Ashish Panigrahi

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About me

I am a 3^{rd} year physics student studying at the **National Institute of Science Education and Research, Bhubaneswar, India**. I am interested in quantum physics & quantum computing with its application in the field of science and technology.

Nationality: Indian

Education

- **National Institute of Science Education and Research** Bhubaneswar, India
  Integrated Master's (CGPA till 4^{th} semester: 9.30/10.0) *2018 - 2023*
  - Major in physics with a minor in computer science.
  - Relevant coursework:
    - Physics:
      - Theory - Quantum mechanics, Classical mechanics, Statistical mechanics, Electromagnetism, Special Theory of relativity, Nuclear & particle physics.
      - Labs - Computational Lab, Electronics Lab, Modern Physics Lab.
    - Mathematics: Mathematical methods, Set Theory, Real Analysis.
    - Computer Science: Theory of Computation, Discrete Structures (Combinatorics & Graph theory), Design and Analysis of Algorithms, Programming & Data structures lab.
- **Maharishi Vidya Mandir Senior Sec. School** Chennai, India
  All India Senior Secondary Certificate Examination (CBSE) - 95.6% *May 2018*
  - Subjects taken: Physics, Mathematics, Chemistry, Computer Science, English.
  - Received a perfect score in Computer Science (Object Oriented Programming in C++).
- **PSG Public School** Coimbatore, India
  All India Secondary School Examination (CBSE) - CGPA 10 *May 2016*
  - Subjects taken: Science, Mathematics, Social Sciences, English, Hindi.

Honors/Awards

- **National Graduate Physics Examination** (*National topper*) 2020
  Indian Association of Physics Teachers
  - Secured a score among the top 118 students in the country.
- **Department Topper** (1^{st} & 2^{nd} *year*) 2018-2020
- **Kishore Vaigyanik Protsahan Yojana** 2017
  Indian Institute of Science *Bengaluru, India*
  - A prestigious fellowship program funded by the *Department of Science and Technology* of the Government of India.
- **National Talent Search Examination** 2016
  National Council of Education Research and Training *New Delhi, India*
  - A national level scholarship program offered by the Government of India.
  - It is one of the oldest and most prestigious scholarship programmes in the country.

Academic exposure

- **Quantum Winter Hackathon** Virtual
  BosonQ Psi, Quantum Computing India *December 2020*
  - A month long hackathon involving the discretization of 1D wave equation using implicit time integration scheme. Also showed the speedup between classical approach and quantum implementation using HHL algorithm.
  - Scored among the top 10 teams around the world.

- **IBM Quantum Challenge (Fall)** Virtual
  IBM *November 2020*
  - A 3 week competition which involved solving puzzles of varying difficulty level using Grover's algorithm and implemented using Qiskit.

- **Global Quantum Programming Workshop** Virtual
  QWorld *November 2020*
  - A 5-day workshop introducing the basics of quantum computing, with hands-on coding exercises using Qiskit.
  - Cleared the quizzes and received a diploma for the same.

- **Qiskit India Challenge** Virtual
  IBM Quantum *September 2020*
  - A 2 week hackathon which involved the basics of programming quantum circuits using Qiskit.
  - The final challenge involved the implementation of a *variational quantum classifier* (VQC) to separate the digits '4' and '9' from an MNIST dataset through machine learning. My team achieved an overall model accuracy of 79.6%.

- **Mini School on quantum machine learning** South Africa
  National Institute for Theoretical Physics *September 2020*
  - A 4 week summer school involving lectures by Amira Mahomed Abbas on the fundamentals of quantum machine learning through Qiskit and PennyLane.
  - Scored above 90% in the 2 quizzes held during the school to qualify for a certificate.

- **Qiskit Global Summer School** Virtual
  IBM Quantum *July-August 2020*
  - An intensive 2 week virtual summer school on quantum computation and designing quantum circuits and algorithms using Qiskit.
  - Did hands-on coding exercises to learn various quantum algorithms, pulse level control of qubits and concepts in quantum chemistry.
  - Also did a project on simulating the ground energy level of LiH molecule using quantum variational eigensolver.

- **National Initiative on Undergraduate Science (Physics)** Mumbai, Maharashtra
  Homi Bhabha Centre for Science Education, TIFR *June 2019*
  - Selected as one of top 70 students in the country to participate in this camp.
  - An extensive 12-day course containing lectures, independent lab work and a field trip for 2 days.
  - Lecture series on quantum mechanics, quantum information theory and quantum computation, basic condensed matter physics, many body physics, astronomy and astrophysics.
  - About 30 hours of independent lab work.
  - Field trip to *Giant Meterwave Radio Telescope (GMRT)* and *National Centre for Radio Astrophysics (NCRA)*.

- **National Science (VIJYOSHI) Camp** Bengaluru, Karnataka
  Indian Institute of Science *December 2018*
  - 3 day science camp organized by the *Institute of Science* and constituting of lecture series on scientific research.

Academic experience

- **Classification of quantum correlations and channels** Remote
  Bose.X (bosex.org) *December 2020 - Present*
  - Working on understanding induced quantum correlations under noisy environments and classification schemes with its application in quantum optics.
  - **Software used:** PIQS, QuTiP
- **Summer Project on Anisotropic Magnetoresistance** Bhubaneswar, India
  Institute of Physics, Bhubaneswar *May - June 2019*
  - Project guide: Dr. Debakanta Samal, Reader-F, Institute of Physics
  - Topics covered: Origin of magnetoresistance, theory of magnetoresistance in real metals using the 2-band charge carrier model, origin of anisotropic magnetoresistance, its applications and current research scenario in the field.

Open-source contributions

- **Qiskit Textbook** GitHub
  Learn Quantum Computation using Qiskit *April 2020 - Present*
  - Qiskit is IBM's software development kit for building software to interact with IBM's quantum devices and OpenQASM.
  - The textbook is equivalent to a university level course for learning quantum computation and beyond.
  - I have been an active contributor to this project with over 30+ commits since April 2020.

Licenses & Certifications

- **Certificate of Recognition** BosonQ Psi
  BosonQ Psi, QCI, ISCFD *December 2020*
  - In recognition of exemplary performance at "Quantum Winter Hackathon 2020".
  - Scored among the top 10 teams from around the world.
- **Challenge Fall 2020 Achievement - Intermediate** IBM
  IBM Quantum *December 2020*
  - Demonstrated an ability to implement near-future quantum data structures and design a quantum game solver using Grover's algorithm.
  - Showed an understanding of quantum circuits, the gates that comprise such circuits, Grover's algorithm, and qRAM (quantum random access memory) as a way to implement complex data structures.
- **Certificate of Quantum Proficiency** IBM
  IBM Quantum *September 2020*
  - For demonstrating an applied understanding of the basics of Quantum Computing using Qiskit, plus the ability to apply and experiment with classical machine learning techniques and the *Variational Quantum Classifier* (VQC) algorithm.
- **CS-191x: Quantum Mechanics and Quantum Computation** edX
  University of California, Berkeley *August 2020*
  - Coursework involved ranging from the basics of the qubit to quantum algorithms such as Grover's, Shor's etc. to the Bloch sphere and Schrödinger's wave equation.
  - Final score: 97%
- **Certificate of Quantum Excellence** IBM
  IBM Quantum *July 2020*
  - Received for demonstrating applied understanding and comfort with and about Quantum Computing using Qiskit.

Volunteering

I have worked under the **Avanti Fellows** NGO programme during the months January-April 2019 as a mentor. My weekend work involved having a one-to-one discussion with students of classes XI and XII of **Jawahar Navodaya Vidyalaya** (JNV) **Dhenkanal, Odisha, India**.

Technical skills

Programming and scripting languages

C, C++, Shell scripting, R and Python (Libraries: *Scipy*, *Numpy*, *Matplotlib*, *Sympy*)

Markup languages

LaTeX, Markdown, Groff, HTML

Quantum Frameworks

Qiskit, PennyLane, QuTiP

General computing literacy

Proficient in operating GNU/Linux (includes Debian and Arch Linux derivatives) & Windows, terminal commands, **tmux** multiplexer, gnuplot and **Vim** text editor. I also have a working knowledge of **Git**, a version control system.