Kanishk Bakshi

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Google Scholar Profile

EDUCATION

Tsinghua University — Beijing, China
Master's Program (Research Track), Computer Science and Engineering — Aug 2025 - Present
- Focus: Quantum Complexity Theory, Hamiltonian Simulation Algorithms.

Vellore Institute of Technology — Vellore, India
Bachelor of Technology - Computer Science and Engineering; GPA: 8.92/10.0 — July 2021 - May 2025
- Minors: Information Security. Undergraduate Research Scholar.

SELECTED PUBLICATIONS

- **Qubit and Qutrit based Quantum Inspired Neural Network: Enhancing Stock Market Prediction**
  K. Bakshi, K. Srinivasan.
  Scientific Reports (Nature Portfolio), 2025.

- **Advancements in Heart Disease Diagnosis: Harnessing Predictive Modeling Techniques**
  K. Bakshi, Raj Kumar, Harshit Setia, S. Vinila Jinny.
  Wiley Advances in Public Health, 2024.

- **Deep Learning for Detecting Manufacturing Defects Using Convolutional Neural Networks**
  K. Bakshi, D. Chaudhary.
  Springer Nature, 2024.

RESEARCH EXPERIENCE

Tsinghua University — Beijing, China
Graduate Research Scholar — Sep 2025 - Present
- Research focus on quantum error correction thresholds and learnability under structured noise models.
- Exploring Quantum Error Correction (QEC) thresholds and resource theory for fault-tolerant computing.

Defense Research and Development Organization (DRDO) — New Delhi, India
Research Fellow (DTRL Lab) — May 2024 - Aug 2024
- Developed a "Knowledge Fusion Network" for high-altitude glacial lake detection, outperforming standard transfer learning methods by minimizing retraining parameters.
- Collaborated with senior scientists to implement deep learning pipelines for satellite imagery analysis in sensitive border regions.

Vellore Institute of Technology — Vellore, India
Undergraduate Research Scholar — Oct 2022 - May 2025
- Designed and simulated a **Qutrit-based Quantum Neural Network (QNN)**, demonstrating a 35-40% speed advantage over qubit-based systems.
- Built a custom simulation environment for qutrit logic gates to handle higher-dimensional quantum states, addressing noise and decoherence in simulation.

KEY PROJECTS

- **Benchmarking Quantum Error Correction Codes (Ongoing)**: Conducted a comparative analysis of Shor's [[9,1,3]] code against the [[5,1,3]] code under realistic noise models. Investigating the threshold behavior and logical error rates to identify resource-efficient encoding schemes.

- **TrackML Particle Tracking with Quantum Algorithms**: Investigated the application of Graph Neural Networks (GNNs) and Quantum Approximate Optimization Algorithm (QAOA) to reconstruct particle tracks in high-energy physics collisions.

- **Fault Injection & Reliability Analysis in Quantum Circuits (Ongoing)**: Simulating targeted "phase-flip" error injection into syndrome extraction ancilla qubits using Qiskit and Stim. Quantifying the logical code's error detection probability to validate reliability thresholds, mimicking classical fault injection methodologies.

TECHNICAL SKILLS

- **Quantum Computing**: Qiskit, CUDA-Quantum, Cirq, Quantum Error Correction (Stabilizer Formalism)
- **AI & Machine Learning**: PyTorch, TensorFlow, Graph Neural Networks (GNNs), Transformers
- **Tools & Cloud**: IBM Quantum Experience, Docker, Git, Linux Environments, MATLAB

Honors, Awards & Grants

- **Raman Research Award** — Vellore Institute of Technology — 2024
  Awarded for exceptional research contribution in Quantum Computing and AI.

- **APJ Abdul Kalam Award** — Vellore Institute of Technology — 2023
  Recognized for academic excellence and innovation in computer science.

- **Research Grant (100,000 INR)** — Vellore Institute of Technology — 2023
  Funded for: "Qubit and Qutrit based Quantum Inspired Neural Network"

- **Research Grant (100,000 INR)** — Vellore Institute of Technology — 2022
  Funded for: Cardiovascular Predictive Modeling Research