

Muhammad Ahmad Sultan, M.S.

Ph.D. Candidate (4th Year), Biomedical Engineering

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Columbus, OH - 43201, USA

CV last updated: Sept 2025


CAREER OBJECTIVE

My research has focused on developing unsupervised deep learning image reconstruction methods for motion-robust accelerated real-time cardiac MRI to streamline image acquisition and reconstruction processes. I am passionate about advancing medical imaging technology using advanced AI techniques, with the ultimate goal of enhancing patient care through my imaging developments.

RESEARCH EXPERIENCE

- **Graduate Research Associate @ Cardiovascular Magnetic Resonance Lab**  Aug 2022 – Present
The Ohio State University, Columbus, OH, USA
 - Developed DISCUS, a self-supervised deep learning reconstruction framework, enabling accelerated dynamic MRI reconstruction by combining deep image prior and manifold discovery, demonstrating improved diagnostic image quality for single-shot free-breathing LGE. | [Paper](#) | [Code](#)
 - Extending ML-DIP framework, a multi-dynamic low-rank DIP, to motion-robust volumetric LGE, integrating Dixon fat-water modeling for multi-echo and joint sensitivity maps estimation, for accelerated ~5-minutes iNAV acquisition, with better arrhythmia handling. | [M-DIP-2D Paper](#) | [Code](#)
- **Research Assistant @ Signal, Image & Video Processing Lab** Aug 2021 – July 2022
Lahore University of Management Sciences, Lahore, Pakistan
 - Developed a machine learning pipeline for a "Vitals Monitoring System" using only PPG signal, engineered features, applied regression for cough-less blood pressure estimation, integrated vitals in a fingertip oximeter, enabling continuous and non-invasive monitoring with one wearable sensor. | [Paper](#)

EDUCATION

- **Ph.D. Biomedical Engineering | Post-candidacy** Aug 2027 (Expected)
The Ohio State University, Columbus, OH, USA
 - GPA: 3.90/4.00
 - Advisor: Rizwan Ahmad, Ph.D., Lab: Cardiovascular Magnetic Resonance Lab 
 - **Research Focus:** Development of self-supervised deep learning methods for accelerated cardiac MRI reconstruction to improve image quality, reduce scan time, and streamline acquisition workflows.
- **M.S. Biomedical Engineering** Dec 2024
The Ohio State University, Columbus, OH, USA
 - GPA: 3.90/4.00
 - **Relevant Coursework:** MR Spectroscopy & Imaging, Medical Imaging & Analysis, Optimization, Probability Theory, Reinforcement Learning
- **B.S. Electrical & Computer Engineering | Gold Medalist** May 2021
University of Engineering and Technology, Lahore, Pakistan
 - GPA: 3.90/4.00, Class Rank: 1/200
 - **Relevant Coursework:** Signal Processing, Machine Learning, Calculus, Linear Algebra, Embedded Systems

SKILLS

- **Research Areas:** Image Reconstruction, Unsupervised Deep Learning, Signal/Image Processing, Inverse Problems
- **Languages:** Python, MATLAB, C, SQL, Verilog
- **Libraries:** Pytorch, Tensorflow, Keras, Scikit-learn, Numpy, Pandas

JOURNAL PUBLICATIONS

- C. Chen, M. Vornehm, P. Chandrasekaran, **M.A. Sultan**, et al. "A multi-dynamic low-rank deep image prior (ML-DIP) for real-time 3D cardiovascular MRI." *arXiv*, July 2025. | [Preprint](#)
- M. Vornehm, C. Chen, **M.A. Sultan**, et al. "Multi-dynamic deep image prior for cardiac MRI." *Magnetic Resonance in Medicine (MRM)*, July 2025. | [Paper](#) | [Code](#)
- **M.A. Sultan**, C. Chen, Y. Liu, et al. "An unsupervised method for MRI recovery: Deep image prior with structured sparsity." *Magn Reson Mater Phy (MRMP)*, May 2025. | [Paper](#) | [Code](#)
- **M.A. Sultan**, & W. Saadeh, "Continuous patient-independent estimation of respiratory rate and blood pressure using robust spectro-temporal features derived from photoplethysmogram only." *IEEE Open Journal of Engineering in Medicine and Biology (EMB)*, 5: 637-649, Nov 2023. | [Paper](#)

CONFERENCE PUBLICATIONS & ORAL PRESENTATIONS

- **M.A. Sultan**, C. Chen, Y. Liu, et al. "Deep image prior with structured sparsity for dynamic MRI reconstruction." 2024 *IEEE International Symposium on Biomedical Imaging (ISBI)*, Athens, Greece. | [Paper](#)
- X. Lei, P. Schniter, C. Chen, **M.A. Sultan**, et al. "Surface coil intensity correction for MRI." 2024 *IEEE International Symposium on Biomedical Imaging (ISBI)*, Athens, Greece. | [Paper](#)
- **M.A. Sultan**, & W. Saadeh, "Robust estimation of respiratory rate from photoplethysmogram with respiration quality analysis." 2022 *IEEE International Symposium on Circuits and Systems (ISCAS)*, Austin, Texas, USA. | [Paper](#)

PEER-REVIEWED ABSTRACTS & POSTER PRESENTATIONS

- C. Chen, **M.A. Sultan**, et al. "FlowDIP: Real-time phase-contrast MRI reconstruction with flow-conditional deep image prior." *Journal of Cardiovascular Magnetic Resonance*, Volume 27, 101504. Presented at **SCMR 2025 Annual Scientific Sessions**, Washington, DC. | [Link](#)
- **M.A. Sultan**, et al. "Deep image prior with structured sparsity for dynamic MRI reconstruction." 2023 *ISMRM & ISMRT Annual Meeting & Exhibition*, Toronto, Canada. | [Link](#)

INVENTIONS & PATENTS

- R. Ahmad, M. Vornehm, C. Chen, **M.A. Sultan**, et al. "Systems and methods for dynamic image reconstruction." Patent pending, filed on Nov 2024, Application number: 63/716,363.

CERTIFICATIONS

- **Computer Vision & NLP Projects** July 2020
 - Completed 3 projects using keras and scikit-learn: twitter sentiment analysis (NLP), house price prediction (regression), and image classification with data augmentation & transfer learning. | [Coursera](#)
- **Deep Learning Specialization by Andrew Ng** May 2020
 - 5-course track covering neural networks, CNNs, sequence models, hyperparameter tuning, and model optimization with hands-on programming assignments. | [Coursera](#)

HONORS & AWARDS

- **Tutor – AI Introductory Class** Mar 2022

Lahore University of Management Sciences, Lahore, Pakistan

 - Tutored three undergraduate students in foundational AI concepts as part of an introductory course.
- **Academic Excellence – Gold Medalist** July 2021

University of Engineering and Technology, Lahore, Pakistan

 - Awarded 5 gold medals for highest departmental GPA across semesters.
- **Merit Scholarship – Top 5 Students** 2017 – 2021

University of Engineering and Technology, Lahore, Pakistan

 - Dean's merit scholarship awarded to top 5 undergraduate students each semester.
- **Best Semester Project – ML Class** Dec 2020

University of Engineering and Technology, Lahore, Pakistan

 - Recognized for top project "NLP-based Fake News Detector" for machine learning class.
- **Cricket Tournament – Best Bowler Award** Mar 2019

University of Engineering and Technology, Lahore, Pakistan

 - Best bowling performance in the champion team of Cricket tournament, ElectroCup2k19.
- **Merit-based Laptop Award** May 2017
 - Awarded by Government of Punjab, Pakistan, for outstanding high-school performance.
- **Merit-based Scholarship Award** 2015 – 2017
 - Super-section, Punjab Group of Colleges, Lahore for maintaining outstanding high-school performance.

WORKSHOPS & SEMINARS

- Attending **weekly seminars** in BME department at The Ohio State University. *Aug 2022 – Present*
- Attended **Research Enhancement Sessions** on IEEE Xplore database & publications at EE, LUMS. *Jan 2022*
- Participated in NVIDIA Deep Learning Workshop on **Accelerated Data Science** held at EE, LUMS. *Dec 2021*

ADDITIONAL INFORMATION

Languages: English, Urdu, Hindi, Punjabi

Interests & Activities: Cooking, reading scientific articles, media analysis, data storytelling (memes)

REFERENCES

1. **Rizwan Ahmad** (Ph.D. Advisor)
Professor, Biomedical Engineering Department
The Ohio State University, Columbus, OH, USA
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2. **Wala Saadeh** (Research Advisor)
Assistant Professor, Electrical and Computer Engineering
Western Washington University, Bellingham, WA, USA
Email: saadehw@wwu.edu | Website: <https://u.wwu.edu/saadeh/> | Scholar: <https://scholar/saadeh/>