Akib Zaman

PhD Student, EECS · Massachusetts Institute of Technology

32 Vassar Street, 32D-375A, Cambridge, MA 02139, USA

akib@mit.edu | https://akibzaman.github.io/

Summary

PhD Student in MIT EECS, developing computational methods that integrate **differential geometry, physics-based simulation**, **machine learning**, and **digital fabrication** to co-design structure and behavior in physically realizable systems, enabling new classes of *soft robots*, *deployable mechanisms*, and *metamaterials*.

Education

Massachusetts Institute of Technology — *Cambridge, MA, USA*

Ph.D. Candidate, Electrical Engineering and Computer Science Department — *Sep 2023 - present*

- Advisor: Mina Konaković Luković
- Research Topic: Computational design of reconfigurable robots and structures

Massachusetts Institute of Technology — *Cambridge, MA, USA*

M.Sc. in Electrical Engineering and Computer Science — *Sep 2023 - May 2025*

- CGPA: 5.00/5.00
- Thesis Title: Fast Assembly of Curved Structures from Flat Configuration

Military Institute of Science and Technology — *Dhaka, Bangladesh*

B.Sc. in Computer Science and Engineering — *Jan 2017 - Mar 2021*

- CGPA: 3.98/4.00 *Summa cum laude, MIST Medal*
- Thesis Title: Digitalization of Battlefield Environment and Effect Analysis: Towards Developing an Effective IPB System Using Intelligent Object Detection

Selected Publications (Check the full list on Google Scholar)

Journal

Zaman, A., Aslarus, J., Li, J, Muller, S., Konakovic, M. *One String to Pull Them All: Fast Assembly of Curved Structures from Flat Auxetic Linkages*, ACM Transaction on Graphics, SIGGRAPH ASIA 2025

Zaman, A., Majib, M.S., Tanjim, S.A., Siddique, S.M.A., Islam, S., Aadeeb, M.S., Khan, N.I., Haque, R., Islam, M.R.U., Faisal, M.R.F. and Malik, S., 2022. *UVC-PURGE: A novel cost-effective disinfection robot for combating COVID-19 pandemic*. Ieee Access, 10, pp.37613-37634.

Zaman, A., Majib, M.S., Tanjim, S.A., Siddique, S.M.A., Ashraf, F., Islam, S., Morshed, A.H.M.M., Shahid, S.T., Hasan, I., Samir, O. and Shafquat, S., 2022. *Phoenix: Towards designing and developing a human assistant rover*. IEEE Access, 10, pp.50728-50754

Zaman, A., Kumar, S., Shatabda, S., Dehzangi, I. and Sharma, A., 2024. *SleepBoost: a multi-level tree-based ensemble model for automatic sleep stage classification*. Medical & biological engineering & computing, pp.1-15

Hossain, B.A., Mukta, M.S.H., Islam, M.A., **Zaman, A.** and Schwitter, R., 2023. Natural Language Based Conceptual Modelling Frameworks: State of the Art and Future Opportunities. ACM Computing Surveys.

Conference

Zaman, A., Tahsin, A., Rahman, M., Akhter, R., Rahman, H., Mustary, S. and Farid, D.M., 2022, November. *Emotion Detection for Children on the Autism Spectrum using BCI and Web Technology*. In 2022 IEEE/WIC/ACM International Joint Conference on Web Intelligence and Intelligent Agent Technology (WI-IAT) (pp. 207-214). IEEE.

Zaman, A., Khan, R.T., Karim, N., Nazrul Islam, M., Uddin, M.S. and Hasan, M.M., 2022. *Intelli-helmet: An early prototype of a stress monitoring system for military operations*. In Information Systems and Management Science: Conference Proceedings of 3rd International Conference on Information Systems and Management Science (ISMS) 2020 (pp. 22-32). Springer International Publishing.

Mukta, M.S.H., **Zaman, A.**, Islam, M.A. and Hossain, B.A., 2022, September. *Predicting Users' Eat-Out Preference from Big5 Personality Traits*. In Congress on Intelligent Systems (pp. 511-523). Singapore: Springer Nature Singapore.

Hasan, A.R., **Zaman, A.**, Ghosh, P., Audry, T.T.B., Bhuiyan, F., Amit, A.K. and Mukta, M.S.H., 2022, December. *Degrees of Anger Prediction from Speech*. In 2022 25th International Conference on Computer and Information Technology (ICCIT) (pp. 318-323). IEEE.

Noor, A.S., Airin, A., Dawla, R.U., Hasan, A.R., Al Hasan, M., **Zaman, A.** and Farid, D.M., 2022, November. A Novel Method for Imbalanced Data Classification based on Label Reassignment. In TENCON 2022-2022 IEEE Region 10 Conference (TENCON) (pp. 1-6). IEEE.

Research Experience

MIT Computer Science & Artificial Intelligence Laboratory *Cambridge, MA, USA*

Graduate Research Assistant | Advisor: Mina Konaković Luković *Sept. 2023 – Present*

- Developed a novel computational approach for designing freeform structures that can be rapidly assembled from initially flat configurations by a single string pull
- Implemented a two-step algorithm to identify the minimal controllable tile subset and optimize a friction-minimizing string path, ensuring smooth, physically realizable actuation.
- Evaluated and Validated the approach with physical prototypes via multi-material 3D printing

UIU Center of Artificial Intelligence & Robotics *Dhaka, Bangladesh*

Lecturer | Advisor: Salekul Islam *July 2021 - Aug. 2023*

- Developed UIU Mars Rover Team from scratch, Mentored the development of mars rover prototype, Managed Research grant (200Milion USD), Achieved 13th and 9th overall in University Rover Challenge, Mars Desert Research Station, Hanksville, UT

Remote Research Collboration - CCIB, Rutgers University *Remote*

Researcher | Co-Advisors: Iman Dehzangi, Alok Sharma, and Shiu Kumar *Feb 2022 - Aug. 2023*

- Developed *SleepBoost*, a multi-level tree-based ensemble model for automatic sleep stage classification that integrates a feature engineering block with mutual information-based feature selection and fuses CatBoost, LGBoost, and Random Forest via a reward-based adaptive weight allocation mechanism, Achieved 86.3% accuracy on the Sleep-EDF-20 dataset and Outperformed state-of-the-art deep learning models

Military Institute of Science and Technology *Dhaka, Bangladesh*

UG Researcher | Co-Advisors: Nazrul Islam, Mahbubur Rahman *Sept. 2017 - May 2021*

- Led the development of *UVC-PURGE*, a cost-effective (<$700 production) semi-autonomous UVC disinfection robot that inactivated SARS-CoV-2, Developed the mathematical modeling of the required UVC radiation, Conducted Experiment design and wrote evaluation Codes, Demonstrated the system at the Medical Robotics Challenge for Contagious Disease 2020 (UK-RAS, Imperial College London)
- Led the development of *PHOENIX*, a Mars rover prototype for University Rover Challenge (URC) 2021, Designed the autonomous navigation system of the Rover, Acquired expertise in Robotic Operating System (ROS) with the integration of LIDAR, ZED 2i, and GPS data, Implemented a novel, multiple bio-molecule based rapid life detection protocol from soil samples, Developed a VGG-16 based multi-class classifier to detect life from rock samples, Managed overall project logistics including coordinating sub-teams, wrote research grants, Resulted in a 92.78/100 System Acceptance Review Score in URC 2021

Projects

TinyRobotEngine(VLM, Model Compression)[Python][Report] Applied quantization techniques to OpenVLA, achieving a 74.3% reduction in model size and successfully porting it to TinyChatEngine for real-time inference on a Mac laptop with Apple Silicon (ARM)

DreamGaussian++(Graphics, 3D Reconstruction)[Python][Report] Improved geometrical alignments and texture mapping of the base model by integrating Zero123++ 2D diffusion prior, Analyzed the relationship between initial Gaussian splat approximation and densification interval during 3D reconstruction

AssemBot(Robotics, Vision)[Python][Report] Developed an end-to-end pipeline that decomposes target structures into building blocks (Image-to-Blocks), estimates block poses using ICP with outlier removal, and plans smooth trajectories via a SQP-Solver integrating kinematic optimization and inverse kinematics for precise robotic arm construction

Intelli-Helmet(ML, Signal Processing)[Python, C++, JavaScript][Paper] Given EEG and Heart rate data, developed a Stress Prediction of a field-deployed soldier, Collected field data and developed a random-forest classifier

Bondhu(ML, Signal Processing)[Python, JavaScript][Paper] Developed an ensemble model to classify emotion of Autism Spectrum Disorder, and deployed the model in a web application to provide data to the parents

Awards, Fellowships, & Grants

2021	**MIST Medal, Highest CGPA in the Department of Computer Science and Engineering**, Military Institute of Science and Technology (MIST), Dhaka, Bangladesh **Seed-Funding Receiver in Portfolio StartUP**, Innovation Design and Entrepreneurship Academy (IDEA), ICT Division, Bangladesh **Team Lead | MIST Mongol Barota | University Rover Challenge(URC) 2021**, The Mars Society	*$ 10000*
2020	**Team Lead | Best Robotic System in Application Category | Medical Robotics Challenge for Contagious Disease**, UK Robotics and Autonomous Systems (UK-RAS) Network	*$ 7000*

2018 **Best Overseas Student Officer | Highest score in Military, Academic, and Professional Exams, Officers' Commissioning Course CC163**, Royal Military Academy Sandhurst (RMAS), Camberley, UK

Professional Experience

2021-2023 **Lecturer**, Department of Computer Science and Engineering, United International University, Dhaka, Bangladesh
2022-2023 **Team Director and Advisor**, UIU Mars Rover Team, United International University, Dhaka, Bangladesh

Teaching and Mentoring Experience

Teaching - Lecturer, United International University

2023 **CSE 2217/8: Data Structures and Algorithms - II**, Lecturer (∼ 40 students), *Summer*
CSE 1115/6: Object Oriented Programming Language, Lecturer (∼ 45 students), *Spring*
CSE 1111/2: Structured Programming Language, Lecturer (∼ 75 students), *Spring, Summer*
2022 **CSE 2215/6: Data Structures and Algorithms- I**, Lecturer (∼ 35 students), *Fall*
CSE 1111/2: Structured Programming Language, Lecturer (∼ 90 students), *Summer, Fall*
CSE 3301: Computer Architecture, Lecturer (∼ 40 students), *Spring, Summer*
2021 **CSE 1111/2: Structured Programming Language**, Lecturer (∼ 90 students), *Spring*
CSE 2233: Theory of Computation, Lecturer (∼ 90 students), *Spring*

Research Supervision and Mentoring

2021-2022 **Prediction of Soil Nutrients using Hyperspectral Satellite August**, Undergraduate Thesis Co-Supervision, UIU, Bangladesh
2022-2023 **Scene Graph Understanding using Attention Mechanism** , Undergraduate Thesis Co-Supervision, UIU, Bangladesh
Meta-learning on Supervised Machine Learning Datasets, Undergraduate Thesis Co-Supervision, Department of CSE, UIU

Outreach & Professional Development

Professional Service and Outreach

2022 **4th International Conference on Machine Intelligence and Signal Processing (MISP 2022)**, Technical Program Committee Member — *Bangalore, India*
2021 **International Conference on Information Systems and Management Science (ISMS 2021)**, Reviewer — *Malta*

Peer Review

Nature - Scientific Reports
IEEE Access

Academic Membership

ACM - Member ID (9596265)
IEEE - Member ID (99572984)
IEEE Robotics and Automation Society

References

Mina Konaković Luković — *Cambridge, MA, USA*
Assistant Professor, EECS, MIT

Iman Dehzangi — *Camden, NJ, USA*
Assistant Professor, Department of CS, Rutgers University

Salekul Islam *Dhaka, Bangladesh*

Professor, Department of CSE, North South University