

# Subhobrata Chatterjee

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Citizenship: India

## Research interests

Quantization of manifolds/supermanifolds, geometric quantization, deformation quantization, quantum Darboux theorems

## Education

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| 2019 – Present | <b>University of California</b> – Davis, United States<br>PhD in Physics<br>Advisor: Andrew Waldron.   |
| 2014 – 2019    | <b>National Institute of Science Education and Research</b> – Jatni, India<br>Integrated Masters (BSc+MSc) in Physics<br>Advisor: Loganayagam R. |

## Honors and scholarships

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| 2022 | Departmental fellowship during the summer (UC Davis)   |
| 2019 | Best thesis award for master's thesis (NISER, India)<br><i>Computed and characterized novel non-local divergences arising in renormalization of non-unitary open quantum field theories.</i> |
| 2018 | S N Bhatt Fellow (International Center for Theoretical Sciences, Bengaluru)<br><i>Worked on triangle loops in open quantum field theory under the guidance of Dr. Loganayagam R.</i>         |
| 2017 | Indian Academy of Sciences Summer Student Research Fellow (Delhi University, India)<br><i>Worked on supersymmetric quantum mechanics under the guidance of Dr. Debajyoti Choudhury</i>       |
| 2017 | Finished in top 1% at the national level of National Graduate Physics Examination, India   |
| 2015 | Represented India in the 9th Asian Science Camp, Thailand  |

- 2015      Awarded Certificate of Merit for outstanding academic performance in the first semester of undergrad at NISER
- 2014-2019      INSPIRE fellow throughout undergrad (NISER, India)
- 2014      Awarded gold medal for outstanding academic performance in grade 12

## Current Research

- Feb 2022 – **Classical measurement theory and discrete systems**  
Present      Mentor: Andrew Waldron (UC Davis).  
The goal is to develop a geometric description of classical measurements for discrete state systems like bits on a computer or spin chains. While supermanifolds encode discrete degrees of freedom, superfunctions that correspond to states of such systems do not have a natural probabilistic interpretation. We therefore equip our system with more geometric data, enough to construct a positive definite inner product on the space of superfunctions.
- June 2021 – **Exact quantization: beyond formality**  
Present      Mentor: Andrew Waldron (UC Davis).  
We want to characterize sufficient conditions for exact solvability of an abelian (Fedosov) connection on the Hilbert bundle/Weyl algebra bundle. Fedosov's deformation quantization procedure only guarantees a formal solution to the quantization problem. There are examples where we can go beyond formality. Lie groups admit Maurer-Cartan frames with Lie algebra structure constants and more generally parallelizable manifolds admit global frames with structure functions. Thus such manifolds most readily admit Maurer-Cartan forms (bonafide connection). We want to investigate this phenomenon for more general class of manifolds.

## Undergraduate Research

- June 2018 – **Renormalization of open quantum field theories**  
Aug 2019      Mentor: Loganayagam R (ICTS)  
Non-unitary open quantum field theories seem to be plagued with novel non-local divergences that do not allow usual Wilsonian renormalization. The goal of this project was to compute and characterize all non-local divergences arising in open scalar field theories. We found interesting geometric interpretations of these divergences reminiscent of the amplitudehedron program.

## Teaching experience

Summer 2022, Winter 2023	<b>Instructor, PHY 7A: Introduction to Physics for bio majors</b> Lecturing and conducting exams on different forms of energy, energy conservation, heat, work and thermodynamics.
Spring 2022	<b>Teaching assistant, PHY 110B: Electricity and Magnetism</b> Held office hours and graded homework and exams
Winter 2022	<b>Teaching assistant, PHY 104B: Computational Methods in Physics</b> Held office hours and graded homework and exams
Winter 2022	<b>Teaching assistant, PHY 155: General Relativity (undergrad)</b> Held office hours and graded homework and exams
Fall 2021	<b>Teaching assistant, PHY 260: Introduction to General Relativity (grad)</b> Held office hours and graded homework and exams
Spring 2021	<b>Teaching assistant, PHY 115A: Foundations of Quantum Mechanics</b> Held office hours and graded homework and exams
Winter 2020, Spring 2020, Summer 2020, Fall 2020, Fall 2022	<b>Teaching assistant, PHY 7A: Introduction to Physics for bio majors</b> Held discussion labs, office hours and graded homework and exams
Fall 2019, Winter 2021, Summer 2021	<b>Teaching assistant, PHY 7B: Introduction to Physics for bio majors</b> Held discussion labs, office hours and graded homework and exams

## Talks and Seminars

Jan 11, 2023	Talked about <b>Quantization and Geometry</b> at the Student-Run Research Seminar
2021-2022	Talked about a variety of topics in the internal research group seminar like Fedosov quantization, classical BRST, Sasakian geometry, Batchelor's theorem etc

## Mentorship

Oct 2021 – Feb 2022	<b>Directed Reading Program (DRP) Mentor</b> Guided an undergraduate student in a reading project on differential geometry
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