Alok Tripathy

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Research Interests

I am interested in the intersection of high-performance computing and deep learning to enable new types of machine learning. Currently, I am working on scalable graph neural network models and sparse ML. I am also interested in applying deep learning to science problems.

Education

Aug 2019 present	**University of California — Berkeley**, *Berkeley, CA* Ph.D. in Computer Science Advised by **Aydın Buluç** and **Katherine Yelick**
Aug 2015 May 2019	**Georgia Institute of Technology**, *Atlanta, GA* B.S. in Computer Science Graduated with Highest Honors

Research Experience

Aug 2019 present	**Research Affiliate**, *Computational Research Division*, Lawrence Berkeley National Laboratory • Studying algorithms for distributed graph neural network training. • Applying graph neural networks to domain science problems. • Mentors: Dr. Aydın Buluç and Dr. Katherine Yelick
May 2021 Sep 2021	**Applied Research Scientist Intern**, *Deep Graph Library (DGL)*, Amazon Web Services (AWS) • Designed algorithms for accelerating GNN training on heterogeneous graphs. • Mentors: Dr. Da Zheng, Dr. Israt Nisa, Dr. Xiang Song.
Nov 2015 May 2019	**Research Assistant**, *High Performance Computing Lab*, Georgia Institute of Technology • Designed high-performance graph algorithms on CPU and GPU. • Mentors: Dr. Oded Green.
Jun 2017 Aug 2017	**Research Intern**, *École polytechnique fédérale de Lausanne (EPFL)*, Lausanne, Switzerland • Developed cache-efficient and NUMA-aware graph memory layout for BFS and PageRank. • Mentors: Dr. Jasmina Malicevic and Dr. Willy Zwanepoel
Jun 2016 Aug 2016	**Research Intern**, *Sandia National Laboratories*, Livermore, CA • Implemented distributed cache coherency protocol using *Go*. • Automated function summary generation for symbolic execution using *Python, angr*.

Publications

2021	O. Selvitopi, B. Brock, I. Nisa, A. Tripathy, K. Yelick, A. Buluç **Distributed-Memory Parallel Algorithms for Sparse Times Tall-Skinny-Dense Matrix Multiplication**. *ACM International Conference on Supercomputing (ICS) 2021*, virtual
2020	A. Tripathy, O. Green **Accurately and Efficiently Estimating Dynamic Point-to-Point Shortest Path**. *IEEE BigGraphs Workshop at International Conference on Big Data 2020*, virtual
2020	A. Tripathy, K. Yelick, A. Buluç **Reducing Communication in Graph Neural Network Training**. *ACM/IEEE International Conference for High Performance Computing, Networking, Storage, and Analysis (SC) 2020*, virtual
2019	J. Fox, A. Tripathy, O. Green. **Improving Scheduling for Irregular Applications with Logarithmic Radix binning**. *IEEE High Performance Extreme Computing (HPEC) 2019*, Waltham, MA
2018	A. Tripathy, O. Green. **Scaling Betweenness Centrality in Dynamic Graphs**. *IEEE High Performance Extreme Computing (HPEC) 2018*, Waltham, MA
2018	A. Tripathy, F. Hohman, D. H. Chau, O. Green. **Scalable K-Core Decomposition for Static Graphs Using a Dynamic Graph Data Structure**. *IEEE International Conference on Big Data 2018*, Seattle, WA
2018	**[Innovation Award]** O. Green, J. Fox, A. Watkins. A. Tripathy, K. Gabert, E. Kim, Xiaojing A., K. Aatish, D. Bader. **Logarithmic Radix Binning and Vectorized Triangle Counting**. *IEEE High Performance Extreme Computing (HPEC) 2018, Waltham, MA*
2018	A. Tripathy, O. Green. **Accurately and Efficiently Estimating Dynamic Point-to-Point Shortest Path**. Senior Thesis.

Preprints

2021	A. Tripathy, O. Green **Scalable Hash Table for NUMA Systems**. *arXiv:2104.00792*

Teaching Experience

Aug 2021 Dec 2021	**Head Teaching Assistant**, *Introduction to Parallel Programming (CS 194-15)*, University of California — Berkeley • Wrote and graded new homework assignments and exam questions, and led both semiweekly lab sections and office hours
Jan 2021 May 2021	**Teaching Assistant**, *Applications of Parallel Computers (CS 267)*, University of California — Berkeley • Led weekly office hours, labs for homework assignments, graded homework assignments and projects
Jan 2016 May 2019	**Teaching Assistant**, *Data Structures and Algorithms (CS 1332)*, Georgia Institute of Technology • Led weekly recitations, office hours, designed, proctored, plagiarism detection, and graded exams • **Senior TA**: wrote recitation guides, exams/practice exams, and delegated tasks to 27 TAs (Aug 2018-May 2019).

Jun 2015	**Teaching Assistant**, *Program in Algorithmic and Combinatorial Thinking*, Princeton University
Aug 2015	• Mentored high school students in a summer theoretical computer science program on discrete math and algorithms

Service

Aug 2019	**Faculty Interview Coordinator**, *CS Graduate Student Association*, University of California — Berkeley
present	• Coordinated and led graduate student-run interviews of CS faculty candidates
Aug 2022	**Coordinator**, *Equal Access to Application Assistance Program*, University of California — Berkeley
present	• Organized application assistance program department to support underrepresented minorities during the PhD application process
Dec 2022	**Committee Member**
present	• Artifact Evaluation Committee (PPoPP 2023)
Aug 2021	**Reviewer**
present	• IPDPS (2023), JPDC (2023), TOPC (2023), TPDS (2022), PACT (2022), TODAES (2021), Rapid-Review COVID-19 (2020)

Mentoring

Jan 2022	**Ujjaini Mukhopadhyay**, *5th-year Masters*, University of California — Berkeley
May 2021	**Danial Khan**, *Undergrad*, University of California — Berkeley

Industry Experience

May 2019	**Software Engineer Intern**, *NVIDIA*, New York, NY
Aug 2019	• Designed and wrote multi-GPU hash table for the RAPIDS cuGraph team in *CUDA/C++*.
May 2018	**Software Engineer Intern**, *Facebook*, Menlo Park, CA
Aug 2018	• Designed and wrote cache to speed up internal tool used for ads integrity by orders of magnitude in *C++*.
	• Wrote web app to automate and accelerate workflow for engineers on the team.
Feb 2015	**Software Engineer Intern**, *Bloomberg L.P.*, Princeton, NJ
Jun 2015	• Designed features for determining table borders in PDF files using *Java, Weka*.

Invited Talks

Reducing Communication in Graph Neural Network Training
- 2023 — SIAM Conference on on Computational Science and Engineering (CSE23), Amsterdam, NL
- 2021 — NVIDIA GPU Technology Conference (GTC), Virtual
- 2020 — ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis (SC20), Virtual

Accurately and Efficiently Estimating Dynamic Point-to-Point Shortest Path
- 2021 — NVIDIA GPU Technology Conference (GTC), Virtual
- 2020 — IEEE BigGraphs Worshop at International Conference on Big Data (BigData), Virtual

Scalable K-Core Decomposition for Static Graphs Using a Dynamic Graph Data Structure
- 2019 — NVIDIA GPU Technology Conference (GTC), San Jose, CA
- 2018 — IEEE International Conference on Big Data, Seattle, WA

Honors

2019	**NSF Graduate Research Fellowship**, *National Science Foundation*