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# Xinlei Lin

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 artificial intelligence and in humans. Currently my research projects focus on comparing deep reinforcement learning algorithms with human planning models, 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
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, Human behavior modelling, Machine learning, Model fitting methodology, Adversarial games |

## Research Experience

**Thesis Project 1: 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 features learned by the trained Deep Reinforcement learning networks.
- Studied the learning and planning mechanisms of AlphaZero agents and compared those to a human planning model.

**Thesis Project 2: 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.
- Develop a toolbox for a more efficient Inverse Binomial Sampling method that can estimate the log-likelihood unbiasedly.

**Thesis Project 3: The latent factors of complex planning decisions** **2020.10 — Present**
*Wei Ji Ma lab* *Center for Neural Science, NYU, NY*

- Coded a battery of 9 planning tasks and cognitive tasks to run a large web-based online study.
- Investigated the individual differences and latent structure of human planning decisions

**Using Artificail Neural Networks to Approximate Bayesian Inference** **2021.2 — 2021.6**

- Trained artificial neural networks (ANNs) on a task that requires inductive reasoning and find that ANNs can perform these tasks using Bayesian-like strategies without the need for an explicit computation of the log likelihood

**Hidden Markov Models and automatic behavioral tracking** **2019.9 — 2020.9**
*Eero Simoncelli Lab, Christine Constantinople lab* *Center for Neural Science, NYU*

- Used Hidden Markov Model to model the context-dependent representations of Visual Cortex.
- Developed behavioral analysis pipeline by training a Convolutional Neural Network to automatically track head angles of rats.

**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

**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** (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
Teaching Assistant for General Chemistry, UCSD 2018.3-2018.7
Poster in UCSD Honors Research Showcase Spring 2018