Arnav Metrani

Mohali, India | ms21254@iisermohali.ac.in | github.com/ArnavMetrani | arnavmetrani.github.io

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, Nuclear Physics, Atomic and Molecular Physics, QCQI
- **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
- **Lab Coursework:** PHY312- Logic gates, flip flops, registers and counters, clock circuits, and programming with Arduino

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.
- Project report and code

Other activities

Blog on STEM — Oct 2022 —

- Written 7 articles on various STEM topics (Site link).

Co-convener of IISER Mohali's Physics Club — Oct 2022 — Oct 2023

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

Talks and Presentations — Sep 2023 —

- (Extended) Introduction to Quantum Algorithms
- Quantum Bayes' rule affirming consistency in measurement inferences in quantum mechanics
- Quantum circuits cannot control unknown operations

Skills

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