

Licong Lin

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Education

University of California at Berkeley

PhD student in Statistics

Berkeley, CA

Aug 2021 - Current

- Worked as a GSI (teaching assistant) for STAT 153, STAT 210B, STAT 135; as a GSR (research assistant).
- **Graduate Courses:** STAT 205B (A), STAT 210A (A+), STAT 210B (A+), STAT 215A (A+), STAT 241 (Reinforcement learning, A+), STAT 256 (Causal inference, A+), EE 227C (Convex optimization, A).

Peking University

B.S. in Statistics

Beijing, China

Sep 2017 - July 2021

- Overall GPA: **3.82**/4 (rank: **2**/45)

Skills

Programming and software Python (proficient), R (proficient), Matlab, Git, \LaTeX .

Research Interests

Machine learning, high dimensional statistics, causal inference, statistical inference

Publication and preprints

Transformers as Decision Makers: Provable In-Context Reinforcement Learning via Supervised Pretraining

Licong Lin, Yu Bai, Song Mei

arXiv preprint arXiv:2310.08566 (2023). 2023

Semi-parametric inference based on adaptively collected data

Licong Lin, Koulik Khamaru, Martin J Wainwright

arXiv preprint arXiv:2303.02534 (2023). 2023

Statistical Limits of Adaptive Linear Models: Low-Dimensional Estimation and Inference

Licong Lin, Mufang Ying, Suvrojit Ghosh, Koulik Khamaru, Cun-Hui Zhang

arXiv preprint arXiv:2310.00532, accepted to Neurips (2023). 2023

Plug-in Performative Optimization

Licong Lin, Tijana Zrnic

arXiv preprint arXiv:2305.18728 (2023). 2023

Near-optimal multiple testing in Bayesian linear models with finite-sample FDR control

Taejoo Ahn, Licong Lin, Song Mei

arXiv preprint arXiv:2211.02778 (2022). 2022

What causes the test error? going beyond bias-variance via anova

Licong Lin, Edgar Dobriban

The Journal of Machine Learning Research 22.1 (2021) pp. 6925–7006. JMLRORG, 2021

Selected Research Projects

Transformers as Decision Makers: Provable In-Context Reinforcement Learning

Berkeley, CA

Advised by Prof. Song Mei (UCB)

May 2023 - Current

- Proposed a theoretical framework for in-context reinforcement learning via supervised pretraining using transformers.
- Theoretically showed that transformers have the ability to in-context approximate near-optimal RL algorithms, e.g., LinUCB, Thompson sampling for stochastic linear bandits, and UCB-VI for tabular MDPs.
- Performed preliminary experiments on in-context RL using GPT-2 to verify our theoretical findings.
- Submitted to ICLR 2024 and Neurips 2023 workshops "Foundation Models for Decision Making" and "Mathematics of Modern Machine Learning".

Inference of one coordinate in GLM given adaptively collected data via online debiasing.

Berkeley, CA

Joint work with Koulik Khamaru (former Statistics PhD at UCB)

Dec 2022 - August 2023

- Follow-up work of the paper on semi-parametric inference (see below). Aim to provide $O(1/\sqrt{n})$ -consistent asymptotically normal estimator of a single coordinate of the unknown parameter vector, when the data points are sequentially collected.
- Start with constructing an estimator of a single coordinate that is $O(1/\sqrt{n})$ -consistent; then perform the online-debiasing trick to modify the estimator so that it is asymptotically normal. The paper is accepted as a poster to Neurips 2023.

Semi-parametric inference with adaptively collected data

Berkeley, CA

Advised by Prof. Martin Wainwright (UCB & MIT)

Dec 2021 - Feb 2023

- Statistical inference of the target parameter in a generalized linear model at the presence of potentially high-dimensional nuisance parameter.
- Assumed the data points are sequentially collected instead of i.i.d. Obtained asymptotic normal estimators via solving a weighted estimating equation.
- Our proposed algorithm works for offline data collected from bandit algorithms or sequential experiments.

Deep learning theory on overparametrization

Philadelphia, PA

Advised by Prof. Edgar Dobriban (UPenn)

May 2020 - Mar 2021

- Aimed to understand the non-monotonicity (e.g. double descent phenomenon) of the test error as a function of model complexity or number of training samples using asymptotic random matrices theory.
- Published in *Journal of Machine Learning Research*, 2021.

Design a new MCMC algorithm

Beijing, China

Advised by Prof. Cheng Zhang (PKU)

Dec 2019 - Dec 2020

- Combined neural networks with HMC algorithm to design a sampling algorithm suitable for high-dimensional problems.
- Introduced the normalizing flow model into the design of the kinetic energy function of HMC. With the strong representability of the neural networks, our algorithm finds a kinetic energy function that significantly improves the sampling performance of HMC.

Ongoing Projects

Landscape analysis of the TAP energy

Berkeley, CA

Advised by Song Mei (UCB)

Jun 2022 - Current

- Analyze the TAP energy of high-dimensional Bayesian linear under proportional limit. Aim to show that a local minimizer of the TAP energy is close to the Bayesian posterior mean; and the TAP energy has benign landscape (e.g., local convexity), which enables optimization algorithms to find the local minimizer.
- Apply Gordon comparison inequalities and results in AMP literature.

Jackknife debiasing of high-dimensional Z -estimators

Berkeley, CA

Joint work with Fangzhou Su, advised by Peng Ding, Martin Wainwright (UCB & MIT)

Dec 2022 - Current

- Analyze the performance of jackknife debiased Z -estimators of one-dimensional functionals. Prove asymptotic normality under the high dimensional regime $p^{3/2} \ll n$, where p is the problem dimension and n is the number of samples.
- The proposed method is an automatic debiasing procedure. It has wide applications in econometrics, causal inference, generalized linear model, etc.
- Apply concentration results of random matrices and U-statistics in the analysis. Derive non-asymptotic bounds for the estimation error of Z -estimators.

Honors & Awards

2021	Huaxin Bachelor , Peking University	China
2021	Honor graduate of Applied Mathematics and Statistics Program , Peking University	China
2018,19,20	Academic Excellence Award , Peking University	China
2019,20	Peking University Scholarship , Peking University	China
2020	Gold Medal in Probability & Statistics , S.-T. Yau College Student Mathematics Contest, placed 1st nationally	China
2018	1st Prize , Beijing College Student Mathematics Competition	China
2016	2nd Prize , China National Mathematical Olympiad	China

References available upon request.