

# Yang P. Liu

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## Employment and Education

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**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

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**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

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- Brand, J. v. d., Chen, L., Kyng, R., Liu, Y. P., Peng, R., Gutenberg, M. P., Sachdeva, S., and Sidford, A. (2023a). A deterministic almost-linear time algorithm for minimum-cost flow. *arXiv preprint arXiv:2309.16629*. To appear in FOCS 2023
- Jambulapati, A., Lee, J. R., Liu, Y. P., and Sidford, A. (2023a). Sparsifying sums of norms. *arXiv preprint arXiv:2305.09049*. To appear in FOCS 2023

3. 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
4. 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
5. 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
6. 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**
7. 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>
8. 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**
9. 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**
10. 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
11. 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
12. 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**

13. 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**
14. 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
15. 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  $\ell_1$ -regression in nearly linear time for dense instances. In *STOC 2021*
16. 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
17. 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**
18. 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**
19. 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
20. 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
21. Liu, Y. P., Peng, R., and Sellke, M. (2019a). Vertex sparsifiers for c-edge connectivity. *arXiv preprint arXiv:1910.10359*
22. 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
23. 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
24. Liu, Y. P. and Zhao, Y. (2019). On the upper tail problem for random hypergraphs. *Random Structures & Algorithms*, to appear

25. 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
26. 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
27. 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
28. Liu, Y., Park, P. S., and Song, Z. Q. (2017). Bounded gaps between products of distinct primes. *Research in Number Theory*, 3(1):26
29. 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

## Invited Talks

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

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

## Work Experience

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

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

## Service

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Subreviewer for SODA 2023, FOCS 2022, STOC 2022, SODA 2022, FOCS 2021, SODA 2021, APPROX 2020, ICALP 2020, SODA 2020, ICALP 2019