KMA Solaiman, Ph.D.

Assistant Teaching Professor, CSEE, UMBC
Director, H.A.R.M.O.N.I. Lab

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Professional Summary

AI/ML researcher and educator focusing on human-aligned and resilient machine learning systems. Expertise spans multimodal information retrieval, open-world learning, and intelligent decision support. Over 8 years of combined experience in research, teaching, and mentoring. Research aims to make AI systems interpretable, adaptive, and robust across real-world domains such as healthcare, smart grids, media bias, and manufacturing.

Academic Appointments

2023–Present **University of Maryland, Baltimore County (UMBC)**
Assistant Teaching Professor, Department of Computer Science and Electrical Engineering.
- Lead instructor for Artificial Intelligence and Machine Learning courses at undergraduate and graduate levels (CMSC 471, CMSC 478, CMSC 678).
- Director of the **H.A.R.M.O.N.I. Lab**, mentoring student researchers on multimodal, novelty-aware, and human-centered AI systems.
- Member, Graduate and Undergraduate Admissions Committee (CSEE).

2016–2023 **Purdue University, West Lafayette, IN**
Research and Teaching Assistant, Department of Computer Science.
- Conducted research under federally funded projects including DARPA SAIL-ON, Northrop Grumman REALM, and SNL STARCS.
- Led modules, labs, and PSOs on Simulation & Modeling, Data Structure and Algorithms, Relational Databases, and Computer Networks.
- Mentored multiple graduate and undergraduate student research projects across institutions.

2014–2016 **Ahsanullah University of Science and Technology (AUST), Dhaka, Bangladesh**
Lecturer, Department of Computer Science and Engineering.
Taught core undergraduate courses in Databases, Software Engineering, and Networking.
Supervised final-year capstone projects.

Education

Summer 2023 **Ph.D. in Computer Science**, *Purdue University*, West Lafayette, IN.
- Advisor: Bharat K. Bhargava | Mentor: Michael Stonebraker (MIT)
- Committee Members: Chunyi Peng, Vaneet Aggarwal, Jianguo Wang, Xavier Tricoche
- Thesis: *Multimodal Data Management in Open-world Environment*

Fall 2022 **M.Sc. in Computer Science**, *Purdue University*, West Lafayette, IN.
- Area: Machine Learning and Databases

July 2014 **B.Sc. in Computer Science and Engineering**, *Bangladesh University of Engineering and Technology (BUET)*, Dhaka, Bangladesh.
- Thesis: *Minimal Parameter Clustering of Complex Shaped and Different Sized Dataset*
- GPA: 3.79/4.00 | Class Rank: 16/153

Research Interests

My research spans three interconnected thrusts within Artificial Intelligence and Machine Learning:
- **Robust AI and Adaptation to Novelty** — detecting and responding to unseen or shifting inputs in dynamic systems.

- **Multimodal Information Retrieval and Reasoning** — aligning text, image, and structured data for open-world understanding.
- **Human-Centered and Trustworthy Decision Systems** — enabling interpretable, context-aware AI for user-centric decision making.

Applications include smart-grid resilience, healthcare triage, multimodal retrieval, and explainable civil analytics.

H.A.R.M.O.N.I. Lab (Human-Aligned, Resilient, Multimodal, Open-ended, Novelty-informed Intelligence)

Current Projects: NovGrid (ICDM 2025), FemmIR (ICDE 2024), BiasLab (ICML MoFA 2025), TRIAGE-M (NeurIPS submission), BoardVision (WACV submission).
Collaborators: UMBC Center for AI, UMMC, UMB School of Pharmacy, Purdue University.
Lab Website: https://ksolaiman.github.io/harmoni-lab/

Publications

∗ Google Scholar Profile: number of citations 73 (** indicates **co-first** authors)

Recent Publications

WACV 2025 [PS6] Brandon Hill and **KMA Solaiman**, *BoardVision: Deployment-ready and Robust Motherboard Defect Detection with Ensemble*, Submitted to WACV 2025; Presented at UMBC CSEE Research Day.

ICML 2025 [W5] **KMA Solaiman**, *BiasLab: Toward Explainable Political Bias Detection with Dual-Axis Annotations and Rationale Indicators*, Presented at ICML MoFA 2025.

NIPS 2025 [PS5] Joshua Sebastian, Karma Tobden, and **KMA Solaiman**, *TRIAGE-M: Triage from MIMIC — Emergency Triage Benchmark bridging Hospital-Rich and MCI-Like Field Simulation*, Submitted to GenAI4Health at NeurIPS 2025; Rejected (reviewer scores: 4 and 5).

CogMI 2025 [PS4] S. Islam and **KMA Solaiman****, R. Oliveira, B. Bhargava, *Domain Complexity Estimation for Distributed AI Systems in Open-World Perception Domain*, **IEEE CogMI**, *2025* [Submitted].

ICDM 2025 [PS3] **KMA Solaiman**, *NovGrid: Novelty-Aware Pipeline for Smart-Grid Resilience: From Detection to Triage*, Submitted to ICDM 2025 ARRL Workshop (acceptance under review).

Peer-reviewed Conference (C), Journal (J), Workshop and Symposium (W) Papers

IEEE 2022 [J1] **Kma Solaiman**, Tao Sun, Alina Nesen, Bharat Bhargava, and Michael Stonebraker, *Applying Machine Learning and Data Fusion to the Missing Person Problem*, IEEE **Computer**, *Volume: 55, Issue: 6, June 2022*.

AAAI 2022 [W4] **KMA Solaiman** and B. Bhargava, *Open-Learning Framework for Multi-modal Information Retrieval with Weakly Supervised Joint Embedding*, **AAAI Spring Symposium** on Designing Artificial Intelligence for Open Worlds, *March 2022*.

AAAI 2022 [W3] **KMA Solaiman** and B. Bhargava, *Measurement of Novelty Difficulty in Monopoly*, **AAAI Spring Symposium** on Designing Artificial Intelligence for Open Worlds, *March 2022*.

IEEE 2021 [C2] A. Nesen, **KMA Solaiman** and B. Bhargava, *Dataset Augmentation with Generated Novelties*, IEEE **TransAI**, *2021*.

SIGMOD'20 [W2] Michael Stonebraker, Bharat Bhargava, Michael Cafarella, Zachary Collins, et al., *Surveillance Video Querying With A Human-in-the-Loop*, Workshop on Human-In-the-Loop Data Analytics (**HILDA**) with **SIGMOD**, *2020*.

VLDB 2019 [W1] S. Palacios, **K Solaiman****, P. Angin, A. Nesen, B. Bhargava, Z. Collins, A. Sipser, M. Stonebraker, *SKOD: A Framework for Situational Knowledge on Demand*, **POLY** at **VLDB**, *Springer 2019*.

IEEE 2013 [C1] **Kma Solaiman**, MM Rahman, and N Shahriar, *AVRA BANGLADESH: Collection, Analysis & Visualization of Road Accident Data in Bangladesh*, IEEE International Conference on Informatics, Electronics & Vision **(ICIEV)**, *2013*.

Preprints, In-Review, and Posters (PS)

ICDE'24 [PS2] **KMA Solaiman** and B. Bhargava, *Feature-centric Multimodal Information Retrieval for Open-world Environment (FemmIR)*, **ICDE** *2024*, [Preparing for Resubmission].

BUET 2014 [PS1] **Kma Solaiman** and AA Muzaddid, *Minimal Parameter Clustering of Complex Shape Dataset for High Dimensional Dataset*, **BUET CSE Thesis Poster Presentation**, *2014*.

Research Grants and Contributions

2026-2027 **Maryland BiLD Grant, $75K**, LOI submitted; awaiting invitation for full proposal
Fusion of Opportunistic Radar-Based Physiological Monitoring and Structured Triage Data for Automated Patient Prioritization.
Key Personnel: **KMA Solaiman (PI)**, Ryan Robucci (Co-PI), Mojdeh S. Heavner (UM-Pharmacy)

2024–2025 **University of Maryland Baltimore (UMB) ICTR, $50K**, Submitted, not selected for funding
Optimizing Pharmacist Team-Integration for ICU Patient Management (OPTIM) — Data Warehouse Development and Advanced Modeling.
Key Personnel: Mojdeh S. Heavner (PI), **KMA Solaiman (Co-PI)**

2025-2026 **Maryland Open Source Textbook (M.O.S.T.) Institutional OER Grant, $20K**, Submitted, not selected for funding
Launching a Modular, Open Curriculum in Data & AI Literacy for Non-Majors.
KMA Solaiman (PI)

2024-2027 **Department of Energy (DoE), $1.35M/year**, Submitted, not selected for funding
A Reformable Cyber-Physical System with Assured Continuous Operation Under Cyber-Attacks.
Key Personnel (UMBC): Riadul Islam, Ryan Robucci, **KMA Solaiman**
Role: Co-developed proposal framework, AI/ML design scope, and contributed to technical writing.

Grant Writing and Preparation during Ph.D.

2023-2026 **DARPA Triage Challenge (DTC) with a budget of $1.5M/year**, Submitted
Autonomous Triage Agent (for secondary triage) to identify physiological features of life-threatening injuries in mass casualty incidents.
Principal Investigators: Xavier Tricoche, Bharat Bhargava, Tianyi Zhang, and Eric Kildebeck
Contribution: Authored one full technical objective and supporting material for proposal narrative.

2022-2026 **DARPA In the Moment BAA, $5M**, Abstract accepted
Hippocrates: Human-aligned Autonomous Triage System.
Principal Investigators: V. N. Venkatakrishnan, Xavier Tricoche, Ardhendu Tripathy and Daniel Shapiro
Contribution: Supported early system design and proposal preparation

2023-2026 **National Science Foundation (NSF), $599K**, Submitted, not selected for funding
VecDB: A Cloud-Native Vector Data Management System.
Principal Investigators: Jianguo Wang and Bharat Bhargava
Contribution: Reviewed and edited technical narrative related to data integration and vector storage.

2022-2023 **DARPA (Joint with USC-ISI), $300K**, Submitted, not selected for funding
Stabilizing Hostilities through Arbitration and Diplomatic Engagement (SHADE).
Contribution: Reviewed and improved final submission draft and technical aims.

Active Contributions on Existing Grants as Graduate Researcher

2022-2024 **Sandia National Lab STARCS, $350K**
Computing Reconfiguration for Resilient Space Platforms.
Principal Investigators: Chris Jenkins and Bharat Bhargava

2019-2022 **Northrop-Grumman REALM Consortium, $460K/year with MIT, CMU, Stanford, (Purdue awarded $200K for last 3 years)**, Ranked highest in nationwide competition
Advances in Learning Machines from Sensing to Acting for Mission Objectives.
Principal Investigators: Bharat Bhargava, Michael Stonebraker, Aarti Singh, and Matei Zaharia

2019-2023 **DARPA SAIL-ON (Joint with USC-ISI), $1.25M (Purdue share over 42 months)**
Generating Novelty in Open-world Multi-Agent Environments (GNOME).
Principal Investigators: Mayank Kejriwal and Bharat Bhargava

Research Mentoring

Current Students

- Joshua Sebastian, Karma Tobden (Project: Triage-M)
- Adam Sayyed, David Majekodunmi (Project: MStolert)
- Sumya Hamid Oishe (Project: NovGrid)
- Brandon Hill (Project: BoardVision)

Past Graduate Students

- Kevin Kochpatcharin (Purdue B.S.+M.S. → Five9)
- Sharuna Anandraj (Purdue M.S. → Meta)
- Myeongsu Kim (Purdue M.S. → Ph.D. at Purdue)
- Tomáš Hrdlovics (Purdue M.S. → WePay)
- Rumela Ghosh (Purdue M.S. → Amazon)

Past Undergraduate Students

- Ashley Kalinock (UMBC → DoD)
- Ananya Patri (UMBC → JHU)
- Leann Alhashshi (UMBC → Cambridge University M.Sc.)
- Harshit Singh (Purdue → Cisco)
- Rabia Varol, Merve Yaman, Doruk Gercel (METU → TUM M.Sc.)
- Aaron Sipser, Zachary Collins (MIT → Meta)

M.Sc. Committee Member

- Rachit Saini (UMBC)
- Venkata Krishna Vamsi Sundarapu (UMBC)

Key Collaborators

MIT	**Massachusetts Institute of Technology**	Michael Stonebraker, Tao Sun
UMichigan	**University of Michigan**	Michael Cafarella
USC-ISI	**University of Southern California, Information Sciences Institute**	Mayank Kejriwal
UT Dallas	**University of Texas at Dallas**	Eric Kildebeck
IDA	**Institute for Defense Analyses**	Josh Alspector
NGC	**Northrop Grumman Corporation**	Jim MacDonald, Jason Kobes

Purdue	**Purdue University**	Xavier Tricoche, Shafkat Islam, Vaneet Aggarwal
METU	**Middle East Technical University**	Pelin Angin
UBD	**Universiti Brunei Darussalam**	Sandhya Aneja, Nagender Aneja
	Visiting Scholars	Ruy Oliveira, Arun Kumar

Teaching Experience

2023 – Now **University of Maryland, Baltimore County**, *Assistant Teaching Professor*.

- CMSC 678: Graduate Machine Learning — *Fall'24, 25*
- CMSC 478: Machine Learning — *Fall'23, 24, 25, Spring'24, 25*
- CMSC 471: Artificial Intelligence — *Fall'23, 24, 25, Spring'24. 25*

2016 – 2023 **Purdue University**, *Teaching Assistant*.

- CS 180: Problem Solving and Object-Oriented Programming (OOP) — *3 semesters*
- CS 251: Data Structures — *3 semesters*
- CS 448: Introduction to Relational Database Systems — *2 semesters*
- CS 543: Simulation & Modeling of Computer Systems — *Graduate Course, Spring 2019*
- CS 536: Data Communication and Computer Networks — *Graduate Course, Fall 2022*

Fall 2019 **Purdue University**, *Guest Lecturer*.

- CS 590: Situational Awareness, Adversarial ML, and Explainable AI — *Graduate Course*
- CS 547: Information Retrieval — *Graduate Course*

2014 – 2016 **Ahsanullah University of Science & Technology, United International University**.

- Primary Instructor for the undergraduate course, Programming Language — *106 students*
- Primary Instructor for the undergraduate course, Network Programming — *143 students*
- Primary Instructor for the undergraduate course, Database — *132 students*
- Primary Instructor for the undergraduate course, Simulation and Modeling — *50 students*
- Primary Instructor for the undergraduate course, Graphics — *50 students*

Open Source Software and Demo

2025 **BiasLab**
Political Bias Annotation Corpus (ICML MoFA 2025).
https://github.com/ksolaiman/PoliticalBiasCorpus/ and Dataset (https://zenodo.org/records/15571668)

2022 **Find-Them**
Video demonstration of the system prototype for 'Applying Machine Learning and Data Fusion to the Missing Person Problem' (IEEE Computer 2022).
Demo (https://youtu.be/hJ_jtLQUIXo)

2020 **Surveillance Video Querying Engine (SurvQ)**
Contains the repository for the video querying engine (SIGMOD 2020). The artifact describes the querying and results UI, the video feature extractor, the video processor module, the relational dbms query processing, and the code for ingestion to delivery workflow.
https://github.com/skod-ng/ and Demo (https://youtu.be/qPO73mGXqds)

2019 **Situational Knowledge on Demand (SKOD)**
Contains the repository for the SKOD framework (VLDB 2019). Video and Tweets ingestion process are implemented in twitter-kafka-docker and videos-docker. The knowledge graph along with the software frontend can be found in knowledge-graph.
https://github.com/purdue-gask and Demo (https://youtu.be/5TqWKzy5SqI)

Public Media

2023 **DARPA project GNOME with USC**
CERIAS News.
https://www.cerias.purdue.edu/research/projects/home/detail/316/darpa_project_gnome_with_usc

May 2019 **The Right Information at the Right Time**
Purdue CS News.
https://www.cs.purdue.edu/news/articles/2019/bhargava-realm-ng.html

Keynote Talks

June 2023 **REALM: Situation Knowledge on Demand (SKOD)**
International Conference on Computing Electrical and Electronics Engineering (IC2E3).
Delivered Presentation for Bharat Bhargava

May 2022 **Detect, Characterize, and Accommodate Novelties in AI systems**
International Semantics Intelligence Conference (ISIC).
Presented with Bharat Bhargava

Feb 2021 **REALM: Situation Knowledge on Demand (SKOD)**
International Semantics Intelligence Conference (ISIC).
Presented with Bharat Bhargava

Invited Talks

Feb 2025 **Introduction to Database Systems**
East Tenesse State University, Johnson City, TN.
Host: Chelsie Dubay

Nov 2023 **Shaping the Future of Computer Science: My Academic Journey and Vision**
Purdue University, West Lafayette, IN.
Host: H.E. Dunsmore

Apr 2023 **Multimodal Information Recommendation in Open-world Environment**
Oberlin College, Ohio, USA.
Host: Cynthia Taylor, Adam Eck

Mar 2023 **Multimodal Information Recommendation in Open-world Environment**
University of North Carolina at Charlotte, USA.

July 2021 **Adaptable AI Systems to deal with Novelties and Attacks**
Artificial Intelligence Campaign Tech Talk.
Presented with Bharat Bhargava

May 2021 **Information-Theoretic approach for determining the difficulty of adaptation to novelty in Monopoly**
Novelty Working Group for SAIL-ON.
Hosts: Joshua Alspector and Pat Langley

Dec 2020 **SKOD Research Progress and Future of Multimodal Information Retrieval**, Extracting relations between features, objects and entities; multimodal data association; logical understanding of similar features; and automated context knowledge generation of multimodal data
NGC REALM Year-End Meeting.
Host: Reid Hyland

Jan 2020 **Situation Knowledge on Demand (SKOD)**
Cyber Defense Engineering and Research group, JPL-NASA.
Hosts: Arun Viswanathan and Jeremy Pecharich

Aug 2019 **SKOD: A Real-time Urban Information System**
Northrop Grumman TechFest, LA, USA.
Host: Keyla Contreras-Cottin

Professional Service

Program Committee Member

2025 External Reviewer for IEEE International Conference on Data Engineering (ICDE)

2025 Reviewer for Journal: 'Electronics' and 'Applied Sciences'

2022, 2021 External Reviewer for European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML PKDD'22, ECML PKDD'21)

2022 Volunteer for the Conference on Neural Information Processing Systems (NeurIPS'22)

2019 External Reviewer for IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC'19)

Workshop Organization

2021 Workshop on **Novelties in Open World**, in conjunction with International Semantic Intelligence Conference (ISIC-2021)

2020-21 Member in Biweekly meetings of **DARPA SAIL-ON NWG** (Novelty Working Group) for 2 years

2014 **Lead organizer**, Seminars on *Higher Education* and *Careers in the Industry* for undergraduate students at BUET

University Services

2025-26 **Graduate Admissions Committee** Member at UMBC

2024-25 Member of **Faculty Hiring Committee** at UMBC

2023-24 **Undergraduate Admissions Committee** Member at UMBC

2024 Curriculum Development for NSA and DPS UMBC

2016 Participated in the **accreditation of undergraduate curriculum** at AUST

2016 **Undergraduate Thesis Committee Member** at Ahsanullah University of Science and Technology

Awards and Honors

2023 Supplement for Undergraduate Research Experiences (SURE), **$1500, UMBC**

2018 Graduate School Summer Research Grant, Purdue University

2009-2012 University Merit Scholarship, Bangladesh University of Engineering and Technology

2008-2011 University Stipend and Dean's List, Bangladesh University of Engineering and Technology

Core Technical Expertise

Machine Learning, Data Mining, Crowdsourced Systems, Database Systems, Artificial Intelligence for Sustainability, and Algorithms; proficient in Python, Java, C++, PyTorch, SQL, and LaTeX