Alok Tripathy

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Research Interests

High-performance computing; machine learning; parallel computing; graph analytics; GPU computing; data science

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
- Research in high-performance and scientific computing
- Currently focusing on scalable graph-representation learning
- 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 acclerating 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 parallel algorithms for k-core, Point-to-Point Shortest Path problem, and Betweenness Centrality problems.
- Mentors: Dr. Oded Green

Jun 2017 – Aug 2017 **Research Intern**, *École polytechnique fédérale de Lausanne (EPFL)*, Lausanne, Switzerland
- Developed a memory layout for graphs that improved cache locality and NUMA-awareness.
- Mentors: Dr. Jasmina Malicevic and Dr. Willy Zwaenepoel

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

2024 U. Mukhopadhyay, A. Tripathy, O. Selvitopi, K. Yelick, A. Buluç. **Sparsity-Aware Communication for Distributed Graph Neural Network Training**. *Proceedings of International Conference on Parallel Processing (ICPP) 2024*, Gotland, Sweden

2024 A. Tripathy, K. Yelick, A. Buluç. **Distributed Matrix-Based Sampling for Graph Neural Network Training**. *Proceedings of Machine Learning and Systems (MLSys) 2024*, Santa Clara, CA

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 preprint arXiv:2104.00792*

Teaching Experience

Jun 2023 – July 2023 **Teaching Assistant**, *JamCoders*, University of the West Indies — Mona, Kingston, Jamaica
- Worked with high school students on college-level computer science concepts in a 5 week summer camp.
- Mentored students in lab sections, in 1:1 settings, and on campus outside of camp hours.

Aug 2021 – Dec 2021 **Head Teaching Assistant**, *Introduction to Parallel Programming (CS194-15)*, University of California — Berkeley
• Wrote and graded new homework assignments and exam questions, and led 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 – present **Teaching Assistant**, *Data Structures and Algorithms (CS 1332)*, Georgia Institute of Technology
• Led weekly recitations, office hours, designed, proctored, and graded exams.
• Senior TA: handled recitation guides for TAs, exams/practice exams, plagiarism detection, and delegated tasks to 27 TAs.

Service

Aug 2022 – present **Coordinator**, *Equal Access to Application Assistance Program*, University of California — Berkeley
• Organized application assistsance program to normalize access to Ph.D. application feedback

Aug 2019 – Sep 2023 **Faculty Liaison**, *CS Graduate Student Association*, University of California — Berkeley
• Coordinated and led graduate student-run interviews of CS faculty candidates.

Committee Member
• Artifact Evaluation Committee SC (2024), PPoPP (2023), MLSys (2023)

Subreviewer
• Parallel Computing (2024), PLDI (2024), ESA (2023), IPDPS (2023), JPDC (2023), TOPC (2023), TPDS (2022), PACT (2022), TODAES (2021), Rapid-Review COVID-19 (2020)

Mentoring

Ujjaini Mukhopadhyay, *5th-year Masters*, University of California — Berkeley → Apple

Danial Khan, *Undergrad*, University of California — Berkeley

Industry Experience

May 2019 – Aug 2019 **Software Engineer Intern**, *NVIDIA*, New York, NY
• Designed and wrote multi-GPU hash table for the RAPIDS cuGraph team in *CUDA/C++*.

May 2018 – Aug 2018 **Software Engineer Intern**, *Facebook*, Menlo Park, CA
• 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 – Jun 2015 **Software Engineer Intern**, *Bloomberg L.P.*, Princeton, NJ
• Designed features for determining table borders in PDF files using *Java, Weka*.

Invited Talks

Distributed Matrix-Based Sampling for Graph Neural Network Training
• 2024 — Conference on Machine Learning and Systems (MLSys24), Santa Clara, CA

Communication-Avoiding Algorithms for Full-Batch and Mini-Batch GNN Training
• 2024 — SIAM Conference on Parallel Processing (PP24), Baltimore, MD
• 2024 — NVIDIA GPU Technology Conference (GTC), San Jose, CA

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

Accurately and Efficiently Estimating Dynamic Point-to-Point Shortest Path
• 2020 — IEEE BigGraphs Workshop 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 (BigData), Seattle, WA

Honors

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

2015 **Computer Security Awareness Week (CSAW) Capture-the-Flag**, *New York University*, National Finalist

2015 **Codegate Capture-the-Flag**, *Seoul, South Korea*, International Finalist