

# Yuxuan (Effie) Li

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- 5 years of interdisciplinary research experience in deep learning, cognitive science, neuroscience
- Research interests: machine/human cognition, human-ai alignment, mechanistic interpretability

## Education

2019 – 2024 **Stanford University**, PhD in Cognitive Psychology (expected Dec 2024). [Transcript](#).

- Weiland Fellow, School of Humanities and Sciences
- Alumna, Center for Mind, Brain, Computation and Technology

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

## Research Experience

2024 Incoming research intern @ **Meta**. Mentor: Karl Ridgeway.

- Use multi-modal (vision+language) representation learning to understand real-world human behavior

2023 PhD research intern @ **Allen Institute for AI**. Mentor: Luca Weihs.

- Designed and implemented self-supervised goal-directed pretraining objectives
- Systematically evaluated representation learning for agent planning in realistic environments ([preprint](#))

2019 – now PhD researcher @ **Stanford University PDP Lab**. Advisor: James McClelland.

- Researching emergent human-like subgoal choices and implicit subgoal selection in transformers learning graph traversal
- Proposed a new sequence encoding method that boosts length generalization in transformers and established mechanistic insights on how self-attention and token contextualization support task decomposition and multi-task learning ([TMLR paper](#), [code](#))
- Built hippocampus-inspired recurrent memory modules for deep RL 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.

- Inspected neural mechanisms of human memory using decoders trained from large-scale EEG time series data under a novel data sampling approach ([NatComm paper](#), [code](#))

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

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

## Publications and Preprints

- 2024 **Li, Y.**, & McClelland, J.L. Emergent human-like subgoal choices in neural networks. *In prep.*
- 2024 **Li, Y.**, Pazdera, J.K., & Kahana, M.J. EEG decoders track memory dynamics. *Nature Communications*.
- 2023 **Li, Y.**, & Weihs, L. Understanding representations pretrained with auxiliary losses for embodied agent planning. *NeurIPS 2023 Generalization in Planning Workshop*.
- 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. 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

- Mar 2024 **Li, Y.** Emergent structured computation from learning and its implications for cognitive science and AI. *Microsoft Research Lab – Redmond*.
- Nov 2023 **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. *Guest 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 and Services

- Reviewer Cognitive Science Society, 2022 –
- Committee Cognitive Neuroscience Seminar Organizing Committee, Stanford Psychology, 2021 – 2022
- TA Department of Psychology, Stanford University. For graduate courses: neural network models of cognition, brain decoding, experimental methods, developmental psychology
- TA Department of Computer Science, Trinity College. For undergraduate courses: introduction to computing, mathematical foundations of computing