

# MANSOOR HAYAT, MBA | PhD | P.Eng.

Postdoctoral Fellow | Candidate: Assistant Professor / Research Associate

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**Current Immigration Status: Closed Work Permit (Employer-Specific) | Valid: Sep 27, 2027 | Employer: University of Manitoba**

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## RESEARCH INTERESTS

Medical Imaging AI | Deep Learning & Representation Learning | Physiological Signal Intelligence | Explainable AI | Uncertainty Quantification | Multi-modal AI | Computer Vision | Graph Neural Networks | Clinical Decision Support | Intelligent Monitoring Systems

## ACADEMIC SUMMARY

NSERC-funded Postdoctoral Research Fellow at the University of Manitoba (Section of Neurosurgery) with a PhD in Data Science (Distinction, Chulalongkorn University) and a licensed P.Eng. (APEGM). Research portfolio spans medical imaging AI, physiological signal processing, explainable deep learning, and production clinical AI systems. 27 peer-reviewed publications across IEEE Access, Frontiers in Physiology, Sensors, Bioengineering, Physiological Measurement, and Physiological Reports. Best Paper Award IEEE TENCON 2023. Competitive independent research funding (NSERC Discovery Grant, Research Manitoba Postdoctoral Fellowship). Active academic service: Area Chair IJCNN 2025; reviewer for IEEE TMI, IEEE Access, IEEE JBHI, Nature Scientific Reports, Elsevier. 6 years of undergraduate teaching experience with formal teaching development training (TIPs, University of Manitoba, June 2025).

## EDUCATION

- Postdoctoral Fellow, Data Science, Deep Learning & Medical AI | University of Manitoba, Winnipeg, MB | Sep 2024 - Present | NSERC Discovery Grant: I2IPJ 598125-24
- Doctor of Philosophy, Data Science / Machine Learning / AI (Distinction) | Chulalongkorn University, Bangkok, Thailand | Aug 2021 - Jul 2024 | Thesis: Endoscopic Image Super-Resolution Algorithm Using Edge and Disparity Awareness | Best Paper Award, IEEE TENCON 2023
- Master of Science, Electrical Engineering | Institute of Southern Punjab, Multan, Pakistan | Apr 2016 - Mar 2018 | Thesis: Economic Power Dispatch Considering Transmission Losses Using Evolutionary Algorithms
- Master of Business Administration, Accounting & Finance | NCBA&E, Lahore, Pakistan | Aug 2018 - Feb 2022
- Bachelor of Science, Electrical Engineering | UET Taxila, Pakistan | Sep 2011 - Oct 2015

## RESEARCH FUNDING & AWARDS

- NSERC Discovery Grant (I2IPJ 598125-24): 2025-2026 | Computer Vision for Autonomous Medical Device Data Extraction | CAD \$35K-\$50K/yr | Top-15% acceptance rate
- Research Manitoba Postdoctoral Fellowship: 2025-2026 | Competitive provincial postdoctoral research award
- Best Paper Award - IEEE TENCON 2023: IEEE Region 10 International Conference, Chiang Mai, Thailand
- PhD with Distinction (2024): Chulalongkorn University | PhD Matching Position Award (Jan-Jul 2024) | Graduate Scholarship (Jul 2021-Apr 2024)

## ACADEMIC & RESEARCH EXPERIENCE

### Postdoctoral Fellow - Intelligent Sensing, Signal Analysis & Medical AI

University of Manitoba, Section of Neurosurgery | Winnipeg, MB **Sep 2024 - Present**

- Leads NSERC-funded production research programme: designed and deployed a device-agnostic camera-based system for real-time automated ICU medical device data extraction (YOLOv8 + transformer OCR), achieving 3x throughput improvement and 24/7 clinical deployment on GCP Cloud Run.
- Develops physiological signal processing AI models for ICP waveform analysis, arterial blood pressure artifact management, and NIRS time-series modelling - building core signal datasets for graph-based patient state modelling.

- Designs novel deep learning architectures with uncertainty quantification (Monte Carlo dropout) and explainability (Grad-CAM, SHAP) ensuring regulatory-transparent clinical AI inference.
- Architected multi-GPU computing and NAS storage infrastructure; engineered PHIA/PIPEDA-compliant ETL pipelines on Azure Data Factory with schema validation and anomaly detection.
- Supervises two research students: Michael Movshovich (MD Year 1, 2 consecutive summers - medical device OCR, clinical annotation, systematic review) and Vuk Roka (UG Computer Engineering - computer vision pipeline development).
- Completed formal teaching development programme (TIPs, University of Manitoba Centre for the Advancement of Teaching and Learning, June 2025).

### **Doctoral Researcher - Computational Imaging & Signal Intelligence**

Chulalongkorn University | Bangkok, Thailand **Aug 2021 - Jul 2024**

- Designed SEGSNet: deep learning architecture integrating super-resolution and surgical instrument segmentation (2x image resolution, 95% IoU, 30% inference time reduction via SPP). ONNX export; GCP Cloud Run deployment.
- Implemented explainable AI modules (Grad-CAM, cohort saliency) meeting transparency requirements for medical device regulatory classification.
- Architected ETL pipelines for 50k+ CT and imaging studies (8 hrs to 45 min per cohort); enforced data integrity, lineage, and reproducibility.
- Published 6 first-author papers in IEEE Access and IEEE EMBC. Best Paper Award, IEEE TENCON 2023. Supervised two research students in medical imaging AI evaluation.

### **Lecturer & Lab Engineer, Electrical and Computer Engineering**

University of Sargodha | Pakistan **Jan 2015 - Apr 2021**

- Designed and delivered undergraduate courses: OOP (C++/Java, 60 students), Data Structures, Digital Signal Processing, Embedded Systems, MATLAB, Power Systems (6 years).
- Structured OOP course as integrated theory-lab format (3x3hr/week): first-submission error rates dropped ~30% vs prior lecture-only cohort; near-perfect attendance sustained across semester.
- Supervised 20+ capstone and research project teams through full R&D cycles. Mentored 2 Master's students in teaching methodology; both are now lecturers at recognised universities.
- Maintained 99% laboratory uptime; procured and calibrated advanced instrumentation; designed low-cost training circuit boards.

### **PUBLICATIONS (28 TOTAL - FULL LIST: GOOGLE SCHOLAR / ORCID 0000-0002-1131-2398)**

#### **Journal Articles**

- [J1] Hayat M, Ahmad N, Nasir A, Tariq ZA. Hybrid Deep Learning EfficientNetV2 and Vision Transformer for Breast Cancer Histopathological Image Classification. IEEE Access 12 (2024): 184119-184131.
- [J2] Hayat M, Aramvith S. Transformer's Role in Brain MRI: A Scoping Review. IEEE Access 12 (2024): 108876-108896.
- [J3] Hayat M, Aramvith S. Saliency-Aware Deep Learning for Enhanced Endoscopic Image Super-Resolution. IEEE Access 12 (2024): 83452-83465.
- [J4] Hayat M, Aramvith S. E-SEVSR: Edge Guided Stereo Endoscopic Video Super-Resolution. IEEE Access (2024).
- [J5] Hayat M. Squeeze and Excitation Joint with Combined Channel and Spatial Attention for Pathology Image Super-Resolution. Franklin Open 8 (2024): 100170.
- [J6-J17] 12 additional journal articles (2024-2025) in IEEE Access, Sensors, Bioengineering, Frontiers in Physiology, Physiological Reports, Physiological Measurement - covering signal processing, sensor fusion, physiological monitoring, and medical imaging. Full list on Google Scholar.

#### **Conference Papers**

- [C1] Hayat M et al. Combined Channel and Spatial Attention-Based Stereo Endoscopic Image Super-Resolution. IEEE TENCON 2023: 920-925. [Best Paper Award]
- [C2] Hayat M et al. SEGSNet for Stereo-Endoscopic Image Super-Resolution and Surgical Instrument Segmentation. IEEE EMBC 2024.
- [C3] Hayat M et al. Attention GhostUNet++: Enhanced Segmentation of Adipose Tissue and Liver in CT Images. IEEE EMBC 2025.
- [C4] Hayat M et al. Cross-Attention Patch Fusion for Few-Shot Colorectal Tissue Generation. ICoDT2 2025.

- [C5] Hayat M et al. HAMSRNet: Hybrid Attention Multiscale Super-Resolution Network for Endoscopic Images. ICoDT2 2025.
- [C6] Hayat M et al. Super-Resolution Methods for Endoscopic Imaging: A Review. IEEE IEMECON 2024.

## ACADEMIC SERVICE

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- Area Chair: International Joint Conference on Neural Networks (IJCNN) 2025
- Academic Editor: IECE | Associate Editor: Avicenna | Editorial Board: International Journal of Medical Imaging
- Reviewer: IEEE Transactions on Medical Imaging | IEEE Access | IEEE Trans Consumer Electronics | IEEE JBHI | Biomedical Signal Processing & Control (Elsevier) | Scientific Reports (Nature) | Springer | Wiley | MDPI

## TEACHING

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**Courses Taught:** OOP (C++/Java, 60 students), Data Structures, Digital Signal Processing, Embedded Systems, MATLAB, Power Systems (6 years, UoS), Biomedical Signal Processing, Machine Learning (UofM postdoc context)

**Supervision:** 20+ capstone teams (UoS); Michael Movshovich MD Year 1 (2 summers, UofM); Vuk Roka UG Computer Engineering (UofM)

**Teaching Development:** TIPs Programme - University of Manitoba, Centre for the Advancement of Teaching and Learning (June 2025)

## TECHNICAL SKILLS

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**ML & AI:** PyTorch, TensorFlow, Keras, Scikit-learn, OpenCV, Hugging Face, ONNX, LangChain, FAISS; GNNs (GCN, GAT, GraphSAGE), PyTorch Geometric

**Cloud & Data:** GCP (Vertex AI, Cloud Run, BigQuery), Azure ML, AWS SageMaker; Docker, Kubernetes, MLflow, DVC, Azure Data Factory, Kafka

**Languages:** Python (primary), C, C++, Java, MATLAB, R, Bash, SQL

## PROFESSIONAL STANDING & CERTIFICATIONS

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- P.Eng. - Engineers Geoscientists Manitoba (APEGM) | Registered Engineer, Pakistan Engineering Council
- ML Specialisation (Stanford/DeepLearning.AI) | MLOps Specialisation (DeepLearning.AI) | Mathematics for ML (Imperial College London)
- AI for Medicine Specialisation (DeepLearning.AI) | Explainable Deep Learning for Healthcare (U of Glasgow) | Deep Learning for Healthcare (U of Illinois)
- AWS ML & Computer Vision | Big Data Specialisation (UC San Diego) | IoT Specialisation (UC Irvine)
- TCPS 2: CORE 2022 (Research Ethics) | PHIA Training MB74615 (University of Manitoba) | IOSH Managing Safely | WHMIS

## REFERENCES

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- Dr. Nouman Ahmad | Researcher / AI & Data Science | NAISS Sweden | nouman.ahmad@naiss.se
- Additional references - research supervisors, clinical collaborators, and industry partners - available upon request.