Muhammad Hamza Sharif

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Google Scholar citations/h-index: 101/3 (Aug. 2024)

Research Interests

Computer vision, deep learning, and statistics. Current Focus is on: i) Developing algorithms for deep learning, particularly in medical imaging ii) Multimodal Foundation Models for medical analysis, and iii) Self-supervised learning methods

Education

08/2021 – 06/2023 **Mohamed bin Zayed University of Artificial Intelligence (MBZUAI)**, Abu Dhabi, UAE.
Master of Science in Computer Vision
- **CGPA:** 3.91 **on scale of** 4.00.
- **Thesis Title:** Exploring the potential of deep learning approaches for Biomedical Image Segmentation. Link
- **Advisors:** Primary: Prof. Min Xu Secondary: Prof. Muhammad Yaqub

09/2013 – 08/2017 **University of Engineering and Technology (UET)**, Lahore, Pakistan.
Bachelor of Science in Computer Engineering
- **CGPA:** 3.521 **on scale of** 4.00.
- **Thesis Title:** Fruitfly Detector: An Intelligent System for food Quality Control. Link
- **Advisor:** Prof. Sheikh Faisal Rashid

Work Experience

02/2021 – 08/2021 **Afiniti**, Karachi, Pakistan.
Data Analyst - AI Link
- Responsible for developing maintaining, and optimizing data pipelines for various international clients.
- Developing and deploying ETL routines and write complex SQL procedures for various data intensive workflows.

12/2019 – 08/2020 **Ephlux**, Karachi, Pakistan.
Machine Learning Engineer Link
- Responsible for collecting and processing data from different sources, performing data profiling, preliminary data analysis, and interpreting results using statistical techniques.
- Responsible for model development, model validation, model deployment, and model explainability for medical datasets using the SHAP library.
- Implement NLP based model for semantic text similarity problems for the medical corpus.

05/2018 – 11/2019 **Barrett Hodgson University**, Karachi, Pakistan.
Research Associate Link
- Conduct research in the computational neuroscience domain for automatic detection of autism using MRI scans.
- Responsible for implementing deep learning methods by scientific studies in a multidisciplinary domain.

07/2016 – 09/2016 **German Research Center for Artificial Intelligence**, Kaisersalutern, Germany.
DAAD Research Intern Link
- I worked on a fruit fly detection problem in fruits using thermography and machine learning techniques. I implemented image processing algorithms and machine learning classifiers in Python, while also gaining experience with RapidMiner and Weka tools during my internship.

Research & Projects

P1 **Object Detection in Aerial: Imagery Improving the Performance of Faster R-CNN on iSAID Dataset.** In this project, we applied multiple techniques to boost the efficiency of the Faster R-CNN detector for aerial imagery. These enhancements resulted in an average precision of 42.7%, marking a 5.5% improvement over the original model.

P2 **Improving Latent Space of Generative Adversarial Networks (GANs)**. In this project, I proposed a novel method that integrates self-supervised contrastive learning with generative adversarial networks (GANs) to generate images with enhanced control over their underlying representations.

P3 **Patient Experience PX-PULSE**. I developed an API to predict patient length of stay in hospitals based on their disease and condition using a regression technique. The process involved retrieving data via API requests, pre-processing and transforming the dataset by imputing missing values, storing it in a Flask−SQLAlchemy database, and applying a regression model.

P4 **Ante Natal Risk Identification using Fetal Doppler**. This collaborative research project between Ephlux, AKUH, and Boston Children's Hospital involved developing an XGBoost model for antenatal risk identification using fetal Doppler data. I optimized the model through hyper-parameter tuning with Grid-Search and interpreted its results using SHAP values.

P5 **iFruitFly Detector: An intelligent System for food Quality Control**. This collaborative research project, funded by **DAAD**, focused on the automatic identification of mangoes infested with fruit flies. Hand-crafted pixel-based features were extracted from thermal video frames of the mangoes. A two-layer MLP model achieved 94.18% accuracy in distinguishing between healthy and infested mangoes. Additionally, the DB-SCAN clustering algorithm was used to mark infested regions, which the MLP identified with an accuracy of 94.00%

Publications

P1 Dmitry Demidov, **Muhammad Hamza Sharif**, Aliakbar Abdurahimov, Hisham Cholakkal, Fahad Khan. Salient Mask-Guided Vision Transformer for Fine-Grained Classification. (**VISAPP-2023 - Oral Best Paper Award**) Link

P2 **Muhammad Hamza Sharif**, Dmitry Demidov, Asif Hanif, Mohammad Yaqub, Min Xu. TransResNet: Integrating the Strengths of ViTs and CNNs for High Resolution Medical Image Segmentation via Feature Grafting. (**BMVC-2022**) Link

P3 Muneera A. Rasheed, Prem Chand, Saad Ahmed, **Hamza Sharif**, Zahra Hoodbhoy, Ayat Siddiqui, Babar S. Hasan. Use of artificial intelligence on Electroencephalogram (EEG) waveforms to predict failure in early school grades in children from a rural cohort in Pakistan. (**PLOS ONE-2021**) Link

P4 **Hamza Sharif**, Rizwan Ahmed Khan. A novel framework for automatic detection of autism: A study on corpus callosum and intracranial brain volume. (**AAI-2021**) Link

Awards

- Awarded VISAPP 2023 Travel Grant.
- Awarded BMVC 2022 Travel Grant.
- Awarded Full scholarship to study Masters in Computer Vision at MBZUAI.
- Research Internship Award (1000 Euro/month Summer @DAAD Award).
- Awarded a Merit-Based Scholarship during the 4th and 5th semesters of my undergraduate studies.

Academic Services

Teaching Assistant

Mohamed bin Zayed University of Artificial Intelligence (MBZUAI), Abu Dhabi, UAE

- Deep Learning (AI702) course - Spring 2023.
- Machine Learning (ML701) course - Fall 2022.
- Tutor for Foundations of AI course and lab instructor for UGRIP internship program.

Conference Reviewing

Served as a Reviewer at **BMVC'22**, **CVPR'23**, **MICCAI'23**, and **MIDL'23**.

Skills

Languages Python, R, Matlab, SQL, HTML/CSS.

Frameworks PyTorch, Keras, Scikit-learn, Pandas, Numpy, Scipy, Statsmodel, Plotly, OpenCV, HuggingFace, Flask, Detectron2, MONAI, Nibabel, SimpleITK, NLTK.

Developer Tools Git, Docker, Anaconda, VS Code, Visual Studio, PyCharm, Linux.

Databases MySQL/Maria DB, SQL Server, Talend, Google Big Query.

References

R1 **Prof. Min Xu** | mxu1@cs.cmu.edu

R2 **Prof. Mohammad Yaqub** | mohammad.yaqub@mbzuai.ac.ae

R3 **Prof. Kun Zhang** | kun.zhang@mbzuai.ac.ae