

# Natansh Mathur

QUANTUM INFORMATION SCIENCE ENTHUSIAST

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*“Do not go gentle into that good night. Rage, rage against the dying of the light.”*

## Summary

A curious computer scientist in making trying to find answers and solutions for problems in quantum information science. Familiar with quantum computing, quantum communications and cryptography, quantum machine Learning and optimisation, and fundamentals of computer science. Easily excited by mathematics, music, and tea.

## Education

### Indian Institute of Technology, Roorkee

Roorkee, India

B.TECH. IN COMPUTER SCIENCE AND ENGINEERING

2017 - Exp. 2021

- CGPA: 9.472/10

### 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

### Institute for Quantum Computing, University of Waterloo

Waterloo, Canada

UNDERGRADUATE RESEARCH ASSISTANT

April, 2020 - July, 2020

- Remote Research Assistant under the guidance of Prof. Norbert Lutkehaus.
- Associated with Optical Quantum Communication Theory Group
- Contributed to the development of the Numerics Software toolbox for calculating key rates. (To Be Released Soon).

### LIP6, CNRS and Sorbonne Université

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
- Contributed to the development of the Quantum Protocol Zoo ([wiki.veriqcloud.fr](http://wiki.veriqcloud.fr)).

### Information Management Group, IIT Roorkee

Roorkee, India

CHIEF OF RESEARCH AND DEVELOPMENT

January, 2018 - PRESENT

- 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

### Numerical key rate calculator for QKD Protocols

Waterloo, Canada

PART OF RESEARCH ASSISTANTSHIP AT IQC, UWATERLOO

April, 2020 - July, 2020

- Contributed to the development of the architecture and wrote protocols fitting into it.
- Wrote unified algorithms to perform parameter optimisation for various QKD Protocols using numerical methods and optimisation techniques.
- Software to be released soon in the public domain.

### 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/index.php?title=Graphs](http://wiki.veriqcloud.fr/index.php?title=Graphs).

## 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

### 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

TO BE PUBLISHED IN QTech, 2020

Barcelona, Spain  
November, 2020 (Exp.)

- The abstract is available at [https://www.premc.org/doc/QTech2020/QTech2020\\_Book\\_Of\\_Abstracts.pdf](https://www.premc.org/doc/QTech2020/QTech2020_Book_Of_Abstracts.pdf)

## Honours & Achievements

- 2020 **USEQIP**, Selected among top 30 individuals from the world by IQC, UWaterloo
- 2017 **Aditya Birla Scholarship Programme**, Shortlisted 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.

## Skills

<b>Programming Languages</b>	Python, MATLAB, C++, Q, JAVA, C
<b>Packages and Environments</b>	Qiskit, IBMQ Simulator, Django, Android Studio, SQL, Numpy
<b>Utilities</b>	Git, Linux Shell, Vim
<b>Relevant Courses (online)</b>	Quantum Information Science, Quantum Cryptography, Quantum Machine Learning
<b>Relevant Courses (offline)</b>	Mathematics-I (Linear Algebra and Calculus), Optimisation Techniques, Quantum Computing, Discrete Structures, Design and Analysis of Algorithms, Theory of Computation

## Extracurricular Activity

### Geek Gazette

EDITOR AND PRESIDENT FOR THE TERM 2019-20

Roorkee, India  
2017 - PRESENT

- Official Tech Magazine based in IIT Roorkee.
- Manage a group of 80 'geeky' people divided into four diversely functional cells - Editorial, Design, Finance and Web.
- Written and edited articles and interviews for 4 issues of the magazine and the *website*.

### Dramatics Section, IIT Roorkee

DRAMATIST

Roorkee, India  
2017 - 2018

- Performed Stage Play and acted as non cast member for 3 stage and street plays.

### Programming and Algorithms Group

PROGRAMMER

Roorkee, India  
2017 - 2018

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

## References

### Dr. Elham Kashefi

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CNRS, LIP6, Sorbonne Universite  
Professor of Quantum Computing  
School of Informatics, University of Edinburgh  
Associate Director  
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### Dr. Sugata Gangopadhyay

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