Anagha **Gokul**

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Education

Birla Institute of technology and Sciences, Pilani(BITS Pilani) *Hyderabad, India*

BE Computer Science Engineering, MSc Mathematics *October 2020-present*

- **CGPA: 8.97/10**

Pushpalata Vidya Mandir *Tirunelveli, India*

Class 12 *April 2018- May 2020*

- **Score: 469/500**

Research interests

Computational Complexity Theory, Algebraic Complexity Theory, Pseudorandomness, Coding Theory

Research Experience

Non-Commutative Edmonds Problem *Chennai, India*

Advisor: Prof. Partha Mukhopadhyay, Chennai Mathematical Institute *May.2023- present*

- Studied about the work done on the Polynomial Identity Testing Problem, particularly in the context of the Edmonds Problem in the commutative and non-commutative settings.
- Surveyed various determinants pertaining to the non-commutative world.
- Worked on extending results pertaining to computational complexity of certain non-commutative determinants.

Supersingular isogenies in Post Quantum Cryptography *Pilani, India*

Advisor: Dr Gaurav Purohit, CEERI Pilani *Jan 2022-May 2022*

- Studied about existing techniques for classical and quantum cryptography, with an emphasis on the Supersingular Isogeny Diffie Hellman Protocol(SIDH)
- Learnt the required theory of Elliptic Curves and supersingular isogenies.
- Implemented a toy model of the $ike182 challenge, and then attempted to break the same using the technique given by Udovenko and Vitto

Projects

Quantum Error Correction: A Brief Walk Through Stabilizer Codes [report] *Hyderabad, India*

Course Project: Quantum Information and Computing, Guide: Dr TSL Radhika *August 2023- December 2023*

- Learnt the basics of quantum error correcting codes, particularly Stabilizer Codes
- Read papers about relevant complexity theoretic results in quantum error correction like Gottesman Knill Theorem, Aaronson Gottesman Theorem and Iyer Poulin Theorem

Commutative Algebra: a SINGULAR approach *Hyderabad, India*

Advisor: Dr Pratyusha Chattopadhyay, BITS Pilani *Jan 2022- May 2022*

- Learnt the basics of ideals and modules using the computer algebra system, SINGULAR
- Wrote programs to understand various algorithms used in polynomial computation

Computational Algebraic Topology [report] *Hyderabad, India*

Advisor: Dr Sharan Gopal, BITS Pilani *Jan 2023-May 2023*

- Learnt about homotopies, fundamental group(of the circle) and Simplicial Complexes
- Implemented a 2D version of the Delauney Triangulation using the Bowyer Watson Algorithm in C++

Ideals, Varieties and Algorithms [report] *Hyderabad, India*

Advisor: Dr Pratyusha Chattopadhyay, BITS Pilani *Jan 2022- May 2022*

- Learnt about affine varieties, parametrizations and ideals.
- Gained a deep understanding about Grobner bases methods and algorithms, elimination theory and the geometry of elimination.
- Independently studied about using reinforcement learning techniques to improve Buchberger's algorithm, and tried to improve results by Peifer et al.

Teaching Experience

Teaching Assistant, MATH F112: Linear Algebra and Complex Analysis — *Hyderabad, India*

Instructor in Charge: Dr Pratyusha Chattopadhyay — *Jan 2022- May 2022*

- Involved in preparation of solutions for tutorial sheets for a class of around 600 students

Teaching Assistant, Linear Algebra and Optimization, Coursera — *Coursera, BITS Pilani*

Instructor in Charge: Dr Dipak Satpathy, Dr Tathagatha Ray — *Feb 2023- July 2023*

- Involved in preparation of slides, graded and ungraded quizzes, and final exams for a class of 396 students for the online BSc in Computer Science course offered by BITS Pilani

Talks

Stabilizer Codes — *Hyderabad, India*

Quantum Information and Computing [slides] — *December 2023*

- Gave an expository talk on the basics of quantum error correcting codes

Non Commutative Determinants — *online*

Spectra Mathematics Conference, 2023 — *September 2023*

- Gave an introductory talk on the interplay between various non commutative determinants such as the Cayley determinant, Quasideterminant and the Dieudonne Determinant

Grobner Bases — *Hyderabad, India*

Reading course [slides] — *Jan 2022-May 2022*

- Gave an introductory talk on computational algebraic geometry with a focus on Grobner Basis Techniques

Selected Coursework

Mathematics:

- Linear Algebra and Complex Analysis
- Algebra 1 (Groups and Rings)
- Algebra 2 (Fields and Galois Theory)
- Commutative Algebra*
- Real Analysis
- Measure Theory
- Introductory Topology
- Functional Analysis
- Differential Geometry
- Number Theory*
- Combinatorics*

Computer Science:

- Introductory Logic
- Data Structures and Algorithms
- Design and Analysis of Algorithms*
- Theory of Computation
- Quantum Information and Computing

* indicates ongoing coursework

Technical Skills

Languages: C/C++, Java, Python, Bash, SQL
Utilities: LaTeX, SymPy, SINGULAR

Honors, Awards and Scholarships

- Provisionally selected for the Summer School for Women in Mathematics(declined due to exams)
- Selected for a summer internship at MPI-SWS(declined)
- Selected for summer internship at CMI