Prathamesh Mayekar

Webpage: https://prathamesh220.github.io/ Linkedin: www.linkedin.com/in/prathamesh-mayekar-04269a28/

Title

Research Scientist at Propheus, Bangalore, India *Present*

Research Interest

Applied Research: Geo Spatial Data Science, Automated Feature Selection for Supervised Learning, Computational Advertising, Federated Learning, Differential Privacy.

Theoretical Research: Information Theory, Applied Probability, Stochastic Optimization, Statistics under Information Constraints, Online Learning, Machine Learning, Multi-Armed Bandits.

Education

Indian Institute of Science, Bengaluru,

Ph.D., Electrical and Communication Engineering *July' 16-July' 21*

- Thesis Topic: *Compression Algorithms for Distributed Computing and Learning*
- CGPA: 9.25/10

Indian Institute of Technology Bombay, Mumbai,

M.Tech., Industrial Engineering and Operations Research *July'13-June'15*

- Thesis Topic: *Multi-armed Bandit Approach to Dynamic Pricing*
- CGPA: 9.44/10

K.J.Somaiya College of Engineering, Mumbai,

B.E, Electronics and Communication Engineering *July'09-June'13*

Honors and Awards

1. Recipient of the Seshagiri Kaikini Medal for the best Doctoral Dissertation from ECE Dept, Indian Institute of Science, 2024.
2. Runner-up for the IKDD Doctoral Dissertation in Data Science, 2022.
3. Recipient of the Jack Keil Wolf Student Paper Award (Best Student Paper Award) at International Symposium on Information Theory (ISIT), 2018, Colorado, USA.
4. Recipient of the Wipro PhD. Fellowship, Indian Institute of Science, 2018.
5. Finalist for Qualcomm Innovation Fellowship, 2018, Bangalore, India.
6. Winner of Poster Presentations at the Supply Chain Practitioner's Council (SCPC), Mumbai Chapter. 2015, Mumbai, India.

Work Experience

Propheus, Bangalore, India *Present*

Senior Research Scientist

- Founding Team Member and Data Science Lead.
- **Digital Atlas for the World:** At Propheus, we are building the digital atlas for the world by integrating techniques from Computer Vision, Natural Language Processing, Bayesian Optimization, and Classical Machine Learning.
- **Conversational Interface and LLM Integration:** We are also building an advanced text-to-SQL and reasoning-based conversational interface powered by Large Language Models (LLMs) with a Retrieval-Augmented Generation (RAG) and agentic architecture. This interface allows users to interact with our database using natural language, enabling efficient responses for both factual and reasoning-based queries.

National University of Singapore, Singapore *September '22 - June '23*

Research Scientist

- **Research Focus:** Research Fellow in the Computer Science Department, working on problems at the intersection of Federated Learning, Online Learning, and Information Theory.
- **Publications:** Published research in AI and information theory venues, including the International Conference on Machine Learning and journals and conferences such as IEEE Transactions on Information Theory and the Information Theory Workshop.

Huawei Research, Bangalore, India *February '22 - August '22*

Research Scientist

- **Programmatic Advertising:** Focused on computational (programmatic) advertising, specifically developing deep learning models to improve click-through rate (CTR) and conversion rate (CVR) across various ad formats.
- **Impact:** Increased model traffic for native ads from 4% to 70% by introducing a model calibration algorithm.
- **Awards:** Received three awards in six months: Huawei India CEO Award (awarded to two teams), the Timely Incentive Award for Q2 (Best Performer Award), and the SPOT Award for July (Best Performer Award).

Indian Urban Data Exchange (IUDX), Bangalore, India *August '21 - January '22*

Research Scientist

- **Research in Differential Privacy:** Conducted research on differential privacy, developing privacy-preserving data pipelines for various public data queries.

TCS Innovation Lab (TRDDC), Pune, India *July '15 - July '16*

Software Engineer

- **System Optimization:** Worked on optimizing IT systems using queuing theory, mathematical programming, and discrete event system simulation.
- **Key Project:** Developed a "what-if simulation engine" for a client, utilizing the discrete event simulation package "Simpy" in Python to analyze and optimize various operational scenarios.

Major Courses

Real Analysis, Information Theory, Probability Theory, Concentration Inequalities, Detection and Estimation Theory, Topics in Information Theory and Statistical Learning, Stochastic Processes and Queuing Theory, Optimization Techniques, Integer Linear Programming, Network Flow and Algorithms, Markov Decision Processes, Game Theory, Foundations of Data Science.

Computing Skills

Programming Languages: Python, Scikit, Numpy, Tensorflow.
Modeling and Computational Software: AWS, AMPL, CPLEX.

Journal Publications

1. **P Mayekar**, S Jha, A T Suresh, and H Tyagi. Wyner-Ziv Estimators for Distributed Mean Estimation with Side Information and Optimization, IEEE transactions on Information Theory.
2. S Jha, **P Mayekar**, and H Tyagi. *Fundamental limits of over-the-air optimization: Are analog schemes optimal?*, IEEE Journal on Selected Areas in Information Theory (Special Issue on Distributed Coding and Computation).

3. **P Mayekar** and H Tyagi. *RATQ: A Universal Fixed-Length Quantizer for Stochastic Optimization*, IEEE Transactions on Information Theory.

4. **P Mayekar**, P Parag, and H Tyagi. *Optimal Source Codes for Timely Updates*, IEEE Transactions on Information Theory.

Conference Publications

1. **P Mayekar**, J Scarlett, and V Tan. Communication-Constrained Bandits under Additive Gaussian Noise, in the proceedings of International Conference on Machine Learning (ICML), 2023.

2. S Jha and **P Mayekar**. Fundamental Limits of Distributed Optimization over Multiple Access Channel, in the proceedings of IEEE Information Theory Workshop (ITW), 2023, Saint-Malo, France.

3. **P Mayekar**, S Jha, and H Tyagi. *Wyner-Ziv Compression is optimal for distributed optimization,* in the proceedings of IEEE International Symposium on Information Theory (ISIT), 2022, Aalto, Finland.

4. S Jha, **P Mayekar**, and H Tyagi. *Fundamental limits of over-the-air optimization: Are analog schemes optimal?* in proceedings of IEEE Global Communications Conference (GLOBECOM), 2021, Madrid, Spain.

5. J Acharya, C Canonne, **P Mayekar**, and H Tyagi. *Information-constrained optimization: Can adaptive processing of gradients help?*, in proceedings of Neural Information Processing Systems (NeurIPS), 2021.

6. **P Mayekar**, A T Suresh, and H Tyagi. *Wyner-Ziv Estimators: Efficient Distributed Mean Estimation with Side Information*, in proceedings of International Conference on Artificial Intelligence and Statistics (AISTATS), 2021.

7. **P Mayekar** and H Tyagi. *Limits on gradient compression for stochastic optimization*, in proceedings of IEEE International Symposium on Information Theory (ISIT), 2020, Los Angeles, USA.

8. **P Mayekar** and H Tyagi. *RATQ: A Universal Fixed-Length Quantizer for Stochastic Optimization*, in proceedings of International Conference on Artificial Intelligence and Statistics (AISTATS), 2020, Palermo, Italy.

9. **P Mayekar**, P Parag, and H Tyagi. *Optimal Lossless Source Codes for Timely Updates*, in proceedings of IEEE International Symposium on Information Theory (ISIT), 2018, Vail, USA. (Winner of the *Jack Keil Wolf Student Paper Award*.)

10. **P Mayekar** and N Hemachandra. *Some algorithms for correlated bandits with non-stationary rewards: Regret bounds and applications.* in proceedings of the Conference on Data Sciences (CODS), 2016, Pune, India

11. **P Mayekar**, V K Rai, A Puvvala, and H Vin. *Is prevention always better? A case in IT service management*, in proceedings of Pacific Asia Conference in Information Systems (PACIS) 2016, Chiayi, Taiwan.

12. **P Mayekar**, J. Venkateswaran, M. K. Gupta and N. Hemachandra. *P*erformance analysis and decomposition results for some dynamic priority schemes in 2-class queues, in proceedings of International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks (WiOpt), 2015, Mumbai, India.

Professional Service

Reviewer

Information Theory

- IEEE Transactions on Information Theory (TIT).
- IEEE Journal on Selected Areas in Information Theory (JSAIT).
- IEEE Transactions on Communication (TCOM).
- IEEE International Symposium on Information Theory (ISIT).
- IEEE Information Theory Workshop (ITW).

Machine Learning

- International Conference on Machine Learning (ICML).
- Conference on Neural Information Processing Systems (NeurIPS).
- International Conference on Representation Learning (ICLR).
- International Conference on Artificial Intelligence and Statistics (AISTATS).

Teaching Assistant

Indian Institute of Science, Bengaluru.

- Random Processes, E2 202 *Autumn'18*

Indian Institute of Technology Bombay, Mumbai.

- Markov Decision Processes, IE 708. *Spring'15*
- Introduction to Stochastic Models, IE 611. *Autumn'14*