



Muhammad Azaz Farooq

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ABOUT ME

Passionate researcher with a strong foundation in **Artificial Intelligence, Machine Learning, Deep Learning, IoT, Cloud Computing, Edge Computing, and Federated Learning**. My expertise lies in developing innovative solutions that harness the power of **AI, edge, and cloud computing** to enhance data processing and optimise the performance of IoT systems. I am committed to advancing technology through research and development, addressing real-world challenges, and improving operational efficiency.

WORK EXPERIENCE

 **MARPOSS S.P.A** – BOLOGNA, ITALY

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

RESEARCH & DEVELOPMENT ENGINEER (AI & ML) – 10/05/2023 – 20/06/2025

This position is part of a University–Industry collaboration funded by the Italian Ministry of University and Research (MUR) through the PNRR PhD program. I developed a proof-of-concept framework using emerging AI cloud tools to meet the growing demand for automation in industrial processes. The main objectives of this work include analyzing industrial data and evaluating algorithms for industrial machines, supported by Azure Machine Learning Studio's no-code features, as well as MS Azure and Azure IoT Central. The project emphasizes creating lightweight machine learning models and deploying them with Docker, while also enabling automation through GitHub Actions-based pipelines. Additional goals involve implementing Azure Functions/Function Apps, integrating industrial protocols such as MQTT with AutoML and ONNX-based workflows, and adopting Infrastructure as Code (IaC) practices to achieve scalable, repeatable deployments.

 **SHENYANG AEROSPACE UNIVERSITY** – SHENYANG, CHINA

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

I have conducted research and development on a range of Machine Learning and Deep Learning algorithms applied to medical imaging problems, gaining strong expertise in Python and its ML/DL ecosystem, including NumPy, Pandas, Scikit-learn, Matplotlib, and Seaborn. My work also involves practical experience with advanced deep-learning frameworks such as TensorFlow and Keras. I have published research papers in journals indexed in Scopus and Web of Science. A key contribution of my research is the enhancement of the Attention U-Net model by integrating feature maps and saliency information, introducing five additional attention blocks into the original U-Net architecture to extract more specific, fine-grained details.

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

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

I have conducted laboratory sessions for various computer science and software engineering courses, including Object-Oriented Programming, Computer Vision, Advanced Programming, Machine Learning, and Compiler Construction. I oversaw the Research and Innovation Lab and served as a demonstrator for undergraduate final-year projects during visits from foreign universities. My duties also included preparing examinations, evaluating student performance, and managing grades. Furthermore, I gained experience working with Learning Management Systems (LMS) and Course Management Systems (CMS) to support academic instruction and course administration.

 **WILSHIRE LABORATORIES PVT. LTD** – LAHORE, PAKISTAN

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

I worked extensively with Oracle Forms and Reports software, contributing to the development of a wide range of analytical and complex reports and forms within a collaborative team environment. In addition, I helped design and implement several new modules in an existing customized Oracle database system, including components for Quality Control, Human Resource Management (HRM), and Asset Management.

EDUCATION AND TRAINING

01/11/2022 – 31/10/2025 Bologna, Italy

PHD IN COMPUTER SCIENCE & ENGINEERING University of Bologna

Developed an automated, adaptable, and privacy-preserving Digital Twin (DT) framework for industrial edge-cloud environments, capable of training and deploying lightweight ML models using industrial datasets under limited computing resources. The work integrates Azure cloud services, custom federated learning strategies, Docker-based edge deployment, and full MLOps automation via GitHub Actions, as demonstrated by a validated industry Proof of Concept. Two research articles have been published based on the work conducted during this period.

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

Thesis A Federated Digital Twin Framework Leveraging AI and MLOps for the IoT Cloud Continuum

Link <https://github.com/Azaz-farooq/ONNX-CI-CD-Pipeline>

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

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

I completed my Master's degree under the supervision of Prof. Guodong Zhang, Dean of the School of Computer Science, and successfully defended my thesis on 5 June 2022. My research focused on Machine Learning, Deep Learning, and Medical Image Analysis, through which I gained strong experience in scientific writing and in using ML/DL tools for experimental validation. My thesis centered on developing a modified version of the benchmark Attention U-Net model to detect and segment breast tumors from an ultrasound image 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

This research-based final-year project focused on computer vision and digital image processing techniques, using OpenCV, Visual Studio, and C++. The work involved deploying various algorithms, including object detection, edge detection, foreground/background segmentation, and morphological operations. The project was well-received and earned an appreciation award at the university's open house.

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

[**Leveraging AI and MLOps for IoT-Edge-Cloud Industrial Digital Twins: a Practical Case Study**](#)

Farooq, M. A., Bellavista, P., Bujari, A., & Sita, A., "Leveraging AI and MLOps for IoT-Edge-Cloud Industrial Digital Twins: a Practical Case Study," 2025 IEEE Conference on Standards for Communications and Networking (CSCN), Bologna, Italy, 2025

Publisher: IEEE

2025

[**FedAdapt-CAD: A Federated Learning Framework for Anomaly Detection with Client-Aware Aggregation and Dynamic Model Adaptation**](#)

Muhammad Azaz Farooq , Paolo Bellavista , Armir Bujari , Alessio Mora , Jamal Nasir , Rohma Ahmed (2026). *FedAdapt-CAD: A federated learning framework for anomaly detection with client-aware aggregation and dynamic model adaptation*. In *Proceedings of the 18th International Conference on Networking and Communications (ICNC)*.

Publisher: IEEE

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

● **CONFERENCES AND SEMINARS**

15/09/2025 – 17/09/2025 Bologna, Italy

IEEE Conference on Standards for Communications and Networking

Presented my Industry collaboration project paper titled "**Leveraging AI and MLOps for IoT-Edge-Cloud Industrial Digital Twins: a Practical Case Study**".

Link <https://cscn2025.ieee-cscn.org/>

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.

● 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

● SKILLS

Research Software and Skills

Data Science | Machine Learning | Deep Learning | Python | SQL | Data Analysis | Artificial Intelligence | Computer Vision | Medical Image Analysis | Digital Image Processing | NLP | Multiple Eye Tracking | MATLAB | Jupyter Notebook | VsCode | Exploratory Data Analysis | Github | edge computing | cloud computing | IIoT | Microsoft Azure | Azure ML Studio | Azure IoT Central | Azure IoT Edge | LaTeX

Python's Libraries skills

Numpy | Pandas | Matplotlib | Seaborn | Sci-kit learn | Keras | Tensorflow | Azure ML SDK

Version Control and OS

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

Soft Skills

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

● RECOMMENDATIONS

Dr. Prof. Paolo Bellavista Professor

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

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

Dr. Jamal Nasir Assistant Professor-Lecturer

School of Computer Science, University of Galway, Ireland

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