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: 3.96/4.0
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

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

PUBLICATIONS

[1] **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]

[2] 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]

[3] **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]

[4] **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]

[5] 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, *AAAI'20,* 2020. [link]

[6] **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, *AAAI'20,* 2020. [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]

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** and Chao Yang, Low Rank Approximation in Simulations of Quantum Algorithms, *arXiv:2104.11396,* 2021. [link]

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

[4] **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]

RESEARCH 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