

# Asish Kumar Mandoi

Junior Undergraduate  
Department of Electrical Engineering  
Indian Institute of Technology Kanpur

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## EDUCATION

- 2019 – 2023 **Bachelor of Technology in Electrical Engineering, Minor in Physics, CPI: 7.5/10.0**  
Indian Institute of Technology Kanpur, India
- 2019 **Grade XII (CBSE Board), Cumulative Percentage: 93.8%**  
MBS Public School, Bhubaneswar, India
- 2017 **Grade X (CBSE Board), CGPA: 10.0/10.0**  
DAV Public School, Bhubaneswar, India

## INTERESTS

Quantum Computing, Quantum Technology, Optimization, Software Development, Open-Source Software, Quantum Physics, Relativity

## EXPERIENCES

- May '22 – Present **Software Engineer Intern, Citrix R&D**  
*Devops and Automation Services*
- Implemented a microservice hosted on **Kubernetes** in **Golang**, added unit tests with 93.8% coverage, and built a multi-branch **CI/CD** pipeline in Jenkins scheduled to run 96 times a day
  - Enhanced customizability of the pipeline service by incorporating it with a metadata analysis component handled using **Grafeas**
  - Created a dashboard and an automated alert system on **Splunk** for **detection of potential flaws** based on reports collected from the pipeline logs
- Dec '21 – Present **Research Associate, QResearch Project, QWorld**  
*QWorld*
- Optimizing Logistics using Quantum Algorithms, Mentor: Dr. Paweł Gora*
  - Validated theoretical results of various solver approaches by carrying out experiments for **550+ instances** of the Vehicle Routing Problem (VRP) on the **D-Wave quantum annealers**
  - Devised a new solver approach** for VRP with **better practical accuracy** compared to similar existing solvers as shown by our experiments
  - Contributed to a comprehensive report** focused on practical implementations of various **hybrid quantum-classical techniques** to solve **combinatorial optimization problems in logistics** with a goal of getting it published in popular journals
  - Presented our work on Quantum Annealing based VRP formulations in the conference **WDI 2022**
- Oct '21 – Jan '22 **Quantum Open Source Foundation**  
*QOSF*
- Quantum Computing Mentorship Program, 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 an assessment task by implementing **Quantum Search on Unstructured Data** using quantum input loading and **Grover's algorithm**
- Task*
- Implemented new solvers based on clustering and non-clustering approaches for the **Travelling Salesman Problem (TSP)** and the **Vehicle Routing Problem (VRP)** using **Quantum Annealing**
- Project*
- Worked on **improving applicability** of quantum annealing-based solvers for TSP and VRP by optimizing our algorithms to use **minimal number of qubits**
  - Compared the runtimes and accuracies of solvers by testing them on **D-Wave Quantum Annealers**
- Presentations**
- Apr '22 S. Borah, A. Mandoi, A. Verma, “Heuristic QUBO Formulations for solving the Vehicle Routing Problem using Quantum Annealing.” Talk presented at 13th **WDI '22**, Warsaw, Poland. (2022)

## SELECTED PROJECTS

- Mar '22 – Present **Quantum Algorithms for Semidefinite Programming and its Applications**  
*Advisor: Prof. Ketan Rajawat*
- Anatomized **Arora and Kale's** classical algorithm based on Multiplicative Weights Update method for solving Semidefinite Programs (SDPs)
  - Compared its query 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**

- May '21 – Jul '21 **IITK-Coin**  
 GitHub ↗ Backend of a pseudo-currency system to be used in the IITK campus | Programming Club, IIT Kanpur
- Developed a **microservices-based application** from the ground up using **Golang** and **SQLite**
  - Reinforced the backend security** by employing the **Bcrypt algorithm** to **hash and salt passwords**, and implementing an **OTP based confirmation system** for the final stage of transactions
  - Built an **extra layer of protection** by incorporating endpoints with user authorization using **JWTs**
  - Facilitated **transaction tracking** for administrators by logging all activity into the database
  - Increased server efficiency** by allowing it to handle up to **300 concurrent transactions per second** by utilizing **Redis** for caching and enabling the **Write-Ahead Logging** mode in **SQLite**
- DockerHub ↗ Containerized the application using **Docker** and automated the workflow using **GitHub Actions**
- Jan '21 – Feb '21 **Crio Winter of Doing**  
 CWoD ↗ Externship program for developers | Crio.Do
- Acquired familiarity in technologies like **HTTP, REST API, AWS, Linux, Git, HTML, CSS, JavaScript** by implementing core concepts on real examples in a structured manner
  - Deployed the backend server of an android app on a self-launched **Amazon EC2 instance**
  - Sorted cities based on the popularity of usage of an application by **analyzing 10k+ logs** using **Linux shell techniques**
  - Set up my **Personal Portfolio** ↗ web application integrated with my **GitHub** account
  - Among the **final 1200 out of 10,000+** total applicants to clear the coding round and reach **Stage-2B**
- Jun '21 - Jul '21 **Edison Tinfoil Phonograph**  
 Advisors: Prof. Anish Upadhyaya, Prof. Shashank Shekhar
- Collaborated with a **team of 10** for a semester-long project on manufacturing the phonograph
  - Designed CAD models** of sophisticated components and assemblies in the phonograph
  - Proposed optimal and cost-effective processing techniques** to be used in the manufacturing of the individual components of the device
  - Presented** the work of the team before the professor and discussed improvements

## ACHIEVEMENTS & HONOURS

### Programming Achievements

- 2021, 2022 **IBM Quantum Challenges**  
 Badge ↗ Among **677 worldwide** to complete the 10 day challenge of *fall 2021* and among **560 worldwide** to complete the 5 day challenge of *spring 2022* by solving problems in areas of applications of Quantum Computing like finance, natural sciences, machine learning and optimization
- 2020, 2021 **Google Kickstart**  
 Globally ranked **1636** in Round E 2021, **1055** in Round D 2021, and **976** in Round H 2020
- 2020, 2021 **Facebook Hacker Cup**  
 Globally ranked **1967** in Round-1 2021 and **2769** in Round-1 2020

### Scholastic Achievements

- 2019 **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
- 2017 **All India Rank 322**, in **KVPY** out of 50,000+ candidates and selected for **KVPY Fellowship** by Govt. of India, and **IISc Bangalore**

## TECHNICAL SKILLS

- Languages** C, C++, Python, Go, MATLAB, JavaScript
- Web** Node.js, Next.js, HTML, CSS, PHP, MySQL, SQLite, Redis
- SDKs** Qiskit, Ocean
- Utilities** Git, Docker, Jenkins, Splunk,  $\text{\LaTeX}$ , Linux shell utilities

## RELEVANT COURSEWORK

- Computer Science** Quantum Computing<sup>[o]</sup>, Data Structures and Algorithms, Fundamentals of Computing, Intro to Machine Learning<sup>[i]</sup> ↗
- Electrical Core** Convex Optimization in SP-COM, Digital Control, Digital Electronics, Microelectronics, Principles of Communications, Digital Communication Networks<sup>[o]</sup>
- Maths & Physics** Quantum Physics, Probability and Statistics, Partial Differential Equations, Complex Analysis

[i]: informal, [o]: ongoing, [hyperlinked at appropriate places]