Sunaina Pati

Website: sunainapati.github.io
Current Research Interests: Algebraic Complexity, Number theoretic Cryptography and Coding theory.
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Education

Chennai Mathematical Institute India
BSc (honors) in Computer Science and Mathematics *August 2023 – Present(May 2026 expected)*

- Relevant Coursework: Linear Algebra, Group theory, Ring and Field theory, Discrete Mathematics, Probability theory, Design and Analysis of Algorithms, Theory of Computation, Algebra and Computation, Complexity-2, Topics in Number theory, Cryptography, Complexity-1, Algebraic Complexity theory, Algebraic Methods in Theoretical Computer Science, Parallel and Small Space Algorithms

Research Experience

Algebraic Complexity theory May 2026 – July 2026
under professor Sébastien Tavenas *LAMA Université Savoie Mont Blanc*

- Research will be funded by RELAX internship program

Algebraic Complexity theory January 2026 – Present
under professor Prerona Chatterjee *National Institute of Science Education and Research*

- Reading and researching on bounds on depth reduction of formula

Algebraic and Circuit Complexity theory May 2025 – Present
under professor Mrinal Kumar *Tata Institute of Fundamental Research (TIFR)*

- Reading and researching on the real τ conejcture and it's application to Algebraic Complexity theory.
- Also, reading and researching on powering and other functions in(or not in) AC^0 circuits

Algorithmic Number theory November 2024 – March 2025
under professor Swastik Kopparty *University of Toronto*

- Reading and researching on finding sparse polynomials which behave almost as the the squareroot function.

Spectral Graph theory July 2025 – September 2025
under professor Partha Mukhopadhyay *Chennai Mathematical Institute*

- Read and researched on computing lower bounds of spectral radius of Universal covers of graphs.

Reading Experience

Galois theory May 2025 – Present
under professor Aditya Karnataki *Chennai Mathematical institute*

- Reading about Galois theory from Howie's book.

Coding theory February 2025 – Present
under professor Sumantha Ghosh *Indian Statistical Institute, Kolkata*

- Reading Guruswami, Rudera and Sudan's essential coding theory and various other related lecture notes.

Lie Algebra June 2024 – August 2024
under professor Apoorva Khare *Indian Institute of Science*

- Read and solved problems from Humphrey's Book Lie Algebras

Teaching Assistant Experience at Chennai Mathematical Institute

Discrete Mathematics January 2026 – April 2026
Under professor V.Arvind

Algebra-3(Rings and Field theory) August 2025 – Present
Under professor Clare-D-Cruz

Algebra-2(Group theory and Advanced Linear algebra) January 2025 – April 2025
Under professor Clare-D-Cruz

Discrete Mathematics January 2025 – April 2025
Under professor V.Arvind and Amit Kumar Sinha Babu

Algebra-1(Linear algebra) August 2024 – November 2024
Under professor Aditya Karnataki

Honors and Awards

ReLaX internship 2025
- Awarded the ReLaX internship. My research internship with professor Tavenas is funded by ReLaX.

Preliminary Arizona Winter School: Mathematical cryptography 2025
- Accepted, invited and attending the 9-week school on mathematical cryptography.

Vigyan Vidushi Math, TIFR 2025
- Accepted, invited and attended to 2-week summer program conducted at Math TIFR, Tata Institute of Fundamental Research.

Vigyan Vidushi STCS, TIFR 2025
- Accepted, invited and attended to 2-week summer program conducted at STCS TIFR, Tata Institute of Fundamental Research

SRIRAM Scholarship, CMI 2023 – Present
- Tuition fee waiver for CMI and a monthly stipend for undergraduate studies.

European Girls' Mathematical Olympiad, Slovenia 2023
- Awarded silver medal at EGMO 2023 held in Slovenia representing India. I scored 29/42 marks.

Mehta Fellowship, Program in Mathematics for Young Scientists (PROMYS) India, IISC 2023
- One of the 24 Indian Students accepted (and attended) the rigorous 6-week program and was awarded Mehta-fellowship.

Spirit of Ramanujan fellowship 2022, 2023
- Was awarded Spirit of Ramanujan fellowship (6000 dollars each time) in 2023 and 2022 to fund my studies.

International Mathematical Olympiad Training Camp (IMOTC), HBCSE 2021, 2022, 2023
- was among the top 30 students in India and was invited for IMO Team selection tests in 2021,2022 and 2023

European Girls' Mathematical Olympiad Training Camp (EGMOTC), CMI 2021,2022
- was among the top performing female students in India and was invited for EGMO Team selection tests in 2021 and 2022

Talks and Presentations

Calkin Wilf Tree 2024
CMI STEMs Camp *Chennai Mathematical Institute (CMI)*
- Discussed the Calkin-Wilf tree and its properties and proved the algebraic formula. Slides link here.

Cyclotomic Polynomials and their applications 2025
CMI Student seminar *Chennai Mathematical Institute (CMI)*
- Talked about Cyclotomic polynomials and their properties. We also used the cyclotomic polynomials on two variables to prove the Zsigmondy theorem. Slides link here.

"Not" Invariants 2025
CMI STEMs Camp *Chennai Mathematical Institute (CMI)*
- Introduced knot theory and talked about various knot diagram invariants. Slides link here.

Cyclic Codes for Error Detection 2025
CMI Student Seminar *Chennai Mathematical Institute (CMI)*
- Talk was based on Peterson and Brown's seminal paper "Cyclic Codes for Error Detection." I also talked about BCH codes and the error correction algorithm. Slides here.

Primality Testing 2025
CMI Student Seminar *Chennai Mathematical Institute (CMI)*
- Talk was based on Primality testing and talked about the Godel Prize winning paper Primes in P. Write up here.

On Explicit, almost optimal, epsilon-balanced codes 2025
Complexity 2 coursework seminar *Chennai Mathematical Institute (CMI)*
- Talk was based on Tashma's STOC 2017 Explicit, almost optimal, epsilon-balanced codes for my Complexity-2 coursework presentation.

On A lower bound for homogeneous algebraic branching programs 2025
Algebraic Complexity coursework seminar *Chennai Mathematical Institute (CMI)*
- Talk was based on Mrinal's CCC A lower bound for homogeneous algebraic branching programs for my Algebraic Complexity coursework presentation. The write up is available here.

Outreach Activities

Resource Person

EGMOTC, INMOTC, IMOTC, PDC — *Chennai Mathematical Institute (CMI)*

- Taught multiple classes on Olympiad geometry and graded the team selection tests at European Girls' Mathematical Olympiad Training Camp (2023,2024), Indian National Mathematics Olympiad training camp of Assam and Tamil Nadu (2025) and International Mathematics Olympiad Training Camp of India (2025).

Teaching assistant — July 2025

Awesome Math Summer Program — *Online*

- Graded multiple problems sets daily and conducted problem-solving session every weekday for 3 weeks.

Counselor (Teaching Assistant) — May 2024 – June 2024

PROMYS India — *Indian Institute of Science (IISc)*

- Graded multiple Problem sets on Number theory and mentored students daily. Recieved honourium of 80,000 rs.

Math Olympiad blog — 2021 – Present

Sunaina thinks Absurd

- Math Olympiad blog with over 150k+ views
- Have discussed 500+ problems from various topics

CMI Student seminar Coordinator — 2024 – Present

CMI Student seminar — *Chennai Mathematical Institute (CMI)*

- organising weekly seminars presented by students on various topics

Expository Articles

On Zsigmondy's Theorem and its applications — March 2025

2025 Issue 2 link — *Mathematical Reflections*

- My write up (link here) on Zsigmondy's Theorem was accepted and published in the well-known Mathematical Reflections 2025 Issue 2.