Arpan Sur

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GitHub | LinkedIn | Portfolio | Scholar | Dhaka, Bangladesh

Education

M.Sc. in Electrical and Electronic Engineering (EEE) — June 2023–June 2025 (Expected)
Bangladesh University of Engineering and Technology (BUET) — Dhaka, Bangladesh
- CGPA: **3.92**/4.00

B.Sc. in Electrical and Electronic Engineering (EEE) — April 2018–May 2023
Bangladesh University of Engineering and Technology (BUET) — Dhaka, Bangladesh
- CGPA: **3.53**/4.00

Research Interests

- Plasmonics
- Ultrafast Optoelectronics
- Nanophotonics
- Quantum Optics
- Integrated Optics
- Nonlinear Optics

Research Experience

Research Fellow
Nov 2023 – Ongoing

Improvement of thin film perovskite solar cells beyond the visible spectrum
Supervisor: *Dr. Ahmed Zubair, Associate Professor, Dept. of EEE, BUET*
- Studied the structural dependence of near-field and far-field enhancement by plasmonic nanoparticles (NPs) embedded in ultrathin perovskite solar cells (PSCs), while excluding the parasitic NP absorption. Presented my findings on high-surface-area nanoparticles at the 85^{th} *JSAP Autumn Meeting 2024*.
- Analyzed the impact of implementing a hyperuniform nanohole pattern in the top layer and absorption layer of perovskite solar cells.

Ultra-compact dielectric-coated graphene based integrated device
Supervisor: *Dr. Ahmed Zubair, Associate Professor, Dept. of EEE, BUET*
- Investigated the surface plasmon polariton modes and their propagation through graphene at various chemical potential in the MIR to THz frequency range.
- Designed an ultra-compact graphene plasmonic logic gate operating at the MIR wavelength, capable of performing both AND and OR operations based on the applied voltage.

Research Student
Aug 2024 – Ongoing

2D material-based nanostructure design for photothermal cancer therapy
Supervisor: *Dr. Md. Kawsar Alam, Professor, Dept. of EEE, BUET*
- Investigated multifunctional nanostructures with superior thermal and optical absorption properties in the NIR spectrum through first-principles and FDTD simulations.

Undergraduate Researcher
May 2022 - May 2023

Collaborative multi-robot coverage path planning and target search system
Supervisor: *Dr. Md. Farhad Hossain, Professor, Dept. of EEE, BUET*
- Evaluated the efficiency of various coverage and exploration algorithms, considering the kinematic and dynamic constraints of both vehicles and sensors.
- Conducted coverage path planning based exploration of the search space through communication between deployed robots and search targets, accounting for path loss models.

Publications Under Review and Preparation

A. Sur, A. Zubair, *"Ultra-Compact Voltage-Controlled Dielectric-Cladded Graphene Plasmonic Waveguide Based Optical Logic Gate"*. **Manuscript submitted in 13^{th} IEEE ICECE.** (2024)

S. Saha*, A. Sur*, S. Bain, T. T. Hasan, *"Development of a Low-Cost Spectrometer for Educational Applications"*. **Manuscript submitted in 13^{th} IEEE ICECE.** (2024)

S. K. Das*, A. Sur*, M. F. Hossain, *"Collaborative Path Planning and Target Search in Multi-Robot Systems with PID-Controlled Uniform Area Partitioning"*. **Manuscript submitted in 27^{th} IEEE ICCIT.** (2024)

Academic Projects and Technical Writings

Design of a Bangla Calendar Clock [Github] Sept 2022
- Developed a clock displaying time and date in Bangla language with internet time synchronization.

Design of a Spectrometer Operating in Visible Wavelength [Presentation] Feb 2023
- CD grating and low-cost camera assisted spectrometer was developed to characterize light sources by inspecting their intensity-wavelength and light-current characteristics in the visible region.

Self-consistent Schrodinger-Poisson solver for Double-gate MOSFET [Report] Aug 2023
- Numerically computed potential profile, band-structure and C-V characteristics using MATLAB.

Investigation of Ternary Barrier Layers in GaN-Based HEMT Devices [Report] Sept 2023
- Invetigated the 2DEG concentration of InAlN/GaN and ScAlN/GaN interface using BandEng.

Review on Material Platform for Integrated Single Photon Detector [Report] Oct 2023
- Studied the working principle of single photon detector (SPD) and conducted a literature survey on widely adopted SPD technologies (SNSPD, SPAD and TES) on different potential material platforms.

Review on Impact of Graphene and its Derivatives Photovoltaic Application Feb 2024
- Reviewed the functionality of Graphene and its derivatives in different layers of various third generation solar cells.

Implementation of a Movie Recommendation System [Report] Mar 2024
- Developed a recommendation system using *MovieLens* dataset with the PyTorch framework.

Technical Skills

Languages: C/C++, MATLAB, Octave, Python Toolbox (MEEP, MPB, Qiskit, PyTorch), ARMv7, Verilog

Simulation Tools: Ansys Lumerical (FDTD, MODE, CHARGE, HEAT), COMSOL Multiphysics, Material Studio, Quartus, Proteus, PSpice, Cisco Packet Tracer, CoppeliaSim, Webots, AutoCAD, PCB design

Microcontroller and Microprocessor: STM32L47x, ATmega328P, Xtensa LX6

Scientific Writing, Graphics and 3D Modelling: LaTeX, Origin, MS Office, Blender, Adobe Illustrator

Honors and Awards

Postgraduate Research Fellowship, BUET [Office Order] Nov 2023–Apr 2025
- Selected as one of the top 6 research proposals from Department of EEE

RISE Student Research Grant, BUET [Certificate] Aug 2022–Aug 2023
- Selected among 155 undergraduate student research proposals.

EEE Faculty Dean's List Award, BUET 2022–2023
- For obtaining a GPA of 3.75 or above in two regular terms of an academic year.

Professional Experience

Research Fellow Nov 2023–Present
Department of EEE, BUET

Relavant Coursework

Undergraduate Courses
- Optoelectronics
- Optical Communication
- Solid State Devices
- Engineering Electromagnetics

Postgraduate Courses
- Heterostructures and Compound Semiconductor Devices
- Nanophotonics and Plasmonics
- Quantum Computing and Quantum Photonics
- Nanoscale Device Modeling and Simulation Techniques
- Laser Theory
- Machine Learning and Pattern Recognition