



## SHAILESH KUMAR

**Designation:** Postdoctoral Fellow

**Present Affiliation:** Indian Institute of Technology Gandhinagar, Gujarat, 382355.

**Permanent Address:** H.No. 339, Shahganj, District-Unnao, 209801, U.P., India.

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- **Date of Birth:** May 02, 1995
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### OVERVIEW

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I am broadly interested in various aspects of gravitation theory starting from black holes to gravitational waves. My PhD thesis provides a detailed study on gravitational memory effect- *a permanent relative displacement of the LIGO test masses induced via the interaction with gravitational waves generated from black hole spacetimes* and its possible connection with asymptotic symmetries emerging near the horizon of black holes. Presently, I am working on the dark matter signatures in Extreme mass ratio inspirals (EMRIs). I am also working on the potential detectability of supertranslation hair.

### EDUCATIONAL QUALIFICATIONS

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#### INDIAN INSTITUTE OF INFORMATION TECHNOLOGY ALLAHABAD (IIIT-A), INDIA

Jul 2018 - Jan 2022

PHD IN PHYSICS

- **Result:** 9.31 CGPI (Cumulative Grade Point Index)
- **Degree Conferred Date:** January 19, 2022.
- **Thesis Supervisor:** [Dr. Srijit Bhattacharjee](#), IIIT-Allahabad, India.
- **Thesis Title:** Gravitational Memory Effect for Near-Horizon Asymptotic Symmetries

#### INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH MOHALI (IISER MOHALI), INDIA

2013 - 2018

BS-MS IN PHYSICS

- **Result:** 7.0 CPI (Cumulative Performance Index)
- **Thesis Supervisor:** [Dr. Kinjalk Lochan](#), IISER Mohali, India.
- **Thesis Title:** Trajectories of particles around lower and higher dimensional black holes

#### SARASWATI VIDYA MANDIR INTER COLLEGE UNNAO (S V M I C), INDIA

May 2012 & June 2010

INTERMEDIATE, UTTAR PRADESH BOARD, MAY 2012

- **Result:** 86.6%, First class with Distinction ; **Subjects:** Physics, Maths, Chemistry, English, Hindi

HIGH SCHOOL, UTTAR PRADESH BOARD, JUNE 2010

- **Result:** 83.5%, First class with Distinction ; **Subjects:** Science, Maths, English, Hindi, Sanskrit, Social Science

## POSTDOCTORAL EXPERIENCE

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- Postdoctoral Fellow at [Indian Institute of Technology Gandhinagar \(IITGN\)](#), Gujarat, 382355, India.  
February 28, 2022 - Present  
**Advisor:** [Dr. Arpan Bhattacharyya](#), IIT-Gandhinagar.

## PUBLICATIONS

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- S. Sarkar, S. Kumar, S. Bhattacharjee, *Can we detect a supertranslated black hole?*, Under review in PRD (Letters), 2021, [Phys. Rev. D 105, 084001](#). [2110.03547]. **DOI:** 10.1103/PhysRevD.105.084001.
- S. Bhattacharjee, S. Kumar, A. Bhattacharyya, *Displacement memory effect near the horizon of black holes*, [J. High Energ. Phys.](#) 2021, 134 (2021). [2010.16086]. **DOI:** [https://doi.org/10.1007/JHEP03\(2021\)134](https://doi.org/10.1007/JHEP03(2021)134).
- S. Bhattacharjee, S. Kumar, *Memory effect and BMS symmetries for extreme black holes*, [Physical Review D102,044041](#) (2020), [2003.09334]. **DOI:** 10.1103/PhysRevD.102.044041.
- S. Bhattacharjee, S. Kumar, A. Bhattacharyya, *Memory effect and bms-like symmetries for impulsive gravitational waves*, [Physical Review D100,084010](#) (2019), [1905.12905]. **DOI:** 10.1103/PhysRevD.100.084010.
- S. Bhattacharjee, S. Kumar, S. Sarkar, *Mass inflation and strong cosmic censorship in a nonextreme BTZ black hole*, [Physical Review D102,044030](#) (2020), [2005.09705]. **DOI:** 10.1103/PhysRevD.102.044030.

## CONFERENCE PROCEEDINGS

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- S. Kumar, *Displacement memory and BMS symmetries*, To appear in proceedings of Sixteenth Marcel Grossmann Meeting [MG16], 2021, [arXiv:2109.13082](#).

## PROFESSIONAL AFFILIATIONS

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- Lifetime member of the [Indian Association for General Relativity and Gravitation \(IAGRG\)](#).
- Lifetime member of [Indian Association of Physics Teachers \(IAPT\)](#).

## SKILLS

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### PROGRAMMING LANGUAGES

- Mathematica, Python, Latex

## RESEARCH INTERESTS

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- Extreme mass ratio inspirals and dark matter signatures
- Gravitational memory and its connection with asymptotic symmetries
- Gravitational Lensing, Shadow and Quasinormal modes
- Various aspects of General relativity and black holes.

## PRESENTATION & ORAL TALKS

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- *Signatures of asymptotic symmetries in gravitational memory*, Memory Chat with [Prof. Eric Thrane](#), [Monash University](#), Australia, October 03, 2021.
- *Signatures of asymptotic symmetries in gravitational memory*, [American Physical Society Far West Section Meeting \(APS FWS\)](#), October 29-30, 2021.
- *Gravitational memory and BMS symmetries*, [North American Einstein Toolkit School](#), July 26-30, 2021.
- *Displacement memory and BMS symmetries*, [16<sup>th</sup> Marcel Grossmann Meeting - MG16](#); July 5-10, 2021.
- *Gravitational memory effect & BMS symmetries*, [Student Talks on Trending Topics in Theory](#); July 5-17, 2021.
- *Gravitational memory effect & BMS symmetries*, [21st British Gravity Meeting](#), [School of Mathematics and Statistics](#), [University College Dublin](#), April 12-16, 2021.
- *Gravitational Memory and BMS Symmetries*, [31st Meeting of the Indian Association for General Relativity and Gravitation \(IAGRG\)](#), [IIT-Gandhinagar](#), India, December 19-20, 2020.

## POSTER PRESENTATIONS

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- *Signatures of asymptotic symmetries in gravitational memory*, [Black Holes Inside and Out 2021 \(BHIO2021\)](#), Japan, 27 September-1 October 2021.
- *Gravitational Memory effect and BMS-like symmetries*, [International Conference on Gravitation & Cosmology \(ICGC'19\)](#), IISER Mohali, India, December 10-13, 2019.
- *Gravitational Memory effect and BMS-like symmetries*, [Applications of Data Science in Astrophysics and Gravitational Wave Research \(DSAP'19\)](#), IIIT-Allahabad, India, November 01-03, 2019.

## OTHER CONFERENCES & WORKSHOPS

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- [Testing Aspects of General Relativity](#), Indian Institute of Technology Gandhinagar, India; March 11-14, 2022.
- [Association of Asia Pacific Physics Societies-The Division of Astrophysics, Cosmology and Gravitation \(AAPPS-DACG\)](#), member countries of DACG; October 04-08, 2021.
- [24<sup>th</sup> CAPRA meeting on radiation reaction in general relativity](#), Perimeter Institute, Canada; June 07-11, 2021.
- [Current Challenges in Gravitational Physics](#), Trieste, Italy; April 21-28, 2021.
- [Flat Asymptotia Workshop](#), Okinawa Institute of Science and Technology, Japan; March 15-18, 2021.
- [Mathematical and Computational Approaches for Solving the Source-Free Einstein Field Equations](#), ICERM, Brown University, USA; October 26-30, 2020.
- [Testing GR using Gravitational Waves](#), IIT-Gandhinagar and IACS-Kolkata, India; August 13-14, 2020.
- Worked as a co-coordinator for [XXXIV Annual IAPT Convention-2019 & National Seminar on Recent Advances & Innovations in Physics Teaching & Research \(RAIPTR-2019\)](#), IIIT-Allahabad, India; October 13-15, 2019.

## SUMMER & WINTER SCHOOLS

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- [Online school on Physics of the Early Universe \(HYBRID\) \(PEU\)](#), ICTS-TIFR, Bangalore, India; January 03-12, 2022.
- [Online summer school on Gravitational Wave Astrophysics](#), ICTS-TIFR, Bangalore, India; May 18-22, 2020.
- [Summer school on Gravitational Wave Astronomy \(GWS2019\)](#), ICTS-TIFR, Bangalore, India; July 15-26, 2019.

## TEACHING ASSISTANT & EXPERIENCE

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- *Engineering Physics* Course (B.Tech 1st yr), Dept. of Applied Sciences, IIIT-Allahabad; Dec-Mar, 2021-22, [Till Jan].  
Instructor: Dr. Srijit Bhattacharjee
- *Biological Data Analytics* (M.Tech 1st yr), Dept. of Applied Sciences, IIIT-Allahabad; September - December, 2021.  
Principal Coordinator: Dr. Srijit Bhattacharjee
- Online self-sponsored short term certificate course on [Computational Methods in Physics using Python \(CoMP-Py\)](#), Dept. of Applied Sciences, IIIT-Allahabad; May - July 15, 2021.  
Principal Coordinator: Dr. Srijit Bhattacharjee
- *Engineering Physics* Course (B.Tech 1st yr), Dept. of Applied Sciences, IIIT-Allahabad; December-March, 2021.  
Instructor: Dr. Srijit Bhattacharjee
- *Numerical Methods* Course (M.Tech 1st yr), Dept. of Applied Sciences, IIIT-Allahabad; January-May, 2020.  
Instructor: Dr. Srijit Bhattacharjee
- *Engineering Physics* Course (B.Tech 1st yr), Dept. of Applied Sciences, IIIT-Allahabad; August-December, 2019.  
Instructor: Dr. Srijit Bhattacharjee
- *Engineering Physics* Course (B.Tech 1st yr), Dept. of Applied Sciences, IIIT-Allahabad; August-December, 2018.  
Instructor: Dr. Srijit Bhattacharjee

## EXTRA

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**NATIONALITY:** INDIAN

**MARITAL STATUS:** UNMARRIED

**SPEAKING LANGUAGES:** *FLUENT:* ENGLISH, HINDI    *NATIVE:* HINDI    *FAMILIAR:* SANSKRIT GRAMMAR

## REFERENCES

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- [Dr. Srijit Bhattacharjee](#), Assistant Professor  
Department of Applied Sciences,  
Indian Institute of Information Technology Allahabad, India.  
**Email:** srijitb@iiita.ac.in, srijuster@gmail.com
- [Dr. Arpan Bhattacharyya](#), Assistant Professor  
Department of Physics,  
Indian Institute of Technology Gandhinagar, India.  
**Email:** abhattacharyya@iitgn.ac.in
- [Dr. Kinjalk Lochan](#), Assistant Professor  
Department of Physical Sciences,  
Indian Institute of Science Education and Research Mohali, India.  
**Email:** kinjalk@iisermohali.ac.in, kinjalk.lochan@gmail.com
- [Prof. Anjan Ananda Sen](#), Professor  
Center For Theoretical Physics, Jamia Millia Islamia Central University (On Leave),  
School of Arts and Sciences, Ahmedabad University, Ahmedabad, India.  
**Email:** anjsen@gmail.com
- [Prof. Pavan Chakraborty](#), Professor  
Head Department of IT,  
Indian Institute of Information Technology Allahabad, India.  
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