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** **August 2023 - Present**
The University of Texas at Arlington *Arlington, Texas, USA*

M.S. in Computer Science **CGPA: 3.8/4.0** **January 2019 - November 2020**
Pakistan Institute of Engineering & Applied Sciences *Islamabad, Pakistan*

B.Sc. in Electrical Engineering **CGPA: 3.52/4.0** **September 2014 - June 2018**
University of Engineering and Technology *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 **August 2022 – August 2023**
Computer Laboratory of Ambient and Wearable Systems *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 **November 2020 – October 2021**
Evercam *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.

Selected Projects

MorphXAI: An Explainable Framework for Morphological Analysis of Parasites in Blood Smear Images
Cyber-Physical System Security Lab @ UTA, 2025

- 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.

Towards Enhanced Sparse-View Tomographic Reconstruction Using Gaussian Splatting
Cyber-Physical System Security Lab @ UTA, 2025

- 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
Cyber-Physical System Security Lab @ UTA, 2024

- 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
Cyber-Physical System Security Lab @ UTA, 2025

- 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.