

Adarsh Barik

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Research Interests

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

Education

- **National University of Singapore** **Singapore**
Institute of Data Science 2023 – now
 - Program: Research Fellow, Host: Professor Vincent Y. F. Tan
 - Developing online learning algorithms for convex and nonconvex loss functions
- **Purdue University** **West Lafayette, USA**
Department of Computer Science 2017 – 2023
 - Program: PhD, 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 sample and computational complexity
- **Indian Institute of Technology Madras** **Chennai, India**
Department of Aerospace Engineering 2008 – 2013
 - 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

Publications and Preprints

1. **Exact Support Recovery in Federated Regression with One-shot Communication**
Adarsh Barik, Jean Honorio *Transactions on Machine Learning Research (TMLR)*, 2023
2. **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
3. **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%
4. **A Simple Unified Framework for High Dimensional Bandit Problems**
Wenjie Li, Adarsh Barik and Jean Honorio *International Conference on Machine Learning (ICML)*, 2022
Acceptance rate < 20%
5. **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
6. **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
7. **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%
8. **Information-Theoretic Bounds for Integral Estimation**
Donald Q. Adams, Adarsh Barik, Jean Honorio *IEEE International Symposium on Information Theory (ISIT)*, 2021

9. **Learning Discrete Bayesian Networks in Polynomial Time and Sample Complexity**
Adarsh Barik, Jean Honorio *IEEE International Symposium on Information Theory (ISIT)*, 2020
 10. **Learning Bayesian Networks with Low Rank Conditional Probability Tables**
Adarsh Barik, Jean Honorio *Neural Information Processing Systems (NeurIPS)*, 2019
Acceptance rate < 22%
 11. **Information Theoretic Limits for Linear Prediction with Graph-Structured Sparsity**
Adarsh Barik, Jean Honorio, Mohit Tawarmalani *IEEE International Symposium on Information Theory (ISIT)*, 2017
 12. **Invex programs - First Order Algorithms and Their Convergence**
Adarsh Barik, Suvrit Sra, Jean Honorio *Preprint*
 13. **On exact solutions of the inner optimization problem of adversarial robustness**
Deepak Maurya, Adarsh Barik, Jean Honorio *Preprint*
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Talks

- **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)**: 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

- Statistical Machine Learning
 - Artificial Intelligence
 - Hands-on Learning Theory
 - High Dimensional Data Analysis
 - Algorithm Design and Analysis
 - Computational Methods in Optimization
 - Randomized Algorithm
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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, hyper-parameter 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