Vatsal Sharan

CONTACT
INFORMATION

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APPOINTMENTS

University of Southern California
Assistant Professor,
Department of Computer Science   **Fall 2021 – present**

Massachusetts Institute of Technology
Norbert Weiner Postdoctoral Associate,
Institute for Data, Systems & Society   **2020 – 2021**

EDUCATION

Stanford University
Ph.D. in Electrical Engineering   **2014 – 2020**
Advisor: Gregory Valiant, Dept. of Computer Science

Indian Institute of Technology Kanpur
B.Tech. in Electrical Engineering   **2010 – 2014**

DISTINCTIONS

- Amazon Research Award   2024
- NSF CAREER Award   2023
- Amazon Research Award   2022
- Best Paper Award at 35th Conference on Learning Theory (COLT)   2022
- Norbert Wiener Postdoctoral Fellowship, MIT   2020
- Outstanding reviewer at ICML'19, NeurIPS'21
- Invited to China Theory Week, Tsinghua University   2018
- Director's Gold Medal for best all-round performance and leadership in
  graduating class, IIT Kanpur   2014
- Best Final Year Project in Electrical Engineering, IIT Kanpur   2014
- Honda Young Engineer and Scientist Award   2013

SELECTED
PUBLICATIONS

(many papers have alphabetical author ordering)

1. **Stability and Group Fairness in Ranking with Uncertain Predictions**
   Siddartha Devic, Aleksandra Korolova, David Kempe, Vatsal Sharan
   International Conference on Machine Learning (ICML) 2024
   Symposium on Foundations of Responsible Computing (FORC 2024)

2. **Regularization and Optimal Multiclass Learning**
   Julian Asilis, Siddartha Devic, Shaddin Dughmi, Vatsal Sharan, Shang-Hua Teng
   Conference on Learning Theory (COLT) 2024

3. **Fairness in Matching under Uncertainty**
   Siddartha Devic, David Kempe, Vatsal Sharan, Aleksandra Korolova
   International Conference on Machine Learning (ICML) 2023
   ACM Conference on Equity & Access in Algorithms, Mechanisms, & Optimization (EAAMO'23)

4. **NeuroSketch: A Neural Network Method for Fast and Approximate Evaluation of Range Aggregate Queries**
   Sepanta Zeighami, Vatsal Sharan, Cyrus Shahabi
   ACM Special Interest Group on Management of Data Conference (SIGMOD) 2023

5. **Efficient Convex Optimization Requires Superlinear Memory**
   Annie Marsden, Vatsal Sharan, Aaron Sidford, Gregory Valiant
   Conference on Learning Theory (COLT), 2022 **(Best Paper Award)**
   Invited to IJCAI 2023 Sister Conference Notable Paper Track

6. **Efficient Gradient Methods for Objectives with Multiple Scales**
   Jon Kelner, Annie Marsden, Vatsal Sharan, Aaron Sidford, Gregory Valiant, Honglin Yuan
   Conference on Learning Theory (COLT), 2022

7. **Multicalibrated Partitions for Importance Weights**
   Parikshit Gopalan, Omer Reingold, Vatsal Sharan, Udi Wieder
   Algorithmic Learning Theory (ALT), 2022

8. **Omnipredictors**
   Parikshit Gopalan, Adam Tauman Kalai, Omer Reingold, Vatsal Sharan, Udi Wieder
   Innovations in Theoretical Computer Science (ITCS), 2022

9. **Modular versus Monolithic Task Formulations in Neural Networks Learning**
   Atish Agarwala, Abhimanyu Das, Brendan Juba, Rina Panigrahy, Vatsal Sharan, Xin Wang, Qiuyi Zhang
   International Conference on Learning Representations (ICLR) 2021

10. **Sample Amplification: Increasing Dataset Size even when Learning is Impossible**
    Brian Axelrod, Shivam Garg, Vatsal Sharan, Gregory Valiant
    International Conference on Machine Learning (ICML) 2020

11. **PIDForest: Anomaly detection via Partial Identification**
    Parikshit Gopalan, Vatsal Sharan, Udi Wieder
    Neural Information Processing Systems (NeurIPS) 2019 **(Spotlight presentation)**

12. **Fast and Accurate Low-Rank Factorization of Compressively-Sensed Data**
    Vatsal Sharan, Kai Sheng Tai, Peter Bailis, Gregory Valiant
    International Conference on Machine Learning (ICML) 2019

13. **Memory-sample Tradeoffs for Linear Regression with Small Error**
    Vatsal Sharan, Aaron Sidford, Gregory Valiant
    Symposium on the Theory of Computing (STOC) 2019

14. **Recovery Guarantees for Quadratic Tensors with Limited Observations**
    Hongyang Zhang, Vatsal Sharan, Moses Charikar and Yingyu Liang
    Artificial Intelligence & Statistics (AISTATS) 2019

15. **A Spectral View of Adversarially Robust Features**
    Shivam Garg, Vatsal Sharan, Brian Zhang, Gregory Valiant
    Neural Information Processing Systems (NeurIPS) 2018 **(Spotlight presentation)**

16. **Efficient Anomaly Detection via Matrix Sketching**
    Vatsal Sharan, Parikshit Gopalan, Udi Wieder
    Neural Information Processing Systems (NeurIPS) 2018

17. **Prediction with a Short Memory**
    Vatsal Sharan, Sham Kakade, Percy Liang, Gregory Valiant
    Symposium on the Theory of Computing (STOC) 2018

18. **Sketching Linear Classifiers over Data Streams**
    Kai Sheng Tai, Vatsal Sharan, Peter Bailis, Gregory Valiant
    ACM SIGMOD Conference on Management of Data (SIGMOD) 2018

19. **Moment-Based Quantile Sketches for Efficient High Cardinality Aggregation Queries**
    Edward Gan, Jialin Ding, Kai Sheng Tai, Vatsal Sharan, Peter Bailis
    Conference on Very Large Data Bases (VLDB) 2018

20. **Learning Overcomplete HMMs**
    Vatsal Sharan, Sham Kakade, Percy Liang, Gregory Valiant
    Neural Information Processing Systems (NeurIPS) 2017

21. **Orthogonalized Alternating Least Squares: A Theoretically Principled Tensor Factorization Algorithm for Practical Use**
    Vatsal Sharan, Gregory Valiant
    International Conference on Machine Learning (ICML) 2017

INTERNSHIPS	**Google Research, Mountain View** *(with Rina Panigrahy)*	Summer 2019
	VMware Research, Palo Alto *(with Parikshit Gopalan)*	Summer 2017

STUDENTS

PhD students
Bhavya Vasudeva (started Fall'21)
Siddartha Devic (started Fall'21, co-advised with Aleksandra Korolova)
Julian Asilis (started Fall'22)
Deqing Fu (started Fall'22, co-advised with Robin Jia)
Devansh Gupta (started Fall'23, co-advised with Meisam Razaviyayn)
Spandan Senapati (started Fall'23, co-advised with Haipeng Luo)
Tianyi Zhou (started Fall'23)

Undergraduate students
Dutch Hansen
Anish Jayant
Natalie Abreu (graduated in Fall'23, now Ph.D. student at Harvard)
Kameron Shahabi (graduated in Fall'24, will start as Ph.D. student at the University of Washington)
Devin Martin (intern in Summer'22, mentored by Bhavya Vasudeva)

TEACHING
AT USC

Theory of Machine Learning: Fall'21, Fall'23
Machine Learning: Fall'22, Spring'24
Computational Perspectives on the Frontiers of Learning: Spring'23

OUTREACH

Learning Theory Alliance (LeT-All), Workshop Committee
- Organized day-long virtual mentoring workshop on "Day-to-day life of an ML/theory researcher" on June 4 2024, attended by around 300 students.
- Organized day-long virtual mentoring workshop on "Communicating your research" on October 26 2023, attended by around 200 students.

High-school students hosted in the summer (in collaboration with USC Viterbi K-12 Center)
Janna Audrey Doratan (Summer'24, mentored by Devansh Gupta)
Angela Zhuang (Summer'23, mentored by Julian Asilis)
Jayron Martinez (Summer'22, mentored by Siddartha Devic)
Luke Pratt (Summer'22, mentored by Bhavya Vasudeva)

Talks for high-school students

Fair & Robust Artificial Intelligence
- As part of USC SHINE program for high-schoolers, June 2022
- Los Angeles County Office of Education (LACOE) CS speaker series, February 2023

INVITED TALKS
& SEMINARS

Transformers Learn Higher-Order Optimization Methods for In-Context Learning
- USC Syposium on Frontiers of Generative AI in Science and Society, March 2024
- Information Theory and Applications, San Diego, February 2024

Memory as a Lens to Understand Efficient Learning and Optimization
- Workshop on Computational/Statistical Gaps in Learning & Optimization, UCLA, February 2024
- Indian Institute of Technology, Delhi, December 2023
- University of Maryland, College Park, September 2023
- Microsoft Research, NYC, September 2023

From Anomaly Detection to Robust ML: Multicalibration as an Algorithmic Paradigm
- Amazon Research, Palo Alto, July 2023

Fairness in Matching under Uncertainty
- Information Theory and Applications, San Diego, February 2023

Sample Amplification: Increasing Dataset Size even when Learning is Impossible
- USC Probability Seminar, October 2023
- Learning Theory Alliance Mentoring Workshop, February 2021
- Simons Institute, Learning in High Dimensions Program, September 2020
- Neurips Machine Learning with Guarantees Workshop, December 2019

Memory-sample Tradeoffs for Continuous Optimization and Learning
- MIT Theory Lunch, October 2020
- NYU Theory Seminar, November 2019
- EPFL Theory Seminar, November 2019
- Northwestern Junior Theorists Workshop, November 2019
- University of Washington Theory Lunch, October 2019
- Cornell ORIE Young Researchers Workshop, October 2019
- Google Research, Mountain View, August 2019

Prediction with a Short Memory
- ETH Zurich Institute for Theoretical Studies, November 2019
- China Theory Week, Tsinghua University, September 2018
- Google Mountain View Algorithms TechTalk, March 2018

Orthogonalized ALS: Theoretically Principled Tensor Factorization for Practical Use
- SIAM Annual Meeting, Portland, July 2018