

Pratyush Sharma

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PUBLICATIONS

- **3SUM in Preprocessed Universes: Faster and Simpler** – Shashwat Kasliwal, Adam Polak, Me [Arxiv version](#). Accepted to *SIAM Symposium on Simplicity in Algorithms '25* conference.

SCHOLASTIC ACHIEVEMENTS

- Secured 1st position in **Spring India Citadel Terminal 2024** hosted by **Correlations One** in an algorithmic tower strategy game and winning the Grand Prize of \$6500. (*Sponsored by Citadel*)
- Secured **All India Rank 10** amongst 1.5 million students and received the **KVPY – SA** scholarship.
- Achieved **AIR 399 (Gen)** in **JEE Advanced 2022** and **AIR 335 (Gen)** in **JEE Mains 2022**.
- Secured **All India Rank 1** in **LIMIT** Exam amongst all Undergraduate students, hosted by *ISI*.
- Achieved **Oxbridge STEM Scholarship** based on past credentials in STEM related academics.
- Achieved **All India Rank 1** in **ResoStart** and awarded a *sponsored 9 days* trip to **NASA**.
- Secured **All India Rank 1** in Aakash National Talent Hunt Examination (**ANTHE**).
- Secured **AIR 2** in **Stamatics '25** and **AIR 9** in **Stamatics '24** hosted by *IIT Kanpur*.
- Secured **All India Rank 1,1,2,3** four different times in Institute for Promotion of Maths (**IPM**).
- Secured **All India Rank 4 & 4** twice in National Science Talent Search Examination (**NSTSE**).

OLYMPIAD ACHIEVEMENTS

- Secured the top-ranked position among teams in the **East Division** of the Simons Marias Mathematical Competition (**SMMC**), receiving the **Best Team Prize**. (*Sponsored by Jane Street/Optiver*)
- Secured **International Rank 4** in Gamma Maths Olympiad (**IGMO**). (*Sponsored by Jane Street*)
- Selected to represent *IIT Delhi* at the **Al-Khorezmi IMO**, to be held in **Uzbekistan** in May 2025.
- Qualified and Attended **IJSO National Camp** (*Top 35 students in India*) in 9th std.
- Qualified for **IOAA National Camp** (*Top 35 students in India*) thrice in 10th, 11th and 12th std.
- Qualified for **IPHO National Camp** (*Top 35 students in India*) in 12th std.
- Secured 6th position in **Inter IIT Maths Competition** hosted by *Chennai Maths Institute*.
- Achieved **Bronze Medal** in South East Asian Maths Olympiad (**SEAMO**) amongst 25,000 students.

RESEARCH EXPERIENCE

- **Research Internship** | *Prof. Adam Polak* | *Bocconi University* (*May 2024 – July 2024*)
 - Improved on state of the art algorithm for the 3SUM problem in the pre-processed setting from $\tilde{O}(N^{11/6})$ to $\mathcal{O}(N^{1.5} \log N)$ using FFT and Hashing techniques.
 - Presently working on another research that improves time complexity of **Dynamic Range Mode**.
- **Research Project** | *Prof. Rajendra Kumar* | *IIT Delhi* (*August 2024 – December 2024*)
 - Exploring the applications of the recently introduced **Continuous Learning with Errors** problem from lattice-based cryptography to improving hardness results for **k means** clustering problems.
 - Surveyed literature on **LWE**, **CLWE** and a bit on post quantum crptography and clustering problems.

TECHNICAL SKILLS

- **Languages:** Python, C/C++, Mathematica, MATLAB, HTML, CSS
- **Software & Development:** Numpy, SciKit, Pandas, Matplotlib, Keras, L^AT_EX, AutoCAD

PROJECTS

- **Differential Private Prompts for LLM** | *Prof. Franziska Boenisch* | *CISPA* (December 2023)
 - Calculated the performance of **soft prompts**, **prefix**, **full fine-tuning**, **LoRA** and **fine-tuning**.
 - Compared the performance difference with and without an **added single layer** on top of *LLM model* of *BERT tiny* and *BERT medium* on the datasets of **SST2**, **QNLI**, **MNLI** and **QQP**.
- **Expression Evaluator and Compile** | *Prof. Subodh Sharma* | *DSA* (November 2023)
 - Developed a **language compiler (E++)** for equation solving using *self-implemented AVL and BST*.
 - Generation of code for parse trees in **Targ** (target machine language) to evaluate expressions.
- **Search Engine with Query Processor** | *Prof. Rahul Garg* | *DSA* (October 2023)
 - Implemented a **query processor** inputting a corpus and query to give the most relevant paragraphs.
 - Linked the query processor to ChatGPT using the API tokens to utilise the API keys in C++.
 - Used **SpaCy LLM** and **TF-IDF** to increase the weight of chosen words and filter out stop words.
 - Utilization of structures like **Tries & Suffix Trees** and search algorithms like **BM & KMP**.
- **Self-Profiting Multi-Threaded Stock Exchange** | *Personal Project* | (September 2022)
 - Implemented simultaneous queuing up of the stock market to match the Buy/Sell commands in C++.
 - Implemented parallel processed algorithms to make decisions for the Buy/Sell to maximise profits.
- **Actor Success Prediction** | *Prof. Niladri Chatterjee* | *ML* (October 2024)
 - Self implemented ML models (*KNN, RF, LR*) with robust preprocessing and tuning to classify data.
 - Boosted accuracy using NLP (TF-IDF, NER) and feature engineering on the dataset.
- **Page Rank Implementation** | *Prof. S. Dharmaraja* | *Stochastic Process* (April 2024)
 - Implemented *PageRank* for ranking web pages utilizing the concepts of **DTMC** and **Power Method**.
 - Implemented a **Stochastic** method to determine the hierarchy for effective web search result ranking.

KEY COURSES

- **Computer Science:** Data Structures & Algorithms, Analysis & Design of Algorithms, Digital Logic, Computer Architecture, Lattices in Cryptography
- **Mathematics:** Probability & Stochastic Process, Discrete Mathematics, Graph Theory, Algebra, Linear Algebra, Calculus, Linear Optimization, Mathematical Computing.

POSITIONS OF RESPONSIBILITY

- **Coordinator, Mathematics Society IITD** (May 2024 – Present)
 - Ideated and hosted **Quant ke Fundae** sessions to guide students with placement preparations.
 - Organised events and led a team of 10 students in planning and executing workshops and sports.
- **Executive, Economics Club IITD** (May 2023 – May 2024)
 - Organized **Trading Market** simulation event and created new mathematical questions for prelims.
- **Chess Captain IITD** (May 2024 – Present)
 - Currently the **Chess Captain** of the Hostel. **State level Chess** player in Maharashtra.

EXTRACURRICULARS

- **TRYST, IIT Delhi 2023:** Participated in the India's largest technical fest
 - 1st in **Codehunt**, a Gamified Competitive Programming contest conducted by *ACES ACM*.
 - 2nd in **GenoQuest**, a competition of synthetic and computational biology conducted by *iGEM*.
 - 3rd in **Integration Bee**, a competition of college integration questions conducted by *MathSoc*.
 - 5th in **Formula Brawl** a competition of physics formulas quiz conducted by *Astronomy Club*.
- **TRYST, IIT Delhi 2024:** Participated in the India's largest technical fest
 - 1st in **Number Games**, a competition of calculation and mental maths conducted by *MathSoc*.
 - 1st in **Integration Bee**, a competition of college integration questions conducted by *MathSoc*.
 - 3rd in **CodeDecode**, a new twist on CP by reverse engineering code conducted by *ANCC*.
- Featured on the **Jane Street** Puzzles website for solving the puzzle of the month *multiple* times.