Shiva Mudide

Contact Information

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Education

MIT, Cambridge, Massachusetts

M.S/PhD, Machine Learning & Mechanical Engineering (M.S Expected 2025)

Caltech, Pasadena, California

B.S, Physics, June 2021
GPA: 3.7/4.0

Research

Physics-informed diffusion models for molecular and material discovery. I design guidance, constraints, and symmetries that encode physics directly into generative models to improve sample quality, controllability, and data efficiency.

Teaching

Teaching Assistant for Deep Learning & Inverse Problems (Harvard Applied Math 216)

Work/Research Experience

Onto Innovation, Research Scientist Intern — June - September, 2025
Developed generative AI models from scratch for void detection in GPU manufacturing. Derived analytical mode solutions for voided GPU structures using Hamiltonian mechanics.

MIT, Graduate Student, Cambridge, Massachusetts — September, 2023 - Present
Physics-informed generative methods for nanostructure metrology and inverse design. Built entire machine learning codebase for AI nanostructure metrology; mentored two undergraduates.

Amazon, Software/Machine Learning Engineer — September, 2021 - March, 2022
Shipped AWS computer vision to improve driver fraud detection.

Caltech, Department of Applied Physics/Materials Science, Pasadena, California — April, 2020 - June 2021
Measured phonon density of states (DOS) in germanium via inelastic neutron scattering; implemented physics-based DOS estimation and compared against experiment.

Amazon, Software Engineer Intern — June - September, 2020
Built a full-stack service to track driver expenses for Prop 22 contingency using AngularJS.

Publications and Invited Talks

Mudide, S. et al. (2025) Tuned-Physics Guidance: Flexible Steering for Physics-Controlled Diffusion. *In review.*

Mudide, S. et al. (2025) A Combined VAE-CNN Architecture for Rapid, Model-Free Nanostructure Metrology. *Invited Talk at SPIE 2025.*

Mudide, S. et al. (2024) Machine learning driven measurement of high-aspect-ratio nanostructures using Mueller matrix spectroscopic ellipsometry. *J. Vac. Sci. Technol. B* 1 January 2025; 43 (1): 012801 doi:10.1116/6.0004058 **Editor's Pick**

Mudide, S. et al. (2024) Machine Learning for Characterizing Deep-Etched Structures via Ellipsometry. *Invited Talk at EIPBN, San Diego*

Bernal-Choban, C., Saunders, C., Yang, S. Lohaus, S., Ladygin, V., **Mudide, S.**, Abernathy, D., & Fultz, B. (2023). Inelastic Neutron Scattering Across the Melt: the Role of Vibrational Entropy in Latent Heat. *Neutron and X-ray Scattering in Materials Science.*

Mudide, S. (2021). The Limits of The Quasi-Harmonic Approximation: Anharmonicity in Germanium and the Entropy of Melting (Dissertation, Caltech).