

Ashish Panigrahi

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About me

I am a 4th year physics student studying at the *National Institute of Science Education and Research, Bhubaneswar, India*. My research interest lies in the experimental aspects of quantum information processing, specifically in quantum photonics investigating photon-photon and spin-photon entanglement using various quantum systems for applications in quantum technologies.

Nationality: Indian

Education

- **National Institute of Science Education and Research (NISER)** Bhubaneswar, India
Integrated Master's (Current CGPA: 9.16/10.0) 2018 - 2023
 - Major in physics with a minor in computer science.
 - Relevant coursework: Quantum Mechanics, Classical Mechanics, Statistical Mechanics, Electromagnetism, Mathematical Methods, Condensed Matter Physics, Quantum Optics, Quantum Information and Computation, Experimental Techniques, Non-linear Optics & Lasers, Computational Physics, Cryptography, Machine Learning.
- **Maharishi Vidya Mandir Senior Sec. School** Chennai, India
All India Senior Secondary Certificate Examination (CBSE) - 95.6% May 2018
- **PSG Public School** Coimbatore, India
All India Secondary School Examination (CBSE) - CGPA 10 May 2016

Project Experience

- **Research Assistantship** Bhubaneswar, India
Ultrafast TeraHertz Dynamics Group, NISER December 2021 - Present
 - Project guide: Dr. Shovon Pal, Assistant Professor, NISER; Adjunct Advisor of Dept. of Materials Science, ETH Zürich.
 - Currently working on understanding electrodynamics and band structures in semiconductor heterostructures specifically GaAs quantum dots for tailoring quantum optical phenomena.
- **Computational Project & Term Paper** Bhubaneswar, India
Semester VII August - December 2021
 - Worked on a computational project on the simulation of surface plasmon resonance in one-dimensional photonic crystals as part of the coursework for P441/P442 openlab course. The relevant code was written in pure Julia.
 - Worked separately on a term paper titled "*Fabrication and Characterization of Photonic Crystals*" as part of the coursework for the P473 Experimental Techniques elective course.

- **Semester Project**
Superconducting Spintronics Group, NISER

Bhubaneswar, India
April - July 2021

 - Project guide: Dr. Kartikeswar Senapati, Reader-F, NISER.
 - Worked on a semester project on the topic, “Study of spin current in NM/HM bilayer and trilayer systems”.
 - The goal was to analyse and be able to detect spin current emerging from a trilayer system involving a layer of Cu sandwiched between two layers of Pt. The idea was to supply through one end of the H-bridge sample, an electric current which would then get converted to spin current via the spin Hall effect and to measure this spin current via a simple non-local electrical measurement at the other end of the sample. On this end, the electric current which originated from the back-conversion of the spin current via the inverse spin Hall effect is measured via a micro-voltmeter.
 - Through the project, I obtained hands on experience with experimental techniques such as UHV systems, magnetron sputtering and focused ion beam.
- **Software Developer Internship**
Quantum Brilliance

Australia
February - April 2021

 - Project guide: Dr. Nariman Saadatmand, QBQE Product Manager.
 - Initially worked on language parsers especially the Earley parser for its use in natural language processing as a potential quantum application. Later transferred to the emulator division, where I worked on the quantum brilliance quantum emulator (QBQE) and enhanced the functionality of its QAOA (Quantum Approximation Optimization Algorithm) module. The relevant code was written in C++.
- **Summer Project**
Institute of Physics, Bhubaneswar

Bhubaneswar, India
May - June 2019

 - Project guide: Dr. Debakanta Samal, Reader-F, Institute of Physics.
 - Did a reading project on “Study on Anisotropic Magnetoresistance”.
 - 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.

Honors/Awards

- **IBM Qiskit Advocate**
IBM Quantum

2021

 - Selected from a global pool of applicants.
 - This achievement depicts a deep level of understanding with Qiskit including circuits, algorithms, simulators, qubits and noise.
 - Through my contributions to the Qiskit and the quantum community, I have demonstrated an ability and commitment to educate and influence others by sharing ideas, knowledge and expertise in the field of quantum computing.
- **Zonal Topper**
Mimamsa 2021

2021
IISER Pune

 - Science quiz competition for undergraduates with participations from universities all over the country.
 - Our team became the zonal topper for the *Odisha and Paschim Medinipur district (WB) zone*.

- **National Topper** 2020
National Graduate Physics Examination

 - A country-wide competitive examination conducted by the *Indian Association of Physics Teachers* for students pursuing a bachelors in physics.
 - Secured a score within the top 1% in the country.
- **Department Topper** (1st & 2nd year) 2018-2020
School of Physical Sciences, NISER

 - Scored the highest grade in my department for four consecutive semesters (fall 2018, spring 2019, fall 2019, spring 2020).
- **INSPIRE Fellowship** 2018
Department of Science and Technology, Govt. of India

 - Eligible for this prestigious fellowship by the Department of Science and Technology, Government of India.
 - Awarded to the top 1% students at their higher secondary (+2) level, for those pursuing a bachelors in basic sciences.
- **Kishore Vaigyanik Protsahan Yojana (KVPY) Fellowship** 2017
Indian Institute of Science *Bengaluru, India*

 - A prestigious fellowship program funded by the *Department of Science and Technology*, Government of India.
 - Cleared the written examination (stage I) and an interview (stage II) to receive the fellowship.
- **National Talent Search Examination (NTSE) Scholarship** 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

- **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 variational quantum 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.
 - Performed around 30 hours of independent lab work.

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 am a collaborator for this project and have actively contributed with over 50+ commits since April 2020.

Licenses & Certifications

- **IBM Certified Associate Developer** IBM
Quantum Computation using Qiskit v0.2X July 2021
 - This certification demonstrates fundamental knowledge of quantum computing concepts and the ability to express them using the Qiskit open source software development kit (SDK).
 - Shows experience in using the Qiskit SDK from the Python programming language to create and execute quantum computing programs on IBM Quantum computers and simulators.
- **Introduction to Quantum Computing Course** Qubit by Qubit
IBM Quantum & The Coding School October 2020 - May 2021
 - Developed a foundational understanding of quantum computing, with topics including introductory linear algebra, coding with Qiskit, quantum mechanics, quantum algorithms, and quantum applications.
- **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.
- **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%

Volunteering

- **Project Lovelace**
Scientific Programming Problems May 2021 - Present
 - Project Lovelace is a platform to learn science through programming.
 - Member of the team to add new problems and maintain the website (both frontend and backend).

- Website: <https://projectlovelace.net>
- **Full-Stack Quantum Computation**
Community-driven, Opensource Education Resources *December 2020 - Present*
 - Part of the team as a curator of various articles on quantum technologies, submitted by volunteers.
 - Website: <https://fullstackquantumcomputation.tech>
- **Volunteer**
NISER Open Day *April 2019*
 - Outreach programme for depicting the wonders of science to school students from grades 9 to 12.
 - I was involved in the demonstration of plasma generation using grapes and a microwave oven as part of our team's project.
- **Mentor**
Avanti Fellows NGO *January - April 2019*
 - Duties included mentoring students from grades 11 and 12.
 - My weekend work involved having a one-to-one discussion with students on physics and general advice on entrance exams.

Technical Skills

Programming and scripting languages

Python (Libraries: *Scipy*, *Numpy*, *Matplotlib*), Julia, C/C++, Bash

Markup languages

\LaTeX , Markdown, Groff, HTML

General computing tools

Git, GitHub, vim, tmux, gnuplot, unix-shell

References

1. **Dr. Shovon Pal**, *Ultrafast TeraHertz Dynamics Group*
 - Assistant Professor of Physics at NISER, Bhubaneswar;
Adjunct Advisor of Department of Materials Science at ETH Zürich, Switzerland.
 - Email: shovon.pal@niser.ac.in, shovon.pal@mat.ethz.ch
2. **Dr. Pratap Kumar Sahoo**, *Ion Beam & Nanomaterials Laboratory*
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