

# ADITYA MOROLIA

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## EDUCATION

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

IIIT Hyderabad

📅 July 2017–June 2023

📍 India

## PUBLICATIONS

- Shantanav Chakraborty, Aditya Morolia, and Anurudh Peduri. Quantum Regularized Least Squares. *Quantum*, 7:988, April 2023 ([Quantum Journal](#))

## RESEARCH EXPERIENCE

### Research Assistant

Centre for Quantum Technologies (CQT), National University of Singapore (NUS)

📅 August 2023 - Present

📍 Singapore

- Advisors: [Divesh Aggarwal](#), [Alessandro Luongo](#), [João Doriguello](#)
- Resource estimation of algorithms used to attack lattice based **Post Quantum Cryptography**

### Research Assistant

International Institute of Information Technology (IIIT) Hyderabad

📅 May 2019 - June 2023

📍 Hyderabad, India

- Advisors: [Shantanav Chakraborty](#), [Indranil Chakraborty](#)
- Worked on Quantum Algorithms for Linear Algebra and optimization used in Machine Learning.
- Worked on bounding the mixing time of quantum walks on a circular graph topology.
- With Prof. [Girish Varma](#), 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

### Mitacs Globalink Research Intern

University of Calgary

📅 August 2021 - December 2021

📍 Calgary, Canada

- Advisor: [Barry C Sanders](#)
- I was working on 'Searching for Quantum Supremacy' which involved demonstrating limited quantum speedup of Quantum Annealing over classical Monte Carlo heuristic algorithms. We formulated this as a structured search problem by converting the problem to search over a manifold.

### Visiting Research Student

Harish-Chandra Research Institute (HRI) Allahabad

📅 Dec 2019 - Jan 2020

📍 Allahabad, India

- Advisors: [Arun K. Pati](#), [Indranil Chakraborty](#)
- Demonstrated an analytical connection between quantum tunnelling and quantum coherence in the Bose-Hubbard model, as a means to explain the flipping of ammonia using an information theoretic quantity.

### Research Intern

Indian School of Business (ISB), Mohali

📅 June 2019–August 2019

📍 WFH

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

### Visiting Student

Indian Statistical Institute (ISI) Kolkata

📅 May 2019

📍 Kolkata, India

- Spent a summer at ISI Kolkata attending lectures by Prof. Guruprasad Kar and his team on the foundations of quantum mechanics, entanglement detection and resource use, key generation and distribution, non-locality and quantum information processing.

## AWARDS AND HONOURS

- Mitacs Globalink Undergraduate Research Fellowship 2021
- Dean's Merit List Award for Academic Performance (top 30% of cohort) Monsoon 2020 Semester
- Dean's Merit List Award for Academic Performance (top 30% of cohort) Spring 2021 Semester
- AICrowd DroneRL (Reinforcement Learning) Competition winner 2020
- Qualified JEE (Mains) (Among top 0.1% candidates) 2017
- Qualified JEE (Advanced) (Among top 0.3% candidates) 2017

## TALKS

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### Quantum Computing for Software Engineers

📅 March 2023

India Developers' Exchange, Goldman Sachs, Hyderabad

📍 Hyderabad, India

Introducing Quantum Computing with the least amount of math possible.

### CQT CS Talk on 'Quantum Algorithms for Regularized Least Squares'

📅 November 2023

Centre for Quantum Technologies

📍 Centre for Quantum Technologies, Singapore

Gave a talk based on [joint work](#) on variable time quantum algorithms for least squares.

### Introduction to Quantum Signal Processing and applications to Linear Systems

📅 November 2023

Singapore QML Seminars

📍 NUS, Singapore

Gave a talk based on [joint work](#) on variable time quantum algorithms for least squares.

### Guest Lecture on 'Applications of Linear Algebra'

📅 May 2022

IIIT Hyderabad

📍 Hyderabad, India

I took a guest lecture for the Linear Algebra course taught by [Prof. Siddhartha Das](#) at IIIT Hyderabad. I covered rank-nullity theorem, eigenvalues and eigenvectors, with applications to toy problems in dynamical systems, graph theory and random walks.

### Quantum Signal Processing with application to Linear Systems

📅 April 2022

IIIT Hyderabad

📍 Hyderabad, India

Introduction to block encodings, quantum signal processing, quantum singular value transformation and least squares optimization at CQST Talks, IIIT Hyderabad.

### PCPs And Hardness of Approximation

📅 January 2021

Theory Reading Group seminar, IIIT Hyderabad

📍 Hyderabad, India

Attempted to present the famous paper, it's on [YouTube](#)

### Quantum Approximate Counting

📅 August 2020

Theory Reading Group seminar, IIIT Hyderabad

📍 Hyderabad, India

Started 'Seminar Saturdays', as a part of the 'Theory Reading Group' at IIIT Hyderabad by giving a talk on quantum approximate counting.

## WORK EXPERIENCE

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### Engineering Analyst

📅 July 2022 - July 2023

Goldman Sachs

📍 GS Hyderabad, India

- I worked in the SecDB team, which designs and implements state of the art distributed database systems. Technologies I used frequently are C++, Git, Linux, and Bash. I was previously a summer analyst in the same team (2021).

### Technical Staff

📅 April 2020–July 2020

AlCrowd

📍 India

- 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** [AlCrowd classroom](#)

### Teaching Assistant

📅 Jan 2020–May 2022

IIIT Hyderabad

📍 Hyderabad

- Linear Algebra**, Spring 2020 (Undergraduate) and Monsoon 2020 (Graduate Course)
- Introduction to Quantum Information and Computation**, Spring 2021 (Elective)
- Automata Theory**, Monsoon 2021 (Undergraduate)
- Quantum Algorithms**, Spring 2022 (Elective)

## SELECTED COURSE PROJECTS

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### Independent study project on Adiabatic Quantum Computing and Combinatorial Optimization

- Semester long survey supervised by [Prof. Shantanav Chakraborty](#). PDF of the report is available.

### Independent study project on General Relativity

- Semester long project to study General Relativity. Supervised by [Prof. Subhadip Mitra](#)

### Independent study project on Quantum Complexity Theory

- Semester long project to study Quantum Complexity Theory. Supervised by [Prof. Indranil Chakrabarty](#)

### Graph Neural Network for Particle Data Classification | *pytorch, cirq*

- Implemented [ParticleNet](#), a graph CNN for particle data classification. [GitHub](#)

### 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. [GitHub](#)

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

- Wrote a Django web app 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. [GitHub](#)

### 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.

### 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**

## CO-CURRICULARS

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- Mentor, Women in STEM Research (WISR) *August 2023*
- Head of Corporate Relations, E-Cell, IIIT-Hyderabad *April 2019 - May 2020*
- Marketing Head, Felicity, IIIT-Hyderabad *June 2019 - May 2020*
- Literary Club Coordinator, IIIT-Hyderabad *July 2018 - July 2020*
- Volunteer @ TEDx Hyderabad *2018, 2019*
- Kickboxing Regional Title Belt winner *June 2015*