

Ativ Joshi

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Education

Chennai Mathematical Institute

MSc Computer Science

CGPA: 8.75/10 (Link to [transcript](#))

Chennai, TN

Aug'19 - Jun'21

Ahmedabad University

BTech in Information and Communication Technology

CGPA: 3.64/4.33 (Link to [transcript](#))

Ahmedabad, Gujarat

Aug'15 - May'19

Interests

Learning Theory, Information Theory, Optimization, Graphical Models, Computer Algebra

Publications

Ativ Joshi and Abhishek Sinha. Universal caching. In *2022 IEEE Information Theory Workshop (ITW)*, pages 684–689, 2022.

Technical Skills

- **Languages & Scripts** (C, C++, Java, Python, Shell),
- **Tools & Libraries** (Maple, Matlab, Numba, SageMath, SciPy/NumPy, SymPy, TensorFlow, Verilog).

Experience

Research Assistant

Tata Institute of Fundamental Research & IIT-Madras, Guide: Dr. Abhishek Sinha

- Working on Online Learning algorithms for network caching at Learning and Networks Group.

Mumbai, India

Jul'21 - present

Intern (MSc Thesis)

IISc, Bangalore, Guide: Dr. Navin Kashyap

- Project 1: We survey the nature of the capacity achieving input distribution of the AWGN channel, its behavior as the amplitude constraint is relaxed, and certain bounds on its support. Lastly we made an (unsuccessful) attempt at generalizing the bounds in a discrete setting.
- Project 2: Read papers on the use of Message Passing Algorithms (MPAs) to bound the the number of k-matchings in bipartite graphs. The bounds are achieved asymptotically for a sequence of 2-lifts of the original graph. These graphical models can also be used to approximate the permanents and subpermanent sums of positive matrices. We also conducted basic experiments to check efficiency of MPA to approximate permanents of various ensembles of sparse matrices.
- Links to [Project 1](#) and [Project 2](#)

Chennai, India

Aug'20 - Jun'21

Intern (BTech Project)

Chennai Mathematical Institute, Guide: Dr. Partha Mukhopadhyay

- Worked on approximating the permanent of a matrix using Markov Random Fields.
- The primary approach is to create a Markov Random Field whose partition function is the permanent of a square matrix. Then use Belief Propagation to compute Bethe Free Energy which approximates the permanent. We then try to generalize the algorithm to compute permanent of rectangular matrices. (The internship was a part of my bachelor's thesis).
- Links to [Code](#) and [Report](#)

Chennai, India

Jan'19 - May'19

Summer Student

Institute of Mathematical Sciences, Guide: Dr. R. Ramanujam

- Studied and presented a parameterized algorithm to approximately count the number of k-paths in a directed graph by embedding the graph into Exterior (or Grassmann) Algebra.
- Attended lectures on topics of theoretical computer science like Parameterized Complexity, Automata Theory, Games and Distributed Algorithms, Computational Geometry, Logic etc.
- : Link to [Certificate](#)

Chennai, India

May'18 - Jul'18

Intern

IIT-Gandhinagar, Guide: Dr. Bireswar Das

Gandhinagar, India

May'17 - July'18

- Studied and implemented the methods of sparse polynomial interpolation and sparse GCD computation for multivariate polynomials.
- Topics studied include Zippel's work on sparse interpolation, Ben-Or/Tiwari's Deterministic interpolation algorithm, early termination approach by Kaltofen et. al., non monic case of sparse GCD by de Kleine et. al., parallel GCD algorithm by Monagan/Hu etc. Implementation is done in Python using SymPy. (Started as a summer intern and later visited IIT-Gn weekly during the third year of BTech).
- Links to [Certificate](#), [Code](#) and [Report](#)

Teaching Assistant

Ahmedabad University, Instructor: Dr. Barbara Morawska

Ahmedabad, India

Aug'18 - Dec'18

- Worked as a teaching assistant for CSC210-Data Structures and Algorithms course.

Projects

Insider Threat Detection: Machine Learning Way

Aug'18 - Oct'18

- Conducted experiments for the chapter [Insider Threat Detection: Machine Learning Way](#) (doi.org/10.1007/978-3-319-97643-3_2) in *Versatile Cybersecurity*, Springer, Cham, 2018.

Online Outlier Detection on FPGA

Nov'16 - Aug'17

- The project involves comparative study, implementation and analysis of various anomaly detection algorithms. The desired goal is to build a hardware for an online (real-time) algorithm designed to detect anomalies when the input is real-time data. A regression model is maintained in online fashion and Cook's Distance is used as a metric to find outlier. Results are compared with a Mahalanobis Distance based similar approach. The Cook's Distance gives accurate results even when the fraction of outliers is large.

Training GANs using Regret Minimization

Oct'17 - Dec'17

- The concept of regret minimization and windowing techniques proposed by Hazan et. al. is used to improve the performance of GAN training. This results in relatively faster and smoother convergence of GANs. The generated images are compared and tested using a pre-trained SVM. (The project was a part of the course on Algorithms and Optimization for Big Data).

Relevant Courses

BTech

- Algorithmic Game Theory
- Information and Coding Theory
- Algorithms and Optimisation for Big Data
- Computer Networks
- Signals and Systems
- Analog and Digital Communications
- Wireless Communications
- Digital Signal Processing

MSc

- Reinforcement Learning
- Computational Complexity
- Game Theory
- Stochastic Processes
- Linear Programming & Combinatorial Optimization
- Graph Theory

Achievements & Other Activities

- Winner of *The Ingenious Hackathon - 2017*, Tech Fest at SEAS, Ahmedabad University.
- Selected for *ICPC Regionals - 2017*, Hindustan University.
- Member of Registration Committee for the 38th IARCS Annual Conference on *Foundations of Software Technology and Theoretical Computer Science (FSTTCS)*, 2018 held at Ahmedabad University.
- Recipient of *Cognizant Foundation Scholarship* (covers the tuition fees for MSc).
- Member of [App Development Team](#) of *Indian Scientists' Response to CoViD-19 (ISRC)* group. Helped develop an SMS-based E-Token system called [SMALL-BAG](#), which helped local vendors to take their business online.
- Conferences attended: [FSTTCS](#), 2018; [Workshop on Algebraic Complexity Theory](#), 2019; [Youth in High-Dimensions](#), 2021 (held online); [Information Theory Workshop](#), 2022.