SUSMEET BAKSHI

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RESEARCH INTERESTS

Photocathode and Surface Photoemission Physics, Semiconductor Optoelectronics, GaN/InAlN Photocathodes, PEEM-based Surface Characterization, Quantum Efficiency and Work Function Evolution, UV Laser/LED-Induced Surface Modification, Surface Photovoltage, Ultrafast and CW Light–Matter Interaction, Electron Emission Materials, Computational Optics, Plasmonics, Quantum Sensing and Quantum Control.

EDUCATION

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

- **Coursework**: Foundations of Quantitative Molecular Science I and II, Semiconductor Device Theory II, Electrodynamics, Statistical ML: Theory to Practice, Probability & Random Processes.
- **Research**: PEEM-based investigation of GaN/InAlN photocathode materials, focusing on UV laser/LED-induced changes in quantum efficiency, work function, surface electronic structure, and energy distribution under ultra-high vacuum conditions.

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**: Quantum Sensing and Quantum Control. Implemented Quantum Fisher Information concepts to enhance Quantum Metrology and investigated ultimate precision limits in quantum sensing. Also worked on mitigation of phase uncertainty in Mach-Zehnder interferometry, including quantum standard limit, Heisenberg limit, and Hamiltonian amplification.

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

WORK EXPERIENCE

Graduate Research Assistantship Tempe, AZ
Photoemission and Bright Beams Lab, Department of Physics Aug 2025–Present
Arizona State University

- Conducting PEEM-based characterization of GaN/InAlN photocathode materials under ultra-high vacuum to study spatially resolved electron emission, quantum efficiency, and work-function evolution.
- Investigating the effects of 230 nm pulsed laser exposure and 233/325/340 nm LED illumination on surface photoemission, energy distributions, and Hg-lamp PEEM contrast.
- Analyzing laser/LED-induced surface modification through exposure-dose, repetition-rate, average-power, and annealing-dependent measurements.
- Developing MATLAB/Python workflows for PEEM image analysis, energy distribution comparison, QE estimation, and time-dependent emission tracking.

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

- Implemented high-performance computational methods using Fortran90 and FFT-based methods to simulate quantum wavepacket dynamics in strong light-matter coupling regimes.
- Developed numerical algorithms including Split-Operator and Discrete Variable Representation methods to solve Schrödinger equations for bound systems.
- Used HPC-based workflows for large-scale numerical simulations of quantum dynamics.

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.
- Gained hands-on experience with free-space optics setup and alignment.
- Used Python-based Finesse software for interferometer simulation.
- Completed graduate-level courses: Introduction to Photonics, Optical Engineering, Math Methods in System Engineering and Linear Dynamical Systems.
- 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 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.
- Completed linear algebra-based reading project on quantum algorithms including Deutsch-Jozsa Algorithm, Shor's Algorithm, Grover Search Algorithm, and protocols including BB84, B92, E91, and quantum key distribution concepts.

ACADEMIC PROJECTS

- PEEM-based study of UV-induced surface modification in GaN/InAlN photocathodes Aug 2025–Present
  Investigating how 230 nm pulsed laser and deep-UV/near-UV LED illumination affect quantum efficiency, work function, surface emission contrast, and electron energy distributions in GaN/InAlN photocathode samples under ultra-high vacuum.
  Photoemission and Bright Beams Lab, Department of Physics, Arizona State University.
- Implementing high-performance Fortran90 solvers using Discrete Variable Representation and Split-Operator/FFT methods Jan 2025–Jul 2025
  Computed 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
  Numerically solved the 2D Schrödinger equation for a 2D Harmonic Oscillator and extended the work 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
  Studied sensitivity enhancement within quantum control protocols using Quantum Fisher Information.
  Guide: Dr. Christian Arenz, Arizona State University
- Project on "Quantum Perspectives on Interferometric Accuracy: From Michelson Interferometer to Gravitational Wave Observation" Aug 2023–Dec 2023
  Guide: Prof. Kanu Sinha, Arizona State University
- Design and Characterization of a Single Photon Source for QKD using Qiskit Jan 2023–May 2023
  Guide: Dr. Christian Arenz, Arizona State University
- Semi-empirical tight binding method to calculate the energy band structure along principal directions in the first Brillouin zone Aug 2022–Dec 2022
  MATLAB-based project on semiconductor band-structure calculation.
  Guide: Dr. Stephen Goodnick, Arizona State University
- Role Quantum Mechanics plays in modern semiconductor devices Aug 2023–May 2024
  Simulated a dual-gate capacitor with metal gates using SCHRED 1.0 on nanoHUB.
  Guide: Dr. Michael Goryll, Arizona State University
- Designing a particle-based Monte-Carlo device simulator Jan 2023–May 2023
  MATLAB-based semiconductor device simulation project.
  Guide: Dr. Dragica Vasileska, Arizona State University
- Extraction of Maximum Power from Photovoltaic Array under Partial Shading Conditions August 2019–July 2020
  MATLAB-based undergraduate final year project.
  Guide: Dr. P.K. Gayen, Kalyani Government Engineering College, India
- Linear Configuration for Second Harmonic Generation (SHG) August 2019–July 2020
  Guide: Dr. Anil Prabhakar, Indian Institute of Technology Madras (IITM), India
- PCB design of Arduino circuit for temperature and humidity measurement using KiCad Jan 2022–May 2022
  Guide: Dr. Anil Prabhakar, Indian Institute of Technology Madras (IITM), India

TEACHING AND STUDENT ASSISTANTSHIPS

Arizona State University Tempe, Arizona

Graduate Teaching Assistantship Aug 2025–Dec 2025

- Teaching Assistant for EEE352: Properties of Electronic Materials. Supported lectures, office hours, grading, and student learning on crystal structure, quantum theory of solids, semiconductor equilibrium, carrier transport, p-n junctions, and electronic materials.

Graduate Teaching Assistantship Aug 2025–Dec 2025

- Teaching Assistant for PHY441: Statistical/Thermal Physics. Assisted with coursework support, grading, and student discussions on statistical mechanics, thermodynamics, and thermal physics concepts.

Graduate Teaching Assistantship Jan 2024–May 2024

- Teaching Assistant for EEE352: Properties of Electronic Materials. Classes and office hours covered crystal structure, introduction to quantum mechanics and quantum theory of solids, statistical mechanics, semiconductors in equilibrium, transport, excess carriers in semiconductors, p-n junctions, and p-n diodes.

Graduate Student Assistantship Aug 2022–Dec 2024

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

SKILLS

- **Programming Languages:** Python, MATLAB, Fortran90, C, PHP, JavaScript, CSS, MySQL, Qiskit.
- **Simulation & Modeling Tools:** Finesse, nanoHUB, SCHRED, LTSpice, OSLO, JAMMT, TinaTI, KiCAD.
- **Quantum & Electromagnetic Modeling:** FDTD, TDSE, DVR, Split-Operator, quantum sensing, quantum control, quantum metrology.
- **High-Performance Computing:** Parallel computing with Fortran90, MPI/OpenMP-based workflows, HPC cluster usage.
- **Optics & Instrumentation:** PEEM, UHV surface characterization, UV laser/LED photoemission measurements, quantum efficiency estimation, work-function and energy distribution analysis, free-space optics, interferometry, laser locking (PDH), FTIR spectroscopy, polarizing microscopy, SSRM.
- **Languages:** English, Bengali, Hindi, German.

INDUSTRIAL AND LABORATORY TRAINING

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

CO-CURRICULAR ACTIVITIES

- Poster presentation at the Photocathode Physics for Photoinjectors (P3) Workshop, Arizona State University. Presented work on light-induced evolution of quantum efficiency and surface work function in GaN photocathodes studied using PEEM. Nov, 2025
- 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.