Mohammad Abu Baker Siddique Akhonda, PhD

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QUALIFICATIONS

- Machine learning (ML) researcher with 5+ years of experience developing **interpretable** algorithms
- 7+ years of experience working with **multimodal** signals and medical images
- Excellent **leadership** skills with problem-solving, training, and cross-functional research experience

PROFESSIONAL AND RESEARCH EXPERIENCE

Staff Fellow | Aug 2023 – Present **|** *Food and Drug Administration (FDA)*
- Conducting independent research on AI and ML based regulatory science and devices
- Developing and validating regulatory science tools, creating AI and ML pipelines and process, and collaborating with other researchers to define, develop, and implement solutions to regulatory science problems

Postdoctoral IRTA | Oct 2022 – Aug 2023 **|** *National Institute of Health (NIH)*
Investigation of brain's functional and structural changes due to age and neurodegenerative disorders
- Conducted independent research to develop and implement ML algorithms for the **multimodal fusion** of multisubject functional and structural MRI data
- Processed **large datasets** for machine learning models, including data cleaning, normalizing, and feature engineering
- Designed and implemented **mixed effect models** between MRI and cognitive behaviors and perform **mathematical** and **statistical** analysis to identify potential biomarkers of disease
- **Collaborated** with other researchers to define new research problem, develop ideas, and implement ML solutions
- Created ML pipelines and process, **toolbox**, optimized and version control codes as a part of a cross-functional team

Research Assistant | Jun 2017 – Sep 2022 **|** *University of Maryland, Baltimore County*
- Designed, developed, and implemented data-driven ML algorithms to analyze **large dimensional** neuro imaging (300-1000 subjects MRI, EEG, and MEG data with 50K-300K samples) datasets for NIH and NSF funded projects
- Utilized state-of-the-art supervised, semi-supervised, and unsupervised methods for the detection, recognition, and classification of **diseases** (Schizophrenia, Bi-polar, and Depression)
- Studied **disease subtypes** and implemented eigen-decomposition based technique for **subgroup** identification
- Maintained **multidisciplinary** collaboration, **mentored** new researchers, and generated ideas for **grant proposals**

Specialist | Aug 2015 – July 2016 **|** *Robi Axiata Limited*
- Provided technical support to install and configure various telecom equipment's
- Developed **UNIX and Python-based** scripts to ensure smooth node maintenance and operation
- Participated in the project planning, deployment, and management to ensure project completion on time

Software Engineer | Oct 2013 – Aug 2015 **|** *Samsung Research and Development (R&D) Institute, Bangladesh*
- Developed and automated test cases using **C++, Python,** and **JAVA** for mobile android applications
- Worked with **cross-functional** teams to ensure successful delivery of the projects on time and within budget
- Participated in programming **contests** and code review **workshops** to maintain high standards in problem-solving

EDUCATION

Ph.D. in Electrical Engineering | *University of Maryland, Baltimore County* **|** 2022
M.Sc. in Electrical Engineering | *University of Maryland, Baltimore County* **|** 2019
B.Sc. in Elec. and Comm. Engineering |*Khulna University of Engineering & Technology, Bangladesh* **|** 2013

SKILLS AND INTERESTS

Programming Languages: C/C++, Python | **Data Analysis:** MATLAB and Python | **ML Framework:** PyTorch, TensorFlow

Research interest: Health Care AI, Computer Vision, Deep Learning, Signal Processing, Health Sensing, Ultrasound Imaging, Big Data Analysis, Optimization, Transfer Learning, Graph Neural Network, Mobile Healthcare, Data Science

Other Interests: Soccer, Badminton, FIFA, Swimming, Driving, Manga, K-drama, Tea, Big bang theory, and Reddit

SELECT PUBLICATIONS AND PRESENTATIONS (5 OF 30)- Google scholar

M.A.B.S. Akhonda, Y. Levin-Schwartz, V. Calhoun, and T. Adali, "Association of Neuroimaging Data with Behavioral Variables: A Class of Multivariate Methods and Their Comparison Using Multi-Task FMRI Data." *Sensors*, vol. 22, art. no. 1224, Feb 2022.

M.A.B.S. Akhonda, B. Gabrielson, S. Bhinge, V. Calhoun, and T. Adali, "Disjoint Sub-spaces for Common and Distinct Component Analysis: Application to the Fusion of Multi-task fMRI Data." *Journal of Neuroscience Methods,* vol. 358, pages 109214, (2021).

T. Adali, F. Kantar, **M.A.B.S. Akhonda**, S. Strother, V. Calhoun, E. Acar, "Reproducibility in Matrix and Tensor Decompositions: Focus on Model Match, Interpretability, and Uniqueness" accepted in *IEEE Signal Processing Magazine,* March 2022.

M.A.B.S. Akhonda, Y. Levin-Schwartz, S. Bhinge, V. D. Calhoun and T. Adali, "Consecutive Independence and Correlation Transform for Multimodal Fusion: Application to EEG and fMRI Data," 2018 *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP),* 2018, pp. 2311-2315.

B. Gabrielson, **M.A.B.S. Akhonda**, Z. Boukouvalas, S. J. Kim and T. Adali, "ICA with Orthogonality Constraint: Identifiability and A New Efficient Algorithm," *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2021, pp. 3720.

SELECT PROJECTS - LinkedIn

Multimodal Data Fusion of physiological signals (MRI, EEG, MEG) and Behavioral Data
- Goal: To develop data-driven machine learning methods to jointly analyze multiple modalities
- Contribution: Developed latent variable-based models to estimate joint interpretable features that can explain the underlying relationship across modalities and identified interpretable biomarkers of disease

Patient Subtypes Identification
- Goal: To identify subtypes of patients to enable personalized treatments
- Contribution: Developed eigenvalue-based approach to identify disease subtypes based on common and distinct features across subjects, used prior information (cognitive scores) to enable faster convergence of the computationally intensive algorithms

Exploitability of the ML Algorithms in medical image processing
- Goal: To ensure estimation of interpretable, reproducible, and replicable results with unsupervised methods
- Contribution: Used prior information as a constrain to ensure better interpretation of the estimated features, used measures such as cross-ISI and cost to ensure reproducibility and replicability of results