Mahdi Islam

mahdiislam79.github.io

EDUCATION

Erasmus Mundus Joint Master: Medical Imaging & Applications (MAIA) Sept. 2023 – July 2025
University of Girona (Spain), University of Cassino (Italy), University of Burgundy (France) **Grade: 8.96/10.00**
Relevant Courses: Advanced Image Analysis, Machine and Deep Learning, Medical Image Segmentation and Applications, Medical Image Registration and Applications, Computer Aided Diagnosis
Master Thesis: Uncertainty-Guided Active Learning for Access Route Segmentation and Planning in Transcatheter Aortic Valve Implantation

Bachelor of Science: Electrical & Electronic Engineering Jan. 2018 – May 2022
Islamic University of Technology (IUT), Bangladesh **Grade: 3.63/4.00**

RESEARCH & WORK EXPERIENCE

Research Assistant, *Department of Radiology*
Medical University of Innsbruck, Austria February 2025 – July 2025

- Implemented active learning strategies for an annotation-efficient 3D segmentation pipeline, followed by vessel diameter measurement, to extract iliac diameter profiles supporting access route planning in Transcatheter Aortic Valve Implantation (TAVI).
- Developed a multimodal pipeline integrating deep learning and imageomics from pre-TAVI CT and CMR scans to predict post-procedural mortality, with interpretability supported by SHAP analysis and survival insights derived from Kaplan-Meier analysis.

Lecturer, *Department of Computer Science & Engineering*
Metropolitan University, Bangladesh August 2022 – June 2023

Undergraduate Research Assistant, *Department of Electrical & Electronic Engineering*
Islamic University of Technology (IUT), Bangladesh April 2021 – April 2022

- Created a novel dataset from sensor-acquired foot sole heat-map videos using image augmentation techniques.
- Developed a real-time multiclass classification model to detect types of gait anomalies using the Keras-Tensorflow.

PUBLICATIONS

- **M. Islam**, M. Tabassum, A. Mayr, C. Kremser, M. Haltmeier, E. Almar. *"Uncertainty-Guided Active Learning for Access Route Segmentation and Planning in Transcatheter Aortic Valve Implantation."* **MDPI Journal of Imaging**, 2025, **doi:** 10.3390/jimaging11090318.
  Publisher: MDPI
  Keywords: Active Learning, Vessel Diameter Quantification, Aortic Segmentation, TAVI Planning, CMR.
- J. Bai, Y. Tang, Z. Zhou, **M. Islam**, M. Tabassum, E. Almar-Muñoz, *et al. "FUGC: Benchmarking Semi-Supervised Learning Methods for Cervical Segmentation."* **IEEE Transactions on Medical Imaging (TMI)**, 2025. *(Under Review)*
  Publisher: IEEE
  Keywords: Cervical Segmentation, Semi-Supervised Learning, Vision Transformer, Fetal Ultrasound.
- **M. Islam**, M. Tabassum, M. M. Nishat, F. Faisal and M. S. Hasan, *"Real-Time Clinical Gait Analysis and Foot Anomalies Detection Using Pressure Sensors and Convolutional Neural Network",* **International Conference on Business and Industrial Research (ICBIR) 2022**, **doi:** 10.1109/ICBIR54589.2022.9786472.
  Publisher: IEEE Xplore
  Keywords: Pressure sensors, Transfer learning, Gait Analysis, Foot Anomalies, Convolutional Neural Network (CNN).

PROJECTS

Deep Learning-Based Brain Tissue Segmentation Using U-Net and MRI Data | *Project Link*
University of Girona November 2024 – January 2025

- Developed a U-Net-based deep learning model for brain tissue segmentation, focusing on cerebrospinal fluid (CSF), gray matter (GM), and white matter (WM) from MRI scans from IBSR18 dataset.
- Preprocessed MRI data with advanced normalization, slice selection, and one-hot encoding while applying data augmentation to enhance model generalizability.
- Achieved improved Dice similarity coefficients by leveraging a robust training pipeline using PyTorch and Weights & Biases for efficient tracking and hyperparameter optimization.

Brain Tissue Segmentation: An approach using Gaussian Mixture Models integrating Atlas-based and Tissue Modeling Techniques | *Project Link*
University of Girona September 2024 - November 2024

- Combined Gaussian Mixture Model (GMM) with probabilistic atlas-based methods for brain tissue segmentation using MRI scans.
- Enhanced Gray Matter (GM), Cerebrospinal Fluid (CSF), and White Matter (WM) segmentation by integrating spatial and intensity data using K-means and Tissue Model.
- Improved segmentation accuracy combining tissue models and probabilistic atlas with Expectation Maximization (EM) algorithm.

Colorectal Cancer Tissue Classification and Gland Segmentation from Histopathology Images | *Project Link*
University of Cassino March 2024 – May 2024

- Developed an image processing segmentation pipeline using K-means clustering and Watershed algorithms, improving segmentation accuracy with grayscale morphology, smoothing, and circularity-based estimation.
- Created a machine learning pipeline for multi-class classification, extracting GLCM, Local Binary Patterns, and Gabor features, and used classifiers such as XGBoost, LightGBM, and SVM for improved classification.
- Engineered a deep learning segmentation pipeline using PyTorch, experimenting with UNet and UNet++ architectures and backbones like VGG16, ResNet, and EfficientNet.

4D Chest CT Volume Registration: DIR-Lab Challenge | *Project Link*
University of Girona November 2024 – January 2025

- Developed a baseline registration model using elastix to align thoracic structures in different respiratory phases of patients with chronic obstructive pulmonary disease (COPD).
- Building a deep learning pipeline using VoxelMorph to enhance registration accuracy and compare with the baseline.

Skin Cancer Detection from Dermoscopic Images: Comparing ML & DL Approaches | *Project Link*
University of Girona September 2024 – January 2025

- Performed image pre-processing tasks such as hair removal, color normalization, and ROI extraction, followed by feature extraction using methods such as GLCM, LBP, Gabor filters, and HOG to capture critical color, texture, and gradient characteristics.
- Implemented SVM, Random Forest, and XGBoost classifiers for binary and multiclass classification, addressing data imbalance through resampling techniques.
- Explored advanced deep learning methods, including EfficientNet, to enhance classification accuracy and performance.

AI Generated Text Detection System | *Project Link*
University of Burgundy September 2023 – December 2023

- Built a web application to detect AI-generated sentences, using a Byte-Pair tokenizer followed by a TFIDF vectorizer for word embeddings.
- Developed a classification model using an ensemble of LightGBM, CatBoost, SGD, and Logistic Regression classifiers.
- Created the web interface using Streamlit for real-time user interaction.

ACCOMPLISHMENTS

Fetal Ultrasound Grand Challenge | ISBI 2025 | *Certificate Link* March 2025

- Ranked 5^{th} among all participating teams

Intherapy Graduate School Scholarship | University of Bourgogne, France | *Certificate Link* Jamuary 2025
Associate Data Scientist Certificate | DataCamp | *Certificate Link* November 2024

EXTRACURRICULAR ACTIVITIES

Deputy Coordinator - IT and Web Design, Erasmus Mundus Association Bangladesh January 2025 – Present
Captain, IUT University Tennis Club April 2021 – May 2022

SKILLS

- **Programming:** Python, R, SQL, MATLAB, C++, JavaScript, Java
- **Deep Learning:** Foundation Models, LLMs, VLMs, CNNs, LSTMs, RNNs
- **Deep Learning & Machine Learning Frameworks:** PyTorch, MONAI, TensorFlow, Hugging Face, Scikit-learn
- **Medical Image Processing Tools:** ITK-SNAP, 3D-Slicer, Elastix, SPM, Transformix
- **Visualization:** Matplotlib, Seaborn, OpenCV, Skimage, PIL, Pandas, NumPy
- **Electrical & Electronic Design Tools:** Proteus, Simulink, PSpice.

RESEARCH INTERESTS

Deep Learning, Machine Learning, Neuroimaging, Biomedical Image Processing, Computational Pathology, Semi/Weakly Supervised Segmentation, Multimodal Data Analysis, Biomarker and Radiomics Analysis for Diagnosis, Prognosis, Survival and Treatment Outcome Prediction.

STANDARDIZED TEST SCORES

IELTS: Listening 9 | Reading 9 | Speaking 7 | Writing 7 | **Overall 8**

REFERENCES

Dr. Xavier Lladó, Full Professor
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Universitat de Girona, 17003 Girona, Spain
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Dr. Agnes Mayr, Associate Professor | Master Thesis Supervisor
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Dr. Alessandro Bria, Associate Professor
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