Aditya Ravi

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Education

PhD |Electrical Engg.
UIUC | 2020-Present
- **Joan and Lalit Bahl** Fellow
- Research: Learning and AI, Bio-informatics, Statistics and Information Theory
- Advisor: Ilan Shomorony

M. Tech |Electrical Engg.
IIT Bombay | 2015-20
- Awarded the **Undergraduate Research Award**
- Thesis: On the Capacity of Gaussian Broadcast Channels with Noisy Feedback

B. Tech |Electrical Engg.
IIT Bombay | 2015-20
- **Gymkhana Citation Award**
- Graduated with honors

Coursework

Stats and Decision Theory
Information Theory (Basic and Advanced), Markov Chains, Queuing systems, Concentration Inequalities, Random Processes
Learning and Data Science
Fundamentals of Data Science, Computer Vision, Intro to ML
Mathematics
Real Analysis, Intro to Graphs

Technical Skills

Programming
Python • MATLAB
• C++ • R
Packages
PyTorch • OpenCV • Keras
• Tensorflow • Fastax-Toolkit
Languages
English • Tamil • Hindi

Foundation Honors

Kishore Vaigyanik Protsahan Yojna (**KVPY**) Fellowship
National Talent Search Exam (**NTSE**) scholar with state rank 2

Learning and AI Research 📄

Data Blind Domain Generalization (current) — *Aug '23 - Present*
- **Domain Generalization** when only trained models are available.
- Developing algorithms, with provable **ERM**, to create generalizable models for Out of Order Distributions **(OOD)**.

Client Priority in Federated Learning — *Jan '23 - July '23*
- Designed "FedALIGN", an adaptive algorithm for subscription-based priority in **Federated Learning**, proving convergence guarantees.
- Outperformed traditional baselines in benchmark tests, highlighting FedALIGN's applicability. **First Author** on a **AISTATS '24** submission.

Unreliable Multi Armed Bandits — *Aug '19 - Jan '20*
- Introduced a variant of the **Multi-Armed Bandit** Problem with an unreliable intermediary, to model recommendation systems.
- Developed a perturbation based strategy to minimize cost, with provable guarantees. **First Author** on a **COMSNET '20** paper.

Bio-informatics Research 📄

Code Design for Spatial Transcriptomics (current) — *Aug '23 - Present*
- Exploring optimal coding in MerFISH, a **Spatial Transcriptomics** pipeline, used on the **MERSCOPE Platform**.

Sequence Similarity Estimation : LexicHash — *Jan '22 - July '23*
- Introduced LexicHash, a novel **similarity estimation** method. Achieved an average improvement of 20.9% over traditional **MinHash**.
- Developed an efficient algorithm (top-T alignment) with a provable $O(n)$ time complexity. **Author** on a **Bioinformatics** journal paper.

Fundamentals of Coded Shotgun Sequencing — *Jan '21 - Dec '21*
- Proved the information theoretic capacity of the **Shotgun Sequencing** channel, to model DNA storage systems.
- **First Author** on **2 papers**, (ISIT'22 conference, JSAIT selected journal)

Statistics and Information Theory Research 📄

Capacity of the Torn Paper Channel — *Aug '20 - Dec '20*
- Proved the information theoretic capacity of the Torn Paper Channel.
- **First Author** on **2 papers**, an ISIT'21 conference proceedings and an IEEE transactions on Information Theory journal submission.

Gaussian Broadcast Channel with Noisy Feedback — *Aug '19 - July '20*
- Provided a provably tight characterization of where the capacity of the Gaussian Broadcast Channel with Noisy Feedback increases.
- **First Author** on **3 papers**, an ISIT '20, '21 conference paper and an IEEE transactions on Information Theory journal paper.

Additional Projects

KLA Tencor - Industrial Research Intern — *May '18-July '18*
- Created a **DBSCAN Based Multiclass Classifier** to classify semi conductor wafer faults, in an industry setting.