Animesh Kumar

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Education

MSc Advanced Computer Science *2025 – 2026*
Newcastle University, UK
- Machine Learning: **92/100**
- Dissertation: *Neural Encoder for Composite DNA Run-Length Limited Codes* under Dr Yonatan Yehezkeally

B.Tech. Computer Science and Engineering *2021 – 2025*
Dr. A.P.J. Abdul Kalam Technical University (AKTU), India

Dissertation Research

Neural Encoder for Composite DNA Run-Length Limited Codes *Ongoing MSc Dissertation*
Supervisor: Dr Yonatan Yehezkeally | PyTorch 2.x | Inspired by Walter & Yehezkeally (ISIT 2025)
- Developed constrained DNA run-length limited coding framework for composite alphabet $Q = 84$ with theoretical and empirical redundancy analysis.
- Implemented sliding-window oracle validator with 22 pytest tests and full branch coverage.
- Designed LSTM autoregressive encoder using constraint-aware regularisation:

$$\mathcal{L} = \mathcal{L}_{\text{CE}} + \frac{\lambda}{n - \omega + 1} \sum_{i} \max(0, v_i - \varepsilon)$$

- Conducted redundancy sweeps to determine empirical floor r^*.

Research Projects

Human Eye Disease Prediction (OCT Classification) *2024–2025*
EfficientNetV2L + Multi-Head Attention + XGBoost | GitHub | Weights | Classification Demo | Pipeline Demo
- Achieved 95.43% accuracy, Macro AUC 0.9941, ECE 0.0024 (5-seed validation).
- Integrated Mahalanobis OOD detection, MC Dropout uncertainty estimation, Grad-CAM and SHAP explainability.
- Optimised deployment: 2.07GB Keras → 237MB ONNX FP32.

OCT Retinal Fluid Segmentation (AttentionTransUNet) *2025*
RETOUCH Dataset | GitHub | Weights | Demo
- Developed 4-class retinal fluid segmentation using AttentionTransUNet with Focal Tversky loss.
- Achieved DSC: IRF 0.9158, SRF 0.8560, PED 0.5811; outperformed nnU-Net on IRF and SRF.
- Applied INT8 quantisation achieving up to 3.9× compression across EfficientNetV2 models.

Plant Disease Detection (EfficientNetV2S) *2025*
PlantVillage Dataset (54,306 images, 38 classes) | Weights | Demo
- Achieved 99.57% accuracy and Macro F1 0.9948.
- Compressed TFLite deployment from 202MB to 23MB using dynamic quantisation.

Professional Experience

AI/ML Engineering Intern *2025*
IBM, India
- Fine-tuned and deployed enterprise-scale LLMs and Generative AI pipelines.

Deep Learning Research Intern *2023*
IIT Kanpur, India
- Developed retinal disease detection pipelines with AWS infrastructure.

Technical Skills

Languages:	Python, SQL, LaTeX, Bash
Machine Learning	PyTorch, TensorFlow/Keras, scikit-learn, XGBoost, ONNX, TFLite
Computer Vision	EfficientNetV2, Vision Transformers (ViT/MHA), RETFound, Grad-CAM
Coding Theory	LDPC, Reed–Solomon, Tanner graphs, VT codes
Infrastructure	Git, NVIDIA NIM, Supabase, Google Colab (A100/H100)

Certifications

Oracle Generative AI Professional
Microsoft Azure Fundamentals (AZ-900)
credly.com/users/animesh-kumar.d87a7137
AWS Solutions Architect
Oracle AI Vector Search Professional

Preprints & Publications

- **A Hybrid CNN-Transformer Framework for Retinal OCT Classification with Integrated Clinical Safety Mechanisms**
  Preprint prepared for arXiv cs.CV submission; awaiting endorsement.
  Zenodo preprint: 10.5281/zenodo.19224304
  Open-source implementation: GitHub, Weights, Classification Demo, Pipeline Demo
- **AttentionTransUNet for Retinal Fluid Segmentation in Multi-Vendor OCT**
  Preprint prepared for arXiv cs.CV submission; awaiting endorsement.
  Zenodo preprint: 10.5281/zenodo.19808008
  Open-source implementation: GitHub, Weights, Demo
- **Neural Encoder for Composite DNA Run-Length Limited Codes**
  Manuscript in preparation with Dr Yonatan Yehezkeally.