

Soham Chatterjee

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in profile

🐙 sohamch08



Education

- 2024 – current 📖 **I-Ph.D Computer Science, Tata Institute of Fundamental Research, Mumbai**
- 2021 – 2024 📖 **B.Sc. Math and Computer Science, Chennai Mathematical Institute**
- 2018 – 2020 📖 **Higher Secondary Education (12th Standard), Baranagar Narendranath Vidya-mandir, Kolkata**
- 2008 – 2018 📖 **Secondary Education (10th Standard), Baranagar Ramakrishna Mission Ashrama High School, Kolkata**




Research Interest

Algorithms and Complexity Theory with Algebraic nature, Error Correcting Codes, Pseudorandomness, Polyhedral Combinatorics, Analysis of Boolean Functions



Research Internships

- Summer 2024 📖 **Worked on *Derandomization of Isolation Lemma over Polytopes***
Guide: Dr. Rohit Gurjar, IIT Bombay
In this project I tried to extend the idea of bounding the number of vectors in the integer lattice which has L_1 norm less than twice the shortest vector for 0-1 matrices with k -column sum to derandomize isolation lemma over more general polytopes. Additionally I read about isolating a path connecting in a black-box layered graph.
- Dec'23-Jul'24 📖 **Project on *Quantum Property Testing of Junta Functions and Partially Symmetric Functions***
Guide: Dr. Arijit Ghosh, ISI Kolkata
In this project I learned about Quantum Boolean Functions and some basics of Quantum algorithms for property testing from the Survey by Montanaro-Osborne, 2008. I learned about Classical and Quantum Junta Function testing. We worked on finding a more efficient Quantum Algorithm for testing Paritally symmetric boolean functions by improving the classical algorithm in Blais-Weinstein-Yoshida's Paper.
- Summer 2023 📖 **Reading project on *Factorization of Arithmetic Circuits***
Guide: Dr. Nitin Saxena, IIT Kanpur
In the project I learned factorization techniques and closure of of VP and VBP under factorization. I also read closure of VF with bounded individual degree from Oliveira, 2016 paper and we worked on removing the bounded individual degree condition
- Dec 2022 📖 **Reading project on *Computational Number Theroy and Algebra for Algebraic Complexity Theory***
Guide: Dr. Nitin Saxena, IIT Kanpur
I did a basic study of Computational Number Theory and Algebra from Nitin Saxena's course and about Arithmetic Circuits from Amir Shpilka's Survey and Ramprasad Saptharishi's Survey on Arithmetic Circuits.

Talks and Presentations

- 2024  **Coursework Presentation (Algebra and Computation)**
"Hensel and Newton Methods in Valuation Rings" by J von zur Gathen
- 2023  **Coursework Presentation (Algorithmic Coding Theory II)**
Algebraic Geometric Codes, jointly presented by Me and Shree Ganesh S J
Report: [PDF]
-  **Coursework Presentation (Parallel Algorithms and Complexity)**
"Iterated Mod Problem" by Karloff and Ruzzo
Slide: [PDF]

Attended Workshops

- 2024  FSTTCS, IIT Gandhinagar
- Jan-Apr 2024  Quantum Computing Semester, CMI

Relevant Courses

• CMI Courses

Math Courses:

- Linear Algebra (Algebra 1)
- Group Theory (Algebra 2)
- Ring and Field Theory (Algebra 3)
- Commutative Algebra
- Real Analysis (Analysis 1)
- Analysis in Euclidean Space (Analysis 2)
- Analysis in Metric Space (Analysis 3)
- Complex Analysis
- Discrete Mathematics
- Calculus
- Probability Theory
- Topology
- Differential Equations

Computer Science Courses:

- Design and Analysis of Algorithms
- Theory of Computation
- Complexity Theory
- Parallel Algorithms and Complexity
- Expander Graphs and Application
- Algorithmic Coding Theory (Two Parts)
- Algebra & Computation
- Quantum Algorithmic Thinking
- Quantum Information Theory
- Functional Programming with Haskell
- Advanced Programming with Python
- Programming Language Concepts (Java, Concurrent Programming, Lambda Calculus)

• TIFR Courses




- Mathematical Foundations of Computer Science
- Algorithms
- Probability
- Computational Complexity
- Algebra, Number Theory & Computation
- Combinatorial Optimization

I have followed the following courses:



- Algebraic Complexity Theory

- Polynomial Methods in Combinatorics
- Algorithmic Game Theory
- Toolkit for Theoretical Computer Science



Achievements

- 2024  Ranked 5 in the Joint Entrance Screening Test I-PhD exam for Theoretical Computer Science.
- 2021  Got selected for NISER for Bachelors through the NEST exam.
- 2020  Ranked 28 in 12th Statistics Olympiad organised by C R Rao Advanced Institute of Mathematics, Statistics and Computer Science.

Miscellaneous

- 2023  **Coursework Project (Quantum Algorithmic Thinking)**
Qiskit Implementation of Quantum Circuit of Modular Exponentiation: Implemented the paper “Quantum Networks for Elementary Arithmetic Operations” by Vedral, Barenco and Artur
 Code: [\[Link\]](#)
-  **Coursework Project (Quantum Algorithmic Thinking)**
Qiskit Implementation of Kushlevitz and Mansour Algorithm: Implemented the paper “Learning Decision Trees Using The Fourier Spectrum” by Kushilevitz and Mansour
 Code: [\[Link\]](#)

Computer Skills

- Languages  \LaTeX (Advanced), Python (Intermediate), Qiskit (Intermediate), Haskell (Basic), Java (Basic), C (Basic), Unix/Linux Shell Scripting, HTML (Basic), CSS (Basic).
- Tools  Git, Basic works in terminal, VIM, Obsidian