Asish Kumar Mandoi

Junior Undergraduate
Department of Electrical Engineering
Indian Institute of Technology Kanpur

Homepage
Asish Mandoi ◇ AsishMandoi
+91 8144106507 ◇ akmandoi@iitk.ac.in
asishmandoi20@gmail.com

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 Error Correction, Optimization, Software Development, Open-Source Software, Quantum Physics, Relativity

Achievements & Honours

Programming Achievements

2021 **IBM Quantum Challenge, Fall 2021**
Badge **Among 677 worldwide** to complete the 10 day challenge by solving problems in areas of finance, natural sciences, machine learning and optimization using **Quantum Computing**

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

Experiences

Dec '21 – Present **Optimizing Logistics using Quantum Algorithms**
QWorld *Research Associate, QResearch Project, QWorld, Mentor: Paweł Gora*

- **Contributed to a comprehensive report** focused on practical implementations of various techniques including hybrid neural networks, graph coarsening, quantum annealing and gate-based approaches to solve **combinatorial optimization problems in logistics**
- Carried out experiments on D-Wave quantum annealers, consolidated results and described the implementations of our solvers
- Presented our work on using Quantum Annealing to solve the Vehicle Routing Problem in the popular talk **WDI 2022** , currently aiming to get our work published in popular journals

Oct '21 – Jan '22 **Quantum Computing Mentorship Program**
QOSF *Quantum Open Source Foundation, Mentor: Dr. Vesselin G. Gueorguiev*

- Among ~**40 out of 1000+** 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**
  GitHub
- 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**
  GitHub
- 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 various solvers run on **D-Wave Quantum Annealers**

Presentations

Apr '22 S. Borah, **A. K. 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

- Analyzed **Arora and Kale**'s classical algorithm based on Multiplicative Weights Update method for solving Semidefinite Programs (SDPs)
- Comapared 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 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 the backend** from the ground up using **Golang** and **SQLite**
- **Secured** the endpoints by incorporating user authorization using **JWT**s
- Built an **additional layer of protection** against hacks by employing the **Bcrypt algorithm** to **hash and salt passwords**
- Added a **transaction tracking** functionality for administrators and implemented an **OTP based confirmation system**
- **Increased server efficiency** by handling up to **300 concurrent transactions per second** by utilizing the **Write-Ahead Logging** mode in SQLite and **Redis** for caching

DockerHub

- Containerized the application using **Docker** and made it **publicly accessible** on DockerHub

Apr '21 – Jun '21 **Algorithms based on Maths**

Stamatics , IIT Kanpur

- Implemented and applied algorithms like prime factorization, factorial calculation, and **polynomial hashing** in C++
- Improved proficiency in **developing optimal approaches** to solve **mathematical programming problems** by actively participating in **competitive-programming** contests

Jun '21 - Jul '21 **Edison Tinfoil Phonograph**

Advisors: Prof. Anish Upadhyaya, Prof. Shashank Shekhar

- Collaborated with a **team of ten** students and worked on a semester-long project on manufacturing the phonograph
- **Designed CAD models** of sophisticated components and assemblies of the phonograph using **AutoCAD**
- **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

Technical Skills

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

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

SDKs Qiskit, Ocean

Utilities Linux shell utilities, Git, Docker, LaTeX

Relevant Coursework

Computer Science Quantum Computing[o], Data Structures and Algorithms, Fundamentals of Computing, Intro to Machine Learning[i]

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

Maths & Physics Quantum Physics, Probability and Statistics, Complex Analysis

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