Muhammad Azaz Farooq

Date of birth: 03/05/1996 | **Nationality:** Pakistani | **Gender:** Male | **Phone number:** (+39) 3409951869 (Mobile) | **Email address:** muhammadazaz.farooq2@unibo.it | **LinkedIn:** https://www.linkedin.com/in/azaz-farooq-8517601a9/ | **Github:** https://github.com/Azaz-farooq | **ResearchGate:** https://www.researchgate.net/profile/Muhammad-Azaz-Farooq | **Skype:** azaz.farooq1 |

Address: Via Giuseppe Garibaldi, Casalecchio di Reno, Bologna, 40033, Bologna, Italy (Home)

ABOUT ME

Passionate researcher with a strong foundation in **artificial intelligence**, **machine learning**, **deep learning** and **data science**. My expertise lies in developing innovative solutions that harness the power of **edge** and **cloud computing** to enhance data processing capabilities and optimize system performance. I am committed to advancing technology through research and development, addressing real-world challenges and improving operational efficiency.

WORK EXPERIENCE

MARPOSS – BOLOGNA, ITALY

Website https://www.marposs.com/eng/

RESEARCH ENGINEER – 10/05/2023 – 20/06/2025

Developed a Proof-of-Concept framework leveraging new AI tools satisfying the growing need of Industrial automation processes.

Key objectives:

1. Industrial Data Analysis
2. Algorthmic Analysis of Industrial Machines
3. Azure Machine Learning studio (no-code implementation)
4. Generate light-weight ML models
5. Docker Implementation of light-weight models
6. Automated Pipelines Intergration
7. Azure Functions/Function App implementations
8. Industrial Protocol (MQTT) integration with AutoML and ONNX.
9. Infrastructure as a Code (IAAC)

SHENYANG AEROSPACE UNIVERSITY – SHENYANG, CHINA

RESEARCH ASSISTANT IN UNIVERSITY – 28/02/2020 – 03/06/2022

- Research and develop different Machine Learning (ML) and Deep Learning (DL) algorithms for medical imaging problems.
- Expertise in Python, ML, DL, and their libraries (NumPy, Pandas, Sci-kit learn, Matplotlib, Seaborn etc.).
- Worked on Python's advance framework (Tensor flow , Keras).
- Published research papers in the Scopus, Web of Science journal.
- The main contribution to the research is the addition of feature maps and saliency in the Attention U-Net model
- 5 additional Attention blocks are added in the original U-net model to extract the more specific details

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY (NUST) – ISLAMABAD, PAKISTAN

LAB ENGINEER – 02/02/2018 – 31/08/2019

- Conduct labs of computer science and software engineering subjects like OOP, computer vision, Advance programming, machine learning , and compiler construction etc.
- In charge of Research and the Innovation lab.
- Demonstrator of final year projects of Undergrad students to foreign universities visits.
- Making exams and prepare the Grades.
- Worked on Learning Management System (LMS) and Course Management System (CMS).

WILSHIRE LABORATORIES PVT. LTD – LAHORE, PAKISTAN

ASSISTANT OFFICER (ERP) – 01/07/2016 – 31/01/2017

- Worked on Oracle Forms and Reports software.
- Build many types of analytical and complex reports and forms in a team environment.
- Develop many new modules in already implemented customized oracle database software like Quality Control, HRM, and Assets,

EDUCATION AND TRAINING

01/11/2022 – CURRENT Bologna, Italy

PHD IN COMPUTER SCIENCE & ENGINEERING University of Bologna

The main goal of the doctorate research is to build an AI-based anomaly detection service that would be distributed in different industrial environments, leveraging the capabilities of edge and cloud computing.

Website https://www.unibo.it/en | **Field of study** Software and applications development and analysis

11/09/2019 – 04/06/2022 Shenyang, China

MASTER OF ENGINEERING IN COMPUTER APPLICATION TECHNOLOGY Shenyang Aerospace University (SAU), China

- Supervised by the dean of the School of Computer Science Prof. Guodong Zhang (zhanggd@sau.edu.cn)
- Successfully passed the Master's defense on 5th June 2022.
- The research area is Machine Learning, Deep Learning, Medical Image Analysis.
- Learn Scientific Document writing, ML & DL based tools for experimental validations.
- Master thesis involve the benchmark model attention U-net modified version to detect and segment the breast tumor from Ultrasound images dataset.

Website https://en.sau.edu.cn/ | **Field of study** Machine Learning (ML) | Deep Learning (DL) | **Final grade** B/84% |

Thesis Breast Cancer Detection from Ultrasound Images Using Attention U-Nets Models

29/08/2011 – 24/12/2015 Bahawalpur, Pakistan

BACHELORS OF SCIENCE IN COMPUTER ENGINEERING The Islamia University of Bahawalpur (IUB), Pakistan

- It was a researched-based final-year project.
- Worked on OpenCV, Visual Studio, and C++.
- This research involved deployment of CV algorithms and DIP techniques (Object Detection, Edge Detection, Foreground and Background Segmentation, Morphological operations etc.)
- The project received the appreciation award in the open house of the University

Website https://www.iub.edu.pk/ | **Field of study** Digital Image Processing (DIP) | Computer Vision (CV) | **Final grade** B/85% |

Thesis Real-time People Detection and Counting in Surveillance Applications

PUBLICATIONS

2025

FedAdapt-CAD: A Federated Learning Framework for Anomaly Detection with Client-Aware Aggregation and Dynamic Model Adaptation-Ready to Submit

The proposed FedAdapt-CAD framework demonstrates a robust and scalable approach to FL for cyber-attack detection, predictive maintenance, and anomaly detection across diverse industrial datasets. By integrating Client-Aware Aggregation (CAA) and Dynamic Model Adaptation (DMA), the framework effectively addresses the challenges of non-IID data distribution, model performance variability, and real-time adaptation to evolving threats. Experimental evaluations on the BATADAL, CMAPSS, and WADI datasets highlight the framework's effectiveness in improving classification accuracy and model fairness.

2025

An Edge-Cloud Federated Learning framework for IoT-Based Predictive AI Models Management for Anomaly Detection in Industry 4.0-InWriting

This paper will present a new architectural model integrating Automated Machine Learning (AutoML) within a hybrid cloud-edge computing environment. The model addresses key challenges of AI systems' portability and adaptability

and leverages opportunities in this emerging paradigm by optimizing the distribution of processing tasks between edge devices, Cloud and IIoT infrastructures.

2024
Anomaly detection using Machine Learning models: An industrial Case study- Draft

This article will describe the machine learning models implemented for anomaly detection with my PhD programme's collaboration with an industry partner. Advanced statistical analysis on a time series dataset with novel machine learning models was performed to detect anomalies in a real industrial dataset.

2023
Alzr-Net: A Novel Approach to Detect Alzheimer Disease

Mehmood, M. H., Hassan, F., Rahman, A. U., Rauf, A., & Farooq, M. A. (2023, May). Alzr-Net: A Novel Approach to Detect Alzheimer Disease. In *2023 International Conference on Communication, Computing and Digital Systems (C-CODE)* (pp. 1-6). IEEE.

2022
Automatic Heart Segmentation Based On Convolutional Networks Using Attention Mechanism

Guodong Zhang, Yu Liu, Wei Guo, Wenjun Tan, Zhaoxuan Gong, and Muhammad Azaz Farooq "Automatic heart segmentation based on convolutional networks using attention mechanism", Proc. SPIE 12342, Fourteenth International Conference on Digital Image Processing (ICDIP 2022), 123421I (12 October 2022); https://doi.org/10.1117/12.2643378

2022
Breast Cancer Detection from Ultrasound Images using Attention U-Nets Model

Muhammad Azaz Farooq , Zhao Xuan Gong, Yu Liu, Muhammad Zubair, Arslan Manzoor Guodong Zhang*, " Breast Cancer Detection from Ultrasound Images using Attention U- Nets Model" in 14th ICDIP, China , March 2022

CERTIFICATIONS

01/06/2020 – 31/07/2020
Structuring Machine Learning Projects

- Certified from Coursera as Machine Learning Project Architect.
- Planning and deployment of Machine Learning projects are the core objective of this certification.

Link coursera.org/verify/BYRWRSTG27GW

01/06/2020 – 31/07/2020
Neural Networks and Deep Learning

- Learn a course from deeplearnin.ai specialized course.
- The basics of neural networks and deep learning are taught in this course.
- Andrew Ng (Father of Deep Learning) was the instructor of this course.

Link coursera.org/verify/48UWEP75XJNV

CONFERENCES AND SEMINARS

20/05/2022 – 23/05/2022 China University of GeoSciences, Wuhan, China
14th International Conference on Digital Image Processing (ICDIP 2022)

- I presented my research paper at 14th ICDIP 2022 conference .
- The title of my paper is " Breast Cancer Detection from Ultrasound Images Using Attention UNETs Model".
- I won the **Best Presentation** Award.

Link http://www.icdip.org/

HONOURS AND AWARDS

01/11/2022

Italian Government Sholarship (PNRR) – University of Bologna

A fully funded scholarship funded by the European Union Commission through the PNRR Initiative for doctorate studies.

01/09/2019

Chinese Government Scholarship – Chinese Scholarship Council (CSC)

- I have been awarded a fully-funded Chinese government scholarship for the session 2019-2022 for my Master's studies.
- Learn research in a competitive and multi-cultural environment.
- Able to learn Chinese till HSK-4 level.

SKILLS

Soft Skills

Research report writing | Manuscript writing | Team Management | Project Management | Independent Research Management | Presentation

Version Control and OS

Windows | Linux (Ubuntu), Git | Fork | Git bash

Research Software and Skills

Data Science | Machine Learning | Deep Learning | Python | C++ | SQL| Data Analysis | Artificial Intelligence | Computer Vision | Medical Image Analysis | Digital Image Processing | NLP | Mutiple Eye Tracking | HCI | MATLAB | Jupyter Notebook | VsCode | Exploratory Data Analysis | Github | edge computing | cloud computing | IIoT

Python's Libraries skills

Numpy | Pandas | Matplotlib | Seaborn | Sci-kit learn | Keras | Tensorflow | Pytorch

RECOMMENDATIONS

Dr. Prof. Paolo Bellavista Professor

Department of Computer Systems and Engineering (DISI), UNIBO, Bologna, Italy

Email paolo.bellavista@unibo.it

Link https://www.unibo.it/sitoweb/paolo.bellavista

Dr. Zhang Guodong Professor, Dean

School of Computer Science, Shenyang Aerospace University, Shenyang, China

Email zhanggd@sau.edu.cn