

Yang P. LIU

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Google Scholar

<https://yangpliu.github.io/>

ACADEMIC POSITIONS

JAN 2025 – PRESENT | **Computer Science Department, Carnegie Mellon University, Pittsburgh, PA.**
ASSISTANT PROFESSOR.
Research interests: graph algorithms, optimization, combinatorics

SEPT 2023 – DEC 2024 | **CSDM Group, Institute for Advanced Study, Princeton, NJ.**
POSTDOCTORAL MEMBER.

EDUCATION

SEPT 2018 – MAY 2023 | **Stanford University, Stanford, CA.**
PH.D. STUDENT IN MATHEMATICS.
Advised by Aaron Sidford

SEPT 2015 – MAY 2018 | **Massachusetts Institute of Technology, Cambridge, MA.**
B.S. MATHEMATICS. GPA 4.9/5.0.

SELECTED HONORS

2025 | **Trevisan Prize.**
2025 | **Best Paper Award at Foundations of Computer Science (FOCS).**
2024 | **A.W. Tucker Prize.** Awarded by *Mathematical Optimization Society* for best thesis.
2023 | **Frontiers of Science Award.** Awarded by the International Congress of Basic Science.
2022 | **Best Paper Award at Foundations of Computer Science (FOCS).**
2022 | **Best Student Paper Award at Innovations in Theoretical Computer Science (ITCS).**
2022 | **Google Research Ph.D. Fellowship.**
2021 | **Best Student Paper Award at Symposium on Theory of Computing (STOC).**
2018 | **NDSEG Graduate Fellowship.**
2014, 2015 | **Gold Medal.** International Math Olympiad.

SELECTED PUBLICATIONS AND PREPRINTS

13. **Quasipolynomial bounds for the corners theorem**
Michael Jaber, Yang P. Liu, Shachar Lovett, Anthony Ostuni, Mehtaab Sawhney,
Best Paper FOCS 2025. [arXiv:2504.07006](https://arxiv.org/abs/2504.07006).
12. **Reasonable Bounds for Combinatorial Lines of Length Three**
Amey Bhangale, Subhash Khot, Yang P. Liu, Dor Minzer, FOCS 2025. [arXiv:2411.15137](https://arxiv.org/abs/2411.15137).
11. **On Approximability of Satisfiable k -CSPs: VII**
Amey Bhangale, Subhash Khot, Yang P. Liu, Dor Minzer, FOCS 2025. [arXiv:2411.15136](https://arxiv.org/abs/2411.15136).
10. **On Approximability of Satisfiable k -CSPs: VI**
Amey Bhangale, Subhash Khot, Yang P. Liu, Dor Minzer, FOCS 2025. [arXiv:2411.15133](https://arxiv.org/abs/2411.15133).
9. **Almost-Linear Time Algorithms for Decremental Graphs: Min-Cost Flow and More via Duality**
Jan van den Brand, Li Chen, Rasmus Kyng, Yang P. Liu, Simon Meierhans, Maximilian Probst Gutenberg, Sushant Sachdeva, FOCS 2024. [arXiv:2407.10830](https://arxiv.org/abs/2407.10830).
8. **Sparsifying generalized linear models**
Arun Jambulapati, James R. Lee, Yang P. Liu, Aaron Sidford, STOC 2024. [arXiv:2311.18145](https://arxiv.org/abs/2311.18145)
7. **Almost-Linear Time Algorithms for Incremental Graphs: Cycle Detection, SCCs, s - t Shortest Path, and Minimum-Cost Flow**
Li Chen, Rasmus Kyng, Yang P. Liu, Simon Meierhans, Maximilian Probst Gutenberg, FOCS 2024. [arXiv:2311.18295](https://arxiv.org/abs/2311.18295).

6. Sparsifying Sums of Norms

Arun Jambulapati, James R. Lee, Yang P. Liu, Aaron Sidford, FOCS 2023, **Invited to SIAM Journal of Computing Special Issue**. [arXiv:2305.09049](https://arxiv.org/abs/2305.09049).

5. Maximum Flow and Minimum-Cost Flow in Almost Linear Time

Li Chen, Rasmus Kyng, Yang P. Liu, Richard Peng, Maximilian Probst Gutenberg, Sushant Sachdeva, **Best Paper** FOCS 2022, *Journal of the ACM*. [arXiv:2203.00671](https://arxiv.org/abs/2203.00671).

4. Optimal Sublinear Sampling of Spanning Trees and Determinantal Point Processes via Average-Case Entropic Independence

Nima Anari, Yang P. Liu, Thuy-Duong Vuong, FOCS 2022, *SIAM Journal of Computing Special Issue*. [arXiv:2204.02570](https://arxiv.org/abs/2204.02570).

3. Fully Dynamic Electrical Flows: Sparse Maxflow Faster Than Goldberg-Rao

Yu Gao, Yang P. Liu, Richard Peng, FOCS 2021, *SIAM Journal of Computing Special Issue*. [2101.07233](https://arxiv.org/abs/2101.07233).

2. Discrepancy Minimization via a Self-Balancing Walk

Ryan Alweiss, Yang P. Liu, Mehtaab Sawhney, **Best Student Paper** STOC 2021, *SIAM Journal of Computing Special Issue*. [arXiv:2006.14009](https://arxiv.org/abs/2006.14009).

1. Faster Divergence Maximization for Faster Maximum Flow

Yang P. Liu, Aaron Sidford, FOCS 2020, *SIAM Journal of Computing Special Issue*. [arXiv:2003.08929](https://arxiv.org/abs/2003.08929).

POPULAR SCIENTIFIC COVERAGE

- Researchers develop fastest possible flow algorithm [ScienceDaily](#)
- Researchers Achieve ‘Absurdly Fast’ Algorithm for Network Flow [Quanta](#)
- 2022’s Biggest Breakthroughs in Computer Science [Quanta](#)

INVITED TALKS

OCT 2025	CSP Inverse Theorems and Additive Combinatorics CMU ACO Seminar
SEP 2025	Improved Algorithms for Estimating the Spanning Tree Count Cargese Workshop on Combinatorial Optimization
MAY 2025	Improved Algorithms for Estimating the Spanning Tree Count Workshop on High-Dimensional and Complex Data Algorithms (Venice)
MAR 2025	CSP Inverse Theorems and Additive Combinatorics MIT Combinatorics Seminar
FEB 2025	CSP Inverse Theorems and Additive Combinatorics UT Austin Theory Seminar
APRIL 2024	Parallel Repetition for 3-Player XOR Games IAS CSDM Seminar
APRIL 2024	Recent Advances in Dynamic Graph Algorithms MIT Theory of Computation Colloquium
FEBRUARY 2024	Sparsifying Generalized Linear Models Rutgers Discrete Math Seminar
FEBRUARY 2024	Sparsifying Generalized Linear Models NYU Theory Seminar
NOVEMBER 2023	Sparsifying Sums of Functions IAS CSDM Seminar
OCTOBER 2023	Recent Advances on Maximum Flows Dagstuhl Seminar on Graph Algorithms: Cuts, Flows, and Network Design
SEPTEMBER 2023	Sparsifying Generalized Linear Models Princeton Theory Lunch
JULY 2023	Sparsifying Sums of Norms Simons Institute Beyond the Boolean Cube Workshop
APRIL 2023	Graphs, Optimization, Geometry, and Fast Algorithms Princeton University Computer Science Seminar
MARCH 2023	Graphs, Optimization, Geometry, and Fast Algorithms MIT Department of Mathematics
MARCH 2023	Graphs, Optimization, Geometry, and Fast Algorithms

MARCH 2023	Carnegie Mellon University Graphs, Optimization, Geometry, and Fast Algorithms University of California Berkeley
JANUARY 2023	Graphs, Optimization, Geometry, and Fast Algorithms University of California Berkeley
NOVEMBER 2022	Maximum Flow and Minimum-Cost Flow in Almost-Linear Time MIT Theory of Computation Colloquium
NOVEMBER 2022	Lessons on Algorithmic Graph Theory from Maxflow University of Michigan Theory Seminar
NOVEMBER 2022	Lessons on Algorithmic Graph Theory from Maxflow University of Washington Theory Seminar
AUGUST 2022	Recent Advances on Maximum Flows and Minimum-Cost Flows Harvard Center for Mathematical Sciences & Applications Interdisciplinary Seminar
APRIL 2022	Maximum Flow and Minimum-Cost Flow in Almost-Linear Time UC Santa Barbara Theory Colloquium
APRIL 2022	Maximum Flow and Minimum-Cost Flow in Almost-Linear Time UC Berkeley Theory Lunch
MARCH 2022	Maximum Flow and Minimum-Cost Flow in Almost-Linear Time Stanford Theory Seminar
OCTOBER 2021	Discrepancy Minimization via a Self-Balancing Walk Carnegie Mellon University Theory Seminar
APRIL 2021	Fully Dynamic Electrical Flows: Sparse Maxflow Faster Than Goldberg-Rao ETH Zurich Algorithms and Complexity Seminar
MARCH 2021	Fully Dynamic Electrical Flows: Sparse Maxflow Faster Than Goldberg-Rao MIT Algorithms & Complexity Seminar
DECEMBER 2020	Faster Algorithms for Unit Maxflow TCS+
AUGUST 2020	Discrepancy Minimization via a Self-Balancing Walk Georgia Tech Combinatorics Seminar
AUGUST 2020	Discrepancy Minimization via a Self-Balancing Walk Microsoft Research Talk Series

REMAINING PUBLICATIONS AND PREPRINTS

30. **Incremental Shortest Paths in Almost Linear Time via a Modified Interior Point Method**
Yang P. Liu, preprint. [arXiv:2506.19207](https://arxiv.org/abs/2506.19207)
29. **Approximate Spanning Tree Counting from Uncorrelated Edge Sets**
Yang P. Liu, Richard Peng, Junzhao Yang, preprint. [arXiv:2505.14666](https://arxiv.org/abs/2505.14666)
28. **Parallel Repetition for 3-Player XOR Games**
Amey Bhangale, Mark Braverman, Subhash Khot, Yang P. Liu, Dor Minzer, STOC 2025. [arXiv:2408.09352](https://arxiv.org/abs/2408.09352).
27. **On Approximate Fully Dynamic Matching and Online Matrix-Vector Multiplication**
Yang P. Liu, FOCS 2024. [arXiv:2403.02582](https://arxiv.org/abs/2403.02582).
26. **Parallel Repetition for k -Player Projection Games**
Amey Bhangale, Mark Braverman, Subhash Khot, Yang P. Liu, Dor Minzer, RANDOM 2024. [arXiv:2312.04783](https://arxiv.org/abs/2312.04783).
25. **On Further Questions Regarding Unit Fractions**
Yang P. Liu, Mehtaab Sawhney, In submission. [arXiv:2404.07113](https://arxiv.org/abs/2404.07113)
24. **Incremental Approximate Maximum Flow on Undirected Graphs in Subpolynomial Update Time**
Jan van den Brand, Li Chen, Rasmus Kyng, Yang P. Liu, Richard Peng, Maximilian Probst Gutenberg, Sushant Sachdeva, Aaron Sidford, SODA 2024. [arXiv:2311.03174](https://arxiv.org/abs/2311.03174).
23. **A Deterministic Almost Linear Time Algorithm for Minimum Cost Flow**
Jan van den Brand, Li Chen, Rasmus Kyng, Yang P. Liu, Richard Peng, Maximilian Probst Gutenberg, Sushant Sachdeva, Aaron Sidford, FOCS 2023. [arXiv:2309.16629](https://arxiv.org/abs/2309.16629).

22. **Chaining, Group Leverage Score Overestimates, and Fast Spectral Hypergraph Sparsification**
Arun Jambulapati, Yang P. Liu, Aaron Sidford, STOC 2023. [arXiv:2209.10539](#).
21. **Dynamic Maxflow via Dynamic Interior Point Methods**
Jan van den Brand, Yang P. Liu, Aaron Sidford, STOC 2023. [arXiv:2212.06315](#).
20. **Vertex Sparsification for Edge Connectivity in Polynomial Time**
Yang P. Liu, ITCS 2023. [arXiv:2011.15101](#).
19. **Exponential Convergence of Sinkhorn Under Regularization Scheduling**
Jingbang Chen, Yang P. Liu, Richard Peng, Arvind Ramaswami, ACDA 2023. [arXiv:2207.00736](#).
18. **Online Edge Coloring via Tree Recurrences and Correlation Decay**
Janardhan Kulkarni, Yang P. Liu, Ashwin Sah, Mehtaab Sawhney, Jakub Tarnawski, STOC 2022, *SIAM Journal of Computing Special Issue*. [arXiv:2111.00721](#).
17. **Improved Iteration Complexities for Overconstrained p -Norm Regression**
Arun Jambulapati, Yang P. Liu, Aaron Sidford, STOC 2022. [arXiv:2111.01848](#).
16. **Faster Maxflow via Improved Dynamic Spectral Vertex Sparsifiers**
Jan van den Brand, Yu Gao, Arun Jambulapati, Yin Tat Lee, Yang P. Liu, Richard Peng, Aaron Sidford, STOC 2022. [arXiv:2112.00722](#).
15. **A Gaussian Fixed Point Walk**
Yang P. Liu, Ashwin Sah, Mehtaab Sawhney, **Best Student Paper** ITCS 2022. [arXiv:2104.07009](#).
14. **Arithmetic progressions in sumsets of sparse sets**
Noga Alon, Ryan Alweiss, Yang P. Liu, Anders Martinsson, Shyam Narayanan, *Integers*. [arXiv:2104.01564](#).
13. **Minor Sparsifiers and the Distributed Laplacian Paradigm**
Sebastian Forster, Gramoz Goranci, Yang P. Liu, Richard Peng, Xiaorui Sun, Mingquan Ye, FOCS 2021. [arXiv:2012.15675](#).
12. **Minimum Cost Flows, MDPs, and ℓ_1 -Regression in Nearly Linear Time for Dense Instances**
Jan van den Brand, Yin Tat Lee, Yang P. Liu, Thatchaphol Saranurak, Aaron Sidford, Zhao Song, Di Wang, STOC 2021. [arXiv:2101.05719](#).
11. **Vertex Sparsification for Edge Connectivity**
Parinya Chalermsook, Syamantak Das, Yunbum Kook, Bundit Laekhanukit, Yang P. Liu, Richard Peng, Mark Sellke, Daniel Vaz, SODA 2021. [arXiv:2007.07862](#).
10. **Faster Energy Maximization for Faster Maximum Flow**
Yang P. Liu, Aaron Sidford, STOC 2020. [arXiv:1910.14276](#).
9. **Constant Girth Approximation for Directed Graphs in Subquadratic Time**
Shiri Chechik, Yang P. Liu, Omer Rotem, Aaron Sidford, STOC 2020. [arXiv:1907.10779](#).
8. **Near-optimal Approximate Discrete and Continuous Submodular Function Minimization**
Brian Axelrod, Yang P. Liu, Aaron Sidford, SODA 2020. [arXiv:1909.00171](#).
7. **On the upper tail problem for random hypergraphs**
Yang P. Liu, Yufei Zhao, *Random Structures & Algorithms*. [arXiv:1910.02916](#).
6. **Parallel Reachability in Almost Linear Work and Square Root Depth**
Arun Jambulapati, Yang P. Liu, Aaron Sidford, FOCS 2019. [arXiv:1905.08841](#).
5. **Short Cycles via Low-Diameter Decompositions**
Yang P. Liu, Sushant Sachdeva, Zejun Yu, SODA 2019. [arXiv:1810.05143](#).
4. **Reproducibility and Pseudo-Determinism in Log-Space**
Ofar Grossman, Yang P. Liu, SODA 2019. [arXiv:1803.04025](#).
3. **An Exponential Separation Between MA and AM Proofs of Proximity**
Tom Gur, Yang P. Liu, Ron D. Rothblum, ICALP 2018; *Computational Complexity. Journal*.
2. **The “Riemann Hypothesis” is True for Period Polynomials of Almost All Newforms**
Yang P. Liu, Peter S. Park, Zhuo Qun Song, *Research in Mathematical Sciences* (2016). [arXiv:1607.04699](#).

1. Bounded Gaps Between Products of Distinct Primes

Yang P. Liu, Peter S. Park, Zhuo Qun Song, *Research in Number Theory* (2017) 3: 26. [arXiv:1607.03887](https://arxiv.org/abs/1607.03887).

SERVICE

JUNE 2025 – JUNE 2025	Summer School on Linear Program Solvers Gave lectures on robust interior point methods at Georgia Tech summer school.
2023 – 2025	Program Committee Member Served on Program Committee for SODA 2024, FOCS 2024, FOCS 2025, ITCS 2026.
JULY 2025 – JULY 2025	Deputy Leader for USA IMO Team Led six students on the USA IMO team to the competition and back.
JULY 2019 – JULY 2019	Deputy Leader for USA IMO Team Led six students on the USA IMO team to the competition and back.
2016 –	Instructor at Math Olympiad Summer Program Taught top high-school students olympiad mathematics at a summer program.

EXPERIENCES AND ACTIVITIES

SUMMER 2021	Microsoft Research Redmond Algorithms Groups. Research Intern. Supervisor: Janardhan Kulkarni and Jakub Tarnawski.
SUMMER 2017	Jane Street Capital. Trading Intern.
SUMMER 2016	Emory REU. Supervisor: Ken Ono.