Khondker Fariha Hossain

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Education

- **University of Nevada, Reno** — Reno, NV, USA
  Ph.D. Candidate in Computer Science & Engineering — *Jan 2021 - May 2025*
- **University of Nevada, Reno** — Reno, NV, USA
  Master of Science in Computer Science & Engineering — *Jan 2021 - Dec 2022*
- **Deakin University** — Melbourne, VIC, Australia
  Master of Data Science — *Mar 2019 - Dec 2020*
- **BRAC University** — Dhaka, Bangladesh
  Bachelor of Science in Computer Science & Engineering — *April 2013 - Aug 2017*

Research Concentration

- Computer Vision, Medical Imaging, Health in AI

Skills

- **Programming Languages:**: Python, R, C++, Bash (Shell Scripting), Matlab, Git, SQL.
- **Imaging Expertise:**: X-rays, Mammograms, OCT, Fundus, Fluorescein Angiography, MRI, PET, CT, Ultrasound.
- **Libraries & Programs**: NumPy, PyTorch, Monai, OpenCV, Tensorflow, Keras, Scikit-learn, Pandas, Caffe, CoreML,Streamlit, Spark, Tensorboard
- **Systems & Cloud-computing**: Slurm, Linux OS, Singularity, Docker, AWS

Work Experience

- **University of Nevada, Reno** — Reno, NV
  Graduate Research Assistant - Prof. Alireza Tavakkoli — *January 2021 - Present*
  - **2D and 3D Multi-Modal Medical Image**: Working on Vision Transformers and Knowledge-Distillation projects for multi-modal medical Image Learning. Developed a pioneering Swin-Transformer-based architecture for segmenting benign and malignant breast micro-masses from MRI and Ultrasound images, achieving a 3-4% improvement over existing state-of-the-art methods. **Funded by by the National Science Foundation under Grant No. OIA- 2148788 and OAC- 2201599**.
  - **Space-associated Neuroocular Syndrome (SANS)**: Developed a Super-resolution Transformer based model for identifying SANS degenerative disease in astronauts. **Funded by NASA Grant No. 80NSSC20K1831**.
    Tools: PyTorch, Pandas, NumPy, Monai, OpenCV.
    Codes: Swin-FSR
  - **Adversarial Attack Detection and Mitigation**: Developed two novel generative adversarial networks for adversarial attack detection in ECG. Also, developed a Game theoretical strategy, implemented with convolutional neural network to mitigate adversarial attack
    Tools: Tensorflow-keras, NumPy, Keras, OpenCV
    Codes: ECG-Adv-GAN, ECG-ATK-GAN
  - **Concussion Detection using Virtual Reality**: Collaborating with Neuromechanics Lab to develop a Virtual Reality system to detect concussions.
    Tools: Tensorflow-keras, Numpy, Pandas.
- **Ford Motor Company** — Melbourne, Australia
  Artificial Intelligence/Machine Learning Engineer Intern — *Aug 2020 - Oct 2020*
  - **Hierarchical Graphical Network**: Worked as a Team Lead(interns) to create a hierarchical Graphical Network of organization Members using Graphical Neural Network
    Tools: Tensorflow, Pandas, Matploblib, NumPy.

- **Visualization of analysis**: Implemented ”Streamlit” for the dynamic visualization of the Machine Learning Model and the Graphical Network.
  Tools: Tensorflow, Pandas, Matploblib, NumPy.
- **Research in ”Oracle Digital Assistance”** : Created Report on ”Oracle Digital Assistance” to create an Economic and Organizational suitability report emphasizing the Policy Maker and Technical perspective.

- **Kyoto Engineering and Automation Ltd.** Dhaka, Bangladesh
  Software Engineer Intern *Oct 2017 - Dec 2017*
  - **Organizational Software**: Worked and Developed multiple Software(Private)
    Tools: Platform : .NET ; Language : C#.
  - **Microsoft SQL Server**: Designed and implemented in the Company’s Software(Private)
    Tools: MySQL.

PUBLICATIONS

5.1 Conference

- **[C1]**: **Khondker Fariha Hossain**, Sharif Amit Kamran, Alireza Tavakkoli, George Bebis, Salah A Baker SwinVFTR: A Novel Volumetric Feature-learning Transformer for 3D OCT Fluid Segmentation, *22th IEEE International Symposium on Biomedical Imaging,(ISBI)2025*
- **[C2]**: **Khondker Fariha Hossain**, Sharif Amit Kamran, Joshua Ong, Andrew G. Lee and Alireza Tavakkoli Revolutionizing Space Health (Swin-FSR): Advancing Super-Resolution of Fundus Images for SANS Visual Assessment Technology, *26th International Conference on Medical Image Computing and Computer Assisted Intervention(MICCAI)2023*
- **[C3]**: Sharif Amit Kamran, **Khondker Fariha Hossain** (*equal contribution*), Alireza Tavakkoli, George Bebis, Sal Baker, SWIN-SFTNet: Spatial Feature Expansion and Aggregation using Swin Transformer For Whole Breast micro-mass segmentation, 2022, *20th IEEE International Symposium on Biomedical Imaging,(ISBI)2023*
- **[C4]**: **Khondker Fariha Hossain**, Sharif Amit Kamran, Alireza Tavakkoli, Xingjun Ma, ECG-ATK-GAN: Robustness Against Adversarial Attacks on ECGs Using Conditional Generative Adversarial Networks, 2022, *Applications of Medical Artificial Intelligence, MICCAI 2022*
- **[C5]**: **Khondker Fariha Hossain**, Sharif Amit Kamran, Alireza Tavakkoli, Lei Pan, Xingjun Ma, Sutharshan Rajasegarar, Chandan Karmaker ECG-Adv-GAN: Detecting ECG Adversarial Examples with Conditional Generative Adversarial Networks, 2021, in *20th IEEE International Conference on Machine Learning and Applications (ICMLA)*
- **[C6]**: **Khondker Fariha Hossain**, Sharif Amit Kamran, Prithul Sarker, Philip Pavilionis, Isayas Adhanom, Nicholas Murray, Alireza Tavakkoli Virtual-Reality based Vestibular Ocular Motor Screening for Concussion Detection using Machine-Learning, 2022, *ISVC 2022: Advances in Visual Computing*
- **[C7]**: **Khondker Fariha Hossain**, Alireza Tavakkoli, Shamik Sengupta,A Game Theoretical vulnerability analysis of Adversarial Attack,*ISVC 2022: Advances in Visual Computing*
- **[C8]**: Sharif A. Kamran, **Khondker F. Hossain**, Alireza Tavakkoli, Stewart L. Zuckerbrod, and Salah A. Baker, Feature Representation Learning for Robust Retinal Disease Detection from Optical Coherence Tomography Images, in *MICCAI 2022.*
- **[C9]**: Sharif A. Kamran, **Khondker F. Hossain**, Alireza Tavakkoli, Stewart L. Zuckerbrod, and Salah A. Baker, VTGAN: Semi-supervised Retinal Image Synthesis and Disease Prediction using Vision Transformers, in *ICCV 2021.*
- **[C10]**: Sharif A. Kamran, **Khondker F. Hossain**, Alireza Tavakkoli, Stewart L. Zuckerbrod, Kenton M. Sanders and Salah A. Baker, RV-GAN: Segmenting Retinal Vascular Structure in Fundus Photographs Using a Novel Multi-scale Generative Adversarial Network, in *MICCAI 2021.*
- **[C11]**: Sharif A. Kamran,**Khondker F. Hossain**, Alireza Tavakkoli, Stewart L. Zuckerbrod, Attention2AngioGAN: Synthesizing Fluorescein Angiography from Retinal Fundus Images using Generative Adversarial Networks, in *ICPR 2020.*
- **[C12]**: **Sharif A. Kamran**, Khondker F. Hossain, Alireza Tavakkoli, Stewart L. Zuckerbrod and Salah A. Baker, Feature Representation Learning for Robust Retinal Disease Detection from Optical Coherence Tomography Images, in *International Workshop on Ophthalmic Medical Image Analysis (OMIA), MICCAI 2022.*
- **[C13]**: **Sharif A. Kamran**, Khondker Fariha Hossain, Alireza Tavakkoli, Stewart Zuckerbrod, Salah A Baker, Kenton M Sanders, Fundus2Angio: a conditional GAN architecture for generating fluorescein angiography images from retinal fundus photography, in *15th International Symposium on Visual Computing (ISVC), 2020.*

5.2 Journals:

- **[J1]**: Sharif A. Kamran, Alireza Tavakkoli, **Khondker F. Hossain** and Stewart L. Zuckerbroad [*Equal Contribution*] A Novel Deep Learning Conditional Generative Adversarial Network for Producing Angiography Images from Retinal Fundus Photographs, 2021, *Scientific Reports, Nature.*
- **[J2]**: Sharif Amit Kamran, **Khondker Fariha Hossain**, Joshua Ong, Nasif Zaman, Ethan Waisberg, Phani Paladugu, Andrew G Lee, Alireza Tavakkoli, SANS-CNN: An automated machine learning technique for spaceflight associated neuro-ocular syndrome with astronaut imaging data, 2024, *npj Microgravity, Nature.*
- **[J3]**: Sharif Amit Kamran, **Khondker Fariha Hossain**, Joshua Ong, Ethan Waisberg, Nasif Zaman, Salah A. Baker, Andrew G. Lee, MD, Alireza Tavakkoli, FA4SANS-GAN: A Novel Machine Learning Generative Adversarial Network to Further Understand Ophthalmic Changes in Spaceflight Associated Neuro-Ocular Syndrome (SANS), 2024, *Ophthalmology Science, Elsevier.*
- **[J14]**: Sharif Amit Kamran, Hussein Moghnieh, **Khondker Fariha Hossain**, Nyanbol Kuol, Sarah Riar, Allison Bartlett, Alireza Tavakkoli, Salah A Baker, Software for segmenting and quantifying calcium signals using multi-scale generative adversarial networks, 2022, in *Star Protocols, Cell Press.*
- **[J5]**: Sharif A. Kamran, **Khondker F. Hossain**, Hussein Moghnieh, Sarah Riar, Allison Bartlett, Alireza Tavakkoli, Kenton M. Sanders, and Salah A. Baker, New open-source software for subcellular segmentation and analysis of spatiotemporal fluorescence signals using deep learning, 2022, in *iScience, Cell Press.*
- **[J6]**: Sharif Amit Kamran, Hussein Moghnieh, **Khondker Fariha Hossain**, Allison Bartlett, Alireza Tavakkoli, Bernard T. Drumm, Kenton M. Sanders and Salah A. Baker, Automated Denoising Software for Calcium Imaging Signals Using Deep Learning, 2024, *Heliyon, Elseiver*.

5.3 Abstracts:

- **[A1]**: Sharif Amit Kamran, **Khondker Fariha Hossain**, Joshua Ong, Alireza Tavakkoli, Andrew G Lee, Detecting spaceflight associated neuro-ocular syndrome (SANS) using light-weight convolutional neural networks, *Journal of Vision, ARVO, 2023.*
- **[A2]**: Sharif Amit Kamran, **Khondker Fariha Hossain**, Joshua Ong, Alireza Tavakkoli, Andrew G Lee, A generative adversarial deep neural network to translate between ocular imaging modalities while maintaining anatomical fidelity, *Journal of Vision, ARVO, 2022.*

5.4 Under Review:

- **[P1]**: **Khondker Fariha Hossain**, Sharif Amit Kamran, Joshua Ong,Alireza Tavakkoli Teach-Former: Enhancing Slim Models with Multimodal, Multi-Teacher Insights for Medical Image Segmentation, *(Submitted to Scientific Report).*

Academic Services

- **Graduate Mentor**: US Army Educational Outreach Program, **Summer'21, Summer'23**.
- **Instructor**: GRAD -778
  - Documentation and Communication (Overleaf)
  - Source Version Control and Visualization
  - Classification with Deep Architectures
  - Segmentation with Deep Architectures
- **Lab Instructor**:
  - Course: CPE 201- Digital Design, **Spring'21,'23, Fall'21**
- **Teaching Assistant**:
  - CS791: Mass Detection in Mammograms, **Spring'22**
  - Course: CS 302- Data Structure, **Fall'22**

Honors and Awards

- Awarded with **Doctoral Research in Innovation**, Vision and Excellence(Nevada Drive Scholar) for consecutive two years: 2023-2024 and 2024-2025.
- CSE graduate student out of 4,000+ students to receive UNR **Graduate Dean's Merit** Scholarship for 2021-2022.
- Received **Outstanding International Graduate Student** Award **Spring'22 and Fall'22** by University of Nevada, Reno.
- Received **Institutional Methodology Grant** in January 2021, 2022

GRANTS

- **National Aeronautics and Space Administration (NASA)** August 2020 - August 2022
  Grant No. 80NSSC20K1831
  - **Title**: A Non-intrusive Ocular Monitoring Framework to Model Ocular Structure and Functional Changes due to Long-term Space flight
  - **Role**: Graduate Research Assistant
  - **Primary Investigator**: Dr. Alireza Tavakkoli
- **National Science Foundation: Harnessing the Data Revolution for Fire Science** June 1 2022 - May 31 2027
  Grant No.OIA- 2148788 and OAC- 2201599.
  - **Title**: Harnessing the Data Revolution for Fire Science
  - **Role**: Graduate Research Assistant
  - **Co-Principal Investigator**: Dr. Alireza Tavakkoli

REFERENCES

Available Upon Request