MUNEEB AHMED KHAN

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Education

- **Ph.D. in Software (Machine Learning & Computer Vision)** March 2021 – Expected Aug. 2025
  - Sangmyung University, Cheonan, Korea
  - **Dissertation:** Efficient and Interpretable Deep Learning Frameworks for Real-World Applications
  - **Advisor:** Dr. Heemin Park
- **Master of Science in Information Technology** 2019
  - National University of Science and Technology (NUST), Islamabad, Pakistan
  - **Thesis:** Prediction based Target Tracking in Wireless Sensor Network
- **Bachelor of Computer Engineering** 2014
  - COMSATS Institute of Information Technology (CIIT), Lahore, Pakistan

Selected Publications

Total: 20 publications

[1] **MA Khan**, Y Choi, J Eum, H Park. "Traffic Sign Recognition Under Visual Perturbations: Light Patches, Simulated Obstructions, and Shadows." (Accepted in IEEE/CVF CVPRw 2025).

[2] **MA Khan**, H Kim, J Eum, Y Myung, Y Choi, H Park. "M-GAID: A Real-World Dataset for Ghosting Artifact Detection and Removal in Mobile Imaging." In Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision Workshops (WACVw), 2025.

[3] H Kim, **MA Khan**, H Park. "Regression Analysis of Ghosting Artifacts in Temporal Fusion Videos Using AutoML." IEEE/ACIS International Conference on Big Data, Cloud Computing, and Data Science (BCD), 2024.

[4] **MA Khan**, H Park. "A Convolutional Block Base Architecture for Multiclass Brain Tumor Detection Using Magnetic Resonance Imaging." *Electronics* 13, no. 2 (2024): 364.

[5] **MA Khan**, H Park. "Exploring Explainable Artificial Intelligence Techniques for Interpretable Neural Networks in Traffic Sign Recognition Systems." *Electronics* 13, no. 2 (2024): 306.

[6] **MA Khan**, H Park, J Chae. "A Lightweight Convolutional Neural Network (CNN) Architecture for Traffic Sign Recognition in Urban Road Networks." *Electronics* 12, no. 8 (2023): 1802.

[7] U Ejaz, **MA Khan**, H Park, H Kim. "FireXplainer: An Interpretable Approach for Detection of Wildfires." In Proceedings of the Korean Information Science Society, 2023. (Best Paper Award).

Full publication list available at Webiste

Research & Industrial Experience

- **Objective Quality Metrics for Ghosting Artifacts in Video and HDR Images** June 2023 – May 2024
  ***Research Funding**: Google Korea*
  Tools: PyTorch, OpenCV, scikit-image, NumPy, Pandas
  - Built a dataset of 2,500+ real images and annotated over 37,000 patches for spatial/temporal artifact detection.
  - Designed data pipelines for collection, annotation, and feature extraction from diverse imaging sources.
  - Trained SOTA deep learning models for domain specific tasks (e.g ghosting artifacts, object detection)
  - Published at IEEE/CVF Winter Conference on Applications of Computer Vision Workshops (WACVw) 2025.
- **Multi-Scale Attention Model for Low-Light Image Enhancement** 2024
  Tools: PyTorch, LoL Dataset v1/v2, GCP A100, SSIM, MS-SSIM, LPIPS
  - Designed a lightweight model (12M parameters) achieving 0.88 SSIM, 0.93 MS-SSIM, 0.207 LPIPS on LoL datasets using GCP A100.
  - Worked on integrating attention Mechanisms and transfer learning.
  - Implemented an adaptive enhancement pipeline balancing perceptual quality and computational efficiency.
  - Reviewed and implemented AAAI, CVPR, and ICCV research papers to optimize model performance.
- **Traffic Sign Recognition with Advanced Neural Network Techniques** 2022 – 2024
  Tools: TensorFlow, OpenCV, Grad-CAM, LIME, GTSRB, ITSD, PTSD
  - Developed an interpretable CNN (2.6M parameters) achieving 98.4% accuracy and 74.34 ms inference.
  - Streamlined ML model development and deployment with MLflow for tracking and reproducibility.
  - Optimize GPU acceleration and parallel processing to optimize the system performance.
  - Accepted in IEEE / CVF Computer Vision and Pattern Recognition Conference Workshop (CVPRw) 2025.

- **Brain Tumor Detection Using Magnetic Resonance Imaging** 2023 – 2024
  Tools: TensorFlow, Keras, Grad-CAM, LIME
  – Developed a lightweight convolutional block architecture achieving 99.51% mAP with 17.2 ms inference speed.
  – Performed tumor segmentation, lesion classification, and anomaly detection in multi-modal MRI sequences.
  – Reduced false positives by 78% using explainable AI techniques (Grad-CAM, LIME).
- **FireXplainNet: Interpretable Wildfire Detection System** 2022 – 2023
  Tools: PyTorch, Grad-CAM, Matplotlib
  – Developed a lightweight interpretable CNN (5.3M parameters) for early wildfire detection.
  – Applied gradient-based attribution (Grad-CAM) for decision explainability in high-risk outdoor scenarios.
  – Achieved high accuracy under variable conditions; received Best Paper Award at KCC 2023.
- **YOLO-Based Real-Time Object Detection and Tracking System** 2021 – 2023
  Tools: YOLOv5, YOLO-NAS, DeepSORT, Kalman Filter, ByteTrack, PyTorch, OpenCV
  – Built a real-time multi-object detection and tracking system using YOLOv5/YOLO-NAS and DeepSORT.
  – Achieved mAP > 92% and 30+ FPS on COCO/MOT datasets, enabling real-time visual intelligence.
  – Leveraged GPU parallelization strategies to optimize inference performance.

Technical Skills

- **ML Frameworks:** TensorFlow, PyTorch, Keras, Python, Pandas
- **Computer Vision:** Object detection and classification, Image segmentation, Visual Intelligence Systems
- **CV Libraries:** OpenCV, Keras, scikit-image, Pillow, NumPy
- **Deep Learning:** SSD, YOLOX, YOLO-NAS, Faster R-CNN, Transfer learning, Attention mechanisms
- **Efficient Model Design:** Lightweight Architecture design, Model Optimization and Quantization
- **Explainable AI:** Grad-CAM, LIME, Integrated Gradients
- **Data Science:** Data collection, Data Cleaning and Labeling, Feature Engineering and Visualization
- **Research Tools:** Google Cloud Platform (GCP), CUDA, Git, LaTeX, Jupyter Notebook

Research Funding & Honors

- **Google Korea Research Grant** (2024-Present): "Post-Processing Methods for Artifact Removal"
- **Google Korea Research Grant** (2023-2024): "Objective Quality Metrics for Ghosting Artifacts"
- **Best Paper Award** (2023): "FireXplainer: An Interpretable Approach for Detection of Wildfires" KCC, Jeju, Korea
- **Professor Scholarship for Ph.D.** (2021-2025): Pi-Lab, Sangmyung University
- **DURE Scholarship** (2022-2023): For international collaboration with Mongolia
- **Teaching Assistant Scholarship** (2021-2022): Department of Software, Sangmyung University

Conference Participation

- **WACV'25, CVPR'23, KCC'23, ICWSM'22, KCC'22, WWW'21, AAAI'21, CSCW'21**

Current Projects

- **Post-Processing Methods for Artifact Removal Using Machine Learning** @Google Korea & Pi Lab, Korea
  ***Research Funding**: Google Korea*
  – Investigating machine learning techniques for suppressing noise, ghosting, and compression artifacts.
  – Optimized artifact removal performance across diverse imaging modalities.
  – Designed deployment strategies suitable for mobile and resource-constrained environments.
- **Multi-Modal Framework for Medical Condition Classification and Detection** @ Pi Lab, Korea
  – Developing multi-class detection system for brain tumors, COVID-19, pneumonia, and lung opacities.
  – Working on CNN architectures to handle ambiguous boundaries in medical images.
  – Optimizing model performance for resource-constrained clinical environments with explainability.
- **Transformer-Enhanced Diffusion Models for Image Segmentation and Super-Resolution** @ Pi Lab, Korea
  – Developing diffusion techniques for image segmentation and resolution enhancement.
  – Integrating text-guided diffusion processes to enhance segmentation precision.
  – Validating performance across diverse imaging modalities for real-world applications.

References

Dr. Heemin Park
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Sangmyung University, Cheonan, Korea
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Quaid-i-Azam University, Islamabad, Pakistan
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