

Natansh Mathur

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Education

Université Paris Cité

PARISIAN MASTER OF RESEARCH IN COMPUTER SCIENCE (MPRI)

Paris, France

2021 - Exp. 2022

Indian Institute of Technology, Roorkee

BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE AND ENGINEERING

- CGPA: 9.538/10

Roorkee, India

2017 - 2021

LBS Senior Secondary School, Kota

GRADE 12 (SENIOR SECONDARY LEVEL)

- Percentage: 95.2%

Kota, India

2017

Nosegay Public School, Sri Ganganagar

GRADE 10 (SECONDARY LEVEL)

- CGPA: 10/10

Sri Ganganagar, India

2015

Experience

IRIF, CNRS and Université Paris Cité

MASTER'S RESEARCH INTERNSHIP

- Research Internship for M2 of the Masters (MPRI).
- Guided and supervised by Prof. Iordanis Kerenidis.

Paris, France

April, 2022 - Present

QC Ware Corp.

RESEARCH ASSISTANT

- Research Assistant under the guidance of Prof. Iordanis Kerenidis.
- Provided QML research consultancy and services to various client firms.

Paris, France

August, 2020 - Present

Quantum Open Source Foundation

MENTOR

- Mentored a candidate to contribute to the Quantum Protocol Zoo.

Online

September, 2021 - January, 2022

IRIF, CNRS and Université Paris Cité

RESEARCH INTERNSHIP

- Research Internship for completion of Bachelor's Thesis Project.
- Guided and supervised by Prof. Iordanis Kerenidis.

Paris, France (Remote)

August, 2020 - December, 2020

Institute for Quantum Computing, University of Waterloo

UNDERGRADUATE RESEARCH ASSISTANT

- Research Assistant under the guidance of Prof. Norbert Lütkenhaus.
- Associated with Optical Quantum Communication Theory Group.

Waterloo, Canada (Remote)

April, 2020 - July, 2020

LIP6, CNRS and Sorbonne Université

RESEARCH INTERNSHIP

- Summer Research Internship under the guidance of Prof. Elham Kashefi.
- Part of the Quantum Internet Alliance team at CNRS.
- Associated with Paris Centre for Quantum Computing.

Paris, France

May, 2019 - July, 2019

Information Management Group, IIT Roorkee

CHIEF OF RESEARCH AND DEVELOPMENT

- Working with a team of around 50 tech enthusiasts to develop software solutions for the college campus community.
- Maintain the IIT Roorkee official website with up-to-date technology stack.

Roorkee, India

January, 2018 - June, 2021

Projects

Orthogonal Neural Networks

Paris, France (Remote)

BACHELOR'S THESIS; PART OF RESEARCH AT IRIF AND QC WARE CORP

August, 2020 - June, 2021

- Designed an orthogonal neural network architecture inspired by quantum gates.
- Developed strategies to train the perfectly orthogonal neural networks.
- Extended it further to actual quantum architecture and bench-mark its performance.

Numerical key rate calculator for QKD Protocols

Waterloo, Canada (Remote)

PART OF RESEARCH ASSISTANTSHIP AT IQC, UWATERLOO

April, 2020 - July, 2020

- Contributed to the development of the software architecture and wrote protocols fitting into it.
- Wrote unified algorithms to perform parameter optimisation for various QKD Protocols using numerical methods and optimisation techniques.
- Used High Performance super-computing clusters of ComputeCanada to evaluate various QKD protocols' key rates for different parameters.
- Software available in the public domain at <https://openqkdsecurity.wordpress.com/>

Quantum Protocol Zoo

Paris, France

PART OF RESEARCH INTERNSHIP AT LIP6, PARIS

December, 2018 - July, 2019

- Added various protocols to the online encyclopedia of Quantum Internet Protocols and reviewed many others.
- Analysed and identified the resource requirements for performing each of the protocols.
- Developed the 'Knowledge Graphs' - a unified, interactive and user-friendly tool for resource visualisation.
- Available online at wiki.veriqcloud.fr.

Linear Cryptanalysis of Substitution-Permutation Network

Roorkee, India

SUMMER PROJECT

May, 2018 - June, 2018

- Learning project under Prof. Sugata Gangopadhyay, Dept. of CSE, IIT Roorkee.
- Implemented a Substitution-Permutation Network based Block Cipher model.
- Implemented a linear cryptanalytic attack on the developed cryptosystem for retrieval of certain key bits.

Publications and Posters

Medical image classification via quantum neural networks

ARXIV PREPRINT

September, 2021

- The preprint is available at <https://arxiv.org/abs/2109.01831>

Classical and Quantum Algorithms for Orthogonal Neural Networks

ARXIV PREPRINT

June, 2021

- The preprint is available at <https://arxiv.org/abs/2106.07198>

Towards an Open-source Software Platform for Numerical Key Rate Calculation of General Quantum Key Distribution Protocols

Amsterdam, Netherlands

POSTER PRESENTED AT QCRYPT, 2020

August, 2020

- The poster is available at <https://2020.qcrypt.net/posters/QCrypt2020Poster139Wang.pdf>

Quantum Protocol Zoo

Barcelona, Spain

PRESENTED AT QTech, 2020

November, 2020

- The abstract is available at https://www.premc.org/doc/QTech2020/QTech2020_Book_Of_Abstracts.pdf

Honours & Achievements

- 2021 **USEQIP**, Selected among top 30 individuals from the world by IQC, UWaterloo consecutively twice
- 2020 **USEQIP & URA**, Selected among top 30 individuals from the world by IQC, UWaterloo
- 2017 **Aditya Birla Scholarship Programme**, Shortlisted among 30 students from various IITs for 2017-18 Awards
- 2017 **All India Rank - 348**, JEE Advanced, administered by Indian Institutes of Technology
- 2017 **All India Rank - 231**, JEE Main, taken by more than a million students.
- 2017 **All India Rank - 114**, KVPY, administered by Indian Institute of Science.

Grants, Fundings, Fellowships

- 2022 **EUR QuanTech Fellowship**, Fellowship for M2 internship by Université Paris Cité
- 2020 **Unitary Fund**, Granted funding for developing open source Quantum Machine Learning teaching material.

Skills

Programming Languages	Python, C++, MATLAB, Q#, JAVA, C
Packages and Environments	Qiskit, Numpy, IBMQ Experience, JAX
Utilities	Git, Linux Shell, Vim, Jupyter

Extracurricular Activity

Quantum Computing Group, IIT Roorkee

Roorkee, India

FOUNDER, CORE MEMBER, SECRETARY FOR THE TERM 2020-21

2020 - 2021

- Established the Quantum Computing reading group under ACM Student Chapter, IIT Roorkee.
- Conducted QC discussions on various topics from the basics to the advanced.
- Mentored beginners in the field to explore the various topics systematically.

Geek Gazette

Roorkee, India

EDITOR AND PRESIDENT FOR THE TERM 2019-20

2017 - 2021

- Official Tech Magazine based in IIT Roorkee.
- Managed a group of 80 students divided into four diversely functional cells - Editorial, Design, Finance and Web.
- Written and edited articles and interviews for 6 issues of the magazine and the *website*.

Student Mentorship Programme

Roorkee, India

MENTOR

2019 - 2020

- Personally mentored five freshmen from the CS Department.
- Individually guided them through personal and academic problems for the entire year.

Dramatics Section, IIT Roorkee

Roorkee, India

DRAMATIST

2017 - 2018

- Performed one Stage Play and acted as non cast member for three stage and street plays.

Programming and Algorithms Group

Roorkee, India

PROGRAMMER

2017 - 2018

- Member of the Competitive Coding club based in IIT Roorkee.

References

Prof. Iordanis Kerenidis

iordanis.kerenidis@qcware.com

Prof. Elham Kashefi

ekashefi@gmail.com

Prof. Norbert Lütkenhaus

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Prof. Sugata Gangopadhyay

sugata.gangopadhyay@cs.iitr.ac.in