ABDULLAH AL MAMUN

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https://scholar.google.com/citations?user=SOJ1o5QAAAAJ&hl=en

PROFILE SUMMARY

PhD candidate in Computer Science at Arizona State University (expected 2027), researching trustworthy and explainable AI for digital health: robust machine learning for wearable sensing, counterfactual explanations, and sparse-event forecasting. Author of 16 research papers (12 published), including first-authored work in ACM Transactions on Computing for Healthcare, Progress in Biomedical Engineering, and Sensors, with research spanning multiple NSF- and NIH-funded projects. Instructor of record for an AI course at ASU (Fall 2024 Modeling Biomedical Knowledge) and reviewer of 48 submissions for venues including IEEE JBHI and AAAI.

Core Expertise: Trustworthy and explainable AI, robust machine learning, counterfactual explanations, time-series forecasting, transformers and large language models, wearable sensing, sparse-event detection, data augmentation

Application Domains: Metabolic health (Type 1/Type 2 diabetes), cardiovascular health (heart failure, medication adherence, activity recognition), neonatal health, and mental health (stress, substance use disorder)

Ongoing Work:

- Expert evaluation of my LLM- and RAG-based meal recommendation method with accurate calories and macronutrients, with results feeding back into model development
- Leading development of a foundation model for mental health

EDUCATION

PhD, Computer Science, Arizona State University (GPA: 4.00) **All but Dissertation (Expected 2027)**

- Dissertation (working title): "Trustworthy AI for Digital Health Through Robust Machine Learning and Clinically Meaningful Explanations." Advisor: Dr. Hassan Ghasemzadeh.
- Proposal defended August 2026. Dissertation defense expected in 2027.

MS (With Distinction), Computer Science, Arizona State University (GPA: 4.00) **May 2025**

- Earned en route to the PhD.

BSc, Computer Science, Bangladesh University of Engineering and Technology (GPA: 3.70) **Oct 2018**

RESEARCH AND PROFESSIONAL EXPERIENCE

Graduate Research Associate, Arizona State University (Phoenix, AZ, USA) **Dec 2021 - Present**

- Authored 16 papers (12 published) at the Embedded Machine Intelligence Lab (https://ghasemzadeh.com).
- Led studies and ML development across federally funded projects (NSF CPS, CHS; NIH R18, R21, R61) in wearable computing, mHealth interventions, and clinical trials; see **Funded Research Projects** and **Publications**.
- Designed user studies, wrote IRB protocols, recruited participants, and collected and analyzed multimodal wearable and behavioral data.
- Built research infrastructure end to end, including iOS/Android data collection apps, backend servers, and API pipelines for AWS S3, Spotify, and Google Drive.

Research Assistant, Washington State University (Pullman, WA, USA) **Jan 2021 - Aug 2021**

- Conducted research on neural networks robust to inference-time sensor failure in mobile health environments (published at IEEE EMBC 2022).

Software Developer, HLC Technologies Limited (Dhaka, Bangladesh) **Nov 2018 - Sep 2019**

- Developed cybersecurity solutions for Windows, macOS, Ubuntu, and CentOS, including patch management and configuration monitoring tools, and an online learning management system.

FUNDED RESEARCH PROJECTS

1. **Keeping Labor Safe**
   Funding: WearTech Center, an applied research center of the Partnership for Economic Innovation
   Role: Built the ML pipeline for AI-based neonatal risk prediction, including a GAN-based data augmentation method to address severe class imbalance in adverse-outcome data, and developed counterfactual explanation

methods for clinical interpretability; first-authored the resulting ACM Transactions on Computing for Healthcare paper and an IEEE BSN 2023 paper.

2. **WorkWell: A Pre-clinical Pilot Study of Increased Standing and Light-Intensity Physical Activity in Prediabetic Sedentary Office Workers**
   Funding: ASU College of Health Solutions Translational Science Award (Metabolic Health Translational Team); Clinical Trial NCT04269070
   Role: Analyzed wearable and dietary data from the trial; developed hybrid machine learning models and LLM-based pipelines for hyperglycemia prediction, with clinically grounded counterfactual explanations that suggest macronutrient adjustments to prevent postprandial hyperglycemia. First-authored the resulting paper (Sensors, 2025).

3. **Developing a Music Listening mHealth Intervention for Stress Reduction in Early Recovery**
   Funding: National Institutes of Health (NIH) #R61AA031474
   Role: Led development of the multimodal data collection platform (iOS/Android apps, backend server); built stress detection models from wearable physiological and music listening data, from tree-based methods to transformers. Co-authored a paper in the International Journal of Stress Management.

4. **Activity-Aware Prompting to Improve Medication Adherence in Heart Failure Patients**
   Funding: National Institutes of Health (NIH) #R21NR015410
   Role: Developed a continual learning algorithm for resource-constrained environments that forecasts medication adherence with over 90% accuracy; first-authored the resulting journal manuscript (under review at Smart Health).

5. **Smartphone-Based Diabetes Prevention in the VA: A Cluster-Randomized Trial**
   Funding: National Institutes of Health (NIH) #R18DK109516
   Role: Developed a multimodal physical activity forecasting model (Best Paper Honorable Mention, IEEE BSN 2022); extended the work in a journal manuscript currently on arXiv.

6. **CPS: Small: Human-in-the-Loop Learning of Complex Events in Uncontrolled Environments**
   Funding: National Science Foundation (NSF) #1932346, #2227002
   Role: Designed the user study, prepared IRB documents, recruited participants, and collected and preprocessed data; co-first-authored an AAAI 2025 student abstract and a journal manuscript in preparation. Additionally, first-authored a comprehensive review of trustworthy AI in digital health (Progress in Biomedical Engineering, 2026) and co-authored a review of AI-powered wearable sensors (Current Opinion in Biomedical Engineering, 2025) under this award.

7. **PARTNER: AIPS: Expanding AI Innovation in Pervasive Systems at Arizona State University**
   Funding: National Science Foundation (NSF) #2402650
   Role: Mentored the first author of the GluBox glucose prediction project from initial poster (IEEE BSN 2024) through journal publication (IEEE Sensors, 2026), advising on the design of a region-weighted loss function for hypo-, normo-, and hyperglycemia and on preventing data leakage between the Bayesian optimization and downstream prediction stages.

PUBLICATIONS

Journal papers:

1. **Use of What-if Scenarios to Help Explain Artificial Intelligence Models for Neonatal Health.** A. Mamun, L. D. Devoe, M. I. Evans, D. W. Britt, J. Klein-Seetharaman, H. Ghasemzadeh. ACM Transactions on Computing for Healthcare (2026). https://dl.acm.org/doi/10.1145/3814951

2. **Trustworthy AI in Digital Health: A Comprehensive Review of Robustness and Explainability.** A. Mamun, S. B. Soumma, H. Ghasemzadeh. Progress in Biomedical Engineering (2026). https://iopscience.iop.org/article/10.1088/2516-1091/ae4e74/

3. **LLM-Powered Prediction of Hyperglycemia and Discovery of Behavioral Treatment Pathways from Wearables and Diet.** A. Mamun, A. Arefeen, S. B. Racette, D. D. Sears, C. M. Whisner, M. P. Buman, H. Ghasemzadeh. Sensors (2025), *25*(17), 5372. https://www.mdpi.com/1424-8220/25/17/5372

4. **AI-Powered Wearable Sensors for Health Monitoring and Clinical Decision Making.** S. B. Soumma, A. Mamun, H. Ghasemzadeh. Current Opinion in Biomedical Engineering, 2025. https://www.sciencedirect.com/science/article/abs/pii/S2468451125000534

5. **Comparable physiological stress responses following music listening and quiet reading: An exploratory pilot study.** N. T. Chatrudi, R. K. Sah, A. Mamun, M. Belgrave, A. Habibi, M. J. Cleveland, H. Ghasemzadeh. International Journal of Stress Management, 2026. https://pmc.ncbi.nlm.nih.gov/articles/PMC13441422/

6. **GluBox: Glucose Prediction for Type 1 Diabetes from Multimodal Wearable Sensors using Region-Sensitive Loss and Bayesian Optimization**. P. Khorasani, E. Farahmand, A. Mamun, H. Ghasemzadeh. IEEE Sensors, 2026. https://ieeexplore.ieee.org/document/11592759/

Conference papers:

7. **Domain-Informed Label Fusion Surpasses LLMs in Free-Living Activity Classification**. S. B. Soumma, A. Mamun, H. Ghasemzadeh. AAAI Conference on Artificial Intelligence (AAAI 2025) Student Abstract. *https://ojs.aaai.org/index.php/AAAI/article/view/35301.*

8. **Designing Deep Neural Networks Robust to Sensor Failure in Mobile Health Environments**. A. Mamun, S. I. Mirzadeh, H. Ghasemzadeh. IEEE Engineering in Medicine and Biology Conference (EMBC 2022). *https://par.nsf.gov/servlets/purl/10325313.*

9. **Multimodal Time-Series Activity Forecasting for Adaptive Lifestyle Intervention Design**. A. Mamun, K. S. Leonard, M. P. Buman, H. Ghasemzadeh. IEEE Wearable and Implantable Body Sensor Networks (BSN 2022). *https://par.nsf.gov/servlets/purl/10389477.*
10. **Neonatal Risk Modeling and Prediction**. A. Mamun, C.-C. Kuo, D. W. Britt, L. D. Devoe, M. I. Evans, H. Ghasemzadeh, J. Klein-Seetharaman. IEEE Conference on Body Sensor Networks (BSN 2023). *https://ieeexplore.ieee.org/document/10331196/*

11. **Enhancing Metabolic Syndrome Prediction with Hybrid Data Balancing and Counterfactuals**. S. P. Sah, A. Mamun, S. B. Soumma, H. Ghasemzadeh. IEEE Engineering in Medicine and Biology Conference (EMBC 2025). https://ieeexplore.ieee.org/document/11253729.

12. **Freezing of Gait Detection Using Gramian Angular Fields and Federated Learning from Wearable Sensors**. S. B. Soumma, S. M. R. Alam, R. Mahi, U. N. Mahi, A. Mamun, S. M. Mostafavi, H. Ghasemzadeh. IEEE Engineering in Medicine and Biology Conference (EMBC 2025). https://pubmed.ncbi.nlm.nih.gov/41336735/.

Pending papers and preprints:

13. **AIMI: Leveraging Future Knowledge and Personalization in Sparse Event Forecasting for Treatment Adherence**. A. Mamun, D. J. Cook, H. Ghasemzadeh. Smart Health (**revision under review**) *https://arxiv.org/abs/2503.16091.*

14. **Multimodal Physical Activity Forecasting in Free-Living Clinical Settings: Hunting Opportunities for Just-in-Time Interventions.** A. Mamun, K. S. Leonard, M. E. Petrov, M. P. Buman, H. Ghasemzadeh. (preprint, submission pending) *https://arxiv.org/abs/2410.09643*

15. **Hybrid Label Fusion Approach using Domain Knowledge Surpasses LLM for Human Activity Recognition in Free-Living Contexts**. S. B. Soumma, A. Mamun, N. Chaytor, D. J. Cook, H. Ghasemzadeh. (preprint, submission pending)

16. **Actsafe: Predicting violations of medical temporal constraints for medication adherence.** P. Seegmiller, J. Gatto, A. Mamun, H. Ghasemzadeh, D. J. Cook, J. Stankovic, S. M. Preum. (Preprint) *https://arxiv.org/abs/2301.07051.*

TEACHING EXPERIENCE

Instructor of Record, Arizona State University (Phoenix, AZ, USA) **Aug 2024 - Dec 2024**

- Taught BMI 311: Modeling Biomedical Knowledge (Fall 2024), with sole responsibility for lectures, assignments, and grading. Topics: machine learning fundamentals (KNN, random forests, SVMs), neural networks and deep learning, clustering, and model validation.
- Received the ASU GSG Teaching Excellence Award (2024).

Teaching Assistant, Washington State University (Pullman, WA, USA) **Aug 2021 - Dec 2021**

- Teaching assistant for Advanced Data Structures in C/C++ (100+ students); led office hours and assisted with assignments and debugging support.

Lecturer, United International University (Dhaka, Bangladesh) **Sep 2019 - Jan 2021**

- Courses taught: Software Engineering, Java and C Programming, Digital System Design, System Analysis and Design.
- Full-time faculty position with independent responsibility for course design, lectures, and assessment.

MENTORING EXPERIENCE

- Mentored a junior PhD student on the GluBox glucose prediction project from initial poster (IEEE BSN 2024) through journal publication (IEEE Sensors, 2026), advising on loss function design and evaluation methodology.
- Supervised an undergraduate student's honors contract research from my BMI 311 course; outcomes include a co-authored full paper at IEEE EMBC 2025.
- Mentored a high school research student, resulting in a first-authored one-page technical abstract accepted at IEEE BSN 2024.

AWARDS & HONORS

- Best Paper (Honorable Mention) Award, IEEE BSN 2022.
- Outstanding Research Award, Arizona State University Graduate Student Government (2024).
- Teaching Excellence Award, Arizona State University Graduate Student Government (2024).
- Full Member, Sigma Xi, The Scientific Research Honor Society (2025-present; by nomination).
- Travel Awards: IEEE, ASU Graduate College, ASU Graduate Student Government (2023 – 2025).

INVITED TALKS

- **Digital Twin for Precision Health.** AZ Health Data Integration Meeting (organized by ASU and Google), 2025.
- **Time-Series Wearable Activity Forecasting.** ASU Machine Learning Day, 2023.

ACADEMIC SERVICES

- Reviewed 48 journal and conference submissions: 5 IEEE JBHI, 2 AAAI 2026, 6 AAAI 2027, 1 BHI'23, 6 BHI'24, 1 BHI'25, 2 BHI'26, 1 PerCom'23, 5 CHIL'24, 2 CHIL'25, 4 ML4H'24, 4 ML4H'25, 1 IEEE EMBC'25, 2 IEEE BSN'25, 4 BSN'26, 1 BMC Health Services Research Journal, and 1 Guthrie Clinic Journal of Medicine.
- Member of Program Committee: AAAI 2026, AAAI 2027, IEEE BSN 2026

TECHNICAL SKILLS

- **Deep Learning:** PyTorch, TensorFlow, Transformers, Large Language Models, Attention, Time-series, Tabular data, Object detection, Image segmentation, Counterfactuals, Generative models.
- **Software Development:** Python, Java, C, C++, ReactJS, Shell, iOS (Swift), Android, Linux, Nginx, HPC/Slurm, AWS/S3, DigitalOcean, SQL/database design, Hadoop, Deployment automation