

Syed Ali Tariq

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Deep learning expert with over 5 years of experience in designing, training, and optimizing state-of-the-art deep learning models for computer vision problems. Strong research and development skills having authored more than ten research papers. Strongly motivated to achieve optimal results for any given task. Can work independently to solve problems. Good at multitasking and time management skills to meet deadlines. Effective at task delegation between junior team members and evaluating their performance.

Expertise

- Computer Vision (CV) applications involving classification, segmentation, and detection tasks.
- Artificial Intelligence (AI), Deep Learning (DL), Explainable AI (XAI).
- Convolutional neural networks (CNN), Vision Transformer (ViT).
- Deep learning models deployment to web and cloud.

Projects completed

- Development of a web-based tool for the identification of TB, COVID-19, and Pneumonia using chest X-rays.
- TB classification and detection using Swin-Transformer.
- Fingerprint classification using multi-view CNN and Bayesian CNN.
- CNN based seizure detection in newborns using EEG signals.
- Road segmentation using multi-view CNN.
- Fingerprint and palmprint biometrics identification speed-up using parallel programming (CUDA).
- Video and Light Field compression using HEVC and MV-HEVC.

Education

Doctor of Philosophy (Computer Science), COMSATS University, Islamabad, Pakistan	2019 – 2023 (Expected)
• Area of research: <i>Explainable Artificial Intelligence (XAI)</i>	
Master of Science (Computer Science) Abasyn University, Islamabad, Pakistan	2014 – 2017
• CGPA of 3.87 out of 4.0 (Gold Medalist). Thesis Title: <i>Palmprint matching using GPU</i>	
Bachelor of Science (Computer and Information Sciences), PIEAS, Islamabad, Pakistan	2007 – 2012
• CGPA of 2.72 out of 4.0	
GCE O (Edexcel International) & A-Level (Cambridge)	
• A-level from DHA Public School O&A Levels, Karachi, Pakistan. (77.5% equivalent)	2005 – 2007
• O-level from The British School in Colombo, Colombo, Sri Lanka. (81.1% equivalent)	2003 – 2005

Ph.D. Experience

Sep 2019 – Present

- Ph.D. research is focused on explainability of convolutional neural networks (DCNNs).
- This research aims to uncover the reasons behind a CNN model's decisions to improve their understanding and transparency that is beneficial for high-risk environments such as medical imaging or autonomous vehicles.
- Developed a method that introduces a way of knowledge extraction through an in-built probe of the CNN.
- Introduced an optimization that can identify critical neurons that can be used to explain model's decisions through counterfactual and contrastive reasoning.
- Benefits of method: security-critical applications, model debugging, model repair, model compression, misclassification analysis, adversarial attack detection, machine teaching applications.

Work Experience

Research Associate

Mar 2020 – Present

Medical Imaging and Diagnostics Lab (MID), NCAI, COMSATS University, Islamabad.

- Developed state-of-the-art DL models for Tuberculosis and COVID detection using chest X-ray and CT scans.
- Currently hold the first position worldwide on TBX11K competition leaderboard: <https://competitions.codalab.org/competitions/25848#results>.
- Developed a computer-aided diagnostic system called Pulmonary Diagnostic System (PDS) for lung disease identification.
- Deployed product to Microsoft Azure cloud platform.
- Performed fieldwork to gather medical datasets from local laboratories and healthcare institutions.
- Assigned tasks to research assistants and MS students and monitored their performance.
- Authored research papers and funding proposals.
- Participated in exhibitions to showcase the developed products.

Trainer/demonstrator

Aug 2021

- Designed and conducted hands-on training on developing and training CNNs and generative adversarial networks (GANs) for computer vision problems at beginner and advanced levels.

Teaching assistant

Jan 2019 – Jan 2020

COMSATS University, Islamabad

- Assisted with administrative tasks, material preparation, and paper marking and uploading.
- Prepared and delivered tutorials on creating and training CNNs using Tensorflow/Keras.

Research Assistant

Apr 2019 – Mar 2020

Medical Imaging and Diagnostics Lab (MID), NCAI, COMSATS University, Islamabad.

- Worked on identification and classification of various lung diseases using DL methodologies.
- Worked on development of web-based tuberculosis identification system using Python/Django framework, authored journal papers, and supervised MS students.

Research Assistant/Software Design Engineer

May 2016 – Mar 2019

House of Technology Pvt. Ltd., Islamabad, Pakistan.

- Worked on research projects including tuberculosis identification, surgical telementoring system using HEVC, fingerprint classification, face recognition, and palmprint/fingerprint identification using parallel GPU programming (Nvidia CUDA). Light Field compression using HEVC and MV-HEVC.
- iOS chat app and auto parts app development. MS Excel reports using VBA and SQL.

Tools and skills

Following is the list of tools, technologies, and languages with expertise and experience:

Artificial intelligence: Python (Tensorflow, Keras, Pytorch) • MMDetection • NumPy • Flask • Pandas • Scikit-learn • Jupyter notebook

Development: HTML • CSS • Bootstrap • Javascript • MS Azure • iOS (Objective-C) • SQL • VBA

Others: HEVC/MV-HEVC • Matlab • Latex • Github • Docker • Nvidia CUDA • C++ • Linux

Research Activities

Research projects

1. Research collaboration with Prof. Mårten Sjöström at Mid Sweden University, Sundsvall, Sweden, titled: “*Collaboration between Sweden and Pakistan to Investigate Rate Distortion Optimization for Light Field Compression*” - approved by The Swedish Foundation for International Cooperation in Research and Higher Education, STINT, 2019.
 - a. Worked on Motion Estimation (ME) optimization for Light Field (LF) compression using Multi-view extension of High-Efficiency Video Coding (HEVC/H.265).
 - b. Designed and conducted Deep Learning labs for the course “Computer Vision using Deep Learning Techniques with Hands-On Implementation in Python/Keras”.

Journal publications

Explainable AI

1. **Syed Ali Tariq**, T. Zia, M. Ghafoor, “Towards Counterfactual and Contrastive Explainability and Transparency of DCNN Image Classifiers”, 1st revision under review at Elsevier Knowledge-Based Systems, Dec 2021

Classification

2. M. Ghafoor, **Syed Ali Tariq**, I. A. Taj, T. Zia, A. Abbas, A. Y. Zomaya, “Fingerprint Identification with Shallow Multi-feature View Classifier”, IEEE Transactions on Cybernetics, Dec 2019. <https://doi.org/10.1109/TCYB.2019.2957188>
3. T. Zia, M. Ghafoor, **Syed Ali Tariq**, I. A. Taj, “Robust Fingerprint Classification with Bayesian Convolutional Networks”, IET Image Processing, Feb 2019. <https://doi.org/10.1049/iet-ipr.2018.5466>
4. Z. Abideen, M. Ghafoor, K. Munir, M. Saqib, Ata Ullah, T. Zia, **Syed Ali Tariq**, G. Ahmad, and A. Zahra, “Uncertainty Assisted Robust Tuberculosis Identification with Bayesian Convolutional Neural Networks”, IEEE Access, Jan 2020. <https://doi.org/10.1109/ACCESS.2020.2970023>
5. N. A. Khan, M. Ghafoor, M. Mohammadi, and **Syed Ali Tariq**, “Convolutional Neural Networks based Time-Frequency Image Enhancement For the Analysis of EEG Signals”, Multidimensional Systems and Signal Processing, Feb 2022. <https://doi.org/10.1007/s11045-022-00822-2>

Segmentation

6. M. Ghafoor, **Syed Ali Tariq**, M. Abu Bakr, Jibrán, W. Ahmad, T. Zia, “Perceptually lossless surgical telementoring system based on non-parametric segmentation”, Journal of Medical Imaging and Health Informatics, 2018. <https://doi.org/10.1166/jmihi.2019.2512>
7. M. Junaid, M. Ghafoor, K. Munir, A. Hassan, S. Khalid, **Syed Ali Tariq**, G. Ahmed, and T. Zia, “Multi-feature View-based Shallow Convolutional Neural Network for Road Segmentation”, IEEE Access, Dec 2019. <https://doi.org/10.1109/ACCESS.2020.2968965>

Video compression

8. W. Ahmad, M. Ghafoor, **Syed Ali Tariq**, R. Olsson, M. Sjöström, “Computationally efficient LF compressing using MV-HEVC framework”, IEEE Access, Sep 2019. <https://doi.org/10.1109/ACCESS.2019.2944765>
9. A. Hassan, M. Ghafoor, **Syed Ali Tariq**, T. Zia, W. Ahmad, “High-Efficiency Video Coding (HEVC) based surgical telementoring system using Convolutional Neural Network”, Journal of Digital Imaging, March 2019. <https://doi.org/10.1007/s10278-019-00206-2>

Parallel programming

10. **Syed Ali Tariq**, S. Iqbal, M. Ghafoor, I. A. Taj, N. M. Jafri, S. Razzaq, T. Zia, “Massively Parallel Palmprint Identification System using GPU”, Cluster Computing, 2017.; <https://doi.org/10.1007/s10586-017-1121-z>
11. M. Ghafoor, S. Iqbal, **Syed Ali Tariq**, N. M. Jafri, I. A. Taj, “Efficient Fingerprint Matching Using GPU”, IET Image Processing, 2017. <https://doi.org/10.1049/iet-ipr.2016.1021>
12. M. Ghafoor, **Syed Ali Tariq**, S. Iqbal, I. A. Taj, N. M. Jafri, “Robust palmprint identification using efficient preprocessing and two-stage matching technique”, IET Image Processing, Sep 2020. <https://doi.org/10.1049/iet-ipr.2018.5736>
13. M. Shafiq, I. A. Taj, M. Ghafoor, **Syed Ali Tariq**, A. Abbas, A. Y. Zomaya, “Accelerating Fingerprint Identification using FPGA for Large-scale Applications”, Journal of Parallel and Distributed Computing, 2020. <https://doi.org/10.1016/j.jpdc.2020.03.007>

Achievements and Awards

- Currently hold the first position in TBX11K Tuberculosis Classification and Detection Challenge: <https://competitions.codalab.org/competitions/25848#results>
- Received Gold Medal with a GPA of 3.87 in MS degree from Abasyn University, Islamabad, Pakistan.

References

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