Raafe Bin Asad

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A Computer Vision Research Engineer with an MS in Artificial Intelligence and a proven track record of taking AI systems from foundational research to large-scale production. Specializes in developing novel algorithms for visual recognition, with deep expertise in deep learning, model optimization, and full-stack vision pipeline development. Passionate about leveraging cutting-edge research to solve real-world challenges in safety and automation, with a publication in a peer-reviewed journal.

SKILLS

- **Frameworks & Libraries:** PyTorch, TensorFlow, Keras, TensorRT, OpenCV, Weights & Biases, scikit-learn, NumPy, Pandas, FastAPI
- **Concepts & Methods:** Deep Learning, Computer Vision, Generative Adversarial Networks (GANs), Transformers, Diffusion Models, Model Optimization (Quantization, Pruning, NAS), ONNX, OpenVINO, TensorRT, Image Processing, OOP, Design Patterns
- **Tools & Platforms:** Docker, AWS IoT Core, Git/GitHub, CI/CD, Google Earth Engine API
- **Research Interests:** Vision-Language Models, Zero-Shot Learning, Cross-Modal Learning, Generative Models, Efficient Model Deployment

PROFESSIONAL EXPERIENCE

POULTA, INC.
Karachi, Pakistan

Computer Vision Engineer
April 2025 – Present

- Engineered an end-to-edge automated weight estimation system by integrating and fine-tuning open-source Computer Vision models reducing manual weighing labour by 100% on deployed farms.
- Deployed, tested, and optimized the weight estimation pipeline across 7+ farms and 30+ individual poultry sheds, tailoring model coefficients for different camera angles, chicken genders, and breeds (breeder & broiler).
- Developed an automated data logging system that captures images, performs analysis, and records key metrics to structured Excel reports every 10 minutes, generating over 140 daily data points per shed for operational analysis.
- Optimized segmentation and depth estimation models for CPU inference, reducing processing time by approximately 50% and enabling stable deployment on low-resource farm hardware.
- Spearheaded the end-to-end development and deployment of a Biosecurity Human-Vehicle access control system by collaborating with R&D on model development, Hardware team on camera integration, Business stakeholders on requirements, Deployment teams on rollout, and Analytics on data utilization, ensuring seamless alignment from concept to production.
- Developed a production-ready facial recognition system from research to deployment, comprising a database encoding pipeline for a farm's personnel, real-time FaceNet-based recognition, and physical gate control integration, reducing reliance on manual security checks.
- Built robust modules for real-time facial recognition processing on both standard webcams and RTSP/ONVIF video streams from IP cameras, achieving sub-second identification times.
- Converted and quantized PyTorch models to ONNX, OpenVINO, FP16, and INT8 format for deployment on dedicated edge AI hardware, overcoming memory and processing constraints to run complex models on-device.
- Developed and scaled an AWS IoT Core framework to support real-time remote monitoring for over 25 farms across the MENA region.
- Leveraged the Google Earth Engine (GEE) API to process satellite imagery and extract environmental data, developing a novel method to calculate localized AQI for specific farm coordinates in Saudi Arabia.
- Researched, tested, and benchmarked various commercial weather and satellite API providers to finalize a solution for retrieving ground-level weather data, documented in a comprehensive technical report for stakeholder decision-making.
- Created universal modules to control TP-Link Tapo smart plugs, enabling remote power cycling of farm equipment and monitoring energy usage, preventing system hangs and reducing downtime.
- Engineered modules to leverage advanced camera control features including Pan-Tilt-Zoom (PTZ) control and two-way communication for Hikvision/Tapo cameras, expanding data collection capabilities.

VIRTUAL REALITY CENTER, NEDUET **Karachi, Pakistan**
Research Associate *Aug 2022 – Jan 2025*

- Pioneered an AI-driven defect detection system for concrete infrastructure using Conditional GANs, incorporating advanced techniques for crack detection, quantification, and categorization.
- Engineered high-performance optimizations in GAN models, achieving real-time inference (0.3 seconds average), significantly enhancing on-site inspection efficiency.
- Developed custom evaluation metrics for computer vision applications, encompassing both pixel-level and block-wise segmentation accuracy for comprehensive model assessment.
- Designed and implemented an innovative mobile application for instantaneous, on-site concrete crack assessment, streamlining infrastructure maintenance processes.
- Created a proprietary algorithm for real-time, pixel-level measurement of crack dimensions, advancing structural integrity assessments in infrastructure inspections.
- Developed an advanced Mask2Image generative AI model, enhancing segmentation capabilities for concrete crack images.
- Fine-tuned and deployed a YOLO v8 model for high-precision multi-class traffic classification, contributing to advancements in urban mobility analysis.
- Engineered a novel hybrid GAN framework for predicting crack propagation under load in concrete structures, pushing the boundaries of predictive maintenance in civil engineering.
- Engineered an advanced crack propagation prediction system using DCGAN-based techniques and latent space manipulation, enhancing structural damage forecasting capabilities.
- Designed and implemented a VR application for structural inspection training, featuring real-time concrete crack propagation simulation to improve assessment accuracy.

VIRTUAL REALITY CENTER, NEDUET **Karachi, Pakistan**
Research Assistant *Feb 2022 – July 2022*

- Conducted comprehensive research on Structural Health Monitoring (SHM) systems and Bridge Deterioration Models, contributing to the advancement of predictive maintenance strategies in civil infrastructure.
- Developed immersive Virtual Reality (VR) visualizations for virtual bridge inspections and damage propagation simulations, enhancing training procedures and risk assessment capabilities in infrastructure management.

OMDENA LIVERPOOL CHAPTER **Remote**
Collaborator *Sep 2022 – Nov 2022*

- Implemented and optimized ML algorithms and techniques for data analysis, leading to the development of predictive models for road traffic collision severity.

EDUCATION

MS ARTIFICIAL INTELLIGENCE, NED UNIVERSITY OF ENGINEERING & TECHNOLOGY **Karachi, Pakistan**
May 2022 – Feb 2024
CGPA: 3.89/4.0
Thesis: Deep Learning-based Application for Crack Detection, Categorization, and Rating for Concrete Bridges

BE SOFTWARE ENGINEERING, NED UNIVERSITY OF ENGINEERING & TECHNOLOGY **Karachi, Pakistan**
Nov 2016 – Oct 2020
CGPA: 3.48/4.0

PUBLICATIONS

TITLE: Enhancing Structural Health Monitoring: Conditional GAN-based Crack Detection in Concrete and Asphalt Surfaces.
JOURNAL: Advances in Structural Engineering
DOI: https://doi.org/10.1177/13694332251381215