Linjian Ma

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RESEARCH STATEMENT

My research interests lie in the intersection of numerical algorithms, high performance computing and system. In particular, I'm now focusing on developing efficient numerical algorithms and parallel systems for tensor computations with applications in quantum algorithms, quantum simulation and data analytics. Previously, I worked on optimization and efficient compression methods of neural networks.

EDUCATION BACKGROUNDS

University of Illinois at Urbana-Champaign August 2019 - Expected 2023
PhD, Computer Science, Advisor: *Edgar Solomonik* GPA: 3.93/4.0
Area: Scientific Computing

University of California, Berkeley August 2018 - May 2019
MEng, Computer Science, Advisor: *Michael Mahoney* Major GPA: 3.94/4.0
Track: Data Science & Systems

University of Illinois at Urbana-Champaign August 2016 - May 2018
MS, Mechanical Engineering, Advisor: *N.R. Aluru* GPA: 3.97/4.0
Concentration: Computational Science and Engineering

Zhejiang University August 2012 - June 2016
BE, Energy Engineering, Advisor: *Tao Wang and Zhongyang Luo* GPA: 3.95/4.0
Graduate with Honors, Chu Kochen Honors College Ranking: 1/155

EXPERIENCES

Lab for Parallel Numerical Algorithms, UIUC August 2019 - Now
Research Assistant, Advisor: *Edgar Solomonik*
Topic: *On efficient algorithms and systems for numerical tensor algebra*

Lawrence Berkeley National Laboratory May 2020 - August 2020
Research Intern, Advisor: *Chao Yang*
Topic: *Analyzing quantum algorithms based on low-rank approximation*

Wave Computing & Berkeley AI Research (BAIR) May 2019 - August 2019
Machine Learning Intern
Topic: *Compressing large scale neural networks based on second-order information*

RiseLab, UC Berkeley August 2018 - May 2019
Research Assistant, Advisor: *Michael Mahoney*
Capstone project: *Second-order optimization of neural network learning*

Beckman Institute, UIUC August 2016 - December 2017
Research Assistant, Advisor: *N.R. Aluru*
Thesis: *A multiscale model for the oxide ion conducting and proton conducting solid oxide cells*

SKILLS

Programming Languages C/C++, Python, Go, Bash, Matlab, CUDA
ML Frameworks Pytorch, TensorFlow

PUBLICATIONS

[1] **Linjian Ma***, Jiayu Ye*, and Edgar Solomonik, AutoHOOT: Automatic High-Order Optimization for Tensors, *International Conference on Parallel Architectures and Compilation Techniques (PACT'20)*, 2020. [link]

[2] Navjot Singh, **Linjian Ma**, Hongru Yang, Edgar Solomonik, Comparison of Accuracy and Scalability of Gauss-Newton and Alternating Least Squares for CP Decomposition, *arXiv:1910.12331,* 2019. [link]

[3] Sheng Shen, Zhen Dong, Jiayu Ye, **Linjian Ma**, Zhewei Yao, Amir Gholami, Michael W. Mahoney, Kurt Keutzer, Q-BERT: Hessian Based Ultra Low Precision Quantization of BERT, *AAAI 2020,* 2019. [link]

[4] **Linjian Ma***, Gabe Montague*, Jiayu Ye*, Zhewei Yao, Amir Gholami, Kurt Keutzer, Michael W. Mahoney, Inefficiency of K-FAC for Large Batch Size Training, *AAAI 2020,* 2019. [link]

[5] **Linjian Ma** and Edgar Solomonik, Accelerating Alternating Least Squares for Tensor Decomposition by Pairwise Perturbation, *arXiv:1811.10573,* 2018. [link]

[6] **Linjian Ma**, A Multiscale Model for the Oxide Ion Conducting and Proton Conducting Solid Oxide Cells, *MS thesis, University of Illinois at Urbana-Champaign*, 2018. [link]

[7] **Linjian Ma**, Pikee Priya, and N. R. Aluru, A Multiscale Model for Electrochemical Reactions in LSCF Based Solid Oxide Cells, *Journal of the Electrochemical Society*, 2018. [link]

HONORS AND AWARDS

Computer Science Gene Golub Fellowship, UIUC	2019
Graduate with Honor, ZJU	2016
Meritorious Winner, Mathematical Contest In Modeling (MCM)	2015
National Scholarship for Undergraduate, ZJU	2014
The First Class Scholarship for Outstanding Students, ZJU	2013 - 2014
The First Prize in China Undergraduates Mathematical Contest	2013

PRESENTATIONS

Upcoming presentations	SIAM'CSE 2021
First author presentations	PACT 2020, SIAM'PP 2020, Berkeley'SCseminar 2019, USNCCM 2017
Posters	SIAM'PP 2020, AAAI 2020

SERVICES

Teaching Assistant	CS 450 Numerical Analysis (Fall 2020)

SELECTED COURSEWORK

UIUC	*Computer Science:* Parallel Programming, Computer System Organization, Distributed Systems, Parallel Numerical Algorithms *Algorithm:* Algorithm, Randomized Algorithms for Big Data *Applied Physics:* Quantum Information Theory, Thermal & Statistical Physics, Molecular Electronic Structure, Mathematical Methods II *Computational Science:* Numerical Methods for PDEs, Computational Mechanics, Numerical Fluid Dynamics, Atomic Scale Simulations, Numerical Analysis
UC Berkeley	*ML:* Introduction to Machine Learning, Convex Optimization, Understanding Deep Neural Networks, Principles of Data Science