Alapan Chaudhuri

Undergraduate Researcher, CQST & CSTAR, IIITH

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Education

International Institute of Information Technology, Hyderabad
B.Tech. (with Honours) in Computer Science and Engineering — *July 2019 - Present*

Teaching Assistant: Automata Theory (Monsoon 2021), Linear Algebra (Spring 2022)
Positions of Responsibility: Student Moderator at NQSTS 2021 (July 2021 - Aug 2021), Literary Club Coordinator (Apr 2020 - Present)

Experience

Collaborator, Ayers Lab
McMaster University, Canada — *June 2022 - Present*

Working with Prof Paul Ayers and his group on extending the Procrustes library to include algorithms specific to the positive semi-definite Procrustes problem. This project is also a part of Google Summer of Code (GSoC) 2022 and I have been accepted as a contributor to the same.

Compiler Developer Intern
Qualcomm Innovation Center — *May 2022 - June 2022*

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

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

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

Entanglement Detection: Working with Prof Indranil Chakrabarty on devising algorithmic approaches to characterize quantum entanglement. Furthermore, studying separability and locality along with their corresponding absolute classes to find similar characterization criteria.

Hamiltonian Simulation: Implementing Hamiltonian simulation frameworks for quantum computing systems using methods such as trotterization and qubitization. Also, working on devising hybrid techniques, for specific groups of Hamiltonians, to further improve the current benchmarks.

Data Analyst Intern
Trivedi Center for Political Data — *Dec 2020 - Jan 2021*

Worked on the data set of Indian Governors to produce representations and visualizations to identify trends and outliers. Furthermore, performed large scale web scraping and data cleaning to ensure correct and standardized data.

Awards

- **Ranked 9^{th}** in **ICPC Asia Regionals** 2020-21 (Gwalior-Pune)
- **Winner** of the **Quantum Chemistry Challenge** (by QunaSys) at QHack 2022
- Nominated for the 2022 ICPC Training Camp powered by Huawei
- 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
- Sports Programming: rated 2022 (5 star) on Codechef, best Google Kickstart rank is 126
- First Place Overall at Kent Hack Enough 2020
- Top 2% (national) in Google HashCode 2022

Projects & Open Source

Nostradamus: Weathering Worth
Nostradamus — *Apr 2021*

- Explored correlations between the stock market - its volatility and behavior - against weather conditions, environmental factors, and natural disasters.
- **Technologies Used:** Python, Yahoo Finance API

Cirq
Google QuantumAI (cirq) — *Aug 2021 - Present*

- Implemented rotation gate and serial concatenation of Kraus Operators (with Zeeshan Ahmed).

Canswer Mobile App
Caregrades Technologies — *Feb 2021 - Apr 2021*

- Created a mobile app (published in playstore) for patient engagement and remote connected care along with a similar version designed for hospitals to connect them to patients directly.
- **Technologies Used:** JavaScript, Firebase, React JS, Python.

Christine
Christine — *Oct 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 Used:** Python, NLTK, Google Cloud, JavaScript, Perspective AI.

Games and Computational Complexity
Playing Games — *Sep 2020 - Nov 2020*

- Proved the video game 'CELESTE' is NP-complete (original work). Furthermore, presented a dissertation explaining computational complexity of different games. Here is the preprint.

Dotabase
Dota2 Analyzer — *Sep 2020*

- Analyzer for professional matches in the popular game Dota 2. Implemented a fully functioning DBMS based on data scraped from OpenDota and built a suitable CLI using Python.
- **Technologies Used:** MySQL, Pymysql, Python.

Mariam: a Linux Shell
Mariam — *Aug 2020 - Sep 2020*

- Basic shell/terminal implemented from scratch in C using Linux system calls. Includes piping, redirection, signal handling as well as extensive error handling.
- **Technologies Used:** C, Linux, Operating Systems.

Skills

Primary Languages: C, C++, Python, LaTeX, Bash, x86, Haskell, Racket
Others: Cirq, Q#, Qiskit, Tensorflow, Tensorflow Quantum, PyTorch, Pennylane
Web: JavaSrcipt, React, HTML/CSS, MySQL, MariaDB

Interests

Quantum Computing, Algorithms and Optimisation, Programming Language Theory, Quantitative Finance