Sumukh Vaidya

Purdue University | sumukhvaidya@gmail.com | linkedin.com/in/sumukhvaidya | sumukhvaidya.github.io
Skills: Photonics, Optics, Tidy3d FDTD, COMSOL FEM, OLED Display Metrology, 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 and MATLAB programming for automated 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.