Kabir Rohit Khanna

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Education

Oct 2022 – June 2023 **University of Oxford** *Oxford, UK*
MSc. Mathematical and Theoretical Physics

Aug 2017 – May 2022 **Indian Institute of Technology Madras** *Chennai, Tamil Nadu*
B.Tech in Engg. Design + M.Tech in Quantum Science & Technology (offered by EE and PH)
CGPA: 9.41/10 - Rank: 3/57
Relevant coursework: Grade Scale: 10

- General Relativity and Cosmology (10)
- Q. Computation and Information (10)
- Advanced General Relativity†
- Quantum Field Theory-1 (9‡)
- Mathematical Physics 2 (9)
- Stochastic Processes (10)
- Quantum Physics (9)
- Optical Signal Processing and Quantum Communication (10)

Aug 2019 - Dec 2019 **Technical University of Denmark (DTU)** *Lyngby, Denmark*
Exchange Student - Semester 5
Relevant coursework:

- Statistical Physics
- Advanced Fluid Mechanics
- Discrete Mathematics 2: Algebra
- Signals and Systems in Discrete Time

Research Experience

Aug 2021 - May 2022 **IIT Madras** *Chennai, India* – **Master's Thesis** — *Grade: 10/10*
Supervisor - Prof. Dawood Kothawala
Title: *Aspects of Quantum Information in Curved Spacetimes*

- *Part 1* - Conducted research in the area of relativistic quantum information.
- Used mathematical techniques from general relativity to bring about a curvature dependence to the phenomena of decoherence due to (gravitational) time dilation, thereby offering a resolution to recent debates on the topic.
- *Part 2* - A pedagogical introduction to the BH information paradox.

June 2021 - Present **University of Lethbridge** *Virtual* – **Research Internship**
Supervisor - Prof. Saurya Das

- Area of research: Quantum Gravity Phenomenology.
- Studying the effects of quantum gravity on the light-matter interaction through the Generalized Uncertainty Principle (GUP).
- Publication in progress.

Jan 2021 - June 2021 **Robert Bosch GmbH** *Bangalore, India* – **R&D intern in Quantum Machine Learning**

- Worked on applying NISQ algorithms like QAOA to real use case problems to look for potential speedups and gauge the efficacy of quantum algorithms in the industry.
- Applied techniques in literature that help to optimize for convergence time. These include parameter initialization heuristics like an RNN to update parameters of the algorithm, and detection of barren plateaus in the problem.

†Audited, ‡Could not formally enroll due to slot constraints. However, I attended the course and was given the top grade in my class.

Jun 2019 - July 2019 **Wolfram Summer School** *Waltham, Massachusetts* – **Summer Research Student**
Supervisors - Christopher Wolfram and Jonathan Gorard

- Conducted research on complex systems called Aggregation Systems.
- Built a framework to work on Aggregation Systems in Mathematica. Contribution to the Wolfram Function Repository can be found here.
- A novel method of studying these systems was taken up using graphs to test confluence in the rules of the systems.
- A short write-up can be found here.

Presentations and Posters

May 2022 **Kabir Khanna**, Dawood Kothawala, *Aspects of Quantum Information in Curved Spacetimes*. Presentation of the work done in my master's thesis, made to students and professors associated to the Quantum Science and Technology master's programme.

June 2021 **Kabir Khanna**, *NISQ Algorithms for Industrial Applications*. Presentation of the work done at Robert Bosch GmbH R&D, made to professors of the Department of Engineering Design.

July 2019 **Kabir Khanna**, *Aggregation Systems*, poster presented at Wolfram Summer School 2019.

Awards and Recognitions

2021 Selected[§] for the DAAD WISE Research Scholarship.

2019 Selected to participate in a tuition-funded semester exchange at DTU, Denmark.

2019 Awarded partial funding to attend the Wolfram Summer School at Waltham, Massachusetts.

2018 Awarded the best volunteer at NSS IITM.

2017 Silver medal for obtaining a top 4000 rank in JEE Advanced 2017 out of 1.2 million students.

2015 Awarded the best outgoing student at my school, DPS Secunderabad.

Tutoring and Volunteering

June 2022 - Present **Math Tutor at Gauthmath** *Virtual*

- Mathematics expert at Gauthmath, an app that helps students with homework problems.

Jan 2022 - May 2022 **Teaching Assistant for PH3520 Quantum Physics** *IIT Madras, Chennai*

Feb 2021 - May 2021 **Academic Mentor at Saathi** *IIT Madras, Chennai*

- Chosen as a part of a Saathi initiative to academically guide three first year students through their initial virtual semesters.

May 2018 - July 2018 **Mathematics and Physics Tutor** *Lamdon School, Leh*

- Tutored over 200 high school and middle school students of a remote town near the Himalayas in mathematics and physics.

July 2017 - May 2018 **Mathematics Educator at NSS** *IIT Madras, Chennai*

- Volunteered to present mathematical concepts through props and presentations to marginalized middle school students in Chennai.

Skills

Languages/Tools: Mathematica, LaTeX, Python, C, MATLAB

Quantum Computing Libraries: Pennylane, Qiskit, Braket, Cirq

[§]I Did not accept it since I had already begun working with Prof. Saurya Das when the DAAD WISE results were announced.