Wahidul Alam

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Education

The University of Iowa (UIOWA) — Iowa City, Iowa, USA — Aug 2019 – Dec 2024 (expected)
Ph.D. in Biomedical Engineering, CGPA: 4.0/4.0

- Selected Coursework: Principles of Magnetic Resonance Imaging, Medical Imaging physics, Digital Image Processing, Machine Learning I & II, Deep learning, Data mining, Generative AI Tools.

Bangladesh University of Engineering & Technology — Dhaka, Bangladesh — May 2012 – Feb 2017
BS in Electrical and Electronic Engineering, CGPA: 3.44/4.0

Experience

Research Assistant, Laboratory of Quantitative & Dynamic MRI [Link] — Aug. 2019 – Present
Advisor: ***Prof. Sajan G. Lingala***

- Project I (Complete): To overcome the limitations of conventional coils for upper-airway imaging, I developed and evaluated a custom 16-channel coil tailored for improved parallel imaging performance enabling efficient accelerated dynamic MRI of the upper-and-infraglottic airway at 3T.
  Parallel MRI | Compressed Sensing | GE SIGNA Premier 3T Scanner
- Project II (Complete): Engineered and improved a physics-driven deep unrolled reconstruction approach for volumetric upper airway static imaging and achieved ∼16-fold reduction in scan time without compromising the image quality.
  Variable-density Cartesian Sampling | Model-based Deep Learning | Conjugate Gradient Descent | Unrolled Reconstruction | PyTorch
- Project III (In-Progress): Routine adaptation of MRI in assessing airway collapse in Obstructive Sleep Apnea (OSA) is significantly limited by spatiotemporal resolution and full-airway coverage. To overcome these challenges, I'm developing a motion-robust learning-based reconstruction technique for 3D dynamic imaging of OSA during sleep.
  Self-supervised Learning | Manifold based Representation Learning | Generative Model | SigPy (MRI) | Variable-density Spiral Sampling | Git

MR Recon Software Developer Intern, GE HealthCare [Link] — Sep 2023 – April 2024
Part-time (Remote)

- Project I (Complete): Designed and developed a 2D multi-slice Cartesian reconstruction application in C++ for Orchestra SDK, utilizing the ScanArchive file format. The application, intended for sharing with the global MR research community, enables faster reconstruction by utilizing the raw and unsorted stream of acquisition data stored in ScanArchive, rather than the traditional sorted k-space order of P-files.
  Object-Oriented Programming (OOP) | CPP | Continuous Integration and Continuous Delivery (CI/CD)
- Project II (Complete): Incorporated the reconstruction logic developed in Project I to build a live app enabling online MRI reconstruction in the MRI scanner and the reconstructed images is immediately accessed from the DICOM database for visualization.
- Project III (In-Progress): The live app built in project II can now additionally access custom python functions/scripts as bindings for inference with pre-trained deep neural networks as an intermediate step before installing images into DICOM database.

Teaching Assistant, Applied Machine learning (graduate-level) [Link] — Jan 2023 – May 2023
Instructor: ***Prof. Mathews Jacob***

- In this project-focused course, I mentored students in designing and implementing both supervised and unsupervised learning to tackle diverse applications including image reconstruction, enhancement, generation, and classification.
  Supervised training: classification & Regression Models | Optimization | Kernel Methods | Auto-encoders | GANs
- Also delivered two ad-hoc, one-hour classroom lectures. One covered the Introduction to Python programming, including Object-Oriented Programming (OOP), and the other focused on an Introduction to PyTorch.

Selected Publications

Journals:

1. **W. Alam**, R.Z. Rusho, S. Reineke, M. Raja, D.V.Daele, J. Liu, S.G. Lingala, *"A flexible 16-channel custom coil array for accelerated imaging of upper and infraglottic airway at 3 Tesla",* Magnetic Resonance in Medicine, 2022. (IF: 4.108) [Link]

2. D. Meyer, R. Z. Rusho, **W. Alam**, G.E. Christensen, D.M. Howard, J. Atha, E.A. Hoffman, B. Story, I.R. Titze, S.G. Lingala, *"High-resolution three-dimensional hybrid MRI + low dose CT vocal tract modeling: A cadaveric pilot study",* Journal of Voice, 2022. (IF: 2.3) [Link]

3. R.Z. Rusho, A.H. Ahmed, S.J. Kruger, **W. Alam**, D. Meyer, D. Howard, I.R. Titze, M. Jacob, S.G. Lingala, *"Rapid dynamic speech imaging at 3 Tesla using combination of a custom vocal tract coil, variable density spirals and manifold regularization",* NMR in Biomedicine. (IF: 4.478) [Link]

Conference Proceedings:

1. **W. Alam**, R.Z. Rusho, J. Liu, D.V. Daele, M. Jacob, S.G. Lingala, *"Self-supervised variational manifold learning: application to dynamic MRI of airway collapse in obstructive sleep apnea",* (digital poster presentation), annual meeting of ISMRM, May 2024.

2. **W. Alam***, R.Z. Rusho*, D.V. Daele, J. Liu, M. Jacob, S.G. Lingala; *equal contribution, *"Accelerated imaging of airway collapse in obstructive sleep apnea with variable density spirals and variational manifold learning",* (oral presentation), ISMRM workshop on data sampling and reconstruction, Sedona, Jan 2023.

3. R. Z. Rusho, Q. Zou, **W. Alam**, S. Erattakulangara, M. Jacob, S. G. Lingala, *"Accelerated pseudo 3D dynamic speech MR imaging at 3T using unsupervised deep variational manifold learning",* In Medical Image Computing and Computer Assisted Intervention–MICCAI 2022: 25th International Conference, Singapore, September 18–22, 2022, Proceedings, Part VI, pp. 697-706. 2022.

4. **W. Alam**, S.G. Lingala, *"Accelerated volumetric vocal tract MRI using model based deep learning",* (digital poster presentation), annual meeting of ISMRM, May 2022.

5. R. Z. Rusho, **W. Alam**, A. Ahmed, S. Kruger, M. Jacob, S. G. Lingala, *"Rapid dynamic speech imaging at 3Tesla using combination of a custom airway coil, variable density spirals and manifold regularization,"* (oral presentation), annual meeting of ISMRM, May 2021. **ISMRM summa cum laude merit award**

Techincal Skills

Programming Languages: Python, C++, MATLAB
ML/DL Frameworks: scikit-learn, PyTorch, TensorFlow
Development tools: Docker, git

Awards and Honors

- Ballard and Seashore Dissertation Fellowship, The University of Iowa. (Fall 2024)
- Dare to Discover'24 campaign rising star, The University of Iowa. (2023-2024)
- NIH T32 Lung Imaging Training Fellow, The University of Iowa. (2023-2024)
- Dean's Graduate Fellow, The University of Iowa. (2020-2023)
- Trainee (Educational) Stipend for annual meeting of ISMRM. (2021, 2022, 2023)
- Graduate & Professional Student Government travel award, The University of Iowa. (2022)
- K.B. Chandran Travel Award, The University of Iowa. (2022, 2023)
- Graduate Student Senate Travel Award, The University of Iowa. (2022)
- ISMRM summa cum laude merit award as co-author. (2021)

Professional Activities

- **Reviewer**, IEEE Transactions on Medical Imaging
- **Student member**, Institute of Electrical and Electronics Engineers (IEEE)
- **Student trainee**, International Society for Magnetic Resonance in Medicine (ISMRM)

Course Project Highlights

- **Robust-feature selection from the complex latent space of DL-based segmentation networks.** GitHub
  - Generated representational latent space from a U-NET architecture aimed at segmentation of region-specific objects from echo-cardiogram dynamic images. scikit-learn PyTorch
  - Achieved comparable binary classification accuracy as the state of the art approach while reducing computational complexity and offering network interpretability.
- **Super-resolution accelerated MRI reconstruction using deep-learning.** GitHub
  - Demonstrated super-resolution for accelerated MRI using both supervised and unsupervised learning. PyTorch
- **Edge-based-object-segmentation-and-classification.** GitHub
  - Deterministic object segmentation and classification on RGB images captured with different orientation, depth and hand-written backgrounds. MATLAB
- **T1-T2 weighted synthetic image generation using CycleGAN.** GitHub
  - GAN-based contrast mapping without compromising speed and image quality on both in-house and open-sourced datasets. TensorFlow
- **CIFAR-10 image classification using support vector machine and deep neural networks.** GitHub
  - Parameter-tuning on both SVM-model and CNN-based multi-class classification. TensorFlow