

# Sumukh Vaidya

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Skills: Photonics, Optics, Python, PyTorch, LabVIEW, MATLAB, Instrument Automation, Nanofabrication.

## Education

- PhD, Physics. **Purdue University** (GPA 3.91/4.0). Advisor: Prof. Tongcang Li. 01/2021-05/2026
- B.Tech + M.Tech in Nanoscience. **IIT Bombay (IITB)**. Advisor: Prof. Dinesh Kabra. 2015-2020

## Publications ([Google Scholar](#))

- Single nuclear spin detection and control in a van der Waals material. [Nature](#) 2025
- Nanotube spin defects for omnidirectional magnetic field sensing. [Nature Communications](#) 2024
- Quantum sensing and imaging with spin defects in hexagonal boron nitride. [Adv. In Phys. X](#) 2023
- Nuclear spin polarization and control in hexagonal boron nitride. [Nature Materials](#) 2022

## Internship Experience

- Photonics Test Engineering Intern. **Applied Materials**, Santa Clara, California. 01/2026-04/2026
  - Performed statistical evaluation of photonics devices to support upcoming device development.
  - Used Python, Numpy and OpenCV for device characterization and evaluation of inter-device variations.
  - Sped up device measurement using Python, PyVISA and PySerial, improving measurement speeds by 2x.
- Display Hardware Engineering Intern. **Apple Inc**, Cupertino, California. 05/2024-08/2024
  - Conducted quantitative analysis of display luminance and color as part of Panel Process and Optics team.
  - Analyzed spectral data using Python, Pandas, Numpy and proposed new metrics to track panel defects.
  - Automated data collection and analysis workflows using Python for photometric and colorimetric characterization, integrating hardware interfaces for real-time measurement, reducing test time by ~50%.
- Visiting Student Researcher. **JPARC**, Tokai, Japan. 11/2017-12/2017
  - Developed trajectory tracking and anomaly detection algorithms leveraging signal processing to isolate noisy cosmic-ray events and enhance data quality.
  - Analyzed ~10k incident particles per second in real-time to detect trajectories for improved data acquisition.

## Work Experience

- Quantum Sensing and Photonics. **Purdue University**, PhD Thesis. 01/2021-Current
  - Research in quantum sensing and quantum memory based on 1D and 2D materials.
  - Integrated Python, LabVIEW, MATLAB for automated real-time control of laser confocal and RF systems.
  - Demonstrated 10x improvement in room-temperature 2D spin qubit coherence times via defect engineering.
  - Devised a high-vacuum ion implantation machine for next-generation solid state quantum emitters.
  - Worked with Toyota Research on development of power-efficient on-chip quantum sensors. ([link](#))
  - Performed COMSOL RF simulations for stripline waveguide design and optimizing S-parameters. ([link](#))
  - Used Tidy3d FDTD for inverse design of nanophotonic grating couplers for emitter- fiber coupling. ([link](#))
- Graduate Data Science Researcher. **Purdue University**, The Data Mine. 01/2024-04/2024
  - Collaborated with Howmet Aerospace on a ResNet-based computer vision model for detecting manufacturing defects using X-Ray scans, achieving accuracy of 94%.
  - Utilized Python and SQL to organize X-Ray datasets along with annotations to improve data consistency.
- Organic Semiconductor Imaging. **IIT Bombay**, Masters Thesis 07/2018-08/2020
  - Developed a real-time automated pipeline using Python and OpenCV for automated profiling of OLEDs, reducing manual effort and accelerating data acquisition rate by ~5x.
  - Performed time-series simulations of charge transport in organic semiconductors using MATLAB.
  - Designed and deployed the research group website using Jekyll. ([link](#))

## Skills

- **Programming:** Python, Machine Learning (PyTorch), MATLAB, LabView, LATEX, C++, Mathematica, Zemax OpticStudio, Comsol Multiphysics, Tidy3D FDTD, KLayout, FPGA, Git, GitHub.
- **Experimental:** Display Radiometry and Colorimetry, Lasers, Optical system design, Optical Measurements (Room and Low-Temperature), Ion Implantation, Nanofabrication, Instrument Automation, AFM, SEM, Confocal Microscopy, Photolithography, High-Vacuum systems, Raman Spectroscopy.