Adarsh Barik

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Research Interests

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

Academic Journey

- **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: 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**
  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. **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

2. **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*

3. **Exact Support Recovery in Federated Regression with One-shot Communication**
   Adarsh Barik, Jean Honorio   *Transactions on Machine Learning Research (TMLR), 2023*

4. **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*

5. **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%

6. **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%

7. **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*

8. **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*

9. **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 $< 3\%$

10. **Information-Theoretic Bounds for Integral Estimation**
    Donald Q. Adams, Adarsh Barik, Jean Honorio   *IEEE International Symposium on Information Theory* (ISIT), 2021

11. **Learning Discrete Bayesian Networks in Polynomial Time and Sample Complexity**
    Adarsh Barik, Jean Honorio   *IEEE International Symposium on Information Theory* (ISIT), 2020

12. **Learning Bayesian Networks with Low Rank Conditional Probability Tables**
    Adarsh Barik, Jean Honorio   *Neural Information Processing Systems* (NeurIPS), 2019
    Acceptance rate $< 22\%$

13. **Information Theoretic Limits for Linear Prediction with Graph-Structured Sparsity**
    Adarsh Barik, Jean Honorio, Mohit Tawarmalani   *IEEE International Symposium on Information Theory* (ISIT), 2017

14. **Invex programs - First Order Algorithms and Their Convergence**
    Adarsh Barik, Suvrit Sra, Jean Honorio   *Preprint*

15. **On exact solutions of the inner optimization problem of adversarial robustness**
    Deepak Maurya, Adarsh Barik, 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*

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 Nonparametric 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

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

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

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

Relevant Programing Experience

Core technical skills: Python, C++, C, MATLAB®, shell script, LaTeX

- **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

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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