Soumyadip Paul

Research Scholar, IndiaAI Fellow, PhD,
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EDUCATION

Indian Institute of Technology Delhi(IITD), Delhi, India — July 2025 – Present
Doctor of Philosophy (PhD) in Applied Research in Electronics — Cumulative GPA: 8.0/10.0
Research Area: Quantum Machine Learning QML and Optimization for 6G and beyond wireless networks
Honor: Awarded the **IndiaAI Fellowship** — 17 December 2025

Government College of Engineering & Ceramic Technology, Kolkata, India — July 2023 – May 2025
Master of Technology in Information Technology — Cumulative GPA: 8.76/10.0
Thesis Title: Quantum Cryptography and Post-Quantum Cryptographic Algorithms

University of Engineering and Management, Kolkata, India — June 2022
Bachelor of Technology in Computer Science and Engineering — Cumulative GPA: 8.15/10.0
(First Class with Distinction)

RESEARCH EXPERIENCE

PhD Research: Quantum Machine Learning and Optimization for 6G and Beyond Wireless Networks — CARE, IIT Delhi, India
Doctoral Research, Advisor: Prof. Neel Kanth Kundu — July 2025 – Present

- **Advisor:** Prof. Neel Kanth Kundu, Centre for Applied Research in Electronics (CARE), Indian Institute of Technology Delhi, India.
- Researching quantum machine learning (QML) and quantum/hybrid quantum-classical optimization algorithms for next-generation (6G and beyond) wireless networks.
- Developed a hybrid quantum-classical detection framework using a warm-start linear-ramp Quantum Approximate Optimization Algorithm (WSLR-QAOA) for QAM MIMO data detection, formulated as a higher-order unconstrained binary optimization (HUBO) problem, validated on IBM quantum hardware (preprint, arXiv:2604.18479), with S. Banerjee, D. Bhowmik, and N. K. Kundu.
- **Honor:** Awarded the **IndiaAI Fellowship** in recognition of doctoral research contributions (17 December 2025).

M.Tech Thesis: Quantum Cryptography and Post-Quantum Cryptographic Algorithms — GCECT, Kolkata, India
Thesis Work, Advisor: Dr. Mausumi Maitra (Mazumdar) — July 2023 – May 2025

- Investigated post-quantum cryptographic algorithms for enhanced data security under the supervision of Dr. Mausumi Maitra (Mazumdar), Professor, Dept. of Information Technology, GCECT, Kolkata, India.
- Developed a quantum-resistant blockchain framework, integrating quantum hash functions with a novel consensus mechanism (Quantum Proof of Stake and Behavior, QPoSB) for malicious behavior detection.
- Designed a hybrid quantum optimization algorithm (HQAOA), theoretically integrating MA-QAOA and AL-QAOA, for efficient blockchain transaction scheduling, under the supervision of Prof. Dr. Sarit Chakraborty.
- Conducted simulations of quantum cryptographic and optimization protocols using Python and quantum computing libraries; findings presented at IEEE ISACC 2025 and IEEE SCEECS 2025.

Research Intern: SERB sponsored project — GCELT, Kolkata, India
Project Work, Advisor: Dr. Sarit Chakraborty (PI) — January 2024 – July 2024

- **Project Title:** Design Optimization of Micro-Electrode-Dot-Array based Digital Microfluidic Biochips (MEDA DMFBs) for Cyber-physical Systems.
- **Sponsored:** Science and Engineering Research Board (SERB), DST, Govt. of India.
- **Advisor:** Dr. Sarit Chakraborty (Principal Investigator), Assistant Professor, Dept. of CSE, Government College of Engineering and Leather Technology, Kolkata, India.

- **Achievements:** Optimized routing of microfluidics in the biochips, reducing self-contamination.
- Also contributed to a related blockchain-based supply chain management solution for Railway Cargo Systems (RCS) using Solidity on Ethereum, presented at AISC 2024.

PUBLICATIONS

S. Paul and N. K. Kundu. "Efficient Quantum Algorithm for Phase Optimization of 1-Bit RIS-Assisted MIMO Communication System," *preprint*, arXiv:2607.14700, 2026. Link

S. Paul, S. Banerjee, D. Bhowmik, and N. K. Kundu. "Warm-Start Quantum Approximate Optimization Algorithm for QAM MIMO Data Detection," *preprint*, arXiv:2604.18479, 2026. Link

D. Das, A.K. Paul, R.S. Ray, S. Paul "Automated Alignment of Course Outcomes with Program Outcomes and Program Educational Objectives Using NLP Techniques," 2025 International Conference on Computing, Intelligence, and Application (CIACON), Durgapur, India, 2025, pp. 1-6, doi: 10.1109/CIACON65473.2025.11189748.

S. Paul and S. Chakraborty, "Hybrid Quantum Approximate Optimization Algorithm (HQAOA) for Efficient Blockchain Transaction Scheduling," 2025 3rd International Conference on Intelligent Systems, Advanced Computing and Communication (ISACC), Silchar, India, 2025, pp. 864-869, doi: 10.1109/ISACC65211.2025.10969380.

A. Sinharay, S. Paul, S. Chakraborty and K. Chatterjee "Partition Matching Maximum Zero-Sum Algorithm to Address VLSI Thermal Placement Issues," 2025 6th International Conference on Recent Advances in Information Technology (RAIT), Dhanbad, India, 2025, pp. 1-6, doi: 10.1109/RAIT65068.2025.11088908.

S. Paul, M.M.Maitra, S. Chakraborty. (2025). "Quantum Resistance Blockchain Algorithm using QHF and Novel Consensus Mechanism," 2025 IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS), Bhopal, India, 2025, pp. 1-6, doi: 10.1109/SCEECS64059.2025.10940775.

S. Paul, S. Chakraborty, H. Rahaman. (2024). A Novel Technique for Optimizing Supply Chain Operations in Railway Cargo System (RCS) using Blockchain Technology. presented at the International Conference on Artificial Intelligence and Sustainable Computing AISC 2024. (Paper has been presented and is Currently under Proceeding of **Information and Communication Technologies Book series**)

RELEVANT COURSES

Advanced Engineering Mathematics, Advanced Software Engineering, Pattern Recognition, Advanced Algorithm, Machine Learning, Research Methodology and IPR, Quantum Computing and Quantum Information.

SKILLS

- **Technical Skills:** Python (familiar with Scipy, Numpy, Qiskit), C++, MATLAB, LaTeX
- **Soft Skills:** Research, Technical Writing, Collaboration, Problem-Solving, Interpersonal Skills, Fast Learner, Work-ethic

MISCELLANEOUS EXPERIENCE

Workshop and Conference participation

- 3rd International Conference on Intelligent Systems, Advanced Computing and Communication ISACC 2025. (oral paper presentation)
- IEEE International Students' Conference on Electrical, Electronics, and Computer Science (SCEECS) 2025. (oral paper presentation)(Certificate Link)

Certification

- IEEE India Council Industry Academia Young Professionals Committee (IAYPC) as a *student mentee* Aug 2024 – Dec 2024 (Certificate Link)