Soumyajit Datta

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Education

2020 - 2025 (Expected) **BS-MS**, *Indian Institute of Science Education and Research*, Kolkata
Current CGPA – 8.18/10

2020 **Higher Secondary**, *Birbhum Zilla School*
Class 12 – 97.8 %

Research Interest

I am interested in particle physics and cosmology, specifically in Beyond Standard Model Physics. I am interested in the Effective Field Theory– its formal aspects and application in Higgs physics, dark matter and neutrino physics.

Master's Thesis

Sept 2024 – Present **Applications of Effective Field Theory in Higgs and Neutrino Physics**
Supervisor: Prof. Subhaditya Bhattacharya, IIT Guwahati

I am currently searching for SMEFT operators in dimensions 6 and 7 that contribute to the Higgs production at the LHC and ILC.

Projects

May 2024 **Applications of Heat-Kernel Method**
Supervisor: Prof. Joydeep Chakrabortty, IIT Kanpur

I worked on the Heat-Kernel method. I studied the book 'Heat Kernel Method and its Applications' by I. Avramidi and learned the ingredients of heat kernel method and its applications in different systems. (Report)

May 2023 **Electroweak Interactions and Effective Field Theory**
Supervisor: Prof. Subhaditya Bhattacharya, IIT Guwahati

I studied the $SU(2)_L \times U(1)_Y$ electroweak theory. I calculated the electroweak interaction terms for the quark sector, and the Fermi constant (G_F^2). I also studied a bit of effective field theory and its application to dark matter.

May 2022 **Some Topics In Lie Algebra and Field Quantization**
IAS-INSA-NASI Summer Research Fellow, 2022
Supervisor: Prof. Urjit A. Yajnik, IIT Bombay

I studied some aspects of Lie algebra, specifically $SU(2)$ and $SU(3)$ groups, and also the Lorentz and Poincaré groups. I also explored a bit of field quantization – the free scalar field and scalar field with ϕ^4 potential. (Report4, Report8)

Scholarship

Mar 2021 – Present **Inspire Scholarship** awarded by Department of Science and Technology, Govt. of India.

Summer Schools and Camps

Dec 2021 **NIUS Physics 18.1 camp**
Organised by HBCSE, TIFR
The camp was conducted online due to the Covid-19 pandemic. We participated in theory sessions covering a range of topics, including nuclear physics, solar astrophysics, particle physics, superconductivity, etc.

Other Projects

May 2023 **Path Integrals in Quantum Mechanics,** *Term Paper*
This term paper was completed as part of the Advanced Quantum Mechanics course taught by Prof. Sourin Das. We studied the path integral formulation of quantum mechanics and applied this formalism to perturbation theory to derive the Fermi Golden rule. (Report, Presentation)

Teaching Experience

Spring 2024 Teaching Assistant of the course PH1201: Electricity and Magnetism

Fall 2023 Teaching Assistant of the course CS1101: Introduction to Computer Programming

Relevant Courses

Physics

- High Energy Physics
- Quantum Field Theory I-II
- Quantum Mechanics I-III
- Classical Electrodynamics
- General Relativity & Cosmology
- Statistical Mechanics
- Computational Physics
- Nuclear Physics Laboratory

Mathematics

- Real Analysis
- Linear Algebra
- Probability I
- Algebra I
- Numerical Analysis

Software Skills

Languages Python, Matlab, Mathematica

Tools LaTeX, Numpy, FeynCalc, GNU Plot

Other Interests

- I like to listen to rock and Indian classical music. I am an amateur guitarist.
- I enjoy designing posters. I have designed many for various events at IISER Kolkata.