RIJWAN ANSARI

Physics Postgraduate | *Quantum Computing & Machine Learning Enthusiast*

Nagaon, Assam, India | LinkedIn | GitHub

Profile Summary

Physics postgraduate developing expertise in machine learning applications, quantum computing, and embedded systems. Experience spans peer-reviewed publication and conference presentation, an M.Sc. dissertation on quantum key distribution, a research fellowship at Harish-Chandra Research Institute, and hands-on software development. Trained in quantum algorithms through the Womanium & WISER Quantum Program 2025 and skilled across Python, web development, and IoT.

Education

M.Sc. in Physics (Hons.) — Nagaon University *2024 – 2026 (Ongoing)*

Department of Physics, Nagaon University | CGPA: 8.57 (till 3rd sem)

- Dissertation: "Design and Experimental Analysis of a Low-Cost BB84-Inspired Optical Key Distribution System Under Real-World Constraints".

B.Sc. in Physics (Honours) — Nowgong College (Autonomous) *2020 – 2023*

Under Gauhati University | CGPA: 8.24 (First Class)

- Dissertation: "Development of Portable Spectrometer for Classification of Honey using Machine Learning Algorithms".

Higher Secondary (Science) — Renaissance Junior College *2018 – 2020*

Assam Higher Secondary Education Council | 83.4% — First Division

HSLC — St. Thomas English School, Kathiatoli *2018*

Board of Secondary Education, Assam | 90.5% — First Division

Research Experience & Publications

M.Sc. Dissertation Project — Nagaon University *2026*

Project: "Design and Experimental Analysis of a Low-Cost BB84-Inspired Optical Key Distribution System Under Real-World Constraints"

- Designed and built a fully automated, low-cost (under $100) optomechanical Quantum Key Distribution (QKD) emulator utilizing ESP32 microcontrollers, a 650 nm laser, and NEMA 17 stepper motors.
- Validated the system's optical fidelity against Malus's Law with an R^2 of 0.9995 and achieved a hardware noise floor of 0.33%, remaining well below the 11% security threshold.
- Developed a multi-factor linear regression model to accurately quantify the impact of mechanical misalignment, ambient light, optical path length, and pulse settling on Quantum Bit Error Rate (QBER).
- Conducted rigorous physical security evaluations by emulating intercept-and-resend attacks and comparing the sifting rates and QBER thresholds of BB84, B92, and SARG04 protocols.
- Identified a novel acoustic side-channel vulnerability in mechanical polarizers and successfully trained a decision-tree machine learning classifier to recover cryptographic bases with 63.2% accuracy from motor audio.

Summer Research Fellow — Indian Academy of Sciences (IASc) / INSA / NASI *Jul – Sep 2025*

Project: "Quantum Communication using Entanglement", under Prof. Aditi Sen De, Harish-Chandra Research Institute, Prayagraj

- Selected for the Science Academies' Summer Research Fellowship Program, jointly sponsored by IASc (Bengaluru), INSA (New Delhi) and NASI (Prayagraj).
- Conducted an in-depth study of quantum communication protocols, focusing on the role of quantum entanglement in dense coding and teleportation.
- Analyzed operational criteria for entanglement detection and calculated quantitative measures, including Logarithmic Negativity, Generalized Geometric Measure (GGM), and Tangle.
- Evaluated super-dense coding capacities for bipartite and multipartite quantum systems, demonstrating the monotonic relationship between GGM and dense coding efficiency.
- Extended the capacity analysis to noisy quantum environments, specifically modeling the effects of one-sided d-dimensional Pauli channels and two-sided depolarizing channels.

Journal Publication — Physics Frontiers: Bridging Theories and Experiments (Vol. I) *2024*

Co-author, "Detection of Honey Adulteration using Linear Regression Method", Physics Frontiers – 2024 National Conference Proceedings, pp. 137–140

- Contributed to a portable UV-NIR spectrometer (AS7265X + Arduino UNO) that used a Linear Regression machine learning model (built in Orange 3.0 / Python) to detect honey adulteration, achieving 78.64% predictive accuracy (R^2) across a 2,600-sample spectral dataset.

Conference Presentation — ICFPAP-2024, USTM Meghalaya *29 Feb – 2 Mar 2024*

- Presented the paper "Development of Portable Spectrometer using Machine Learning Algorithm" at the International Conference on Frontiers in Pure and Applied Physics (ICFPAP-2024), organised by the Department of Physics, University of Science & Technology Meghalaya, in collaboration with the Physics Academy of North East (PANE).

Work Experience

Web & Software Development Intern — Karbi Anglong Autonomous Council (KAAC) *Jun – Jul 2024*

- Developed a role-based Intern Management System as both a web application and an offline-capable desktop client to digitise the complete internship workflow — registration, OTP-based email verification, department-wise application review, multi-level approvals, task assignment/submission tracking, and certificate generation.
- Built the web application (Intern_Management_System_Web) with PHP, MySQL, Node.js and React.js, and the desktop client (Intern_Management_System_Desktop) with Electron.js, with separate dashboards for interns, moderators, sub-admins, admins, and super admins, plus automated certificate ID generation via database trigger logic.
- Project link: View Demo

Quantum Computing Certifications — Womanium & WISER Quantum Program 2025

- QBronze using Qiskit (QWorld) — "Quantum Computing & Programming", Bronze-Qiskit introductory tutorial. Diploma No. QBronze169-587.
- Quantum Algorithms to Solve Linear PDEs — quantum linear system solvers and quantum algorithmic approaches to linear PDEs (Issued 6 Aug 2025).
- PennyLane Challenge — "Introduction to LCUs" (Linear Combination of Unitaries), completed 31 Jul 2025.
- PennyLane Challenge — "A Simple Trotterization Challenge", completed 7 Aug 2025.
- Quantum Algorithms for Nonlinear PDEs — Carleman linearization and Quantum Nonlinear Processing Units (Issued 11 Aug 2025).

Workshops, Seminars & Conferences

- National Seminar cum Workshop on "Recent Trends in Quantum Materials and Devices", Tezpur University, 3–4 March 2025.
- Innovation, Design and Entrepreneurship (IDE) Bootcamp, Edition 2 – Phase II, Tezpur University (AICTE's Innovation Cell, Ministry of Education), 17–21 February 2025.
- "Semiconductor Ecosystem: Awareness & Opportunities for Northeast India" workshop, jointly organised by Jagiroad College, VLSI Society of India, NEISED and NIELIT Guwahati, 25 October 2024.

Online Courses & Additional Certifications

- Web Development Course (12 months) — STP Computer Education, New Delhi; A Grade (Jun 2023 – Jun 2024).
- Master Python Web Scraping & Automation using BS4 & Selenium — Udemy (Feb 2024).
- Make 3 IoT Projects – Beginner, Intermediate & Advanced — Udemy (Feb 2024).
- Python Programming: 200+ Exercises for Practice — Udemy (Feb 2024).

Technical Skills

Programming & Web:	Python, PHP, JavaScript, React.js, Node.js, Electron.js, MySQL
Data & Machine Learning:	Linear Regression, Orange 3.0, data preprocessing & model evaluation (MAE, MSE, RMSE, R^2)
Quantum Computing:	Qiskit, PennyLane, quantum algorithms (VQE, LCU, Trotterization), QKD (BB84)
Hardware / IoT:	Arduino UNO, AS7265X Triad Spectroscopy Sensor, sensor interfacing
Tools:	Git/GitHub, Web Scraping (BeautifulSoup, Selenium)