VANSHAJ BINDAL

MSc Physics at Cardiff University

vanshajbindal98@gmail.com Linkedin Github United Kingdom

EDUCATION

MSc in Physics

Cardiff University

09/2023 - 09/2024 Cardiff, UK

- Student representative for the program
- Award Classification: 1st/ Distinction
- Concentration: Theoretical Physics, Condensed Matter Theory, Quantum Information
- *Relevant Coursework:* Quantum Theory of Solids, Advanced Particle Physics, Data Analysis, Statistical Mechanics, Theoretical Physics, Philosophy of Physics
- Thesis: Holographic Quantum Error Correction, Supervisor: Dr Pieter Naaijkens, Score: 83%

PG Certificate in Physics

Queen Mary University of London

09/2021 - 09/2022 London, UK

- Award Classification: 2.1/Merit
- Concentration: Theoretical Physics, High Energy Physics
- *Relevant Coursework:* Quantum Mechanics, Spacetime & Gravity, Solar System, Intro QFT, Adv QFT, Intro String Theory

BTech in Industrial and Production Engineering

Manipal Institute of Technology

08/2016 - 02/2021 Manipal, India

- Concentration: Mechanical Engineering, Applied Physics, Material Science
- *Relevant Coursework:* Math-4, Fluid mechanics, Radiation Physics, Engineering Physics, Physics lab, Basic electrical technology etc
- Thesis: Experimental & Data analysis on Fiber Metal Laminates - Scored a perfect 10 GPA

EXPERIENCE

Volunteer

XPANSE - Exponential Technologies Summit

11/2024 - 11/2024 Abu Dhabi, United Arab Emirates

- Selected as a volunteer for this global summit, focused on advancing cutting-edge physics, technology and multidisciplinary innovation.
- Assisted in organizing and managing sessions featuring prominent physicists, scientists including keynote speeches, panel discussions, and networking events.
- Facilitated smooth communication and coordination between speakers, attendees, and the event management team.
- Gained firsthand experience in event logistics and fostered professional connections within the physics and technology communities.

Mentee/Research Student

QOSF - Mentorship Program - Cohort 10

10/2024 - Present Remote

- Selected for the quantum computing mentorship program run by Quantum Open Source Foundation (QOSF)
- Successfully completed the one of the screening task, impressing the creator of the task with clear and well structured code, the task was to create a state-vector simulator for quantum circuits from scratch using two different approaches
- As part of the screening task I developed a simulation framework for quantum circuits using matrix and tensor-based approaches, analysing runtime and scalability - *repository*
- Currently undertaking a project on classical simulation of quantum systems. This work involves implementing real and imaginary time evolution algorithms in the Pauli basis and developing efficient methods for Heisenberg picture simulations

SUMMARY

Dynamic and motivated physicist with a strong foundation in theoretical physics, quantum information, and condensed matter theory, complemented by hands-on research in quantum technologies. Proficient in advanced mathematics, computational modeling, and programming languages such as Python. Experienced in researching and analysing holographic quantum error correction codes, tensor networks, and many-body quantum systems using tools like QuTiP and Cirq. Skilled in interdisciplinary collaboration, scientific communication, and technical writing. Recognized for academic excellence, including prestigious scholarships, with a demonstrated ability to adapt to emerging fields such as quantum computing, quantum simulations, and statistical physics. Eager to learn and contribute to cutting-edge research in integrable systems, many-body chaos, and quantum information.

SKILLS

Analytical Skills | Advanced Mathematics | Theoretical Physics | Quantum Computing | QuTiP | Cirq | Latex | Linux | Python | Matplotlib | Numpy | Pandas | Scipy | ML | Julia (Beginner) | Github | Tensor Networks

INTERESTS

- **Theoretical Physics**
- **Applied Mathematics**
- **Philosophy of Physics**

KEY ACHIEVEMENTS

Cardiff University India Scholarship for master's programme - 5000 Pounds, 2023

Awarded for academic excellence and commitment to advancing knowledge in physics.

Student Leadership

Selected as student representative for MSc Physics program at Cardiff University.

Quantum Course Excellence

Scored 96% in quantum computing course across two semesters.

EXPERIENCE

Participant

IQOQI - Summer School

09/2024 - 09/2024 Vienna, Austria

- Attended a rigorous week-long program on quantum optics and information science, hosted by IQOQI in Vienna and Innsbruck, Austria
- Participated in lectures by eminent researchers on topics spanning quantum mechanics, computing, and information theory, deepening expertise in both theoretical and experimental aspects of quantum science
- Explored cutting-edge experimental research facilities through lab tours, gaining hands-on insight into the practical implementation of quantum technologies

Student

Qubit by Qubit's Introduction to Quantum Computing

09/2023 - 04/2024 Remote

- Completed the comprehensive two semester course with a score of 96%, which covered quantum mechanics, quantum information theory, quantum hardware
- Engaged in hands-on labs and coding exercises on actual quantum computers, enhancing practical quantum computing skills
- Developed a capstone project on Holographic Error Correction codes, which included preparing and presenting an infographic on the topic

Research Student

Condensed Matter Group - Cardiff University

10/2023 - 03/2024 Cardiff, UK

- As a research student, conducted a focused theoretical and computational study on Quantum Electrodynamics (QED) to investigate dissipative processes within the Jaynes-Cummings model, under the guidance of Dr Amy Morreau
- Developed and ran simulations using the QuTiP software to model decoherence and quantum noise effects
- Built custom functions for better utility
- Authored a comprehensive paper detailing the methodology, findings, and implications of the study, showcasing ability to synthesise complex information into a professional report - *repository*

Teaching Assistant

Cardiff University

09/2023 - 12/2023 Cardiff, UK

- I was teaching assistant for the module "Physics of Fields and Flows"
- Primary responsibility was marking papers and homework

Research Student

Monte Carlo Methods in Statistical Field Theories

07/2023 - 08/2023 Remote

- Selected for a rigorous two-month project under the mentorship of UC Berkeley faculty
- Focused on statistical mechanics and statistical field theories
- Learnt to apply elementary Monte Carlo methods in SFT's
- Prepared and presented a final report and a poster

Participant

7th Superconductivity Summer School

07/2022 - 07/2022 Oxford, UK

- Participated in an intensive program on superconductivity hosted by the IOP at Wolfson College, University of Oxford
- Engaged in practical experiences, including a site visit to Oxford Instruments and various expert lectures on different theoretical and practical aspects of superconductivity

KEY ACHIEVEMENTS

Distinction In MSc

Achieved a Distinction classification with a score of 83% for MSc thesis.