

Nairen Cao

Associate Professor

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CURRICULUM VITAE

Research Interests

Design and analysis of algorithms for combinatorial optimization; graph and clustering algorithms, including parallel and distributed algorithms; applications to LLM systems, including LLM evaluation and KV-cache optimization.

Education

Ph.D. in Computer Science, Georgetown University Advisors: Jeremy T. Fineman and Ophir Frieder Dissertation: Single-source Shortest Paths for Digraphs	2016 - 2022
M.S. in Software Engineering, Peking University	2013 - 2016
B.Eng. in Software Engineering, Sun Yat-sen University	2009 - 2013

Academic Appointments

Associate Professor Shanghai University of Finance and Economics Institute for Theoretical Computer Science, School of Computing and Artificial Intelligence	Current
Faculty Fellow Department of Computer Science, NYU Tandon School of Engineering Host: Martin Farach-Colton	Sep. 2024 - Jun. 16, 2026
Postdoctoral Researcher Department of Computer Science, Boston College Host: Hsin-Hao Su	Sep. 2022 - Aug. 2024
Research Assistant Institute for Theoretical Computer Science, Shanghai University of Finance and Economics Host: Zhihao Tang	Mar. 2019 - May 2019
Research Assistant Department of Computer Science, The University of Hong Kong Host: Siu-Ming Yiu	Sep. 2014 - Aug. 2016

Honors

Outstanding Paper Award, ACM Symposium on Parallelism in Algorithms and Architectures (SPAA 2023 and SPAA 2022).

Conference Publications

- Static to Dynamic Correlation Clustering**
Nairen Cao, Vincent Cohen-Addad, Euiwoong Lee, Shi Li, David Rasmussen Lolck, Alantha Newman, Mikkel Thorup, Lukas Vogl, Shuyi Yan, Hanwen Zhang
International Colloquium on Automata, Languages, and Programming (ICALP 2026)
- Bounding the Fragmentation of B-Trees Subject to Batched Insertions**
Michael A. Bender, Aaron Bernstein, **Nairen Cao**, Alexander Conway, Martín Farach-Colton, Hanna Komlós, Yarin Shechter, Nicole Wein
ACM SIGMOD-SIGACT-SIGART Symposium on Principles of Database Systems (PODS 2026)
- Min-Max Correlation Clustering via Neighborhood Similarity**
Nairen Cao, Steven Roche, Hsin-Hao Su
European Symposium on Algorithms (ESA 2025)

Conference Publications (continued)

4. **Simultaneously Approximating All Norms for Massively Parallel Correlation Clustering**
Nairen Cao, Shi Li, Jia Ye
International Colloquium on Automata, Languages, and Programming (ICALP 2025)
5. **Solving the Correlation Cluster LP in Sublinear Time**
Nairen Cao, Vincent Cohen-Addad, Euiwoong Lee, Shi Li, David Rasmussen Lolck, Alantha Newman, Mikkel Thorup, Lukas Vogl, Shuyi Yan, Hanwen Zhang
ACM Symposium on Theory of Computing (STOC 2025)
6. **Understanding the Cluster LP for Correlation Clustering**
Nairen Cao, Vincent Cohen-Addad, Euiwoong Lee, Shi Li, Alantha Newman, Lukas Vogl
ACM Symposium on Theory of Computing (STOC 2024)
7. **Breaking 3-Factor Approximation for Correlation Clustering in Polylogarithmic Rounds**
Nairen Cao, Shang-En Huang, Hsin-Hao Su
ACM-SIAM Symposium on Discrete Algorithms (SODA 2024)
8. **Parallel and Distributed Exact Single-Source Shortest Paths with Negative Edge Weights**
Vikrant Ashvinkumar, Aaron Bernstein, **Nairen Cao**, Christoph Grunau, Bernhard Haeupler, Yonggang Jiang, Danupon Nanongkai, Hsin-Hao Su
European Symposium on Algorithms (ESA 2024)
9. **Nearly Optimal Parallel Algorithms for Longest Increasing Subsequence**
Nairen Cao, Shang-En Huang, Hsin-Hao Su
ACM Symposium on Parallelism in Algorithms and Architectures (SPAA 2023), **Outstanding Paper Award**
10. **Parallel Exact Shortest Paths in Almost Linear Work and Square Root Depth**
Nairen Cao, Jeremy T. Fineman
ACM-SIAM Symposium on Discrete Algorithms (SODA 2023)
11. **Nested Active-Time Scheduling**
Nairen Cao, Jeremy T. Fineman, Shi Li, Julián Mestre, Katina Russell, Seeun William Umboh
International Symposium on Algorithms and Computation (ISAAC 2022)
12. **Parallel Shortest Paths with Negative Edge Weights**
Nairen Cao, Jeremy T. Fineman, Katina Russell
ACM Symposium on Parallelism in Algorithms and Architectures (SPAA 2022), **Outstanding Paper Award**
13. **Brief Announcement: Nested Active-Time Scheduling**
Nairen Cao, Jeremy T. Fineman, Shi Li, Julián Mestre, Katina Russell, Seeun William Umboh
ACM Symposium on Parallelism in Algorithms and Architectures (SPAA 2022)
14. **Brief Announcement: An Improved Distributed Approximate Single Source Shortest Paths Algorithm**
Nairen Cao, Jeremy T. Fineman, Katina Russell
ACM Symposium on Principles of Distributed Computing (PODC 2021)
15. **Efficient Construction of Directed Hopsets and Parallel Approximate Shortest Paths**
Nairen Cao, Jeremy T. Fineman, Katina Russell
ACM Symposium on Theory of Computing (STOC 2020)
16. **Brief Announcement: Improved Work Span Tradeoff for Single Source Reachability and Approximate Shortest Paths**
Nairen Cao, Jeremy T. Fineman, Katina Russell
ACM Symposium on Parallelism in Algorithms and Architectures (SPAA 2020)

Conference Publications (continued)

17. **Toward RSA-OAEP without Random Oracles**
Nairen Cao, Adam O'Neill and Mohammad Zaheri
IACR International Conference on Practice and Theory of Public-Key Cryptography (PKC 2020)
18. **I/O-Efficient Algorithms for Topological Sort and Related Problems**
Nairen Cao, Jeremy T. Fineman, Katina Russell, Eugene Yang
ACM-SIAM Symposium on Discrete Algorithms (SODA 2019)

Journal Publications

19. **Self-supervised Representation Learning on Electronic Health Records with Graph Kernel Infomax**
Hao-Ren Yao, **Nairen Cao**, Katina Russell, Der-Chen Chang, Ophir Frieder, Jeremy T. Fineman
ACM Transactions on Computing for Healthcare (HEALTH) 2024
20. **I/O-Efficient Algorithms for Topological Sort and Related Problems**
Nairen Cao, Jeremy T. Fineman, Katina Russell, Eugene Yang
ACM Transactions on Algorithms 18(1), 2022

Workshop Papers and Posters

21. **Efficient Cost-Aware LLM Evaluation via Bayesian Bandit Gittins Indices**
Qian Xie, Yueli He, **Nairen Cao**
International Conference on Machine Learning (ICML 2026) Workshop on Decision-Making from Offline Datasets to Online Adaptation: Black-Box Optimization to Reinforcement Learning (DEMO), **Spotlight**
22. **Efficient Construction of Directed Hopsets and Parallel Single-source Shortest Paths**
Nairen Cao, Jeremy T. Fineman, Katina Russell
Highlights of Parallel Computing (HOPC 2023)
23. **LRCRYPT: Leakage-Resilient Cryptographic System (Design and Implementation)**
Xiaoqi Yu, **Nairen Cao**, Gongxian Zeng, Ruoqing Zhang, Siu-Ming Yiu
International Workshop on Information Security Applications (WISA 2016)

Teaching

Instructor, NYU Tandon School of Engineering

- CS-GY 6033, Design and Analysis of Algorithms I: Fall 2024, Fall 2025.
- CS-GY 6753, Theory of Computation: Spring 2025, Spring 2026.

Teaching Assistant, Georgetown University

- Database Management Systems: Fall 2019, Spring 2020, Spring 2021 (Ophir Frieder).
- Algorithms: Fall 2020 (Jeremy T. Fineman).

Professional Service

Organizer, NYC Student Theory Day: Spring 2025, Fall 2025, Spring 2026.

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

Reviewer for SPAA, SODA, STOC, FOCS, ITCS, PODC, ICALP, and other conferences.