Aryaman Maithani

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Indian Institute of Technology, Bombay

Education

2018 – 2022* **Indian Institute of Technology Bombay, India** 9.81/10 GPA
B.S. in Mathematics with honors

2016 – 2018 **Nehru Smaraka Vidyalaya** 94.00%
Higher Secondary

2016 **Ryan International School** 94.67%
Junior Secondary

* currently studying

Research

2021 **Computational Algebra** *Guide: Prof. A. Seceleanu | University of Nebraska-Lincoln*

Participated in the Polymath Jr. collaborative mathematical research program for undergraduates. We examined the Betti tables of quadratic ideals with three generators in the polynomial ring $\mathbb{F}_2[x, y, z]$ and resolved all these ideals using theoretical results as well as Macaulay2. We have plans to submit our work for publication in early 2022.
I also presented this work in the Young Mathematicians Conference organized by the Ohio State University. The video can be found here.

Reading Projects

2021* **Homological Algebra** *Guide: Prof. Dipendra Prasad | IIT Bombay*

Reading *An Introduction to Homological Algebra* by *Charles A. Weibel* and have covered topics such as Abelian categories, Chain complexes, Chain homotopies, δ-functors, Derived functors, Projective and Injective resolutions, Adjoint functors, Balancing Tor and Ext.

2021 **Algebraic Geometry** *Guide: Prof. Arvind Nair | TIFR*

Participated in the month long Visiting Students' Research Programme conducted by Tata Institute of Fundamental Research.
Read *Foundations of Algebraic Geometry* by *Ravi Vakil* and covered topics such as Sheaves, Affine schemes, Morphisms of Schemes and Chevalley's Theorem.
The final presentation can be found here.

2021 **Representation Theory** *Guide: Prof. Ananthnarayan Hariharan | IIT Bombay*

Read *Representation Theory of Finite Groups* by *Benjamin Steinberg* and covered topics such as Maschke's Theorem, the orthogonality relations, characters, permutations and regular representations, induction of representations, dimension theorem, representations of dihedral and symmetric groups and applications to group theory such as Burnside's pq-theorem.
The report can be found here.

Reading Projects (continued)

2020 **Algebraic Topology** *Guide: Prof. Rekha Santhanam | IIT Bombay*
Read homotopy theory including theorems like Van Kampert Theorem, existence of a universal covering space, Galois correspondence for covering spaces and applications to group theory. Also read homology theory and applications such as invariance of domain, degree of maps, hairy ball theorem as well as CW complexes.
The report and related presentation can be found here.

2020 **Primes is in P** *Guide: Prof. Ronnie Sebastian | IIT Bombay*
Read the paper *PRIMES is in P* by *Manindra Agrawal, Neeraj Kayal, Nitin Saxena* about the AKS Algorithm and wrote a report on that, which can be found at the end of notes here.

2019 **Posets** *Guide: Prof. Koushik Saha | IIT Bombay*
Read about posets from *Enumerative Combinatorics* by *Richard P. Stanley* and gave a presentation on it as part of extra reading in Combinatorics, which can be found here.

2019 **Topology - Classification of Surfaces** *Guide: Senior Student | IIT Bombay*
Read about Topology and made a report that contains an introduction to topology and a proof of the Classification of Surfaces, which can be found here.

Teaching and Mentorship

2019-2021 Entrusted with the responsibility of being a Teaching Assistant in IIT Bombay for the following courses

Year	Course	Course Instructor
2021	MA 205, Complex Analysis	*Prof. Sudarshan R. Gurjar*
2021	MA 106, Linear Algebra	*Prof. Sudhir R. Ghorpade*
2020	MA 109, Calculus I	*Prof. Ravi Raghunathan*
2020	MA 205, Complex Analysis	*Prof. Sudarshan R. Gurjar*
2020	MA 108, Ordinary Differential Equations	*Prof. Preeti Raman*
2020	MA 106, Linear Algebra	*Prof. Jugal K. Verma*
2019	MA 105, Calculus	*Prof. Sudhir R. Ghorpade*

This involved

- conducting problem solving sessions for a batch of 50 students throughout the course and helping them clear conceptual doubts through personal interaction,
- correction of answer sheets,
- creating webpages containing compilation of personal solutions, extra questions, and relevant resources which were used by 1400+ freshmen.

2021 Mentored five juniors students from IIT Bombay as part of the Summer of Science initiative by the Maths and Physics Club. This involved guiding the students to relevant resources and clarifying any conceptual difficulties over the course of two months. The topics covered Group Theory, Ring Theory, Galois Theory, Topology, and Algebraic Topology.

2020 Conducted nine sessions for teaching concepts of Computer Programming, Calculus, Linear Algebra, Complex Analysis and helping in solving doubts, organized by the Student Support Services, IIT Bombay.

2019 Completed 80 hours of community service by teaching in NGOs as a volunteer of National Service Scheme, IIT Bombay.

2018 Mentored a team of students at the Code Camp organized by CodePrompt, Internet Academy in association with the Web and Coding Club, IIT Bombay.

Academic Achievements

2018- Department Rank **1** in the Mathematics Department.

Awarded the **AP** grade, for excellent performance, in

- 2019 MA 403 (**Real Analysis**), awarded to 2 out of 70 students.
- 2019 MA 419 (**Basic Algebra**), awarded to 1 out of 70 students.
- 2019 CS 228 (**Logic for CS**), awarded to 2 out of 132 students.
- 2018 CS 101 (**Computer Programming**), awarded to 5 out of 663 students.

2018 Achieved All-India Rank **595** out of 1,000,000 participants in **JEE (Main) 2018**.

2018 Achieved All-India Rank **742** out of 165,000 participants in **JEE (Advanced) 2018**.

2018 Secured a seat in **Chennai Mathematical Institute (CMI)** on the basis of my performance in its entrance exam.

2017 Secured an All-India Rank of **147** out of 50,000 in the **Kishore Vaigyanik Protsahan Yojana (KVPY) 2017** scholarship exam.

2018 A recipient of the KVPY fellowship offered by the **Indian Institute of Science** (IISc) and attended the Vijyoshi Camp conducted in IISc.

Select Courses Undertaken

Mathematics	Foundational Mathematics and Proof Writing, Calculus, Linear Algebra, Ordinary Differential Equations, Partial Differential Equations, Real Analysis, Complex Analysis, Basic Number Theory, Multivariable calculus, Topology, Measure Theory, Group Theory, Ring Theory, Galois Theory, Module Theory, Theory of Projective Resolutions, Combinatorics, Extremal Graph Theory
Computer Science	Computer Programming and Utilization, Logic for CS, Algebraic Theory of Regular Languages and Connections to Logic, Topics in Computational Ring Theory and Algebras, Data Structures and Algorithms

Technical Skills

Languages LaTeX, Python, Macaulay2, Sage, Lean

Miscellaneous

Maths and Physics Club, IIT Bombay

- Conducted activities in a team of 7 to foster enthusiasm in mathematics and physics, tending to a community of 400 - 500 in campus with an online presence of over 8000.
- Worked in conducting of Summer Of Science 2019, a novel initiative through which over 400 students got an opportunity to pursue a reading project in a topic of their interest, under the guidance of over 120 senior student mentors.
- Conducted the quizzing event Bazinga! Maths which involved hosting as well as creating the question paper for the same.

Project Euler

Project Euler is a series of challenging mathematical/computer programming problems that will require more than just mathematical insights to solve. Although mathematics will help you arrive at elegant and efficient methods, the use of a computer and programming skills will be required to solve most problems. Have solved over **175** questions on Project Euler.