Animesh Banik

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Profile

Researcher in Quantum Information Science focusing on state discrimination, teleportation, and quantum communication protocols. Experienced in circuit design and simulation using Qiskit and PennyLane, with a first-author publication in AVS Quantum Science and recognition as Best Oral Presenter (Theoretical Physics) at ICPSDT-2025. Selected as a Qiskit Advocate (IBM Quantum, 2025) for contributions to global quantum education and outreach.

Research Interests

- Quantum Communication
- Quantum Cryptography
- Quantum Simulation
- Quantum Error Correction
- Quantum Algorithm
- Optics and Photonics

Publications

- **Journal Publications:**

1. **Animesh Banik**, Md. Shihab Khan, Rafid Masrur Khan, Syed Emad Uddin Shubha, Mahdy Rahman Chowdhury, "Secure and Efficient n-Qubit Entangled State Teleportation Using Partially Entangled GHZ Channels and Optimal POVM." AVS Quantum Science, 2025 (Q1, IF: 3.0).
   `doi: 10.1116/5.0284072 Code`

- **Conference Presentations:**

1. **Animesh Banik**, Md. Shihab Khan, Rafid Masrur Khan, Syed Emad Uddin Shubha, Quazi Muhammad Rashed Nizam, "Generalized State Discrimination for Binary Non-orthogonal States." 6th International Conference on Physics for Sustainable Development and Technology (ICPSDT-2025), Chittagong University of Engineering & Technology (CUET), Bangladesh.
2. **Animesh Banik**, Md. Shihab Khan, Md. Tareq Aziz, Dr. Quazi Muhammad Rashed Nizam. "In search of a potential method for teaching quantum mechanics at undergraduate level". In 5th ICPSDT organized by Department of Physics, CUET.

Research & Teaching Experience

Research Assistant — University of Chittagong, Chattogram June 2024 – Present

Supervisor: Professor Dr. Quazi Muhammad Rashed Nizam

- Designed and delivered lecture materials for graduate-level Quantum Mechanics courses, improving clarity and engagement for 90+ students.
- Assisted in course restructuring by integrating problem sets and simulations, enhancing student problem-solving practice.
- Co-supervised undergraduate researchers, guiding them toward independent project development and manuscript preparation.
- Conducting research in quantum communication and simulation, leading multiple manuscripts under review and preparation.

- **Ongoing Research Projects:**

1. "Generalized State Discrimination for Tunable Quantum Key Distribution" — Developing a hybrid POVM framework for improved balance between error and inconclusive outcomes and investigating the consequences in a modified B92 protocol (prepared for submission).

2. "Quantum Simulation of Nuclear Reactions" — Contributing variational simulation methods to explore low-energy nuclear reaction dynamics (in preparation).
3. "Variational Quantum Eigensolver (VQE) for Hydrogen Isomers" — Implementing VQE circuits to model spin states and bonding of hydrogen isomers (in preparation).

Education

University of Chittagong June 2024 – Present
M.Sc. in Physics

University of Chittagong
B.Sc. in Physics CGPA: 3.40/4.00

Relevant Courses: Quantum Mechanics I & II, Solid State Physics I & II, Computational Physics, Statistical Mechanics and Radiation, Computer Architecture and Programming.

Honors and Awards

- *Best Oral Presenter* - 6th International Conference on Physics for Sustainable Development and Technology (ICPSDT-2025), CUET, Bangladesh.
- *IBM Quantum Excellence Badge (QGSS 2025)* — Awarded for completing all four core labs of the IBM Quantum Global Summer School 2025.
- *QBronze: Quantum Computing and Programming (using Qiskit)* — Diploma awarded for completing the QBronze Workshop organized by QWorld and QIndia.
- *International Astronomy and Astrophysics Olympiad 2023* — Qualified for the Pre-final Round, showcasing strong skills in physics, astronomy, and analytical reasoning.

Test Scores

- **IELTS Academic (2025)**: Overall 8.0/9.0 [Reading: 9.0; Listening: 8.5; Writing: 8.0; Speaking: 7.0]

Technical & Soft Skills

Programming Languages : Python, C, C++ (Applied in relevant data analysis).
Simulation Software : Qiskit, PennyLane, Cirq (Used for simulating quantum algorithms and protocols).
Formatting Application : LaTeX (Used for scientific writing).
Soft Skills : Scientific communication, Collaboration, Leadership, Self-directed learning, Public outreach & engagement, Integrity & intellectual independence.

Selected Certificates

- *QWorld QTraining for Bronze (Instructor)* – Successfully completed QTraining10-3 and served as an instructor in a mock QBronze workshop organized by QWorld (September 2025).
- *Mahdy Research Academy Thesis Program (2024–2025)* – Completed both (*first* and *second*) parts of the private online thesis course/program in Quantum Computing & Information.
- *Womanium and WISER Quantum Program Challenges (2025)* – Completed PennyLane *Introduction to LCUs* and *A Simple Trotterization*.
- *Basic programming with Python* – issued by Bangladesh Computer Council (ICT Division, EDGE Project) for successfully completing the training program on "Basic programming with Python"

Leadership & Outreach

- **Team Leader, QRNLab Outreach Booth:** Led the QRNLab team in organizing and managing a public outreach booth at a national research festival, engaging hundreds of visitors with demonstrations on quantum physics and fostering scientific curiosity among students and the general public.
- **Qiskit Advocate:** Engaged in global community outreach, mentoring beginners, and contributing educational content to promote quantum computing literacy through IBM Quantum initiatives.