Alapan Chaudhuri

Undergraduate Researcher, CQST & CSTAR, IIITH

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Education

International Institute of Information Technology, Hyderabad
B.Tech. and M.S. in Computer Science and Engineering
CGPA (out of 10): ***9.08*** *(in-major),* *8.63 (overall)* *July 2019 - Present*

Teaching Assistant: Automata Theory (Monsoon '21 and '22), Linear Algebra (Spring '22)
Positions of Responsibility: Moderator at NQSTS 2021, Literary Club Coordinator

Research Interests

Quantum Computation
Algorithm Design (*with applications in ML*)
Formal logic and Programming Languages
Computational Economics (*with applications to finance*)

Experience

Quantitative Researcher
Quarkstone Capital *Oct 2022 - Present*

Working on building multivac, our data analytics system and trading terminal, to improve and accelerate decision-making for trading/investing across all domains of the Indian financial markets.

Collaborator, Ayers Lab
McMaster University, Canada *June 2022 - Oct 2022*

Working with Prof Paul Ayers and his group on optimization algorithms for solving the positive semi-definite Procrustes problem, and extending the Procrustes python library.

Research Assistant
Centre of Quantum Science and Technology, Hyderabad *Dec 2021 - Present*

Adiabatic Quantum Computing: Working with Prof Shantanav Chakraborty on algorithms to predict avoided crossings for quantum systems under adiabatic evolution.

Entanglement Detection: Working with Prof Indranil Chakrabarty on identifying the degree of entanglement within a given quantum state using unsupervised learning.

Compiler Engineering Intern
Qualcomm Innovation Center, Austin, United States *May 2022 - June 2022*

Worked with the LLVM team at Qualcomm on using QEMU decodetree for Hexagon target. The aim was to improve the Hexagon target by transitioning from building its own decodetree to the Python infrastructure provided by QEMU for creating instruction decoders.

Awards

- Accepted as a Google Summer of Code 2022 contributor to Open Chemistry.
- **Ranked 9^{th}** in **ICPC Asia Regionals** 2020-21 (Gwalior-Pune).
- **Winner** of the **Quantum Chemistry Challenge** at QHack 2022 by Xanadu.
- Ranked 1^{st} (world) in the Grand Prix of Kyoto at Open Cup (Div 2) 2022.
- **Winner** of the **Goldman Sachs Challenge** at Texas A&M Datathon 2021.
- Certificate of Merit (top 1%) for the 2019 Indian Olympiad Qualifier in Physics.

Pre-prints & Publications

Classifying CELESTE as NP Complete
CST 2022 | arXiv:2012.07678

Projects & Open Source

Racket Compiler
Racket Compiler *2022*

- Developed a nano pass compiler for a subset of racket language. Optimised register allocation in assembly using graph coloring and implemented tail call optimization.
- **Technologies:** Racket, Compiler Engineering

PauliZee
PauliZee *2022*

- Implemented a framework to simulate Hamiltonians on a quantum computing system using optimized trotter methods and Szegedy quantum walks.
- Benchmarked it to be better than the default Qiskit implementation for simulating the Heisenberg Spin Chain Hamiltonian on a 7-qubit IBM quantum computer.
- **Technologies:** Python, Qiskit

Nostradamus: Weathering Worth
Nostradamus *2021*

- Explored correlations using statistical learning between volatility and behavior of NYSE stocks against environmental factors, weather conditions, natural disasters.
- Closely studied 28 stocks across 5 major sectors and monitored behavior of total 10913 tickers.
- **Technologies:** Python, Yahoo Finance API

Canswer
Dcode Care *2021*

- Worked with Dcode Care on a mobile application for patient engagement and remote connected care amongst people battling with cancer. Published in Google Play with 100+ downloads.
- **Technologies:** JavaScript, Firebase, React JS, Python.

Benchmarking Algorithms for Graph Classification
How Powerful are Graph Neural Networks? *2021*

- Designed a provably maximally powerful GNN under the neighborhood aggregation framework and compared our implementation with that of Graph Isomorphism Networks (GINs) and the Weisfeiler-Lehman Test.
- **Technologies**: PyTorch, Datasets for Graph Classification (PROTEINS, MUTAG)

Cirq
Google QuantumAI (cirq) *2021*

- Implemented rotation gate, serial concatenation of Kraus Operators and minor structural updates (with Zeeshan Ahmed).
- **Technologies:** Python, Scientific Programming (scipy and numpy), Cirq.

Christine
Christine *2020*

- Discord-bot that moderates online harassment along with toxicity and depressive behavior. Used 1.6 million tweets for constructing a scale to measure depression from text messages.
- **Technologies:** Python, NLTK, Google Cloud, JavaScript, Perspective AI.

Skills

C, C++, Python, Haskell, LaTeX, Bash, x86, Racket, Cirq, Q#, Qiskit, Tensorflow, PyTorch, Pennylane, JS, React, HTML/CSS, MySQL