# **VANSHAJ BINDAL**

# **MSc Physics at Cardiff University**

## **EDUCATION**

# MSc in Physics

## **Cardiff University**

iii 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**

- 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**

- 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 cuttingedge 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**

iii 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 - <u>repository</u>
- 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**

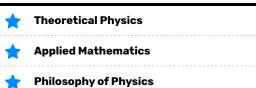
Dynamic and motivated physicist with a strong foundation in theoretical physics, quantum information, and condensed matter theory, complemented by hands-on research in quantum technologies. Proficient in advanced mathematics, computational modeling, and programming languages such as Python. Experienced 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		Adva	Advanced Mathematics		
Theoreti	cal Phy	sics (	Quantum Co	omputing	
QuTiP	Cirq	Latex	Linux		
Python	Matplotlib		Numpy	Pandas	
Scipy	ML Julia (Beginner)		Github		

**Tensor Networks** 

# **INTERESTS**



# **KEY ACHIEVEMENTS**



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



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

Scored 96% in quantum computing course across two semesters



# **Quantum Course Excellence**

# **EXPERIENCE**

## **Participant**

#### **IQOQI - Summer School**

iii 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**

- 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**

- 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 - <u>repository</u>

# **Teaching Assistant**

## **Cardiff University**

- 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**

- 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**

iii 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.