Ghazi Khan

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Research Interests

- Computational EM
- Superconducting Qubits
- Quantum Engineering
- Quantum Information
- Open Quantum Systems
- AMO

Current Academic Status and Previous Education

Purdue University - West Lafayette **Aug. 2022 – Current**
Electrical and Computer Engineering-PhD *West Lafayette, USA*

- Research Assistant under Dr. Thomas Edgar Roth

Lahore University of Management Sciences **Aug. 2017 – May 2021**
Bachelor of Science in Electrical Engineering with Physics Minor *Lahore, Pakistan*

Relevant Research Projects

Semi-classical modeling of multi-qubit transmon systems **June 2024 – Current**
Research Assistant to Dr.Thomas Edgar Roth

- Using Semi-classical methods to model the interaction of multiple qubits with a resonator in the dispersive Regime. While also developing robust Finite Element Time Domain Methods (FETD) to solve the coupled Partial Differential Equations. **Project is in Progress.**

Field-Based Formalism for Calculating Multi-Qubit Exchange Coupling Rates **May 2023 – May 2024**
Research Assistant to Dr.Thomas Edgar Roth

- Derived the Hamiltonian for a multi-qubit system coupled via an electromagnetic resonator in the dispersive regime through the Schrieffer Wolff transform. Related this to the field-based formalism to derive a succinct expression relating the qubit exchange rate to the impedance response of the system. **Project is under review.**

Quantum Zeno and anti-Zeno effects in the strong coupling regime **Sep 2021 – Nov 2022**
Research Assistant to Dr.Adam Zaman Chaudhry

- Analytically derived and simulated the decay rate and modified decay rate for an arbitrarily initialized spin system in the strongly interacting paradigmatic Spin-Boson Model. **Published.**

Publications

1. **G. Khan**, H. Soomro, M. U. Baig, I. Javed, and A. Z. Chaudhry, "A generalized framework for the quantum zeno and anti-zeno effects in the strong coupling regime," *Scientific Reports*, vol. 12, no. 1, p. 18652, 2022
2. **G. Khan** and A. Z. Chaudhry, "Detection of weak magnetic fields using nitrogen-vacancy centers with maximum confidence," *arXiv preprint arXiv:2112.04856*, 2021

Relevant Course Projects

Implementation of Shor's Algorithm | *PHY 414: Quantum Computation and Information* **Spring 2021**

- Implemented the Shor's Algorithm for a 4-bit prime in the Qisket space.

Gradient Descent to generate desired entangled superposition state | *QOSF task(Link)* **Fall 2020**

- Used gradient descent to deduce the parameters for a quantum circuit to give an entangled superposition state with the desired measurement probabilities.

Cross View Image Retrieval | *CS 437: Deep Learning(Link)* **Spring 2020**

- The course involved the application of several Deep learning structures like RNN, CNNS, GANs etc which culminated in developing an image retrieval algorithm from the Google Street View Dataset.

Technical Skills

Languages: Python, C++, C, LaTeX, MATLAB, Qiskit, Verilog
Softwares: Proteus Design Suite, PTC Creo, MikroC, LABVIEW, Mathematica, Adobe Suite, LTspice, COMSOL
Hardware: PCB Design/Fabrication, Vector Network Analyzer, Arduino, PIC, Rasberry PI, FPGA, Software Defined Radios