Ahmed Imtiaz Humayun

CONTACT
INFORMATION

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EDUCATION

Rice University   2019-

M.S., Electrical and Computer Engineering
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

INTERESTS

Deep Learning Theory, Generative Modeling, Synthetic Data Training, Neural Representations

KEY
PUBLICATIONS

SplineCam: Exact Visualization and Characterization of Deep Neural Network Geometry and Decision Boundary
AI Humayun, R Balestriero, G Balakrishnan, R Baraniuk
CVPR 2023 (Highlight, Top 2.5%)   [url]

Exact Visualization of Deep Neural Network Geometry and Decision Boundary
AI Humayun, R Balestriero, R Baraniuk
NeurIPS 2022 Workshop on Symmetry and Geometry in Neural Representations   [url]

Polarity Sampling: Quality and Diversity Control of Pre-Trained Generative Networks via Singular Values
AI Humayun, R Balestriero, R Baraniuk
CVPR 2022 (Oral Presentation, Top 4%)   [url]

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

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

Towards Domain Invariant Heart Sound Abnormality Detection using Learnable Filterbanks
AI Humayun, S Ghaffarzadegan, Z Feng and T Hasan
IEEE Journal of BHI, 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 BHI, 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]

SUPERVISED PUBLICATIONS	**OOD-Speech: A Large Bengali Speech Recognition Dataset for Out-of-Distribution Benchmarking** FR Rakib, SS Dip, S Alam, N Tasnim, MIH Shihab, +7 authors, AS Sushmit†, **AI Humayun**† INTERSPEECH, 2023 [url]

BaDLAD: A Large Multi-Domain Bengali Document Layout Analysis Dataset
MIH Shihab, MR Hassan, M Rahman, SM Hossen, +11 authors, AS Sushmit†, **AI Humayun**†
ICDAR, 2023 [url]

Bengali Common Voice Speech Dataset for Automatic Speech Recognition
S Alam, A Sushmit, Z Abdullah, S Nakkhatra, +3 authors, T Reasat, **AI Humayun**
ArXiv, 2022 [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]

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

OTHER PUBLICATIONS	**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, R Baraniuk ICASSP, 2021 [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]

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]

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]

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]

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] Regarding novel contributions on Linear Phase 1DCNNs and their application as learnable filter banks.

EXPERIENCE	**Co-founder and Chief, Bengali.AI** Dec 2017-

I have founded and lead Bengali.AI, a non-profit initiative from Bangladesh that 1) builds crowd-sourced datasets for Bengali Vision-NLP research 2) crowdsources Bengali Vision-NLP methods through AI competitions, e.g., GEC '23, ASR '22, OCR '20. Recent achievements:

− Kaggle Research Grant for upcoming Out-of-Distribution Speech Recognition competition
− Awarded BRAC Research Grant for Bengali Speech Research
− Largest Bengali Document Layout Analysis Dataset - 700K polygon annotations
− Largest Bengali ASR dataset - 1800 hours from 24,000 speakers.

Graduate Research Assistant, Rice University May 2020-

I'm developing novel techniques that harness the spline theory of Deep Learning to understand, visualize, characterize and improve deep learning methods. My proposed theoretically driven frameworks, have a wide range of applications across generative modeling, active learning, privacy and robustness.

Full-time Research Assistant, Digital Health Lab, BUET Sept 2017 - July 2019

Lead number of joint projects with Human Machine Intelligence Group-2 at Bosch Research and Technology Center. Developed novel Linear Phase and Zero Phase 1DCNN Learnable Filterbanks, which provably annuls phase distortion of vanilla 1DCNNs. This has wide applications in time-series deep learning and biosignal domain adaptation.

HONORS AND AWARDS	**Kaggle Research Grant**, for upcoming Bengali.AI Out-of-distribution ASR Comp. 2023.
	D2K Fellowship, Rice University Fall 2022.
	Kaggle Community Host Award, for Bengali.AI Speech Rec. Comp. 2022.
	Loewenstern Fellowship, Graduate Student Recipient, 2019-20.
	Kaggle Research Grant for Bengali.AI Grapheme Rec. Comp. 2019-20
	D2K Project Showcase Winner, Rice University 2019
	Rice University Graduate Fellowship, 2019-2020.
	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.

INVITED TALKS	**Polarity Sampling: Controllable Generation For Free**, FAIR, Montreal, Oct 2022
	Controlling Generative Models via Spline Theory, FAIR, NY, Mar 2022
	Breaking the Wall of Blindness with Wearables, Academy of Arts, Berlin, Dec 2016

FEATURED NEWS	**The Front Page**, Jan 2023, Democratizing Bengali Language Technology '71 years after '52.	[url]
	The Business Standard, Dec 2022, Bengali.AI: Democratizing AI Research in Bengali	[url]
	The Daily Star, Nov 2022, Meet the Bengali.AI	[url]
	Somoy TV, Nov 2022, on Bengali.AI 2000 hrs Speech Rec. Dataset	[url]
	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, IEEE Signal Proc. Cup	[url]
	BBC Media Action, Jan 2017, Project AudoVisor- wearable blind-aid	[url]
	The Asian Age, Oct 2016, Falling Walls Lab award winner	[url]

SKILLS	Python, Tensorflow, Pytorch, Graph-tool, python-igraph, JAX, Pytorch JIT, C/C++, Matlab, Mitsuba, Blender, QT, Manim

COMMUNITY SERVICE	**Reviewer**, CVPR 2023, ICCV 2023, NeuRIPS 2022 Workshop, TOPML Workshop 2021.	
	"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]