

# Curriculum Vitae

Dhruva Sambrani

August 18, 2022

## Educational Qualifications

**BS-MS | 2018-2023 | IISER M**

CPI: 9.01

SPI (Year 1): 9.8

SPI (Year 2): 9.1

SPI (Year 3): 8.5

SPI (Year 4): 8.9

**12th Grade | 2018 | Primus**

Physics: 99

Math: 94

Chemistry: 95

**10th Grade | 2016 | Prakriya**

Science: 94

Math: 95

## Academic Endeavours

**KVPY | 600 | 1118 | 24**

Qualified KVPY SA, SX, SB with a rank of 600, 1118 and 24 respectively and hold a KVPY Fellowship

**Vijyoshi Camp | 2017**

Attended the Vijyoshi camp in December 2017 against KVPY SA

**Mimamsa Center toppers | IISER Pune | 2019**

My team was the centre topper in Mimamsa 2019, a Science quiz conducted by IISER-P.

**Qiskit Global Summer School | Qiskit | 2022**

Participated and completed the QGSS-22. Certificate.

## Research and Work Experience - Discovering the World

**Relativistic Black Body Radiation | JS Bagla | Winter 2018**

As part of my First Year Winter Project, I took up the project Black body radiation in special relativistic frames under JS Bagla, IISER Mohali, where I looked at how Black Body Radiation transforms in a frame that is moving uniformly with respect to the source. We see that the radiation is no more uniform, leading to a force on the particle. The quantitative analysis of this force is done using numerical methods in Julia.

### **Ordering Channels | Sarah Brandsen | Winter 2020**

An attempt to partial ordering of quantum channels by concepts of Data Driven Inferences. We define an order over the set of positive, trace preserving maps on the existence of another map which when applied would lead to equivalence. Based on Buschemi et. al. [New J. Phys. 21 113029] and Dall'Arno et. al. [Proc. R. Soc. A.47320160721].

### **Quantum Resetting of Quantum Systems | MN Bera | Summer 2021-22**

An ongoing project building on multiple works on Stochastic Resetting of Classical Systems [arXiv:2107.11686] and on Quantum Systems [arXiv:2008.00510.pdf; Phys. Rev. B 98, 104309], and extending Anubhav Srivastava's Master's Thesis [2021, IISER Mohali], we apply a superposition of the evolve and the reset mechanisms and explore the resulting dynamics of the system. We see that for numerical examples, the convergence rate is faster and much closer to the reset location than in stochastic resetting. We want to extend this faster convergence to potentially speed up Quantum Walks [ISBN:978-3-319-97812-3], speeding up multiple algorithms which depend on Quantum Walks. Further, stochastic resetting can also model certain biological and economical processes which may be better explained by Quantum Resetting.

### **Quantum Intern | BQP | Summer 2022**

Interned at BosonQ Psi in the Quantum team where I proposed and built methods to solve problems of interest as part of a multiskilled team. Projects I was involved in were related to Feynman-Kac equation, Quantum Monte Carlo methods and Complexity analysis.

### **Introduction to Quantum Mechanics and Computing | Arvind | Summer 2019**

My First Year Summer Project was an introductory reading to the Mathematical Structures that underlie Quantum Mechanics and then take it forward to a theoretical introduction to Quantum Information and Quantum Computing. I also attempt to simulate a Quantum Computer on a Classical computer and making a Julia module for the same. This paper serves as a very brief introduction to Quantum Computing and documentation of the code in the form while publishing.

### **RLNN for Quantum Multiple Hypothesis Testing | Sarah Brandsen | Summer 2020**

Optimized certain parts of the code for the algorithm suggested in the paper. Project stopped due to non-continuation of project from guide.

### **Superpositioned Grover's Algorithm | MN Bera | Summer 2021**

In a similar vein to Quantum Resetting, this is an ongoing project to speed up the Grover's Search problem by applying a superposition of the Oracle and the Unitary.

## **Programming - Reinventing The World**

### **IISER-M App | Android | Firebase**

I started making the Unofficial IISER-M app for Android in the Summer of 2019. With 200+ downloads, it remains in constant development with new features being added every 6 Months

### **QuantumComputing.jl | Julia**

An attempt to simulate a Quantum Computer and making a Julia module for the same. The associated paper also acts as the documentation

### **Coursera Courses | Python, Scala | Coursera**

Completed the course Simulation and modeling of natural processes offered by Geneva University. Received Certificate with a grade of 95.31%

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Completed the Specialization Introduction to Discrete Mathematics for Computer Science offered by National Research University Higher School of Economics & University of California San Diego. See Certification Courses Completed:

Mathematical Thinking in Computer Science

Introduction to Graph Theory

Combinatorics and Probability

Delivery Problem

Number Theory and Cryptography

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Completed the course Functional Programming Principles in Scala offered by Geneva University. Received Certificate with a grade of 96.00%

### **PlutoReport.jl | Julia | Pluto**

A Julia package to make better reports and talks in Pluto Notebooks, especially with citation support, presentation mode with controls and timing, and planned integration with bibliography managers.

### **Modelling Complex Systems | Julia**

As part of a course, I have learnt multiple models often used in the field and explored quite a bit in the following repository

### **Minivet Birding App | Android | SQL**

I contributed in making the Minivet Birding App under Dr. Manjari Jain's Behavior and Ecology Lab, IISER-M. Minivet is an app developed to assist both budding and experienced birders.

### **Tetra: Turing Hunt Game Engine | Python | PySimpleGUI**

A game engine for the annual Turing Virtual Treasure Hunt. Built in Python with PySimpleGUI.

### **Github Profile | Multiple Languages**

Do visit my GitHub profile to see my other projects in a multitude of languages and fields! Link at the bottom of the page

## **Extra-Curricular Activities**

### **Teaching Underprivileged Children | 2016**

As a way to give back to the community, I taught underprivileged children English and Mathematics for two weeks in my school in 2016. The group involved two children, both of whom had learning disorders.

### **Photography**

I also occasionally dabble in photography, though I don't consider myself to be very good at it. Visit my Photography Page for a peek at some of my photos!

### **Blog**

I've started a new blog, lets see how it goes!

### **Convener, Turing Club | IISER-M | 2019-21**

Convener of the Turing Club of IISER Mohali in the academic year of 2019-20, and the interim Convener for 2020-21

## **Coding and Programming**

I am an avid programmer and know multiple languages. Visit the Programming Section of this website