

# Ali Vakilian

**E-mail:** vakilian@ttic.edu  
**Home Page:** <http://www.ttic.edu/vakilian>  
**Citation Metrics:** (on Dec 13, 2024) total citations: 1240, h-index: 18, i-index: 27 ([Google Scholar Profile](#))

## Research Interests

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Learning-Augmented Algorithms, Fairness of Algorithms and Machine Learning, Learning in the Presence of Strategic Agents, Algorithms for Massive Data, Approximation Algorithms and Combinatorial Optimization

## Academic Positions

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- **Toyota Technological Institute at Chicago** ..... 9/2022 – present  
Research Assistant Professor.
- **Toyota Technological Institute at Chicago, IDEAL Institute** ..... 9/2020 – 9/2022  
Postdoctoral Researcher.
- **University of Wisconsin–Madison** ..... 9/2019 – 9/2020  
Postdoctoral Researcher.

## Education

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- **Massachusetts Institute of Technology (MIT)** ..... 9/2013 – 9/2019  
Ph.D. in Computer Science, CSAIL  
**Thesis Title:** *New Directions in Streaming Algorithms*  
**Advisors:** Erik Demaine and Piotr Indyk
- **University of Illinois at Urbana-Champaign (UIUC)** ..... 9/2011 – 9/2013  
M.S. in Computer Science  
**Thesis Title:** *Prize-Collecting Survivable Network Design Problem in Node-Weighted Graphs*  
**Advisor:** Chandra Chekuri
- **Sharif University of Technology** ..... 9/2007 – 6/2011  
B.S. in Computer Engineering

## Conference Publications

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48. **Minimax Group Fairness in Strategic Classification** ..... SaTML 2025  
with Emily Diana and Saeed Sharifi-Malvajerdi.  
Proceedings of *3rd IEEE Conference on Secure and Trustworthy Machine Learning*.
47. **Learning-Augmented Streaming Algorithms for Approximating Max-Cut** ..... ITCS 2025  
with Yin hao Dong and Pan Peng.  
Proceedings of *16th Innovations in Theoretical Computer Science Conference*.
46. **Sublinear Metric Steiner Tree via Improved Bounds for Set Cover** ..... ITCS 2025  
with Sepideh Mahabadi, Mohammad Roghani and Jakub Tarnawski.  
Proceedings of *16th Innovations in Theoretical Computer Science Conference*.

45. **Bayesian Strategic Classification** ..... NeurIPS 2024  
with Lee Cohen, Saeed Sharifi-Malvajerdi, Kevin Stangl and Juba Ziani.  
Proceedings of *Advances in Neural Information Processing Systems*. PMLR
44. **On Socially Fair Regression and Low-Rank Approximation** ..... NeurIPS 2024  
with Zhao Song, David Woodruff and Samson Zhou.  
Proceedings of *Advances in Neural Information Processing Systems*. PMLR
43. **Streaming Algorithms for Connectivity Augmentation** ..... ICALP 2024  
with Ce Jin, Michael Kapralov and Sepideh Mahabadi.  
Proceedings of *51st International Colloquium on Automata, Languages, and Programming (vol. 297, pp. 93:1–93:20)*.
42. **Learning-Based Algorithms for Graph Searching Problems** ..... AISTATS 2024  
with Adela DePavia and Erasmo Tani.  
Proceedings of *International Conference on Artificial Intelligence and Statistics (vol. 238, pp. 928-936)*. PMLR.  
– **Selected as an oral paper.**  
– **Recipient of Outstanding Student Paper Highlight award** (awarded to 7 out of 547 accepted papers)
41. **Scalable Algorithms for Individual Preference Stable Clustering** ..... AISTATS 2024  
with Ron Mosenzon.  
Proceedings of *International Conference on Artificial Intelligence and Statistics (vol. 238, pp. 1108-1116)*. PMLR.
40. **Improved Frequency Estimation Algorithms with and without Predictions** ..... NeurIPS 2023  
with Anders Aamand, Justin Chen, Huy Nguyen and Sandeep Silwal.  
Proceedings of *Advances in Neural Information Processing Systems (pp. 14387-14399)*. PMLR  
– **Selected as a spotlight paper.**
39. **Constant Approximation for Individual Preference Stable Clustering** ..... NeurIPS 2023  
with Anders Aamand, Justin Chen, Allen Liu, Sandeep Silwal, Pattara Sukprasert and Fred Zhang.  
Proceedings of *Advances in Neural Information Processing Systems (pp. 43646-43661)*. PMLR  
– **Selected as a spotlight paper.**
38. **Tight Bounds for Volumetric Spanners and Applications** ..... NeurIPS 2023  
with Aditya Bhaskara and Sepideh Mahabadi.  
Proceedings of *Advances in Neural Information Processing Systems (pp. 916–930)*. PMLR
37. **Approximating Red-Blue Set Cover** ..... APPROX 2023  
with Eden Chlamtáč and Yury Makarychev.  
Proceedings of *Approximation, Randomization, and Combinatorial Optimization (vol. 275, pp. 11:1–11:19)*.
36. **Sequential Strategic Screening** ..... ICML 2023  
with Lee Cohen, Saeed Sharifi-Malvajerdi, Kevin Stangl and Juba Ziani.  
Proceedings of *International Conference on Machine Learning (pp. 6279-6295)*. PMLR.
35. **Approximation Algorithms for Fair Range Clustering** ..... ICML 2023  
with Sedjro S. Hotegni and Sepideh Mahabadi.  
Proceedings of *International Conference on Machine Learning (pp. 13270-13284)*. PMLR.
34. **Learning the Positions in CountSketch** ..... ICLR 2023  
with Yi Li, Honghao Lin, Simin Liu and David Woodruff.  
Proceedings of *the Eleventh International Conference on Learning Representations*.

– **Selected as a Notable-top-25% paper.**

33. **Faster Fundamental Graph Algorithms via Learned Predictions** ..... ICML 2022  
with Justin Chen, Sandeep Silwal and Fred Zhang.  
Proceedings of *International Conference on Machine Learning* (pp. 3583-3602). PMLR.
32. **Individual Preference Stability for Clustering** ..... ICML 2022  
with Saba Ahmadi, Pranjal Awasthi, Samir Khuller, Matthäus Kleindessner, Jamie Morgenstern and Pat-tara Sukprasert.  
Proceedings of *International Conference on Machine Learning* (pp. 197-246). PMLR.  
– **Selected for a long presentation.**
31. **Multi Stage Screening: Enforcing Fairness and Maximizing Efficiency in a Pre-Existing Pipeline** FAccT 2022  
with Avrim Blum and Kevin Stangl.  
Proceedings of *the 2022 ACM Conference on Fairness, Accountability, and Transparency* (pp. 1178-1193)
30. **Fair Representation Clustering with Several Protected Classes** ..... FAccT 2022  
with Zhen Dai and Yury Makarychev.  
Proceedings of *the 2022 ACM Conference on Fairness, Accountability, and Transparency* (pp. 814-823)
29. **Improved Approximation Algorithms for Individually Fair Clustering** ..... AISTATS 2022  
with Mustafa Yalçın.  
Proceedings of *International Conference on Artificial Intelligence and Statistics* (pp. 8758-8779). PMLR.
28. **Approximating Fair Clustering with Cascaded Norm Objectives** ..... SODA 2022  
with Eden Chlamtáč and Yury Makarychev.  
Proceedings of *the ACM-SIAM Symposium on Discrete Algorithms* (pp. 2664-2683).
27. **Approximation Algorithms for Socially Fair Clustering** ..... COLT 2021  
with Yury Makarychev.  
Proceedings of *Conference on Learning Theory* (pp. 3246-3264). PMLR.
26. **Learning Online Algorithms with Distributional Advice** ..... ICML 2021  
with Ilias Diakonikolas, Vasilis Kontonis, Christos Tzamos and Nikos Zarifis.  
Proceedings of *International Conference on Machine Learning* (pp. 2687-2696). PMLR.
25. **Individual Fairness for  $k$ -Clustering** ..... ICML 2020  
with Sepideh Mahabadi.  
Proceedings of *International Conference on Machine Learning* (pp. 6586-6596). PMLR.
24. **Improved Local Computation Algorithm for Set Cover via Sparsification** ..... SODA 2020  
with Christoph Grunau, Slobodan Mitrović and Ronitt Rubinfeld.  
Proceedings of *the ACM-SIAM Symposium on Discrete Algorithms* (pp. 2993-3011).
23. **Learning-Based Low-Rank Approximations** ..... NeurIPS 2019  
with Piotr Indyk and Yang Yuan.  
Proceedings of *Advances in Neural Information Processing Systems* (pp. 7402-7412).
22. **Structural Rounding: Approximation Algorithms for Graphs Near an Algorithmically Tractable Class** ESA 2019

with Erik Demaine, Timothy Goodrich, Kyle Kloster, Brian Lavalley, Quanquan Liu, Blair Sullivan and Andrew van der Poel.  
 Proceedings of *European Symposium on Algorithms*.

21. **Tight Tradeoffs for Maximum  $k$ -Coverage Problem in the General Streaming Model** . . . . . PODS 2019  
 with Piotr Indyk.  
 Proceedings of *the ACM SIGMOD-SIGACT-SIGAI Symposium on Principles of Database Systems* (pp. 200-217).
20. **Sample-Optimal Low-Rank Approximation of Distance Matrices** . . . . . COLT 2019  
 with Piotr Indyk, Tal Wagner and David Woodruff.  
 Proceedings of *Conference on Learning Theory* (pp. 1723-1751). PMLR.
19. **Scalable Fair Clustering** . . . . . ICML 2019  
 with Arturs Backurs, Piotr Indyk, Krzysztof Onak, Baruch Schieber and Tal Wagner.  
 Proceedings of *International Conference on Machine Learning* (pp. 405-413). PMLR.
18. **Learning-Based Frequency Estimation Algorithms** . . . . . ICLR 2019  
 with Chen-Yu Hsu, Piotr Indyk and Dina Katabi.  
 Proceedings of *the Seventh International Conference on Learning Representations*.
17. **Local Computation Algorithms for Spanners** . . . . . ITCS 2019  
 with Merav Parter, Ronitt Rubinfeld and Anak Yodpinyanee.  
 Proceedings of *10th Innovations in Theoretical Computer Science Conference*.
16. **Set Cover in Sub-linear Time** . . . . . SODA 2018  
 with Piotr Indyk, Sepideh Mahabadi, Ronitt Rubinfeld and Anak Yodpinyanee.  
 Proceedings of *the ACM-SIAM Symposium on Discrete Algorithms* (pp. 2467-2486).
15. **Fractional Set Cover in the Streaming Model** . . . . . APPROX 2017  
 with Piotr Indyk, Sepideh Mahabadi, Ronitt Rubinfeld, Jonathan Ullman and Anak Yodpinyanee.  
 Proceedings of *Approximation, Randomization, and Combinatorial Optimization*.
14. **Cost-Effective Conceptual Design Over Taxonomies** . . . . . WebDB 2017  
 with Yodsawalai Chodpathumwan, Arash Termehchy and Amir Nayyeri.  
 Proceedings of *the 20th International Workshop on the Web and Databases* (pp. 35-40).
13. **Towards Tight Bounds for the Streaming Set Cover Problem** . . . . . PODS 2016  
 with Sariel Har-Peled, Piotr Indyk and Sepideh Mahabadi.  
 Proceedings of *the 35th ACM SIGMOD-SIGACT-SIGAI Symposium on Principles of Database Systems* (pp. 371-383).
12. **On Streaming and Communication Complexity of the Set Cover Problem** . . . . . DISC 2014  
 with Erik Demaine, Piotr Indyk and Sepideh Mahabadi.  
 Proceedings of *28th International Symposium on Distributed Computing* (pp. 484-498). Springer Berlin Heidelberg.
11. **Which Concepts Are Worth Extracting?** . . . . . SIGMOD 2014  
 with Arash Termehchy, Yodsawalai Chodpathumwan and Marianne Winslett.  
 Proceedings of *the ACM SIGMOD International Conference on Management of Data* (pp. 779-790).
10. **Improved Approximation Algorithms for Degree-Bounded Network Design Problems with Node Con-**

- nectivity Requirements** ..... STOC 2014  
with Alina Ene.  
Proceedings of *the 46th ACM Symposium on Theory of Computing* (pp. 754-763).
9. **Prize-Collecting Survivable Network Design in Node-Weighted Graphs** ..... APPROX 2012  
with Chandra Chekuri and Alina Ene.  
Proceedings of *International Workshop on Approximation Algorithms for Combinatorial Optimization* (pp. 98-109). Springer Berlin Heidelberg.
8. **Node-Weighted Network Design in Planar and Minor-Closed Families of Graphs** ..... ICALP 2012  
with Chandra Chekuri and Alina Ene.  
Proceedings of *39th International Colloquium on Automata, Languages, and Programming* (pp. 206-217).

## Manuscripts

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7. **A Polynomial-Time Approximation for Pairwise Fair  $k$ -Median Clustering** .....  
with Sayan Bandyapadhyay, Eden Chlamtác and Yury Makarychev. *May 2024*
6. **(Learned) Frequency Estimation Algorithms under Zipfian Distribution** .....  
with Anders Aamand and Piotr Indyk. *February 2020*.
5. **Approximation Algorithms for Nearly  $H$ -Minor-Free Graphs** .....  
with Erik Demaine and Quanquan Liu. *November 2018*.
4. **Connected Domatic Packing Node-Capacitated Graphs** .....  
with Alina Ene and Nitish Korula. *July 2013*.

## Journal Publications

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3. **Node-Weighted Network Design in Planar and Minor-Closed Families of Graphs** ..... TALG 2021  
with Chandra Chekuri and Alina Ene.  
*ACM Transactions on Algorithms (TALG)*, 17(2), 1-25.
2. **Cost-Effective Conceptual Design Using Taxonomies** ..... VLDB 2018  
with Yodsawalai Chodpathumwan, Arash Termehchy and Amir Nayyeri.  
*The VLDB Journal*, 27(3), 369-394.
1. **Cost-Effective Database Design For Information Extraction Applications** ..... TODS 2015  
with Arash Termehchy, Yodsawalai Chodpathumwan and Marianne Winslett.  
*ACM Transactions on Database Systems (TODS)*, 40(2), 1-39.

## Mentoring

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- **Interns at TTIC**
  - Chirag Pabbaraju ..... (Informally) Summer 2024  
*PhD student at Stanford*
  - Madhusudhan Pittu ..... Summer 2023  
*PhD student at CMU*
  - Erasmo Tani ..... Summer 2023  
*PhD student at University of Chicago*

- **Fatima Fellows**

*The Fatima Fellow program ([fatimafellowship.com](http://fatimafellowship.com)) is an initiative aimed at increasing representation of students from marginalized communities in graduate schools throughout North America and Europe.*

- Sedjro Hotegni ..... 5/2022 – 2/2023  
*MS student at African Institute for Mathematical Sciences–Rwanda*

- **PhD Thesis Committee Members**

- Kevin Stangl ..... Spring 2024  
*PhD student at TTIC*
- Erasmo Tani ..... Spring 2024  
*PhD student at University of Chicago*
- Thy Nguyen ..... Spring 2024  
*PhD student at Northeastern University*
- Zhen Dai ..... Spring 2023  
*PhD student at University of Chicago*

## Teaching

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- **Instructor at TTIC/University of Chicago:**

Mathematical Toolkit (TTIC 31150/CMSC 31150) ..... Spring 2023

- **Teaching Assistant at MIT:**

Introduction to Algorithms (6.006) ..... Spring 2017  
 Introduction to Algorithms (6.006) ..... Fall 2016  
 Advanced Algorithms (6.854) ..... Spring 2016

## Awards and Honors

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- **Recipient of AISTATS outstanding student paper highlight award** .....2024  
*Awarded to 7 out of 547 accepted papers*
- **Recipient of ETH Zurich Presidential Fellowship** ..... 2019
- **Siebel Scholar** ..... 2013  
*Awarded annually to 85 top students from the world’s leading graduate schools.*  
**Siebel Scholar is the largest award offered by the College of Engineering at UIUC.**
- **3<sup>rd</sup> highest GPA** among all computer engineering students of class 2011 (+150 students) .....
- **Outstanding Student Award** .....2008  
*Sharif University of Technology*
- **Ranked 38<sup>th</sup>** in the annual nationwide universities entrance exam in Iran .....2007  
*Among 300,000+ participants*

## Professional Service

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- **Program Committees**

- Program Committee Member ..... ACDA 2025
- Program Committee Member ..... ICALP 2024
- Program Committee Member ..... PODS 2022
- Area Chair ..... AISTATS 2025 & 2024 & 2023
- Junior Program Committee Member ..... COLT 2024
- Junior Program Committee Member ..... ALT 2023 & 2022
- **Workshop Organization**
  - Summer Workshop on “**Learning-Augmented Algorithms**” at TTIC ..... August 2024
  - SoCG’23 Workshop on “**Recent Developments in Geometric Clustering**” ..... June 2023
  - Chicago Junior Theorists Workshop at Northwestern University and TTIC ..... January 2023
  - STOC Workshop on “**Algorithms with Predictions**”, Virtual ..... June 2020
  - Summer Workshop on “**Learning-Based Algorithms**” at TTIC ..... August 2019
- **Reviewer**
  - STOC, FOCS, SODA, ITCS, ICALP, APPROX, RANDOM, PODS, DISC, ESA, STACS, KDD and WG
  - ICML, NeurIPS, ICLR, AISTATS and COLT
  - JACM, TALG, SICOMP, Algorithmica, JCSS and IJCAI

## Research Programs and Visits

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- Schloss Dagstuhl ..... October 2024  
*Seminar on Machine Learning Augmented Algorithms for Combinatorial Optimization Problems*
- Simons Institute, Berkeley ..... Summer 2024  
*Sublinear Algorithms Program.*
- Simons Institute, Berkeley ..... Fall 2023  
*Data Structures and Optimization for Fast Algorithms Program.*
- Schloss Dagstuhl ..... February 2023  
*Seminar on Scheduling*
- TTI, Chicago ..... Summer 2017  
*Mentored by Julia Chuzhoy.*
- Google Research, NYC ..... Summer 2015  
*Mentored by Aditya Bhaskara, Silvio Lattanzi and Morteza Zadimoghaddam.*

## Recent Invited Talks

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- **Exploring Fairness in Clustering: Definitions, Techniques, and Applications**
  - Joint EnCORE and IDEAL workshop on “Foundations of Fairness and Accountability” at Northwestern University ..... 11/19/2024
- **Learning-Based Algorithms for Graph Searching Problems**
  - Machine Learning Augmented Algorithms for Combinatorial Optimization Problems Seminar at Schloss Dagstuhl ..... 10/29/2024

- **Strategic Sequential Screening**  
INFORMS Annual Meeting ..... 10/22/2024
- **Streaming Algorithms for Connectivity Augmentation Problems**  
Simons Institute at Berkeley, Extroverted Sublinear Algorithms Workshop ..... 6/20/2024
- **Algorithms for Socially Fair Clustering: Min-Max Fairness to Cascaded Norms**  
MIT, A&C Seminar ..... 12/6/2023  
UW Seattle, Theory Seminar ..... 11/14/2023  
INFORMS Annual Meeting ..... 10/15/2023  
UT Austin, Theory Seminar ..... 10/6/2023  
Stanford University, Algorithmic Fairness Seminar ..... 10/2/2023
- **Learning-Augmented Algorithms for Massive Data**  
INFORMS Annual Meeting ..... 10/18/2023
- **Tight Bounds for Volumetric Spanners in All Norms**  
Simons Institute at Berkeley, Sketching and Algorithm Design Workshop ..... 10/11/2023
- **Individual Preference Stability for Clustering**  
TRIPODS Postdoc Workshop ..... 8/22/2023  
Research at TTIC ..... 2/24/2023
- **Graph Algorithms with Learned Duals**  
Scheduling Seminar at Schloss Dagstuhl ..... 2/9/2023
- **Learning Online Algorithms with Distributional Advice**  
Algorithms Under Uncertainty Workshop at FSTTCS'22, IIT Madras ..... 12/6/2022
- **Algorithm Design in the Machine Learning Era**  
Research at TTIC ..... 5/13/2022
- **Individually Fair Clustering**  
IDEAL Workshop on Clustering ..... 4/23/2022
- **Approximation Algorithms for Fair Clustering**  
University of Wisconsin—Madison, IFDS ..... 6/10/2021  
UC San Diego, Department of Computer Science & Engineering ..... 5/17/2021  
UWaterloo, Combinatoics & Optimization Department ..... 5/17/2021  
MIT A&C Seminar ..... 5/10/2021  
TOC4Fairness Seminar ..... 4/28/2021  
Joint Purdue University and University of Michigan Theory Seminar ..... 4/23/2021  
University of Washington, Department of Computer Science ..... 4/20/2021



UIUC, Department of Computer Science .....	4/19/2021
Google Research .....	4/15/2021
<b>• Learning-based Algorithms For Massive Data</b>	
INFORMS Annual Meeting .....	11/10/2020