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 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*

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: jhonorio@unimelb.edu.au, jhonorio@purdue.edu
3. Petros Drineas
   - Professor and Associate Head, Department of Computer Science, Purdue University
   - Email: pdrineas@purdue.edu