Sumit Barua

Kalamazoo, Michigan, USA
Homepage — Linkedin — Google Scholar — GitHub

RESEARCH FOCUS

Trustworthy, explainable, and uncertainty-aware AI for high-stakes healthcare, emergency response, and decision-support systems, with emphasis on multimodal and edge healthcare AI, smart-ambulance/EMS reliability, robustness under domain shift, human-AI collaboration, and evidence-grounded LLM/RAG systems.

EDUCATION

Western Michigan University, Kalamazoo, MI Aug 2025 – Apr 2027
- M.S. in Computer Science
- GPA: 4.0 / 4.0
- Advisor: Prof. Alvis Fong
- Relevant Coursework: Generative AI, Machine Learning, Secure Programming, Cloud Computing, Big Data, MS Thesis

Western Michigan University, Kalamazoo, MI Aug 2018 – Apr 2022
- B.S. in Computer Science
- GPA: 3.60 / 4.0
- Relevant Coursework: Java Programming, Data Structure and Algorithm, System Programming, Artificial Intelligence, Software Development

PUBLICATIONS

1. **Barua, S.**, Bahre, R., and Hong, G. Y. "Edge-Enabled Explainable Multimodal AI for Emergency Wound Assessment in Smart Ambulance IoMT Networks." *IEEE Communications Magazine*, vol. 64, no. 9, pp. 86–91, September 2026, doi: 10.1109/MCOM.001.2500767.

2. **Barua, S.**, Bahre, R., Babiceanu, R., Hong, G. "Uncertainty-Aware Wound Localization and First-Aid Decision Support From Smartphone Images Using an Explainable Multimodal AI Framework." *Cureus Journal of Computer Science*, vol. 3, May 18, 2026, es44389-026-00077-z, doi: 10.7759/s44389-026-00077-z.

MANUSCRIPTS UNDER REVIEW

1. **Barua, S.**, Jabran, S., Rodgers, C., Fong, A. "Quantifying Behavioral Contributions to Diabetes Risk: An Explainable Machine-Learning Analysis of BRFSS 2024." *Accepted at Discover Public Health.*

2. **Barua, S.**, Hong, G., Dursunoglu, H., Rodgers, C., Fong, A. (2026) "CiteGuard-RAG: A Validation-Centered AI System for Evidence-Grounded Question Answering." *arXiv.* arXiv:2609.15830. *Under review at Engineering Reports.*

3. **Barua, S.**, & Mahmud, B. U. (2026). "Applicability-Aware Reliability Scoring and Prediction of EMS Patient-Care Records for Trustworthy Smart Ambulance AI." *Preprints*, 2026090497. DOI. *Under review at Artificial Intelligence.*

4. Mahmud, B. U., **Barua, S.**, Hong, G. Y., Gupta, A., & Liu, H. (2026). "Commonsense Reasoning in Computer Vision: Foundations, Recent Advancements, and Future Directions." *arXiv.* arXiv:2609.05257. *Under review at JAIR.*

5. **Barua, S.**, Fong, A. "Feature-Stable Explainable Machine Learning for IoMT Intrusion Detection Under Dataset Shift." *Under review at Wiley Security & Privacy.*

SELECTED RESEARCH PROJECTS

Explainable Hybrid Multimodal Framework for Remote Wound Assessment [GitHub]

- Developed an explainable multimodal AI framework using *YOLOv11* for wound localization, *ResNet-50* for anatomical classification, and *Mistral-7B* LLM-assisted generation for first-aid decision support in smart-ambulance and remote-care settings.
- Integrated Grad-CAM-based visual explanation and bounding-box localization to support transparent wound assessment; resulted in two first-author publications in *IEEE Communications Magazine* and *Cureus*.

CiteGuard-RAG: Citation-Constrained System for Legal Question Answering [GitHub]

- Built a retrieval-augmented generation pipeline combining hybrid retrieval, citation-constrained generation, sentence-level validation, and bounded regeneration using *Mistral-7B* and *Sentence Transformers*.
- Evaluated reliability under controlled and external domain-shift settings, achieving 95.4% grounded answer accuracy, 100% citation validity, and a 1.5% hallucination rate.

Explainable Machine Learning for Diabetes Risk Analysis Using BRFSS 2024 [GitHub]

- Trained interpretable machine-learning models on BRFSS 2024 data to classify no diabetes, prediabetes, and diabetes risk using behavioral, demographic, and anthropometric predictors.
- Applied SHAP-based explainability to quantify behavioral contributions to diabetes risk and support transparent public-health decision analysis.

PROFESSIONAL EXPERIENCE

Graduate Research Assistant Jan 2026 – Present
WMU Department of Computer Science Kalamazoo, MI

- Develop machine-learning and explainable-AI workflows for research problems involving IoMT systems, smart ambulance networks, healthcare decision support, and cyber-resilient connected systems.
- Develop and maintain Unity-based interactive simulation environments for an NSF-funded research project, supporting experimental workflows, user interaction, and applied AI/game-based system development.
- Contribute to manuscript development, experiment design, dataset preprocessing, model evaluation, and technical documentation for peer-reviewed research outputs.

Software Engineer Jun 2022 – May 2025
Dematic Corporation Grand Rapids, MI

- Developed automation software for order-fulfillment and material-handling systems.
- Supported system integration, testing, troubleshooting, and deployment of reliable industrial automation software.
- Collaborated with cross-functional engineering teams to deliver practical software solutions for warehouse automation environments.

Software Engineering Intern May 2021 – Aug 2021
Frontier Communications Allen, TX

- Designed and implemented a web application using Flask and Jinja to fetch the network port information and their real-time status.
- Developed tools to provide automated basic troubleshooting based on the port status for speedy customer service, which reduces the time for on-call troubleshooting for the customer service team.

TECHNICAL SKILLS

Programming:	Python, SQL, Java, C
Machine Learning / AI:	scikit-learn, TensorFlow, XGBoost, YOLOv11, ResNet-50, SHAP, Grad-CAM, Retrieval-Augmented Generation, Large Language Models
Development Tools:	Git, Linux, Django, Flask, Streamlit, REST APIs, MS SQL Server, Unity
Research Methods:	Dataset preprocessing, feature engineering, model evaluation, explainability analysis, domain-shift evaluation, uncertainty-aware decision support

HONORS AND AWARDS

- **Global Education Graduate Merit Scholarship Recipient**
  Western Michigan University *Fall 2025–Spring 2027*
  - Awarded $10,000 in renewable tuition support over four semesters based on academic merit.

- **Haenicke Global Education Undergraduate Merit Scholarship Recipient**
  Western Michigan University *Fall 2018–Spring 2022*
  - Awarded $16,000 in renewable merit-based tuition support throughout eight semesters of undergraduate study.