

EDUCATION	Statistics & Mathematics Unit, Indian Statistical Institute	Bangalore, India
	<i>Master of Mathematics</i>	2023 - 2025(<i>expected</i>)
	• Percentage : 91.67	
	Department of Mathematics & Statistics, Indian Institute of Science Education & Research, Kolkata	Kolkata, India
	<i>Master of Science in Mathematics (Left after one year)</i>	2022 - 2023
	Department of Electronics & Electrical Engineering, Indian Institute of Technology, Guwahati	Guwahati, India
	<i>B.Tech in Electronics & Electrical Engineering with minor in Mathematics</i>	2018 - 2022
	• CGPA: 8.49	
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	<i>Dr. Anita Naolekar, ISIB</i>
	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 .	
	Intersection Theory in Algebraic Geometry - Fall 2024	<i>Dr. Suresh Nayak, ISIB</i>
	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 .	
	Algebraic K-Theory - Summer 2024	<i>Dr. Rahul Gupta, IMSc</i>
	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 .	
	Function Fields & Algebraic Curves - Spring 2022	<i>Prof. Rupam Barman, IITG</i>
	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 .	
	Generalized Galois Theories - Fall 2021	<i>Prof. Rupam Barman, IITG</i>
	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 .	
	Sheaves & Topos Theory - Summer 2021	<i>Dr. Amit Kuber, IITK</i>
	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 .	

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 | • Complex analysis |
| | • Topology-3 : Cohomology & homotopy theory | • Measure theory |
| | • Differential geometry | • Functional analysis |
| | • Vector bundles & characteristic classes | • 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