

# RAO FARHAT MASOOD

AI/ML/DL Expert | Computer Vision & Multi-Modal AI | Tenured Engineer | PE (PEC) | Lt Col (retd.)

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## PROFILE HIGHLIGHTS

Distinguished practitioner with **eighteen years of engineering leadership**, including a decade of specialised **Electrical/Biomedical and Clinical Engineering practice**, across tertiary cardiac institute, surgical hospital and a UN Level-III field hospital in Sudan, complemented by **active doctoral research in Artificial Intelligence and Computer Vision (ongoing PhD)**. Experienced in **curriculum design and professional instruction**, including delivery of the Special Equipment Course – Electromedical at the **College of EME, NUST** to professional graduate engineers and structured training programs for multidisciplinary clinical and technical audiences. Teaching competence spans **machine learning, deep learning architectures, computer vision, large language models, retrieval-augmented generation, multimodal AI, data analytics, Python programming, biomedical engineering and engineering management**. **Gold Medal recipient (MS Electrical Engineering, 2021)** committed to practice-oriented education addressing Pakistan's healthcare challenges while maintaining international excellence standards. Committed to **practice oriented, research informed education** that equips graduates with the technical depth, professional maturity and ethical values to lead and innovate in a rapidly evolving technological landscape.

## CORE COMPETENCIES

### Managerial

- Team Leadership
- Recruitment & Staffing
- Technical Advisory/Consultancy
- Training and HRD
- Analytical Prowess
- Articulate Communicator

### Healthcare Facility Management

- Equipment Lifecycle Management
- Preventive/Corrective Maintenance
- Hospital Infrastructure Operations
- Healthcare Consultancy
- Internet of Medical Things (IoMT)
- Dynamic Trend Analytics

### Academic & Research

- Deep Learning
- AI/ML Frameworks
- Medical Image Analysis
- Computer Vision & NLP
- Clinical Validation
- Scientific Writing

## PROFESSIONAL EXPERIENCE

### Senior Engineering Manager – Biomedical Engineering Department

*Armed Forces Institute of Cardiology (AFIC) & National Institute of Heart Diseases*

**2023 – April 2026**

*Rawalpindi, Pakistan*

- Direct **multidisciplinary technical team** managing complex healthcare infrastructure serving **400-bed tertiary cardiac center**, ensuring **24/7 operational continuity and clinical service availability** for cardiovascular disease management through strategic leadership and cross-functional collaboration.
- Implemented **predictive analytics platform and real-time monitoring systems** using performance data and ML-driven insights, achieving **measurable reduction in unplanned downtime**, optimizing resource allocation through **data-driven decision support and iterative optimization**.
- Directed **annual technology budgets** for capital investments, conducting **evidence-based technical evaluations**, negotiating vendor partnerships and establishing validation protocols ensuring cost-effectiveness, scalability and organizational value alignment.
- Partnered with **senior clinical stakeholders** (cardiologists, radiologists, surgeons) and operational teams to **align technology roadmaps with organizational priorities**, patient safety requirements and quality improvement initiatives through effective stakeholder engagement and collaborative decision-making.
- Designed and delivered **competency-based training programs** for technical staff, **building sustainable expertise** in complex systems management, emerging technologies adoption and continuous improvement methodologies.

### Staff Officer – Logistics & Coordination

*Defence Forces of Pakistan*

**2021 – 2023**

*Pakistan*

- Orchestrated **integrated operations supporting 10,000+ personnel** across geographically dispersed locations, coordinating **supply chain optimization, resource allocation and strategic planning** in dynamic, high-complexity environments.
- Led **crisis response operations** including rapid deployment coordination, resource distribution and **multi stakeholder program management** to address urgent operational requirements in challenging conditions.
- Optimized processes and distribution systems through iterative improvements, achieving **measurable efficiency gains and cost optimization** while maintaining service excellence under resource constraints.
- **Developed and enforced institutional SOPs**, quality assurance systems, and compliance frameworks ensuring operational excellence, process standardization, and accountability across functional units.

### Department Head – Biomedical Engineering Department

*Combined Military Hospital (CMH)*

**2019 – 2021**

*Rawalpindi, Pakistan*

- Led engineering operations for **1,000-bed tertiary hospital** with advanced services, ensuring **diagnostic and therapeutic service availability**; managed **cross-functional coordination** across 16 operating theaters and multiple critical departments.
- Conceptualized **Smart Hospital digital transformation initiative** integrating **IoT-enabled monitoring, AI-driven predictive analytics and intelligent decision support systems**—demonstrating vision for emerging technology adoption and innovation leadership.
- Developed **COVID-19 rapid deployment protocol** enabling **fast, evidence-based technology validation** during pandemic surge; collaborated with multidisciplinary teams to establish agile frameworks under emergency conditions requiring iterative problem-solving.
- Partnered with **senior leadership stakeholders** (clinical heads, administrators) to align technology investments with strategic priorities; designed **mentorship and development programs building team capabilities** and ensuring knowledge transfer.
- Formulation of **Tiered Manual (Daily, Weekly, Monthly, Annually)** on Inspection, Use, Maintenance and Operations of Equipment.

#### Operations Manager – Maintenance and Management

**2018 – 2019**

*United Nations Level-III Hospital*

*Darfur, Sudan*

- Maintained **operational availability** for sole UN Level-III facility serving **2,500 personnel** in **conflict-affected environment**, managing critical infrastructure (ICU, diagnostic services, surgical operations) under **extreme resource constraints** requiring **innovative problem-solving**.
- Ensured **shifting of Medical Facility** within the Mission Zone with complete equipment relocation, installation and commissioning **without OEM support**.
- Successful **conduct of quarterly COE inspections** by acting as the focal person.
- Demonstrated **operational resilience and adaptability** in complex humanitarian context, ensuring **continuous service delivery** despite supply chain disruptions, infrastructure limitations and challenging conditions requiring rapid decision-making and iterative solutions.
- Collaborated with **multinational, cross-functional teams** including professionals from diverse backgrounds, demonstrating **cross-cultural collaboration effectiveness** and ability to maintain excellence in high-complexity international environment.

#### Engineering Manager – Biomedical Engineering Department

**2016 – 2018**

*Armed Forces Institute of Cardiology (AFIC) & NIHD*

*Rawalpindi, Pakistan*

- Led **50-member technical team** managing healthcare infrastructure for tertiary cardiac center, ensuring **operational continuity across multiple critical departments** (Emergency, Operating Theaters, ICUs, Radiology, Pathology) through strategic planning and team leadership.
- Conducted **User Level Training** sessions on **ECG Machine, Defibrillator, Cardiac Monitor and Ventilator**.
- Deployment of **Maintenance Management System (MMS)** module for workshop integration in **HMIS**.
- Directed **technology investments** including vendor negotiations and deployment of critical systems; established **validation frameworks ensuring cost-effectiveness, scalability** and organizational value alignment.
- Implemented **systematic quality improvement initiatives** including performance monitoring systems and optimization frameworks, **improving system reliability and operational efficiency** through continuous improvement methodologies.

#### Engineering Manager – Corps of Electrical and Mechanical Engineers

**2007 – 2016**

*Defence Forces of Pakistan*

*Pakistan*

- Managed **fleet engineering operations** for a diverse inventory of wheeled and tracked platforms, implementing **preventive and predictive maintenance regimes**, readiness tracking systems and life-cycle management protocols that sustained **operational availability across all assigned equipment classes**.
- Directed **multi-discipline repair workshops** encompassing **automotive, armaments, optronics and IT systems**, establishing structured workflow management, workload prioritization and quality assurance frameworks that ensured consistent turnaround and **zero compromise on operational safety standards**.
- Implemented **equipment safety and security protocols** across storage, handling and field deployment environments; enforced compliance with standing operating procedures and institutional regulatory standards to **mitigate operational risk and protect critical assets**.
- Governed **procurement cycles** for spare parts, consumables, and technical equipment; prepared technical specifications, evaluated vendor proposals, managed contract execution and maintained **audit-ready documentation** under national procurement regulatory frameworks.
- Conducted systematic **engineering analysis and fault trend diagnostics** across equipment fleets, identifying recurring failure patterns, root causes and corrective interventions that produced **measurable reductions in resource expenditure and unplanned downtime**.
- Developed and enforced **standard operating procedures, technical frameworks and quality assurance sys-**

tems across maintenance echelons, institutionalizing best practices and ensuring **operational excellence through systematic process improvement**.

- Led **large-scale emergency engineering operations (2009–2012)** in support of disaster-affected communities, directing infrastructure deployment, logistics coordination and essential services restoration under conditions requiring **rapid adaptive planning and cross-functional stakeholder management**.
- Directed **reconstruction and community development programs (2014–2016)**, mobilizing resources through stakeholder partnerships, coordinating engineering teams across multi-phase projects and **designing skills development and technical training initiatives** to build sustainable operational capacity.

## EDUCATION

### PhD Electrical Engineering

2023 – Present

*Capital University of Science & Technology (CUST), Islamabad*

Focus: Computer Vision, Medical Image Segmentation, Deep Learning, NLP, Clinical Validation

- Developing **NLP pipelines for extracting structured clinical information from unstructured radiology reports**, applying transformer-based language models to medical text for automated information extraction and clinical entity recognition
- Implementing **vision-language models** integrating computer vision and NLP for automated radiology report generation, demonstrating cross-modal representation learning and text-image alignment
- **Published Work:** [WELDE](#)
- **Manuscripts Under Review:** 3 journal manuscript

### MS Electrical Engineering – Gold Medal (1st Position)

2019 – 2021

*Capital University of Science & Technology (CUST), Islamabad*

Thesis: [Deep Learning Based Lumbar Spine Vertebrae Segmentation, Automated Measurements and Disorders Classification](#)

### BE Electrical Engineering

2003 – 2007

*National University of Sciences & Technology (NUST), Islamabad*

FYP: [Design and Implementation of Smart Washing Machine, Neural Fuzzy Logic Based.](#)

## TECHNICAL SKILLS

|                                                       |                                                                                                                                                                                                                         |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Computational Modeling &amp; Neural Networks</b>   | PyTorch, TensorFlow, Deep Learning Architectures, LLMs, Keras, ViTs, VLAs, PEFT                                                                                                                                         |
| <b>Biomedical Engineering &amp; Signal Processing</b> | Medical Signal Processing, Physiological Monitoring Systems, Medical Device Integration, Real-time Data Acquisition, Clinical Validation Protocols, Sensor Interface Design, Patient Safety Standards                   |
| <b>Computer Vision &amp; Pattern Recognition</b>      | Semantic Segmentation, Multi-Modal Data Fusion, Object Detection, Attention Mechanisms, Transfer Learning, Domain Adaptation, Feature Extraction, Image Analysis Algorithms                                             |
| <b>Programming &amp; Software Development</b>         | Python (Advanced), MATLAB, C/C++ (Foundational), Scikit-learn, Pandas/NumPy, Git/GitHub, Algorithm Implementation, Data Preprocessing & Quality Assurance                                                               |
| <b>Research &amp; Scientific Methods</b>              | Experimental Design, Peer-Reviewed Publications (5), Peer Review (Medical Image Analysis, The Visual Computer), Scientific Writing & Presentations, Cross-Disciplinary Collaboration, International Research Experience |

## PUBLICATIONS

### Journal Articles (4)

**[WELDE: a weighted ensemble loss with diversity enhancement for imbalanced object classification in medical imaging](#)**

*Network Modeling Analysis in Health Informatics and Bioinformatics*, 15:125

**2026**

**R.F. Masood, I.A. Taj**

**[Deep learning-based vertebral body segmentation with extraction of spinal measurements and disorder disease classification](#)**

*Biomedical Signal Processing and Control*, 71:103230

**2022**

**R.F. Masood, I.A. Taj, M.B. Khan, M.A. Qureshi, T. Hassan**

## Boosting the Classification of Complex Large Synoptic Survey Telescope (LSST) Data

*Journal of Engineering and Information Technology, UCP*

2024

R.F. Masood, I.A. Taj

## Localization and Edge-Based Segmentation of Lumbar Spine Vertebrae to Identify the Deformities Using Deep Learning Models

*Sensors, 22(4):1547*

2022

M. Mushtaq, M.U. Akram, N.S. Alghamdi, J. Fatima, R.F. Masood

### Conference Proceedings & Datasets (1)

## A Composite Dataset of Lumbar Spine Images with Mid-Sagittal View Annotations and Clinically Significant Spinal Measurements

*IEEE ICoDT2, Rawalpindi, Pakistan*

2022

R.F. Masood, T. Hassan, H. Raja, B. Hassan, J. Dias, N. Werghi

## COURSES/CERTIFICATIONS

|                                     |                 |               |
|-------------------------------------|-----------------|---------------|
| Machine Learning with Python        | IBM             | July, 2023    |
| Foundations: Data, Data, Everywhere | IBM             | June, 2023    |
| Image and Video Processing          | Duke University | October, 2020 |
| Neural Networks and Deep Learning   | deeplearning.ai | August, 2020  |
| AI for Medical Diagnosis            | deeplearning.ai | August, 2020  |

## HONORS, LEADERSHIP & PROFESSIONAL DEVELOPMENT

### Recognition & Awards

- Gold Medal – First Position, MS Electrical Engineering, Capital University of Science & Technology 2021

### Academic & Peer Review Service

- Scientific Peer Reviewer 2022–Present

**Elsevier:** *Medical Image Analysis, Artificial Intelligence in Medicine, Engineering Applications of Artificial Intelligence, Data in Brief.*

**Springer Nature / BMC:** *Scientific Reports, The Visual Computer, BMC Medical Imaging, BMC Musculoskeletal Disorders, Biomedical Engineering OnLine, BMC Medical Informatics & Decision Making, Journal of Orthopaedic Surgery & Research, Signal, Image and Video Processing, Journal of Imaging Informatics in Medicine.*

**Frontiers:** *Frontiers in Surgery.*

- Technical Judge – CUST AI/ML Hackathons (Healthcare AI & Clinical Systems) 2024–2025

### Professional Certifications

- Professional Engineer – Pakistan Engineering Council (ELECT/24896)
- Member – Institute of Engineers, Pakistan, MIE(Pak) (M-18382/LHR-4789)

## TECHNICAL MENTORSHIP & CAPABILITY DEVELOPMENT

### Engineering Team Development

- Designed and delivered **technical training programs** for engineering teams across multiple organizations, building sustainable expertise in emerging technologies, system management and quality assurance frameworks
- Instructor** at National University of Sciences & Technology (NUST): Taught 30 graduate engineers on advanced technology systems, lifecycle management and operational excellence methodologies

### Research & Innovation Mentorship

- Mentored capstone research projects on AI/ML applications, computer vision and data analytics; guided students in experimental design, technical validation and presentations
- Supervised university internships on Medical Imaging, Biomedical Equipment, Healthcare Management and related areas with a view to acquaint the undergraduate students with practical constraints and making them industry ready