

# Parth Bhargava

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## EDUCATION

### National University of Singapore

Aug 2024 – May 2028

Bachelor of Science in Physics (Honors, Distinction)

GPA: 4.43

## EXPERIMENTAL PHYSICS

- Measured carrier mobility and type in semiconductors via Hall effect; cross-validated results through magnetoresistance analysis ( $R^2 > 0.99$ ); identified intrinsic transition temperature
- Determined lattice constants via X-ray diffraction with sub-2% accuracy; applied structural fingerprinting to identify unknown crystal phases; validated Kramers theory for bremsstrahlung cutoff
- Calibrated Helmholtz field configuration; validated five independent scaling laws ( $R^2 > 0.997$ ); quantified uncertainty in field constant to 3.3% through cross-method comparison
- Characterized electron spin resonance in paramagnetic systems; extracted g-factors and analyzed hyperfine interactions
- Analyzed laser light propagation through optical media; measured diffraction patterns and beam characteristics

## PROJECTS

### Quantum Wavepacket Visualization

Jan 2025 – Mar 2025

*Developed interactive visualizations of quantum phenomena in Python*

- 3D simulation of a quantum wavepacket traversing a potential barrier
- Quantum harmonic oscillator dynamics

## RELEVANT COURSEWORK & CAPABILITIES

### Mechanics:

Lagrangian and Hamiltonian formulations, coupled ODEs, variational principles

### Electromagnetism:

Maxwell's equations, boundary-value problems, vector calculus

### Quantum Mechanics:

Schrödinger equation, operator methods, eigenvalue problems

### Mathematical Methods:

Linear algebra, ODEs/PDEs, Fourier analysis, complex analysis

### Computation:

Python, Julia, C++; numerical methods, data analysis, visualization

### Experimental Methods:

Statistical analysis, uncertainty propagation, calibration, regression

## ACHIEVEMENTS

- BITSAT:** 321/390, strong proficiency in Physics, Chemistry, and Mathematics
- JEE Mains:** 99.14 percentile (Top 1% of 2 million candidates)
- JEE Advanced Rank:** 9112, exceptional problem-solving abilities
- Awarded Silver Medal in International Aerospace Olympiad 2024
- IISER Aptitude Test Rank:** 357

## INTERESTS

- Computational Physics and Machine Learning:** Physics-informed neural networks, scientific computing, and data-driven approaches to modeling complex physical systems
- Experimental and Theoretical Integration:** Laboratory techniques in condensed matter physics, instrumentation development, and bridging experimental data with computational models