CURRICULUM VITAE

Vaidehi Srinivas

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EDUCATION

Ph.D. in Computer Science
Sep. 2021 – present
Advisor: Aravindan Vijayaraghavan
Area: Algorithms, Machine Learning Theory
Northwestern University
Evanston, Illinois

Fulbright Visiting Student
Sep. 2020 – May 2021
Host: Christian Schulz
Theory and Application of Algorithms group
University of Vienna
Vienna, Austria

B.S. in Computer Science, minor in German Studies
Aug. 2016 – May 2020
University and college honors
Carnegie Mellon University
Pittsburgh, Pennsylvania

PUBLICATIONS

Competitive strategies to use "warm start" algorithms with predictions [arXiv]
with Avrim Blum,
ACM-SIAM Symposium on Discrete Algorithms (SODA) 2025.
A "warm start" algorithm is one that takes an instance *I* and a predicted solution *P* as input, and outputs the true solution *S* to *I* in time proportional to the distance between *P* and *S* ("error" of the prediction). Such algorithms are useful when solving sequences of related instances. We give competitive guarantees in settings where instances come from a mixture of "clusters."

The Predicted-Updates Dynamic Model: Offline, Incremental, and Decremental to Fully Dynamic Transformations [arXiv]
with Quanquan C. Liu,
37th Annual Conference on Learning Theory (COLT) 2024.
We introduce the predicted-updates dynamic model, one of the first beyond-worst-case models for dynamic algorithms. We give a novel framework that "lifts" offline divide-and-conquer algorithms to the fully dynamic setting, when given predictions of update times. Our runtime matches that of the offline algorithm when the L1 prediction error is near-linear in the number of updates, does no worse than a fully-dynamic algorithm when the prediction error is high, and exhibits a graceful linear tradeoff between the two cases. We further generalize our result to lift incremental and decremental algorithms to the fully dynamic setting given predictions of only the deletion and insertion updates, respectively.

New Tools for Smoothed Analysis: Least Singular Value Bounds for Random Matrices with Dependent Entries [arXiv]
with Aditya Bhaskara, Eric Evert, and Aravindan Vijayaraghavan,
56th Annual ACM Symposium on Theory of Computing (STOC) 2024.
We develop new techniques for proving lower bounds on the least singular value of structured random matrices with limited randomness. Showing that such matrices are well-conditioned is a key step in providing "smoothed analysis" guarantees in many settings. Our new techniques both simplify known results and generalize to new settings, allowing us to get smoothed analysis results for previously open settings. Statements of this form are matrix "anti-concentration" inequalities, which require a different set of techniques and are not as well-understood as matrix concentration (or large deviation) bounds.

The Burer-Monteiro SDP method can fail even above the Barvinok-Pataki bound [arXiv]
with Liam O'Carroll and Aravindan Vijayaraghavan,
36th conference of Neural Information Processing Systems (NeurIPS) 2022.
The Burer-Monteiro method is a practical and popular heuristic for solving semidefinite programs (SDPs). We provide a family of instances that have spurious local minima for high rank (so Burer-Monteiro could indeed fail), which justifies the use of beyond-worst-case paradigms like smoothed analysis to obtain guarantees.

Memory Bounds for the Experts Problem [arXiv] [talk]
with David P. Woodruff, Ziyu Xu, and Samson Zhou,
54th Annual ACM Symposium on Theory of Computing (STOC) 2022.

We initiate the study of the online learning with expert advice problem in the streaming (low memory) setting. Our upper and lower bounds give a smooth tradeoff between memory and regret.

Simpler Approximations for the Network Steiner-tree Problem [pdf]
advised by Anupam Gupta,
Undergraduate Honors Thesis 2020.
The 11/6 and 1.55-approximation algorithms given by Zelikovsky ('93) and Robins and Zelikovsky ('05) are classic results in approximation algorithms. They are also notorious for their very technical analyses. We provide a simple modular analysis by reducing to submodular function optimization under knapsack constraints (idea due to Deeparnab Chakrabarty).

AWARDS AND FELLOWSHIPS

Northwestern University Presidential Fellowship
Fall 2023 – Summer 2025
Evanston, Illinois

Northwestern University Computer Science Department PhD Student Research Award
2022-2023 Academic Year
Evanston, Illinois

Peter and Adrienne Barris Outstanding Teaching Assistant Award
Fall 2022
Northwestern University CS Department, Evanston, Illinois

Todd M. and Ruth Warren Fellowship
Fall 2021 – Spring 2022
Northwestern University CS Department, Evanston, Illinois

Fulbright Combined Award for Austria
Sep. 2020 – Jun. 2021
Vienna, Austria

Andrew Carnegie Society Scholar
2020 Graduation Year
Carnegie Mellon University, Pittsburgh, Pennsylvania

Phi Beta Kappa
2020 Graduation Year
Carnegie Mellon University, Pittsburgh, Pennsylvania

INTERNSHIPS

IDEAL Summer Exchange Program
June 2023 – Sep. 2023
Toyota Technological Institute (TTIC), Chicago, Illinois
Research intern hosted by Avrim Blum at TTIC, and funded by the Institute for Data, Econometrics, Algorithms, and Learning

News Engineering Intern at Apple
May 2018 – Aug. 2018
Cupertino, California

Software Engineering Intern at BlueJeans Network
Jun. 2017 – Aug. 2017
Mountain View, California

INVITED TALKS

(poster) **TRIPODS Annual Meeting**, *Chicago, Illinois, Dec. 2024*
(poster) **IDEAL Get Ready for Research Workshop**, *Chicago, Illinois, Oct. 2024*
IDEAL NSF Site Visit, *Evanston, Illinois, Sep. 2024*
TTIC Workshop on Learning-Augmented Algorithms, *Chicago, Illinois, Aug. 2024*
25th Annual Symposium on Mathematical Programming (ISMP), *Montréal, Canada, Jul. 2024*
Stanford University Theory Lunch, *Stanford, California, Mar. 2024*
(poster) **TRIPODS Annual Meeting**, *San Diego, California, Feb. 2024*
McCormick School of Engineering Advisory Council, *Evanston, Illinois, Nov. 2023*
Google Research, *Mountain View, California, Nov. 2023*
INFORMS Annual Meeting, *Phoenix, Arizona, Oct. 2023*
IDEAL NSF Site Visit, *Chicago, Illinois, Aug. 2023*
University of Chicago Theory Lunch, *Chicago, Illinois, Apr. 2023*

Capital Area Theory Seminar @ University of Maryland, *College Park, Maryland, Apr. 2023*

CONFERENCE/JOURNAL REVIEWS

Served as a (sub)reviewer for conferences: STOC 2023, ICML 2023, FOCS 2023, SODA 2024, ITCS 2024, STOC 2024, STOC 2025. Served as a reviewer for journal: SICOMP (2023).

TEACHING

TA for CS 396/496: Foundations of Quantum Computing and Quantum Information
Winter 2024
Northwestern University, Evanston, Illinois

TA for CS 212: Mathematical Foundations of Computer Science
Fall 2022
Northwestern University, Evanston, Illinois
Peter and Adrienne Barris Outstanding Teaching Assistant Award for Fall 2022

Fulbright English Teaching Assistant
Oct. 2020 – May 2021
Vienna, Austria

TA for 15-451: Algorithms
Spring 2020
Carnegie Mellon University, Pittsburgh, Pennsylvania

TA for 15-354: Computational Discrete Math
Fall 2019
Carnegie Mellon University, Pittsburgh, Pennsylvania

(Head) TA for 15-251: Great Ideas in Theoretical Computer Science
Spring 2018, Fall 2018, (Head TA) Spring 2019
Carnegie Mellon University, Pittsburgh, Pennsylvania

OUTREACH

Books and Breakfast
Jan. 2022 – present
Evanston, Illinois

Math Circles of Chicago
Sep. 2022 – May 2024
Chicago, Illinois

Calico Youth Services
May 2020 – August 2020
Palo Alto, California

FORGE
Aug. 2019 – May 2020
Pittsburgh, Pennsylvania

LEADERSHIP

Northwestern CS PhD Advisory Council
2022 - 2024
Northwestern University, Evanston, Illinois

IDEAL Student Event Planning
Spring 2022
Northwestern University, Evanston, Illinois

Women@SCS and SCS-4-ALL
Jan. 2018 – May 2020
Carnegie Mellon University, Pittsburgh, Pennsylvania