Botao Hao

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Research Interests

I am currently a research scientist at OpenAI working on improving ChatGPT. Previously, I worked on developing principled data-efficient RLHF for fine-tuning LLMs and their application for Google Bard and Gemini. I am also interested in fundamental research on reinforcement learning and multi-armed bandits.

Educations

Ph.D. in Statistics Sep. 2014 - Dec. 2019
Department of Statistics, Purdue University
Advisor: Prof. Guang Cheng

B.S. in Statistics Sep. 2010 - Aug. 2014
School of Mathematics, Nankai University

Professional Experiences

▲ Research Scientist, OpenAI, San Francisco Jun. 2024 - Now
▲ Senior Research Scientist, Deepmind, Mountain View Feb. 2022 - Jun. 2024
▲ Research Scientist, Deepmind, London Nov. 2020 - Feb. 2022
▲ Postdoctoral Researcher, Princeton University Dec. 2019 - Nov. 2020
Advisor: Prof. Mengdi Wang
▲ Research Intern, Deepmind, London May 2019 - Sep. 2019
▲ Research Intern, Adobe Research May 2018 - Aug. 2018

Journal Publications

▲ **Stochastic Low-rank Tensor Bandits for Multi-dimensional Online Decision Making**
Jie Zhou, **Botao Hao**, Zheng Wen, Jingfei Zhang, Will Wei Sun
Journal of the American Statistical Association (2024). [ArXiv]

▲ **Bridging Imitation and Online Reinforcement Learning: An Optimistic Tale**
Botao Hao, Rahul Jain, Dengwang Tang, Zheng Wen
Transactions on Machine Learning Research (2023). [ArXiv]

▲ **Sparse Tensor Additive Regression**
Botao Hao, Boxiang Wang, Pengyuan Wang, Emma Jingfei Zhang, Jian Yang, Will Wei Sun
Journal of Machine Learning Research (2021). [ArXiv]

▲ **Sparse and Low-rank Tensor Estimation via Cubic Sketchings**
Botao Hao, Anru Zhang, and Guang Cheng
IEEE Transactions on Information Theory (2020). [ArXiv]

▲ **Nonparametric Bayesian Aggregation for Massive Data**
Zuofeng Shang, **Botao Hao**, and Guang Cheng
Journal of Machine Learning Research (2019). [ArXiv]

▲ **Simultaneous Clustering and Estimation of Heterogeneous Graphical Models**
Botao Hao, Will Wei Sun, Yufeng Liu, and Guang Cheng
Journal of Machine Learning Research (2018). [ArXiv]

Conference Publications

▲ **Efficient Exploration for LLMs**
Vikranth Dwaracherla, Seyed Mohammad Asghari, **Botao Hao**, Benjamin Van Roy
ICML 2024. [ArXiv]

▲ **Leveraging Demonstrations to Improve Online Learning: Quality Matters**
Botao Hao, Rahul Jain, Tor Lattimore, Benjamin Van Roy, Zheng Wen
ICML 2023. [ArXiv]

▲ **Regret Bounds for Information-Directed Reinforcement Learning**
Botao Hao, Tor Lattimore
NeurIPS 2022. [ArXiv]

▲ **The Neural Testbed: Evaluating Predictive Distributions**
Ian Osband, Zheng Wen, Mohamammad Asghari, Vikranth Dwaracherla, **Botao Hao**, Morteza Ibrahimi, Dieterich Lawson, Xiuyuan Lu, Brendan O'Donoghue, Benjamin Van Roy
NeurIPS 2022. [ArXiv][GitHub]

▲ **Contextual Information-Directed Sampling**
Botao Hao, Tor Lattimore, Chao Qin
ICML 2022. [ArXiv]

▲ **Interacting Contour Stochastic Gradient Langevin Dynamics**
Wei Deng, Siqi Liang, **Botao Hao**, Guang Lin, Faming Liang
ICLR 2022. [OpenReview]

▲ **Confident Least Square Value Iteration with Local Access to a Simulator**
Botao Hao, Nevena Lazic, Dong Yin, Yasin Abbasi-Yadkori, Csaba Szepesvári
AISTATS 2022. [ArXiv]

▲ **Efficient Local Planning with Linear Function Approximation**
Dong Yin, **Botao Hao**, Yasin Abbasi-Yadkori, Nevena Lazic, Csaba Szepesvári
ALT 2022. [ArXiv]

▲ **Bandit Phase Retrieval**
Tor Lattimore, **Botao Hao**
NeurIPS 2021. [ArXiv]

▲ **Information Directed Sampling for Sparse Linear Bandits**
Botao Hao, Tor Lattimore, Wei Deng
NeurIPS 2021 (spotlight). [ArXiv]

▲ **Bootstrapping Statistical Inference for Off-Policy Evaluation**
Botao Hao, Xiang Ji, Yaqi Duan, Hao Lu, Csaba Szepesvári, Mengdi Wang
ICML 2021. [ArXiv]

▲ **Sparse Feature Selection Makes Batch Reinforcement Learning More Sample Efficient**
Botao Hao, Yaqi Duan, Tor Lattimore, Csaba Szepesvári, Mengdi Wang
ICML 2021. [ArXiv]

▲ **Online Sparse Reinforcement Learning**
Botao Hao, Tor Lattimore, Csaba Szepesvári, Mengdi Wang
AISTATS 2021. [ArXiv]

▲ **Adaptive Approximate Policy Iteration**
Botao Hao, Nevena Lazic, Yasin Abbasi-Yadkori, Pooria Joulani, Csaba Szepesvári

AISTATS 2021. [ArXiv]

▲ **High-Dimensional Sparse Linear Bandits**
Botao Hao, Tor Lattimore, Mengdi Wang
NeurIPS 2020. [ArXiv]

▲ **Adaptive Exploration in Linear Contextual Bandit**
Botao Hao, Tor Lattimore, and Csaba Szepesvári
AISTATS 2020. [ArXiv]

▲ **Sparse and Low-rank Tensor Estimation via Cubic Sketchings**
Botao Hao, Anru Zhang, and Guang Cheng
AISTATS 2020. [Link]

▲ **Bootstrapped Upper Confidence Bound**
Botao Hao, Yasin Abbasi-Yadkori, Zheng Wen, and Guang Cheng
NeurIPS 2019. [ArXiv]

Book Chapters

▲ **Tensors in Modern Statistical Learning**
Will Wei Sun, **Botao Hao**, Lexin Li
In Wiley StatsRef: Statistics Reference Online. [Link]

Preprints

▲ **Sequential Best-Arm Identification with Application to Brain-Computer Interface**
Xin Zhou, **Botao Hao**, Jian Kang, Tor Lattimore, Lexin Li
Submitted. [ArXiv]

▲ **Sample Efficient Deep Reinforcement Learning via Local Planning**
Dong Yin, Sridhar Thiagarajan, Nevena Lazic, Nived Rajaraman, **Botao Hao**, Csaba Szepesvari
Major revision at Journal of Machine Learning Research. [ArXiv]

▲ **Optimization Issues in KL-Constrained Approximate Policy Iteration**
Nevena Lazic, **Botao Hao**, Yasin Abbasi-Yadkori, Dale Schurmans, Csaba Szepesvári
Preprint. [ArXiv]

▲ **Residual Bootstrap Exploration for Bandit Algorithms**
Chi-Hua Wang*, Yang Yu*, **Botao Hao**, Guang Cheng
Preprint. [ArXiv]