Syed Hudaifah

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LinkedIn — GitHub

Education

Indian Institute of Technology (IIT), Hyderabad
Master of Technology (M.Tech) in Quantum and Solid-State Devices [Expected: June 2025]
- GPA: 8.56
- Relevant Coursework: Quantum Computing, Information Theory, Machine Learning, Convex Optimization, Many-Body Physics, Quantum Cryptography, Quantum Measurement and Sensing

Experience

C Developer (Quantum Key Distribution)
Qdit Labs [March 2025 – May 2025]
- Built low-level C firmware for real-time control and synchronization in Quantum Key Distribution (QKD) systems.
- Implemented secure communication protocols and timing-critical modules for quantum hardware interfaces.

Teaching Assistant (High-Performance Computing Simulation)
IIT Hyderabad [2024]
- Simulated quantum circuits using MPS and PEPS on tensor networks across 100+ nodes.
- Optimized matrix operations with QSP and QSVT in large-scale simulations.
- Leveraged MPI for distributed computing, boosting simulation speeds and efficiency.

Quantum Computing Intern
Creed and Bear, Abu Dhabi [October 2024- March 2025]
- Performed Quantum Distributed Computing on several nodes using Flask API and Quantum Circuit simulations.
- Improved circuit optimization and distribution using hypergraph planes.

Technical Skills

- **Quantum Computing**: Qiskit, PennyLane, Cirq, TensorFlow Quantum
- **Quantum Algorithms**: QAOA, Quantum Walks, Adiabatic Algorithm, Linear Systems Solvers, PCA, QSP, QSVT, Shor's, Grover's
- **High-Performance Computing**: MPI, Tensor Networks (MPS, PEPS), Distributed Computing, Multithreading
- **Programming**: Python, C++, C, MATLAB, R, Julia
- **Embedded Systems & Electronics**: Circuit Design, Microcontrollers, PCB Design, Embedded C, Device Fabrication
- **AI & ML**: TensorFlow, PyTorch, Scikit-learn, Quantum ML, Transformers, XAI, Time-Series Forecasting, Signal Processing
- **Software Engineering**: Django, Flask, FastAPI, API Design, Cloud (AWS, GCP), Databases (MySQL, PostgreSQL, MongoDB), Docker, Kubernetes, Git, Linux

Research Projects

Dimension Witness Algorithms for Quantum Systems
IIT Hyderabad [2024]
- Investigated the dimension of quantum systems using the NPA hierarchy and See-saw optimization methods.
- Implemented scalable algorithms in Python with CVXPY for convex optimization of quantum state probability distributions.
- Focused on applications in self-testing, quantum certification, and measurement-device-independent quantum information processing.

Distributed Compiler and Task Scheduler for Heterogeneous Systems [2024]
- Designed a distributed task scheduler and compiler backend for CPU-GPU-FPGA based heterogeneous compute clusters.
- Implemented dependency-aware scheduling using DAG analysis and memory management optimizations across nodes.
- Developed the backend using LLVM, NetworkX, and MPI for real-time job allocation and load balancing.
- Achieved significant reduction in compute latency through fine-tuned graph partitioning and adaptive scheduling policies.

Quantum Machine Learning Optimizer [2023]
- Built a hybrid quantum-classical pipeline using Cirq and TensorFlow Quantum for optimizing classification accuracy on complex datasets.
- Integrated Quantum Walks and QAOA into the QML framework for performance benchmarking against classical methods.
- Focused on model modularity, training efficiency, and noise resilience in near-term quantum environments.

Quantum Circuit Scheduler for Distributed Quantum Systems [2023]
- Designed a quantum circuit scheduler that partitions and allocates large circuits across multiple QPUs using graph-based optimization.
- Built a compiler backend using NetworkX, Qiskit, and MPI4Py, with scheduling algorithms minimizing inter-node latency and decoherence.
- Simulated execution on distributed nodes via Flask-based API endpoints to model cross-QPU coordination.

Achievements

- International Math Olympiad Winner
- Gold Medalist in Abacus
- Winner of International Model United Nations (MUN)
- Judge for National-Level Debate Competitions

Leadership & Extracurricular Activities

Head of Debate Team
IIT Hyderabad [2024]
- Led the team, fostering skills in public speaking and strategic thinking through regular workshops.