

Sumukh Vaidya

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Skills: Photonics, Optics, Tidy3d FDTD, COMSOL FEM, Instrument Automation, Nanofabrication.

Summary

- Researcher with 5+ years of academic experience in photonics, optics, programming and instrument control.

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

- **Display Hardware Engineering Intern.** *Apple Inc*, Cupertino, California. 05/24-08/24
 - Working with the Panel Process and Optics team on OLED display characterization.
 - Automated a setup for photometry, radiometry and colorimetry of thermal shifts in luminance and color.
 - Performed panel spectral analysis and color shift quantification.
 - Analyzed spectral data and proposed new metrics to track panel defects and drive development decisions.
- **Visiting Student Researcher.** *JPARC*, Tokai, Japan. 12/17
 - Implemented trajectory tracking algorithms for cosmic rays to reduce spurious noisy signals.
- **Visiting Summer Student Researcher.** *KEK*, Tsukuba, Japan. 05/17
 - Studied Photomultiplier tubes in simulated experimental conditions for the Muon g-2/EDM experiment.

Work Experience

- **Quantum Sensing and Photonics.** *Purdue University*, PhD Thesis. 01/21-Current
 - Research in quantum sensing and quantum memory based on 2D and 1D materials.
 - Python, LabVIEW, MATLAB programming for automated instrument control of laser and RF experiments.
 - Built confocal laser microscope for spin-qubit characterization at room and cryogenic temperatures.
 - Built a high-vacuum ion implantation machine for creating and studying solid state quantum emitters.
 - Worked with Toyota Research on development of on-chip quantum sensors for the real world. ([link](#))
 - Used COMSOL RF simulations for stripline waveguide design and optimizing S-parameters. ([link](#))
 - Used Tidy3d FDTD to design waveguide grating couplers for single photon emitter- fiber coupling. ([link](#))
- **Graduate Data Science Researcher.** *Purdue University*, The Data Mine. 01/24-04/24
 - Worked with Howmet Aerospace on an ML model for manufacturing defect inspection in X-Ray scans.
 - Built ML models with PyTorch to improve anomaly detection accuracy to 94% from 87% for humans.
- **Organic Semiconductor Imaging, Perovskite Solar Cell Fab.** *IIT Bombay*, Master's Thesis. 07/18-08/20
 - Fabricated next-gen Perovskite Solar Cells in a clean room environment.
 - Did MATLAB simulations of charge transport in organic semiconductors to study OLED efficiency.
 - Built an imaging setup for thin film organic semiconductors to determine photoemitter orientation.
 - Built and deployed the research group website using Jekyll. ([link](#))

Education

- **PhD, Physics.** Purdue University, Indiana (GPA 3.91/4.0) *Advisor: Prof. Tongcang Li.* 2021-2025
- **B.Tech + M.Tech in Nanoscience.** IIT Bombay (IITB), India. *Advisor: Prof. Dinesh Kabra* 2015-2020

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, RF circuits, Instrument Automation, Atomic Force Microscopy, Scanning Electron Microscopy, Confocal Microscopy, Photolithography, High-Vacuum systems, 2-D materials, Raman Spectroscopy.