Shahed Ahmed

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Education

PhD, Electrical and Computer Engineering (ECE) 08/*2024 – Present*
Purdue University (West Lafayette)
Courses taken: Intro to Neural Networks, Optimization for Deep Learning

MSc, Electrical and Electronic Engineering 07/*2021 – 09/2023*
Bangladesh University of Engineering and Technology (BUET)
CGPA: **4.00/4.00**, Relevant courses: Biomedical Signal Processing, Digital Image Processing, Machine Learning and Pattern Recognition, Deep Learning

BSc, Electrical and Electronic Engineering 02/*2016 – 02/2021*
Bangladesh University of Engineering and Technology (BUET)
CGPA: **3.96/4.00**, Class Rank: 2/215 (Top 1%)
Relevant courses: Digital Signal Processing I and II, Random Signals and Processes

Oxford Machine Learning Summer School 2023 05/*2023 – 07/2023*
University of Oxford
Tracks participated: ML x Fundamentals & Cases, ML x Health

Work Experience

Graduate Research Assistant (RA), School of ECE *08/2024 – Present*
Purdue University (West Lafayette)

Lecturer, Dept. of Electrical and Electronic Engineering *08/2021 – 07/2024*
Bangladesh University of Engineering and Technology (BUET)

Research Interests

Signal Processing, Machine Learning, Deep Learning, Brain Computer Interfacing, , Self- and Semi-Supervised Learning, Representation Learning

Research Experience

Makin Lab, School of ECE, Purdue University *08/2024 – Present*
Supervisor: Prof. Joseph G. Makin

- Currently working on developing ML models for speech decoding from neural data

Digital Signal Processing Research Lab, BUET *04/2019 – 08/2023*
Supervisor: Prof. Md. Kamrul Hasan

- Developed deep learning models with novel signal processing inspired ideas to achieve generalized medical image segmentation across diverse medical imaging modalities such as ultrasound, MRI, X-ray, histopathology, optical, etc.
- Developed the first deep learning based approach for Ultrasound Shear Wave elasticity imaging. A large volume of simulated phantom data was generated in COMSOL Multiphysics for training purpose. The trained model was tested on real world CIRS phantom data with good reconstruction performance.

Research Experience (cont.).

EuProw Research Lab, BUET 08/*2021 – 08/2022*
Supervisor: Prof. Shaikh Anowarul Fattah

- Developed a novel neural network with computation-efficient non-local blocks to achieve high accuracy in three separate public nuclei segmentation datasets.
- Formulated a deep learning model with a speech enhancement preprocessing block for robust sound source localization. The model demonstrated good performance on the open source DREGON dataset.

Skills

Programming:	C/C++, MATLAB, Python, Latex, Verilog
Software and Tools:	Pytorch, Tensorflow, Git, Illustrator, COMSOL, Spice, Keil uVision, 3D Slicer
Languages:	English, Bengali

Selected Publications

1. **S. Ahmed**, B.R. Hasan, S.A. Fattah, M. Saquib. "CAB-SegNet: A Context Aware Boundary Preserving Dual-Stage Network for Accurate Nucleus Segmentation." *In Review*
2. **S. Ahmed**, M.K. Hasan. "Twin-SegNet: Dynamically coupled complementary segmentation networks for generalized medical image segmentation." *Computer Vision and Image Understanding*, p.103910, 2023
3. **S. Ahmed**, M.K. Hasan. "COMA-Net: Towards generalized medical image segmentation using complementary attention guided bipolar refinement modules." *Biomedical Signal Processing and Control*, 86, p. 105198, 2023
4. M.J. Alam, M.S. Mohammad, M.A.F. Hossain, I.A. Showmik, M.S. Raihan, **S. Ahmed**, T.I. Mahmud. "S2C-DeLeNet: A parameter transfer based segmentation-classification integration for detecting skin cancer lesions from dermoscopic images." *Computers in Biology and Medicine*, 150, p. 106148, 2022
5. **S. Ahmed**, M.T. Islam, S. Biswas, R. Samrat, T.I. Akash, A. Subhana, C. Shahnaz. "CapNet: A Deep Learning-based Framework for Estimation of Capnograph Signal from PPG." *2022 44th Annual International Conference of the IEEE Engineering in Medicine & Biology Society,* pp. 3392-3395, IEEE, 2022
6. N. Tasnim, J. Halder, **S. Ahmed**, S.A. Fattah. "An Approach for Analyzing Cognitive Behavior of Autism Spectrum Disorder Using P300 BCI Data." *2022 IEEE Region 10 Symposium (TENSYMP*), pp. 1-6, IEEE, 2022
7. **S. Ahmed**, U. Kamal, M.K.Hasan. "DSWE-Net: A deep learning approach for shear wave elastography and lesion segmentation using single push acoustic radiation force." *Ultrasonics*, 110,p. 106283, 2021

Selected Projects

- *"Deep Learning based Surgical Gesture Segmentation from videos using JIGSAWS dataset"*: A hybrid 1D CNN-transformer architecture was developed to perform temporal surgical action segmentation using video features from the JIGSAWS dataset.
- "*Real-time Vehicle Detection from Fisheye Images*": An object detection framework with YOLOv4 backbone was adopted with a novel non-vehicle suppression post processing block for the VIP Cup 2020 dataset.
- "*Traffic Sign Detection and Recognition under Challenging Conditions*": A dual stream segmentation model based on the Gated-SCNN architecture was optimized using a local L1-constraint guided Tversky loss function for traffic sign detection on the CURE-TSD dataset.

Teaching and Mentorship

- Taught the following undergraduate level courses: *Digital Signal Processing-I, Digital Signal Processing-II, Fundamentals of Electrical Engineering, Artificial Intelligence and Machine Learning Laboratory, Digital Signal Processing-I Laboratory, Biomedical Signals, Measurement and Instrumentation Laboratory*
- Mentored several groups of undergraduate students during their laboratory course projects. Some of these projects have resulted in publications at reputed journals/conferences.

Professional Affiliations and Activities

- IEEE Signal Processing Society membership, 06.2020-present
- IEEE Engineering in Medicine and Biology Society (EMBS) membership, 06.2022-present
- Organizing Committee member, ICECE-2022, Dhaka, Bangladesh, 09.2022-12.2022
- Member, Bureau of Research, Testing and Consultation (BRTC), BUET, 10.2023-present

Honors and Awards

- BUET undergraduate merit scholarship for 8 consecutive semesters (2016-2021)
- Dean's List Award in 4 consecutive years at BUET (2017-2021)
- Huawei academic scholarship (2017)

Academic Service

- **Reviewer**, Biomedical Signal Processing and Control