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## EDUCATION

### Master of Science (Physics)

2021 - 2023

*Kirori Mal College, University of Delhi*

**First Division(62%)**

### Bachelor of Science (Honours) in Physics

2018 - 2021

**CGPA:- 8.83/10, First Division with Distinction**

*Jamia Millia Islamia*

## RESEARCH PUBLICATIONS

- Paper Submission in [International conference on mathematical modelling and emerging trends in computing](#). **Akhilesh Dubey**<sup>1</sup>, Shivam Sawarn, priyanka, Shaik Ahmed, Ram Soorat, Investigating the Effect of Laser line width and Detector Bandwidth on Signal Behaviour with Balanced Homodyne Technique, Modern Physics Letters-B (I.F: 1.948), June 2023
- In preparation:- Shivam Sawarn, **Akhilesh Dubey**, Priyanka, Shaik Ahmad, D Sajeer and Ram Soorat, Optimising Quantum Error Correction with Mach-Zehnder Interferometer. March 2023

## CONFERENCE PRESENTATIONS

- Poster presentation on "Target probabilities with quantum circuit" at open Quantum 2023(Dept of Physics and Materials Science & Engineering, Jaypee Institute of Information Technology)
- Presented a conference paper in South Asia Wolfram Virtual Technology Conference as Co-author. Shivam Sawarn and **Akhilesh Dubey** February 2023 on [Target Probabilities With Quantum Circuits](#)

## RESEARCH EXPERIENCE

- **Quantum Ghost Imaging** May -Present  
Mentor:- Dr. Shashi Prabhakar(AMOPH Division, Physical Research Laboratory, Ahmedabad)
  - Combined two techniques of computational ghost imaging and machine learning to identify the object in effectively less amount of time.
  - Implemented the simulation part for various masks used in quantum ghost imaging experiment like Hadamard, Walsh and obtained results.
  - Analyzed more than 3,600 images for training to detect patterns in data for machine learning model and analysing over 21,600 images with an efficient accuracy and less loss.
- **Target Probabilities with Quantum Circuits** Dec 2022
  - Published the project in Fundamental Science Winter School 2023.
  - Investigated systematic methods to generate a desired probability distribution from a quantum circuit functionality by creating a high-level circuit model.
  - Learned to produce a desired optimal quantum circuit out of many possible combinations that matches from given random probability generator output.
  - Continuing the project under Wolfram Research for bench marking on real quantum computers
- **Quantum Tic-Tac-Toe Game** july-2022
  - Presented and Published the project in Wolfram Summer School 2022
  - The project proposes quantum version of Tic-Tac-Toe which accurately resemble the inherent probabilistic nature of the measurement Principle in Quantum Mechanics.
  - Aimed at showing the formulation of quantum rules, by using quantum superposition of different states and entanglement from the aid of qutrits and quantum gates representing the whole Game Tree.

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<sup>1</sup>CV updated On 1 August,2023

- **Qiskit Global Summer School 2022-Quantum Excellence** **August-2022**
  - Developed the skills and know-how to explore the world of quantum computing and its applications with a focus on quantum simulations using NISQ hardware.
  - Completed an intensive hands-on lab and have gained significant knowledge and skill in quantum computation, using the required physics, math, and python skills to model a molecule using Qiskit.
- **Numerically Solving Schrodinger equation using Python** **April-2021**  
Mentor:- Dr. Syed Rashid Ahmad (Dept. of Physics, Jamia Millia Islamia)
  - Employed the different computational methods using python to solve numerically solving the Schrodinger Equation.
  - Solved finite square well bound state of Harmonic Oscillator using Taylors method, Discretization, Forward and Backward first order differential(first & second order), finite difference method and Matrix representation

## HONOURS & AWARDS

- Qualified and got among first 23% people in Joint Admission Test For Masters(JAM) conducted by Indian Institute Of Science, Bengaluru.
- **Fundamentals of Quantum Computing** **Sept-2022**
  - Certified by The Linux Foundation for understanding the fundamentals, current capabilities, and probable technological disruptions quantum computing may bring.
  - Grasped the technological, governmental, and industrial implications as the technology matures and how it could be used for complex decision-making.
  - Learnt to determine use cases for quantum computing and discern security advantages and possible challenges around secure communication and encryption.
- **IBM Quantum Spring Challenge 2022** **June-2022**
  - Issued a badge by IBM for the ability to use Qiskit to perform simulations of complex problems.
  - Enhanced understanding of how to setup, analyze, and compare quantum simulations against their classical computing counterparts, with a focus on many-body and fermionic systems.
- **IBM Quantum Challenge - Fall 2021** **Nov-2021**
  - Issued a badge for learning to use Qiskit's application module in the area of Finance and Natural sciences.
  - Able to successfully implement Variational Quantum algorithms to optimize finance portfolios and reliably predict the excited states of a molecule specified in the challenge problem.
  - Generated ability to successfully run VQE using Qiskit Runtime and demonstrated an ability to use Qiskit's application module in the area of finance and natural sciences.

## ADDITIONAL EXPERIENCE

- **Student Ambassador at Wolfram** **May 2023- Present**
  - Setting up the workshops for Wolfram live coding events and mini hackathons at schools and universities.
  - Participation in roundtables with top Wolfram developer.
- **Co-founder of UttarKunji Company** **Jan 2021-Present**
  - Our platform offers an extensive collection of M.Sc Physics previous year questions, answers, syllabi, cutoffs, and seat matrices designed.
- **Subject Matter Expert** **2020-2021**
  - Collaborated with students to help in completing homework assignments, identify lagging skills and correct weaknesses.
  - Drilled students on subject matter and used flashcards and writing technique to improve recoil.

## SKILLS

<b>Programming</b>	Python, C, Wolfram Language, Fortran, Git, L <sup>A</sup> T <sub>E</sub> X
<b>Packages &amp; Library</b>	QuTip, Matplotlib, Numpy, TensorFlow, Keras, Pandas, Scipy, Sklearn
<b>Laboratory work</b>	Quantum Lab, Nuclear Lab, Electronics Lab, Solid State Lab, Mechanics Lab
<b>Communication</b>	English (Professional), Hindi (Native), Urdu (Beginner)
<b>Other</b>	LabView, Github, Linux, Unix, Windows, Inkspace, Blender

## RELEVANT COURSEWORK

- **Quantum Mechanics:** The Schrodinger Equation, Operator & matrices, The three-Dimensional Problem, Quantum Dynamics, Angular Momentum, Approximation methods for Static and Time Dependent Perturbation, Scattering, Relativistic Quantum Mechanics
- **Optics:** Young's Double slit experiment, Division of wave front. Fresnel's bi-prism. Division of amplitude. Interference in thin films, Newton's rings, Michelson's interferometer, Polarisation Plane, Polarization of light, Double refraction, Nicol prisms, Wave plates, Optical activity, Geometrical Optics, Diffraction Grating and Holography
- **Solid State Physics:** Band Theory of Solids, Semiconductors, Superconductors, Crystal binding & Lattice & Atomic Bonding, Dielectrics and Magnetic property
- **Atomic & Molecular Physics:** Atomic Physics, Molecular Structure, Molecular Spectra, Lasers
- **Statistical Physics:** Quantum Statistical Mechanics, Canonical Ensemble Theory, Interacting system & Phase Transition
- **Computational Physics:** Scientific Programming and Logic (Python & Fortran), Programming in C, Numerical Methods, Matrices & Integration
- **Mathematical Physics:** Linear Vector Space, Theory of Probability and Statistics, Complex Analysis, Tensors, Special Functions, Dirac Delta Function, Fourier Series and Transform
- **Mathematics:** Single & Multi Variable Calculus, Linear Algebra, Groups, Rings & Vector Spaces, Ordinary & Partial Differential Equations
- **Labs:**  
Bachelors of Science (Physics):-  
Lab I (Mechanics & Oscillations), Lab II (Electronics & Thermal Physics), Lab III Optics, Lab IV (Electricity & Magnetism), Lab V (Modern Physics), Lab VI (Advanced Electronics)  
  
Master of Science (Physics):-  
Physics Lab I (Electronics & Nuclear), Physics Lab II (Solid State & Optics), Physics Lab III (Advanced Nuclear I), Physics Lab IV (Advanced Nuclear II)

## CERTIFICATIONS

- **Internship in Research Training**  
(Ministry of Micro, Small and Medium Enterprises, Govt of India Society)

**Jun-Jul 2022**

- Learned Research methodology, read and write of research articles, selection of journals and publication, Mendeley and Zotero, reference manager.
- Learned about resources for finding and accessing scientific papers, literature reviews and articles.
- **Student development program on Artificial Intelligence and Machine learning by IIT Kanpur Apr 2022**
  - AI learning, Data management with Pandas, Matplotlib, Numpy, Scipy, Sklearn packages Implementation
  - Implemented neural network with Tensorflow in supervised and unsupervised learning, Convolutional Neural Network with Keras API
- **MIT IQUHACK developed a Quantum maze game Feb 2022**
  - Developed a quantum maze game which is a classical ludo inspired game that allows beginners to delve into the basic concepts of different quantum gates. The dice roll is symbolised as a quantum measurement of a circuit with two hadamard gates. The winning move involves applying a suitable quantum gate to a bloch sphere to bring it back to state 0. It is a two player game with both of them playing alternatively to reach the winning destination.
- **Calculus By Wolfram Mathematica Aug-2020**
  - Learned lesson videos, polling the group to review key concepts, by a Wolfram-certified instructor who guides each session by sharing introducing practice problems and answering questions.
  - Focused on building fundamental concepts in calculus. A certificate of program completion will be awarded to participants who attend online sessions and pass quizzes.
- **Workshop on Latex Programming by NIT Jamshedpur July-2020**
  - A seven days workshop conducted in which major packages and uses of Latex instructed in complete manner.
- **Linear Algebra By Wolfram Mathematica Oct-2020**
  - Concepts and techniques learned from linear algebra in cutting-edge disciplines such as data science, quantum computation and in the field of numerical analysis.
  - Solved and attend online sessions and pass quizzes to get course completion .
- **Qbronze Nov-2021**
  - Solved collection of Jupyter notebooks, and each notebook has many programming tasks to provide hands-on experiences. We see Bronze as a laboratory where you can learn the basics of quantum computing and quantum programming by doing.
- **Computational Mathematics with Sage Math (IIT Madras) Jan-March 2020**
  - Learned open source computer algebra system (CAS), Concepts in Calculus, Applied Linear Algebra and Numerical Methods. Learned SageMath software along with plotting 2D and 3D objects. The main focus is on using SageMath to explore topics in Calculus, Applied Linear Algebra and Numerical Method along with several applications.
- **Physics through computational thinking by IISER Bhopal Feb-March 2020**
  - Learned to formulate a basic problem that is amenable to full analytical solution.
  - Translated the problem into a form that can be analyzed on a computer, first by visual tools followed by more sophisticated computational tools.
  - Designed complementary computational approaches whose results can be subjected to test against the analytical solutions, thus building confidence and making transparent both the methods.
  - Exploited the confidence developed to tackle problems that are not amenable to a full analytical solution.
- **Joy of computing using python(IIT Madras) Jan-Feb 2019**
  - Learned about loops and Conditionals, Variables and Expressions, Functions and Module with File Handling, Generators and Iterators with Data structures, Writing codes for making games