

BISMAH RIZWAN

☎ (+92)-334-0559700 ✉ bismah_rizwan@mines.edu
in [linkedin.com/in/bismah-rizwan](https://www.linkedin.com/in/bismah-rizwan) 📍 Islamabad, Pakistan

RESEARCH INTERESTS

Open Quantum Systems – Quantum Information Science – Quantum Measurement

EDUCATION

Lahore University of Management Sciences <i>Bachelor of Science in Physics</i> CGPA: 3.22/4.00	Sept 2019 - Jan 2024
Cedar College <i>Cambridge International Advanced Level</i> CGPA: 4.33/4.33	Sept 2017 - June 2019

RESEARCH EXPERIENCE

Quantum Sensing for the Ohmic Quantum Reservoir <i>Senior Year Project; Supervisor: Dr. Adam Zaman Chaudhry</i>	Sept 2022 - May 2023
---	----------------------

- Studied quantum metrology and spectral density functions in the Ohmic regime
- Understood the methods employed to reduce decoherence, such as the bound-state mechanism
- Used the quantum Fisher information to show that the shot noise limit can be surpassed, achieving Heisenberg scaling
- Estimated the parameters of spectral density functions belonging to Ohmic families, using the pure dephasing model, and showed that the spin number N and encoding time t both can be used as quantum resources

[View Report](#)

Optical Spectroscopy of Molybdenum Disulfide <i>Research Assistant under Dr. Ata Ulhaq</i>	Mar 2021 - Aug 2021
--	---------------------

- Understood experimental design and execution, and gained proficiency in operating a wide range of laboratory equipment, such as optical microscopes
- Carried out the mechanical exfoliation of MoS_2 samples and transferred them to polydimethylsiloxane substrate
- Studied the optical contrast using imaging software, by detecting monolayers of MoS_2
- Detected the number of layers in a region based on optical contrast and made comparisons with Raman spectroscopy results

COURSE PROJECTS

Neural Networks as Function Approximators

Fall 2023

PHY 603: Machine Learning for Physics

Analyzed the impact of hidden layers, units, and activation functions on the mean squared error after approximating a given function. Applied regression analysis to quantify the influence of parameters on the neural network's accuracy.

[View Report](#)

Analysis of Bernstein-Vazirani Algorithm

Spring 2023

PHY 612: Quantum Information Science and Technology

Worked with a group to explore the intuition, mathematical formulation, circuit implementation, and complexity for the Bernstein-Vazirani algorithm. Also explored the probabilistic oracle for multiple strings.

[View Report](#)

Wormholes

Spring 2023

PHY 442: General Relativity

Solved the Einstein field equations for the Ellis drainhole metric, in order to provide a solution for a traversable wormhole.

[View Report](#)

Magnetic Birefringence and Determining the Verdet Constant

Spring 2022

PHY 300: Advanced Physics Laboratory

Studied and demonstrated the advantages of phase sensitive detection, by using a lockin amplifier to amplify nanoscale measurements. Calculated the Verdet constant for a Terbium Gallium Garnet crystal, by first demonstrating magnetic birefringence.

[View Report](#)

Gamma Ray Spectroscopy

Spring 2022

PHY 300: Advanced Physics Laboratory

Used software to detect gamma rays from a radioactive source, by first calibrating the energy spectrum of Cobalt, to account for the background radiation. Carried out calculations to find the mass absorption coefficient.

Building an Arduino Robot

Fall 2019

EE 100: Electrical Engineering Laboratory

Built and programmed an Arduino Uno robot to follow a line based on color recognition, and detect objects using infrared sensors.

TEACHING EXPERIENCE

PHY 104: Modern Physics

Jan 2022 - May 2022

Teaching Assistant

- Designed assignments and quizzes, and graded work for a class of 130+ students
- Held weekly office hours and revision classes

LUMS Community Service Society

Sept 2019 - Nov 2021

Teacher

- Travelled to remote areas and taught middle school students
- Educated students about history and social issues

RELEVANT COURSEWORK

Theoretical Physics: Introduction to Quantum Field Theory, General Relativity, Advanced Quantum Mechanics, Quantum Optics, Quantum Information Science and Technology, Condensed Matter Physics, Relativistic Electrodynamics, Machine Learning for Physics

Experimental Physics: Advanced Physics Laboratory, Introductory Engineering Laboratory

TECHNICAL SKILLS

Programming: C++, Python, MATLAB, \LaTeX
Software & Tools: IBM Quantum Composer, Microsoft Office, Image Processing, Adobe Photoshop and Premiere Pro
Miscellaneous: Academic and Content Writing

EXTRACURRICULAR

Volleyball Team Sept 2021 - Dec 2023
Athlete

- Participated in multiple inter-university tournaments

Publications at LUMS Oct 2021 - May 2023
Head Editor

- Helped set goals and implement them for the editorial board
- Wrote and edited content for the society's publications

Anime and Manga at LUMS Sept 2020 - May 2022
Founder and General Secretary

- Responsible for corresponding with all interfaces within the organization
- Supervised all departments and kept our timeline on check

AWARDS

- [Honorific Chandrasekhar Fellowship](#) 2021 - 2022
- Dean's Honors List 2019 - 2020
- Honor Roll 2018
- Best Delegation award – [Habib University National Science Olympiad](#) 2018
- Membership to the [New York Academy of Sciences](#) awarded by Habib University 2018
- 50% merit-based scholarship for Cambridge International A Levels 2017 - 2019