Shreyan Datta

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Summary

Nanofabrication Process Engineer and Ph.D. candidate (4th year) with 4+ years of hands-on expertise in CMOS-compatible fabrication, SEM imaging, and optical metrology. Operated three advanced ZEISS SEM platforms across MIT.nano and SUNY Buffalo. Demonstrated 85% cost reduction in sensor production and 92% accuracy in nanoscale feature extraction. Proven record of building cross-functional feedback systems linking design, process, and marketing teams. Patent-pending inventor and published researcher with strong background in biosensing, yield analysis, and defect diagnostics for scalable manufacturing.

Core Technical Competencies: Design of Experiments (DOE), Nanophotonics, Optoelectronics, Plasmonics, Biosensing, Nanofabrication, Image Analysis (Feature extraction and Yield analysis), Cross-Functional Teamwork.

Skills

- **Fabrication & Process Engineering:** Atomic Layer Deposition, Electron Beam Evaporation, Photolithography, Spin Coating, Sputtering, Rapid Thermal Annealing, Reactive-ion Etching.
- **Optical & Material Characterization:** Scanning Electron Microscopy (ZEISS Merlin, Sigma HDVP, Auriga), Atomic Force Microscopy, Energy-Dispersive X-ray Spectroscopy, Fourier Transform Infrared Spectroscopy, Optical Microscopy, Raman Spectroscopy, UV-Vis Spectroscopy
- **Lab Proficiency:** Cleanroom (Class-100 & 1000), Sputtering Systems, Fume Hood (with corrosives, ex: HF), Microfluidics, 3D Printing, Vacuum Chambers
- **Software:** Lumerical FDTD, MATLAB (image processing toolbox, signal processing toolbox), ImageJ, AutoCAD Inventor, Fusion 360, LaTeX, Microsoft Office
- **Analysis:** Statistical Process Control (SPC), Yield Analysis, Defect Characterization

Work Experience

Metalenz | SEM Imaging & Process Intern **May 2025 – August 2025**

- Developed **advanced image processing algorithms** and **end-to-end pipelines** for **SEM-based nanoscale feature extraction, repeatability analysis**, and **trend detection**.
- Achieved **92%** feature extraction accuracy and **near-nanometer sigma** repeatability.
- Operated **Scanning Electron Microscopy (SEM) (ZEISS Merlin HRSEM, ZEISS Sigma HDVP)**, **Spin Coater**, **Sputter** systems at **Massachusetts Institute of Technology Cleanroom (MIT.nano)** for structural analysis of metasurface optics.
- Established a feedback mechanism between the Process and Design teams, accelerating time-to-insight for design iterations and R&D workflows by **30%**.
- Performed SPC analysis and designed DOE matrices to identify critical fabrication parameters impacting performance for devices fabricated in **Harvard University Center of Nanoscale Systems** and **Foundry partners**.
- Delivered SEM imagery support to Marketing team for nanoscale 3D visualization and product communication strategies.

The State University of New York at Buffalo | PhD Candidate **Aug 2021 – Present**

- Developed a novel, cost-effective three-step cleanroom fabrication process leveraging **Electron Beam Evaporation**, **Rapid Thermal Annealing (RTA)**, and Liquid Gallium to create high-performance Surface-Enhanced **Raman Spectroscopy** (SERS) sensors for chemical and biological sensing.
- Reduced fabrication costs by over **85%** compared to conventional E-beam and photolithography-based processes, enabling scalable, high-throughput manufacturing for next-gen biosensors.
- Performed advanced material characterization using **Scanning Electron Microscopy (SEM)(ZEISS Auriga)**, **Energy Dispersive Spectroscopy (EDS)**, **Fourier Transform Infrared Spectroscopy (FTIR)**, **Atomic Force Microscopy (AFM)**, and **UV-Vis Spectroscopy** to validate sensor performance and material integrity.
- Engineered sensors that achieved more than **100×** enhancement in Raman signal intensity, significantly outperforming conventional colloidal gold nanoparticle-based sensors and demonstrating superior sensitivity for real-world detection applications.
- Pioneered a commercially viable SERS platform, providing a more scalable, cost-effective, and high-sensitivity alternative to current state-of-the-art Raman sensing technologies, with potential applications in medical diagnostics, environmental monitoring, and chemical detection.

The State University of New York at Buffalo | Lecturer/Instructor **July 2022, July 2024**

- **Signals and Systems:** Taught **20+** students advanced techniques (Fourier, Laplace, Z-transforms) for real-world signal processing applications across various engineering systems.

The State University of New York at Buffalo | Graduate Teaching Assistant **Aug 2021 – Dec 2024**

- Taught and mentored **600+** undergraduate students across core EE subjects including **Analog Circuits, Digital Design, and Signals & Systems**, with hands-on lab instruction in **CMOS/MOSFET/BJT circuits, logic design, and signal processing fundamentals**.

University at Kentucky, KY, USA | Visiting Research Scholar **May 2020 – May 2021**

- Modeled CMOS-integrated nanophotonic polymorphic ALU with **14nm and 45/32nm silicon-photonic (SiP)** nodes using MATLAB.
- Developed **design-for-manufacturability (DFM)-aware photonic logic architectures** and **five key scalability guidelines** enabling future translation into CMOS-compatible next-gen fabrication pipelines.
- Collaborated with leading photonics researchers, utilizing **MATLAB** for system-level performance simulations, achieving close to **70%** reduction in latency and **30%** increase in frequency.

Indian Institute of Science Bangalore, Bangalore, India | Summer Research Intern **May 2019 – July 2019**

- Explored optical communication components, simulated modulators, and proposed an optical full adder, published in IEEE.

Education

Doctor of Philosophy in Electrical Engineering (Nanophotonics & Biosensing) **January 2026**
The State University of New York at Buffalo - GPA **3.9/4**
Master of Science in Electrical Engineering **May 2023**
The State University of New York at Buffalo - GPA **3.89/4**
Bachelor of Technology in Electronics and Communication Engineering **May 2021**
National Institute of Technology Durgapur - GPA **8.88/10**

Publications

- Surface-Enhanced Raman Scattering Sensors Employing a Nanoparticle-On-Liquid-Mirror (NPoLM) Architecture (Small Methods 2024)
- Design exploration and scalability analysis of a CMOS-integrated, polymorphic, nanophotonic arithmetic-logic unit (ACM Sensys 2021)
- Google Scholar for more publications: https://scholar.google.com/citations?user=lnPpNeMAAAAJ&hl=en

Key Achievements

- Winner - 1st Place – University at Buffalo, Electrical Engineering Department Poster Competition
- Presented SERS platform design and experimental outcomes at **UB Student Excellence Showcase (2023)** to peers, faculty, and external evaluators.
- Filed a provisional patent and **International Patent Application (PCT) Published**: Sensors using liquid metal-based nanophotonic structures. Published as WO2024054949A1, with International Search Report evaluating novelty and patentability

Volunteering & Leadership

The State University of New York at Buffalo | Electrical Engineering Graduate Student Association **Sept 2023 – Sept 2025**

- Vice President - Led initiatives benefiting **150+** graduate students through professional development and funding support.

Primary Grant Reviwer | Mark Diamond Research Fund (MDRF), SUNY Buffalo **April 2025**

- Evaluated graduate research proposals for technical merit, feasibility, and research impact as part of the MDRF selection committee.
- Provided structured feedback to the Graduate Student Association for funding decisions.

National Institute of Technology Durgapur | Entrepreneurship Development Cell **Aug 2017 – May 2021**

- **Innovation Cell Head** – Elected as the first student representative to bridge the Entrepreneurship Development Cell with the newly formed Institution's Innovation Council (IIC) under the Ministry of Education, Government of India, **spearheading the integration of student-driven innovation initiatives with national incubation goals**, and catalyzing early-stage mentorship, ideation challenges, and proof-of-concept development at NIT Durgapur.
- Co-organized the second-largest entrepreneurship summit in Eastern India, drawing over **2,000 attendees** and featuring panels with industry leaders and government representatives.

National Institute of Technology Durgapur | Student Union Representative, Executive Council Member **July 2018 – May 2021**

- Raised department concerns at student council, collaborated with administration during COVID lockdown to ease student learning and academic progress.

National Institute of Technology Durgapur | Training and Placement Coordinator **March 2019 – May 2021**

- Spearheaded partnerships with **100+** corporations, streamlining hiring logistics and increasing student job placements by **71%**. Led a **22**-member team, assisting **600+** peers in securing roles at top firms.