



AQSA YOUSAF

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Summary

Ph.D. candidate in Computer Science with a strong interest in medical imaging, explainable AI, 3D scene reconstruction, and signal processing for wearable healthcare systems.

Education

Ph.D. in Computer Science CGPA: 4.0/4.0

The University of Texas at Arlington

August 2023 - Present

Arlington, Texas, USA

M.S. in Computer Science CGPA: 3.8/4.0

Pakistan Institute of Engineering & Applied Sciences

January 2019 - November 2020

Islamabad, Pakistan

B.Sc. in Electrical Engineering CGPA: 3.52/4.0

University of Engineering and Technology

September 2014 - June 2018

Lahore, Pakistan

Technical Skills

Languages: Python, C++, MATLAB, SQL, Bash, JavaScript, HTML/CSS

Libraries/Frameworks: PyTorch, TensorFlow, Keras, OpenCV, Scikit-learn, NumPy, Pandas, Seaborn, Matplotlib

Cloud & DevOps: AWS (SageMaker, EC2, Lambda, S3), Google Cloud, Azure, Docker, Git, GitHub, GitLab

Hardware & Sensors: Raspberry Pi, Arduino, STM32L4, TIVA C, Sensor integration

Selected Publications

- **A. Yousaf**, et al. "MorphXAI: An Explainable Framework for Morphological Analysis of Parasites in Blood Smear Images", Winter Conference on Applications of Computer Vision (**WACV**), 2026.
- **A. Yousaf**, et al. "Towards Enhanced Sparse-View Tomographic Reconstruction Using 3D Gaussian Splatting", International Conference on 3D Vision (**3DV**), 2026.
- **A. Yousaf**, et al. "Beyond Detection: Comparative Explainability Study on *Trypanosoma cruzi* Using CAMs and DETR Attention", International Conference on Biomedical and Health Informatics (**BHI**), 2025.
- **A. Yousaf**, et al. "DAPS-AGF: Depth-Aware Perceptual Similarity with Adaptive Gradient Filtering for Enhanced Outdoor Scene Reconstruction", **ICCV E2E3D**, 2025.
- **A. Yousaf**, et al. "Food Intake Detection in the Face of Limited Sensor Signal Annotations", International Conference on Communications and Electronics (**ICCE**), 2024.
- **A. Yousaf**, et al. "Protein Active Site Prediction for Early Drug Discovery and Designing", International Review of Applied Sciences and Engineering (IRASE), 2021.

Work Experience

Research Assistant

Computer Laboratory of Ambient and Wearable Systems

August 2022 – August 2023

Tuscaloosa, Alabama

- Designed an AI system to detect eating events using signals from wearable sensors mounted on eyeglasses.
- Processed time-series data from accelerometer and piezoelectric muscle sensors to capture head movement and chewing patterns of a user.
- Implemented a semi-supervised autoencoder to extract meaningful features from unlabeled sensor data to train a lightweight ML classifier for computationally efficient food intake detection.
- Assisted in configuring and calibrating wearable sensors, ensuring reliable signal acquisition for time-series data collection during real-world use.

Machine learning Developer

Evercam

November 2020 – October 2021

Dublin, Ireland (Remote)

- Developed a custom GAN-based super-resolution model to enhance low-resolution construction site video feeds from 4K video frames to 8K, improving visibility of small and distant objects.
- Built an end-to-end computer vision pipeline that uses YOLO to detect and count objects (e.g., trucks, equipment) across time, enabling automated monitoring of site activity.
- Improved detection and counting accuracy by integrating super-resolved frames with object tracking, and deployed the full pipeline on AWS for scalable, low-cost construction site monitoring.

MorphXAI: An Explainable Framework for Morphological Analysis of Parasites in Blood Smear Images

- Developed MorphXAI, the first framework that unifies parasite detection with fine-grained morphological explainability, predicting clinically relevant traits such as shape, curvature, dot count, flagellum presence, and developmental stage.
- Curated a clinician-annotated dataset across *Leishmania*, *T. cruzi*, and *T. brucei*, establishing a benchmark for interpretable parasite analysis.
- Integrated a morphology-aware transformer decoder into RT-DETRv3, enabling joint optimization for detection and morphology prediction.
- Achieved +0.9% AP improvement over baseline RT-DETRv3 while providing structured, real-time, and biologically meaningful explanations interpretable by clinicians.

Semantic Grounding for Reliable Disease Detection in Deformable Attention Models

- Developed a post-hoc framework for semantic reliability assessment in deformable-attention-based medical object detectors, grounding predictions in disease-specific evidence.
- Proposed a semantic reliability score by combining detector confidence with prototype-based semantic similarity computed at deformable attention sampling locations.
- Reduced false positives by 36% while maintaining fixed recall, achieving a +9.7 percentage point precision improvement at 80% recall on the VinDr-CXR dataset.
- Demonstrated complementary reliability beyond confidence, improving true-positive vs. false-positive discrimination (AUC-ROC: 0.834 vs. 0.772).

Towards Enhanced Sparse-View Tomographic Reconstruction Using Gaussian Splatting

- Developed a 3D CT reconstruction pipeline for sparse-view X-ray projections using Gaussian Splatting, enabling high-quality reconstructions under low-dose imaging constraints.
- Proposed a novel log-space optimization approach grounded in the Beer-Lambert law to more accurately model X-ray attenuation during volume rendering.
- Designed a structure-aware initialization method that prioritizes anatomically salient regions to guide Gaussian placement, significantly reducing reconstruction artifacts.
- Achieved consistent improvements across multiple medical CT datasets (chest, jaw, head), demonstrating +3.08% PSNR and +3.21% SSIM over baseline while reducing the number of Gaussians by 10%.

DAPS-AGF: Depth-Aware Perceptual Similarity with Adaptive Gradient Filtering for Enhanced Outdoor Scene Reconstruction

- Developed a 3D scene reconstruction framework tailored for outdoor environments using Gaussian Splatting, addressing the challenge of poor reconstruction in peripheral and background regions.
- Introduced DAPS, a depth-aware perceptual similarity module that guides optimization to focus on under-represented areas of the scene.
- Proposed Adaptive Gradient Filtering (AGF) to control Gaussian growth, reducing redundant densification and improving memory efficiency during training.
- Constructed an outdoor benchmark using Mip-NeRF 360 and Tanks & Temples scenes to evaluate generalization on diverse real-world scenes.
- Demonstrated superior visual quality with +3.05% SSIM, +3.94% PSNR, and -17.78% LPIPS compared to 3DGS baseline, while maintaining comparable memory usage.

Beyond Detection: Comparative Explainability Study on *Trypanosoma cruzi* Using CAMs and DETR Attention

- Developed an explainable deep learning framework for automated detection of *Trypanosoma cruzi* in microscopy images using YOLOv8 (CNN) and DINO-DETR (Transformer).
- Proposed a novel query-specific attention explainability method for transformer-based object detection to localize model focus with high precision.
- Integrated and benchmarked 10 CAM-based interpretability techniques across multiple YOLOv8 layers using localization (IoU, EBPg) metrics.
- Revealed key behavioral differences between CNN and Transformer explainability patterns, highlighting their strengths in parasite-focused visual reasoning.
- Identified limitations in existing saliency evaluation metrics for dense multi-object detection, motivating the need for clinically meaningful XAI evaluation protocols.