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*   📍 *Hyderabad*

MS Thesis was co-supervised by Prof. Shantanav Chakraborty and Prof. Indranil Chakrabarty

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*

- Working on resource estimation of enumeration and sieving algorithms for the shortest vector and related problems

Mitacs Globalink Research Intern   **University of Calgary**

📅 *August 2021 - December 2021*   📍 *Calgary, Canada*

- I was working under the supervision of Prof. Barry C. Sanders on 'Searching for Quantum Supremacy' in which we tried to demonstrate limited quantum speedup of Quantum Annealing over classical Monte Carlo heuristic algorithms as a structured search problem by converting the problem to search over a manifold.

Undergrad Research Assistant   **International Institute of Information Technology (IIIT) Hyderabad**

📅 *May 2019 - June 2023*   📍 *Hyderabad, India*

- I worked with Prof. Shantanav Chakraborty on Quantum Algorithms for Linear Algebra and optimization used in Machine Learning. We also worked on bounding the mixing time of quantum walks on particular graph topology.
- I worked with Prof. Indranil Chakrabarty on Quantum Information Theory.
- **Miscellaneous work:** Independent study (IS) on 'Adiabatic Quantum Computing and Combinatorial Optimization' under Prof. Shantanav; IS on General Relativity supervised by Prof. Subhadip Mitra; Honours Project on Quantum Complexity Theory jointly supervised by Prof Subhadip Mitra and Prof. Indranil Chakrabarty.

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 Information and Computing   **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

Talks

Applications of Linear Algebra   **IIIT Hyderabad**

📅 *May 2022*   📍 *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 Algorithms for Regularized Least Squares   **Centre for Quantum Technologies**

📅 *November 2023*   📍 *CQT, Singapore*

Gave a talk based on our work on variable time quantum algorithms for least squares at the Singapore QML Journal seminar.

Quantum Signal Processing with application to Linear Systems   **IIIT Hyderabad**

📅 *April 2022*   📍 *Hyderabad, India*

I gave a talk to the CQST (IIIT Hyderabad) students and faculty members, covering block encodings, quantum signal processing, quantum singular value transformation and least squares optimization.

Quantum Computing for Software Engineers   **Goldman Sachs, Hyderabad**

📅 *March 2023*   📍 *Hyderabad, India*

I gave a talk on quantum computing at the Developer's Exchange conference at Goldman Sachs Hyderabad.

WORK EXPERIENCE

Engineering Analyst   **Goldman Sachs**

📅 *July 2022 - July 2023*   📍 *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   **AICrowd**

📅 *April 2020–July 2020*   📍 *WFH*

- Built a simulator for the purpose of hypothesis testing on our reputation and ranking system, also worked on a Rails web app, Django web app, helped create reinforcement learning challenges, and won their DroneRL challenge.

Teaching Assistant   **IIIT Hyderabad**

📅 *Jan 2020–May 2022*   📍 *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)

PROJECTS

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 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. 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**

SKILLS

Programming and scripting: C, C++, Python, Javascript, Bash, Java
Web and Mobile: HTML5, Bootstrap, Django, ReactJS, React-Native, Flask
Misc.: Linux, Git, Docker, PostgreSQL, MySQL, Qiskit, Q#, Haskell, Sklearn, Pytorch, Scipy, SageMath, Latex, Golang, Neo4j

CO-CURRICULAR

- 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