

Ziheng Cheng

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EDUCATION

Ph.D. in Industrial Engineering and Operations Research

Sep, 2024-

UC Berkeley, CA, USA

B.S. in Mathematics

Sep, 2020-Jun, 2024

Peking University, Beijing, China

PUBLICATIONS & MANUSCRIPTS

(* stands for equal contribution)

- Kernel Semi-Implicit Variational Inference
Ziheng Cheng*, Longlin Yu*, Tianyu Xie, Shiyue Zhang, Cheng Zhang
(ICML 2024)
- Reflected Flow Matching
Tianyu Xie*, Yu Zhu*, Longlin Yu*, Tong Yang, **Ziheng Cheng**, Shiyue Zhang, Xiangyu Zhang, Cheng Zhang
(ICML 2024)
- The Limits and Potentials of Local SGD for Distributed Heterogeneous Learning with Intermittent Communication
Kumar Kshitij Patel*, Margalit Glasgow*, Lingxiao Wang, Nirmal Joshi, **Ziheng Cheng**, Nathan Srebro
(COLT 2024)
- Momentum Benefits Non-IID Federated Learning Simply and Provably
Ziheng Cheng*, Xinmeng Huang*, Pengfei Wu, Kun Yuan
(ICLR 2024)
- Particle-based Variational Inference with Generalized Wasserstein Gradient Flow
Ziheng Cheng*, Shiyue Zhang*, Longlin Yu, Cheng Zhang
(NeurIPS 2023)
- Joint Graph Learning and Model Fitting in Laplacian Regularized Stratified Models
Ziheng Cheng*, Junzi Zhang*, Akshay Agrawal, Stephen Boyd
(preprint, under review)

WORKING PAPERS

- Distributed Adaptive Algorithms with Local Updates
Ziheng Cheng, Margalit Glasgow, Tengyu Ma

RESEARCH EXPERIENCE

Distributed Adaptive Optimization

Jun, 2023 - Oct, 2023

Advisor: Prof. Tengyu Ma, Department of Computer Science, Stanford University

- Studied the benefits of local iterations to reduce communication in distributed setting.
- Proposed a distributed adaptive optimization algorithm based on gradient-clipping and Adam.
- Achieved the convergence result of Adam in distributed setting for the first time.

Optimization Theory of Federated Learning

Mar, 2023 - Jun, 2023

Advisor: Prof. Kun Yuan, Center for Machine Learning Research, Peking University

- Studied the theoretical benefits of momentum in federated learning with heterogeneous clients
- Proved that momentum can accelerate the convergence of FedAvg and Scaffold without additional assumption.
- Achieved the state of the art convergence result under this setting.

Multi-task Learning / Stratified Models

Oct, 2022 - May, 2023

Advisor: Prof. Stephen Boyd, Department of Electrical Engineering, Stanford University

- Studied and improved the method to jointly learn both the graph and the model in Laplacian Regularized stratified models.
- Proposed an optimization algorithm for the joint learning framework and proved its convergence under nonconvex setting.
- Conducted related empirical analysis to validate our method based on both synthetic and real data.

Particle-based Variational Inference

May, 2022 - May, 2023

Advisor: Prof. Cheng Zhang, School of Mathematical Sciences, Peking University

- Studied general Wasserstein gradient flow in probability space to propose a general particle-based VI algorithm with functional gradient.
- Established the first convergence guarantee of particle-based VI in this setting and exhibited the advantages over traditional sampling methods such as Langevin Monte Carlo.
- Conducted numerical experiments on Bayesian inference and confirmed the effectiveness of our method.

AWARDS AND HONORS

Awards

- Honorable Mention in Alibaba Global Mathematics Competition 2022, 2023
- Bronze Medal in S.-T. Yau College Student Mathematics Contest 2022
- Meritorious Winner in Mathematical Contest in Modeling 2022

Honors

- May-Fourth Scholarship (top scholarship in Peking University, 0.5%) 2023
- National Scholarship (top 0.2% nation-wide) 2021
- Merit Student of Peking University 2021-2023