

VARUN RAMAPRASAD

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PROFESSIONAL SUMMARY

- PhD physicist specializing in **computational and experimental photonics**, with expertise in optical system modeling, numerical simulation, and physics-based software workflows for complex electro-optical platforms.
- Experienced in developing **end-to-end simulation-to-experiment validation pipelines**, translating theoretical models into scalable computational tools and experimentally verified system insights.
- Strong record of **independent research, scientific publications, and cross-disciplinary collaboration**, addressing device-level imperfections, nonlinear effects, and system-level performance limits.

EDUCATION

PhD in Experimental Physics (Applied Optics & Quantum Materials), University of California San Diego	April 2026
MS in Physics, Indian Institute of Science, Education & Research, Kolkata (BS-MS CGPA 9.0/10)	June 2019
BS in Physics, Indian Institute of Science, Education & Research, Kolkata	June 2018

EXPERIENCE

Doctoral researcher UC San Diego, La Jolla CA, USA	Aug 2020 – Apr 2023, Apr 2024 – Present
<ul style="list-style-type: none">Designed and validated tunable infrared electro-optical systems using physics-based numerical optical simulations (FDTD / electromagnetic solvers) integrated with experimental validation.Developed a LiNbO₃-based optical source and beam-shaping module using diffractive phase-front engineering, integrating optics, detectors, and electronics into a repeatable test platform for spatial and spectral characterization.Built bench-top optical characterization systems using IR sources, modulators, detectors, lock-in amplifiers, and DSP to measure optical throughput, noise, stability, and dynamic response of integrated electro-optical assemblies.Performed device-level and system-level tuning of nanophotonic infrared sensors, correlating coupling efficiency, resonance quality factor, alignment sensitivity, and fabrication variation with measured optical performance and repeatability.Developed Python-based scientific software pipelines for automated optical-system characterization and physics-driven performance modeling.	
Research Trainee Materials Research Science & Engineering Center (MRSEC), La Jolla CA, USA	Apr 2023 – Mar 2024
<ul style="list-style-type: none">Contributed to a multi-million-dollar NSF proposal in optics and plasmonics of quantum materials, resulting in a preliminary \$300k seed grantDeveloped an infrared metrology scheme using self-assembled Ag nanoparticles on Si. Demonstrated frequency-tunable terahertz sensing.	
Graduate Research associate Molecular Dynamics Lab - IISER Kolkata, West Bengal, India	Apr 2018 – May 2019
<ul style="list-style-type: none">Demonstrated time-of-flight (TOF) measurements of oxygen clusters using high-speed electronics and electro-optics.Developed Python codes for using large-scale TOF data to obtain molecular velocity distribution and auto-identify clusters.	
Visiting research scholar University of Duisburg-Essen, Duisburg, Germany	May 2017 – Aug 2017
<ul style="list-style-type: none">Implemented sub-picosecond ultrafast infrared pulse characterization using Frequency Resolved Optical Gating (FROG).Received scholarship of €2000 through DFG(German Research Foundation) to spend a summer doing research in Germany.	

PUBLICATIONS

- Peer reviewed publications (2), Pre-prints (1), Manuscripts under preparation (3), Conference abstracts (4)
- **Selected publications and conference proceedings** (Citations : 38)
 1. Huang, Yuwei, et al. "All-silicon active bound states in the continuum terahertz metamaterials." *Optics & Laser Technology* (2024)
 2. Verma, Anita, et al. "Picosecond volume expansion drives a later-time insulator–metal transition in a nano-textured Mott insulator." *Nature Physics* (2024)
 3. Nandi, D., I. Jana, and V. Ramaprasad. "Dissociative electron attachment to supersonically cooled oxygen." *Journal of Physics: Conference Series*. Vol. 1412. No. 17. IOP Publishing, 2020.

SKILLS

Optical and Electromagnetic Simulation

CST Microwave Studio (FDTD, Passive/Driven mode analysis); Ansys HFSS; Ansys Zemax OpticStudio; SolidWorks

Data Acquisition & Analysis

MATLAB {Digital signal processing (DSP), Fast-Fourier Transform (FFT)}; Python (see projects below); LabVIEW

Optical systems and metrology

Lasers {Ti:Sapphire, CO₂, Diode}; Optical Parametric Amplifiers (OPA); Electro-Optic Modulators (EOM); Nonlinear light generation (NLG); Scattering Nearfield Optical Microscopy (SNOM); Atomic Force Microscopy (AFM); Heterodyne detection

Electro-optical Test & Hardware

Test equipment {Oscilloscope, Spectrum analyzer, Intensity autocorrelator}; Data processing {Pre-amplifier, Lock-in amplifier, and Data Acquisition (DAQ) card}; Multi-Channel Plate (MCP) detector; Photo-multiplier tube (PMT)

AWARDS AND RECOGNITION

- INSPIRE fellowship (Department of Science & Technology, Government of India, 2014–2019) – Top 1% in India
- UC San Diego Physics Excellence award (2019) - \$11,000 cash award
- UC San Diego Physics Chair's challenge award (2024)
- Shortlisted for Best MS Thesis in Physics (2019).

PROFESSIONAL ACTIVITIES

- Peer-reviewed scientific articles for **Nature Physics**, **Proceedings of the National Academy of Sciences (PNAS)**, **Nanoletters** and **Physical Review B**
- Served as an **Associate Instructor** for introductory physics lab - training and supervising 50+ PhD-level teaching assistants
- Selected and served as a **graduate panelist for the UC San Diego Academic Integrity Office** (2023-24)
- **Certified by Fleet Science Center** for science communication (2023) Balboa Park, San Diego CA

PROJECTS BEYOND DOCTORAL RESEARCH

1. Gold nano-slit filter for multi-terahertz frequencies – Skills : CST Microwave Studio
 - Developed a frequency tunable nano-slit array that can be embedded in polyamide and applicable to material surfaces.
2. Automated phase-retrieval of reflected electromagnetic wave – Skills : Python, MATLAB
 - EM waves accrue a small phase shift upon reflection due to a physical misplacement of $\sim \mu\text{m}$ with respect to reference
 - Developed code for auto-retrieval of this misplacement error using Kramers-Kronig relations between FFT components
3. Infrared spectrometer based on Michelson interferometry – Skills : Experimental optics, MATLAB
 - Built a compact, portable spectrometer for characterizing infrared spectrum in the 600 nm – 20 μm range
 - Developed code for automating frequency identification from time-domain measurement