Nirmal Baishnab

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PROFESSIONAL SUMMARY

- **Machine learning (ML) and software developer intern with around 1 year of industry experience**, focused on building scalable computer vision pipelines, synchronized multi-camera annotation tools, and automated model training workflows using AWS.
- **Over 5 years of research experience** in machine learning, deep learning, and computational materials science, applying ML/DL to solve real-world engineering challenges, especially in optimizing organic solar cell (OSC) microstructures and modeling complex disordered solids.
- **Strong collaborator with cross-functional teams**, bringing innovative problem-solving skills, technical expertise, and a proven ability to translate complex research into practical, high-impact solutions.

PROJECTS & WORK EXPERIENCE

Emerging Technologies at Musco Lighting

Machine Learning & Software Developer Intern 5/2024-Present

Responsibilities

- Built a custom video annotation tool for synchronized stereo and conventional camera feeds, enabling millisecond-level frame alignment and accurate ground-truth generation.
- Developed a scalable end-to-end ML pipeline for sports analytics; automated data ingestion, preprocessing, augmentation, training, and validation using AWS S3, Lambda, and EC2 instances.

Iowa State University

Graduate Researcher 8/2020-Present

Responsibilities: Teaching Assistant (1st year), Research Assistant (2nd – 5th year)

- Created a 3D microstructure generation framework using conditional VAE and diffusion models to synthesize million-voxel OPV morphologies.
- Developed chemistry-aware ML models for short-circuit current prediction and morphology optimization.
- Achieved 400x speedup in device simulation by integrating a surrogate model with adaptive Bayesian optimization for high-throughput characterization.

Missouri State University

Graduate Researcher 8/2017-7/2019

Responsibilities: Teaching Assistant (1st year), Research Assistant (2nd year)

- Molecular dynamics simulation and ML driven data analysis on complex disorder solids
- Facilitated hands-on physics lab sessions, guiding students through experiments and concepts in classical mechanics and electromagnetism

SKILLS

ML/DL Libraries	**Expertise:** PyTorch, Pandas, Scikit-Learn **Proficiency**: TensorFlow, Keras
Cloud & MLOps Platforms	AWS (S3, EC2, Lambda), Hugging Face Hub, Docker
Programming Languages	**Expertise:** Python, Bash **Familiar**: C, C++, MATLAB, R,
Data Science Tools	**Proficiency:** HPC systems, Git, Linux System, Command Line, Virtual Environments, Jupyter Notebook **Familiar**: Multi-GPU Computing, Singularity Containers, MongoDB
ML/DL Architecture Development	**Expert**: Computer Vision, Stable Diffusion, VAE, Clustering, Bayesian Optimization, Transfer Learning **Familiar**: LLM, Active Learning, Reinforcement Learning, Transformers, GANs, LSTM, RNN, PINN, NLP

SELECTED PUBLICATIONS

- BioTrove: A Large Curated Image Dataset Enabling AI for Biodiversity. Chih-Hsuan Yang, Ben Feuer, .. **Nirmal Baishnab**, Baskar Ganapathysubramanian. NeurIPS 2024 (Advances in Neural Information Processing Systems, Vol. 37, pp. 102101–102120)
- 3D Multiphase Heterogeneous Microstructure Generation Using Conditional Latent Diffusion Models. **Nirmal Baishnab**, Ethan Herron, Aditya Balu, Baskar Ganapathysubramanian (arXiv preprint arXiv:2503.10711)
- Identifying representative sub-domains in 3D microstructures for accelerated structure–property mapping in organic photovoltaic. **Nirmal Baishnab**, Ankush Mishra, Olga Wodo, Baskar Ganapathysubramanian. (*Computational Materials Science* 244 (2024): 113193.)
- Chemistry aware machine learning (ML) model for short circuit current prediction. **Nirmal Baishnab**, Hao Liu, Olga Wodo, Baskar Ganapathysubramanian (Manuscript under preparation)
- Constructing Generalizable Microstructure–Property Maps Across Diverse Microstructure Classes, Hao Liu, **Nirmal Baishnab**, Balaji Pokuri, Baskar Ganapathysubramanian, Olga Wodo (Manuscript under preparation)
- Role of generated free radicals in synthesis of amorphous hydrogenated boron carbide from orthocarborane using argon bombardment: A ReaxFF molecular dynamics study. **Nirmal Baishnab,** Rajan Khadka, Michelle Paquette, Paul Rulis, Nathan Oyler, Jinwoo Hwang, Ridwan Sakidja. Published in Journal MRX. Article reference: MRX-119110
- Study of amorphous Boron Carbide (a-BxC) materials using Molecular Dynamics (MD) and Hybrid Reverse Monte Carlo (HRMC). Rajan Khadka, **Nirmal Baishnab**, Ridwan Sakidja, George Opletal. Published in Journal of Non-Crystalline Solids (doi.org/10.1016/j.jnoncrysol.2019.119783).

EDUCATION

Iowa State University, Ames, Iowa 8/2020 - 9/2025
PhD in Mechanical Engineering, Co-major in Computer Engineering
CGPA 3.97/4.00

Missouri State University, Springfield, Missouri 8/2017 - 7/2019
M.Sc. in Materials Science
CGPA 3.97/4.00

Bangladesh University of Engineering & Technology 5/2010 - 9/2015
B.Sc. in Electrical and Electronic Engineering
CGPA 3.30/4.00

INTERESTS

- Chess player, former member of Bangladesh Chess Federation (FIDE ID 10213716), and current member of US Chess Federation (ID 16669951)
- Rated Table Tennis Player, Ratings Central ID 150056
- Skilled in Badminton and speed cubing