Linjian Ma

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RESEARCH INTERESTS

Numerical analysis	numerical linear algebra, tensor decompositions, tensor networks, randomized algorithms, numerical optimizations
High performance computing	parallel algorithms, communication-avoiding algorithms, scalable mathematical systems
Quantum computing	quantum linear algebra, simulation of quantum algorithms

EDUCATION BACKGROUNDS

University of Illinois at Urbana-Champaign — August 2019 - Expected 2023
PhD, Computer Science, Advisor: *Edgar Solomonik* — GPA: 3.97/4.0
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

HONORS AND AWARDS

Kenichi Miura Award, UIUC — 2021

Mavis Future Faculty Fellow, UIUC — 2021-2022

SIAM Student Travel Award, CSE21, LA21 — 2021

Kuck Computational Science & Engineering Scholarship, UIUC — 2020

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'PP 2022
First author presentations	SIAM'LA 2021, IPDPS 2021, SIAM'CSE 2021, PACT 2020, SIAM'PP 2020, Berkeley'SCseminar 2019, USNCCM 2017
Posters	NeurIPS 2021, SIAM'PP 2020, AAAI 2020

PUBLICATIONS

[1] **Linjian Ma** and Chao Yang, Low Rank Approximation in Simulations of Quantum Algorithms, *Journal of Computational Science,* 2022. [link]

[2] **Linjian Ma** and Edgar Solomonik, Accelerating Alternating Least Squares for Tensor Decomposition by Pairwise Perturbation, *Numerical Linear Algebra with Applications (NLAA)*, 2022. [link]

[3] **Linjian Ma** and Edgar Solomonik, Fast and Accurate Randomized Algorithms for Low-rank Tensor Decompositions, *Conference on Neural Information Processing Systems (NeurIPS'21)*, 2021. [link]

[4] Navjot Singh, **Linjian Ma**, Hongru Yang, and Edgar Solomonik, Comparison of Accuracy and Scalability of Gauss-Newton and Alternating Least Squares for CP Decomposition, *SIAM Journal on Scientific Computing (SISC),* 2021. [link]

[5] **Linjian Ma** and Edgar Solomonik, Efficient Parallel CP Decomposition with Pairwise Perturbation and Multi-sweep Dimension Tree, *International Parallel and Distributed Processing Symposium (IPDPS'21)*, 2021. [link]

[6] **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]

[7] Sheng Shen, Zhen Dong, Jiayu Ye, **Linjian Ma**, Zhewei Yao, Amir Gholami, Michael W. Mahoney, and Kurt Keutzer, Q-BERT: Hessian Based Ultra Low Precision Quantization of BERT, *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI'20),* 2020. [link]

[8] **Linjian Ma***, Gabe Montague*, Jiayu Ye*, Zhewei Yao, Amir Gholami, Kurt Keutzer, and Michael W. Mahoney, Inefficiency of K-FAC for Large Batch Size Training, *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI'20),* 2020. [link]

[9] **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]

PREPRINTS AND TECHNICAL REPORTS

[1] Zhewei Yao, **Linjian Ma**, Sheng Shen, Kurt Keutzer, and Michael W. Mahoney, MLPruning: A Multilevel Structured Pruning Framework for Transformer-based Models, *arXiv:2105.14636,* 2021. [link]

[2] **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]

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*

Center for Computational Quantum Physics, Flatiron Institute June 2021 - August 2021
Research Intern, Advisor: *Miles Stoudenmire* and *Matthew Fishman*
Topic: *Automatic differentiation systems for tensor networks*

Lawrence Berkeley National Laboratory May 2020 - August 2020
Research Intern, Advisor: *Chao Yang*
Topic: *Low-rank approximation in simulations of quantum algorithms*

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*

SERVICES

Teaching Assistant CS 450 Numerical Analysis (Fall 2020)
CS 554 Parallel Numerical Algorithms (Fall 2021)

SKILLS

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

SELECTED COURSEWORK

UIUC
Computer Science: Parallel Programming, Computer System Organization, Distributed Systems, Parallel Numerical Algorithms
Algorithm: Algorithm, Approximation Algorithms, Randomized Algorithms, High-Dimensional Geometric Data Analysis, Statistical learning theory
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