Natansh **Mathur**

✉ nmathur@cs.iitr.ac.in | ⬚ nashmathur | in natanshmathur

Education

Université de Paris	*Paris, France*
PARISIAN MASTER OF RESEARCH IN COMPUTER SCIENCE (MPRI)	*2021 - Exp. 2022*

Indian Institute of Technology, Roorkee	*Roorkee, India*
BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE AND ENGINEERING	*2017 - 2021*

- CGPA: 9.538/10

LBS Senior Secondary School, Kota	*Kota, India*
GRADE 12 (SENIOR SECONDARY LEVEL)	*2017*

- Percentage: 95.2%

Nosegay Public School, Sri Ganganagar	*Sri Ganganagar, India*
GRADE 10 (SECONDARY LEVEL)	*2015*

- CGPA: 10/10

Experience

QC Ware Corp.	*Paris, France (Remote)*
RESEARCH ASSISTANT	*August, 2020 - PRESENT*

- Research Assistant under the guidance of Prof. Iordanis Kerenidis.
- Provided QML research consultancy and services to Hoffmann-La Roche.

Quantum Open Source Foundation	*Online*
MENTOR	*September, 2021 - January, 2022*

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

IRIF, CNRS and University of Paris	*Paris, France (Remote)*
RESEARCH INTERNSHIP	*August, 2020 - December, 2020*

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

Institute for Quantum Computing, University of Waterloo	*Waterloo, Canada (Remote)*
UNDERGRADUATE RESEARCH ASSISTANT	*April, 2020 - July, 2020*

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

LIP6, CNRS and Sorbonne University	*Paris, France*
RESEARCH INTERNSHIP	*May, 2019 - July, 2019*

- 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.

Information Management Group, IIT Roorkee	*Roorkee, India*
CHIEF OF RESEARCH AND DEVELOPMENT	*January, 2018 - June, 2021*

- 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.

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

PART OF RESEARCH ASSISTANTSHIP AT IQC, UWATERLOO

Waterloo, Canada (Remote)

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

PART OF RESEARCH INTERNSHIP AT LIP6, PARIS

Paris, France

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.veriqloud.fr*.

Linear Cryptanalysis of Substitution-Permutation Network

SUMMER PROJECT

Roorkee, India

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

POSTER PRESENTED AT QCRYPT, 2020

Amsterdam, Netherlands

August, 2020

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

Quantum Protocol Zoo

PRESENTED AT QTECH, 2020

Barcelona, Spain

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

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, Django, Android Studio, SQL
Utilities	Git, Linux Shell, Vim, Jupyter
Relevant Courses (online)	Quantum Information Science, Quantum Cryptography, Quantum Machine Learning (All Audited)
Relevant Courses (offline)	Mathematics-I (Linear Algebra and Calculus), Optimisation Techniques, Quantum Computing, Discrete Structures, Design and Analysis of Algorithms, Theory of Computation, Machine Learning Computational Complexity Theory, Introduction to Probability

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 'geeky' people 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. Norbert Lütkenhaus
lutkenhaus.office@uwaterloo.ca

Prof. Elham Kashefi
ekashefi@gmail.com

Prof. Sugata Gangopadhyay
sugata.gangopadhyay@cs.iitr.ac.in