

Zirui (Ray) Liu

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RESEARCH INTEREST

- Large-scale machine learning in general;
- Randomized algorithms;
- Scaling up machine learning solutions to scientific and social computing problems.

EDUCATION

- **Rice University** Houston, TX
Ph.D. Candidate in Computer Science, Advised by Prof Xia Hu Aug. 2021 – Expected Aug. 2024
- **Texas A&M University (Transfer Out)** College Station, TX
Ph.D. Student in Computer Science, Advised by Prof Xia Hu Aug. 2019 – Aug. 2021
- **Harbin Institute of Technology** Harbin, China
Electrical Engineering, Master of Engineering Sep. 2016 – Jun. 2018
- **Harbin Institute of Technology** Harbin, China
Electrical Engineering, Bachelor of Science Sep. 2012 – Jul. 2016

PREPRINT

1. **Zirui Liu**, Zhaozhuo Xu, Beidi Chen, Yuxin Tang, Jue Wang, Kaixiong Zhou, Xia Hu, Anshumali Shrivastava “*Compress, Then Prompt: Improving Accuracy-Efficiency Trade-off of LLM Inference with Transferable Prompt*”, ArXiv Preprint, [PDF](#)
2. Cameron Diao, Kaixiong Zhou, **Zirui Liu**, Xiao Huang, Xia Hu “*MolCPT: Molecule Continuous Prompt Tuning to Generalize Molecular Representation Learning*”, Under Review

PUBLICATION

1. **Zirui Liu**, Guanchu Wang, Shaochen Zhong, Zhaozhuo Xu, Daochen Zha, Ruixiang Tang, Zhimeng Jiang, Kaixiong Zhou, Vipin Chaudhary, Shuai Xu, and Xia Hu “*Winner-Take-All Column Row Sampling for Memory Efficient Adaptation of Language Model*”, The 37th Conference on Neural Information Processing Systems (**NeurIPS**), 2023, [PDF](#)
2. **Zirui Liu***, Zhimeng Jiang*, Shaochen Zhong, Kaixiong Zhou, Li Li, Rui Chen, Soo-Hyun Choi and Xia Hu. “*Editable Graph Neural Network for Node Classifications*”, The 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining on Mining and Learning with Graphs Workshop (**KDD MLG Workshop**), 2023. [PDF](#)
3. **Zirui Liu**, Kaixiong Zhou, Zhimeng Jiang, Li Li, Rui Chen, Soo-Hyun Choi, and Xia Hu. “*DSpar: Embarrassingly Simple Strategy for Efficient GNN training and inference via Degree-based Sparsification*”, Transactions on Machine Learning Research (**TMLR**), 2023. [PDF](#)
4. **Zirui Liu**, Shengyuan Chen, Kaixiong Zhou, Daochen Zha, Xiao Huang, and Xia Hu. “*RSC: Accelerating Graph Neural Networks Training via Randomized Sparse Computations*”, The 40th International Conference on Machine Learning (**ICML**), 2023. [PDF](#)

5. **Zirui Liu**, Qingquan Song, Li Li, Soo-Hyun Choi, Rui Chen, and Xia Hu. “*PME: Pruning-based Multi-size Embedding for Recommender Systems*”, **Frontier in Big Data**, 2023. [PDF](#)
6. **Zirui Liu**, Kaixiong Zhou, Fan Yang, Li Li, Rui Chen, and Xia Hu. “*EXACT: Scalable Graph Neural Networks Training via Extreme Activation Compression*”, The 10th International Conference on Learning Representations (**ICLR**), 2022. [PDF](#)
7. **Zirui Liu***, Haifeng Jin*, Ting-Hsiang Wang, Kaixiong Zhou and Xia Hu. “*DivAug: Plug-in Automated Data Augmentation with Explicit Diversity Maximization*”, The 18th International Conference on Computer Vision (**ICCV**), 2021. [PDF](#)
8. **Zirui Liu**, Qingquan Song, Kaixiong Zhou, Ting-Hsiang Wang, Ying Shan, and Xia Hu. “*Detecting Interactions from Neural Networks via Topological Analysis*”, The 35th Conference on Neural Information Processing Systems (**NeurIPS**), 2021. [PDF](#)
9. **Zirui Liu**, Ming Yang, and Dianguo Xu. “*A novel algorithm for on-line inertia identification via adaptive recursive least squares*”, The 43rd Annual Conference of the IEEE Industrial Electronics Society, **IECON** 2017. [PDF](#)
10. **Zirui Liu**, Ming Yang, Jiang Long, Dianguo Xu. “*Speed measurement error reduction via adaptive strong tracking Kalman filters*”, IEEE Transportation Electrification Conference and Expo, Asia-Pacific, (**ITEC Asia-Pacific**), 2017. [PDF](#)
11. Ruixiang Tang*, Jiayi Yuan*, Yiming Li, **Zirui Liu**, Rui Chen, and Xia Hu “*Setting the Trap: Capturing and Defeating Backdoor Threats in PLMs through Honeypots* ”, The 37th Conference on Neural Information Processing Systems (**NeurIPS**), 2023,
12. Shaochen Zhong, Zaichuan You, Jiamu Zhang, Sebastian Zhao, Zachary LeClaire, **Zirui Liu**, Vipin Chaudhary, Shuai Xu, and Xia Hu “*One Less Reason for Filter Pruning: Gaining Free Adversarial Robustness with Structured Grouped Kernel Pruning*”, The 37th Conference on Neural Information Processing Systems (**NeurIPS**), 2023,
13. Xiaotian Han*, Zhimeng Jiang*, Hongye Jin*, **Zirui Liu**, Na Zou, Qifan Wang, Xia Hu. “*Retiring ΔDP : New Distribution-Level Metrics for Demographic Parity*”, Transactions on Machine Learning Research (**TMLR**), 2023. [PDF](#)
14. Guanchu Wang, **Zirui Liu**, Zhimeng Jiang, Ninghao Liu, Na Zou, and Xia Hu. “*DIVISION: Memory Efficient Training via Dual Activation Precision*”, The 40th International Conference on Machine Learning (**ICML**), 2023. [PDF](#)
15. Daochen Zha, Louis Feng, Liang Luo, Bhargav Bhushanam, **Zirui Liu**, Yusuo Hu, Jade Nie, Yuzhen Huang, Yuandong Tian, Arun Kejariwal, and Xia Hu. “*Pre-train and Search: Efficient Embedding Table Sharding with Pre-trained Neural Cost Models*”, The 6th Conference on Machine Learning and Systems (**MLSys**), 2023. [PDF](#)
16. Daochen Zha, Louis Feng, Qiaoyu Tan, **Zirui Liu**, Kwei-Herng Lai, Bhargav Bhushanam, Yuandong Tian, Arun Kejariwal, and Xia Hu. “*DreamShard: Generalizable Embedding Table Placement for Recommender Systems*”, The 36th Conference on Neural Information Processing Systems (**NeurIPS**), 2022. [PDF](#)
17. Keyu Duan, **Zirui Liu**, Wenqing Zheng, Peihao Wang, Kaixiong Zhou, Tianlong Chen, Zhangyang Wang and Xia Hu. “*A Comprehensive Study on Large-Scale Graph Training: Benchmarking and Rethinking*”, The 36th Conference on Neural Information Processing Systems (**NeurIPS**), 2022. [PDF](#)
18. Kaixiong Zhou, **Zirui Liu**, Rui Chen, Li Li, Soo-Hyun Choi, and Xia Hu. “*Table2Graph: Transforming Tabular Data to Unified Weighted Graph*”, The 31st International Joint Conference on Artificial Intelligence (**IJCAI**), 2022. [PDF](#)

19. Zhimeng Jiang, Kaixiong Zhou, **Zirui Liu**, Li Li, Rui Chen, Soo-Hyun Choi, and Xia Hu. “*An Information Fusion Approach to Learning with Instance-Dependent Label Noise*”, The 10th International Conference on Learning Representations (**ICLR**), 2022. [PDF](#)
20. Ruixiang Tang, Mengnan Du, Yuening Li, **Zirui Liu** and Xia Hu. “*Mitigating Gender Bias in Captioning Systems*”, The 32nd Web Conference (**WWW**) 2021. [PDF](#)
21. Ting-Hsiang Wang , Qingquan Song, Xiaotian Han, **Zirui Liu**, Haifeng Jin, and Xia Hu. “*AutoRec: An Automated Recommender System*”, The 15th ACM Conference on Recommender Systems (Demo track) (**RecSys Demo paper**), 2021. [PDF](#)
22. Zhigang Qu, Liqun Wu, Bin Yue, Yang An, **Zirui Liu**, Pengfei Zhao, Jikui Luo, Yuedong Xie, Ying Liu, Qiuyu Wang, Zhiyuan Wang, Rui Dai, and Wuliang Yin. “*Eccentric triboelectric nanosensor for monitoring mechanical movements*”, Nano Energy, 2019. [PDF](#)
23. Ming Yang, Na Chai, **Zirui Liu**, Boyang Ren, and Dianguo Xu. “*Motor speed signature analysis for local bearing fault detection with noise cancellation based on improved drive algorithm*”, IEEE Transactions on Industrial Electronics, 2019. [PDF](#)
24. Ming Yang, **Zirui Liu**, Jiang Long, Wanying Qu, and Dianguo Xu. “*An algorithm for online inertia identification and load torque observation via adaptive Kalman observer-recursive least squares*”, Energies, 2019. [PDF](#)
25. Yingqiang Li, Ming Yang, Jiang Long, **Zirui Liu**, and Dianguo Xu. “*Current sensorless predictive control based on extended Kalman filter for PMSM drives*”, IEEE Transportation Electrification Conference and Expo, Asia-Pacific, (**ITEC Asia-Pacific**), 2017. [PDF](#)

BOOK CHAPTER

Kaixiong Zhou, **Zirui Liu**, Keyu Duan, and Xia Hu. “*Graph Neural Networks: AutoML*”, in **Graph Neural Networks: Foundations, Frontiers, and Applications**.

RECOGNITION & AWARDS

- Rice Graduate Fellowship 2021
- The GMCC’s Scholarship (Corporation Scholarship) 2015
- The MOONS’ Scholarship (Corporation Scholarship) 2013
- First Prize of Excellent Student Scholarship of HIT. 2012, 2013

INDUSTRY EXPERIENCES

- **Linkedin** Sunnyvale, CA
Research Intern, Advertisement AI team, advised by Dr. Qingquan Song. May. 2023 – Aug. 2023
 - Improving the inference efficiency of language models via dynamic sparsity.
- **Meta** Sunnyvale, CA
Research Intern, Capacity Engineering and Analysis team. May. 2022 – Aug. 2022
 - Incorporating semi-supervised learning for improving advertisement models.
- **Samsung Research America** Remote
Research Intern, Advertisement AI team, advised by Dr. Li Li and Dr. Rui Chen. May. 2021 – Aug. 2021
 - Incorporating the graph structure into the App embeddings for improving the click-through-rate.
- **4Paradigm** Beijing, China
Research Developer Intern, Advised by Mr. Xiawei Guo. Mar. 2019 – Aug. 2019
 - Developed the automated machine learning system for tabular data.

TEACHING

- Guest Lecturer, COMP 631: Introduction to Information Retrieval, Rice University 2023
- Teaching Assistant, COMP 631: Introduction to Information Retrieval, Rice University 2022, 2023

SELECTED MENTORSHIP

- **Keyu Duan** **Fall 2021 – Present**
Ph.D. Student *National University of Singapore*
- **Guanchu Wang** **Fall 2021 – Present**
Ph.D. Student *Rice University*
- **Shengyuan Chen** **Summer 2022 – Present**
Ph.D. Student *The Hong Kong Polytechnic University*
- **Henry Zhong** **Fall 2022 – Present**
Ph.D. Student *Rice University*
- **Jiayi Yuan** **Fall 2022 – Present**
Ph.D. Student *Rice University*
- **Jeff Wang** **Summer 2023 – Present**
Ph.D. Student *Rice University*

SERVICE

- **Program Committee Member:** NeurIPS, ICML, ICLR, KDD, ICCV
Journal Reviewers: TPAMI, TKDD, TMLR