

# Ashish Panigrahi

🌐 <https://ashishpanigrahi.xyz>

✉ [ashish.panigrahi@niser.ac.in](mailto:ashish.panigrahi@niser.ac.in) · 🌐 [paniash](#) · in [ashish-panigrahi99](#)

## About me

---

I am a 4<sup>th</sup> 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.
- **P443/P444 OpenLab Project** Bhubaneswar, India  
*Semester VII* January - May 2022
  - Undertook a joint project with a colleague as part of the coursework for the P443/P444 laboratory course.
  - Worked and built a working Nd:YAG solid-state laser with light emission at a wavelength of 1064 nm.
  - The setup involved an optical rail, onto which a diode laser source, the Nd:YAG crystal, along with necessary optical components such as a collimator, focussing lens, DBR reflector mirror (for constructing an optical resonator cavity) were placed.

- Studied various properties of the Nd:YAG crystal such as the lifetime of the metastable energy state which is responsible for the lasing 1064 nm emission.
  - Also explored other nonlinear phenomena such as second harmonic generation (SHG) using a Cr:YAG crystal which gave a light emission at a wavelength of 532 nm.
- **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** Bhubaneswar, India  
*Superconducting Spintronics Group, NISER* *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** Australia  
*Quantum Brilliance* *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** Bhubaneswar, India  
*Institute of Physics, Bhubaneswar* *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** 2021  
*IBM Quantum*
  - 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** 2021  
*Mimamsa 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** (1<sup>st</sup> & 2<sup>nd</sup> 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**

*IBM Quantum*

Virtual

*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)**

*Homi Bhabha Centre for Science Education, TIFR*

Mumbai, Maharashtra

*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**

*Learn Quantum Computation using Qiskit*

[GitHub](#)

*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**

*Quantum Computation using Qiskit v0.2X*

IBM

*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**

*IBM Quantum & The Coding School*

Qubit by Qubit

*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 Quantum*

IBM

*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** May 2021 - Present  
*Scientific Programming Problems*
  - 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** December 2020 - Present  
*Community-driven, Opensource Education Resources*
  - Part of the team as a curator of various articles on quantum technologies, submitted by volunteers.
  - Website: <https://fullstackquantumcomputation.tech>
- **Volunteer** April 2019  
*NISER Open Day*
  - 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** January - April 2019  
*Avanti Fellows NGO*
  - 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

$\text{\LaTeX}$ , 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](mailto:shovon.pal@niser.ac.in), [shovon.pal@mat.ethz.ch](mailto:shovon.pal@mat.ethz.ch)
2. **Dr. Pratap Kumar Sahoo**, *Ion Beam & Nanomaterials Laboratory*
  - Associate Professor of Physics at NISER, Bhubaneswar.
  - Email: [pratap.sahoo@niser.ac.in](mailto:pratap.sahoo@niser.ac.in)
3. **Dr. Satyaprasad Senanayak**, *Nanodevice & Physics Laboratory*
  - Assistant Professor of Physics at NISER, Bhubaneswar.
  - Email: [satyaprasad@niser.ac.in](mailto:satyaprasad@niser.ac.in)

