FAHIM AHMED ZAMAN

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CORE COMPETENCIES

· Machine Learning · Deep Learning · Computer Vision · Diffusion Models · GAN · LLM

EXPERIENCE

Post Doctoral Scholar August 2024 - Present
Department of ECE, University of Iowa *Iowa city, IA, USA*

- **Latent diffusion for medical image segmentation:**
  Developed a novel end-to-end trained latent diffusion model for fast sampling and accurate image segmentation. The model jointly learns image embedding, target objects' shape manifolds and a score-model in latent space that significantly increase computational efficiency with faster sampling and produces robust and accurate segmentation for multi-class objects in n-D medical imaging dataset.
- **Pathophysiological feature identification with explainable artifical intelligence (XAI):**
  Developed a novel spaiotemporal DL model for improved differential diagnosis of a rare cardiovascular disease: Takotsubo Syndrome (TTS). Identified pathophysiological features with XAI using DL-model's feature visualization and optical flow algorithm for robust disease diagnosis and validated the results with external datasets from 10 medical institution across USA.
- **Video to report generation by integrating LLM with Vision Transformers:**
  Working on developing a novel video to text-report generative model by learning a video embedder and optimizing LLM model using cross-modal learning.

Graduate Research Assistant August 2018 - July 2024
Department of ECE, University of Iowa *Iowa city, IA, USA*

- **Medical image segmentation:**
  Developed a novel score-based surface cold diffusion model for surface segmentation of medical images
- **Segmentation quality assessment (SQA):** Developed and validated three novel DL-based SQA models which, (1) uses surface optimization for identifying erroneous surface regions on multi-class segmentation, (2) uses GAN and regression network to quantify the patch-wise region based segmentation errors, and (3) uses GAN based surface reconstruction to detect adversarial attack on a segmentation network.
- **Cardiovascular disease diagnosis:** Adapted the DL-based classification method for improved differential diagnosis of TTS using non-invasive techniques. Used XAI to discover latent imaging features associated with causative TTS pathophysiology.

System Engineer December 2014 - March 2017
Department of Regional Operations, Grameenphone LTD. *Dhaka, Banglaedsh*

- Coordinated the network migration from TDM to IP transmission for the Cox's Bazar sub-center.
- Lead 3G roll out project for 108 BTS within 3 month span.
- Ensured first level fault handling and troubleshooting of BTS, transmission network, core network and power equipment within defined service level.
- Managed and coordinated different vendors to secure best services from them for preventive maintenance of network element to maintain network quality

EDUCATION

PhD in Computer Engineering *August 2018 - Till Date*
University of Iowa, USA
Overall GPA: 3.79/4.00

M.S. in Computer Engineering *December 2022*
University of Iowa, USA
Overall GPA: 3.79/4.00

B.S. in Electrical & Electronics Engineering *November 2014*
Islamic University of Technology, Bangladesh
Overall GPA: 3.80/4.00

TECHNICAL STRENGTHS

Programming Languages	Python, MATLAB, R, C, C++, Arduino, AvrStudio5
Circuit Design & Simulation	Simulink, Proteus, PSpice, Microwind, Calculux
ML & Imaging Libraries	Tensorflow, PyTorch, Scikit, ITK, VTK
Tools	Microsoft Word, Excel, Power Point, Latex

GRANT WRITING EXPERIENCE

- **NIH R01 Grant (2024):** "Deep Hybrid Medical Image Analysis: Beyond Pure Deep Learning", with Dr. Xiaodong Wu, Dr. Danny Chen and Dr. Milan Sonka.
- **NIH R01 Grant (2023):** "Implications of Spatiotemporal Deep Learning Neural Networks in Echocardiographic Diagnosis and Prognostication of Takotsubo Syndrome", with Dr. Kan Liu and Dr. Xiaodong Wu.

PUBLICATIONS

[Google Scholar Link]

Project: Medical Image Segmentation and Segmentation Quality Assessment (Funded by: NIH)

[1] **Zaman, F.A.**, Zhang, L., Zhang, H., Sonka, M. and Wu, X., 2023. Segmentation quality assessment by automated detection of erroneous surface regions in medical images. Computers in Biology and Medicine, p.107324.

[2] **Zaman, F.A.**, Roy, TK., Sonka, M., Wu, X.. "Patch-wise 3D Segmentation Quality Assessment Combining Reconstruction and Regression Networks", Journal of Medical Imaging, 10(5), 054002 (8 September 2023).

[3] Peng, Y., Zheng, H., Liang, P., Zhang, L., **Zaman, F.**, Wu, X., Sonka, M. and Chen, D.Z., 2022. KCB-Net: A 3D knee cartilage and bone segmentation network via sparse annotation. Medical image analysis, 82, p.102574.

[4] Xie, H., Pan, Z., Zhou, L., **Zaman, F.A.**, Chen, D.Z., Jonas, J.B., Xu, W., Wang, Y.X. and Wu, X., 2022. Globally optimal OCT surface segmentation using a constrained IPM optimization. Optics Express, 30(2), pp.2453-2471.

[5] **Zaman, F.A.**, Wu, X., Xu, W., Sonka, M., Mudumbai, R., 2023. "Trust, but Verify: Robust Image Segmentation using Deep Learning", accepted in the Asilomar Conference on Signals, Systems and Computers.

[6] Wu, X., Zhou, L., **Zaman, F.**, Qiu, B. and Buatti, J.M., 2023, June. Model-Informed Deep Learning for Surface Segmentation in Medical Imaging. In International Conference on Information Processing in Medical Imaging (pp. 822-834). Cham: Springer Nature Switzerland.

[7] **Zaman, F.A.**, Jacob, M., Chang, A., Liu, K., Sonka, M. and Wu, X., 2023. Surf-CDM: Score-Based Surface Cold-Diffusion Model For Medical Image Segmentation. arXiv preprint arXiv:2312.12649.

[8] Zhang, L., Chen, Z., Zhang, H., **Zaman, F.A.**, Wahle, A., Wu, X. and Sonka, M., 2023. Efficient Deep-Learning-Assisted Annotation for Medical Image Segmentation.

Project: Cardiac Disorder Diagnosis and Prognostication (Funded by: NIH and Obermann Center and Institute for Clinical and Translational Science, University of Iowa)

[9] **Zaman, F.**, Ponnapureddy, R., Wang, Y.G., Chang, A., Cadaret, L.M., Abdelhamid, A., Roy, S.D., Makan, M., Zhou, R., Jayanna, M.B. and Gnall, E., 2021. Spatio-temporal hybrid neural networks reduce erroneous human "judgement calls" in the diagnosis of Takotsubo syndrome. EClinicalMedicine, 40, p.101115.

[10] **Zaman, F.**, Isom, N., Chang, A., Wang, Y.G., Abdelhamid, A., Khan, A., Makan, M., Abdelghany, M., Wu, X. and Liu, K., 2023. Deep Learning from Atrio-Ventricular Plane Displacement in Patients with Takotsubo Syndrome: Lighting Up the Black-Box. European Heart Journal-Digital Health, p.ztad077.

[11] Lu, C., Wang, Y.G., **Zaman, F.**, Wu, X., Adhaduk, M., Chang, A., Ji, J., Wei, T., Suksaranjit, P., Christodoulidis, G. and Scalzetti, E., 2022. Predicting adverse cardiac events in sarcoidosis: deep learning from automated characterization of regional myocardial remodeling. The international journal of cardiovascular imaging, 38(8), pp.1825-1836.

[12] **Zaman, F.A.**, Alam, W., Roy, T.K., Chang, A., Liu, K. and Wu, X., 2023. Diagnosis Of Takotsubo Syndrome By Robust Feature Selection From The Complex Latent Space Of DL-based Segmentation Network. arXiv preprint arXiv:2312.12653.

HONORS AND AWARDS

- Invited talk at the ECE Graduate Seminar on "GPT-4: Rising capabilities, implications, limitations and challenges ahead for advancing towards deeper and more comprehensive versions", University of Iowa, IA - 2023.
- Invited talk at the IIBI Seminar on "Segmentation Quality Assessment", University of Iowa, IA - 2021.
- Recipient of Ballard & Seashore Dissertation Fellowship from the Graduate College of University of Iowa.
- National Runners-up of line-follower robotics competition in Mecceleration 2014