — Jul 2017 – Jul 2018

- Developed a two-layer retina model using Gaussian filters of varying resolutions to simulate humans' visual attention mechanisms, specifically in the context of numerosity counting;
- Developed a one-shot numerosity estimation model using generic feed-forward neural networks to investigate how humans acquire and develop their approximate number system (ANS);
- Developed a differentiable recurrent attentional counting (DRAC) model using a multi-task learning curriculum that simulates children's counting behavior with comparable learning trajectory and error patterns.

Center for Big Data Mining & Knowledge Engineering, Beijing Normal University — Beijing, China
Research Assistant (Advisor: Yunchuan Sun, Ph.D.) — Nov 2015 – Jun 2017

- Developed an auto-update professional stock sentiment lexicon specialized for large texts in finance;
- Constructed an investor sentiment index with online news and posts from a popular Chinese stock forum – Guba;
- Built a novel stock recommendation system that leverages the correlation between retail investor sentiment and stock market trends in China, with theoretical cumulative profit outperforming the CSI300 index.

Publications

Fang, M.*, Mao, J.*, Donner, T., Stocker, A. (2026). The resource-rational dynamics of evidence accumulation. *bioRxiv*. (*equal contribution)

Fang, M. & Stocker, A. (2025). Categorical Representations in Sequential Evidence Accumulation. *Journal of Vision*, 25(9), 2775-2775.

Fajardo, G.*, **Fang, M.***, Anzellotti, S. (2025). Distinct portions of superior temporal sulcus combine auditory representations with different visual streams. *Journal of Neuroscience*, 45(45).

Fang, M., Mao, J., Donner, T., Stocker, A. (2024). Sequential Evidence Accumulation is A Resource-Rational Process. *Journal of Vision*, 24(10), 1004-1004.

Fang, M., Mao, J., Donner, T., Stocker, A. (2023). Effect of Temporal Interruptions on Sequential Sensory Integration. *Journal of Vision*, 23(9), 5548-5548.

Fang, M., Aglinskas, A., Li, Y., Anzellotti, S. (2023). Angular Gyrus Responses Show Joint Statistical Dependence with Brain Regions Selective for Different Categories. *Journal of Neuroscience*, 43(15), 2756-2766.

Fang, M., Poskanzer, C., Anzellotti, S. (2023). Multivariate Connectivity: A Brief Introduction and An Open Question. *Frontiers in Neuroscience*, 16.

Fang, M., Poskanzer, C., Anzellotti, S. (2022). PyMVPD: A Toolbox for Multivariate Pattern Dependence. *Frontiers in Neuroinformatics*, 16, 835772.

Poskanzer, C., **Fang, M.**, Aglinskas, A., Anzellotti, S. (2022). Controlling for Spurious Nonlinear Dependence in Connectivity Analyses. *Neuroinformatics*, 20(3), 599-611.

Fang, M., Zhou, Z., Chen, S., McClelland, J. (2018). Can a Recurrent Neural Network Learn to Count Things?. *Proceedings of the 40th Annual Conference of the Cognitive Science Society*.

Chen, S., Zhou, Z., **Fang, M.**, McClelland, J. (2018). Can Generic Neural Networks Estimate Numerosity Like Humans?. *Proceedings of the 40th Annual Conference of the Cognitive Science Society*.

Sun, Y., **Fang, M.**, Wang, X. (2018). A Novel Stock Recommendation System using Guba Sentiment Analysis. *Personal and Ubiquitous Computing*, 22(3), 575-587.

Sun, Y., **Fang, M.**, Wang, X., Diao, S. (2017). GubaLex: Guba-Oriented Sentiment Lexicon for Big Texts in Finance. *Proceedings of the 13th International Conference on Semantics, Knowledge and Grids (SKG) (pp. 25-32). IEEE.*

Conference Presentations & Invited Talks

Invited Talk @ Computational Cognitive Neuroscience Seminar, UKE — Hamburg, DE, Jun 2025

Sequential evidence accumulation is a resource-rational process.

Invited Talk @ Social Cognitive & Neural Sciences Lab, Columbia University — New York, NY, May 2023

Angular gyrus responses show joint statistical dependence with brain regions selective for different categories

Poster Presentation @ Conference on Cognitive Computational Neuroscience San Francisco, CA, Aug 2022

Angular gyrus responses show joint statistical dependence with brain regions selective for different categories

Invited Talk @ Leipzig Symposium on Intelligent Systems (LEISYS) Leipzig, DE, Jul 2021

Learning to Count Visual Stimuli with a Recurrent Neural Network

Poster Presentation @ Cognitive Neuroscience Society Annual Meeting Boston, MA, May 2020

Artificial neural networks reveal multivariate integration of information across different brain regions

Invited Talk @ Artificial Intelligence Meets Neuroscience Symposium, MIT Boston, MA, Apr 2019

Using artificial intelligence to understand how brain regions "talk" to each other

Poster Presentation @ PDP Symposium, Princeton University Princeton, NJ, Sept 2018

Learning to count in a recurrent neural network

Mentorship

2026	**Brandon Kwon**. Undergraduate, University of Pennsylvania.
2025	**Jerry Liu**. Undergraduate, University of Pennsylvania.
2024	**Gabriel Sternberg**. Undergraduate, University of Pennsylvania.
2022 - 2023	**Geshi Yeung**. Undergraduate, University of Pennsylvania; now Graduate Student, Harvard University.
2020 - 2022	**Gabriel Fajardo**. Undergraduate, Boston College; now Graduate Student, Dartmouth College.

Peer Review

CogSci, CCN, CSAE, Frontiers in Neuroscience

Awards & Extracurricular Activities

2026	**Vision Sciences Society**. Elsevier/Vision Research Travel Award
2026	**Penn Three Minute Thesis (3MT)**. Audience Choice's Award
2026	**Penn Arts & Sciences Dissertation Completion Fellowship**. Recipient
2024 - 2026	**CNI's Interdisciplinary Training in Computational Neuroscience**. Trainee
2024 - 2025	**MindCORE's Diversity and Equity Initiative (DivE In)**. Mentor
2023 - 2026	**SASGov at the University of Pennsylvania**. Vice President of Social Affairs
2023 - 2024	**Medical Mandarin Class at Perelman School of Medicine**. Volunteer
2022	**GAPSA Research Student Individual Grant**. Funded by the University of Pennsylvania.
2018	**PDP Symposium Honoring James L. McClelland at Princeton University**. Travel Award
2016	**the 6th Economic Analysis Competition at Tsinghua University**. First Prize
2016	**the 12th Mathematical Contest in Modeling at Beijing Normal University**. First Prize