

SOHAM CHATTERJEE

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EDUCATION

- **Chennai Mathematical Institute** **2021 – 2024**
B.Sc. - Mathematics and Computer Science *Chennai, India*
- **Baranagar Narendranath Vidyamandir** **2018 – 2020**
Higher Secondary (12th Standard) Education *Kolkata, India*
- **Baranagar Ramakrishna Mission Ashrama High School** **2008 – 2018**
Secondary (12th Standard) Education *Kolkata, India*

ACADEMIC ACHIEVEMENTS

- **GS Exam, I-PhD, Computer Science, 2024** **TIFR Mumbai, India**
Nation wide entrance exam in Computer Science for Tata Institute of Fundamental Research. Only 2 people got selected.
- **JEST, I-PhD, Theoretical Computer Science, 2024 - Rank 5** **IMSC, India**
Nation wide entrance exam in Computer Science for Institute of Mathematical Sciences
- **NEST, B.Sc., 2021** **NISER, India**
Nation wide bachelors entrance exam for National Institute of Science Education and Research
- **WBJEE, B.Tech, 2020 - Rank 1893** **WBJEEB**
Joint Entrance exam for B.Tech for West Bengal state
- **12th Statistics Olympiad, 2020 - Rank 28** **AIMSCS**
Organised by C R Rao Advanced Institute of Mathematics, Statistics and Computer Science

INTERNSHIPS

- **Polyhedral Combinatorics and Derandomization of Isolation Lemma** **May - Jul, 2024**
Supervisor: Rohit Gurjar, IIT Mumbai
 - I read the papers
 - 'Bipartite Perfect Matching is in QUASI-NC' by Fenner, Gurjar and Thierauf
 - 'Linear Matroid Intersection Is in QUASI-NC' by Gurjar and Thierauf
 - 'Fractional Linear Matroid Matching is in QUASI-NC' by Gurjar, Oki and Raj
 - Learned how the idea of giving nonzero circulations to cycles and bounding number of integral vectors (corresponding those cycles) twice the size of smallest vector helps construct an isolating weights for bipartite perfect matching polytope to fractional matroid matching polytopes
 - Additionally I read about isolating a path connecting the source vertex and sink vertex in a black-box layered graph from the paper 'Derandomizing Isolation in Space-Bounded Settings' by Melkebeek and Prakriya.
- **Quantum Property Testing of Junta Functions and Partially Symmetric Functions.** **Dec, 2024 – Going on**
Supervisor: Arijit Ghosh, Indian Statistical Institute, Kolkata
 - I learned about Fourier Analysis of Quantum Boolean Functions and Quantum algorithms for Testing and Learning Stabilizer States from Quantum boolean functions' by Montanaro and Osborne
 - Also learned about Classical Junta Testing from Eric Blais' paper Testing Juntas Nearly Optimally and then read about Quantum Junta Testing Algorithm from 'Testing and Learning Quantum Juntas Nearly Optimally' by Chen, Nadimpalli and Yuen
 - And I learned about Partially Symmetric Boolean Functions and it's classical algorithm of testing partially symmetric functions from the paper 'Partially Symmetric Functions are Efficiently Isomorphism-Testable' by Blais, Weinstein and Yoshida and we were trying to come up with a Quantum Algorithm for Testing Partially Symmetric Boolean Functions.
- **Factorization of Arithmetic Circuits in Algebraic Complexity Theory** **May - Jul, 2022**
Supervisor: Nitin Saxena, IIT Kanpur
 - I read 'Discovering the roots: Uniform closure results for algebraic classes under factoring' by Dutta, Saxena and Sinhababu where I learned factorizing multivariate arithmetic circuits and VP closure under factorization.
 - Also read the Kaltofen's proof of VP closed under factorization.
 - Also learned how Polynomial Identity Testing and Multivariate Factorizations are equivalent from 'Equivalence of Polynomial Identity Testing and Deterministic Multivariate Polynomial Factorization' by Kopparty, Saraf and Shpilka
 - I also read how VBP is closed under factorization from Sinhababu and Thierauf's paper 'Factorization of Polynomials given by Arithmetic Branching Programs'

- Learned about the difficulties about proving factor closure for VF from the above mentioned two papers. I read about factorization of formulas with individual degree bounded form the paper ‘Factors of low individual degree polynomials’ by Rafael Oliveira and we were trying to remove the condition for formulas
- **Computational Number Theroy and Algebra for Algebraic Complexity Theory.**
Supervisor: [Nitin Saxena](#), IIT Kanpur Dec - Jan, 2022
 - I learned about Computational Number Theory and Algebra from Nitin Saxena’s Course and read the book ‘Modern Computer Algebra’ by Von Zur Gathen and Jurgen Gerhard
 - Also I learned about Arithmetic Circuits from [Amir Shpilka’s Survey](#) and [Ramprasad Saptharishi’s Survey](#) on Arithmetic Circuits.

COURSE PROJECTS

- **Presentation on Iterated Mod Problem:** [Slides](#)
Presented the paper “[Iterated Mod Problem](#)” by Karloff and Ruzzo in Parallel Algorithms and Complexity course at CMI
- **Report on Algebraic Geometric Codes:** [Report](#)
Followed the survey “[Algebraic-geometry codes](#)” by Blake, Heegardm Høholdt, Wei and Gil Cohen’s [Course](#)
- **Qiskit Implementation of Quantum Circuit of Modular Exponentiation:** [Link](#)
Implemented the paper “[Quantum Networks for Elementary Arithmetic Operations](#)” by Vedral, Barenco and Ekert
- **Qiskit Implementation of Kushlevitz and Mansour Algorithm:** [Link](#)
Implemented the paper “[Learning Decision Trees Using the Fourier Spectrum](#)” bu Kushilevitz and Mansour
- **Qiskit Implementation of Some Quantum Algorithms:** [Link](#)
Implemented Iterative Phase Estimation and Grover Search for 2×2 sudoku

RELEVANT COURSE WORK

Math Courses:

- Algebra
 - Linear Algebra (Algebra 1)
 - Group Theory (Algebra 2)
 - Ring and Field Theory (Algebra 3)
 - Commutative Algebra
- Analysis
 - Real Analysis (Analysis 1)
 - Analysis in Euclidean Space (Analysis 2)
 - Analysis in Metric Space (Analysis 3)
- Other Math Courses
 - Complex Analysis
 - Calculus
 - Probability Theory
 - Topology

Computer Science Courses:

- Discrete Mathematics
- Design and Analysis of Algorithms
- Theory of Computation
- Complexity Theory
- Expander Graphs and Application
- Parallel Algorithms and Complexity
- Algorithmic Coding Theory (Two Parts)
- Quantum Algorithmic Thinking
- Quantum Information Theory

WORKSHOP, CONFERENCES ATTENDED

- **Quantum Semester Online** **Chennai Mathematical Institute**
2024, Jan-May
Chennai, India
- **Sage Days 122** **Chennai Mathematical Institute**
2024, Jan-May
Chennai, India
- **p-adic Number Theory Lecture Series: Ram Murty** **Chennai Mathematical Institute**
2024, Jan-May
Chennai, India

COMPUTER SKILLS

- **Programming Languages:** C (Basic), Python (Basic), Qiskit (Intermediate), Haskell (Basic), Java (Intermediate), Unix/Linux Shell Scripting, HTML, CSS
- **Technical Skills:** LaTeX (Advanced), Markdown, Git, Basic works in terminal, VIM, Obsidian