

Weihan Li

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Education

Georgia Institute of Technology, PhD in Machine Learning Sept 2023 – now

- **Ph.D. Advisor:** Prof. Anqi Wu
- **Department:** School of Computational Science and Engineering.

Zhejiang University, Master in Computer Science and Technology Sept 2020 – May 2023

- **Advisor:** Prof. Gang Pan
- **Department:** College of Computer Science and Technology.

Zhejiang University, Bachelor in Computer Science and Technology Sept 2016 – June 2020

Research Interests

My research focuses on developing advanced methods for modeling large-scale neural (behavioral) data to address fundamental problems in neuroscience. Additionally, I am interested in the intersection of reinforcement learning and LLMs.

Methodologies: State-space models, Reinforcement Learning, Probabilistic Generative Modeling, Probabilistic Inference

Applications: Neuroscience, LLM Alignment, LLM Reasoning.

Selected Research Projects

Inverse Reinforcement Learning for Robust Reward Inference from Animal Behavior Feb 2025 - now

- Developed advanced IRL methods to infer interpretable and robust reward functions from observations of animal behaviors.
- Explored novel inference techniques that capture subtle behavioral nuances and generalize well to complex decision-making scenarios.
- Investigated potential applications of developed reward-inference methods for better modeling and interpreting human preferences, with implications for improving human-aligned feedback mechanisms in LLMs.

Learning Time-Varying Multi-Region Communications via Scalable Markovian Gaussian Processes Aug 2024 - Jan 2025

- Developed a Markovian Gaussian Process framework for capturing dynamic, multi-region brain communications with continuously evolving temporal delays.
- Integrated Gaussian Processes with State Space Models via a novel universal connection, significantly improving model flexibility and biological relevance.
- Leveraged parallel scan based inference algorithms, reducing computational complexity from $O(T^3)$ to $O(\log T)$, enabling efficient processing of large-scale neural datasets.

Multi-Region Markovian Gaussian Process: An Efficient Method to Discover Directional Communications Across Multiple Brain Regions Sep 2023 - Jan 2024

- Developed a novel framework integrating State Space Models with multi-output Gaussian Processes to capture latent neural interactions across brain regions.
- Established a new theoretical connection, converting multi-output Gaussian Processes with complex-valued kernels into state-space approximation, explicitly modeling frequencies and phase delays of neural activities.
- Achieved linear computational complexity with respect to the number of time points, combining the efficiency of State Space Models with the expressive power of Gaussian Processes.

Publications

Learning Time-Varying Multi-Region Communications via Scalable Markovian Gaussian Processes Preprint [\[link\]](#)

Weihan Li, Yule Wang, Chengrui Li, Anqi Wu

A Revisit of Total Correlation in Disentangled Variational Auto-Encoder with Partial Disentanglement Preprint [\[link\]](#)

Chengrui Li, Yunmiao Wang, Yule Wang, *Weihan Li*, Dieter Jaeger, Anqi Wu

Exploring Behavior-Relevant and Disentangled Neural Dynamics with Generative Diffusion Models NeurIPS 2024 [\[link\]](#)

Yule Wang, Chengrui Li, *Weihan Li*, Anqi Wu

Multi-Region Markovian Gaussian Process: An Efficient Method to Discover Directional Communications Across Multiple Brain Regions ICML 2024 [\[link\]](#)

Weihan Li, Chengrui Li, Yule Wang, Anqi Wu

A Differentiable Partially Observable Generalized Linear Model with Forward-Backward Message Passing ICML 2024 [\[link\]](#)

Chengrui Li, *Weihan Li*, Yule Wang, Anqi Wu

Forward χ^2 Divergence Based Variational Importance Sampling ICLR 2023 [\[link\]](#)

Chengrui Li, Yule Wang, *Weihan Li*, Anqi Wu

Online Neural Sequence Detection with Hierarchical Dirichlet Point Process NeurIPS 2022 [\[link\]](#)

Weihan Li, Yu Qi, Gang Pan

Efficient Point-Process Modeling of Spiking Neurons for Neuroprosthesis EMBC 2021 [\[link\]](#)

Weihan Li, Cunle Qian, Yu Qi, Yiwen Wang, Yueming Wang, Gang Pan

Technique Skills

Languages: C++, Python, Matlab, Latex

Technologies: PyTorch, Jax

Teaching and Academic Services

Teaching Experience: TA for Gatech CSE-8803 Statistical machine learning models for neural and behavioral data analysis.

Conference Reviewer: NeurIPS 2023/2024/2025, ICML 2024/2025, ICLR 2024/2025.