

Zain Shabeeb

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EDUCATION

Georgia Institute of Technology

Atlanta, GA

PhD Chemical and Biomolecular Engineering | Advisor: [Dr. Vida Jamali](#)

Aug 2022 – Dec 2026

Thesis: AI-Driven Computational Methods for Electron Microscopy | Minor: Data Science for the Chemical Industry

GPA: 3.88/4.00

The University of Manchester

Manchester, United Kingdom

MSc Advanced Process Integration and Design - Advisor: [Dr. Nan Zhang](#)

Sep 2018 – Sep 2019

Thesis: Modeling & Optimization of Electrodeionization Process for Water-treatment | Grade: Distinction

Newcastle University

Newcastle, United Kingdom

BS Chemical Engineering (transferred from NUST, Pakistan in 2016) | Grade: First Class Honors

Aug 2014 – June 2018

WORK EXPERIENCE

Dow

Virtual

R&D Data Science Intern, Advanced Digital Internships

May 2026 – Present

- Orchestrated an end-to-end Python pipeline transforming 20,000+ raw material formulations into a relational schema to centralize analytics for 100+ researchers
- Trained predictive and inverse machine learning models and utilized Bayesian optimization to suggest targeted experiments, deploying the framework via Databricks API endpoints and an interactive Posit Connect app for innovation projects mapped to a \$260M NPV

Georgia Institute of Technology

Atlanta, GA

Graduate Research Assistant, Jamali Lab

Sep 2022 – Present

- Developed a physics-informed deep learning model to learn and simulate nanoparticle motion in liquid-phase electron microscopy (LPEM) videos, achieving 95%+ accuracy on generated trajectories by training on collected experimental data ([Nature Communications](#))
- Pioneered cryoSENSE, a compressive cryo-EM framework leveraging generative diffusion models to reconstruct high-resolution protein images from compressed measurements, enabling 2.5× throughput gains for microscopy ([CVPR](#)) ([Website](#))
- Designed SAM-EM, a fine-tuned version of Meta's SAM 2 foundation model for segmenting noisy LPEM videos, trained on 46,600 synthetic frames, outperforming zero-shot SAM 2 and U-Net baselines, particularly under high-noise conditions ([NeurIPS AI4Mat 2025](#))

Selected Coursework & Projects

- Bayesian Statistics: Leveraged Markov Random Fields for image segmentation, achieving 10-fold IoU gain over thresholding
- Data Analytics: Led development of U-Net framework for microscopy images, increasing segmentation IoU by 63% over baselines
- Process Systems Engineering: Formulated surrogate models for inverse optimization with 5-person team, reducing test MSE by 21%

Fatima Group

Lahore, Pakistan

Supply Chain Management Trainee Officer

Sep 2021 – Aug 2022

- Created price forecasting tool in R using causal and historical trends to predict commodity prices covering 90% of company spend
- Implemented PowerBI and OracleBI dashboards for data visualization and communicating insights to 5 cross-functional teams

SELECTED PUBLICATIONS

- Shabeeb, Z***; Saeedi, D*; Tsui, D*; Jamali, V†; Aghazadeh, A†; "cryoSENSE: Compressive Sensing Enables High-throughput Microscopy with Sparse and Generative Priors on the Protein Cryo-EM Image Manifold", [Conference on Computer Vision and Pattern Recognition \(CVPR\)](#) ([Website](#)) (2026)
- Shabeeb, Z**; Goyal N; Nantogmah, P; Jamali, V; "Learning the Diffusion of Nanoparticles in Liquid Phase TEM via Physics-informed Generative AI", [Nature Communications](#) (2025)
- Wang, A; Xu, M; Goel, R; **Shabeeb, Z**; Panicker, I; Jamali, V; "SAM-EM: Real-Time Segmentation for Automated Liquid Phase Transmission Electron Microscopy", [NeurIPS AI for Accelerated Materials Design Workshop](#) (2025)

SELECTED TALKS

- "Toward autonomous LPTeM: Physics-informed generative modeling and AI-assisted tracking of nanoparticle motion" Mar 2026
ACS Spring 2026
- "AI-Assisted LPTeM: A Unified Framework for Nanoparticle Tracking and Physics-Informed Generative Modeling" Nov 2025
2025 AIChE Annual Meeting
- "Learning Surface Diffusion of Nanoparticles in Liquid Phase TEM Using Physics-informed Generative AI" Jun 2024
98th ACS Colloids and Surface Science Symposium

AWARDS

- Eckert Graduate Fellowship (ChBE) - \$10,000 stipend awarded for potential for highly creative research by Georgia Tech (2025)
- Exemplary Academic Achievement (4.0 GPA) by Georgia Tech (2023)

SKILLS

Programming & Data Engineering: Python, Databricks, Azure DevOps, GitHub, Posit Workbench, REST APIs, Relational Databases, Linux, MATLAB

Machine Learning & Analytics: PyTorch, Keras, Scikit-Learn, Pandas, NumPy, PowerBI, Generative AI, Computer Vision

Microscopy & Image Processing: Electron microscopy of proteins/nanoparticles, deep learning image segmentation with U-Net, SAM 2

Structural Biology: Software (CryoSPARC, CryoDRGN, ModelAngelo), Databases (EMDB, PDB, UniProt)