

Adarsh Barik

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Research Interests

- Statistical Machine Learning
 - High-Dimensional Data Analysis
 - Optimization
 - Information Theory
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Academic Journey

- **National University of Singapore** **Singapore**
2023 – now
Institute of Data Science
 - Program: Research Fellow, Host: Professor Vincent Y. F. Tan
 - Developing online learning algorithms for convex and nonconvex loss functions
 - **Purdue University** **West Lafayette, USA**
2017 – 2023
Department of Computer Science
 - Program: Ph.D., Advisor: Professor Jean Honorio, GPA: 4.0/4.0
 - Developed novel continuous relaxations for combinatorial problems - extended beyond convexity
 - Provided sufficient and necessary theoretical bounds on the sample and computational complexity
 - **Indian Institute of Technology Madras** **Chennai, India**
2008 – 2013
Department of Aerospace Engineering
 - Program: B.Tech and M.Tech, Advisor: Professor M Ramakrishna, GPA: 8.49/10
 - Developed mathematical and computational model of flow inside a flexible tube
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Publications and Preprints

1. **On exact solutions of the inner optimization problem of adversarial robustness**
Deepak Maurya, Adarsh Barik, Jean Honorio
International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2025
2. **p -Mean Regret for Stochastic Bandits**
Anand Krishna, Philips George John, Adarsh Barik, Vincent Y. F. Tan
Association for the Advancement of Artificial Intelligence (AAAI), 2025
3. **An SDP Formulation for Minimizing p -th Order Controversy with Unknown Initial Opinions**
Meher Chaitanya, Adarsh Barik, Jean Honorio
Conference on Complex Networks and Their Applications, 2024
4. **Exact Support Recovery in Federated Regression with One-shot Communication**
Adarsh Barik, Jean Honorio
Transactions on Machine Learning Research (TMLR), 2023
5. **Provable Computational and Statistical Guarantees for Efficient Learning of Continuous-Action Graphical Games**
Adarsh Barik, Jean Honorio
International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2023
6. **Sparse Mixed Linear Regression with Guarantees: Taming an Intractable Problem with Invex Relaxation**
Adarsh Barik, Jean Honorio
International Conference on Machine Learning (ICML), 2022
Acceptance rate < 20%
7. **A Simple Unified Framework for High Dimensional Bandit Problems**
Wenjie Li, Adarsh Barik, Jean Honorio
International Conference on Machine Learning (ICML), 2022
Acceptance rate < 20%
8. **Provable Sample Complexity Guarantees for Learning of Continuous-Action Graphical Games With Non-parametric Utilities**
Adarsh Barik, Jean Honorio
International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2022

9. **Information Theoretic Limits for Standard and One-Bit Compressed Sensing with Graph-Structured Sparsity**
Adarsh Barik, Jean Honorio *International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2022
 10. **Fair Sparse Regression with Clustering: An Invex Relaxation for a Combinatorial Problem**
Adarsh Barik, Jean Honorio *Neural Information Processing Systems (NeurIPS)*, 2021
Spotlight, Acceptance rate < 3%
 11. **Information-Theoretic Bounds for Integral Estimation**
Donald Q. Adams, Adarsh Barik, Jean Honorio *IEEE International Symposium on Information Theory (ISIT)*, 2021
 12. **Learning Discrete Bayesian Networks in Polynomial Time and Sample Complexity**
Adarsh Barik, Jean Honorio *IEEE International Symposium on Information Theory (ISIT)*, 2020
 13. **Learning Bayesian Networks with Low Rank Conditional Probability Tables**
Adarsh Barik, Jean Honorio *Neural Information Processing Systems (NeurIPS)*, 2019
Acceptance rate < 22%
 14. **Information Theoretic Limits for Linear Prediction with Graph-Structured Sparsity**
Adarsh Barik, Jean Honorio, Mohit Tawarmalani *IEEE International Symposium on Information Theory (ISIT)*, 2017
 15. **Invex programs - First Order Algorithms and Their Convergence**
Adarsh Barik, Suvrit Sra, Jean Honorio *Preprint*
 16. **Minimizing Polarization in Social Networks: Modifying Network Topology with Fully and Partially Observed Initial Opinions**
Meher Chaitanya, Adarsh Barik, Mansi Rankawat, Jean Honorio *Preprint*
 17. **LEARN: An Invex Loss for Outlier Oblivious Robust Online Optimization**
Adarsh Barik, Anand Krishna, Vincent Y. F. Tan *Preprint*
 18. **A Sample Efficient Alternating Minimization-based Algorithm For Robust Phase Retrieval**
Adarsh Barik, Anand Krishna, Vincent Y. F. Tan *Preprint*
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Talks

- **Outlier Oblivious Robust Online Optimization**
IIT Kanpur, India and TIFR, India, 2024
 - **Sparse Mixed Linear Regression with Guarantees: Taming an Intractable Problem with Invex Relaxation**
Spotlight *International Conference on Machine Learning (ICML)*, 2022
 - **A Simple Unified Framework for High Dimensional Bandit Problems**
Spotlight *International Conference on Machine Learning (ICML)*, 2022
 - **Provable Sample Complexity Guarantees for Learning of Continuous-Action Graphical Games With Non-parametric Utilities**
International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2022
 - **Information Theoretic Limits for Standard and One-Bit Compressed Sensing with Graph-Structured Sparsity**
International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2022
 - **Fair Sparse Regression with Clustering: An Invex Relaxation for a Combinatorial Problem**
Spotlight *Neural Information Processing Systems (NeurIPS)*, 2021
 - **Learning Discrete Bayesian Networks in Polynomial Time and Sample Complexity**
IEEE International Symposium on Information Theory (ISIT), 2020
 - **Learning Bayesian Networks with Low Rank Conditional Probability Tables**
Neural Information Processing Systems (NeurIPS), 2019
 - **Information Theoretic Limits for Linear Prediction with Graph-Structured Sparsity**
IEEE International Symposium on Information Theory (ISIT), 2017
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Teaching

- **Instructor**, Purdue University
 - **Business Statistics**, MGMT305, Summer 2017 - **Outstanding Instructor Award**
 - **Teaching Assistant**, Purdue University
 - **Statistical Machine Learning**, CS578, Fall 2017, Spring 2018, Spring 2020, Spring 2023
 - **Computational Methods in Optimization**, CS520, Spring 2021
 - **Numerical Methods**, CS314, Fall 2020, Fall 2021
 - **Foundation of Computer Science**, CS182, Summer 2020, Summer 2021
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Service

- **PC Member (Reviewer)**: AAAI 2025, NeurIPS 2025, ICLR 2025, AISTATS 2025, NeurIPS 2024, ICML 2024, NeurIPS 2023, AISTATS 2023, NeurIPS 2022, ICML 2022, AISTATS 2022, AISTATS 2021
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Professional Experience

- **Associate Software Developer, FlexTrade Systems, India** 2013-2015
 - Worked on high-performance execution management and order management systems for equities, foreign exchange, options, futures, and fixed-income
 - **Project Trainee, Honeywell Technology Solutions, India** 2011
 - Studied various modeling techniques for squeeze film dampers and damping simulation on bolted flange joints under high-loading conditions
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Other Projects

- **IITMSAT Satellite Project** **Indian Institute of Technology Madras**
 - Founding member of the first student satellite project of IIT Madras
 - Leader of the structures subsystem and was responsible for the vibrational and structural robustness of the satellite structure
 - **Minimum Area Polygon Problem** **Indian Institute of Technology Madras**
 - Used Genetic algorithm to provide a novel greedy algorithm for finding a simple polygon with minimum enclosed area for a given number of data points
 - Formulated the algorithm and implemented using MATLAB®
 - **ASTROSAT Project** **Tata Institute of Fundamental Research**
 - Worked on structural analysis of CZT (Calcium-Zinc-Telluride) Imager of ASTROSAT satellite for an improved vibrational and thermal performance
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Relevant Courses

Grade A or better

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|----------------------------------|---|
| • Statistical Machine Learning | • Algorithm Design and Analysis |
| • Artificial Intelligence | • Computational Methods in Optimization |
| • Hands-on Learning Theory | • Randomized Algorithm |
| • High-Dimensional Data Analysis | |
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Relevant Programing Experience

Core technical skills: Python, C++, C, MATLAB®, shell script, L^AT_EX

- **Classroom projects** - <https://github.com/Adarsh-Barik>
 - **Python**, Implemented a multiclass support vector machine classifier to recognize characters using Chars 74K data set (English characters) which contained code for feature extraction, model generation, hyperparameter estimation and cross-validation
 - **Python**, Implemented Sequential Minimization Optimization algorithm from scratch to solve soft margin problem in support vector machines
 - **Python**, Implemented two-phase Simplex algorithm from scratch to solve linear programs
 - **Python**, Implemented a basic peer-to-peer chat application from scratch with no centralized server
 - **Master's project**
 - **Python**, Designed a three-dimensional mathematical model using Navier-Stokes equations and membrane equation to study flow-structure interaction and implemented it using MacCormack's finite-difference scheme
 - **Professional Software Developer**
 - **C++**, Designed and implemented custom trading strategies and customizable click-and-trade front-end applications as a professional software developer for 2 years
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References

1. Vincent Y. F. Tan
 - Professor, Department of Mathematics and Department of Electrical and Computer Engineering, National University of Singapore
 - Email: vtan@nus.edu.sg
2. Jean Honorio
 - Senior Lecturer, School of Computing and Information Systems, The University of Melbourne
 - Adjunct Professor, Department of Computer Science and Department of Statistics, Purdue University
 - Email: jean.honorio@unimelb.edu.au
3. Petros Drineas
 - Professor and Head, Department of Computer Science, Purdue University
 - Email: pdrineas@purdue.edu