Rasel Ahmed Bhuiyan

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Summary

Ph.D. candidate in Computer Science at the University of Notre Dame with **5+ years of research experience in machine learning and computer vision, solving complex problems**, seeking a **Computer Vision/Machine Learning Research Scientist** internship to apply expertise in **classification, segmentation, recognition, generative AI, multimodal perception, and scalable deep learning** toward impactful applications in human biometrics, healthcare, security, or robotics. Committed to deploying cutting-edge research into production systems.

Education

Ph.D. Computer Science – University of Notre Dame, Notre Dame, IN 12/2026
Focus: Iris Recognition at Life Extremes | Advisor: Adam Czajka

M.Sc. Computer Science – University of Notre Dame, Notre Dame, IN 05/2025
Focus: Forensic Iris Recognition | CGPA: 3.83/4.00

B.Sc. Computer Science & Engineering – University of Asia Pacific, Dhaka, BD 03/2018
Graduated with **highest distinction** | CGPA: 3.94/4.00

Research Experience

Graduate Research Assistant 01/2022 - Present
Computer Vision Research Laboratory (CVRL), University of Notre Dame *Notre Dame, IN*

- **Multimodal PMI Prediction:** Designed a vision model fusing RGB+NIR to **reduce post-mortem interval (PMI) estimation error by 36%** (77.7 → 45.8 hrs), aiding criminal investigations. GitHub
- **Infant Iris Recognition:** Developed a universal segmentation model **improving AUC from 77% → 99%**, enabling real-time newborn ID systems to **prevent baby swapping**, reduce **abductions**, and improve **post-natal health monitoring** globally. GitHub
- **Synthetic Data Generation:** Created a **PMI-conditioned StyleGAN2 generator**, synthesizing **180K+ forensic iris images** to **reduce data scarcity** and enhance training and benchmarking. GitHub
- **Open-Source Tools:** Built the **largest post-mortem iris dataset (338+ subjects)** and released a forensic iris toolkit with **explainable AI** for human-in-the-loop analysis.
- **Iris Presentation Attack Detection:** Developed a deep-learning based **PAD model** with **>95% accuracy** on unseen attack types, enhancing biometric security. GitHub

Research Lead (as Lecturer) 10/2018 - 12/2021
Uttara University *Dhaka, Bangladesh*

- **Epileptic Seizure Recognition:** Segmented EEG signals into time windows, extracted statistical features, and applied an SVM classifier, achieving **99%+ accuracy** on the Bonn dataset for **automated seizure diagnosis**.
- **Human Activity Recognition:** Designed a window-based frequency-domain model using EPS features with SVM, **improving performance from 93% → 99%+ on DU-MD** and achieving **up to 99%+ class-wise accuracy on UCI-HAR**, surpassing state-of-the-art for **wearable health monitoring**.
- **Wearable Patient Monitoring:** Developed an **enhanced BoW features** with DWT and K-means, achieving **98% accuracy**, **surpassing BoW baselines** and **reducing computational cost** vs. state-of-the-art.

Research Assistant 03/2016 - 09/2018
Computer Vision & Pattern Recognition Lab, University of Asia Pacific *Dhaka, Bangladesh*

- **Hand Gesture Recognition:** Developed a gesture recognition system **improving accuracy from 61% → 78%** through advanced feature engineering and genetic algorithm–based optimization, enabling **enhanced communication for deaf and dumb users**.
- **ASL Recognition:** Built a low-cost, real-time HCI system using Deep-CNN feature extraction and multi-class SVM, achieving **94.6% accuracy** to support **interactive communication for deaf and dumb users**.
- **Arrhythmia Diagnosis:** Designed a hybrid PCA-ICA pipeline to extract statistical features from ECG signals, achieving **98.67% accuracy** in arrhythmia classification on the MIT-BIH dataset.

Technical Skills

Programming Languages: Python, MATLAB
Libraries and Tools: MLOps, PyTorch, TensorFlow, OpenCV, Scikit-learn, Pandas, NumPy, Matplotlib, Git, LaTeX
ML & CV: Vision-Language Models, Object Detection, Generative AI, Segmentation, Classification
Platforms: HPC Clusters, Multi-GPU Training, Distributed Computing
Specialties: Biometric AI, Health AI, Iris & Face Recognition, Visual Intelligence, Multimodal Learning, Few-shot Learning

Leadership Experience

Social Chair 2023/2024
Bangladeshi Student Association, University of Notre Dame *Notre Dame, IN*

- Organized meetings, took meeting minutes, and published announcements to coordinate academic and social activities.

President 2016/2017
CSE Student Association, University of Asia Pacific *Dhaka, Bangladesh*

- Advocated for student welfare by identifying issues, proposing solutions to the administration, and organizing student events.

Awards & Honors

- **Best Paper Award – CV4Smalls - WACV 2025:** *Iris Recognition for Infants.*
- Fully Funded Graduate Assistantship, University of Notre Dame.

Selected Publications

1 **Rasel Ahmed Bhuiyan**, Parisa Farmanifard, Renu Sharma, Andrey Kuehlkamp, Aidan Boyd, Patrick J Flynn, Kevin W Bowyer, Arun Ross, Dennis Chute, and Adam Czajka, "Beyond Mortality: Advancements in Post-Mortem Iris Recognition through Data Collection and Computer-Aided Forensic Examination," IEEE Transactions on Biometrics, Behavior, and Identity Science (T-BIOM), 2025.

2 **Rasel Ahmed Bhuiyan** and Adam Czajka, "Forensic Iris Image-Based Post-Mortem Interval Estimation", Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), Tucson, Arizona, 2025.

3 **Rasel Ahmed Bhuiyan** and Adam Czajka, "Iris Recognition for Infants", Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), Tucson, Arizona, 2025. [**Received Best Paper Award**]

4 **Rasel Ahmed Bhuiyan** and Adam Czajka, "Forensic Iris Image Synthesis", Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), Waikoloa, Hawaii, 2024.

5 **Rasel Ahmed Bhuiyan**, Shams Tarek, and Hongda Tian, "Enhanced Bag-of-Words Representation for Human Activity Recognition using Mobile Sensor Data", Signal, Image and Video Processing (SIViP), Springer Nature, 1–8, 2021.

6 **Rasel Ahmed Bhuiyan**, N Ahmed, Md Amiruzzaman, and MR Islam, "A Robust Feature Extraction Model for Human Activity Characterization using 3-Axis Accelerometer and Gyroscope Data", Sensors, MDPI, 20(23):6990, 2020.

7 A Matin, **Rasel Ahmed Bhuiyan**, SR Shafi, AK Kundu, and MU Islam, "A Hybrid Scheme Using PCA and ICA Based Statistical Feature for Epileptic Seizure Recognition from EEG Signal", Joint 2019 IEEE 8^{th} International Conference on Informatics, Electronics, and Vision (ICIEV) and 3^{rd} International Conference on Imaging, Vision, and Pattern Recognition (IVPR), Eastern Washington University, USA, 2019. [**Nominated for the best paper award**]

8 MR Islam, UK Mitu, **Rasel Ahmed Bhuiyan**, and J Shin, "Hand Gesture Feature Extraction Using Deep Convolutional Neural Network for Recognizing American Sign Language", 2018 IEEE 4^{th} International Conference on Frontiers of Signal Processing (IEEE-ICFSP), France, 2018.

9 **Rasel Ahmed Bhuiyan**, AK Tushar, A Ashiquzzaman, J Shin, MR Islam, "Reduction of gesture feature dimension for improving the hand gesture recognition performance of numerical sign language", 2017 IEEE 20^{th} International Conference of Computer and Information Technology (IEEE-ICCIT), Bangladesh, 2017.