

Research Interests

Parallel Graph Processing, Dynamic and Streaming Graph Processing, and Graph Clustering. I am currently interested in applying techniques from parallel and dynamic graph algorithms to design provably-efficient and scalable clustering algorithms for massive datasets.

Employment

- Sep 2020 - **Postdoctoral Researcher**, *Massachusetts Institute of Technology*, Cambridge, MA,
Present Mentor: Julian Shun.
- Aug 2019 - **Student Researcher**, *Google Research*, New York City, NY,
Aug 2020 Mentors: Jakub Lacki and Vahab Mirrokni.

Education

- Aug 2015 - **Ph.D. in Computer Science**, *Carnegie Mellon University*, Pittsburgh, PA,
Aug 2020 Thesis: Provably Efficient and Scalable Shared-Memory Graph Processing
Advisor: Guy Blelloch.
- Aug 2010 - **B.S. in Computer Science**, *Carnegie Mellon University*, Pittsburgh, PA.
May 2014

Awards

- 2019 **Distinguished Paper Award** at the ACM SIGPLAN Symposium on Programming Language Design and Implementation (PLDI), 2019
- 2018 **Best Paper Award** at the ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), 2018
- 2014 **Allen Newell Award for Excellence in Undergraduate Research**
- 2014 **Yahoo! Undergraduate Research Award**
- 2014 **Phi Beta Kappa**
- 2014 **University Honors, College Honors**, upon graduation from CMU SCS

Publications

Under Submission

Distributed Graph Algorithms in Constant Adaptive Rounds

Soheil Behnezhad, *Laxman Dhulipala*, Hossein Esfandiari, Jakub Lacki, Vahab Mirrokni, Warren Schudy

Parallel Batch-Dynamic k -Clique Counting

Laxman Dhulipala, Quanquan Liu, Julian Shun, Shangdi Yu

The Read-Only Semi-External Model

Guy E. Blelloch, *Laxman Dhulipala*, Phillip B. Gibbons, Yan Gu, Charlie McGuffey, Julian Shun

Parallel Clique Counting and Peeling Algorithms

Jessica Shi, *Laxman Dhulipala*, Julian Shun

ConnectIt: A Framework for Static and Incremental Parallel Connectivity Algorithms

Laxman Dhulipala, Changwan Hong, Julian Shun

[Refereed Full Publications](#)

VLDB'20 **Sage: Parallel Semi-Asymmetric Graph Algorithms for NVRAMs**

Laxman Dhulipala, Charlie McGuffey, Hongbo Kang, Yan Gu, Guy E. Blelloch, Phillip B. Gibbons, Julian Shun

SODA'20 **Parallel Batch-Dynamic Graphs: Constant Round Algorithms and Lower Bounds**

Laxman Dhulipala, David Durfee, Janardhan Kulkarni, Richard Peng, Saurabh Sawlani, Xiaorui Sun

CGO'20 **PriorityGraph: A Unified Programming Model for Optimizing Ordered Graph Algorithms**

Yunming Zhang, Ajay Brahmakshatriya, Xinyi Chen, Laxman Dhulipala, Shoaib Kamil, Saman Amarasinghe, Julian Shun

ESA'20 **Parallel Batch-dynamic Trees via Change Propagation**

Umut Acar, Daniel Anderson, Guy Blelloch, Laxman Dhulipala, Sam Westrick

FOCS'19 **Near-Optimal Massively Parallel Graph Connectivity**

Soheil Behnezhad, Laxman Dhulipala, Hossein Esfandiari, Jakub Lacki, Vahab Mirrokni

PLDI'19 **Low-Latency Processing on Graph Streams Using Purely-Functional Trees**

Laxman Dhulipala, Guy Blelloch, Julian Shun

[Distinguished Paper Award](#)

SPAA'19 **Massively Parallel Computation via Remote Memory Access**

Soheil Behnezhad, Laxman Dhulipala, Hossein Esfandiari, Jakub Lacki, Vahab Mirrokni, Warren Schudy

[Invited to Special Issue](#)

SPAA'19 **Parallel Batch-Dynamic Graph Connectivity**

Umut Acar, Daniel Anderson, Guy Blelloch, Laxman Dhulipala

ALENEX'19 **Batch Parallel Euler-Tour Trees**

Thomas Tseng, Laxman Dhulipala, Guy Blelloch

SPAA'18 **Theoretically Efficient Parallel Algorithms Can Be Fast and Scalable**

Laxman Dhulipala, Guy Blelloch, Julian Shun

[Best Paper Award](#)

[Invited to Special Issue](#)

SPAA'17 **Julienne: A Framework for Parallel Graph Algorithms using Work-efficient Bucketing**

Laxman Dhulipala, Guy Blelloch, Julian Shun

KDD'16 **Compressing Graphs and Indexes with Recursive Graph Bisection**

Laxman Dhulipala, Igor Kabiljo, Brian Karrer, Guiseppe Ottiviano, Sergey Pupyrev, Alon Shalita

DCC'15 **Smaller and Faster: Parallel Processing of Compressed Graphs with Ligra+**

Julian Shun, Laxman Dhulipala, Guy Blelloch

SPAA'14 **A Simple and Practical Linear-Work Parallel Algorithm for Connectivity**

Julian Shun, Laxman Dhulipala, Guy Blelloch

[Refereed Short Publications](#)

GRADES- **The Graph Based Benchmark Suite**

NDA'20 *Laxman Dhulipala, Jessica Shi, Tom Tseng, Guy Blelloch, Julian Shun*

NVMW'20 **Semi-Asymmetric Parallel Graph Algorithms for NVRAMs**

Laxman Dhulipala, Charlie McGuffey, Hongbo Kang, Yan Gu, Guy E. Blelloch, Phillip B. Gibbons, Julian Shun

[Memorable Paper Award Nominee](#)

SPAA'20 **ParlayLib - A Toolkit for Parallel Algorithms on Shared-Memory Multicore Machines**
Guy Blelloch, Daniel Anderson, *Laxman Dhulipala*

Internships/Industry Experience

- 2019 **Visiting Researcher**, *Massachusetts Institute of Technology*, Cambridge, MA.
- Worked with Prof. Julian Shun at MIT CSAIL on parallel algorithms for parallel-dynamic graph algorithms including low-outdegree orientations, dynamic clique-counting, and dynamic graph frameworks. Internship resulted in three working papers, two of which are currently in submission.
- 2018 **Research Intern**, *Google Research*, New York City, NY.
- Worked with Jakub Lacki on the Graph Mining (OMEGA) team. I worked on shared-memory clustering algorithms on large-memory, multicore machines. I also studied several theoretical problems in the MPC model with sublinear space per machine. Our results improved on prior work for fundamental graph problems including graph connectivity, and is conditionally optimal for a wide range of graphs, based on a well known conjecture.
- 2017 **Research Intern**, *Google Research*, Mountain View, CA.
- Worked with Zoya Svitkina on the Discrete Algorithms team. I studied load-balancing algorithms that maximize redundancy and minimize load-imbalance, both theoretically and in the context of algorithms deployed in Google data centers. Our algorithms led to significant improvements in load balance in practice while ensuring high redundancy.
- 2014–2015 **Software Engineer**, *Facebook*, Menlo Park, CA.
- Worked on the Infrastructure Optimization team on algorithms for partitioning, embedding and reordering massive graphs. My work during this year resulted in a publication in KDD.

Visits

- Aug 2019 **Dagstuhl Workshop on Algorithms for Big Data**, *Schloss Dagstuhl*, Wadern, Germany.
- Apr 2019 **Microsoft Research (Algorithms Group)**, Redmond, WA.
Hosted for a week-long visit by Janardhan Kulkarni and Richard Peng

Patents

- 2018 Cache efficiency by social graph data ordering. **US Grant (US10025867B2)**.

Teaching Experience

Workshops

- February 2020 **Tutorial Organizer and Presenter**, *PPoPP 2020*, San Diego, California,
Abstractions and Algorithms for Efficiently Programming NVRAMs.
- March 2016 **Tutorial Organizer and Presenter**, *PPoPP 2016*, Barcelona, Spain,
Large-Scale Graph Processing in Shared Memory.
- 2016–2018 **Graduate Teaching Assistant** for Algorithms in the Real World (15-853), Undergraduate Complexity Theory (15-455), Graduate Algorithms (15-750)
- 2012–2014 **Teaching Assistant** for Computational Geometry (15-456), Algorithm Design and Analysis (15-451), Parallel Data Structures and Algorithms (15-210), and Introduction to Functional Programming (15-150)

Invited Talks

- 2020 **Parallel Semi-Asymmetric Graph Processing**, *Google Research (Algorithms and Optimization Group)*, New York City, NY.
- 2019 **Fast and Theoretically-Efficient Parallel Graph Processing on Static and Dynamic Graphs**, *Microsoft Research*, Redmond, WA.
- 2019 **Algorithms and Systems for Processing Massive Static and Evolving Graphs**, *MIT Fast Code Seminar*, Cambridge, MA.
- 2019 **Low-Latency Graph Processing using Compressed Purely-Functional Trees**, *Dagstuhl Workshop on Algorithms for Big Data*, Schloss Dagstuhl, Wadern, Germany.
- 2018 **Low-Latency Graph Processing using Compressed Purely-Functional Trees**, *Google Research (Algorithms and Optimization Group)*, New York City, NY.
- 2018 **Shared-Memory Parallelism at Google**, *Google Research (Graph Mining Group)*, New York City, NY.
- 2017 **Shared-Memory Parallel Graph Algorithms**, *Google Research (Algorithms Seminar)*, Mountain View, CA.

Professional Service

- 2020 **JMLR Editorial Board Reviewer**
- 2020 **PLDI'20 Artifact Evaluation Committee**
- 2020 **CMU CSD Faculty Hiring Committee** (one of two student members)
- 2016, 2020 **Parallel Reading Group Organizer** (seminar at CMU)
- Journal Reviewer.** JMLR {'20,'19,'18}, TOPC {'20,'19,'18,'17}, TPDS'16
- Reviewer.** VLDB'20, SODA'20, SIGMETRICS'20, SPAA {'20,'19,'18,'17,'16}, ESA {'20,'19}, DCC'18, SPIRE'18