

Fatwir Sheikh Mohammed

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Interests: Machine Learning, Deep Learning, Computer Vision, Signal Processing, Image Processing

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Education

- University of Washington** Seattle, USA
 - Master of Science in Electrical Engineering (GPA: 3.89/4.00)* Sept 2022 - June 2024
 - Specialization: Machine Learning, Deep Learning and Computer Vision, Advised by Dr. Linda Shapiro
- National Institute of Technology Karnataka** Surathkal, India
 - Bachelor of Technology in Electrical and Electronics with Minor in Computer Science* July 2018 - May 2022
 - CGPA: 9.71/10, Ranked 2nd out of 109 students in the department, Advised by Dr. CS Seelamantula (IISc) and Dr. JM Gonda (NITK)

Professional Experience

- Alpenglow Biosciences** Seattle, USA
 - Deep Learning Research Intern* June 2023 - Present
 - Worked on the stain transfer problem utilizing supervised and adversarial approaches, saving the company approximately 700 hours in manual annotations. Also, this resulted in a staggering cost reduction of staining from \$5 million to only \$1000
 - Experimented with normalization and chunking for large 3D datasets (~250 GB) leading to 10% improvement in training loss
 - Employed supervised learning with UNets, incorporating losses such as KLD, weighted MSE and trained on 7500 images
 - Implemented Pix2Pix, outperforming the supervised method by almost 15% on a validation set of 750 images
 - Optimized data processing pipeline, refining algorithm accuracy, and implementing parallelization for large datasets. This included a content-based autocropping feature, that led to 40% reduction in processing time and saving 30 – 50% in storage
 - Skills:** Python, PyTorch, OpenCV, NumPy, SciPy, Scikit-Learn, AIVIA, Napari, Jira, Git, AWS, Dask
- RadiusAI** Seattle, USA
 - Computer Vision Researcher (Capstone)* Jan 2023 - June 2023
 - Worked on self-checkout problem using synthetic Image Generation (2D/3D) to improve training of object detection models
 - Accelerated training by almost 20% using Fully-Fused MLPs to train a custom object dataset of around 140 images
 - Achieved a validation PSNR of 25.96 dB in training a Neural Radiance Field (NeRF), with a mere 0.6 dB deviation from the original implementation. Notably, training time was substantially reduced by 42% by efficiently utilizing 93% of the GPU
 - Skills:** Python, PyTorch, OpenCV, NumPy, SciPy, Scikit-Learn, COLMAP

Publication(s)

- W. O. Ikezogwo, M. S. Seyfioglu, F. Ghezloo, D. S. C. Geva, **F. S. Mohammed**, P. K. Anand, R. Krishna, L. Shapiro, "Quilt-1M: One Million Image-Text Pairs for Histopathology", Proc. NeurIPS 2023 Datasets and Benchmarks Track (**Oral Presentation**)
- S. Asokan, **F. S. Mohammed**, and C. S. Seelamantula, "A game of snakes and GANs," Adversarial Learning Track, Proc. IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2023 (**Oral Presentation**)

Research Experience

- GRAIL: UW Graphics and Imaging Laboratory** Seattle, USA
 - Graduate Research Assistant* Nov 2022 - June 2023
 - Developed the largest public vision-language histopathology dataset, comprising approximately 1, 000, 000 image and text pairs
 - Designed a neural network (*QuiltNet*) for this dataset and achieved superior performance compared to State-of-the-Art models
 - Made significant improvement in zero-shot and linear probing for classifying diverse images and in cross-modal retrieval tasks
 - This LLM-based multimodal data generation approach was bestowed with an oral publication at Datasets Track of NeurIPS 2023
 - Skills:** Python, PyTorch, OpenCV, NumPy, SciPy, SpaCy, Seaborn, Scikit-Learn
- Indian Institute of Science, Bangalore** Bangalore, India
 - Bachelor Thesis* Dec 2021 - July 2022
 - Worked on optimizing the performance of GANs as a precursor to which Wasserstein Generative Adversarial Networks (WGAN) were implemented for 1D and 2D Gaussian Target Distributions whilst analyzing snakes using gradient vector flow (GVF) fields
 - Solved the optimal discriminator PDE by bridging the gap between GVFs and GANs - finite differences and grid inversion in 2D
 - Accelerated convergence within 100 iterations (vs. *SOTA*) on 2D Gaussian targets with active contours using WGANs
 - Improved computational efficiency for the *SnakeGAN* to learn the latent space distribution of SVHN and CelebA datasets
 - This snake based GAN optimization was bestowed with an oral publication at the Adversarial Learning Track of ICASSP 2023
 - Skills:** Python, TensorFlow, Keras, OpenCV, NumPy, SciPy, Scikit Learn
- Peter L. Reichertz Institute for Medical Informatics - TU Braunschweig** Braunschweig, Germany
 - Research Intern - DAAD-WISE Scholar* July 2021 - Nov 2021
 - Performed Blood Pressure estimation from photoplethysmogram signals taken from the *MIMIC - III* waveform dataset
 - Devised a spectro-temporal Deep Neural Network and attained near perfect correlation ($R \approx 0.95$) between BP with PPG
 - Improved R value by 0.15 by exploiting frequency information of PPG and its derivatives using GRUs and spectrograms
 - Enhanced the performance of the DeepNet by 10% leveraging Python, MATLAB and Bash scripts for extensive data preprocessing using classical signal processing techniques (Elgendi Algorithm, Hampel and Frequency Filters)
 - Trained the network on 251 patient records (approximately 2 hours of time-data) using leave-one subject out cross-validation
 - Skills:** Python, TensorFlow, Keras, Pandas, OpenCV, NumPy, SciPy, Scikit Learn
- Centre for Computational Imaging - IIT Palakkad** Palakkad, India
 - Summer Research Intern - IAS-SRFP Scholar* May 2021 - Nov 2021
 - Analysed Subtle Motion on ultrasound images of the Common Carotid Artery to perform video magnification to estimate BP
 - Estimated phase by oscillation enhancement and computing single orthant analytic signal, followed by motion magnification
 - Skills:** MATLAB, Quaternion FT, Advanced Image Processing, Ultrasound Imaging

Relevant Courses

Advanced Introduction to ML, Computer Vision, Control Theory, Data Structures and Algorithms, Digital Imaging Systems, Digital Signal Processing, Fourier and Wavelet Analysis, Graph Theory, Machine Learning, Neural Networks, Linear Algebra, Probability and Random Processes, Optimization Techniques, Soft Computing, Signals and Systems