SUSMEET BAKSHI

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RESEARCH INTERESTS

Computational Optics, Plasmonics, Nonlinear Optics, Semiconductor Materials and Devices, Optoelectronics, Infrared Photodetectors, Band Structure Engineering, Quantum Dynamics, Epitaxial Thin-Film Growth, Device Modeling and Simulation, Spectroscopy, Quantum Chemistry, Photonics, Quantum Optics, Quantum Sensing and Quantum Control, Quantum Computing and Quantum Information, Quantum Amplification.

EDUCATION

Arizona State University   Tempe, AZ
PhD, Electrical Engineering   December 2027

- **Coursework**: Foundations of Quantitative Molecular Science I and II.
- **Research**- Theoretical & Computational Investigation of Molecular Dynamics under Strong Light-Matter Coupling.

Arizona State University   Tempe, AZ
MSE, Electrical Engineering (Physical Electronics and Photonics)   December 2024

- **Coursework**: Quantum Optics and Quantum Info, Quantum Computing and Quantum Information, Quantum Mechanics for Engineers, Intro to Solid State Physics, Semiconductor Device Theory, Advanced Modelling and Device Simulation, Electromagnetic Field and Guided Waves.
- **Research**- 1) Quantum Sensing and Quantum Control. Implemented Quantum Fisher Information concepts to enhance Quantum Metrology. Specifically, investigated the ultimate precision limits in this field. 2) Mitigation of Phase uncertainty in Mach-Zehnder Interferometer (Quantum Standard Limit, Heisenberg limit, Hamiltonian Amplification)

Kaylani Government Engineering College   Kalyani, India
Bachelor of Technology, Electrical Engineering   June 2020

WORK EXPERIENCE

Graduate Research Assistantship   Tempe, AZ
School of Applied Sciences and Arts   Jan 2025–Present
Arizona State University

- Implementing high-performance computational methods (Fortran, parallelized FFT) to simulate quantum wavepacket dynamics in strong light-matter coupling regimes, reducing simulation runtime by compared to baseline approaches.
- Developed numerical algorithms (Split-Operator, DVR) to solve Schrödinger equations for bound systems, enabling accurate prediction of ground/excited states and energy spectra in double-well potentials.
- Optimized code efficiency for large-scale simulations, leveraging HPC clusters ([e.g., MPI, OpenMP]).

Research Associate (FTE)   Chennai, India
ICSR, **Indian Institute of Technology, Madras**   July 2020–June 2022
LIGO R&D for India Project (The Gravitational Wave Detector For India)

- Demonstrated expertise in setting up Fabry-Perot cavity locking setup and Laser injection locking setup, implementing PDH locking techniques.
- Hands on experience on Free space Optics setup.
- Proficient in using Python-based Finesse software for interferometer simulation.
- Completed grad level courses- Introduction to Photonics, Optical Engineering, Math Methods in System Engineering and Linear Dynamical (Credit Transferred to ASU MS).
- Award: Recipient of Samsung IITM-Pravartak Fellowship

INTERNSHIPS

Summer Internship (Optics and Photonics)   June 2019–Aug 2019
Indian Institute of Technology Madras (IITM), India

- Conducted optical experiments including interferometer alignment and non-linear optics demonstrations.
- Constructed Non-linear optical setup for Second Harmonic Generation (SHG) and implemented mode-matching matching using the JAVA applet Just Another Mode Matching Tool (JAMMT).

Summer Internship (Quantum Computation and Quantum Information)   June 2018–Aug 2018
Poornaprajna Institute of Scientific Research (PPISR), Bengaluru, India.

- Developed analogical model for application of Projection operators using Polarizers.
- Linear algebra based reading project on quantum algorithms like Deutsch-Jozsa Algorithm, Shor's algorithm, Grover Search Algorithm and protocols like BB 84 Protocol (QKD), The Controlled-NOT attack, The B92 Protocol, E91 Protocol(Ekert).

ACADEMIC PROJECTS

- Implementing high-performance Fortran90 solvers using   Jan 2025–Present
  Discrete Variable Representation and Split-Operator/FFT methods to compute
  eigenvalues, eigenfunctions, and time-evolution of quantum systems in
  double-well potential and light-matter coupled environments.
  Guide- Prof. Maxim Sukharev, Arizona State University

- Analytically deriving eigenenergies and developing a Fortran90 split-operator code   March 2025–April 2025
  to numerically solve the 2D Schrödinger equation for a 2D Harmonic Oscillator
  and further it to investigate quantum dynamics in a helical potential system
  Guide: Prof. Maxim Sukharev, ASU & Prof. Abraham Nitzan, UPenn

- Quantum sensing application in recently established quantum control schemes   Aug 2023–May 2024
  to study sensitivity enhancement within these protocols.
  Guide- Dr. Christian Arenz, Arizona State University.

- Project on "Quantum Perspectives on Interferometric Accuracy: From Michelson   Aug 2023–Dec 2023
  Interferometer to Gravitational Wave Observation".
  Guide- Prof. Kanu Sinha, Arizona State University.

- Design and Characterization of a Single Photon Source for Quantum Key   Jan 2023–May 2023
  Distribution (Qiskit based)
  Guide- Dr. Christian Arenz, Arizona State University.

- Extraction of Maximum Power from Photovoltaic Array under Partial   August 2019–July 2020
Shading conditions" (MATLAB based)
Bachelor's Final year project
Guide- Dr. P.K Gayen, Kalyani Govt. Engineering College, India.

- Linear Configuration for Second Harmonic Generation (SHG)   August 2019–July 2020
Guide- Dr. Anil Prabhakar, Institute of Technology Madras (IITM), India.

- PCB design (using KiCad) of Arduino circuit for Temperature   Jan 2022–May 2022
and Humidity measurement
Guide- Dr. Anil Prabhakar, Indian Institute of Technology Madras (IITM), India.

- Role Quantum Mechanics plays in modern semiconductor devices   Aug 2023–May 2024
by simulating a Dual Gate Capacitor with Metal Gates" in SCHRED 1.0 (nanoHUB)
Guide- Dr. Michael Goryll, Arizona State University.

- Semi-empirical tight binding method to calculate the energy band   Aug 2022–Dec 2022
structure along principle directions in the first Brillouin zone (MATLAB)
Guide- Dr. Stephen Goodnick, Arizona State University.

- Designing a particle based (Monte-Carlo) Device simulator (MATLAB based)   Jan 2023–May 2023
Guide Dr. Dragica Vasileska, Arizona State University.

TEACHING AND STUDENT ASSISTANTSHIPS

Arizona State University   Tempe, Arizona
Graduate Teaching Assistantship   Jan 2024–May 2024

- Teaching Assistantship role for the course EEE352: Properties of Electronic Materials. Classes and office hours covering Crystal structure, introduction to quantum mechanics and quantum theory of solids, statistical mechanics, semiconductor in equilibrium, transport, excess carriers in semiconductors, p-n junction, and p-n diode.

Graduate Student Assistantship   July 2020–June 2022

- EEE241: Fundamentals of Electromagnetics
- EEE341: Engineering Electromagnetics
- EEE394: Quantum Mechanics for Quantum Information Science
- EEE591: Quantum Mechanics for Engineers

SKILLS

- **Programming Languages** Python, Fortran90, MATLAB, C, PHP, JavaScript, CSS, MySQL, Qiskit.

- **Simulation & Modeling tools:** Finesse, nanoHUB, SCHRED, LTSpice, OSLO, JAMMT, TinaTI, KiCAD.

- **Optics & Electronics:** Free-space optics & Interferometry, Laser locking (PDH), FTIR Spectroscopy, Microscopy-Polarizing, SSRM

- **Language:** English, Bengali, Hindi, German.

INDUSTRIAL AND LABORATORY TRAINING

- Research Visit (Polaritonic Chemistry)   March 2025–April 2025
  Department of Chemistry, University of Pennsylvania, Philadelphia.

- Vocational Training on Mains department (HT & LT)   Dec 2018–Jan 2019
  Calcutta Electric Supply Corporation Limited, Kolkata, India.

- Vocational Training on "Power Plant Control System"   Dec 2019
  Kolaghat Thermal Power Station (KTPS)- West Bengal Power Development Corporation
  Limited (WBPDCL), West Bengal, India.

- Training in FTIR system and Polarization Microscopy   Dec 2022–Jan 2023
  Yao Group, High power Laser lab, Arizona State University.

- Training in Scanning Spreading Resistance Microscopy   Jan 2023–July 2023
  Guide- Umberto Celano, Arizona State University

CO-CURRICULAR ACTIVITIES

- Workshop on "Build a Detector" (Gravitational wave detector)   July 2021
  University of Glasgow jointly with LIGO India in collaboration with Newton-Bhabha.

- Diploma in Painting from Bangiya Sangeet Parishad, India.   Dec 2015

PUBLICATION

Som S., Gayen P.K., Bakshi S., Mondal S. (2022) Vehicle License Plate Image Preprocessing Strategy Under Fog/Hazy Weather Conditions. In: Mandal J.K., Hinchey M., Sen S., Biswas P. (eds) Applications of Networks, Sensors and Autonomous Systems Analytics. Studies in Autonomic, Data-driven and Industrial Computing. Springer, Singapore. https://doi.org/10.1007/978-981-16-7305 − 4_27.