Yuxuan (Effie) Li

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- 5 years of interdisciplinary research experience in deep learning, cognitive science, neuroscience
- Research interests: emergent behavior, representations, interpretability, generalization, embodied AI

Education

2019 – 2024 **Stanford University, Ph.D. Candidate** in Cognitive Psychology. Transcript.
- Weiland Fellow, School of Humanities and Sciences
- Trainee, Center for Mind, Brain, Computation and Technology

2013 – 2017 **Trinity College, B.S.** in Computer Science and Psychology. *summa cum laude.*

Research Experience

2023 Ph.D. research intern @ **Allen Institute for Artificial Intelligence**. Advisor: Luca Weihs.
- Designed and implemented novel self-supervised goal-directed learning
- Evaluated representation pretraining for embodied agent planning in realistic environments (preprint)

2019 – Ph.D. student @ **Stanford University PDP Lab**. Advisor: James McClelland.
- Researching emergent human-like subgoal choices in neural networks over learning
- Work provided new insights on how attention layers in transformers support structured task decomposition and systematic generalization (TMLR paper, code)
- Explored human hippocampus-inspired recurrent memory modules for deep reinforcement learning agents (report, code)
- Designed online experiments, collected behavioral data, and built drift-diffusion models to study human goal-directed planning (PLOS paper, code)

2017 – 2019 Research specialist @ **UPenn Computational Memory Lab**. Advisor: Michael Kahana.
- Developed human memory decoders from large-scale EEG time series data
- Designed and implemented a novel data sampling approach for classifier training leading to new understanding of the neural biomarkers of human memory

2016 – 2017 Student researcher @ **Trinity College**. Advisors: R.A. Morelli, M.A. Grubb, E.D. Casserly.

2016 Research intern @ **Columbia Business School**. Advisor: Bruce Kogut.

Publications and Preprints

2023 **Li, Y.**, & Weihs, L. Understanding representations pretrained with auxiliary losses for embodied agent planning. *Under review.*

2023 **Li, Y.**, Pazdera, J.K., & Kahana, M.J. EEG decoders track memory dynamics. *Accepted at Nature Communications.*

2023 **Li, Y.**, & McClelland, J.L. Representations and computations in transformers that support generalization on structured tasks. *Transactions on Machine Learning Research.*

2023 Kahana, M.J., Lohnas, L.J., Healey, K., . . ., **Li, Y.**, . . ., & Weidemann, C.T. The Penn Electrophysiology of Encoding and Retrieval Study. *JEP: LMC*.

2022 **Li, Y.**, & McClelland, J.L. Systematic generalization and emergent structures in transformers trained on structured tasks. *NeurIPS 2022 Workshop on All Things Attention.*

2022 **Li, Y.**, & McClelland, J.L. A weighted constraint satisfaction approach to human goal-directed decision making. *PLOS Computational Biology*.

2022 Katerman, B.S., **Li, Y.**, Pazdera, J.K., Keane, C., & Kahana, M.J. EEG biomarkers of free recall. *NeuroImage*.

2018 Grubb, M.A., & **Li, Y.** Assessing the role of accuracy-based feedback in value-driven attentional capture. *Attention, Perception, & Psychophysics*.

Talks and Presentations

Nov 2022 **Li, Y.** Systematic generalization and emergent structures in transformers trained on structured tasks. *FriSem seminar, Department of Psychology, Stanford University.*

Apr 2022 **Li, Y.** A weighted constraint satisfaction approach to human goal-directed decision making. *Cognitive Tools Lab, University of California, San Diego.*

Feb 2021 **Li, Y.** Model-based reinforcement learning and the reinforcement learning framework for human behavior. *TA Lecture in PSYCH 209, Stanford University.*

2020, 2021 **Li, Y.** Building online psychology experiments with jsPsych: a tutorial. *TA Lecture in PSYCH 251, Stanford University.*

Jul 2018 **Li, Y.**, & Kahana, M.J. Neural dynamics of memory encoding and retrieval. *Talk at the 51st Annual Meeting of the Society of Mathematical Psychology, Madison, WI.*

Honors and Awards

2022 – 2024 Ric Weiland Graduate Fellowship in the Humanities & Sciences. Stanford University.

2013 – 2017 Phi Beta Kappa, Dean's Scholar (top 5%), Faculty Honors, Holland Scholar. Trinity College.

Teaching Experience

2020 – **Teaching Assistant** @ Department of Psychology, Stanford University. For graduate courses: neural network models of cognition, brain decoding, experimental methods, developmental psychology

2015 – 2017 **Teaching Assistant** @ Department of Computer Science, Trinity College. For undergraduate courses: introduction to computing, mathematical foundations of computing

Service

Reviewer Cognitive Science Society, 2022 –

Committee Cognitive Neuroscience Seminar Organizing Committee, Stanford Psychology, 2021 – 2022

Technical Skills

Coursework Graduate coursework in deep learning, reinforcement learning, deep multi-task and meta-learning, machine learning, computational neuroscience

Programming **Python, R,** some experience with MATLAB, HTML/CSS/JavaScript (jquery, jspsych)

Packages **Deep learning** (pytorch, allenact, einops, pytorch-lightning), **experiment/server management** (wandb, beaker), **machine learning** (scikit-learn), **data analysis** (scipy, numpy, pandas; tidyr, dplyr, lme4), **data visualization** (matplotlib; ggplot2), **cognitive (neuro)science** (mne, ptsa; rtdists)

Other LaTeX, statistics (linear modeling, generalized linear modeling, mixed-effects models), representation analysis, online behavioral platforms (Amazon MTurk, Prolific)