Xinlei Lin (Daisy)

Ph.D. candidate

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I am a Ph.D. candidate in Computational Neuroscience at New York University. I study how sequences of actions in complex environments are made in AI and in humans. Currently my research projects focus on comparing deep reinforcement learning algorithms with human planning models, using large language models to predict human behavior, studying the latent factors of complex planning and improving a stochastic log likelihood estimation algorithm.

Education

Ph.D. candidate in Neuroscience (System and Computational track), *New York University* 2019.9 — present (Graduating 2024.10)
Research Focus: Planning and Reinforcement Learning
B.S/M.S in Biochemistry, *University of California, San Diego* 2014.10 — 2019.3

Skills

Tools and Languages	Python, TensorFlow, PyTorch, Matlab, Git, R, JavaScript
Quantitative Research	Reinforcement learning and planning, Mathematical modeling, Deep learning model training and analysis, Large language models, Human behavior modelling, Machine learning, Model fitting methodology

Research Experience

Learning how humans play board games with Large Language Models (GPT-4IAR) **2023.6 — Present**
Wei Ji Ma lab + Acerbi lab *Center for Neural Science and department of Computer Science, NYU*
- Trained a GPT model on a large mobile game dataset to predict different characteristics of human gameplay.

Compare planning between AI and humans **2021.4 — Present**
Wei Ji Ma lab *Center for Neural Science, NYU*
- Trained Deep Reinforcement learning models (AlphaZero type agents) to play a planning task of intermediate complexity.
- Analyzed feature representation by the trained Deep Reinforcement learning networks.
- Studied the learning and planning mechanisms of AlphaZero agents and compared those to a human planning model.

Improve the efficiency of an unbiased log-likelihood estimation method **2021.3 — present**
Luigi Acerbi lab *Department of Computer Science, University of Helsinki*
- Compared the efficiencies of log-likelihood estimations in different models using Inverse Binomial Sampling with different allocation methods.
- Developing a toolbox for a more efficient Inverse Binomial Sampling method that can estimate the log-likelihood unbiasedly.

The latent factors of complex planning decisions **2020.10 — Present**
Wei Ji Ma lab *Center for Neural Science, NYU, NY*
- Developed a battery of 8 games to run a large web-based behavioral data collection.
- Investigated the individual differences and latent structure of human planning decisions

Using neural networks to approximate Bayesian inference **2021.2 — 2021.6**
- Trained artificial neural networks on a task that requires inductive reasoning and found that those networks can perform these tasks using Bayesian-like strategies without the need for an explicit computation of the log likelihood

Large neural population analysis **2017.1 — 2019.6**
Takaki Komiyama Lab *UCSD*
- Investigated patterns in a large neural imaging dataset to decode neural activities and the source of information segregation.

Publications and Conferences

V. Yeom-Song, **X. Lin**, I. Kuperwajs,H.Schütt, W.Ma, L.Acerbi, **Learning How Humans Play Board Games with GPT-4IAR** (FCAI AI Day 2023)
X. Lin.*, Z.Zheng.*, J.Topping.*, W.Ma, **Comparing Machine and human learning in a planning task of intermediate complexity** (Proceedings of the Annual Meeting of the Cognitive Science Society, 2022; The Multi-disciplinary Conference on Reinforcement Learning and Decision Making, 2022)
Gjoni E.*, Sristi R.D.*, Liu H.*, Dror S., **Lin, X.,** O'Neil, K.,Arroyo O., Hong S.W., Blumenstock S., Lim B., Mishne G., and Komiyama T. **Dissection of inter-area interactions of motor circuits** (COSYNE 2023, 2022 Simons Collaboration for the Global Brain Annual Meeting, 2022 the Society for Neuroscience Annual Meeting)

Activities

Teaching Assistant for Brain and Behavior, NYU 2021.1-2021.5