

# Asish Kumar Mandoi

Senior Undergraduate  
Department of Electrical Engineering  
Indian Institute of Technology Kanpur

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## EDUCATION

Year	Degree/Certificate	Institute	CPI/%
2019 - 2023	B.Tech in Electrical Engineering, <i>Minor in Quantum Physics</i>	Indian Institute of Technology Kanpur, India	7.50/10.00
2019	Grade XII (CBSE Board)	MBS Public School, Bhubaneswar, India	93.80%
2017	Grade X (CBSE Board)	DAV Public School, Bhubaneswar, India	10.0/10.0

## EXPERIENCES

### Software Engineer Intern, Citrix

May '22 – Jul '22

*DevOps and Automation Services Team, Bengaluru, India*

- Developed a robust monitoring system for detecting issues related to **Grafeas**, a software auditing service critical for multiple internal applications at Citrix
- Implemented a **Golang** microservice with **safeguarded endpoints against DDoS attacks** and deployed it with **Kubernetes** using **Helm Charts** to private cloud
- Built a periodically triggered **CI/CD** pipeline using **Jenkins** and incorporated it with a **metadata capturing** component handled using **Grafeas**
- Facilitated **active monitoring of the Grafeas API** by creating a dashboard and an alert system on Slack based on reports collected from the pipeline logs using **Splunk**
- Secured a **pre-placement offer** for valuable contribution during the internship

### Research Associate, QResearch Project, QWorld

Dec '21 – Present

*Optimizing Logistics using Quantum Algorithms, Mentor: Dr. Paweł Gora*

- Contributed to a working publication** focused on various **hybrid quantum-classical techniques** to solve **combinatorial optimization problems in logistics**
- Validated theoretical results of 5 solvers of the Vehicle Routing Problem (VRP) by performing experiments for **550+ VRP instances** on the **D-Wave quantum annealers**
- Devised a new solver** for VRP with **higher performance** compared to existing solvers
- Co-mentored** several interns in designing **QUBO** formulations for VRP
- Presented our work on Quantum Annealing based VRP formulations at the **IT conferences WDI 2022** and **Data Science Summit 2022**

### Quantum Computing Mentorship Program, QOSF

Oct '21 – Jan '22

*Mentor: Dr. Vesselin G. Gueorguiev*

- Among **40 out of 1000+** applicants to be selected for the program and recognized for developing **one of the best solutions** to a **Quantum Search problem**
- Implemented new solvers for the **Travelling Salesman Problem (TSP)** and the **Vehicle Routing Problem (VRP)** based on clustering and non-clustering techniques
- Improved performance** of existing quantum annealing-based solvers for TSP and VRP by optimizing our algorithms to use **minimal number of qubits**
- Benchmarked accuracies and running times of solvers by testing them on **D-Wave Quantum Annealers**

## PRESENTATIONS

S. Borah, A. Mandoi, A. Verma, “*Heuristic QUBO Formulations for solving the Vehicle Routing Problem using Quantum Annealing.*” Talk presented at the 13th **WDI '22**, Warsaw, Poland. (Apr 2022)

A. Mandoi, “*Quantum Annealing methods for solving the Vehicle Routing Problem.*” Talk presented at **Data Science Summit 2022**, Warsaw, Poland. (Nov 2022)

## SELECTED PROJECTS

### Quantum Algorithms for Semidefinite Programming

Mar '22 – Apr '22

*Advisor: Prof. Ketan Rajawat*

- Studied **Arora and Kale's** classical algorithm based on Multiplicative Weights Update method for solving Semidefinite Programs (SDPs)
- Compared its complexity and lower bounds with that of **Brandão and Svore's** quantum extension of SDP solvers and **Apeldoorn and Gilyén's** subsequent speed-ups
- Investigated practical applications of quantum algorithms for solving SDPs like **Quantum Error Recovery** and **Shadow Tomography**

### IITK-Coin

May '21 – Jul '21

*Backend of a pseudo-currency system | Programming Club, IIT Kanpur*

*GitHub*

- Developed a microservices-based application** using **Golang** and **SQLite**
- Reinforced backend security** by employing **Bcrypt algorithm** to **hash & salt passwords** and implementing an **OTP-based confirmation system** for transactions
- Built an **additional layer of protection** against attacks by incorporating endpoints with user authorization using **JSON Web Tokens**
- Facilitated **transaction tracking** for admins by logging all activity into the database
- Increased server efficiency** by allowing up to **300 concurrent transactions per second** by utilizing **Redis** for caching and enabling **WAL journal mode** in **SQLite**
- Containerized the application using **Docker** with minimal size *DockerHub*
- images and **automated the workflow** using **GitHub Actions**

## ACHIEVEMENTS & HONOURS

### Programming Achievements

#### HAQS, qBraid

2022

Won the qBraid Open Challenge and among the **top three winners** of the QML Challenge

#### Quantum Excellence, QGSS22, IBM

2022

Among **1200 worldwide** to complete the 2 week long **Qiskit Global Summer School** program with intensive hands-on labs focused on **quantum simulations using NISQ hardware**

#### IBM Quantum Challenges

2021, 22

Among **1000 worldwide** to complete challenges of *fall 2021* and *spring 2022* by solving problems in areas of finance, fermionic chemistry, machine learning and optimization

#### Google Kickstart

2020, 21, 22

Globally ranked **846** in Round E 2022, **1055** in Round D 2021, and **976** in Round H 2020

#### Facebook Hacker Cup

2020, 21

Globally ranked **1967** in Round-1 2021 and **2769** in Round-1 2020

### Scholastic Achievements

**All India Rank 3592** in **JEE-Advanced** out of **220,000+** shortlisted candidates 2019

**All India Rank 7480** in **JEE-Main** out of **0.9 million+** candidates 2019

**National Top 300** to be selected for **Indian National Chemistry Olympiad, HBCSE** 2019

**All India Rank 322** in **KVPY** out of **50,000+** candidates and awarded **KVPY Fellowship** by Govt. of India, and **IISc Bangalore** 2017

## TECHNICAL SKILLS

**Languages** C, C++, Python, Go, MATLAB, JavaScript

**Web** Node.js, Next.js, HTML, CSS, PHP, MySQL, SQLite, Redis

**SDKs** Qiskit, Ocean

**Tools** Git, Docker, Kubernetes, Jenkins, Splunk,  $\LaTeX$ , Linux shell utilities

## RELEVANT COURSEWORK

**Computer Science** Quantum Computing, Data Structures and Algorithms, Fundamentals of Computing, Intro to Machine Learning

**Electrical Core** Digital Communication Networks, Convex Optimization in SP-COM, Digital Control, Digital Electronics, Microelectronics, Principles of Communications

**Maths & Physics** Quantum Mechanics I, Probability and Statistics, Partial Differential Equations, Complex Analysis