Kushagra Garg

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LinkedIn/arXiv/Google Scholar
Webpage/GitHub/X

Education

International Institute of Information Technology — Hyderabad, India
M.S. in Computational Natural Science — 2023 - 2025

- Advisors: Shantanav Chakraborty, Subhadip Mitra
- Research area: Quantum Algorithms
- GPA: 9.5/10

B.Tech in Computer Science — 2019 - 2023

- GPA: 8.55/10

Experience

Fujitsu Research — Bangalore, India
Research Scientist — July 2024 - Present

- Designed a Lindbladian simulation algorithm for early fault-tolerant quantum computers, requiring only a single ancilla qubit.
- Achieved exponential circuit-depth reduction through polynomial interpolation techniques and collision models.
- Validated the end-to-end method, demonstrating up to 10,000× precision improvement over existing approaches at comparable circuit depths.
- Co-developing a quantum resource estimation package to enable comparisons across algorithms, error-correction schemes, and device architectures.

Microsoft Research — Bangalore, India
Research Intern — Feb 2024 - July 2024

- Explored the application of multi-party computation for secure inference of large language models, focusing on OT-based protocols.
- Leveraged symmetry properties of neural network operators (ReLU, GeLU, LayerNorm) to optimize secure inference protocols, reducing computational and communication costs by more than 50%.

QunaSys Inc. — Tokyo, Japan
Research Intern — June 2022 - Jan 2024

- Developed qubit-efficient entanglement estimation methods, enabling simulations of larger quantum states on limited hardware.
- Used ZX-calculus to show that MERA tensor-network ansätze avoid barren plateaus, making them more reliable for variational algorithms.
- Contributed hardware-tailored diagonalization algorithms to the Quri-SDK package, enabling reduction of circuit depth for variational quantum eigensolvers.

Publications

- **K. Garg**, Z. Ahmed, S. Mitra, S. Chakraborty. Simulating quantum collision models with Hamiltonian simulations using early fault-tolerant quantum computers. *Physical Review A*, vol. 112, no. 2, Aug. 2025.
- **K. Garg**, Z. Ahmed, A. Thomasen. Entanglement determination with a deep multiscale entanglement renormalization ansatz. *Physical Review A*, vol. 111, no. 4, Apr. 2025.
- Z. Ahmed, A. Chaudhuri, K. S. S. Grover, A. Rao, **K. Garg**, P. Malhotra. Classifying CELESTE as NP Complete. *arXiv:2012.07678*, 2020.

Awards

- Deans List Academic Award 2023
- Deans List Academic Award 2022
- Winner of Quantum Chemistry Challenge Qhack 2022
- KVPY Scholarship 2021

Academic Services

Reviewer for: *Quantum Journal*, *AQISC 2025*.
Teaching Assistant: *Automata Theory*, *Statistical Mechanics*.
Student Moderator: *ACM CompEd 2023*, *NQSTS 2021*.
Club Coordinator: The Art Society, Astronomy Club.

Skills

Languages: English, Hindi.
Programming: `Python`, `C/C++`, `MATLAB`, `Go`.
Miscellaneous: `LaTeX`, `Git`, `Qiskit`.