

EXPERIENCE

- **Ahmedabad University** Ahmedabad, India
Sep 2023 - May 2024
Research Assistant
 - Developed a **multi-dimensional framework** for **nonlinear optimal control** problems under the mentorship of Dr. Alok Shukla and Dr. Prakash Vedula, addressing challenges through canonical quantization and constraint Hamiltonian derivation.
 - Designed and implemented a customized **Variational Quantum Algorithm (VQA)** for non-Hermitian systems, specifically broken-PT symmetric systems, overcoming limitations of conventional approaches and exploring intricate mechanisms.
 - Implemented mathematical formulations and coding framework for the modified VQA, utilizing Python libraries such as PennyLane, Qibo, and SciPy, along with Mathematica for generalizing functions and optimizing solver methods. Anticipating pre-print publication soon.
- **Qiskit Advocate Mentorship Program** Remote
Apr 2023 - Present
Mentee
 - Developed a **Quantum Reinforcement Learning (QRL)** framework, specifically implementing the Proximal Policy Optimization (PPO) algorithm within an environment created using QuTech's 'qgym' package, to address the evolution of **complex quantum open systems**. Mentored by IBM Researchers Abhijit Mitra and Dr. Vaibhaw Kumar.
 - The framework addresses three key challenges: approximating non-Hermitian systems into unitary operators, ensuring generality by training the agent to handle a diverse range of open-quantum systems, and designing a smart reward policy to simultaneously enhance accuracy and reduce depth.
- **Quantum Open Source Foundation** Remote
Apr 2024 - Present
Mentee
 - Mentored by **Ryan Hill**, CTO of qBraid. One of approximately forty participants selected out of a cohort of **more than 200** applicants. Working on creating a Python framework for Quantum Reservoir Computing (QRC) with customizable models and integration with QuEra.
- **Ahmedabad University** Ahmedabad, India
Jan 2023 - May 2023
Teaching Assistant (Computer Networks and Advanced Statistics)
 - Conducted tutorials and supervised labs.
 - Was a **substitute instructor** for three weeks where I taught topics regarding Inter-networking, End-to-End Protocols, Controlled Experiments, Correlation and Regression, Chance Variability, and Sampling.
 - Provided guidance and support to **more than 190 students** in their learning.
 - Received a [Dean's letter of appreciation](#) for exceptional dedication and contributions to teaching.
- **Artificial Brain** Remote
Jul 2022 - Dec 2022
Quantum Computing Intern
 - Developed and co-authored a white paper titled "[Space Sustainability using Quantum Computing](#)," focusing on leveraging quantum computing techniques such as **QAOA algorithms**, quantum annealing, and optimization methods to address challenges related to space debris.
 - Additionally, contributed to the formulation of a **quantum scheduling algorithm** for Earth Observation Satellites and collaborated in the development of [a quantum optimization algorithm](#) aimed at maximizing the Sharpe ratio for portfolio management on D-Wave systems.
- **Mentor** Remote
Nov 2022
IBM Quantum Challenge Fall 2022
 - Assisted participants with tasks and ensured their comprehension of relevant topics.

EDUCATION

- **Ahmedabad University** Ahmedabad, India
Jul 2019 - May 2023
Bachelor of Technology in Computer Science and Engineering; GPA: 3.73/4
[Rank: 2/140](#)
Dean's Recognition List Awardee, *Graduated with certificate of highest excellence*
- **Qiskit Global Summer School** Remote
2020, 2022
Score: 100 per cent
 - Attended the two-week intensive program on two occasions, with a focus on quantum computing and an emphasis on quantum simulation, especially in quantum chemistry applications, aimed at empowering future quantum researchers and developers.

ACHIEVEMENTS

- [QHack Open Hackathon 2024](#)
 - Won [third prize](#) in Seeing the Future Challenge.
 - Won AWS' "Top 3 Prize" and will receive mentorship opportunity with Michael Brett, Global Lead for Quantum Technologies Business Development at AWS.
- [Winner, QRISE 2024's Classiq Challenge](#)
- [IBM Certified Associate Developer - Quantum Computation using Qiskit v0.2X.](#)
- [Qiskit Advocate](#)
- IBM Quantum Challenge [2020](#) and [2021](#) by successfully completing all challenges and earning Advanced badges.
- Qiskit Challenge India: Demonstrated proficiency by achieving perfect scores in all challenges.

SELECTED PROJECTS

- **'NISQ algorithm for simulating open-quantum systems'** Team - 4, Mar 24
Remote
QHack Open Hackathon 2024
 - I led the team "Quantum_Questers" in developing a Python-based framework for simulating open-quantum systems, specifically tailored for NISQ devices. Implemented shallow-depth Parameterized Quantum Circuits (PQCs) inspired by Universal Quantum Algorithms to address the absence of existing VQA frameworks for specialized problems.
 - We introduced enhancements to increase robustness and usability, with a focus on implementing PQCs with low depth for initial state preparation and time evolution. Conducted extensive testing of the state preparation method using both arbitrary and real-world Alzheimer's data through parallelized optimization computations, leveraging NVIDIA's CuQuantum library, and exploring the effectiveness of cat qubits ("EMU:15Q:LOGICAL_EARLY").
- **'Zero Noise Extrapolation method'** Individual, Apr 24
Remote
QOSF Screening Task
 - Implemented Zero Noise Extrapolation (ZNE) which is a popular quantum error mitigation technique, through a 'DepolarizingNoiseModel' class and functions for scaling noise levels through unitary folding method to Qiskit circuits.
 - Applied various extrapolation methods to achieve zero-noise limit and compared mitigated and unmitigated results.
- **Hamiltonian simulation of coupled classical harmonic oscillators** Team - 3, Apr 24
Remote
Classiq QRISE 2024 Challenge
 - I led the team "Classiq Entanglers" in simulating coupled classical oscillators on Classiq's platform, based on the algorithm by Babbush et al., aiming for scalability to showcase practical demonstration on a 70+ qubit system, potentially achieving quantum supremacy.
 - Developed and implemented state preparation approaches, Hamiltonian formulation methods, and quantum simulation methodologies for Hamiltonian simulation, aiming to achieve accurate fidelity while minimizing circuit depth.
- **Open-Source Contributions**
 - Working on a contribution for preparing uniform quantum superposition states based on the algorithm by Alok et al. for [Qiskit's Circuit library](#).
 - Co-authored a subsection on Grover's algorithm chapter in the [Qiskit Textbook](#).
 - Collaborated with co-author Frank Harkins to fix a bug in [Qiskit Terra](#).
 - Translated over 5,000 words of [Qiskit's educational material](#) into Hindi.
- **Other Projects**
[Quantum Counting Algorithm](#), [VQE for an arbitrary matrix with noise](#), [Internet Radio using IP Multicast](#), [Cache Pipelining with three levels of 4-way Set-Associative method and LRU algorithm implementation](#), [The Movie Database \(IMDB\)](#).

PROGRAMMING SKILLS

- **Languages:** Python, Mathematica, MATLAB, Julia, C, C++, PostgreSQL, HTML
- **Tools/Libraries:** Qiskit, PennyLane, NumPy, SciPy, Qibo, SymPy, QuTiP, Matplotlib, PyTest, Git, LaTeX, Flask

ONLINE COURSES

- CS50X (2020) : Introduction to Computer Science from HarvardX
- CS191X (2020) : Quantum Mechanics and Quantum Computation from BerkeleyX
- CS50P (2021) : CS50's Introduction to Programming with Python from HarvardX
- Coursera (2023) : Mathematics for Machine Learning by Imperial College London.