Rupadarshi Ray

rupadarshiray.github.io Fifth year mathematics major rupadarshi2014@gmail.com
IISER Mohali

Education

MS21, IISER Mohali . . . . . 2021- · Mohali, Punjab
5 years BSMS

· current CPI: 8.42

Techno India Group Public School (TIGPS), Balurghat . . . . . 2007-2020 · Balurghat, West Bengal
Primary, Middle and High Scool

· Standard XII CBSE board exams: 93.6%

· Standard X CBSE board exams: 90.6%

Thesis

Rigidity of locally symmetric spaces . . . . . Fall 2025-Spring 2026 · IISER Mohali
Masters thesis under Dr. Arghya Mondal

· Mostow rigidity theorem for locally symmetric spaces of non-compact type

Academic interests

Recently, I have been studying

- Differential geometry, symmetric spaces and Lie groups
- Rigidity of locally symmetric spaces and lattices in semi-simple Lie groups

I have done coursework and reading in the following algebras

- Dynamical systems, ODEs and Ergodic theory
- Symplectic geometry and Hamiltonian flows
- Representation theory of Lie groups and Lie algebras

However, I am also interested in

- Riemann surfaces, complex manifolds and complex analytic geometry
- Integrable systems

Internship, coursework and personal reading history

First and second year of BSMS

Ordinary differential equations, Hamiltonian dynamics and quantum mechanics . . . . Summer 2022 ·
Personal reading from lectures by V Balakrishnan

- Classification of linear flows in $\mathbb{R}^2$
- Some theorems in Hamiltonian dynamics
- Quantum mechanical systems as a representation of the Hisenberg Lie algebra

MTH201 - Differential geometry of curves and surfaces . . . . . Semester 3 ·IISER Mohali
Mathematics course instructed by Dr. Shane D' Mello

- Curvature of curves and surfaces in $\mathbb{R}^3$
- Gauss's theorema egregium

NIUS 19.1, HBCSE-TIFR . . . . . December 2022 · HBCSE-TIFR, Mumbai
Undergraduate physics camp

- Attended talks about quantum computation, history of phase transitions, phase transitions in Ising model and neural networks, etc.
- Attended laboratory sessions "experimental problem solving".

Algebraic topology and smooth manifolds . . . . . Spring 2023 ·
Personal reading

- Fundamental group, singular homology, categories and functors
- Differential forms (derivative and integrals) and vector fields (bracket and flows) on manifolds

Sheaf theoretic proof of de Rham isomorphism . . . . . Summer 2023 ·IISER Mohali
Summer reading under Dr. Shane D' Mello

- Lee on de Rham cohomology of differential forms
- Griffiths and Harris on sheaf cohomology of differential forms
- Bott and Tu on Cech-de Rham double complex

Third and fourth year of BSMS

Representation theory of groups and Lie algebras . . . . . Winter 2023-Summer 2024 ·
Reading

- Fulton and Harris on representation theory of finite groups and Lie algebras
- Woit on quantum mechanics and representation theory

Complex analysis . . . . . Semester 6 ·IISER Mohali
Mathematics course instructed by Dr. Kapil Hari Paranjape

- Etale space of sheaf of holomorphic functions

MTH436 - Knots and braids . . . . . Semester 6 ·IISER Mohali
Mathematics course instructed by Dr. Shane D' Mello

- Jones polynomial of knots and links
- Universal Abelian cover of knot complements and Alexander polynomial

Riemannian geometry . . . . . Semester 7 ·IISER Mohali
Mathematics course instructed by Dr. Soma Maity

- Riemannian manifolds, Levi-Civita connection and geodesics
- Classification of constant curvature Riemannian manifolds

Meromorphic functions on Riemann surfaces . . . . . Summer 2025 ·IISER Mohali
Seminar organized with talks by Dr. Kapil Hari Paranjape

- Etale space of sheaf of holomorphic and meromorphic functions, ringed space definition of Riemann surfaces
- Constructing meromorphic functions on Riemann surfaces
- Riemann-Roch theorem, Abel's theorem and Jacobi's inversion theorem

Rigidity of Discrete Groups . . . . . June 30 - July 4, 2025 ·IISER Mohali
Workshop organized by Dr. Krishnendu Gongopadhyay and Dr. Pranab Sardar

- Attended talks on the Mostow rigidity theorem for hyperbolic 3-manifolds by Dr. Arghya Mondal

Ergodic theorems for actions of locally compact groups . . . . . Summer 2025 ·IISER Mohali
Summer reading under Dr. Jotsaroop Kaur

- Following Einsiedler and Ward, I presented proofs of ergodic theorems for measure preserving transformations and actions of Amenable groups with tripling property

Fifth year

Boundary of symmetric spaces . . . . . Fall 2025 ·IISER Mohali
Seminar organized by Dr. Arghya Mondal

- Symmetric spaces of non-compact type
- $P(n, \mathbb{R})$ and its totally geodesic submanifolds

Skills

Programming	Python, C, C++
Computational	MATLAB, R
Design	HTML, CSS, Adobe Illustrator

Involvement

- **Electronics project in Standard XII:** Implementation of A · B + C using resistance-transistor logic
- Wrote a route-map for introductory resources for mathematics and physics.
- Volunteered in official help sessions on linear algebra for first year students in IISER Mohali in Monsoon 2023

- Volunteered to give a talk on Fourier series in a summer camp in IISER Mohali

Talks presented

- Gave a talk on **Irrational rotations on the torus** for the mathematics club of IISER Mohali, Infinity, in Spring 2024
- **Periods of elliptic curves**, Arithmetic of elliptic curves course, IISER Mohali, Semester 8
- **Symplectic manifolds and Hamiltonian flows**

  Introductory talk in the Graduate Students Seminar, IISER Mohali, Spring 2025

  Talk with regards to the orbit method in Representation theory, Summer 2025

  Talks towards symplectic toric manifolds in a discord server
- **Abel's theorem and Jacobi's inversion theorem**, Meromorphic functions on Riemann surfaces seminar, IISER Mohali, Semester 8
- **Ergodic theorems for actions of locally compact groups**, Summer reading presentation, IISER Mohali, Summer 2025
- **Reductive subgroups of $GL(n,\mathbb{R})$ and totally geodesic submanifolds of $P(n,\mathbb{R})$**, Boundary of symmetric spaces seminar, IISER Mohali, Fall 2025