Ahmed Imtiaz Humayun

CONTACT INFORMATION

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EDUCATION

Rice University 2019-

Ph.D. Student, Electrical and Computer Engineering

Advised by Prof. Richard Baraniuk

Bangladesh University of Engineering and Technology (BUET) 2017

Bachelor, Electrical and Electronic Engineering

RESEARCH INTERESTS

Deep Generative Modeling, Spline Approximations, Fair Machine Learning, Differentiable Rendering, Signal Processing

RESEARCH EXPERIENCE

Graduate Research Assistant, Rice University Aug 2019-

I'm developing novel techniques that harness the spline theory of Deep Generative Models to allow controllable generation based on manifold density, with applications in generative modeling, data augmentation, active learning, and implicit representation models.

Research Assistant, Bangladesh University of Engineering and Technology (Full-time) Sept 2017 - July 2019

I have developed novel Linear Phase and Zero Phase 1DCNN Learnable Filterbanks, which provably annuls phase distortion of vanilla 1DCNNs. Applications in time-series deep learning and biosignal domain adaptation. In collaboration with Human Machine Intelligence Group, BOSCH US.

LEADERSHIP EXPERIENCE

Founder and Chief, Bengali.AI Dec 2017-

Bengali.AI is a non-profit initiative from Bangladesh that is focused on building crowdsourced, metadata rich ML datasets for Bengali Vision-NLP and open-sourcing them through AI competitions on Kaggle. On 2020, Bengali.AI launched a featured competition supported by a Kaggle research grant of 120K USD. Currently, I'm performing a supervisory role for the ongoing research projects. [url]

PATENTS

Method and System for Detecting Abnormal Heart Sounds
S Ghaffarzadegan, Z Feng, **AI Humayun**, T Hasan
Assignee Robert Bosch GmbH in US, Germany and China, 2019 [url]
On a hardware+software prototype for heart sound auscultation and automated cardiac health monitoring. The work included novel contributions on Linear Phase 1DCNNs and their application as learnable filter banks.

PUBLICATIONS

Polarity Sampling: Quality and Diversity Control of Pre-Trained Generative Networks via Singular Values
AI Humayun, R Balestriero, RG Baraniuk
CVPR 2022 (Oral Presentation) [url]

MaGNET: Uniform Sampling from Deep Generative Network Manifolds without Retraining
AI Humayun, R Balestriero, RG Baraniuk
ICLR 2022 [url]

No More than 6ft Apart: Robust K-means via Radius Upper Bounds
AI Humayun, R Balestriero, A Kyrillidis, RG Baraniuk
ICASSP 2022 [url]

Detection of Junctional Ectopic Tachycardia by Central Venous Pressure
X Tan, Y Dai, **AI Humayun**, H Chen, G Allen, P Jain
AI in Medicine Conference, 2021 [url]

Wearing a MASK: Compressed Representations of Variable-Length Sequences Using Recurrent Neural Tangent Kernels
S Alemohammad, H Babaei, R Balastriero, MY Cheung, **AI Humayun**, D Lejeune, L Luzi, RG Baraniuk
ICASSP, 2021 [url]

A Large Multi-Target Dataset of Common Bengali Handwritten Graphemes
S Alam, T Reasat, AS Sushmit, SM Siddique, F Rahman, M Hasan, **AI Humayun**
ICDAR 2021 [url]

A Novel Algorithm for Early Detection of Junctional Ectopic Tachycardia in Patients With Congenital Heart Disease
H Babaei, S Barua, R Patel, Y Dai, **AI Humayun**, M Paciuc, M Stauffer, V Gagne, C Rusin, P Jain
Pediatric Critical Care Medicine, 2020 [url]

Towards Domain Invariant Heart Sound Abnormality Detection using Learnable Filterbanks
AI Humayun, S Ghaffarzadegan, Z Feng and T Hasan
IEEE Journal of Biomedical Health Informatics, 2020 [url]

End-to-end Sleep Staging with Raw Single Channel EEG using Deep Residual ConvNets
AI Humayun, AS Shahriyar, T Hasan and MIH Bhuiyan
IEEE Conf. of Biomedical Health Informatics, 2019 [url]

X-Ray Image Compression Using Convolutional Recurrent Neural Networks
AS Shahriyar, S Zaman, **AI Humayun**, T Hasan and MIH Bhuiyan
IEEE Conf. of Biomedical Health Informatics, 2019 [url]

An Ensemble of Transfer, Semi-supervised and Supervised Learning Methods for Pathological Heart Sound Classification
AI Humayun, MT Khan, S Ghaffarzadegan, Z Feng and T Hasan
INTERSPEECH 2018 [url]

Learning Front-end Filter-bank Parameters using Convolutional Neural Networks for Abnormal Heart Sound Detection
AI Humayun, S Ghaffarzadegan, Z Feng and T Hasan
IEEE EMBC 2018 [url]

NumtaDB - Assembled Bengali Handwritten Digits
S Alam, T Reasat, RM Doha, **AI Humayun**
arXiv 2018 [url]

Predictive Real-time Beat Tracking from Music for Embedded Application
IA Hussaini, **AI Humayun**, SI Foysal, S Alam, R Hyder, SS Chowdhury and MA Haque
IEEE Multimedia Information Processing and Retrieval (MIPR), 2018 [url]

Research Projects [url]

Visualizing and Improving Deep Learning Methods using Spline Theory with Prof. Richard Baraniuk.

Controlling GAN/VAE Generation via Spline Insights of Deep Learning with Prof. Richard Baraniuk.

Robust K-means via Radius Constraints for Fair Data Summarization with Prof. Richard Baraniuk and Prof. Anastasios Kyrillidis.

Neural Implicit Representations for Resource Constrained CT Image Reconstruction with Prof. Richard Baraniuk and Prof. Ashok Veeraraghavan

Differentiable Rendering for Coherent Light with Prof. Richard Baraniuk and Prof. Ashok Veeraraghavan.

Interpretable ECG Visualization and a Human-in-the-Loop Annotation tool, with Dr. Parag Jain (Texas Children's Hospital) and Prof. Genevera Allen

Linear Phase 1DCNNs and Learnable Filter banks for Heart Sound with Prof. Taufiq Hasan and BOSCH US Human machine intelligence group.

Honors and Awards

Loewenstern Fellowship, Graduate Student Recipient, 2019-20.

Kaggle Research Grant for Bengali.AI 2019-20

Data2Knowledge Project Showcase Winner, Rice University 2019

ISCA Student Travel Grant for INTERSPEECH 2018

IEEE Signal Processing Cup 2017 Honorable Mention for Real-Time Beat Tracker

Young Innovator of the Year, Falling Walls Lab 2016, Berlin.

Featured News

NVIDIA Dev Blog on Bengali.AI, Dec 2020, Grandmaster Series by Bojan Tunguz [url]

Technology.org, Dec 2019, Bengali.AI Grapheme Recognition Challenge [url]

IEEE SP Magazine, July 2017, Embedded Systems Feel the Beat [url]

BBC Media Action, Jan 2017, Project AudoVisor- wearable blind-aid [url]

The Asian Age, Oct 2016, Falling Walls Lab award winner [url]

Community Service

Reviewer, TOPML Workshop 2021, IEEE BHI 2019, IEEE EMBC 2019.

"What Is the Future of Signal Processing?", **IEEE Signal Processing Magazine**, Nov 2017 [url]

Founding Moderator, Bengali.AI Community of 5k+ AI/ML enthusiasts from Bangladesh [url]

Invited Talks

Controlling generative models via Spline Theory, Facebook AI Research, NY, March 2022

Breaking the Wall of Blindness with Wearables, Academy of Arts, Berlin, Dec 2016

Skills

Python, Tensorflow, Pytorch, JAX, C, C++, Matlab, Mitsuba, Blender, QT