Rachel Lee

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EDUCATION

Phd Candidate, Princeton University (2017 -)
Neuroscience Department
Cumulative GPA: 3.90/4.0
Supported by National Science Foundation Graduate Research Fellowship (NSF GRF)
MA received in (2019. Expected graduation in 2023

BS, Stanford University (2011- (2015)
Major: Mathematical and Computational Science with Honors in Theoretical Neuroscience.
Cumulative GPA: 3.89/4.00
Coursework: Applied Mathematics, Statistics, Computer Science, Neuroscience, and Cognitive Science.

AWARDS AND GRANTS

RLDM Student Travel Grant. (2019)
National Science Foundation Graduate Research Fellowship. (2019)
Center of Brain Minds and Machines Summer Course. (2018)
Bachelor's degree awarded with Distinction. (Top 15% of graduating class), (2015)
Computational and Systems Neuroscience Conference Undergraduate Travel Grant. (2015)
Stanford Undergraduate Research and Advising Major Grant. (2014)
Stanford Symbolic Systems Undergraduate Summer Research Grant. (2013)
Stanford Bio-X Undergraduate Summer Research Grant. (2013)
Stanford STEM Fellowship Nominee. (2013)

RESEARCH EXPERIENCE

Princeton University: Dopaminergic Reinforcement Learning Models for High-Dimensional Tasks (2017-)
Advisors: Professor Ilana Witten and Professor Nathaniel Daw
- Examined and analyzed heterogeneous dopaminergic recordings from mice that reflected several behavioral variables from an evidence accumulation task.
- Expanded on classic temporal difference learning to accommodate heterogeneous dopamine activity, theorizing that the heterogeneity is inherited from the state variable needed to capture the high-dimensional sensory input of the mice's task.
- Trained a deep RL model to perform the same evidence accumulation task, and compared extracted features with dopamine responses from mice.

Stanford University: Modeling Perceptual Learning with Deep Networks (2012 - 2015)
Advisors: Professor James McClelland and Dr. Andrew Saxe
- Presented a deep learning framework for perceptual learning, arguing that the neural mechanisms of orientation discrimination can be modeled with a deep, chain-like network initialized to mimic the visual system and trained with back-propagation gradient descent.
- Developed a deep neural network in MATLAB to model results from several neurobiology papers.

- Evaluated analytical results from a simplified linear deep neural network to derive novel predictions.

Massachusetts Institute of Technology: Modeling Spontaneous Hypothesis Generation with Particle Filter (2014)
Advisors: Professor Josh Tenenbaum and Professor Sam Gershman
- Examined computational model that describes hypothesis generation processes such as doctors choosing the appropriate diagnostic hypothesis when presented with a series of input observations.
- Developed probabilistic model of particle filter to capture the quantitative computation involved in generating hypotheses spontaneously.

INVITED TALKS

Pavlovian Society Annual Meeting (2021). Invited speaker for Symposium "The increasingly diverse role of midbrain dopamine neurons in reinforcement learning."

Bernstein Conference (2021). Invited speaker and panelist for Workshop "Distributed Representation in RL From AI to Dopamine."

O'Doherty Lab, California Institute of Technology. (2021)

PUBLICATIONS AND POSTERS

Lee, R., Engelhard, B., Witten, I. B., & Daw, N. D. (2021). Explaining dopaminergic response heterogeneity via high-dimensional value function approximation. Poster at COSYNE 2021.

Lee, R., Mattar, M. G., Parker, N. F., Witten, I. B., & Daw, N. D. (2019). Reward prediction error does not explain movement selectivity in DMS-projecting dopamine neurons. *Elife*, *8*, e42992.

Lee, R., Engelhard, B., Witten, I.B., Daw, N.D. (2019). Reconciling Heterogeneous Dopaminergic Responses with Reward Prediction Error Models. Poster at Reinforcement Learning and Decision Making 2019, Montreal.

Lee, R., Mattar, M.G., Parker, N.F., Witten, I.B., Daw, N.D. (2018). Dopamine neurons targeting Dorsomedial Striatum are modulated by reward and choice independently. Poster at Society of Neuroscience 2018, San Diego.

Lee, R., Saxe, A. (2015). The effect of pooling in a deep learning model of perceptual learning. Poster at COSYNE 2015, Salt Lake City.

Lee, R., Saxe, A., McClelland, J. L. (2014). Modeling perceptual learning with deep networks. Poster at CogSci 2014, Quebec City, Canada.

TEACHING

Princeton University: Basal Ganglia in Health and Disease (2019)
- Reviewed and corrected weekly journal summaries
- Participated in leading weekly discussion on key papers on basal ganglia circuitry

Princeton University: Mathematical Tools for Neuroscience (2018)
- Taught weekly lab classes on programming, linear algebra, dynamics, and probability through Julia.
- Developed, reviewed, and corrected weekly problem sets and quarterly exams.
- Facilitated in adapting the class material from programming in Python to Julia.

Stanford University: Programming Methodology and Abstractions Section Leader (2014 - 2015)
- Taught weekly sections on Computer Science concepts through Java and C++.
- Reviewed and corrected coding assignments and exams.
- Engaged graduate students and undergrads for one-on-one feedback and guidance for their programming projects.

WORK EXPERIENCE

Microsoft Corporation Powerpoint Team: Program Manager (2016 - 2017)
- Projects include: Find on Mobile, Closed Captions, and Accessibility
- Led the Powerpoint team in part of the larger Microsoft Office Accessibility effort to ensure that Powerpoint was compliant with Accessibility standards.
- Contributed to the Accessibility effort that led to Microsoft winning the Helen Keller Achievement Award in (2018 from the American Foundation for the Blind.
- Cooperated closely with a team of 10 engineers to prioritize and complete accessibility features.
- Planned and designed future accessibility features for Powerpoint to help make Powerpoint usable for accessibility users.

Tableau Softwares: Program Manager Intern (2015)
- Directed Dashboard Web Authoring feature as Product Owner as part of Tableau's effort to bring their Data Analytics and Visualization product to the Web.
- Defined product development and strategy with veteran developers, testers, and designers.
- Engaged with customers to understand user needs and find solutions for pain points.
- Assisted in showcasing product features for the annual Tableau Customer Conference's Keynote presentation for 11,000 customers.