

Guannan Liang

Contact Information

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Research Interests

Machine Learning; Mathematical Optimization; Statistics; Deep Learning; Recommender System.

Education

University of Connecticut, Storrs, CT *January 2016 ~ Present*
Ph.D. in Machine Learning, Department of Computer Science and Engineering
Advisor: Jinbo Bi

University of California, Davis, CA *September 2014 ~ December 2015*
M.S.in Statistics, Department of Statistics

Zhengzhou University, Zhengzhou, PRC *September 2009 ~ June 2013*
B.S. in Mathematics, School of Mathematics and Statistics

Employment

Research Intern at Rakuten USA, CA *September 2020 ~ December 2020*

- Focus on developing new recommender system with cold start item.
- Explore shared network structure and different attention mechanisms to improve the performance of item cold start recommender system.

Research Assistant at Laboratory of Machine Learning & Health Informatics, UCONN
January 2016 ~ Present

- Develop new machine learning algorithms, such as for sparse learning problem, optimizers for deep learning applications, differential private (DP) algorithms and federated learning algorithms.
- Collaborate across labs to identify new composite traits for alcohol dependence.

Graduate Assistant at Eversource Energy Center, UCONN *May 2017 ~ Present*

- Implemented weather forecasting (WRF 3.7, WRF 3.8 and ICLAMS systems) , Flooding forecasting (CREST system) and machine learning models for power outage predictions for Eversource Energy (CT, MA, NH areas) and The United Illuminating Company (UI) on the HPC resources at UConn.
- Proposed new machine learning and deep learning methods to improve the performance of existing operational system, such as LSTM model to capture the sequence information in weather.

Projects

Effective algorithms for non-convex non-smooth regularized learning problems

- Proposed a group of stochastic proximal gradient methods based on arbitrary sampling to solve a family of non-convex non-smooth regularized empirical risk minimization problems.
- Presented a new analytic approach to investigate the convergence and computational complexity of the proposed methods, which helps compare the different sampling schemes.

Faster algorithm for nonconvex sparse learning problems

- Proposed a hard thresholding method based on stochastically controlled stochastic gradients (SCSG-HT) to solve a family of sparsity-constrained empirical risk minimization problems.
- Proved that the new method has a strong guarantee to recover the optimal sparse estimator and its computational complexity is independent of sample size n , which enhances the scalability.

Effective ADAM-type optimizers to speed up (Federated) Deep Learning training process

- Designed a new (Fed) ADAM-typed method by calibrating the A-LR with a softplus function.
- Conducted experiments to show that the proposed methods outperform existing (Fed)ADAM-typed methods and generalize even better than S-Momentum in multiple deep learning tasks.

Matrix completion problem with application in recommender system

- Proposed a new algorithm which utilize side information to improve existing matrix completion methods.
- Designed experiments show that our new proposed approach outperforms three state-of-the-art methods both in simulations and on real world datasets.

Multi-party differential private machine learning algorithms with privacy guarantees

- Developed differentially private decentralized ADMM algorithms.
- Designed stochastic differentially private hard thresholding algorithms for non-convex sparse learning problems.

Conference and Journal Publications

- (1) Jiahao Ding, Guannan Liang, Jinbo Bi and Miao Pan. Differentially Private and Communication Efficient Collaborative Learning, AAAI Conference on Artificial Intelligence (AAAI 2021)
- (2) Tan Zhu, Guannan Liang, Chun Jiang Zhu and Jinbo Bi. Adaptive Strategies for Deep Stochastic Contextual Bandits, AAAI Conference on Artificial Intelligence (AAAI 2021)
- (3) Qianqian Tong, Guannan Liang, Xingyu Cai, Chunjiang Zhu, Jinbo Bi, Asynchronous Parallel Stochastic Quasi-Newton Methods, Parallel Computing Journal (2020).
- (4) Guannan Liang, Qianqian Tong, Jiahao Ding, Miao Pan and Jinbo Bi, Effective Proximal Methods for Non-convex Non-smooth Regularized Learning, International Conference on Data Mining (ICDM 2020)
- (5) Jiahao Ding, Jingyi Wang, Guannan Liang, Jinbo Bi and Miao Pan, Towards Plausible Differentially Private ADMM Based Distributed Machine Learning, International Conference on Information and Knowledge Management (CIKM 2020)
- (6) Berk Alpay, David Wanik, Peter Watson, Diego Cerrai, Guannan Liang, and Emmanouil Anagnostou, Dynamic Modeling of Power Outages Caused by Thunderstorms, Forecasting (2020)

- (7) Guannan Liang, Qianqian Tong, Chunjiang Zhu and Jinbo Bi, An Effective Hard Thresholding Method Based on Stochastic Variance Reduction for Nonconvex Sparse Learning, AAAI Conference on Artificial Intelligence (AAAI 2020)
- (8) Jin Lu, Guannan Liang, Jiangwen Sun and Jinbo Bi , A Sparse Interactive Model for Inductive Matrix Completion, Neural Information Processing Systems(NeurIPS 2016)
- (9) Shaochun Chen, Guannan Liang and Honru Chen , The Convergence of Zienkiewicz Element Under Un-anisotropic Grid, Mathematica Numerica Sinica (2013)

**Manuscripts
Under Review**

- (11) Qianqian Tong, Guannan Liang and Jinbo Bi, Calibrating the Adaptive Learning Rate to Improve Convergence of ADAM , arXiv (2019)
- (12) Qianqian Tong, Guannan Liang and Jinbo Bi, Effective Federated Adaptive Gradient Methods with Non-IID Decentralized Data, arXiv(2020)
- (13) Guannan Liang, Qianqian Tong, Chun Jiang Zhu and Jinbo Bi. Escaping Saddle Points with SCSG Methods.
- (14) Qianqian Tong, Guannan Liang, Tan Zhu, Jinbo Bi. Federated Nonconvex Sparse Learning
- (15) Guannan Liang, Qianqian Tong, Jinbo Bi. Stochastic Privacy-Preserving Methods for Nonconvex Sparse Learning

Certifications

National Computer Rank Examination Database Engineer Certificate (China, 2011)
National Computer Rank Examination C Language Certificate (China, 2010)

Honors

Research Fellowship, Department of Computer Science and Engineering, UCONN, 2020
Doctoral Student Travel Fellowship, University of Connecticut, 2020
Eversource Energy Center Graduate Fellowship, University of Connecticut, 2017-2020
Merit Student Scholarship, Zhengzhou University, 2010-2013
Natural Sciences 1st Prize in Zhengzhou University, National College Student Challenge Cup Competition, 2013
Outstanding Graduate of Zhengzhou University, 2013
Outstanding Student Union Leader of Zhengzhou University, 2012
Outstanding University Student of Henan Province, 2012

**Professional
Services**

Program Committee Member of IJCAI 2021
Program Committee Member of AAAI 2021

**Conference
Talks**

- o Effective Proximal Methods for Non-convex Non-smooth Regularized Learning.
At **ICDM 2020**.
- o An Effective Hard Thresholding Method Based on Stochastic Variance Reduction for Nonconvex Sparse Learning.
At **AAAI 2020**.