Utsav Shah

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Education

Howard University (CGPA: 4.0/4.0) — Washington, DC
Bachelor of Science in Computer Science (Minor: Mathematics) — *Aug 2023 – May 2027*

Massachusetts Institute of Technology — Cambridge, MA
Bachelor of Science in Aerospace Engineering (Visiting/Guest Student) — *Jan 2026 – May 2026*

Research Experiences

LCLS Summer Research Intern — Jun 2026 – Aug 2026
SLAC National Accelerator Laboratory, Stanford University — *Menlo Park, CA*

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AI/ML Undergraduate Research Assistant — Aug 2025 – Present
Department of Computer Science, Howard University — *Washington, DC*

- Developing a graph-based Machine Learning framework for dynamic, hyper-localized advertisement placement using KNNs, and vector-embedding pipelines to model spatiotemporal proximity between vehicles and businesses
- Implementing selective machine unlearning techniques to ensure privacy-preserving updates to graph embeddings as user mobility patterns evolve, and removal of nodes or edges without full retraining
- Designed and evaluated algorithms for real-time ad-targeting decisions based on distance, demographic metadata, and temporal context, improving relevance and reducing computational overhead
- Collaborating with faculty to integrate geospatial data streams and mobility graphs into a scalable prototype system for intelligent vehicular advertising

Undergraduate Summer Research Intern — Jun 2024 – Jul 2024
Department of Aerospace Engineering, University of Maryland — *College Park, MD*

- Engineered a high-speed cleaning system for lunar EVA suit dust mitigation, designing a 9500-rpm electromechanical cleaning apparatus integrating rotational dynamics, electromagnetic actuation, and thermal considerations for lunar-regolith removal
- Developed CAD models, mechanical layouts, and system-level prototypes for a self-cleaning lint-roller mechanism, enabling automated removal of lunar regolith from adhesive surfaces, and ran simulation studies to evaluate torque, vibration, thermal behavior, and structural integrity under expected lunar-environment constraints
- Developed a wxPython-based control interface for the **NASA**-funded LuSTR project (**Artemis** program), integrating motor-control logic with real-time monitoring of temperature and current draw, and implementing automated data-collection and live-plotting pipelines using NumPy and Pandas
- Performed mechanical validation analyses—including torque load evaluation, stress-distribution modeling, and failure-mode assessment—to refine the electromechanical design for lunar-analog conditions, and co-authored the final technical report synthesizing design rationale, simulation results, and prototype performance for the Hartzell Lab

Nanomaterials Physics Undergraduate Research Assistant — Jan 2024 – May 2024
Department of Physics & Astronomy, Howard University — *Washington, DC*

- Modeled piezoelectric properties of ZnS and ZnO quantum dots using **SIESTA** and **Quantum ESPRESSO**, integrating computational, theoretical, and experimental data to evaluate their suitability as next-generation semiconductor materials for quantum computing architectures
- Conducted first-principles simulations and analyzed electronic band structures, charge distributions, and polarization behavior using datasets from **Materials Project**, identifying material trends relevant to qubit stability and coherence
- Collaborated with a multidisciplinary team to compare DFT-based predictions with laboratory measurements, refining simulation parameters to improve agreement between theoretical and experimental results
- Authored technical summaries and visualizations that informed ongoing investigations into alternative quantum-grade semiconductor candidates

Teaching Experiences

Teaching Assistant Aug 2025 – Present

Department of EECS, Howard University *Washington, DC*

- Sole TA for Computer Organization & Architecture (**108 students**), responsible for grading programming assignments, exams, and hardware-level problem sets with consistency and rigor
- Led weekly office hours and review sessions for Engineering Mathematics and Signals & Systems, clarifying complex topics such as Differential Equations, Fourier transforms, Laplace analysis, and pipeline hazards
- Developed grading rubrics, automated checks, and structured feedback that improved student performance and reduced regrade requests
- Coordinated with instructors & department to identify learning gaps & implement targeted instructional interventions

Peer Tutor Aug 2025 – Present

Department of Mathematics, Howard University *Washington, DC*

- Tutored 50+ undergraduates (4.8/5.0 rating) across Mathematics and CS courses, strengthening conceptual understanding and analytical reasoning through structured one-on-one and group sessions
- Designed customized practice problems, review sheets, and targeted learning strategies in collaboration with faculty to support at-risk students and improve course retention
- Enabled measurable improvements in exam performance and problem-solving proficiency across multiple cohorts through iterative assessment and feedback cycles
- Provided mentorship on study habits, algorithmic thinking, and mathematical modeling, contributing to improved student confidence and engagement

Publications & Technical Reports

- **Shah, U.**, Mugisha, D. *Design and Development of a Dedicated Appliance to Clean the Synthetic Gecko Skin-Based Lint Roller*. Technical Report, Hartzell Lab, University of Maryland, 2024. (Link)

Community Service

Volunteer Sep 2020 – Oct 2020

MCHN Program, United Nations World Food Program (UNWFP) *Saptari, Nepal*

- Orchestrated a large-scale nutritional intervention during the COVID-19 pandemic and flood crisis, collaborating with Municipal and Ward offices and District Health Office to mobilize manpower across three municipalities
- Conducted critical health screenings for over 1,500 high-risk individuals, including pregnant women, lactating mothers, and children under five, utilizing Mid-Upper Arm Circumference (MUAC) and weight metrics to identify and treat severe malnutrition through the distribution of fortified super cereals
- Managed the end-to-end collection of sensitive beneficiary data, including citizenship and health records, ensuring 100% accuracy in reporting for the United Nations World Food Programme (UNWFP) while operating under high-risk, lockdown conditions
- Put my life to risk to help the needy and suffering

Awards & Honors

Howard University Achievers Scholarships: $76,000 merit-based scholarship distributed across four years
LNSEC Ford Philanthropy Scholarship: $10,000 merit-based scholarship
Dean's List: Consecutive Dean's List across all 6 Semesters so far
Socieites: Tau Beta Pi (TBP) Honor Society, National Society of Black Engineers (NSBE) & Engineers Without Borders (EWB) active member

Extracurricular Activities

Regional Level Basketball Player from Junior Category 2020-2022: Member of Biratnagar Basketball Academy (BBA), Nepal
District Level Chess Player

Skills

Programming Languages: Python, Java, C/C++, SQL
Web & Cloud Technologies: HTML, CSS, JavaScript, TypeScript, APIs, ReactJS, AngularJS, Next.js, Node.js, Amazon Web Services (AWS), Kubernetes, Vercel
Development & Design Tools: Git Version Control System, GitHub, GitLab, Linux/Unix, Figma, Adobe Photoshop, Canva, Arduino, Raspberry Pi
Data Science & Specialized: PyTorch, TensorFlow, Keras, Scikit-Learn, OpenCV, HuggingFace, LabVIEW, AutoDesk Fusion 360