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Xinlei Lin

Ph.D. candidate

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I am a fourth year 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 (Focus: Planning and Reinforcement Learning), *New York University* 2019.9 — present
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	Mathematical modeling, Reinforcement learning and planning, Computational cognitive modeling, Neural networks, Deep learning models, Model fitting methodology, Web development

Research Experience

Thesis Project 1: Compare planning between AI and humans **2021.3 — 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

Rotation project: Hidden Markov Models **2019.12 — 2020.8**
Eero Simoncelli Lab *Center for Neural Science, NYU*

- Used Hidden Markov Model to study the context-dependent representations of Visual Cortex.

Rotation project: deepLabCut for behavior **2019.8 — 2019.12**
Christine Constantinople Lab *Center for Neural Science, NYU*

- Developed behavioral analysis pipeline by training a convolutional neural network, deepLabCut, to automatically track head angles of rats to infer regret in reward-associated behavior.

Large neural population analysis **2017.1 — 2019.6**
Takaki Komiyama Lab *UCSD*

- Discovered patterns in a large neural imaging dataset to decode neural population activities and to investigate 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)
Liu, H., **Lin, X.,** O'Neil, K., DeViso, M., Turner, M., Arroyo, O., Lilascharoen, V., Lim, B.K., and Komiyama, T. **Target Cell-Type Specificity of Corticostriatal Activity** (2022, paper in preparation)

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