Mubashara Rehman

Doctoral Researcher in Medical Imaging
Università degli Studi di Udine (Enrolled)
IRCCS Centro di Riferimento Oncologico di Aviano, Italia (Research project host)
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Short Biography

Mubashara Rehman is a passionate researcher in medical imaging, with a focus on deep learning-based metal artifact reduction and domain transformation in CT imaging. Currently pursuing her Ph.D. at the University of Udine, Italy, in collaboration with the National Cancer Research Institute, CRO IRCCS, her work is supported by the Italian Ministry of Health. She holds a Master's degree from Tianjin University, China, and a Bachelor's degree from Pakistan, both of which laid the foundation for her expertise in computer vision and artificial intelligence. Driven by a strong interest in advancing clinical imaging, she aims to extend her research to AI-driven CT reconstruction and enhancement, fostering innovations that bridge technical development with real-world healthcare impact.

Research Interest

Deep Learning for Medical Imaging, Metal Artifact Reduction in CT, Cross-Modality Domain Transformation (kVCT → MVCT), AI-driven CT Reconstruction and Enhancement, Frequency-Aware Learning, Implicit Neural Representations.

Education and Training

Ph.D. in Artificial Intelligence and Data Analysis for Personalized Oncology
Sept. 2023 - Ongoing

Dipartimento di Scienze Matematiche, Informatiche e Fisiche,
Università degli Studi di Udine,
Udine (Italia).
Collaboration with IRCCS Centro di Riferimento Oncologico (CRO), Aviano.

Advisor: Prof. Christian Micheloni (Machine Learning and Perception Lab, UNIUD)
Co-Advisors: Prof. Niki Martinel (Machine Learning and Perception Lab, UNIUD)
Collaborators: Dr. Michele Avanzo (IRCCS Centro di Riferimento Oncologico, CRO), Dr. Riccardo Spizzo (IRCCS Centro di Riferimento Oncologico, CRO).

- Research focused on AI-driven methodologies for personalized treatment strategies in oncology.
- Developed advanced techniques for Metal Artifact Reduction (MAR) in oncological radiomics.

Master of Science in Software Engineering Sept. 2017 - Apr. 2020

College of Intelligence and Computing, Tianjin University,
Tianjin (China)

- Graduated with 83.2% marks.
- Awarded Tianjin University International Student Scholarship.

Bachelor of Science in Software Engineering Sept. 2012 - Jun. 2016

Department of Software Engineering, Fatima Jinnah Women University,
Rawalpindi (Pakistan).

- Final grade: 82%.
- Senior Design Thesis: "Design and Development of an Android Application for Indoor Navigation and Positioning System using Sensor Networks" – secured A+.
- Degree verified by World Education Services (WES).

Research Collaborations

Universidad de Santiago de Compostela (Spain) Apr. 2024 – Sep. 2024
Collaboration with Dr. Belén Serrano-Antón and Prof. Alberto P. Muñuzuri.

- FlowReserve Labs S.L., Santiago de Compostela, Spain
- CITMAga, Santiago de Compostela, Spain
- Group of Nonlinear Physics, University of Santiago de Compostela, Spain

Worked on medical imaging research focused on metal artifact reduction and CT domain transformation.
Outcome: Co-authored the paper "MAR-DTN: Metal Artifact Reduction using Domain Transformation Network for Radiotherapy Planning," published at the *27th International Conference on Pattern Recognition (ICPR)*, 2024.

Professional Experience

Research Collaborator Sept. 2023 – on-going

IRCCS Centro di Riferimento Oncologico di Aviano, Aviano, Friuli-Venezia Giulia (Italy).

- Collaborated with oncologists and medical physicists on CT imaging datasets.
- Focused on AI-driven methodologies for Metal Artifact Reduction (MAR) and cross-modality domain transformation (kVCT → MVCT).
- Worked on integrating deep learning models for CT reconstruction and enhancement in radiotherapy workflows.

IT Project Lead and CRM Manager May 2021 – Jun. 2023

Moreno Holdings Pvt Ltd., Islamabad (Pakistan).

Senior Research Executive Jun. 2016 – Dec. 2019

resourcex.io IT Consulting, Rawalpindi (Pakistan) - Remote

Trainee Oct. 2015 – May 2016

Crevo Technologies, Islamabad (Pakistan).

Internee Aug. 2015 – Oct. 2015

Directorate General Defence Purchase (DGDP), Rawalpindi (Pakistan).

Awards and Honours

- PhD Fellowship Award – Fully funded doctoral fellowship granted by the Italian Ministry of Health-2023, in collaboration with the National Cancer Research Institute, CRO IRCCS.
- Master's Scholarship – Tianjin University International Student Scholarship-2017, awarded for academic excellence.
- Laptop Award – Recipient under the Prime Minister's Best Student Laptop Scheme 2015, Government of Pakistan.

CAD Skills

- **Programming:** Python, C/C++
- **Libraries/Frameworks:** PyTorch, OpenCV, scikit-image, Matplotlib, Seaborn, Weights & Biases (Wandb), NumPy, Pandas
- **Tools/Platforms:** Git, PyCharm, Jupyter Notebook, Jupyter Lab, Draw.io, Jira, Miro
- **Medical Imaging Software:** 3D Slicer (primary), ITK-SNAP (basic use)
- **Research Tools:** LaTeX, BibTeX, EndNote, Mendeley
- **Languages:** Strong reading, writing, and speaking competencies in English and Urdu

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Professional Affiliations

- **Member** (2025 – Current), Associazione Italiana per la Ricerca in Computer Vision, Pattern Recognition e Machine Learning (CVPL), affiliated with the International Association for Pattern Recognition (IAPR).

Publications

- **Mubashara Rehman**, Niki Martinel, Michele Avanzo, Riccardo Spizzo, Christian Micheloni, "MAR-VDTN: Multi-Modal Alignment Automation and 2.5D Volumetric CT Domain Transformation with Metal Artifact Reduction for Radiotherapy Planning," under review at *International Journal of Computer Assisted Radiology and Surgery*, 2026.
- **Mubashara Rehman**, Niki Martinel, Michele Avanzo, Riccardo Spizzo, Christian Micheloni, "H3D-MarNet: 3D Dual-Encoder Hybrid Network for Implicit Metal Artifact Reduction via CT Domain Transformation," under review at *IEEE Journal of Biomedical and Health Informatics (JBHI)*, 2026.
- **Mubashara Rehman**, Niki Martinel, Michele Avanzo, Riccardo Spizzo, Christian Micheloni, "WAVEFORM-Net: Wavelet-Enhanced Frequency Fusion for Transformer-Based Metal Artifact Reduction in CT Domain Translation," under review at *IEEE Journal of Biomedical and Health Informatics (JBHI)*, Jul. 2026.
- **Mubashara Rehman**, Niki Martinel, Michele Avanzo, Riccardo Spizzo, Christian Micheloni, "ReMAR-DS: Recalibrated Feature Learning for Metal Artifact Reduction and CT Domain Transformation," Accepted at *23rd International Conference on Image Analysis and Processing (ICIAP)*, Sept. 15–19, 2025.
- Damiano Spina, Kevin Roitero, Stefano Mizzaro, Vincenzo Della Mea, Francesca Da Ros, Michael Soprano, **Mubashara Rehman**, et al., "Report on the Hands-On PhD Course on Responsible AI from the Lens of an Information Access Researcher," *ACM SIGIR Forum*, Vol. 58, Issue 2, pp. 1–61, ACM, Mar. 6, 2025.
- **Mubashara Rehman**, Niki Martinel, Michele Avanzo, Riccardo Spizzo, Christian Micheloni, "MAR-DTN: Metal Artifact Reduction using Domain Transformation Network for Radiotherapy Planning," *27th International Conference on Pattern Recognition (ICPR)*, Jun. 10, 2024.
- **Mubashara Rehman**, Chung Ming Own, Ziqi Li, "A Fast and Robust Embedded Optical Flow Unit on Motion Estimation," *2021 10th International Conference on Software and Computer Applications (ICSCA)*, Feb. 2021, pp. 180–185.

Extra-Curricular Activities

Chinese Opera Culture Week – Peking Opera Oct. 2018
Participated in cultural volunteering at the 9th China (Beijing) International Garden Expo.

Soprano Singing – International Students Chorus, Tianjin University Nov. 2019
Performed as part of the international students' chorus, representing cultural exchange through music.

Volunteer Work

Esmile Khursheed Welfare, Rawalpindi (Pakistan).

. Interaction with students, extra-curricular activities, and confidence-building sessions.

Al-Shifa Eye Trust Hospital, Rawalpindi (Pakistan).

. Assisted staff in patient handling and interacted with patients during daily operations.

References

- **Prof. Christian Micheloni**
  Professor, University of Udine, Udine (Italy)
  Email: christian.micheloni@uniud.it
- **Prof. Niki Martinel**
  Associate Professor, University of Udine, Udine (Italy)
  Email: niki.martinel@uniud.it

- **Dr. Riccardo Spizzo**
  Medical Director, Noncoding RNA Lab
  Medical Director, Molecular Oncology and Preclinical Models of Tumor Progression,
  IRCCS Centro di Riferimento Oncologico (CRO), Aviano (Italy)
  Email: rspizzo@cro.it