

Arnav Metrani

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EDUCATION

Indian Institute of Science Education and Research, Mohali

Mohali, India

Integrated MSc., Physics

Jan 2022 —

- Physics Coursework: Introduction to Mechanics, Introduction to Electromagnetism, Waves and Optics, Thermodynamics, Quantum Mechanics, Electrodynamics, Classical Mechanics, Differential Equations, Advanced QM, Statistical Mechanics, Foundational QM, Solid State (Ongoing), Nuclear Physics (Ongoing), Atomic and Molecular Physics (Ongoing), QCQI (Ongoing)
- Math Coursework: Introduction to Group Theory, Real Analysis in One variable, Introduction to Differential Geometry, Introduction to Differential Equations, Probability Theory, Theory of Computation, Linear Algebra and Group Theory

PROJECTS

Introduction to Special Relativity and Analysis

April 2022 — July 2022

Professor Jasjeet Singh Bagla- Indian Institute of Science Education and Research, Mohali

Mohali, India

- Project comprised of Lorentz transforms, Minkowski geometry analysis, paradoxes, four-vector formulation, analysis of accelerating frames including Rindler frames, electrodynamic effects and optical effects.

Introduction to Quantum Algorithms and Quantum Error Correction

May 2022 — July 2022

Professor Kuntal Roy- Indian Institute of Science Education and Research, Bhopal

Online

- Studied foundational aspects of Quantum Computing, various Quantum Algorithms, Quantum Error Correction Algorithms, and applications of Quantum Fourier Transform incl. QFT addition.
- Wrote and executed quantum circuits on IBM-Q's public quantum computers (written on Qiskit).
- [Project report and code](#)

Physical Implementations of Quantum Key Distribution Protocols

May 2023 — July 2023

Professor Varun Raghunathan- Indian Institute of Science, Bangalore

Bangalore, India

- Project consisted of analysis and physical implementation of the T-12 protocol and the MDI-QKD protocol.
 - Theoretical aspects included analysis of BB-84, T-12, MDI-QKD protocols, SKR and QBER analysis, analysis of physical components used, characterization of beamsplitter operations, and characterization of single photon and coherent pulses.
 - Programming work included streamlining the instruments' calibration processes, SKR and QBER analysis for T-12 protocol, and analysis of MDI-QKD scenarios.
 - Practical work included running the setup (for T-12 protocol and MDI-QKD protocol) for calibration purposes and for obtaining real-time experimental data.

PUBLICATIONS AND TALKS

Talk, Extended Introduction to Quantum Algorithms (<https://arnavmetrani.github.io/talks/>)

3rd September 2023

- Presented an in-house talk on behalf of the Physics (phi@i) and Computer (Turing) club of IISER-Mohali. Talk covered current landscape of QC and current shortcomings, and explained the working of a few quantum algorithms and sub-routines.

EXTRACURRICULAR ACTIVITIES

Co-convener of IISER Mohali's Physics Club

Oct 2022 — Oct 2023

- Hosted demonstrations in IISER-M Foundation Day 2023
- Hosted workshops on Special Relativity, QCQI, CV and Email writing, and PhD applications.
- Hosted 10 talks incl. a panel on Summer Internships.
- Hosted Grand Canonical Ensemble (Physics Week 2023)

Blog on STEM

Aug 2022 --- Present

- Written 7 articles on various STEM topics.

SKILLS AND AWARDS

- **Programming Languages:** Python, Java, Mathematica, LabVIEW
- **Technologies:** \LaTeX , Typst