Niraj Kumar

Quantum Information Researcher & Data Analyst

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Education

2019–present **Post-Doctoral Researcher**, *School of Informatics, University of Edinburgh*.

2015–2018 **Ph.D. Researcher**, *Sorbonne Université, Paris*.

2009–2014 **Integrated Bachelors & Masters in Physics**, *Indian Institute of Technology (IIT), Kanpur*, **GPA:** 8.1/10.

Work Interests

Hardware Photonics based quantum computing,

Theory Quantum computation, Quantum networks and Internet, Quantum cryptography, Quantum verification and authentication

Expertise

Laboratory Fiber optics, Interfacing optics with electronics, Signal synchronisation.

Tools Semi-definite programming, Linear optimization.

Languages C, C++, Python, Matlab, R.

Design Autodesk Inventor, Blender

Recognition and Awards

2018 News coverage by **Quanta magazine** and **Wired magazine** for performing the first *Milestone Experiment Proves Quantum Communication Really Is Faster*.

2015 **EDITE** scholarship for PhD in Paris.

2012 **SURGE** research fellowship program by IIT Kanpur from May-July 2012.

2012 Quarter-final finish among more than 40 national teams in **ABU ASIA ROBOCON** robotics competition held at Pune, India during March 2012 .

Work Experience

2015–2018 **PhD Research**, *Sorbonne Université*.
Supervisors: Eleni Diamanti and Iordanis Kerenidis.
Topic: Design, analysis and photonic based implementation of communication complexity, cryptographic (quantum money) and computational based models.

2013–2014 **Master's Thesis**, *IIT Kanpur*.
Supervisor: Rajat Mittal.
Topic: Investigation of constraint satisfaction problems. Modelling it into non-local games to look for game structures that permit quantum advantage.

2013 **Researcher (Internship)**, *IRIF, Université Paris Didérot*.
Supervisors: Iordanis Kerenidis and Eleni Diamanti.
Topic: Design, analysis and photonic implementation of non-cooperative bayesian games which admits a higher payoff using quantum resources.

2012 **Researcher (Internship)**, *IIT Kanpur*.
Supervisor: Debabrata Goswami.
Design of a quantum oracle based algorithm to solve a maze with an exponential population in polynomial steps.

Journal Publications

2019 **N. Kumar**, I. Kerenidis, E. Diamanti *Experimental demonstration of quantum advantage for one-way communication complexity surpassing best-known classical protocol*. Nature Communications vol. 10, Article number: 4152

2019 **N. Kumar** *Practically feasible robust quantum money with classical verification*. arXiv preprint:1908.04114

2019 F. Centrone, **N. Kumar**, E. Diamanti, I. Kerenidis. *Quantum communication advantage with coherent states and one beam splitter*. Quantum Information and Measurement

2017 **N. Kumar**, E. Diamanti, I. Kerenidis, *Efficient quantum communications with coherent state fingerprints over multiple channels*, Phys. Rev. A 95, 032337.

2015 A. Pappa, **N. Kumar**, T. Lawson, M. Santha, S. Zhang, E. Diamanti, I. Kerenidis, *Non-locality and conflicting interest games*, Phys. Rev. Lett. 114, 020401.

2013 **N. Kumar**, D. Goswami, *Quantum algorithm to solve a maze*, arxiv:1312.4116.

Conferences

Talks QCrypt 2019, Montreal, Canada.
Challenges in Quantum Information Science (CQIS) 2018, $Tokyo$, $Japan$.
GdR IQFA 6^{th} colloquium 2015, $Palaiseau$, $France$.
Journées Informatique Quantique 2015, $Grenoble$, $France$.
Quantum Information Processing & Communication 2015, $Leeds$, $England$.
QuPa 2015, $Paris$, $France$.

Poster GDR IQFA 2017, $Nice$. QCrypt 2017, $Cambridge$. TQC 2016, $Berlin$. YQIS 2015, $Palaiseau$. AQIS 2013, $Chennai$.

Languages

English **Fluent**
Hindi **Native Speaker**
French **Intermediate**

Interests

Robotics Automated Bots, Drones, Swarm Bots
Cryptocurrency Bitcoin, NEX-ICO
Sport Lawn tennis player with 6+ years experience