

# ADITYA MOROLIA

CSE Student — Undergrad Researcher (Quantum Computing) at C-STAR, IIIT Hyderabad

✉ aditya.morolia@research.iiit.ac.in in aditya-morolia 📧 TheCharmingSociopath 🌐 Aditya Morolia

## EDUCATION

### B.Tech in Computer Science and MS by Research in Computational Natural Sciences

IIIT Hyderabad

📅 July 2017–Present

📍 Hyderabad

CGPA: 8.68; MS Thesis being co-advised by Prof. Shantanav Chakraborty and Prof. Indranil Chakrabarty

## RESEARCH EXPERIENCE

### Mitacs Globalink Research Intern

University of Calgary

📅 August 2021 - Present

📍 Calgary, Canada

- I'm working with Prof. Barry C. Sanders on 'Searching for Quantum Supremacy' in which we are formulating the problem of demonstrating limited quantum speedup of Quantum Annealing over classical Monte Carlo heuristics as an automated search problem using ML and structured search. I'm continuing this project after the 3 month Mitacs intern got over to finish up a paper.

### Undergrad Research Assistant

International Institute of Information Technology (IIIT) Hyderabad

📅 May 2019 - Present

📍 Hyderabad, India

- I work with Prof. Shantanav Chakraborty on Quantum Algorithms for Linear Algebra used in Machine Learning, in the block encoding and Quantum Singular Value Transformation framework.
- I work with Prof. Indranil Chakrabarty on Quantum Information Theory.
- Miscellaneous work:** (Link to) Independent study report on Adiabatic Quantum Computing and Optimization, Talk on PCPs and hardness of approximation for a course project, Course project report on Open Quantum Systems and Quantum Thermodynamics

### Visiting Research Student

Harish-Chandra Research Institute (HRI) Allahabad

📅 Dec 2019 - Jan 2020

📍 Allahabad, India

- Took up a research project on Quantum Coherence and tunnelling advised by Prof. A. K. Pati.

### Honours Project on Monte Carlo Sampling

International Institute of Information Technology (IIIT) Hyderabad

📅 January 2021 - May 2021

📍 Hyderabad, India

- Studied Monte Carlo Algorithms, Mixing time of Markov Chains, Ranking and Matchmaking Algorithms for gaming systems, and later worked on formulating a Matchmaking algorithm using Monte Carlo Sampling (with Prof. Girish Varma)

### Research Intern

Indian School of Business (ISB), Mohali

📅 June 2019–August 2019

📍 WFH

- Work on basketball game data collection and data analysis with Dr. Siddharth Sharma to derive relation between team performance and pollsters' predictions.

### Summer School on Quantum Computing and Quantum Information

Indian Statistical Institute (ISI) Kolkata

📅 May 2019

📍 Kolkata, India

- Summer school was taken by Prof. Guruprasad Kar and his team at PAMU, ISI Kolkata.
- Studied the formalism of quantum mechanics, no cloning, entanglement detection and resource use, key generation and distribution, non-locality, quantum information theory and processing, bell's theorem, quantum cryptography, and quantum computation.

## WORK EXPERIENCE

### Summer Analyst

Goldman Sachs

📅 June 2021 - July 2021

📍 GS Bengaluru, India

- Worked on SecDB Architecture in the Saral Trading Team, which designs and implements state of the art distributed database systems for SecDB.

### Technical Staff

AICrowd

📅 April 2020–July 2020

📍 WFH

- Built a simulator for the purpose of hypothesis testing on our reputation and ranking system in **Python**, then added features on the basis of the observations to the **Rails web app**
- After **winning** the campus **Reinforcement learning** challenge DroneRL, I was responsible for creating a new in house RL challenges.
- Developed a new **Django web app** named AICrowd classrooms.

## Teaching Assistant

📅 Jan 2020–Present

IIIT Hyderabad

📍 Hyderabad

- **Linear Algebra**, Spring 2020 (UG1) and Monsoon 2020 (H2, PG1)
- **Introduction to Quantum Information and Computation**, Spring 2021 (H2, Elective)
- **Automata Theory**, Monsoon 2021 (H2, UG2)
- **Quantum Algorithms**, Spring 2022 (Elective)
- Responsibilities included taking tutorials, setting the assignments and projects, paper corrections and working with students on their projects.

## SysAdmin

📅 Dec 2018–Jan 2019

Felicity, IIIT Hyderabad

📍 Hyderabad, India

- Responsible for deploying the websites and utility services like the mailtrain on our server.

## Mobile App developer

📅 April 2019–June 2019

BUILDtheWorld

📍 THub, Hyderabad, India

- Developed various features for the **React Native** mobile app

## PROJECTS

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### Face Classification and Verification | *Python, SKLearn*

- The project work included depth understanding as well as implementation of computing eigen-faces required to satisfactorily reconstruct a person in the given dataset (combining 3 different datasets), Face Recognition using kernels and classifiers, Visualization of faces using t-SNE and Face Verification.

### Distributed MapReduce | *C++, Boost, MPI*

- C++ implementation of the MapReduce library to handle MapReduce tasks on a distributed system. This library handles worker failures and performs load balancing.

### COVID-19 Vaccination Management | *Django, Python, HTML, CSS, JavaScript*

- Wrote a Django WebApp to manage the complete vaccination pipeline. Includes an algorithm to automatically distribute vaccines to states and districts on the basis of Population, number of vaccination centres and rate of change of number of active cases.

### C- - Compiler | *C++, Antlr*

- Compiler for a toy language C- inspired by C and Decaf. Includes a parser made using Antlr, custom syntax tree construction using Visitor Design Pattern, and LLVM IR generation.

### Automated Bidding Agent | *Java*

- Made an automated bidding agent for targeted Ad space using Java to compete in a second prize sealed bid auction under limited budget constraints.

### Question Generation from a given corpus using NLP | *NLTK, Spacey, gensim*

- Designed a question generator from the corpus of Science textbooks using NLTK, Spacey, gensim involving concepts of Named Entity Recognition and word2vec in **24 Hours** in a team of 4 for a hackathon

### Molecular Dynamics Simulation | *Python*

- Python script to simulate molecular dynamics to calculate macroscopic properties like temperature and pressure using **Minimum image convention** and **Periodic boundary condition** using **Monte Carlo Markov chains methods**

### Game Development with Graphics Libraries | *OpenGL (C++) and WebGL(JavaScript)*

- Developed a replica of games like JetpackJoyride and SubwaySurfers using OpenGL (C++) and WebGL(JavaScript) graphics libraries
- Implemented object-oriented programming practices such as inheritance to create different account types and databases.

## SKILLS

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**Programming and scripting:** C, C++, Python, Javascript, Bash, Java

**Web and Mobile:** HTML5, Bootstrap, Django, ReactJS, React-Native, Flask

**Misc.:** Linux, Git, Docker, Postgres SQL, MySQL, Qskit, Q#, Haskell, Sklearn, Pytorch, Scipy, SageMath, Latex, Golang, Neo4j

## Co-CURRICULARS

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- Corporate Relations Head, E-Cell, IIIT-H April 2019 - May 2020
- Marketing Head, Felicity, IIIT-H June 2019 - May 2020
- Literary Club Coordinator, IIIT-H July 2018 - July 2020
- Kickboxing Regional Title Belt winner June 2015
- Boxing, Swimming, Drumming