Subhobrata Chatterjee

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Citizenship: India

Research interests

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

Education

2019 – Present **University of California** – Davis, California
PhD in Physics
Advisor: Andrew Waldron.

2014 – 2019 **National Institute of Science Education and Research** – Jatni, Odisha
Integrated Masters (BSc+MSc) in Physics
Advisor: Loganayagam R.

Honors and scholarships

2022 Departmental fellowship during the summer (UC Davis)

2019 Best thesis award for master's thesis (NISER, India)
Computed and characterized novel non-local divergences arising in renormalization of non-unitary open quantum field theories.

2018 S N Bhatt Fellow (International Center for Theoretical Sciences, Bengaluru)
Worked on triangle loops in open quantum field theory under the guidance of Dr. Loganayagam R.

2017 Indian Academy of Sciences Student Research Fellow (Delhi University, India)
Worked on supersymmetric quantum mechanics under the guidance of Dr. Debajyoti Choudhury

2017 Finished in top 1% at the national level of National Graduate Physics Examination, India

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)

Research projects

Feb 2022 – Present

Classical measurement theory and discrete systems
Mentor: Andrew Waldron (UC Davis).
The goal of is to develop a geometric description of classical measurements for discrete systems like bits on a computer or spin chains. While supermanifolds encode discrete degrees of freedom, the data of a bundle connection on a representative vector bundle associated to the supermanifold allows one to define positive definite inner product on the space of superfunctions.

June 2021 – Present

Exact quantization: beyond formality
Mentor: Andrew Waldron (UC Davis).
In this project, 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.

June 2018 – Aug 2019

Renormalization of open quantum field theories
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

Instructor, PHY 7A: Introduction to Physics
Lecturing and conducting exams on different forms of energy, energy conservation, heat, work and thermodynamics.

Spring 2022

Teaching assistant, PHY 110B: Electricity and Magnetism
Held office hours and graded homework and exams

Winter 2022 **Teaching assistant, PHY 104B: Computational Methods in Physics**
Held office hours and graded homework and exams

Winter 2022 **Teaching assistant, PHY 155: General Relativity (undergrad)**
Held office hours and graded homework and exams

Fall 2021 **Teaching assistant, PHY 260: Introduction to General Relativity (grad)**
Held office hours and graded homework and exams

Spring 2021 **Teaching assistant, PHY 115A: Foundations of Quantum Mechanics**
Held office hours and graded homework and exams

Winter 2020, Spring 2020, Summer 2020, Fall 2020, Fall 2022 **Teaching assistant, PHY 7A: Introduction to Physics**
Held discussion labs, office hours and graded homework and exams

Fall 2019, Winter 2021, Summer 2021 **Teaching assistant, PHY 7B: Introduction to Physics**
Held discussion labs, office hours and graded homework and exams

Talks and Seminars

Jan 11, 2023 Talked about **Quantization and Geometry** 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 **Directed Reading Program (DRP) Mentor**
Guided an undergraduate student in a reading project on differential geometry