

# Rupadarshi Ray

[rupadarshiray.github.io](https://rupadarshiray.github.io)

Fifth year mathematics major  
IISER Mohali

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## Education

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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 School*

★ Standard XII CBSE board exams: 93.6%

★ Standard X CBSE board exams: 90.6%

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## Thesis

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[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

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## Academic interests

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My primary interests lie in

- Differential geometry: Riemannian manifolds, symplectic manifolds and Lie groups
- Dynamics on manifolds: Hamiltonian flows, geodesic flows and ergodic theory
- Symmetric spaces of non-compact type, their boundaries and rigidity of locally symmetric spaces

I have done coursework and reading/also am interested in the following areas

- Symplectic geometry and Hamiltonian flows
- Representation theory of Lie groups and Lie algebras
- Riemann surfaces, complex manifolds and complex analytic geometry

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## Talks

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- A talk on **irrational rotations on the torus** titled “Are you dense in chaos?” for the mathematics club of IISER Mohali, Infinity, in Spring 2024
- A talk on **some comparison theorems in Riemannian geometry** for the course on Riemannian geometry, IISER Mohali, Semester 7
- A talk on **knower’s and liar’s paradoxes and their formalizations** titled “What does a knower and a liar have in common?”, course on Philosophy of language, IISER Mohali, Semester 7
- A short talk on **topological conjugacy of linear flows** for the course on seminar delivery, IISER Mohali, Semester 7

- A talk on **periods of elliptic curves** for the course on Arithmetic of elliptic curves, IISER Mohali, Semester 8
- A short talk on **construction of Riemann surface of holomorphic functions** for the course on seminar delivery, IISER Mohali, Semester 8
- A talk on **construction of Haar measure on locally compact Hausdorff groups** for the course on Fourier analysis, IISER Mohali, Semester 8
- **Symplectic manifolds and Hamiltonian flows**

Introductory talk titled “When does a vector field kill area?” in the Graduate Students Seminar, IISER Mohali, Spring 2025

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

- **Abel’s theorem and Jacobi’s inversion theorem**, Meromorphic functions on Riemann surfaces seminar, IISER Mohali, Summer 2025
- **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

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## Background

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### First and second year of BSMS

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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 Heisenberg Lie algebra

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 Čech-de Rham double complex

### Third and fourth year of BSMS

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Representation theory of groups and Lie algebras . . . . . Winter 2023-Summer 2024 ·  
*Reading under Dr. Vaibhav Vaish*

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

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*

Arithmetic of elliptic curves . . . . . Semester 8 ·IISER Mohali  
*Mathematics course instructed by Dr. Abhik Ganguli*

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 of BSMS

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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

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## Involvement

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- **Electronics project in Standard XII:** Implementation of  $A \cdot B + C$  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