

# PRANAV JANGIR

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## Education

### NYU, Courant Institute of Mathematical Sciences

*Master of Science in Computer Science. GPA: 3.95/4.0*

**Thesis (Ongoing): Mechanism Design with Predictions**

**Sep. 2022 – May 2024**

*Manhattan, NY*

*Adviser: Richard Cole*

### Indian Institute of Technology, Guwahati

*Bachelor of Technology in Mathematics and Computing. GPA: 9.12/10.0*

**Thesis: A Study on Partition Functions**

**Jul. 2016 – May 2020**

*Guwahati, Assam*

*Adviser: Rupam Barman*

## Publications & Preprints

### Papers

1. **P. Jangir**, N. Koti, V. B. Kukkala, A. Patra, B. R. Gopal, “Mosaic: Fast and Secure Pattern Matching”. (*Under Review at USENIX Security '24*)
2. **P. Jangir**, N. Koti, V. B. Kukkala, A. Patra, B. R. Gopal and S. Sangal, “Vogue: Faster Computation of Private Heavy Hitters,” in IEEE Transactions on Dependable and Secure Computing, 2023. [doi](#).

### Posters

1. **P. Jangir**, N. Koti, V. B. Kukkala, A. Patra, B. R. Gopal and S. Sangal. 2022. Poster: Vogue: Faster Computation of Private Heavy Hitters. In Proceedings of the 2022 ACM SIGSAC Conference on Computer and Communications Security (CCS '22). [doi](#).

## Presentations

1. **Poster Presentation at ACM CCS'22 (Virtual):** Presented our work titled “Vogue: Faster Computation of Private Heavy Hitters” in the poster presentation workshop.

## Research Experience

### Algorithmic Game Theory

**Jan. 2023 – Present**

*Prof. Richard Cole, Professor, Computer Science*

*NYU Courant*

- Working on mechanisms for online scheduling of jobs to unrelated machines when machines are strategic agents. The mechanism uses predictions that are easier to predict than the predictions in current literature. The mechanism can also be modified to work in the setting when the jobs are strategic.
- Studying a novel variation of facility location when the preferences of the agents are doubly peaked, developing approximate truthful mechanisms in the absence of money.

### Fast Filter Subset Scan for Anomalous Pattern Detection

**Mar. 2023 – Present**

*Prof. Daniel Neill, Associate Professor, Computer Science, Machine Learning for Good Lab*

*NYU Courant*

- Designing and implementing methods for fast and scalable detection of anomalous patterns such as an emerging disease outbreak or smuggling activity in massive, multivariate datasets.
- Developed a subset scanning technique that leverages prior information to efficiently scan extensive datasets, bypassing the use of exhaustive searches which may be impossible due to time or memory constraints.

### Secure Machine Learning & Data Analysis

**Dec. 2021 – Aug. 2022**

*Dr. Arpita Patra, Associate Professor, Department of CSA*

*Indian Institute of Science*

- Designed an algorithm that solves the Private Heavy Hitters problem and beat the state of the art [Poplar](#) in running time by upto 6x. Poster accepted at ACM CCS'22 and full paper at IEEE TDSC. [\[Paper\]](#) [\[GitHub\]](#)
- Implemented state of the art multiplication triples verification using Distributed Zero Knowledge proofs, privacy preserving Tensor operations and activation functions in C++. All implementations leverage SIMD operations to enhance performance. [\[GitHub\]](#)

### Fractional Partition Functions

**Aug. 2019 – April 2020**

*Prof. Rupam Barman, Professor, Department of Mathematics*

*IIT Guwahati*

- Studied algebraic and combinatorial properties of fractional partition functions and their relation to the famous Ramanujan congruences.
- As a part of my bachelor's thesis, wrote a survey of the many congruences that can be proved using fractional partition functions and other open problems colloquially known as “Mao's conjectures”. [\[Thesis\]](#)

## Industry Experience

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### Google

Aug. 2020 – Mar. 2022

#### *Software Engineer*

- Improved ad quality and coverage for low resource languages having low ad coverage but high volume.
- Collaborated with Google research team to train an efficient translation quality scorer, resulting in improved downstream translations.

### Tower Research Capital

May 2019 – July 2019

#### *Software Engineering Intern*

- Developed a semi-automated Machine Learning pipeline for extracting tabular data out of PDF/text files. Reduced pdf parsing time from 3 days to a few hours.

## Selected Projects

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### Future video frames prediction | [GitHub](#) | [Paper](#) | [Presentation](#)

Jan. 2023 – May 2023

- Leveraged self-supervision techniques with the SimVP model for future segmentation prediction in videos. Achieved a 44% Jaccard similarity, improving over the baseline of 23%.
- Innovated a New Object Suppression (NOS) decision tree-based technique to rectify prediction errors.

### Verkle Trees benchmarking | [GitHub](#) | [Report](#)

Sep. 2022 – Dec. 2022

- Implemented Verkle, Patricia-Merkle, and Binary-Merkle in C++. Compared the proof sizes, proof generation time, and proof verification time for varying key sizes for all the three trees.
- Compared two vector commitment schemes KZG and IPA in our Verkle Trees across different widths.

### Real time Bus Routing Algorithm | [GitHub](#)

Oct. 2019 – Dec. 2019

- Developed a heuristic algorithm for the NP-Hard School Bus Routing Problem (SBRP) in dynamic edge weight graphs.
- Implemented metaheuristic Tabu search algorithm along with genetic algorithm to ensure that the solution converges quickly.

### PintOS | *Operating Systems*

Sep. 2018 – Nov. 2018

- Implemented a multi-level feedback queue scheduler, system calls for user programs and virtual memory management module for an instructional operating system framework - PintOS

## Technical Skills

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**Languages:** Python, Scala, OCaml, C++, C, MATLAB, R, Solidity, SQL

**Developer Tools:** VS Code, Vim, Eclipse, Google Cloud Platform, AWS, Slurm, Docker

**Technologies/Frameworks:** PyTorch, TensorFlow, OpenSSL, OpenMP, Linux, GitHub, GoogleTest

## Misc

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**Google:** Awarded 2 spot bonuses & 3 peer bonuses for leading the project and helping engineers onboard. Mentored a summer intern in the Ads Research team (NLP), helped them land a fulltime offer.

**Google Kick Start:** Ranked 36<sup>th</sup> globally (out of  $\approx$ 4k participants) in Google Kick Start Round F 2019 and 58<sup>th</sup> globally in round G 2019.

**National Service Scheme:** Actively participated in a two-year community service initiative during my undergraduate studies, involving road cleanliness campaigns and educational outreach for underprivileged middle school children.