

# Linjian Ma

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## RESEARCH INTERESTS

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

## EDUCATION BACKGROUNDS

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<b>University of Illinois at Urbana-Champaign</b> PhD, Computer Science, Advisor: <i>Edgar Solomonik</i> Area: Scientific Computing	August 2019 - Expected 2023 GPA: 3.96/4.0
<b>University of California, Berkeley</b> MEng, Computer Science, Advisor: <i>Michael Mahoney</i> Track: Data Science & Systems	August 2018 - May 2019 Major GPA: 3.94/4.0
<b>University of Illinois at Urbana-Champaign</b> MS, Mechanical Engineering, Advisor: <i>N.R. Aluru</i> Concentration: Computational Science and Engineering	August 2016 - May 2018 GPA: 3.97/4.0
<b>Zhejiang University</b> BE, Energy Engineering, Advisor: <i>Tao Wang and Zhongyang Luo</i> Graduate with Honors, Chu Kochen Honors College	August 2012 - June 2016 GPA: 3.95/4.0

## HONORS AND AWARDS

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<b>Kenichi Miura Award</b> , UIUC	2021
<b>Mavis Future Faculty Fellow</b> , UIUC	2021-2022
<b>SIAM Student Travel Award</b> , CSE21, LA21	2021
<b>Kuck Computational Science &amp; Engineering Scholarship</b> , UIUC	2020
<b>Computer Science Gene Golub Fellowship</b> , UIUC	2019
<b>Graduate with Honor</b> , ZJU	2016
<b>Meritorious Winner</b> , Mathematical Contest In Modeling (MCM)	2015
<b>National Scholarship</b> for Undergraduate, ZJU	2014
<b>The First Class Scholarship</b> for Outstanding Students, ZJU	2013-2014
<b>The First Prize</b> in China Undergraduates Mathematical Contest	2013

## PRESENTATIONS

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<b>Upcoming presentations</b>	SIAM'PP 2022, NeurIPS 2021
<b>First author presentations</b>	SIAM'LA 2021, IPDPS 2021, SIAM'CSE 2021, PACT 2020, SIAM'PP 2020, Berkeley'SCseminar 2019, USNCCM 2017
<b>Posters</b>	SIAM'PP 2020, AAI 2020

## PUBLICATIONS

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- [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, *Proceedings of the AAAI Conference on Artificial Intelligence (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, *Proceedings of the AAAI Conference on Artificial Intelligence (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

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- [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

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<b>Lab for Parallel Numerical Algorithms, UIUC</b> Research Assistant, Advisor: <i>Edgar Solomonik</i> Topic: <i>On efficient algorithms and systems for numerical tensor algebra</i>	August 2019 - Now
<b>Center for Computational Quantum Physics, Flatiron Institute</b> Research Intern, Advisor: <i>Miles Stoudenmire</i> and <i>Matthew Fishman</i> Topic: <i>Automatic differentiation systems for tensor networks</i>	June 2021 - August 2021
<b>Lawrence Berkeley National Laboratory</b> Research Intern, Advisor: <i>Chao Yang</i> Topic: <i>Low-rank approximation in simulations of quantum algorithms</i>	May 2020 - August 2020
<b>Wave Computing &amp; Berkeley AI Research (BAIR)</b> Machine Learning Intern Topic: <i>Compressing large scale neural networks based on second-order information</i>	May 2019 - August 2019

**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

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**Teaching Assistant**

CS 450 Numerical Analysis (Fall 2020)

CS 554 Parallel Numerical Algorithms (Fall 2021)

## SKILLS

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**Programming Languages**

Python, C/C++, Julia, Go, Matlab, CUDA

**ML Frameworks**

Pytorch, TensorFlow

## SELECTED COURSEWORK

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**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