Junyi Li

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Research Interest

My research interests lie primarily in the field of machine learning, with a specialized focus on optimization problems and Federated Learning (FL). I'm specifically intrigued by bilevel optimization issues within machine learning and the unique challenges that arise in a FL setting. Recently, I have developed an interest in foundation models, focusing on the trustworthiness of Large Language Models (LLMs) and their efficient training in distributed environments.

Education

University of Maryland, College Park — *College Park, MD*
Ph.D. in Computer Science — *Jan. 2024 - Dec.2024*

University of Pittsburgh — *Pittsburgh, PA*
Ph.D. in Machine Learning — *Sep. 2019 - Dec.2023*

University of Michigan, Ann Arbor — *Ann Arbor, MI*
M.S. in Signal and Image Processing & ML — *Sep. 2017 - Dec. 2018*

Fudan University — *Shanghai, China*
B.S. in Micro-electronics Engineering — *Sep. 2013 - June. 2017*

Work Experience

Alexa AI Natural Understanding, Amazon.com — *Boston, MA*
Applied Scientist Intern — *May 2023 - Aug 2023*

- Recent findings indicate that Large Language Models (LLMs) can express viewpoints that resonate with a particular group when presented with subjective queries.
- We delves into the steerability of LLMs, examining their alignment with the perspectives of various personas. These personas are identified in a data-driven way, specifically derived from survey-based question-and-answer pairs.
- Furthermore, we have trained a prompting network to influence the LLMs' outputs based on a continuous embedding vector of personas.

On Amp, Amazon.com — *Los Angeles, CA*
Applied Scientist Intern — *May 2022 - Aug 2022*

- Amp is a live-streaming platform developed with music enthusiasts in mind, providing a space where fans can engage with their preferred artists. However, personalizing recommendations for fans who are newcomers to the platform presents a unique challenge.
- To address this, we developed a service that tailors show and artist recommendations to recently joined users. This system utilizes auxiliary information to deliver personalized content.
- By incorporating a random forest model, we managed to enhance the recommendation performance for new users, achieving over a three percent improvement. This indicates a promising step forward in fine-tuning our platform's user experience for new users.

JD Digits — *Mountain View, CA*
Research Intern — *May 2019 - Aug 2019*

- Homomorphic Encryption (HE) can conduct computations over an encrypted field and enables secure model learning outsourcing to powerful public cloud computing environments that might not be fully trusted. However, the high computational complexity of HE-based training makes its application to large-scale problems an open question.
- We have developed a novel, distributed, HE-based data mining framework to address the scalability issue, where we leverage slightly higher communication overhead to create a shallower computational circuit in HE, thereby reducing overall complexity.
- Our framework's efficiency and effectiveness have been demonstrated across various algorithms and benchmark datasets: we train a logistic regression model to distinguish between the digits 3 and 8 in roughly 5 minutes, which would take a centralized counterpart nearly 2 hours.

Selected Publications

FedDA: Faster Framework of Local Adaptive Gradient Methods via Restarted Dual Averaging
Junyi Li, Feihu Huang, Heng Huang
To appear in ICLR 2024 (2024). 2024

Device-Wise Federated Network Pruning
Shangqian Gao*, **Junyi Li***, Zeyu Zhang, Yanfu Zhang, Weidong Cai, Heng Huang
To appear in CVPR 2024 (2024). 2024

FedSep: Separating Communication and Learning in Federated Learning
Junyi Li, Heng Huang
Advances in Neural Information Processing Systems 36 (2023). 2023

Communication-Efficient Federated Bilevel Optimization with Local and Global Lower Level Problems
Junyi Li, Feihu Huang, Heng Huang
Advances in Neural Information Processing Systems 36 (2023). 2023

Communication-efficient robust federated learning with noisy labels
Junyi Li, Jian Pei, Heng Huang
Proceedings of the 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, 2022

A fully single loop algorithm for bilevel optimization without hessian inverse
Junyi Li, Bin Gu, Heng Huang
Proceedings of the AAAI Conference on Artificial Intelligence, 2022

Full List of Publications

Conference Proceedings

On the steerability of large language models toward data-driven personas
Junyi Li, Ninareh Mehrabi, Charith Peris, Palash Goyal, Kai-Wei Chang, Aram Galstyan, Richard Zemel, Rahul Gupta
To appear in NAACL 2024 (2024). 2024

Device-Wise Federated Network Pruning
Shangqian Gao*, **Junyi Li***, Zeyu Zhang, Yanfu Zhang, Weidong Cai, Heng Huang
To appear in CVPR 2024 (2024). 2024

FedDA: Faster Framework of Local Adaptive Gradient Methods via Restarted Dual Averaging
Junyi Li, Feihu Huang, Heng Huang
To appear in ICLR 2024 (2024). 2024

Dropout Enhanced Bilevel Training
Peiran Yu, **Junyi Li**, Huang Heng
To appear in ICLR 2024 (2024). 2024

Adaptive Federated Minimax Optimization with Lower complexities
Feihu Huang, Xinrui Wang, **Junyi Li**, Songcan Chen
To appear in AISTATS 2024 (2024). 2024

FedSep: Separating Communication and Learning in Federated Learning
Junyi Li, Heng Huang
Advances in Neural Information Processing Systems 36 (2023). 2023

Communication-Efficient Federated Bilevel Optimization with Local and Global Lower Level Problems
Junyi Li, Feihu Huang, Heng Huang
Advances in Neural Information Processing Systems 36 (2023). 2023

Federated Conditional Stochastic Optimization
Xidong Wu, Jianhui Sun, Zhengmian Hu, **Junyi Li**, Aidong Zhang, Heng Huang
Advances in Neural Information Processing Systems 36 (2023). 2023

Enhanced bilevel optimization via bregman distance
Feihu Huang, **Junyi Li**, Shangqian Gao, Heng Huang
Advances in Neural Information Processing Systems 35 (2022) pp. 28928–28939. 2022

Communication-efficient robust federated learning with noisy labels
Junyi Li, Jian Pei, Heng Huang
Proceedings of the 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, 2022

On the convergence of local stochastic compositional gradient descent with momentum
Hongchang Gao, **Junyi Li**, Heng Huang
International Conference on Machine Learning, 2022

A fully single loop algorithm for bilevel optimization without hessian inverse
Junyi Li, Bin Gu, Heng Huang
Proceedings of the AAAI Conference on Artificial Intelligence, 2022

Super-adam: faster and universal framework of adaptive gradients
Feihu Huang, **Junyi Li**, Heng Huang
Advances in Neural Information Processing Systems 34 (2021) pp. 9074–9085. 2021

Faster secure data mining via distributed homomorphic encryption
Junyi Li, Heng Huang
Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, 2020

Generating realistic stock market order streams
Junyi Li, Xintong Wang, Yaoyang Lin, Arunesh Sinha, Michael Wellman
Proceedings of the AAAI Conference on Artificial Intelligence, 2020

Preprints

FedGRec: Federated Graph Recommender System with Lazy Update of Latent Embeddings
Junyi Li, Heng Huang
FL: Recent Advances and New Challenges (FL-NeurIPS'22) (2022). 2022

Biadam: Fast adaptive bilevel optimization methods
Feihu Huang, **Junyi Li**, Shangqian Gao
arXiv preprint arXiv:2106.11396 (2021). 2021

Compositional federated learning: Applications in distributionally robust averaging and meta learning
Feihu Huang, **Junyi Li**, Heng Huang
arXiv preprint arXiv:2106.11264 (2021). 2021

Improved bilevel model: Fast and optimal algorithm with theoretical guarantee
Junyi Li, Bin Gu, Heng Huang
arXiv preprint arXiv:2009.00690 (2020). 2020

Professional Services

PC member/Reviewer for Conferences **NeurIPS**, **ICML**, **ICLR**, **AAAI**, **CVPR**,**ACL**, **NAACL**, **ICCV**, **KDD**

Awards and Honors

Travel Grant/Scholar Award: **ICML** 2022, **NeurIPS** 2023

Teaching Experience

C++ Programming The course covers fundamental concepts and techniques for solving problems using C++.

Neuro-signal modeling & analysis The course focuses on statistical theory and practical application related to brain imaging analysis.