
EDUCATION	Statistics & Mathematics Unit, Indian Statistical Institute <i>Master of Mathematics</i> • Percentage : 91.67	Bangalore, India 2023 - 2025(<i>expected</i>)
	Department of Mathematics & Statistics, Indian Institute of Science Education & Research, Kolkata <i>Master of Science in Mathematics (Left after one year)</i>	Kolkata, India 2022 - 2023
	Department of Electronics & Electrical Engineering, Indian Institute of Technology, Guwahati <i>B.Tech in Electronics & Electrical Engineering with minor in Mathematics</i> • CGPA: 8.49	Guwahati, India 2018 - 2022
PUBLICATIONS AND PREPRINTS	1. A. Renanse, A. Sharma, R. Chandra, <i>Memory capacity of recurrent neural networks with matrix representation</i> . Neurocomputing, Volume 560, December 2023, 126824, Elsevier. 2. S. Sharma, A. Renanse, <i>C-triviality of manifolds of low dimensions</i> . arXiv:2411.05558.	
PROJECTS	Simplicial Sets & The Cobar Construction - Spring 2025 After covering basics of simplicial sets and simplicial homotopy theory, studied the cobar construction of Adam. Ended with the study of homotopy coherent realization and the work of Dugger-Spivak on its mapping simplicial sets, which is then used in proving Adam's theorem on homology of loop spaces, following the work of Rivera. Report .	<i>Dr. Anita Naolekar, ISIB</i>
	Intersection Theory in Algebraic Geometry - Fall 2024 Covered main results on Chow groups and intersection product from the books by Fulton and Eisenbud-Harris. Serre's Tor formula gives a correct product for properly intersecting cycle which descends to Chow groups via a moving lemma. After calculating Chow ring for \mathbb{A}^n & \mathbb{P}^n , ended with geometry and Chow ring of Grassmannians via Chern classes. Report .	<i>Dr. Suresh Nayak, ISIB</i>
	Algebraic K-Theory - Summer 2024 Studied classical definitions, results and examples of K_0, K_1 & K_2 of a commutative ring with 1 and then studied the first definition of higher K-theory via the $+$ -construction on $BGL(R)$. After studying Loday's product in K-theory, ended with homotopy groups with coefficients which is then used to calculate K-groups with coefficients for \mathbb{F}_p . Gave a proof of the uniqueness of the homotopy type of X^+ . Report .	<i>Dr. Rahul Gupta, IMSc</i>
	Function Fields & Algebraic Curves - Spring 2022 Studied algebraic function fields of one variable and algebraic curves and showed that they are equivalent. Covered Riemann-Roch theorem for curves and studied ElGamal elliptic curve cryptosystem from the book of Niederreiter and Xing. Report .	<i>Prof. Rupam Barman, IITG</i>
	Generalized Galois Theories - Fall 2021 Studied Galois theory for finite and infinite dimensional commutative K-algebras for an extension L/K , establishing an equivalence between K-algebras split by L and profinite spaces with $\text{Gal}(L/K)$ -action. Ended with an overview of categorical Galois theorem of Janelidze. Report .	<i>Prof. Rupam Barman, IITG</i>
Sheaves & Topos Theory - Summer 2021 Studied sheaves and topoi from the book of MacLane and Moerdijk. After studying general results about internal logic in a topos, studied categorical logic and semantics from Johnstone's book and ended by reading the proof of independence of AC and CH via topos theoretic tools. Report .	<i>Dr. Amit Kuber, IITK</i>	

After setting up Fisher information matrix for a recurrent network with matrix representations, we generalized some known bounds on Fisher information classically known only in vector representation case. We also introduced a new memory network similar to the classical neural Turing machine but which stores matrix representations and did a comparison on some algorithmic tasks. [Paper](#).

- FELLOWSHIPS
- **M.Math Fellowship.** ISIB, 2023-Present
 - **IMSc Summer Research Fellow.** IMSc, May-July 2024
 - **Samsung Research Scholarship.** Fellowship for bachelor's thesis. IITG, 2021-2022
 - **O.P. Jindal Engineering & Management Scholarship.** IITG, 2019

- TALKS AND PRESENTATIONS
- **The oriented cobordism ring & Thom's theorem.** Seminar on Characteristic Classes, ISI Bangalore, March 2025.
 - **Simplicial sets & homotopy theory.** eCHT Kan Seminar (online), March 2025.
 - **Chern classes & cohomology ring of \mathbb{C} -Grassmannian.** Seminar on Characteristic Classes, ISI Bangalore, February 2025.
 - **Cohomology long exact sequence for sheaves & Dolbeault's theorem.** Riemann Surfaces Seminar, ISI Bangalore, April 2024.
 - **Perverse sheaves : Examples and properties.** [Intersection Homology Learning Seminar](#), ISI Bangalore, March 2024.
 - **Memory capacity of matrix recurrent networks.** Transitional AI Seminar, Univ. New South Wales (online), October 2023.
 - **Galois theorem for commutative algebras.** DMS Day, IISER Kolkata, February 2023.
 - **Categories & functors.** Indian School on Logic & Applications, IIT Kanpur, May 2022.
 - **Memory capacity of matrix recurrent networks.** Machine Learning Research Week, IIT Guwahati, March 2021.

- ADVANCED COURSEWORK
- Topology-2 : Covering spaces, homology & CW-complexes
 - Topology-3 : Cohomology & homotopy theory
 - Differential geometry
 - Vector bundles & characteristic classes
 - Complex analysis
 - Measure theory
 - Functional analysis
 - Algebraic geometry[†]
 - Symplectic geometry[†]
 - Riemannian geometry[†]

[†] : Courses attending in Spring 2025.

- SEMINARS AND CONFERENCES
- [eCHT Kan Seminar](#) by Dr. Jack Carlisle, Notre Dame (online), Jan-April 2025.
 - [Operads in Topology](#), National Center of Mathematics Workshop, IIT Bombay, Dec 2024.
 - [Intersection Homology Learning Seminar](#) by Dr. Charanya Ravi, ISI Bangalore, Jan-April 2024.
 - [Indian School on Logic & Applications](#), IIT Kanpur, May 2022.

MATHEMATICAL WRITEUPS

A detailed list of notes and writeups can be found at my webpage [here](#).

SOFTWARE
EXPERIENCE

Python, C++ and ML packages like PyTorch and TensorFlow. Major projects can be found [here](#).

REFERENCES

- **Dr. Amit Kuber**
Associate Professor
Department of Mathematics & Statistics
Indian Institute of Technology, Kanpur
askuber@iitk.ac.in
- **Dr. Suresh Nayak**
Associate Professor
Statistics & Mathematics Unit
Indian Statistical Institute, Bangalore
snayak@isibang.ac.in
- **Dr. Aniruddha Naolekar**
Associate Professor
Statistics & Mathematics Unit
Indian Statistical Institute, Bangalore
ani@isibang.ac.in
- **Dr. Anita Naolekar**
Associate Professor
Statistics & Mathematics Unit
Indian Statistical Institute, Bangalore
anita@isibang.ac.in
- **Dr. Manish Kumar**
Associate Professor
Statistics & Mathematics Unit
Indian Statistical Institute, Bangalore
manish@isibang.ac.in
- **Dr. Rahul Gupta**
Reader
Department of Mathematics
The Institute of Mathematical Sciences
rahulgupta@imsc.res.in