

Muhammad Zain Asad

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EDUCATION

University of Alberta

Bachelor of Science in Computer Science, Major in Artificial Intelligence

Edmonton, Alberta

May 2027

EXPERIENCE

Machine Learning Intern

January 2025 – December 2025

Centre for Defence: Advanced Materials (CDAM)

University Of Alberta

- **Constructed a Graph Neural Network** for predicting material properties of advanced ceramics, achieving energy prediction errors of **40 meV/atom** and force errors of **60 meV/Å**, outperforming baseline ML methods.
- **Optimised data preprocessing and training algorithms**, lowering training loss by **40%** and enabling efficient large-scale simulations of ceramic structures (100+ atoms) through **automated graph exports** and **lazy-loading datasets**.
- **Integrated energy–force consistency** ($F = -\nabla E$) into training, ensuring physically meaningful predictions aligned with first-principles calculations and improving model reliability for scientific use.
- Expanded role from project contributor to **full-time research intern**, entrusted with leading **hyperparameter optimization efforts** (Optuna, GPU training), **cutting validation MAE by 15%** and driving model generalization across diverse ceramic structures.

Software Engineering Intern

June 2024 – August 2024

Connexix

Remote

- Built a scalable e-commerce platform with AI-driven product recommendations and predictive inventory tracking, **improving user engagement by 25%** and **reducing overstock by 30%**.
- Spearheaded the implementation of a **collaborative filtering algorithm**, boosting click-through rates on product recommendations by 8%, resulting in **increased user engagement** with the e-commerce platform.

PROJECTS

GNN-CeramicMap | *Python, PyTorch, PyTorch Geometric, Matplotlib*

January 2025 - April 2025

- Implemented a **Graph Convolutional Network** to predict **energies of ceramic structures**, achieving an **MSE of 0.01** and an **R-squared score of 0.91** on validation data.
- Engineered a data pipeline with a **custom VASP POSCAR/OUTCAR** parser for **2,200+ DFT structures**, converting atomic data into graph inputs for scalable training.
- **Led benchmarking of GCN architectures**, improving predictive accuracy by **20%** compared to baseline ML methods; insights informed advanced energy–force modeling at CDAM.

AI Project Management Platform | *React, JavaScript, Node.js, OpenAI API, MongoDB*

January 2025

- **Prototyped an AI-powered project management platform** at a hackathon, integrating OpenAI API to automate task generation, reducing manual allocation by 40% and assignment time by **30%**.
- **Engineered a React-based interface** optimized for speed and usability, **boosting navigation efficiency by 50%** and reducing onboarding time for new users by **20 minutes**.

3D Ray Tracer | *C, Vector Math, PPM Rendering*

December 2024

- Crafted a **C-based ray tracer** implementing sphere intersection, directional lighting, and shadow calculations using vector algebra, **achieving realistic 3D rendering** with ambient occlusion and material properties.
- Enhanced visual quality by integrating **anti-aliasing (FS)** with **3x3 supersampling**, reducing jagged edges and improving pixel-level smoothness in output images.

SKILLS

ML/AI: PyTorch, PyTorch Geometric, TensorFlow, Scikit-learn, Deep Learning, Neural Networks, Computer Vision

Programming & Scientific Computing: Python, C, SQL, NumPy, Pandas, SciPy, Matplotlib

Software Development: React, Flask, Django, Node

Tools & Databases: AWS, Git, GitHub, Jupyter, VS Code, PyCharm, MongoDB