

**Amit Rohan Rajapurohita**

# **Curriculum Vitae**

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## **Summary Statement**

I am a motivated Ph.D. student in Applied Physics at Cornell University with a strong interest in experimental quantum computing and materials research for next-generation qubits.

## **Education**

**Cornell University, Ithaca – Main Campus**

**Doctor of Philosophy,  
College of Applied Engineering Physics** Aug 2023 – Present

Purdue University, West Lafayette - Main Campus

**Bachelor of Science, Physics Honors** Aug 2019 – May 2023  
**Minors: Electrical Engineering, Computer**  
**Science and Entrepreneurship**  
**GPA: 3.9**

**VVS Sardar Patel Pre University College, Bengaluru**

**Grade 11 and 12 – Concentration in Physics,  
Chemistry, Mathematics and Electronics** **2017 - 2019**

## Positions

**Cornell University, Ithaca - Main Campus**

<b>Research Assistant</b>	Dept. of Electrical Engineering	With Prof. Debdeep Jena	Jan 2024 - Present
<b>Research Assistant (Rotation)</b>	Dept. of Applied Engineering Physics	With Prof. Peter McMahon	Aug 2023 – Jan 2024

Purdue University, West Lafayette - Main Campus

<b>OUR Scholar</b>	<b>Dept. of Physics</b>	<b>With Prof. Arnab Banerjee</b>	<b>Aug 2022 – May 2023</b>
<b>SURF Scholar</b>	<b>Dept. of Physics</b>	<b>With Prof. Arnab Banerjee</b>	<b>Summer 2022</b>

Research Assistant	Dept. of Physics	With Prof. Arnab Banerjee	Aug 2021 – May 2023
Research Assistant	Dept. of Physics	With Prof. Arnab Banerjee	Summer 2021
Research Assistant	Dept. of Physics	With Prof. Erica Carlson	Aug 2020 – May 2023
Teaching Assistant Grader	Dept. of Physics Dept. of Mathematics		Aug 2021 – May 2023 Aug 2021 – May 2023
Academic Tutor	Purdue Athletics		Jan 2021 – May 2021
Teaching Assistant	Purdue Polytechnic		Aug 2020 – Dec 2020
Physics Tutor	Dept. of Physics		Aug 2020 – May 2023

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## Coursework

AEP 5560	Graduate Electrodynamics (Prof Gennady Shvets)
ECE 5350	Quantum Physics of Semiconductor Materials and Devices (Prof Debdeep Jena)
PHYS 6500	Advanced Physics Laboratory (Prof Jie Shan)
ECE 5360	Semiconductor Device Physics (Prof Debdeep Jena)
PHYS 6572	Graduate Quantum Mechanics (Prof Kin Fai Mak)
PHYS 41600	Statistical and Thermal Mechanics (Prof James P. Sethna)
PHYS 43100	Electricity and Magnetism 2 Honors
ECE 26400	Advanced C Programming
ENTR 48200	Venture Planning and Design
ECE 27000	Introduction to Digital System Design
PHYS 46100	Quantum Mechanics 2 Honors
PHYS 45000	Optics Laboratory
PHYS 43000	Electricity and Magnetism 1 Honors
PHYS 41100	Physical Mechanics 2 Honors
ECE 20002	Electrical Engineering Fundamentals 2
ECE 20008	Electrical Engineering Fundamental 2 Laboratory
CS 25100	Data Structures and Algorithms
PHYS 46000	Quantum Mechanics 1 Honors
PHYS 41000	Physical Mechanics 1 Honors
ECE 20001	Electrical Engineering Fundamentals 1
ECE 20007	Electrical Engineering Fundamental 1 Laboratory
CS 24000	Programming in C
STAT 30100	Elementary Statistical Methods
PHYS 42200	Waves and Oscillations
MA 26600	Ordinary Differential Equations
MA 26500	Linear Algebra
PHYS 34400	Modern Physics
PHYS 30600	Mathematical Methods of Physics
PHYS 34000	Modern Physics Lab
MA 26100	Multivariate Calculus
CS 18200	Discrete Mathematics in Computer Science
PHYS 27200	Electricity and Magnetism Interactions Honors
MA 16600	Analytic Geometry and Calculus 2
CS 18000	Object Oriented Programming in Java
PHYS 17200	Modern Mechanics Honors
MA 16500	Analytic Geometry and Calculus 1

ENTR 20000 Introduction to Entrepreneurship and Innovation  
ENTR 31000 Marketing and Management for new Ventures  
ENTR 48200 Venture Planning

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## Research

### Jena-Xing Lab – Prof Debdeep Jena – January 2023 to Present

*Title: Nitride based superconductor semiconductor devices*

- Established the complete measurement infrastructure for the quantum device subgroup, including setup and integration of the Bluefors LD-250 dilution refrigerator and all supporting instrumentation for DC and RF measurements of superconducting resonators, qubits, Josephson junctions (JJs), high-electron-mobility transistors (HEMTs), and resonant tunneling diodes (RTDs).
- Fabricated and characterized superconducting coplanar waveguide (CPW) resonators and Josephson junctions, focusing on material and process optimization to achieve high coherence and low loss.
- Investigated intrinsic and extrinsic loss mechanisms limiting superconducting lifetimes—including two-level system (TLS), vortex, dielectric, and piezoelectric losses—through resonator spectroscopy and quantitative modeling.
- Performed low-temperature RF and DC transport measurements down to the single-photon regime, probing superconducting resonators, qubits, and quantum transport in JJs, HEMTs, and RTDs within the dilution refrigerator environment.
- Experienced in S-parameter analysis and fitting techniques to extract internal ( $Q_i$ ), coupling ( $Q_c$ ), and loaded ( $Q_l$ ) quality factors, and to quantify loss mechanisms in superconducting CPW resonators.
- Fabricated and characterized GaN/AlN-based RTDs, analyzing magneto-transport behavior at both room and cryogenic temperatures.
- Project 1: Leading the effort to explore substrate-dependent loss mechanisms using Nb-based superconducting CPW resonators, encompassing material growth, device fabrication, and cryogenic measurement.
- Project 2: Leading the measurement and characterization of nitride-based molecular-beam-epitaxy-grown crystalline superconductors and Josephson junctions, with the goal of realizing the first nitride-material-based transmon qubit.
- Project 3: Contributing to the development of NbN–GaN hybrid superconducting devices, aiming to proximitize heavily n-doped GaN to create Josephson Junction Field-Effect Transistors (JJ-FETs) for use as quantum-limited cryogenic amplifiers.
- Experienced in semiconductor and superconducting device transport physics, with a strong foundation in charge carrier dynamics, quantum transport, and coherence phenomena.

- Implemented classical and quantum-mechanical simulation algorithms to quantitatively correlate experimental transport data with theoretical models.

### **McMahon Group – Prof Peter McMahon – Aug 2023 to Present**

*Title: 2-mode reservoir computing using transmon qubits.*

- Performed quantum simulation of spiral classification by a single mode quantum reservoir using qutip.
- Prepared a DC slot for the BlueFors dilution refrigerator to prevent thermal photons affecting the qubits from higher temperature plates in AutoCAD which resulted in 15% better T1 time of the qubit.
- Performed simulations on engineering pulses in the frequency domain for custom POVM measurement for parity in transmon qubits.

### **Carlson Group – Prof Erica Carlson – Aug 2020 to May 2023**

*Title: Macroscopic resistance of Vanadium Dioxide during temperature driven metal insulator phase transition.*

- Collaborated closely with experimental collaborators at ESPCI Paris to design and perform the experiment.
- Applied machine learning and image processing techniques to convert experimentally obtained optical data into numerical data set for analysis.
- Developed a Java based algorithm which uses surface images of VO<sub>2</sub> obtained from optical microscopy techniques and calculates its macroscopic resistance adopting Bond Propagation Algorithm.
- Performed simulations of the phase transition to obtain microscopic resistance values and percolation threshold using the 2-Dimensional Random Field Ising Model.
- Applied data analytic techniques such as logarithmic binning, approximation, constrained curve fitting, and graphing using Mathematica, SPSS and Microsoft Excel.

### **Banerjee Lab – Prof Arnab Banerjee – April 2021 to May 2023**

*Title: Realization of  $\alpha$ -RuCl<sub>3</sub> magnetic Josephson Junction*

- Lead the efforts with engineers from Oxford Instruments in planning out and installation of USA's first Proteox MX Dilution Refrigerator with a 14 Tesla magnet in our new lab during the summer of 2021.
- Developed strong knowledge in the working of the dilution refrigerator and various hall effect measurement techniques.
- Headed the project to develop a LabView code to interface the dilution refrigerator and all the other data measurement instruments for robust data collection, storage and remote access.
- Got funded by Purdue Engineering as Summer Undergraduate Research Fellow 2022 to continue this research for the summer.
- Got funded for the academic year 2022-2023 by the College of Science as an Office of Undergraduate Research (OUR) scholar to continue.

- Developed strong skill set in milliKelvin electronics, RF circuitry, wiring, testing and debugging the dilution refrigerator.
  - Initiated collaboration with a post-doc from Prof Michael Manfra's group to learn fabrication techniques involving Quantum Spin Liquid candidates and superconductors to build Josephson Junctions.
  - Assisting graduate students in building electronic circuits to measure temperature characteristics of Kitaev Quantum Spin Liquid candidates.
  - Performing the installation and testing of Quantum Design – Superconducting Quantum Interference Device (SQUID) inside the dilution refrigerator.
  - Trained in lab, gas, cryogenic, machine shop, hazardous materials, clean room and fabrication safety.
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## Posters and Presentations

- Poster presentation – “Development of the bond propagation algorithm” – Purdue Undergraduate Research Symposium - Summer 2021.
  - Poster presentation – “Calculating temperature independent macroscopic resistance of Vanadium Dioxide using the bond propagation algorithm” – Purdue Undergraduate Research Symposium – Oct 2021.
  - Poster presentation – “Macroscopic resistance of Vanadium Dioxide during temperature driven metal insulator phase transition” – American Physical Society March Meeting – Chicago – March 2022.
  - 15 min research talk - “Macroscopic resistance of Vanadium Dioxide during temperature driven metal insulator phase transition” – Purdue Undergraduate Research Symposium – April 2022.
  - 10 min research talk – “Road to realization of  $\alpha$ -RuCl<sub>3</sub> magnetic Josephson Junction” – Summer Undergraduate Research Symposium – Summer 2022.
  - Poster presentation – “Macroscopic resistance of Vanadium Dioxide during temperature driven metal insulator phase transition” – The Elmore ECE Emerging Frontiers Center: Crossroads of Quantum and AI
  - 15 min research talk - “Resistance avalanche analysis of Vanadium Dioxide during temperature driven metal insulator phase transition” – Purdue Undergraduate Research Symposium – Oct 2022.
  - Purdue Physics and Astronomy Departmental Poster Session - “Macroscopic resistance of Vanadium Dioxide during temperature driven metal insulator phase transition” – Oct 2022.
  - 15 min research talk – “Fabrication of  $\alpha$ -RuCl<sub>3</sub> magnetic Josephson Junction” – Purdue Undergraduate Research Symposium – March 2023.
  - 15 min research talk - “Resistance avalanche analysis of Vanadium Dioxide during temperature driven metal insulator phase transition” – American Physical Society March Meeting – Las Vegas – March 2023.
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## Other Skills / Certifications

Java Programming Masterclass  
Raspberry Pi Essentials  
The Complete Excel Course

Udemy  
Udemy  
Udemy

Python Programming Masterclass  
Programming with Arduino  
Microsoft Excel  
Microsoft PowerPoint  
Microsoft Word  
MATLAB  
C Programming

Udemy  
Purdue Milestones  
LinkedIn  
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## Clubs and Activities

### Undergraduate Physics Student Council (UPSC) – President

- Joined when the club was just formed and two semesters old.
- Reopened the library that was closed due to administrative issues and lack of funding for teaching assistants to hold review and help sessions.
- Created Purdue Undergraduate Mentorship Program (PUMP) where incoming freshmen can get mentored by juniors and seniors for better insight and customized help.
- Collaborating with faculty to bring changes in the physics curriculum to better serve students based on their feedback on classes.
- Assisted the academic advisors committee to create and deliver the freshmen seminar class effectively.

### Stallions Cricket Team – Captain

- Led the cricket team to its first maiden title in the intra Purdue League.
- Co-led the team to become runners up twice.
- Co-led the team to the playoffs every season.
- Created social events to build rapport within the team.
- Actively scouted for talent for the betterment of the team before every season.
- Joined the Purdue Cricket Team as a fast bowling all-rounder to play the Midwest Cricket Tournament.

### Purdue Old Masters – Student Host

- Got selected from more than 200 student leaders on campus to host some of the most distinguished Alumni at Purdue University.
- Hosted Michael Moses, the president of Virgin Galactic, for a three-day event.
- Acted as the connection between alumni, student leaders on campus and the faculty members.

### Society of Physics Students (SPS) – Member

- Involved in social and fun research activities.

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## Awards, recognition, and other achievements

- Rhodes Scholarship – 2<sup>nd</sup> Round Interview **2022**
- College of Science – Office of Undergraduate Research (OUR) scholarship **2022**
- College of Engineering – Summer Undergraduate Research Fellowship (SURF) **2022**
- Department of Physics and Astronomy – Junior of the year scholarship **2022**
- Most Valuable Player of the season – Purdue Cricket Club **2021**
- Best Bowler of the season – Purdue Cricket Club **2021**
- 11 Man of the Match awards **2019- present**