Raju Mandal

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Research Interest

- **Theoretical High Energy Physics:** My research mainly focuses on exploring the symmetries of the **S-matrix** and its implications. I have been working on **Celestial holography** and **Asymptotic symmetries** since last couple of years. Celestial holography is a proposed duality between a **quantum theory of gravity** in 4D **Asymptotically Flat spacetime** and a **2D Celestial CFT** that lives on the **Celestial sphere** at **null infinity**. I am interested to explore more about **Celestial CFTs** and other aspects of **quantum field theory** in future.

Education

Sep 2022- present — **Ph.D (2nd year onwards), National Institute of Science Education and Research (NISER), Bhubaneswar-752050.**
Thesis title: *Scattering Amplitudes and Asymptotic Symmetries*

Jan 2021 - Aug 2022 — **Pre-doc(1st year of Ph.D), Institute of Physics Bhubaneswar (IOPB), Bhubaneswar-751005.**
Thesis title: *Massless Particles at Null Infinity*.
Thesis Advisor : *Prof. Shamik Banerjee*

2017– 2019 — **M.Sc. in Physics, IACS, Kolkata-700032.**

2014 – 2017 — **B.Sc. in Physics, Scottish Church College, Kolkata-700006**

2012 – 2014 — **Higher Secondary Education in Science stream, Akrurmoni Coronation Institution (H.S), Malda-732101**

2007 – 2012 — **Secondary Education, Nagharia High School (H.S), Malda-732208**

Research Publications

Journal Articles

1. S. Banerjee, R. Mandal, S. Misra, S. Panda, and P. Paul, "All OPEs invariant under the infinite symmetry algebra for gluons on the celestial sphere," *Phys. Rev. D*, vol. 110, no. 2, p. 026 020, 2024. DOI: 10.1103/PhysRevD.110.026020. arXiv: 2311.16796 [hep-th].
2. R. Mandal, S. Misra, P. Paul, and B. Roy, "Singularity Structure of the Four Point Celestial Leaf Amplitudes," Oct. 2024. arXiv: 2410.13969 [hep-th].
3. S. Banerjee, R. Mandal, A. Manu, and P. Paul, "MHV gluon scattering in the massive scalar background and celestial OPE," *JHEP*, vol. 10, p. 007, 2023. DOI: 10.1007/JHEP10(2023)007. arXiv: 2302.10245 [hep-th].

Teaching Assistantship

- **Quantum Field Theory II (P 470)** Even semester, Academic Year 2023-24, Course Instructor: **Prof. Yogesh K. Srivastava**
- **Quantum Field Theory I (P 453)** Odd semester, Academic Year 2023-24, Course Instructor: **Prof. Yogesh K. Srivastava**

Teaching Assistantship (continued)

- **Quantum Mechanics I (P 206)** Even semester, Academic Year 2022-23, Course Instructor: **Dr Ashok Mohapatra**

Posters and slides of my talks

- Presented poster on **Celestial Holography** in **1st DAE Conclave, October 22-26, 2024 at NISER Bhubaneswar**.
- Talked about **An Infinite Family of S Invariant Theories on the Celestial Sphere** in **Future Perspectives on QFT and String(2024)** at IISER Pune.
- Presented poster on our work **An Infinite Family of S Invariant Theories on the Celestial Sphere** in **Future Perspectives on QFT and String(2024)** at IISER Pune.
- Talked about **An Infinite Family of S Invariant Theories on the Celestial Sphere** in **Students Talks on Trending Topics in Theory, 2024 (ST4)** at IIT Bombay.
- Brief talk on **Celestial Holography** in **SPS Day Event (2024)** at NISER, Bhubaneswar.
- Presented poster on **MHV Gluon Scattering in the Massive Scalar Background and Celestial OPE** in **Students Talks on Trending Topics in Theory, 2023 (ST4)** at IIT Mandi.
- Pre-doc project talk on **Massless Particles at Null Infinity** at IOP, Bhubaneswar in 2022.
- Term project talk on **Left-Right Symmetric Model** at IOP, Bhubaneswar in 2021.

Schools, Workshops and Conferences

- Participant of **1st DAE Conclave, October 22-26, 2024 at NISER Bhubaneswar**.
- Short talk and poster in **Future Perspective on QFT and Strings** July 24-27, 2024 at IISER Pune.
- Short talk in **Student Talks on Trending Topics in Theory(ST4), IIT Bombay, 1st-13th July 2024** workshop.
- Participant of **The 18th Kavli Asian Winter School on Strings, Particles and Cosmology**,December 5 - December 14, 2023 Yukawa Institute for Theoretical Physics, Kyoto University.
- Poster presenter in **Student Talks on Trending Topics in Theory(ST4), IIT Mandi, 2023** workshop.
- Participant of **Current Topics in String Theory and Cosmology, NISER Bhubaneswar** Apr 24-26, 2023
- Participant of Regional String Meeting, NISER Bhubaneswar, Sept 5-9, 2022.
- Participant of String Meet(local), IOPB Bhubaneswar April, 2022

Skills

Languages	Bengali, English and Hindi.
Coding	Fortran90, Mathematica and LaTeX.
Animations	Ising model, Elliptic pool table , Fermat's principle of least time, Elastic pendulum, Double pendulum, Butterfly effect Bouncing ball... (All were done using Fortran90 and gnuplot)

Awards and Achievements

Dec 2019	Qualified **CSIR-UGC NET (JRF)** with AIR 115.
Feb 2020	Qualified **Joint Entrance Screening Test(JEST)**.
Mar 2020	Qualified **GATE**.

Awards and Achievements (continued)

2014-2017 Awarded **INSPIRE Scholarship for Higher Education (INSPIRE-SHE), Department of Science & Technology (DST), India**

References

Prof Shamik Banerjee
Professor
National Institute of Science Education and Research(NISER),
Bhubaneswar 752050.
https://www.niser.ac.in/profile/bshamik