Rasel Ahmed Bhuiyan

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Summary

Ph.D. candidate in Computer Science at the University of Notre Dame seeking an **Applied Computer Vision/Machine Learning Research Internship** to apply expertise in **segmentation, recognition, generative AI, multimodal perception, and scalable deep learning** toward real-world problems in human biometrics, healthcare, security, or robotics. Passionate about 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 05/2024
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

University of Notre Dame Notre Dame, IN
Graduate Research Assistant, Computer Vision Research Laboratory (CVRL) *01/2023 - Present*

- **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.
- **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.
- **Synthetic Data Generation:** Created a **PMI-conditioned StyleGAN2 generator**, synthesizing **180K+ forensic iris images** to **reduce data scarcity** and enhance training and benchmarking.
- **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.

Technical Projects

Iris Recognition Pipeline | *PyTorch, Scikit-Learn, OpenCV, Pillow, Pandas*

- Built an open-source **end-to-end pipeline** (segmentation → recognition → visualization). GitHub
- Achieved **<3% EER** on infant iris datasets, outperforming SOTA.

Real-time ASL Recognition | *PyTorch, Scikit-Learn, CVZONE, OpenCV*

- Trained a **CNN-based gesture recognition** system with **<50ms latency**, optimized for robotics integration. GitHub

Iris Presentation Attack Detection | *PyTorch, Scikit-Learn, Pillow*

- Developed a deep-learning based **PAD model** with **>95% accuracy** on unseen attack types, enhancing biometric security. GitHub

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
Platforms: HPC Clusters, Multi-GPU Training, Distributed Computing
Specialties: Biometric AI, Health AI, Iris & Face Recognition, Visual Intelligence, Multimodal Learning, Few-shot Learning

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.