JESSICA SHI

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RESEARCH INTERESTS

I am interested in developing shared-memory parallel clustering algorithms, with strong theoretical guarantees and efficient implementations using performance engineering techniques.

EDUCATION

May 2020 - present Expected June 2023	**Ph.D. Candidate in Computer Science**, *Massachusetts Institute of Technology* **Advisor**: Julian Shun
Aug 2018 - May 2020	**M.S. in Computer Science**, *Massachusetts Institute of Technology* **Thesis**: Parallel algorithms for butterfly computations **Advisor**: Julian Shun
Aug 2014 - June 2018	**A.B. in Mathematics**, *Princeton University* **Highest Honors, Computer Science Minor** **GPA**: 3.92 / 4.00, **Major GPA**: 4.00 / 4.00 **Thesis**: Dominating sets in graphs with no long induced paths **Advisor**: Maria Chudnovsky
Jan 2017 – June 2017	**Study Abroad**, *Oxford University* **Grade**: A+ on all courses

EMPLOYMENT

March 2021 - present	**Student Researcher**, *Google Research*, New York City, NY Ongoing work with the Graph Mining team on shared-memory parallel clustering frameworks.
May 2020 - Sept 2020	**Research Intern**, *Google Research*, New York City, NY Worked with the Graph Mining team to design, implement, and evaluate shared-memory parallel affinity clustering and correlation clustering. Demonstrated significant parallel speedups of up to 28.44x over the best sequential implementations of these algorithms, on real-world graphs with up to tens of billions of edges using a 30-core machine with two-way hyperthreading.
June 2017 – Sept 2017	**Software Engineering Intern**, *D.E. Shaw*, New York City, NY Worked with the Futures division to add features to their underlying array infrastructure, including sharding, extending axes, indexing with keys, and indexing

with arrays and boolean masks. Investigated cache conflicts between using memory mapped arrays and IBM General Parallel File System (GPFS).

June 2016 – Aug 2016   **Software Engineering Intern**, *Google*, Mountain View, CA

Worked with the Fiber Ads Team on building a system to continuously evaluate the quality in which Fiber TV ads are inserted over underlying TV network streams. Created a video alignment tool to locate and verify where TV ads are injected into the stream, and collect associated stream data.

June 2015 – Aug 2015   **Software Development Intern**, *Bloomberg L.P.*, New York City, NY

Worked with the News Division on overhauling legacy multimedia functions. Created two services: one extracts subtitles from fragmented-MP4 video containers and processes keywords for expanded search functionality, and the other extracts, processes, and stores thumbnails from videos.

HONORS & AWARDS

2022	Best Paper Award of ACM Symposium on Parallelism in Algorithms and Architectures (SPAA)
2021	Best Student Presentation of SIAM Conference on Applied and Computational Discrete Algorithms (ACDA)
2018	National Science Foundation (NSF) Graduate Research Fellowship
2018	Middleton Miller '29 Prize, Mathematics Department, Princeton University Awarded for the best independent work in mathematics.
2018	Phi Beta Kappa, Princeton University
2017	Honorable Mention for the Computing Research Association (CRA) Outstanding Undergraduate Researchers Award
2015	Computer Science Poster Winner, Computer Science Department, Princeton University
2014	Outstanding Presentation Winner of the MAA Undergraduate Poster Session at the Joint Math Meetings (JMM)
2014	Intel Science Talent Search (STS) Finalist

PUBLICATIONS

FOCS '22   **Differential privacy from locally adjustable graph algorithms: k-core decomposition, low outdegree ordering, and densest subgraphs**
Laxman Dhulipala, Quanquan C. Liu, Sofya Raskhodnikova, Jessica Shi, Shangdi Yu, Julian Shun

SPAA '22   **Parallel batch-dynamic k-core decomposition**

Quanquan C. Liu, <u>Jessica Shi</u>, Shangdi Yu, Laxman Dhulipala, Julian Shun
Best Paper Award

VLDB '22   **Theoretically and practically efficient parallel nucleus decomposition**
<u>Jessica Shi</u>, Laxman Dhulipala, Julian Shun

VLDB '21   **Scalable community detection via parallel correlation clustering**
<u>Jessica Shi</u>, Laxman Dhulipala, David Eisenstat, Jakub Łącki, Vahab Mirrokni

ICML '21   **Hierarchical agglomerative graph clustering in nearly-linear time**
Laxman Dhulipala, David Eisenstat, Jakub Łącki, Vahab Mirrokni, <u>Jessica Shi</u>

ACDA '21   **Parallel clique counting and peeling algorithms**
<u>Jessica Shi</u>, Laxman Dhulipala, Julian Shun
Best Student Presentation

SEA '21   **Parallel five-cycle counting algorithms**
Louisa Ruixue Huang, <u>Jessica Shi</u>, Julian Shun
Invited to Special Issue

GRADES-   **The Graph Based Benchmark Suite (GBBS)**
NDA '20   Laxman Dhulipala, <u>Jessica Shi</u>, Tom Tseng, Guy Blelloch, Julian Shun

APoCS '20   **Parallel algorithms for butterfly computations**
<u>Jessica Shi</u>, Julian Shun
Published in Massive Graph Analytics

ANALCO '18   **Exponential bounds on graph enumerations from vertex incremental characterizations**
Jérémie Lumbroso, <u>Jessica Shi</u>

TEACHING EXPERIENCE

Fall 2021   **Teaching Assistant**, *6.006 Introduction to Algorithms (MIT)*

Fall 2020,   **Mentor**, *MIT Graduate Application Assistance Program (GAAP)*
Fall 2021
Mentored EECS PhD applicants from underrepresented groups, including guidance through the EECS PhD application process and feedback on statements of purpose and resumes.

Spring 2021   **Academic Mentor**, *MIT Program for Research in Mathematics, Engineering,*
- Fall 2021   *and Science for High School Students (PRIMES)*

Mentored Yihao Huang and Claire Wang on a research project involving designing and implementing shared-memory parallel bi-core decomposition algorithms.

Overall gold prize winners of the 2021 S-T Yau High School Science Award

Second place winners of the 2022 Massachusetts Science & Engineering Fair (MSEF)

Spring 2020 **Academic Mentor**, *MIT Program for Research in Mathematics, Engineering,*
- Fall 2020 *and Science for High School Students (PRIMES)*

Mentored Ho Tin Fan and Alvin Lu on a research project involving designing and implementing shared-memory parallel batch-dynamic 3-vertex subgraph counting algorithms.

Summer **Academic Tutor**, *Research Science Institute (RSI)*
2019

Advised high school students throughout their individual research projects, on best practices in research, paper writing, and presenting skills.

Spring 2018 **Course Assistant**, *MAT 375 Introduction to Graph Theory (Princeton University)*

Fall 2016 **Grader**, *COS 226 Algorithms and Data Structures (Princeton University)*

INVITED TALKS

Aug 2022 **Theoretically and Practically Efficient Parallel Nucleus Decomposition**, *Foundations of Data Science Institute (FODSI) Sublinear Algorithms Workshop at Massachusetts Institute of Technology, Cambridge, MA*

June 2022 **Bridging Theory and Practice in Parallel Subgraph Computations**, *Not-so-local Local Algorithms at Massachusetts Institute of Technology, Cambridge, MA*

May 2022 **Bridging Theory and Practice in Parallel Subgraph Computations**, *Algorithms Seminar at Stony Brook University, Stony Brook, NY*

April 2022 **Bridging Theory and Practice in Parallel Subgraph Computations**, *Fast Code Seminar at Massachusetts Institute of Technology, Cambridge, MA*

April 2022 **Bridging Theory and Practice in Parallel Subgraph Computations**, *CS Systems at Rutgers University, New Brunswick, NJ*