

## CURRICULUM VITAE

**Vaidehi Srinivas**

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### EDUCATION

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#### **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

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#### **Guarantees for Alternating Least Squares in Overparameterized Tensor Decomposition**

*with Dionysios Arvanitakis and Aravindan Vijayaraghavan,  
under submission.*

Alternating Least Squares (ALS) is a popular iterative heuristic used for tensor (CP) decomposition. While this method is widely used in practice, little is known in terms of provable global convergence guarantees. We establish guarantees for a mild variant of the standard ALS method, showing that it does indeed achieve global convergence in a beyond-worst-case setting.

### **Online Conformal Prediction with Efficiency Guarantees** [\[arXiv\]](#)

*under submission.*

We study online conformal prediction in a novel framework that directly optimizes efficiency of the output prediction sets.

### **Computing High-Dimensional Confidence Sets for Arbitrary Distributions** [\[arXiv\]](#)

*with Chao Gao, Liren Shan, and Aravindan Vijayaraghavan,*

[38<sup>th</sup> Annual Conference on Learning Theory \(COLT\) 2025.](#)

We provide guarantees for learning the high-density region of an arbitrary distribution. This has immediate consequences for high-dimensional conformal prediction. We show insights from robust statistics can be leveraged to tackle this problem.

### **Volume Optimality in Conformal Prediction with Structured Prediction Sets** [\[arXiv\]](#)

*with Chao Gao, Liren Shan, and Aravindan Vijayaraghavan,*

[42<sup>nd</sup> International Conference on Machine Learning \(ICML\) 2025.](#)

We provide the first provable distribution-free efficiency guarantees for the standard setting of conformal prediction.

### **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,*

[37<sup>th</sup> 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,*  
[56<sup>th</sup> 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,*  
[36<sup>th</sup> conference on 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,*  
[54<sup>th</sup> 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**

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### **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**

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### **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*

## **WORKSHOPS AND TUTORIALS**

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**Co-presenter of Minitutorial on Learning-Augmented Algorithms** [\[web\]](#),

*Symposium on Applied and Computational Discrete Algorithms (ACDA) 2025, Montréal, Canada*

**Co-organizer of Workshop on Predictions and Uncertainty** [\[web\]](#),

*Conference on Learning Theory (COLT) 2025, Lyon, France*

## **INVITED TALKS**

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**Optimization Unplugged Workshop**, *Lausanne, Switzerland, Aug. 2025*

**IDEAL Annual Meeting**, *Chicago, Illinois, Jun. 2025*

(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*

**25<sup>th</sup> 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**

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Served as a (sub)reviewer for conferences: STOC 2023, ICML 2023, FOCS 2023, SODA 2024, ITCS 2024, ICML 2024, STOC 2024, STOC 2025,ICALP 2025, COLT 2025 (junior PC), NeurIPS 2025, SODA 2026. Served as a reviewer for journal: SICOMP (2023).

## TEACHING

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### Guest lectures

- *(Winter 2024)* CS 396/496: Foundations of Quantum Computing and Quantum Information
- *(Spring 2024)* CS 262: Mathematical Foundations of CS Part 2: Continuous Mathematics for Computer Science

### 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

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### 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**

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**Northwestern CS PhD Advisory Council**

*2022 - 2024*

*Northwestern University, Evanston, Illinois*

**Northwestern CS Theory Seminar Organizer**

*Fall 2023*

*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*