NAIREN CAO

Email: nc1827@nyu.edu
Homepage: https://nairenc.github.io

RESEARCH INTERESTS

I am a "Theory+Parallel" guy. My research interest lies in algorithm design and analysis of combinatorial optimization problems, focusing on the intricacies of graph algorithms in parallel and distributed models.

PROFESSIONAL EXPERIENCE

Faculty Fellow, Department of Computer Science, NYU Tandon School of Engineering
Hosted by: Martin Farach-Colton *September 2024 - Present*

Postdoctoral Researcher, Department of Computer Science, Boston College
Hosted by: Hsin-Hao Su *September 2022 - August 2024*

Research Assistant, ITCS, Shanghai University of Finance and Economics
Hosted by: Zhihao Tang *March 2019 - May 2019*

Research Assistant, Department of Computer Science, The University of Hong Kong
Hosted by: Siu-Ming Yiu *September 2014 - August 2016*

EDUCATION

Ph.D. in Computer Science, Georgetown University *September 2016 - August 2022*

- **Advisors**: Jeremy T. Fineman and Ophir Frieder
- **Thesis**: *Single-source Shortest Paths for Digraphs*

M.S. in Software Engineering, Peking University *September 2013 - June 2016*

B.Eng. in Software Engineering, Sun Yat-sen University *September 2009 - June 2013*

WORKING PAPERS

1. Nairen Cao, Shi Li, Jia Ye. "Simultaneously Approximating All Norms for Massively Parallel Correlation Clustering."

CONFERENCE PAPERS

1. Nairen Cao, Vincent Cohen-Addad, Euiwoong Lee, Shi Li, Alantha Newman, Lukas Vogl. "Understanding the Cluster Linear Program for Correlation Clustering." In *Proceedings of the 56th Annual ACM Symposium on Theory of Computing (STOC 2024)*.

2. Vikrant Ashvinkumar, Aaron Bernstein, Nairen Cao, Christoph Grunau, Bernhard Haeupler, Yonggang Jiang, Danupon Nanongkai, Hsin-Hao Su. "Parallel and Distributed Exact Single-Source Shortest Paths with Negative Edge Weights." In *European Symposium on Algorithms (ESA 2024)*.

3. Nairen Cao, Shang-En Huang, Hsin-Hao Su. "Breaking 3-Factor Approximation for Correlation Clustering in Polylogarithmic Rounds." In *Proceedings of the 35th ACM-SIAM Symposium on Discrete Algorithms (SODA 2024)*.

4. Nairen Cao, Shang-En Huang, Hsin-Hao Su. "Nearly Optimal Parallel Algorithms for Longest Increasing Subsequence." In *Proceedings of the 35th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA 2023)*. **Outstanding Paper Award**.

5. Nairen Cao, Jeremy Fineman. "Parallel Exact Shortest Paths in Almost Linear Work and Square Root Depth." In *Proceedings of the 34th ACM-SIAM Symposium on Discrete Algorithms (SODA 2023)*.

6. Nairen Cao, Jeremy T. Fineman, Shi Li, Julián Mestre, Katina Russell, Seeun William Umboh. "Nested Active-Time Scheduling." In *Proceedings of the 33rd International Symposium on Algorithms and Computation (ISAAC 2022)*.

7. Nairen Cao, Jeremy T. Fineman, Shi Li, Julián Mestre, Katina Russell, Seeun William Umboh. "Brief Announcement: Nested Active-Time Scheduling." In *Proceedings of the 34th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA 2022)*.

8. Nairen Cao, Jeremy T. Fineman, Katina Russell. "Improved Parallel Shortest Path with Negative-Weight Edges." In *Proceedings of the 34th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA 2022)*. **Outstanding Paper Award**.

9. Nairen Cao, Jeremy T. Fineman, Katina Russell. "Brief Announcement: An Improved Distributed Approximate Single-Source Shortest Paths Algorithm." In *Proceedings of the 40th ACM Symposium on Principles of Distributed Computing (PODC 2021)*.

10. Nairen Cao, Jeremy T. Fineman, Katina Russell. "Brief Announcement: Improved Work-Span Trade-off for Single Source Reachability and Approximate Shortest Paths." In *Proceedings of the 32nd ACM Symposium on Parallelism in Algorithms and Architectures (SPAA 2020)*.

11. Nairen Cao, Jeremy T. Fineman, Katina Russell. "Efficient Construction of Directed Hopsets and Parallel Approximate Shortest Paths." In *Proceedings of the 52nd ACM Symposium on Theory of Computing (STOC 2020)*.

12. Nairen Cao, Adam O'Neill, Mohammad Zaheri. "Toward RSA-OAEP without Random Oracles." In *Proceedings of the IACR International Conference on Practice and Theory of Public-Key Cryptography (PKC 2020)*.

13. Nairen Cao, Jeremy Fineman, Katina Russell, Eugene Yang. "I/O-Efficient Algorithms for Topological Sort and Related Problems." In *Proceedings of the 30th ACM-SIAM Symposium on Discrete Algorithms (SODA 2019)*.

POSTERS AND WORKSHOP PAPERS

1. Nairen Cao, Jeremy Fineman, Katina Russell. "Efficient Construction of Directed Hopsets and Parallel Single-source Shortest Paths." In *Proceedings of Highlight of Parallel Computing (HOPC 2023)*.

JOURNAL PAPERS

1. Hao-Ren Yao, Nairen Cao, Katina Russell, Der-Chen Chang, Ophir Frieder, Jeremy Fineman. "Self-supervised Representation Learning on Electronic Health Records with Graph Kernel Infomax." *ACM Transactions on Computing for Healthcare* 5(2), 2024.

2. Nairen Cao, Jeremy T. Fineman, Katina Russell. "I/O-Efficient Algorithms for Topological Sort and Related Problems." *ACM Transactions on Algorithms* 18(1), 2022.

TEACHING EXPERIENCE

Instructor

- *Design and Analysis of Algorithms I*, CS-GY 6033 Fall 2024
  NYU Tandon School of Engineering

Teaching Assistant

- *Database Management Systems* Fall 2019, Spring 2020, Spring 2021
  Georgetown University, with Professor Ophir Frieder
- *Algorithms* Fall 2020
  Georgetown University, with Professor Jeremy T. Fineman

SERVICE

Departmental Service

- Organizer, NYC Graduate Student TCS Day, October 18, 2024.

Professional Service

- Reviewer for SPAA, SODA, STOC, FOCS, ITCS, PODC, ICALP, and more.