Fatwir Sheikh Mohammed

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Interests: Machine Learning, Deep Learning, Computer Vision, Image Processing   +1-(206)-687-2438

Education

University of Washington — Seattle, USA
Master of Science in Electrical Engineering — *Sept 2022 - June 2024*
- GPA: 3.86/4.00, Specialization: Machine 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, *Thesis: A Game of Snakes and GANs [3]*
- Awarded the DAAD-WISE Fellowship by the German Consulate and the IAS Fellowship by the Indian Academy of Sciences

Professional Experience

Allen Institute — Seattle, USA
Research Engineer - Representation Learning — *June 2024 - Present*
- Conducted research on the JUMP dataset (~ 3 million images), extracting interpretable features using deep learning models such as β**-VAEs**, **Diffusion Autoencoders**, **CA-MAEs** and **Masked VQ Autoencoders**, enhancing feature representation for biological analysis.
- Wrote scripts to parallelize **CellProfiler** segmentation pipelines with **X11** forwarding and demonstrated strong correlation between fraction retrieved **(FR)** values from model embeddings and the baseline **CellProfiler** method, validating feature extraction efficacy.
- Contributed to the development of **Cyto-DL**, a **Hydra** and **PyTorch Lightning** - based suite for training, testing, and tracking deep learning models on microscopy datasets, streamlining model development and experimentation workflows.
- Contributed to maintenance and refactoring of key codebases, including **aics-shparam** and **aics-cytoparam**, improving modularity!
- Enhanced reproducibility of experiments for **Morphology appropriate RL**, ensuring robust result validation through testing with **95% code coverage** and optimized package installation processes for seamless deployment, resulting in acceptance to *Nature Methods*.

Alpenglow Biosciences — Seattle, USA
Deep Learning Research Intern — *June 2023 - Dec 2023*
- Made progress on the **neural stain style transfer problem**. Achieved a 90% reduction in staining time and a 1000-fold decrease in staining costs using **supervised** and **adversarial learning**, enabling **virtual staining** on the fly
- Boosted training by 10% through normalization and chunking for UNets on 7500 patched 2D slices (512×512) for a 3D dataset (~ 250) GB
- Implemented **Pix2Pix and CycleGAN** from scratch, outperforming the baseline supervised model by 15% on a validation set of **750** images
- Investigated various guided **diffusion**-based models, including pre-trained and custom-built, for **zero-shot** stain transfer
- Prototyped a content-based autocropping feature that optimized the **data processing pipeline** for large 3D image datasets
- Implemented feature reduced processing time by 40% and saved almost $30 - 50\%$ in storage space
- Contributed to development of a **GUI** for microscope software and enhanced the saving module for laser calibration and scan settings

RadiusAI — Seattle, USA
Computer Vision Researcher (Capstone) — *Jan 2023 - June 2023*
- Worked on the **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** for a custom retail product dataset of around 140 images
- Obtained a validation PSNR of 25.96 dB in training a Neural Radiance Field (NeRF), deviating by a mere **0.6 dB** from original implementation
- Effectively harnessed 93% of the **GPU**'s capacity and slashed the training time by almost 42%, marking notable improvement in efficiency

Publication(s)

1. Ritvik Vasan, … , **Fatwir Mohammed**, … , Matheus P. Viana, "Interpretable representation learning for 3D multi-piece intracellular structures using point clouds," *Nature Methods*, 2025
2. 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 - Acceptance $\sim 0.5\%$)**
3. 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 - Acceptance $\sim 13\%$)**

Peer Review Service: NeurIPS 2025 Workshops (AI4D3, ML4PS, AI4Science), Journal of Imaging Informatics in Medicine

Research Experience

GRAIL: UW Graphics and Imaging Laboratory — Seattle, USA
Graduate Research Assistant (Computer Vision and NLP) — *Dec 2022 - June 2024*
- Used **VQ-GANs** to develop codebooks for **OCT** and **IR** images, enhancing synthesis and downstream capabilities (systemic disease prediction)
- Developed the **largest** public vision-language histopathology dataset, comprising approximately $1,000,000$ image-text pairs
- Fine-tuned a pre-trained CLIP model **(QuiltNet)** on zero-shot classification across **12** datasets, achieving an improvement of 10% in accuracy
- With our **LMM, QuiltNet**, we obtained around a 5% improvement on 4 datasets in **linear probing** using $\{1, 10, 100\}\%$ of data and boosted cross-modal retrieval by an average of 36% in image-text and text-image retrieval on the *Quilt-1M* holdout dataset
- This **LLM and ASR-based** multimodal data generation approach was bestowed with an oral publication in the datasets track of **NeurIPS 2023**

Indian Institute of Science, Bangalore — Bangalore, India
Bachelor Thesis (GenAI and Optimization) — *Dec 2021 - July 2022*
- Worked on optimizing the performance of **GANs** as a precursor to which Wasserstein GANs were implemented for 1D and 2D Gaussian Targets
- 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. *State-Of-The-Art*) on 2D Gaussian targets with active contours using WGANs
- This snake based GAN optimization was bestowed with an **oral** publication at the **Adversarial Learning** Track of **ICASSP 2023**

Peter L. Reichertz Institute for Medical Informatics - TU Braunschweig — Braunschweig, Germany
Research Intern - DAAD-WISE Scholar (Deep Learning for Medical data) — *July 2021 - Nov 2021*
- Performed **Blood Pressure estimation** from photoplethysmogram (PPG) 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 signals
- Enhanced the performance of the DeepNet by 10% leveraging **Python, MATLAB and Bash** scripts for extensive data preprocessing

Relevant Skills

Python, PyTorch, OpenCV, NumPy, SciPy, Scikit-Learn, Git, AWS, COLMAP, Seaborn, TensorFlow, Keras, Pandas, Hydra, MLFlow, WandB, Lightning