GYANATEET DUTTA

Research Engineer | Machine Learning & Code Analysis

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SUMMARY

Master's graduate in Computer Science & AI with proven expertise in developing ML-based tools for code analysis and generation. Strong foundation in **deep learning architectures** (Transformers, Diffusion Models), **computer vision**, and **physics-based ML**. Demonstrated ability to work with large, noisy datasets and collaborate across interdisciplinary teams. Seeking to advance AI systems for code correctness, safety, and security analysis at Google DeepMind.

EDUCATION

Master of Science - Computer Science & Artificial Intelligence
University of Leeds, UK | 2023-2024

- Specialization: Machine Learning, AI, Computer Graphics, GPU Computing
- Research Focus: Hybrid ML architectures, Neural Rendering, Physics-based Deep Learning

Bachelor of Technology - Electronics and Computer Science
KIIT University, India | 2019-2023

- Grade: 8.61/10 (First Class with Distinction)

PROFESSIONAL EXPERIENCE

Research Intern | *University of Leeds* | Mar 2025 – Sep 2025

- Developing **computer vision methods for real-time surgical phase detection** using Vision Transformers (ViTs)
- Applying **self-supervised learning (DINOv2)** to analyze surgical video data for clinical applicability
- Investigating model robustness and performance optimization for production deployment
- **Technologies:** Python, PyTorch, Vision Transformers, DINOv2, Computer Vision

Research and Development Scientist | *Science Museum Group* | Nov 2023 – Present

- Led development of **computer vision pipelines for 3D reconstruction** using Structure-from-Motion (SfM) and Neural Radiance Fields (NeRF)

- Integrated AI models with **Unreal Engine** for interactive VR environments
- **Achieved 95% geometric accuracy** on large-scale photogrammetry pipeline (10k+ images)
- **Technologies:** Python, PyTorch, NeRF, SfM, Unreal Engine, VR, Swin Transformers, CUDA

AWS AI & ML Scholar | *Amazon Web Services (Remote)* | Jul 2022 – Jun 2023

- Developed and optimized **Deep Racer model using Proximal Policy Optimization (PPO)**
- **Achieved top 15% performance** in AWS Summit competition through advanced RL techniques
- Gained experience in **model deployment strategies and production environments**
- **Technologies:** Python, AWS SageMaker, Reinforcement Learning, Docker

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CORE TECHNICAL SKILLS

Programming Languages: Python (Expert), C++, JAX, JavaScript, CUDA C++/Python
ML/AI Frameworks: PyTorch, TensorFlow, Hugging Face (Transformers, Diffusers), Scikit-learn
Code Analysis & Tools: Git, Docker, Linux, Static Analysis, Model Optimization
Data Analysis: NumPy, Pandas, Large Dataset Processing, Visualization (Matplotlib, Seaborn)
Deep Learning: Transformers (ViT, Swin, LoRA), Diffusion Models, GANs, Self-Supervised Learning
Specialized Areas: Computer Vision, Neural Rendering, Physics-based ML, Production Deployment

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RESEARCH & PUBLICATIONS

"Surgical Video Prediction using Hybrid VAE-Transformer Models" | *Master's Thesis, 2024*

- Developed **hybrid VAE-Transformer architecture** for future frame prediction in surgical videos
- **Achieved +2.36dB PSNR improvement** over baseline with efficient inference (28.13 PSNR @ 22 FPS)
- Implemented **FP16 precision and gradient checkpointing** for real-time deployment optimization

"Improved Pothole Detection Using YOLOv7 and ESRGAN" | *arXiv:2401.08588, 2024*

- Enhanced **computer vision-based detection accuracy** from low-resolution images
- Integrated **Enhanced Super-Resolution GANs (ESRGAN) with YOLOv7** object detection
- Demonstrated novel approach to **improving model performance on noisy, real-world datasets**

"Solving The Travelling Salesmen Problem using HNN and HNN-SA algorithms" | *arXiv:2202.13746, 2022*

- Investigated **neural network-based optimization algorithms** for complex graph theory problems
- Applied **Hopfield Neural Networks and Simulated Annealing** variants for computational problem-solving

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KEY PROJECTS

B3tt3r: Enhanced 3D Reconstruction | *Personal Research*

- Developed **novel 3D reconstruction techniques** combining state-of-the-art Mast3r and Spann3r models
- Aimed to improve reconstruction quality and robustness through **advanced feature fusion**
- **Technologies:** Python, PyTorch, 3D Reconstruction Libraries, CUDA

8th Place - JAX Diffusers Event | *Hugging Face & Google Cloud, 2023*

- **Globally ranked 8th** in competitive ML event with 1000+ participants
- Developed **ControlNet model for anime-realism art generation** using diffusion transformers
- Utilized **JAX and Google Cloud TPUs (v4)** for efficient training and inference optimization
- **Technologies:** JAX, Flax, Diffusers, TPUs, Stable Diffusion, ControlNet

Vision Transformer Implementation from Scratch | *GitHub: Ryukijano*

- Implemented **complete Vision Transformer architecture** using PyTorch for foundational understanding
- Built **multi-headed self-attention, patch embeddings, and positional encoding** components
- Demonstrates deep understanding of **transformer mechanisms for computer vision applications**

ACHIEVEMENTS & RECOGNITION

🥇 **1st Place Winner** - "Quantum Bits" Competition (IIV Quantum & Quantum Rings, 2025)
🏆 **8th Place Finalist** - JAX Diffusers Community Event (Hugging Face & Google Cloud, 2023)
🎓 **AWS AI & ML Scholar** - Amazon Web Services (2022-2023)
🎯 **AWS Deep Racer - Top 15% Performance** - AWS Summit
📚 **IBM Quantum Challenge 2024** - Completed all notebooks with distinction
🔬 **Future Leaders in Quantum Hackathon 2025** - Selected participant
GB **UK Quantum Hackathon 2025** - Selected by National Quantum Computing Centre

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RELEVANT EXPERIENCE FOR CODE ANALYSIS

Large Dataset Processing: Extensive experience working with **noisy, large-scale datasets** (10k+ images in photogrammetry pipeline, surgical video datasets, satellite imagery)

Model Architecture Development: Built **custom neural architectures from scratch** including Vision Transformers, demonstrating deep understanding of model internals and optimization

Production Deployment: Proven track record in **optimizing models for real-time inference** with techniques like FP16 precision, gradient checkpointing, and CUDA optimization

Cross-Disciplinary Collaboration: Successfully collaborated with **medical teams, museum curators, and cultural heritage experts**, bridging technical ML expertise with domain-specific requirements

Code Quality & Tools: Active **open-source contributor** on Hugging Face with multiple shared models, datasets, and interactive spaces, demonstrating commitment to reproducible research

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AFFILIATIONS & COMMUNITY

- **Active Contributor** - Hugging Face Community (shared models, datasets, spaces)
- **Member** - Leeds Extended Reality (XR) Society, University of Leeds
- **Member** - Google Developer Student Club (GDSC) Leeds, University of Leeds
- **Research Interests:** Geometric Deep Learning, Neural Rendering, Physics-Based ML, AI in Healthcare

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"*Passionate about advancing AI systems that can rigorously analyze correctness, safety, and security properties of code while generating code that satisfies these properties by construction.*"