Soham Joshi

EDUCATION

Indian Institute of Technology, Bombay *(2021-2025)*
Major & Honors in Computer Science and Minor in Mathematics
Current Major CPI/GPA after 5 semesters: 9.37/10

RESEARCH INTERESTS

Algorithms & Complexity, Game Theory, Graph Theory, Markov Decision Processes

KEY PROJECTS

Evolutionary Game Theory (arXiv) *Summer 2023*
Guide : Prof. Krishnendu Chatterjee | Research Internship *Chatterjee Group, IST Austria*
- Examined the **moran process** with birth-death and death-birth updating for weighted population networks
- Showed robust, modular weighted networks that act as amplifiers for **birth-death** and **death-birth** updating
- Showed existence of quantities that are impossible to improve for death-birth and birth-death updating simultaneously
- **Submitted** the paper to PLOS Computational Biology, a **peer reviewed journal** and awaiting review

Extension of Matroids (Report) *Autumn 2023*
Guide : Prof. Rohit Gurjar | Ongoing Research Project *IIT Bombay*
- Showed that if matroids have a **small extension** complexity then the **matroid union** also has a small extension
- Studied the extension complexity for transversal, regular matroids and exploring it for **dilworth truncation**
- Examined **randomised communication** based protocols for finding extension complexity of $k - l$ sparsity matroids

Distributional safety for MDPs *Autumn 2023*
Guide : Prof. S. Akshay | Ongoing Research Project *IIT Bombay*
- Examining algorithms for template based approaches to **affine invariant synthesis** for affine safety objectives
- Proved that for 2-state MDPs, distributional strategies with initialised safety, **memoryless** strategies suffice
- Examining the **computational complexity** of the problem for the affine safety of **3-state** MDPs

SCHOLASTIC ACHIEVEMENTS

- Received the **Institute Academic Award** for **Institute Rank 1** among **1400+** students *(2022)*
- Secured **5 AP (Advanced Proficiency)** grades awarded to **top 1%** among 1400+ students *(2022)*
- Secured **All India Rank 46** in Joint Entrance Examination Advanced amongst **0.25 million** candidates *(2021)*
- Achieved **All India Rank 39** and was awarded the prestigious **KVPY fellowship** by IISc Bangalore, India *(2021)*

OLYMPIADS

- Qualified for the **Mathematics Olympiad Orientation Camp** (MOOC) conducted by HBCSE *(2021)*
- Cleared **Indian Olympiad Qualifier in Mathematics** (IOQM) conducted by MTA(I) with **State rank 1** *(2021)*
- Among **top 64** students in the country in the **Indian National Chemistry Olympiad** (INChO) *(2021)*
- Attended the **Chemistry Olympiad Orientation Camp** (COOC) conducted by HBCSE *(2021)*

TEACHING & EXPOSITORY EXPERIENCE

Popularizing higher mathematics in School *Autumn 2022 - Spring 2023*
Guide: Prof. Rekha Santhanam | Summer Undergraduate Research Project (SURP) *IIT Bombay*
- **Published a book**, introducing **Linear Algebra**, with aspects of cryptography, geometry in the theme of the story
- The story, a book of **8 chapters**, and associated **math expository sessions** have impacted **2000+ students**

Teaching Assistant *Autumn 2022 - Spring 2023*
Dept. of Mathematics | Prof. Sanjoy Pusti, Prof. Niranjan Balachandran & Prof. Dipendra Prasad *IIT Bombay*
- Worked as a **TA** for **Calculus-I (MA109)**, **Calculus-II (MA111)** & **Linear Algebra (MA106)** courses
- Conducted **weekly interactive and problem solving sessions** for 45+ 1st year UG students students

RELEVANT COURSES

Theoretical Computer Science: Data Structures and Algorithms, Discrete Structures, Design and Analysis of Algorithms, Logic for CS, Extremal Combinatorics, Automata Theory, Applied Algorithms, Spectral Graph Theory, Approximation Algorithms*

Mathematics: Linear Algebra, Calculus-I, Calculus-II, Differential Equations, Real Analysis, General Topology, Complex Analysis*, Numerical Analysis*

Machine Learning: Data Analysis and Interpretation, Introduction to AI and ML

* To be completed by May 2024