

Yang P. Liu

Department of Mathematics

Stanford University

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Employment and Education

Institute for Advanced Study, Princeton, NJ

Postdoctoral Member in the School of Mathematics

2023 - present

Stanford University, Stanford, CA

Ph.D. in Mathematics

2018 - 2023

Massachusetts Institute of Technology, Cambridge, MA

Bachelor of Science in Mathematics

2015 - 2018

Honors and Awards

A.W. Tucker Prize 2024

Frontiers of Science Award

Awarded by the International Congress of Basic Science, 2023

Best Paper, FOCS 2022

Best Student Paper, ITCS 2022

Best Student Paper, STOC 2021

Google Research Fellowship, 2022 - 2023

National Defense Science and Engineering Graduate Fellowship, 2018 - 2021

Gold Medal, International Math Olympiad 2014, 2015

Papers and Preprints

1. Liu, Y. P. (2024). On approximate fully-dynamic matching and online matrix-vector multiplication. *CoRR*, abs/2403.02582. To appear in FOCS 2024
2. Brand, J. v. d., Chen, L., Kyng, R., Liu, Y. P., Meierhans, S., Probst Gutenberg, M., and Sachdeva, S. (2024a). Almost-linear time algorithms for decremental graphs: Min-cost flow and more via duality. *arXiv*. To appear in FOCS 2024

3. Jambulapati, A., Lee, J. R., Liu, Y. P., and Sidford, A. (2024). Sparsifying generalized linear models. In Mohar, B., Shinkar, I., and O'Donnell, R., editors, *Proceedings of the 56th Annual ACM Symposium on Theory of Computing, STOC 2024, Vancouver, BC, Canada, June 24-28, 2024*, pages 1665–1675. ACM
4. Chen, L., Kyng, R., Liu, Y. P., Meierhans, S., and Probst Gutenberg, M. (2024). Almost-linear time algorithms for incremental graphs: Cycle detection, sccs, s-t shortest path, and minimum-cost flow. In Mohar, B., Shinkar, I., and O'Donnell, R., editors, *Proceedings of the 56th Annual ACM Symposium on Theory of Computing, STOC 2024, Vancouver, BC, Canada, June 24-28, 2024*, pages 1165–1173. ACM
5. Brand, J. v. d., Chen, L., Kyng, R., Liu, Y. P., Peng, R., Gutenberg, M. P., Sachdeva, S., and Sidford, A. (2024b). Incremental approximate maximum flow on undirected graphs in subpolynomial update time. In Woodruff, D. P., editor, *Proceedings of the 2024 ACM-SIAM Symposium on Discrete Algorithms, SODA 2024, Alexandria, VA, USA, January 7-10, 2024*, pages 2980–2998. SIAM
6. Brand, J. v. d., Chen, L., Peng, R., Kyng, R., Liu, Y. P., Gutenberg, M. P., Sachdeva, S., and Sidford, A. (2023a). A deterministic almost-linear time algorithm for minimum-cost flow. In *64th IEEE Annual Symposium on Foundations of Computer Science, FOCS 2023, Santa Cruz, CA, USA, November 6-9, 2023*, pages 503–514. IEEE
7. Jambulapati, A., Lee, J. R., Liu, Y. P., and Sidford, A. (2023a). Sparsifying sums of norms. In *64th IEEE Annual Symposium on Foundations of Computer Science, FOCS 2023, Santa Cruz, CA, USA, November 6-9, 2023*, pages 1953–1962. IEEE
8. Liu, Y. P. (2023). Vertex sparsification for edge connectivity in polynomial time. In Kalai, Y. T., editor, *14th Innovations in Theoretical Computer Science Conference, ITCS 2023, January 10-13, 2023, MIT, Cambridge, Massachusetts, USA*, volume 251 of *LIPIcs*, pages 83:1–83:15. Schloss Dagstuhl - Leibniz-Zentrum für Informatik
9. Brand, J. v. d., Liu, Y. P., and Sidford, A. (2023b). Dynamic maxflow via dynamic interior point methods. In Saha, B. and Servedio, R. A., editors, *Proceedings of the 55th Annual ACM Symposium on Theory of Computing, STOC 2023, Orlando, FL, USA, June 20-23, 2023*, pages 1215–1228. ACM
10. Jambulapati, A., Liu, Y. P., and Sidford, A. (2023b). Chaining, group leverage score overestimates, and fast spectral hypergraph sparsification. In Saha, B. and Servedio, R. A., editors, *Proceedings of the 55th Annual ACM Symposium on Theory of Computing, STOC 2023, Orlando, FL, USA, June 20-23, 2023*, pages 196–206. ACM
11. Chen, L., Kyng, R., Liu, Y. P., Peng, R., Probst Gutenberg, M., and Sachdeva, S. (2022b). Maximum flow and minimum-cost flow in almost-linear time. In *63rd IEEE Annual Symposium on Foundations of Computer Science, FOCS 2022, Denver, CO, USA, October 31 - November 3, 2022*, pages 612–623. IEEE
Best Paper
12. Chen, J., Liu, Y. P., Peng, R., and Ramaswami, A. (2022a). Exponential convergence of sinkhorn under regularization scheduling. *CoRR*, abs/2207.00736. Available at <https://arxiv.org/pdf/2207.00736.pdf>

13. Anari, N., Liu, Y. P., and Vuong, T. (2022). Optimal sublinear sampling of spanning trees and determinantal point processes via average-case entropic independence. In *63rd IEEE Annual Symposium on Foundations of Computer Science, FOCS 2022, Denver, CO, USA, October 31 - November 3, 2022*, pages 123–134. IEEE
Invited to SICOMP Special Issue
14. Kulkarni, J., Liu, Y. P., Sah, A., Sawhney, M., and Tarnawski, J. (2022). Online edge coloring via tree recurrences and correlation decay. In Leonardi, S. and Gupta, A., editors, *STOC '22: 54th Annual ACM SIGACT Symposium on Theory of Computing, Rome, Italy, June 20 - 24, 2022*, pages 104–116. ACM
Invited to SICOMP Special Issue
15. Brand, J. v. d., Gao, Y., Jambulapati, A., Lee, Y. T., Liu, Y. P., Peng, R., and Sidford, A. (2022). Faster maxflow via improved dynamic spectral vertex sparsifiers. In Leonardi, S. and Gupta, A., editors, *STOC '22: 54th Annual ACM SIGACT Symposium on Theory of Computing, Rome, Italy, June 20 - 24, 2022*, pages 543–556. ACM
16. Jambulapati, A., Liu, Y. P., and Sidford, A. (2022). Improved iteration complexities for overconstrained p -norm regression. In Leonardi, S. and Gupta, A., editors, *STOC '22: 54th Annual ACM SIGACT Symposium on Theory of Computing, Rome, Italy, June 20 - 24, 2022*, pages 529–542. ACM
17. Liu, Y. P., Sah, A., and Sawhney, M. (2022). A gaussian fixed point random walk. In *ITCS*, volume 215 of *LIPICs*, pages 101:1–101:10. Schloss Dagstuhl - Leibniz-Zentrum für Informatik
Best Student Paper
18. Gao, Y., Liu, Y. P., and Peng, R. (2021). Fully dynamic electrical flows: Sparse maxflow faster than goldberg-rao. In *62nd IEEE Annual Symposium on Foundations of Computer Science, FOCS 2021, Denver, CO, USA, February 7-10, 2022*, pages 516–527. IEEE. Appears in SIAM Journal of Computing Special Section for FOCS 2021
Invited to SICOMP Special Issue
19. Forster, S., Goranci, G., Liu, Y. P., Peng, R., Sun, X., and Ye, M. (2021). Minor sparsifiers and the distributed laplacian paradigm. In *FOCS*, pages 989–999. IEEE
20. Brand, J. v. d., Lee, Y. T., Liu, Y. P., Saranurak, T., Sidford, A., Song, Z., and Wang, D. (2021). Minimum cost flows, mdps, and ℓ_1 -regression in nearly linear time for dense instances. In *STOC 2021*
21. Alon, N., Alweiss, R., Liu, Y. P., Martinsson, A., and Narayanan, S. (2021). Arithmetic progressions in sumsets of sparse sets. *Integers*, 21A(Ron Graham Memorial Volume):Paper No. A3, 7
22. Alweiss, R., Liu, Y. P., and Sawhney, M. (2021). Discrepancy minimization via a self-balancing walk. In Khuller, S. and Williams, V. V., editors, *STOC '21: 53rd Annual ACM SIGACT Symposium on Theory of Computing, Virtual Event, Italy, June 21-25, 2021*, pages 14–20. ACM. To appear in SIAM Journal of Computing Special Section for STOC 2021
Best Student Paper
23. Kathuria, T., Liu, Y. P., and Sidford, A. (2020). Unit capacity maxflow in almost $m^{4/3}$ time. In Irani, S., editor, *61st IEEE Annual Symposium on Foundations of Computer Science*,

FOCS 2020, Durham, NC, USA, November 16-19, 2020, pages 119–130. IEEE. Appears in SIAM Journal of Computing Special Section for FOCS 2020

Invited to SICOMP Special Issue

24. Liu, Y. P. and Sidford, A. (2020). Faster energy maximization for faster maximum flow. In *Proceedings of the 52nd Annual ACM SIGACT Symposium on Theory of Computing*, pages 803–814
25. Chechik, S., Liu, Y. P., Rotem, O., and Sidford, A. (2020). Constant girth approximation for directed graphs in subquadratic time. In *Proceedings of the 52nd Annual ACM SIGACT Symposium on Theory of Computing*, pages 1010–1023
26. Liu, Y. P., Peng, R., and Sellke, M. (2019a). Vertex sparsifiers for c-edge connectivity. *arXiv preprint arXiv:1910.10359*
27. Axelrod, B., Liu, Y. P., and Sidford, A. (2020). Near-optimal approximate discrete and continuous submodular function minimization. In *Proceedings of the Fourteenth Annual ACM-SIAM Symposium on Discrete Algorithms*, pages 837–853. SIAM
28. Jambulapati, A., Liu, Y. P., and Sidford, A. (2019). Parallel reachability in almost linear work and square root depth. In *2019 IEEE 60th Annual Symposium on Foundations of Computer Science (FOCS)*, pages 1664–1686. IEEE
29. Liu, Y. P. and Zhao, Y. (2019). On the upper tail problem for random hypergraphs. *Random Structures & Algorithms*, to appear
30. Liu, Y. P., Sachdeva, S., and Yu, Z. (2019b). Short cycles via low-diameter decompositions. In *Proceedings of the Thirtieth Annual ACM-SIAM Symposium on Discrete Algorithms*, pages 2602–2615. SIAM
31. Grossman, O. and Liu, Y. P. (2019). Reproducibility and pseudo-determinism in log-space. In *Proceedings of the Thirtieth Annual ACM-SIAM Symposium on Discrete Algorithms*, pages 606–620. SIAM
32. Gur, T., Liu, Y. P., and Rothblum, R. D. (2018). An exponential separation between MA and AM proofs of proximity. In *45th International Colloquium on Automata, Languages, and Programming (ICALP 2018)*. Schloss Dagstuhl-Leibniz-Zentrum fuer Informatik
33. Liu, Y., Park, P. S., and Song, Z. Q. (2017). Bounded gaps between products of distinct primes. *Research in Number Theory*, 3(1):26
34. Liu, Y., Park, P. S., and Song, Z. Q. (2016). The Riemann Hypothesis is true for period polynomials of almost all newforms. *Research in the Mathematical Sciences*, 3(1):31

Journal Publications

1. Kulkarni, J., Liu, Y. P., Sah, A., Sawhney, M. S., and Tarnawski, J. (2024). Online edge coloring via tree recurrences and correlation decay. *SIAM J. Comput.*, 53(1):87–110
2. Chen, L., Kyng, R., Liu, Y. P., Peng, R., Probst Gutenberg, M., and Sachdeva, S. (2023). Almost-linear-time algorithms for maximum flow and minimum-cost flow. *Commun. ACM*, 66(12):85–92

3. Gao, Y., Liu, Y., and Peng, R. (2023). Fully dynamic electrical flows: Sparse maxflow faster than goldberg-rao. *SIAM Journal on Computing*, (0):FOCS21–85
4. Kathuria, T., Liu, Y. P., and Sidford, A. (2022). Unit capacity maxflow in almost $m^{4/3}$ time. *SIAM Journal on Computing*, (0):FOCS20–175
5. Alweiss, R., Liu, Y. P., and Sawhney, M. S. (0). Discrepancy minimization via a self-balancing walk. *SIAM Journal on Computing*, 0(0):STOC21–211–STOC21–224

Invited Talks

1. **MIT Theory of Computation Colloquium**
Recent Advances in Dynamic Graph Algorithms
April 2024
2. **Rutgers Discrete Math Seminar**
Sparsifying Generalized Linear Models
February 2024
3. **NYU Theory Seminar**
Sparsifying Generalized Linear Models
February 2024
4. **Dagstuhl Seminar on Graph Algorithms: Cuts, Flows, and Network Design**
Recent Advances on Maximum Flows
October 2023
5. **Princeton Theory Lunch**
Sparsifying Generalized Linear Models
September 2023
6. **Simons Institute Beyond the Boolean Cube Workshop**
Sparsifying Sums of Norms
July 2023
7. **Princeton University Computer Science Seminar**
Graphs, Optimization, Geometry, and Fast Algorithms
April 2023
8. **MIT Department of Mathematics**
Graphs, Optimization, Geometry, and Fast Algorithms
March 2023
9. **Carnegie Mellon University**
Graphs, Optimization, Geometry, and Fast Algorithms
March 2023
10. **University of California Berkeley**
Graphs, Optimization, Geometry, and Fast Algorithms
March 2023

11. **University of California Berkeley**
 Graphs, Optimization, Geometry, and Fast Algorithms
 January 2023
12. **MIT Theory of Computation Colloquium**
 Maximum Flow and Minimum-Cost Flow in Almost-Linear Time
 November 2022
13. **University of Michigan Theory Seminar**
 Lessons on Algorithmic Graph Theory from Maxflow
 November 2022
14. **University of Washington Theory Seminar**
 Lessons on Algorithmic Graph Theory from Maxflow
 November 2022
15. **Harvard Center for Mathematical Sciences & Applications Interdisciplinary Seminar**
 Recent Advances on Maximum Flows and Minimum-Cost Flows
 August 2022
16. **UC Santa Barbara Theory Colloquium**
 Maximum Flow and Minimum-Cost Flow in Almost-Linear Time
 April 2022
17. **UC Berkeley Theory Lunch**
 Maximum Flow and Minimum-Cost Flow in Almost-Linear Time
 April 2022
18. **Stanford Theory Seminar**
 Maximum Flow and Minimum-Cost Flow in Almost-Linear Time
 March 2022
19. **Carnegie Mellon University Theory Seminar**
 Discrepancy Minimization via a Self-Balancing Walk
 October 2021
20. **ETH Zurich Algorithms and Complexity Seminar**
 Fully Dynamic Electrical Flows: Sparse Maxflow Faster Than Goldberg-Rao
 April 2021
21. **MIT Algorithms & Complexity Seminar**
 Fully Dynamic Electrical Flows: Sparse Maxflow Faster Than Goldberg-Rao
 March 2021
22. **TCS+**
 Faster Algorithms for Unit Maxflow
 December 2020
23. **Georgia Tech Combinatorics Seminar**
 Discrepancy Minimization via a Self-Balancing Walk
 August 2020

24. Microsoft Research Talk Series

Discrepancy Minimization via a Self-Balancing Walk

August 2020

Work Experience

Research Intern at Microsoft Research Redmond, June 2021 - September 2021

Trading Intern at Jane Street Capital, May 2017 - August 2017

Service

Subreviewer for SOSA 2025, ALENEX 2025, STOC 2024, ITCS 2024, SOSA 2024, SODA 2024, FOCS 2023, ESA 2023, ICALP 2023, STOC 2023, SODA 2023, FOCS 2022, STOC 2022, SODA 2022, FOCS 2021, SODA 2021, APPROX 2020, ICALP 2020, SODA 2020, ICALP 2019

Program committee member for SODA 2024, FOCS 2024