Mohammad Al Fahim K

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Education

Master of Science - Electrical Engineering Aug. 2021 - Present
Indian Institute of Technology Madras *Chennai,TN,India*

- Relevant Coursework: Medical Image Analysis, Computational Photography, Convex Optimization.

Bachelor of Technology - Electrical Engineering Aug. 2017 - May 2021
Indian Institute of Technology Tirupati *Tirupati,AP,India*

- Relevant Coursework: Medical Imaging, Machine Learning for Image Processing, Computer Vision, Speech Signal Processing, Digital Signal Processing, Signal & Systems.

Skills

Programming Languages	Python, Matlab, C++.
Software Skills	PyTorch, Keras, Tensorflow, OpenCV in Python, Android Studio.
Areas of Interest	Deep Learning, Medical Imaging, Computer Vision, Machine Learning, Image Processing.

Work Experience

Project Intern May 2020 - July 2020
Tarah Technologies *Banglore,Karnataka,India*

- Developed an Android mobile application for Telugu Handwritten Text Recognition.

- Deployed the Deep Learning model as part of the Telugu Handwritten Text Recognition project in multiple cloud servers like Heroku and Amazon Web Services for backend word recognition.

Research Experience

Research Associate Jan. 2022 - Present
Healthcare Technology Innovation Centre, IIT Madras *Chennai,TN,India*
Advisors: Keerthi Ram, Dr. Prashanth Dumpuri, Dr. Mohanasankar Sivaprakasam

- Developing novel Transformer-based Deep Learning architectures for accelerated MRI Reconstruction.

- Implemented self-supervised learning approaches for accelerated MRI reconstruction.

- Developing and implementing image translation-based GANs for synthesizing Dynamic Contrast Enhanced sequential images from Prostate T2, PD, and ADC MRI data using the public ProstateX dataset.

- Implemented Node Regression GNNs for Data Imputation of missing data in the public ADNI dataset for multi-modal time series forecasting system of Alzheimer's disease relying on graph representation learning.

Bachelor's Thesis - Sinogram-based Detection of Traumatic Brain Injuries using CNN-RNN Architectures Aug. 2020 - May 2021
Indian Institute of Technology Tirupati *Tirupati,AP,India*
Advisors: Dr. Subrahmanyam Gorthi, Dr. Phaneendra K Yalavarthy

- Explored the potential feasibility of using sinograms in deep learning-based approaches to detect Intracranial Haemorrhages (ICH) and proposed a cascaded CNN-RNN architecture for detecting ICH. Our model exploits the inter-slice dependencies of ICHs to reduce false predictions.

- Proposed a deep learning model for synthesizing intensity-transformed sinograms from the acquired raw sinograms.

- Showcased the robustness of the proposed sinogram-based approach versus existing CT-based approaches on Offset and Poisson error tests.

- Detection of ICH in sinograms will prove extremely useful as it can save lots of time spent reconstructing CT scans from sinograms.

PUBLICATIONS

- **MA Fahim**, S Ramanarayanan, GS Rahul, MN Gayathri, K Ram, M Sivaprakasam., "OCUCFormer: An Over-Complete Under-Complete Transformer Network for Accelerated MRI Reconstruction", *Medical Image Analysis (MedIA) - Under Review*, 2023.

- C Sindhura, **MA Fahim**, PK Yalavarthy, S Gorthi., "Fully Automated Sinogram-based Deep Learning Model for Detection and Classification of Intracranial Hemorrhage", *Medical Physics - Under Review*, 2023.

- S Ramanarayanan, **MA Fahim**, GS Rahul, AK Jethi, K Ram, M Sivaprakasam., "HyperCoil-Recon: A Hypernetwork-based Adaptive Coil Configuration Task Switching Network for MRI Reconstruction", *IEEE/CVF International Conference on Computer Vision (ICCV) Workshop on Computer Vision for Automated Medical Diagnosis (CVAMD)*, 2023.[Paper].

- CS Sree, **MA Fahim**, K Ram, M Sivaprakasam., "Geometric Learning-Based Transformer Network for Estimation of Segmentation Errors", *International Conference on Medical Image Computing & Computer Assisted Intervention (MICCAI) Workshop on Shape in Medical Imaging (ShapeMI)*, 2023.[Paper].

- MN Gayathri, S Ramanarayanan, **MA Fahim**, GS Rahul, K Ram, M Sivaprakasam., "SFT-KD-Recon: Learning a Student-friendly Teacher for Knowledge Distillation in Magnetic Resonance Image Reconstruction", *International Conference on Medical Imaging with Deep Learning*, 2023. [Paper].

- GS Rahul, S Ramanarayanan, **MA Fahim**, K Ram, M Sivaprakasam., "SDLFormer for Accelerated MRI Image Reconstruction", *International Conference on Medical Image Computing & Computer Assisted Intervention (MICCAI) Workshop on Medical Image Learning with Limited & Noisy Data (MILLanD)*, 2023. [Paper].

PROJECTS

Detection, Classification and Segmentation of Traumatic Brain Injuries: Implemented a state-of-the-art deep learning model in PyTorch for detection and classification of Intracranial Hemorrhages (ICH) in CT scans. Due to the inability of the model to give out precise regions of ICH, a UNet++ architecture-based model was developed in Keras and Tensorflow for 2D and 3D semantic segmentation of ICH regions.

Telugu Handwritten Text Recognition: Developed a Convolutional Recurrent Neural Network model to recognize Telugu text from handwritten text images. We used conventional image processing techniques to capture bounding boxes around the words, and individual word images were fed to the model for recognition. The model was developed with Keras and Tensorflow in Python.

StarGAN-v2 for Synthesis of DCE Prostate: Implemented StarGAN-v2 to synthesize Dynamic Contrast Enhanced Prostate images given T2, Proton-Density, and Diffusion-weighted MRI protocol images. StarGAN-v2 was trained in PyTorch to generate Prostate MRI images of half-diffusion and full-diffusion of contrast agents in the Prostate, highlighting the cancerous regions.

Classification and Segmentation of White Blood Cells: Implemented several state-of-the-art deep learning architectures for classifying White Blood Cells (WBC). To segment WBCs, we implemented unsupervised and weakly-supervised methods like K-Means Clustering and Graph-Cuts methods due to the unavailability of segmentation maps. The models were implemented with Keras and Tensorflow in Python.

ACHIEVEMENTS

- **Samsung - IITM Pravrtak Fellowship:** Selected for the post-graduate research fellowship by Samsung for $2022 - 23$.

EXTRA-CURRICULAR ACTIVITIES

- Won first place in the 2023 Football Schroeter's Cup (Inter-Hostel) in IIT Madras.

- Participated in the Inter-IIT 2019 Football Tournament.

POSITIONS OF RESPONSIBILITIES

- **Co-ordinator of Treasure Hunt Event - Tirutsava** 2019**:** The Tirupati-wide Treasure Hunt event consisted of two rounds. The preliminary round was an aptitude test and a sticker-hunting round on the college campus. The final round was a traditional treasure hunt round with a thrilling story around the city. My partner and I reviewed both rounds' proceedings and decided on the judgment criteria.