ZHIJIE CHEN

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SUMMARY

I am a second-year PhD student in Computer Science at UIUC. I am supervised by Prof. Arindam Banerjee. My research focuses on optimization in machine learning (ML), with a particular emphasis on designing efficient ML optimizers in the context of federated learning. Recently, I have been analyzing the theoretical challenges associated with achieving efficiency in machine learning.

PROFESSIONAL SKILLS

- Programming: Python, Pytorch, Huggingface, Matlab, C++, Gurobi.
- Theory: Optimization Theory, Randomized Algorithms.

EDUCATION

University of Illinois at Urbana-Champaign   *Aug. 2023 - May. 2028 (Expected)*
PhD, Computer Science   *IL, United States*

University of Illinois at Urbana-Champaign   *Aug. 2021 - May 2023*
MSCS, Computer Science   *IL, United States*

Shanghai Jiao Tong University   *Sept. 2016 - Jul. 2021*
B.E., Computer Science and Technology   *Shanghai, China*

RESEARCH EXPERIENCE

Federated Low-Rank Adaptation [Fed-LoRA].   *Aug. 2024 - Mar. 2025*

- Design LoRA paradigms tailored for federated learning to avoid inexact aggregate step.
- Prove convergence of the proposed Fed-LoRA algorithm under rank-deficiency and non-smoothness.
- Validate performance on image classification (ViT), natural language understanding (GPT2) and reasoning (Mistral-7B) tasks.

Communication-Efficient Federated Learning. [Sketch]   *Jan. 2024 - May. 2024*

- Design communication-efficient federated learning algorithms by adopting randomized sketching.
- Combine sketching methods with adaptive gradient clipping to counter heavy-tailed noise in FL.
- Improve existing convergence rates of compressed gradient methods to be dimension-independent.

Efficient Non-smooth Optimization. [RnD]   *Sept. 2021 - Aug. 2022*

- Propose a single-loop projection-free algorithm for constrained non-smooth optimization.
- Prove the sublinear convergence rate for the proposed method.
- Apply the method to supply-chain oriented problems with improved empirical convergence.

GraphEBM: Energy-based Graph Construction in SSL.   *Oct. 2019 - Jan. 2020*

- Propose a probabilistic approach for constructing graph in semi-supervised learning (SSL).
- Develop a scalable algorithm based on energy-based methods to model graph edge distributions.
- Ensure global graph properties by local guidance, grounded with extended Wasserstein distance.

SOFTWARE

1. **MLOpt.** A machine learning framework supporting plug-and-play data/model/optimizer modules.

2. **RnD.** Implementation of primal-dual subgradient methods to solve resilient network design problems.

PUBLICATIONS

1. Zhijie Chen, Yuxing Liu, Arindam Banerjee, *Truncate without Fear: Module Aggregation and Redistribution in Federated Low-Rank Adaptation.* Modular, Collaborative, and Decentralized Deep Learning Workshop at ICLR 2025. [Fed-LoRA]

2. Zhijie Chen, Qiaobo Li, Arindam Banerjee, *Sketched Adaptive Federated Learning: A Sharp Convergence Analysis.* In Submission.[Sketch]

3. Zhijie Chen, *Designing Resilient Lifeline Networks: A Primal-dual Optimization Approach.* Master Thesis. [RnD]

4. Mingquan Feng, Zhijie Chen, Yixin Huang, Yizhou Liu, Junchi Yan, *Optimal Control Operator Perspective and a Neural Adaptive Spectral Method.* AAAI Oral, 2025.

5. Pedro Cisneros-Velarde, Zhijie Chen, Sanmi Koyejo, Arindam Banerjee, *Optimization and Generalization Guarantees for Weight Normalization.* TMLR, 2025.

6. Zhijie Chen, Hongtai Cao, Kevin C.C. Chang, *GraphEBM: Energy-based Graph Construction for Semi-Supervised Learning.* IEEE International Conference on Data Mining (ICDM), 2020.