

# Debanuj Nayak

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## Education

- 2016 - 2020 **IIT Gandhinagar**, *B.Tech (Hons.) Computer Science & Engineering*, CPI: 9.56/10.0.  
2016 **Mahathi Junior College, Visakhapatnam**, *High School*, Percentage: 96.8%.  
2014 **Delhi Public School, Visakhapatnam**, CGPA: 10/10.

## Publications

- Mar 2020 **Akhil Bhimaraju, Debanuj Nayak, Rahul Vaze. Non-clairvoyant Scheduling of Coflows**, *International Symposium on Modeling and Optimization in Mobile, Ad hoc, and Wireless Networks, WiOPT 2020*, **Best Paper Award**.  
Nov 2021 **Neeldhara Misra, Debanuj Nayak. On Fair Division with Binary Valuations Respecting Social Networks**, *International Conference on Algorithms and Discrete Applied Mathematics, CALDAM 2022*.

## Research Experience

- Aug 2019 - Ongoing **Learning Non-Gaussian mixture models in a Stream**, *Dr. Anirban Dasgupta. IIT Gandhinagar*
  - Gaussian mixture models can be learnt in a streaming setting. Can these streaming algorithms be extended to other classes of distributions.
  - We analyze the efficacy of streaming k-means on learning mixtures models of Log-Concave and multi dimensional Bernoulli distributions.
  - Learnt techniques for analysis: Concentration bounds for martingales, approximate distributions using their sub-Gaussian/ sub-exponential behavior.
- May 2019 - Dec 2019 **Non Clairvoyant Scheduling of Coflows**, *Dr. Rahul Vaze. TIFR Mumbai*
  - Coflows are an abstraction developed to capture communication patterns in data centers. Investigated different scheduling problems in concerning coflows.
  - Applied linear programming techniques to develop a scheduling policy called BlindFlow which reduces total coflow completion time.
  - Simulated BlindFlow and compared it with previous state of the art systems such as Aalo.
- Aug 2018 - Ongoing **Fair Division with Binary Valuations on Graphs**, *Dr. Neeldhara Misra. IIT Gandhinagar*
  - Explored the problem of fair division on a graph i.e. distributing goods to agents on a social network.
  - Experimented with 0/1 valuations and different fairness notions such as envy-freeness and proportionality.
  - Introduced new notions of fairness and tackled fair division on undirected graphs. Previous results were concerned with directed graphs.
- May 2018 - July 2018 **Fault Tolerant Distance Preservers**, *Dr. Manoj Gupta. IIT Gandhinagar*
  - A  $k$  - fault tolerant distance preserver is a subgraph which preserves the distance between a single source vertex to all other vertices in the original graph upto  $k$  edge failures.

- Researched and developed algorithms to compute the fault tolerant distance preserver for any arbitrary graph for  $k=1$  and  $2$ .
- The space required to store the  $k$ -FT distance preserver in our result was the same as previous results however the algorithm and proofs are very simple.

## Professional Experience

Jul 2020 - **Goldman Sachs - Analyst (Software Engineer)**, Built enterprise applications for business users internal to Goldman Sachs. Gained practical experience in technologies like Java, Relational Databases, React, Linux, Shell scripting and Spring batch.

## Course Projects

- **Neurips 2019 Reproducibility Challenge - Advanced Machine Learning**  
Succesfully reproduced the paper "Making AI Forget You: Data Deletion in Machine Learning" by Ginart et.al.
- **Approximating Densest Subgraphs in a Streaming setting - Data Science**  
Implemented an algorithm which provides a  $2+\epsilon$  approximation to the densest subgraph problem in the streaming setting. Conducted tests on the Twitter retweet network to showcase empirical results.
- **Instrument 2 Instrument - Machine Learning**  
Applied machine learning techniques to convert music played on one instrument to another. Extract features from audio files, and train a model to predict the notes and duration of the audio files.
- **Why Products Receive Bad Reviews - Natural Language Processing**  
Study product reviews that receive very low ratings using natural language processing. Read research papers and implemented algorithms for feature extraction and sentiment analysis. Used Amazon reviews to showcase our results.
- **Implementation of Map Reduce architecture - Operating Systems**  
Built a basic Map-Reduce library from scratch on C++, for a single machine. Built simple applications related to image processing which use the Map-Reduce library.

## Teaching Experience

Aug 2018 - **Teaching Assistant - ES112 Computing, IIT Gandhinagar**, Supervised lab programming sessions. Setting questions and grading exams and quizzes. Conduct sessions to clear doubts for students.

Dec 2018

Jan 2020 - **Academic Tutor - MA102 Real and Complex Analysis, IIT Gandhinagar**, Conducted QnA sessions to help students understand concepts and clarify their doubts.

Mar 2020

Aug 2017 - **Academic Tutor - MA101 Multivariate Calculus, IIT Gandhinagar**, Conducted QnA sessions to help students understand concepts and clarify their doubts.

Dec 2017

## Achievements

- **KVPY Fellowship Award** - Achieved All India Rank 304 and selected for the Fellowship in 2015.
- **Dean's List IIT Gandhinagar** - Selected for the Prestigious Dean's List for academically meritorious students in Semesters I , II , III , IV and V.
- **IIT JEE Advanced 2016** - Secured All India Rank **AIR 2487** among close to 200,000 candidates.

## Summer Schools

Jun - Jul 2017 **ACM Summer School on Graph Theory and Graph Algorithms, IIT Gandhinagar.**

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## Relevant Courses

Computer Science	<b>Data Science, Advanced Machine Learning, Advanced Algorithms, Probability and Random Processes, Natural Language Processing, Quantum Computing.</b>
Mathematics	<b>Discrete Mathematics, Number Theory, Topology, Complex Analysis.</b>

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## Skills

- **Languages** Fluent in English, Hindi, Bengali
- **Programming Languages** Python, Java, C, C++, Javascript
- **Research** Latex
- **Python Data Science Toolkit** Numpy, Pandas, Matplotlib, Scikit Learn
- **Version Control** Git, Subversion
- **Web development** Django, React, Vue.js
- **Other Technologies** SQL, Relational databases, Shell script, Spring Batch

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## Extra Curricular Activities

**Sponsorship Coordinator**, *Amalthea '17*, *Annual Technical Summit of IIT Gandhinagar*, Managed team of 6 members. Brought 30 lac rupees worth sponsorship amount for Amalthea '17. Acquired communication and negotiation skills and experience in interacting with professionals.

**Inter IIT Tech Meet 2018, IIT Bombay**, *Represented IIT Gandhinagar at Inter IIT Tech Meet 2018.*, Achieved 7th place among 23 IITs at Star Cluster Competition.

**Student Guide**, *Foundation Programme 2017, IIT Gandhinagar*, Mentoring new undergraduate students as a buddy/guide to help them transition into college life.

**Events Team Member**, *Blithchron '17, Cultural Fest IIT Gandhinagar*, Organized two events, Antaragnee, Inter College Drama competition and Taste Tussle, Cooking Competition as part of Blithchron.

**Member**, *Metis - Coding Club, Digis - Game Development Club, IIT Gandhinagar.*