Tanvir Hossain Ovi

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EDUCATION

University of Chittagong, Bangladesh *Jan 2020 – Nov 2025*
BSc in Electrical and Electronic Engineering

CGPA: 3.78 / 4.00 | **Merit Position: 2nd out of 63 students**

Thesis: *EEG-based cognitive load analysis in 360° virtual reality and 2D laptop video modes*

PUBLICATIONS

1. A. Hossain, **T. H. Ovi**, M. A. I. Mahmood, and M. F. Kader, "Classification of Envisioned English Speech from EEG using Deep Learning Approaches," *Machine Learning with Applications*, vol. 22, p. 100752, 2025.
2. M. A. Z. Akas, **T. H. Ovi**, and M. F. Kader, "Impact of Mobile Phone Use on the Brain Activity: Audio Call vs Video Call," *Acta Psychologica*, vol. 262, p. 106160, 2026.
3. **T. H. Ovi**, M. M. Islam, M. A. Uddin, K. Ghazinour, A. M. M. Chowdhury, and N. Siddique, "Frequency Band Dissociation Between Cognitive State Recognition and Person Identification in EEG," *Machine Learning with Applications*, p. 100901, 2026.
4. **T. H. Ovi**, A. M. M. Chowdhury, K. Ghazinour, and M. Simsek, "AI-Driven Clustering and Multi-stage Intrusion Detection for APT Mitigation in IoT Networks," in *Proceedings of the 9th International Balkan Conference on Communications and Networking (BalkanCom)*, 2026. [Accepted]
5. **T. H. Ovi**, T. Forsythe, A. M. M. Chowdhury, N. Siddique, and Y. Li, "Phenotype-aware personalization for cross-session EEG-based emotion recognition," *Pattern Recognition*, 2026. [Under Review]
6. **T. H. Ovi**, T. F. Arin, M. A. I. Mahmood, and M. F. Kader, "EEG-Based Cognitive Load Analysis in Immersive Virtual Reality and Laptop-Based Video Learning Environments," *Applied Cognitive Psychology*, 2026. [Submitted]
7. T. F. Arin, **T. H. Ovi**, and M. F. Kader, "Bangla Imagined Speech Using EEG to Understand Emotional Words," *Acta Psychologica*, 2026. [Submitted]
8. A. Hossain, M. A. Z. Akas, **T. H. Ovi**, and M. F. Kader, "Heterogeneous Deep Learning Approaches for EEG-Based Imagined Bangla Word-Level Speech Recognition," *Computer Speech & Language*, 2026. [Submitted]

RESEARCH EXPERIENCE

Phenotype-Aware Personalization for Cross-Session EEG Emotion Recognition 2025–2026

- Investigated cross-session performance degradation in EEG-based emotion recognition by analyzing

the SEED-IV dataset across three weekly recording sessions per participant.
- Implemented variance decomposition and two-way ANOVA to partition performance variance, examining whether cross-session variability reflects structured individual differences rather than random noise.
- Conducted brain-behavior correlation analysis and hierarchical clustering to identify distinct user phenotypes affecting cross-session model generalization.
- Developed and evaluated personalized fine-tuning strategies, demonstrating the efficacy of phenotype-aware domain adaptation over uniform correction methods for cross-session reliability.

EEG-Based Frequency Band Analysis for Cognitive State and Biometric Applications 2025

- Independently analyzed a publicly available EEG dataset of 20 participants across three weekly recording sessions to investigate frequency band dissociation between task classification and person authentication.
- Implemented complete preprocessing pipeline with ICA artifact removal and computed cognitive engagement metrics including Theta to Alpha Ratio and Engagement Index.
- Developed and evaluated EEGNet with Squeeze and Excitation blocks, Channel Mixing variants, and EEGPT architectures for cognitive state classification across seven frequency bands.
- Conducted cross session subject authentication experiments, discovering that delta oscillations achieved 86.9% task classification accuracy but only 15.6 to 23.6% authentication accuracy, while broadband signals reached 69.9% authentication performance.

Cognitive Load Analysis in Virtual Reality and Traditional Display Environments 2024–2025

- Designed experimental protocol comparing cognitive load during 360 degree VR immersive viewing versus 2D laptop display with 30 participants using 14 channel Emotiv EPOC X.
- Developed preprocessing pipeline incorporating bandpass filtering, ICA artifact rejection, and signal normalization, then extracted Theta Alpha Ratio, Engagement Index, and Beta Alpha Ratio.
- Performed statistical validation using MANOVA and ANOVA with FDR correction and built classification models with SVM, Random Forest, and kNN using five fold cross validation.
- Demonstrated that VR environments reduced cognitive load by 21% while increasing engagement by 59%, achieving 83.5% classification accuracy with TAR identified as the optimal marker.

TECHNICAL SKILLS

- **Programming & Frameworks:** Python (3 yrs), TensorFlow, Keras,PyTorch, Scikit-learn (Machine Learning & Deep Learning: 2 yrs)
- **Signal Processing:** MNE-Python, EEGLAB, EEG preprocessing and feature extraction
- **Statistical Analysis:** Hypothesis testing (t-test, Wilcoxon, ANOVA, MANOVA), data modeling
- **Computer Vision:** MediaPipe, OpenCV, ROI extraction, image standardization (NFIQ2)
- **Data Visualization:** Matplotlib, Seaborn, Tableau
- **Tools & Platforms:** LaTeX, Google Colab, Git, Linux
- **Simulation:** Advanced Design System (ADS), RSoft, Pspice

STANDARDISED TESTS

IELTS Academic *14 April 2026*

Overall Band Score: **7.5** | Listening: 8.0 Reading: 8.0 Writing: 6.0 Speaking: 7.0

HONORS AND AWARDS

- First Runner-up, Student Merit Award, EEE Fest, University of Chittagong *Feb 2025*
- Champion, Robo Soccer Competition, EEE Fest, University of Chittagong *Jan 2023*
- Second Runner-up, Robo Soccer Competition, Engineering Day, University of Chittagong *Jun 2022*
- Industrial Training Certificate, General Electric Manufacturing Company Limited (14-day program) *Jul 2025*

REFERENCES

Dr. Nazmul Siddique
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