MOHAMMAD AL FAHIM K | EE21S050

Indian Institute of Technology, Madras
Placement Reg. No. : 55/EE/24/050 |

Education

Program	Institution	CGPA	Year
M.S. (Electrical Engineering)	IIT-Madras, Chennai, TN, India	8.40	ongoing
B.Tech (Electrical Engineering)	IIT-Tirupati, Tirupati, AP, India	8.44	2021
XII (CBSE)	The Velammal International School, Chennai, TN	91.80%	2017
X (CBSE)	The Velammal International School, Chennai, TN	10.00	2015

Skills Summary

- **Languages**: Python, Matlab, C++
- **Area Of Interest**: Deep Learning, Machine Learning, Image Processing, Computer Vision, Medical Image Analysis
- **Frameworks**: PyTorch, Keras, Tensorflow, OpenCV in Python, Scikit-learn, Scikit-image, Android Studio

Professional Experience

- **Research Associate - HTIC, IIT-M, Research Park** *Sep '21 - present*

  Analytics for Precision Medicine *Dec '21 - May '22*
  - 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.

  Accelerated MRI Reconstruction *May '22 - present*
  - Developing **novel Transformer-based Deep Learning architectures** for accelerated MRI Reconstruction.
  - Implemented **self-supervised learning** approaches for accelerated MRI reconstruction.

  Dynamic MRI synthesis for Prostate Cancer - in collaboration with GE Healthcare *Jan '23 - present*
  - Working in a DBT Grant based project with GE Healthcare, for developing state-of-the-art **deep learning image translation GANs** for synthesizing Dynamic Contrast Enhanced MRI from Prostate structural images (T2, PD), and ADC of diffusion MRI in the ProstateX dataset.

- **Bachelor's Thesis: Sinogram-based Detection of TBIs - IIT-Tirupati** *Aug. '20 - May '21*
  - 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.

- **Summer Intern - Tarah Technologies, Banglore** *May '20 - July '20*
  - Developed an Android mobile application for an end-to-end pipeline of 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.

Publications

- **MA Fahim**, S Ramanarayanan, GS Rahul, MN Gayathri, A Sarkar, K Ram, M Sivaprakasam., "OCUCFormer: An Over-Complete Under-Complete Transformer Network for Accelerated MRI Reconstruction", *Computers in Biology and Medicine (CIBM) - 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*, 2023.Paper
- 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 to detect and classify 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.
  - 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 Pravartak Fellowship:** Awardee of the post-graduate research fellowship by Samsung for 2022-23.
- Secured All India Rank of **10,463** out of **1.72 lakh** candidates in **JEE Advanced 2017** examination.
- Won **first place** in the 2023 Football Schroeter's Cup (Inter-Hostel) in IIT Madras.
- Selected in the **top ∼120** participants out of **2000+** applicants from Europe and Asia to participate in a week-long datathon organized by MSD; offered interview opportunity to work at MSD/Merck & Co., Inc.
- Selected to represent IIT Tirupati in Football at the Inter-IIT Sports Meet 2019.

Course work

• Machine Learning for Image Processing.
- Course Projects: KNN Classification. •Bayesian Classification. •Histogram of Gradients (HoG), PCA, FLD, Bayesian Classification using HoG features. •ANNs (from scratch and using libraries) for MNIST Classification. •Telugu Handwritten Text Recognition

• Medical Image Analysis.
- Course Projects: Contrast enhancement and edge detection. •Hough Transform. •Histogram based and Graph cut based Segmentation. •Classification and Segmentation of White Blood Cells

• Computer Vision.
- Course Projects: Image Filtering, Template Matching, Image Gradients. •Line and Circle Hough Transform.

• Computational Photography.
- Course Projects: Camera Pipeline: Demosaicing, White Balancing and Tone Mapping, Image denoising •Motion deblurring •High Dynamic Range(HDR) Imaging

• Convex Optimization • Data Science: Theory and Practice • Probability Foundations for Electrical Engineers • Digital Signal Processing • Speech Signal Processing • Signal and Systems • Medical Imaging • Introduction to Neurohacking in R (Coursera)

Positions of Responsibilities

- **Co-ordinator of Treasure Hunt Event - Tirutsava**[1] 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 colleague and I reviewed both rounds' proceedings and decided on the judgment criteria.

[1] Tirutsava - IIT Tirupati's Techno-Cultural Fest