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Summary: A third-year B.Tech student in Information Technology at NIT Raipur (CPI: 9.19 ≈ 3.85/4.0), consistently ranked in the top 3 among 900+ students during the first year, with over five quantum computing courses and five original projects. Recently completed a research internship at IISc Bangalore, where we demonstrated that neural network-based surface code decoders improved pseudo-threshold by 10× and increased fault-tolerance thresholds by 2× compared to MWPM decoders, and also conducted photonic simulations of silicon microring resonators (high-Q filtering, resonant feedback) and InAs/GaAs quantum dot–silicon cavity integration for enhanced emission and narrow-linewidth lasing. Completed an international research internship at Universiti Malaya, where we developed and optimized a Classical U-Net and a Hybrid Quantum Neural Network (HQNN) for brain tumor segmentation on the BraTS2020 dataset, processing 51,475 multi-modal MRI scans, achieving up to 92.35% IoU and demonstrating a 59% reduction in model parameters while maintaining competitive accuracy through quantum integration. Additionally, selected for the TEEP (Taiwan Experience Education Program) internship this winter, becoming the first student from NIT Raipur to be selected for this prestigious opportunity.

Education

National Institute of Technology, Raipur **B.Tech, Information Technology** – CGPA: 9.19/10.0 (Approx. 3.85/4.0)	**2023 − Present** *Raipur, India*
Nalanda Academy, Kota Class 12 – 91%	**2020 − 2022** *Kota, India*
Delhi Public School, Bangalore Class 10 – 88%	**2019 − 2020** *Bangalore, India*

Research Experience

Indian Institute of Science, Bangalore (IISc) ↗
Quantum Computing Research Intern – Applied Photonics Lab   May 2025 − June 2025

- Internship under **Prof. Srinivas Talabattula** at the **Applied Photonics Lab**, part of the **Quantum Technology Initiative (IQTI)** of IISc Bangalore.
- Designed and simulated **3-qubit bit-flip and phase-flip codes** in Qiskit, achieving over **99% logical qubit recovery** under simulated noise.
- Implemented **Shor's 9-qubit code** to correct both bit-flip and phase-flip errors simultaneously, with syndrome measurements for fault-tolerant correction.
- Developed **machine learning-based surface code decoders** using feedforward and convolutional neural networks (CNNs), achieving a **10× improvement in pseudo-threshold** and **2× increase in threshold**.
- Initiated **hardware-level implementation** of the decoder on an **FPGA (Digilent Genesys 2 Kintex-7)** to evaluate real-time performance against software simulations.
- Performed **photonic simulations** using Lumerical MODE and FDTD, including **silicon microring resonators** for high-Q filtering and resonant feedback, and explored **InAs/GaAs quantum dot–silicon cavity integration** for enhanced emission and narrow-linewidth lasing.
- Tools & Technologies: **Python, Qiskit, NumPy, Qiskit Aer, Scikit-learn, FFNN, CNN, FPGA (Verilog), Lumerical MODE/FDTD**

Universiti Malaya (UM), Malaysia ↗
Quantum Machine Learning Research Intern   June 2025 − July 2025

- **Prof. Vannajan Sanghiran Lee**, Head of Centre of Excellence UM Quantum Information Science and Technology (CoE UMQiST) at **Universiti Malaya, Kuala Lumpur, Malaysia**.
- Project - **Hybrid Quantum-Classical U-Net for Brain Tumor Segmentation**.
- **Developed and optimized** a **Classical U-Net** and a **Hybrid Quantum Neural Network (HQNN)** for brain tumor segmentation on the **BraTS2020 dataset**, processing **51,475 multi-modal MRI scans** (T1, T1c, T2, FLAIR, 240×240×155).
- **Achieved 92.35% validation IoU** and **0.0704 DiceLoss** with Classical U-Net (**5.50M parameters**), and **90.38% IoU** and **0.0936 DiceLoss** with HQNN (**2.26M parameters**), using a **90:10 train-validation split** (46,328 train, 5,147 val).
- **Engineered HQNN** by integrating quantum circuits into the bottleneck layer, **reducing parameters by 59%** (2.26M vs. 5.50M) while maintaining competitive IoU (**90.38% vs. 92.35%**), demonstrating **quantum efficiency**.
- **Implemented per-class IoU metrics** for necrosis, edema, and enhancing tumor.
- **Generated learning curves and efficiency plots**, revealing HQNN's superior **IoU/parameter ratio** (4.00e-07 vs. 1.68e-07), highlighting potential for **resource-constrained medical imaging applications**.
- Tools & Technologies: **PennyLane, PyTorch, MONAI, Dice Score, nnUNet, Streamlit**

National Dong Hwa University, Hualein, Taiwan (NDHU) ↗
Incoming Winter Research Intern - TEEP (Taiwan Experience Education Program)   Dec 2025 − Feb 2026 (Scheduled)

- Selected as the **first student from NIT Raipur** for the prestigious **TEEP (Taiwan Experience Education Program)** funded by the Taiwan Ministry of Education.
- Research under **Dr. Wang-Chi Vincent Yeh**, focusing on **machine learning-assisted discovery of nano-materials** for **green hydrogen generation**, the program provides a stipend of **NTD$ 15,000/month (USD$ 510/month)**.

Projects

Quantum Error Correction Codes ☒
Quantum Error Correction (QEC) with Bit-Flip & Phase-Flip Codes   May 2025
- Designed and simulated **3-qubit bit-flip and phase-flip codes** using Qiskit, achieving **more than 99% logical qubit recovery** under simulated noise.
- Implemented **Shor's 9-qubit code** to correct simultaneous errors, using syndrome measurements for fault tolerance.
- Verified performance through **10,000+ simulations** with randomized X/Z errors; analyzed fidelity decay and correction accuracy.
- Tech Stack: **Python, Qiskit, NumPy, Quantum Simulation (Aer)**

MNIST Digit Recognition with Neural Networks ☒
3-Layer Neural Network   May 2025
- Built a **3-layer neural network** using TensorFlow/Keras for handwritten digit classification.
- Achieved **98.9% training accuracy** and **96.5% test accuracy** on the MNIST dataset.
- Integrated an **image preprocessing pipeline** for real-world digit recognition.
- Visualized performance using a **confusion matrix** with Seaborn.
- Developed an **end-to-end prediction system** for user-uploaded digit images.
- Optimized architecture with **ReLU activation** and the **Adam optimizer**.
- Tech Stack: **Python, TensorFlow, Keras, OpenCV, NumPy, Matplotlib**

Quantum Teleportation Simulator ☒
Quantum Information Transfer via Teleportation   March 2025
- Built a **Quantum Teleportation Protocol** using a 3-qubit quantum circuit.
- Simulated state transfer using **entanglement and classical communication**.
- Executed **1,000 quantum simulations** on Qiskit Aer and visualized outcomes with measurement histograms.
- Tech Stack:**Python, Qiskit, NumPy, Matplotlib**

Clinical Diagnostic Model Using SVM ☒
Diabetes Prediction with Machine Learning   May 2025
- Built a **diabetes prediction system** using a **Support Vector Machine (SVM)** classifier.
- Applied **StandardScaler** to normalize clinical health data for better model performance.
- Achieved **81.8% test accuracy** with robust generalization on unseen data.
- Validated with a **stratified 90-10 train-test split** and feature comparison.
- Developed a **production-ready prediction pipeline** for clinical diagnostics.
- Tech Stack:**Python, scikit-learn, Pandas, NumPy**

QRNG using a 3-Qubit Circuit ☒
Quantum Random Number Generator (QRNG)   March 2025
- Developed a QRNG using a **3-qubit quantum circuit** on Qiskit.
- Ran **1,000 quantum measurements** to produce unbiased random sequences.
- Achieved a **Shannon entropy score of 2.9943 bits**, indicating high-quality randomness.
- Verified statistical uniformity with histogram-based distribution analysis.
- Tech Stack:**Python, Qiskit, NumPy, Matplotlib**

Courses & Certifications

QTM2x : The Hardware of a Quantum Computer
edX - DelftX(TU Delft and QuTech)   April 2025
- Completed a course provided by **Delft University of Technology (TU Delft)** and **QuTech**, focusing on the physical realization and control mechanisms of quantum computers.
- Studied four solid-state qubit implementations: **superconducting Transmon qubits**, **silicon spin qubits**, **diamond NV center qubits**, and **topological qubits**, analyzing their operational principles and challenges.
- Explored the execution of quantum gates across different qubit types, understanding how quantum logic operations are performed in various hardware architectures.

Hands-on quantum error correction with Google Quantum AI
Coursera - Google Quantum AI   June 2025
- Implemented the **surface code**, a leading quantum error-correcting code, to detect and correct bit-flip and phase-flip errors.
- Utilized **Stim** to simulate quantum circuits and estimate hardware error thresholds for robust quantum computation.
- Gained proficiency with **Crumble**, a tool for decoding surface code syndromes, enhancing understanding of fault-tolerant quantum computing.

Practical Quantum Computing with IBM Qiskit for Beginners
Coursera - Packt   April 2025
- Built and simulated quantum circuits using **Qiskit**, implementing single- and multi-qubit gates such as **Pauli X, Y, Z**, **Hadamard**, and **CNOT**.
- Executed quantum algorithms like the **Deutsch–Jozsa algorithm** to demonstrate quantum parallelism and speedup over classical counterparts.
- Deployed quantum circuits on real IBM quantum hardware via the **IBM Quantum Experience**, analyzing results using Bloch sphere visualizations and histogram outputs.

Quantum Computing
Centre for Development of Advanced Computing, Hyderabad & Indian Institute of Technology, Roorkee June 2025
- Organised by Centre for Development of Advanced Computing, Hyderabad & Indian Institute of Technology, Roorkee with the support of Ministry of Electronics and Information Technology, Government of India.
- Covered fundamental concepts including qubits, quantum gates, superposition, and entanglement with practical implementations using Qiskit/QuEST
- Explored quantum algorithms such as Shor's factorization, Grover's search, and quantum error correction techniques
- Hands-on experience with quantum circuit design and simulation on IBM Quantum Experience platform

MATLAB Onramp
MathWorks - Training Service March 2025
- Developed proficiency in MATLAB's desktop environment, utilizing the editor and command window for script creation and debugging.
- Implemented array operations and matrix manipulations, leveraging built-in functions and constants for efficient data analysis.
- Visualized data through plotting functions, enhancing the ability to interpret and present scientific and engineering data effectively.

Leadership & Extracurricular Activities

Executive
The Aviation Club May 2025 - Present
- Team leader of the design team consisting of over **10+** members.
- Drafted **50+** letter of appointments.

Core Mentor
Sahyog - The Mentorship Club NIT Raipur July 2024 - Present
- Drafted over **140+** letter of appointments for the first time ever in the club's history.
- Delivered **500+** certificates to Career Catalyst participants within 48 hours.

Honors & Awards
- Secured **AIR-179/40,000+** in IMU-CET and offered seats at top maritime institutes including IMU Kolkata, Vizag, Chennai, Mumbai, and Cochin.
- Achieved **Branch Rank 1/77** in Biotechnology during the academic year 2023–24, later sliding to Information Technology.
- Ranked **University Rank 3** across all 9 engineering branches at the end of 1st year.
- Offered seats at **3+** premier research institutes including IISER TVM, Bhopal, and Berhampur for the 5-year BS-MS research program.
- **Provisionally qualified for the RBI-90 Quiz**, a prestigious national-level competition conducted by the **Reserve Bank of India** in collaboration with **NABARD, SEBI, and NPCI**, commemorating RBI's 90-year legacy.
- **Only first-year Biotechnology team selected** from NIT Raipur to participate in **Vigyaan**, *Central India's largest science fest*, showcasing innovation and technical aptitude at an intercollegiate level.

Technical Skills
Languages and Frameworks: Qiskit, Python, Tensorflow, Keras, Scikit-learn, Pytorch, Numpy, R
Utilities: Latex, Git, Github, KiCAD, Excel, SolidWorks, MATLAB, Canva
Soft Skills: Leadership
Core Subjects: OOPS, DBMS
Operating System: Macintosh, Windows