
EDUCATION

- May 2027 (expected) **Ph.D. in Information Systems (A.B.D.)**
University of Maryland, Baltimore County (UMBC), *Baltimore, MD*
- Advisor: Dr. Md Osman Gani
 - Dissertation: *Causal Representation Learning for Dynamical Systems: Uncovering Causal Mechanisms in Climate Science*
- December 2023 **M.S. in Information Systems**
University of Maryland, Baltimore County (UMBC), *Baltimore, MD*
- September 2019 **M.S. in Computer Science & Engineering**
University of Chittagong, Bangladesh (Second Merit Position)
- September 2017 **B.Sc. in Computer Science & Engineering**
University of Chittagong, Bangladesh (First Merit Position)

PROFESSIONAL EXPERIENCE

- May 2022 – Present **Graduate Research Assistant**
iHARP: NSF HDR Institute (NSF Award #2118285), UMBC, *Baltimore, MD*
- Build interpretable, reliable, and robust causal representation learning and time-series methods, tested first in polar science: benchmarks, prediction under distribution shift, Arctic sea ice forecasting, and cryospheric image analysis [U1–U2, C5–C9, J5–J6, W1–W3].
 - Released code and data on GitHub, Zenodo, and PyPI (*rictsc* [C7]), and presented a reproducibility study at the FAIR in ML, AI Readiness & Reproducibility (FARR) Workshop [U3].
 - Turn polar-science questions into causal machine learning problems with glaciologists, atmospheric scientists, and data scientists across iHARP's eight institutions.
- Jul 2025 – Apr 2026 **Team Lead**
NSF HDR Machine Learning Challenge (Year 2), iHARP, UMBC, *Baltimore, MD*
- Led the four-person team that implemented, ran, and evaluated iHARP's sub-challenge, *Predicting Coastal Flooding Events*, part of the Scientific Out-of-Distribution challenge run with A3D3 and Imageomics.
 - Drew 151 participants and 2,709 submissions; \$4,000 in cash prizes and AWS and NVIDIA cloud credits. [\[Codabench\]](#)
 - Led iHARP's session at the NSF HDR virtual hackathon and supported the challenge awards session at the FARR Workshop, Washington, DC.
- Fall 2024 – Spring 2026 **Guest Lecturer and Workshop Instructor**
Department of Information Systems and iHARP, UMBC, *Baltimore, MD*
- IS 790, *Causal AI* (graduate), Spring 2026. Topic: *Causal Representation Learning*.
 - IS 733, *Data Mining* (graduate), Fall 2024 and Fall 2025. Topic: *Deep Sequence Modeling*.
 - iHARP Artificial Intelligence Workshop Series, Spring 2026. Topic: *Explainable AI*.
- Aug 2022 – May 2024 **Graduate Teaching Assistant**
Department of Information Systems, UMBC, *Baltimore, MD*
- IS 320, *Advanced Business Applications* (undergraduate): taught the weekly lab sessions, designing exercises and assessing student work.
 - IS 636, *Structured Systems Analysis and Design* (graduate), Fall 2022 and Spring 2023: held office hours, graded assignments and exams, and advised student project teams.
 - IS 734, *Data Analytics for Cybersecurity*, and IS 603, *Decision Making Support Systems* (both graduate): tutored students, gave written feedback, and graded coursework.

- Aug 2021 – May 2022 **Graduate Research Assistant**
 Department of Computer Science, Florida International University, *Miami, FL*
- Developed machine learning models for distributed cache management under the NSF *Caching-as-a-Service* project (NSF Award #1956229).
- Jan 2018 – Jul 2021 **Lecturer**
 Port City International University, *Chittagong, Bangladesh*
- Taught twelve undergraduate CS courses, sections of 20–60 students: *Artificial Intelligence* (CSE 341), *Algorithms* (CSE 227), *Data Structures* (CSE 217), *Operating Systems* (CSE 231), *Theory of Computing* (CSE 317), *Compiler* (CSE 411), *Computer Graphics* (CSE 421), *Peripherals & Interfacing* (CSE 333), *Discrete Mathematics* (MATH 135), and introductory programming (CSE 111, 121, 211), teaching the companion laboratory section in nine of them.
 - Designed each course end to end, from learning outcomes to assessments, using think-pair-share in lectures and pair programming in labs.

GRANTS, AWARDS & HONORS

- 2026 **Conference Travel Grant**, Department of Information Systems, UMBC, for PoIDS 2026 [W3]
- 2026 **Doctorate Student Award**, COEIT Research Day, UMBC [P7]
- 2025 **Conference Travel Grant**, Department of Information Systems, UMBC, for ICMLA 2025 [C7]
- 2025 **Doctorate Student Award (Honorable Mention)**, COEIT Research Day, UMBC [P5]
- 2024 **Professional Development Grant**, Graduate Student Association (GSA), UMBC
- 2023 **Survey Certification**, *Transactions on Machine Learning Research* (TMLR) [J5]
- 2019 **Second Merit Position** (of 45), M.S., University of Chittagong, Bangladesh
- 2017 **First Merit Position** (of 70), B.Sc., University of Chittagong, Bangladesh

MENTORING & ADVISING

- Aug 2026 – Present **Peer Mentor**, Causal Artificial Intelligence Lab (CAIL), UMBC
 Advising a first-year Ph.D. student transitioning into AI/ML from electrical engineering: building foundations, reading the literature, and designing first experiments.
- Jan 2025 – Aug 2026 **Research Mentor**, iHARP Education & Outreach Program
 Mentored a high school student building research foundations in machine learning, deep learning, and causal AI, applied to type 2 diabetes.
- Aug 2022 – May 2023 **Research Mentor**, iHARP Education & Outreach Program
 Mentored a high school student on machine learning for Arctic sea ice prediction, including research methods and academic writing; the student won an Honorable Mention at the UMBC Information Systems Student Research Symposium 2023.
- Jan 2018 – Jul 2021 **Undergraduate Thesis Advisor**, Port City International University, Bangladesh
 Advised ~20 senior-year thesis students in AI/ML on projects spanning financial time-series forecasting, medical image analysis, air quality prediction, and human-computer interaction. Four theses resulted in six peer-reviewed publications [J1–J3, C1, C3, C4].

SOFTWARE & DATASETS

- Code and data for my first-author papers are on GitHub and Zenodo to support open science and reproducibility.
- Software **ricts**: Python package implementing RIC-TSC, causal time-series classification of supraglacial lake evolution under distribution shift [C7]. [\[PyPI\]](#) [\[code\]](#)
- Benchmark **TimeGraph**: synthetic benchmark for time-series causal discovery, ~1 GB [C6]. [\[code and data\]](#)
- Datasets Supraglacial lake evolution time series (Sentinel-1/2, Landsat-8, CARRA), 18.6 GB [C7]. [\[data\]](#)
 Greenland Ice Sheet-wide supraglacial lake dataset, 2018–2019 melt seasons [J6]. [\[data\]](#)
 Per-class lead-time data and results for supraglacial lake outcome classification [W3]. [\[data\]](#)

SERVICE

Reviewer	Conferences: AAAI 2027; ICLR 2025, 2026; NeurIPS 2026; AISTATS 2025, 2026; KDD 2025; MLHC 2023, 2024, 2025, 2026; ML4H 2024, 2025; ICDH 2023. Journals: <i>IEEE Computer</i> 2025, 2026; <i>ACM Transactions on Internet Technology</i> 2025; <i>Applied Artificial Intelligence</i> , <i>Information Fusion</i> , and <i>International Journal of Approximate Reasoning</i> 2022.
Outreach	Invited Panelist , "Higher Studies: Insights from Our Mentors," PCIU Computer Club, Port City International University, Bangladesh, 2026. iHARP Representative , UMBC Earth Month Community Day, 2024.
Memberships	ACM 2025–Present; IEEE 2024–2026; AMS 2023
Volunteering	Staff , ICPC Southeast USA Regional Contest, 2022; Volunteer , National High School Programming Contest, Bangladesh, 2015

PROFESSIONAL DEVELOPMENT

Jan 2026 – May 2026	Artificial Intelligence Workshop Series, iHARP, UMBC: self-supervised learning, reproducible AI, foundation models, generative AI, physics-informed neural networks (PINNs), and LLMs
Jul 2025 – Aug 2025	Polar Science Workshop Series, iHARP, UMBC: atmospheric science, ocean science, ice sheets and sea ice, and reanalysis and model emulation
May 2025 – Aug 2025	WiseByte Wednesdays Professional Development Workshop Series, iHARP, UMBC: research pitching, presentation skills, technical writing, interview skills, and digital storytelling
Jan 2025	Full-Circle Climate Communication Workshop, iHARP, Imaging Research Center, and Center for Social Science Scholarship, UMBC
Nov 2024	High Performance Computing (HPC) Bootcamp, iHARP and UMBC Division of Information Technology (DoIT): Ada cluster, Linux, and SLURM
Jan 2024	AWS Geospatial Immersion Days, Amazon Web Services (AWS) and iHARP
Jun 2023	Machine Learning Institute, Texas Advanced Computing Center (TACC), UT Austin
Mar 2023	AWS Immersion Days: Introduction to Cloud Computing, AWS and iHARP

PEER-REVIEWED PUBLICATIONS

Reverse chronological within each category. Underline marks my name; † marks a student I advised.

Under Review & In Preparation	[U3] Evaluating a Benchmark Dataset for Supraglacial Lake Detection on the Greenland Ice Sheet. Bayu Adhi Tama, Michael MacFerrin, Josephine Namayanja, Sai Vikas Amaraneni, <u>Emam Hossain</u> , Maloy Kumar Devnath, Vandana Janeja, Aneesh Subramanian, Mohamed Mokbel. <i>In preparation, Nature Scientific Data</i> .
	[U2] PCG-VAE: Learning Causal Representations under Partial Structural Knowledge. <u>Emam Hossain</u> , Md Osman Gani. <i>Under review, IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) 2027</i> .
	[U1] VLM-Gauge: Pricing Vision-Language Supervision for Causal Representation Learning. <u>Emam Hossain</u> , Md Osman Gani. <i>Under review, International Conference on Learning Representations (ICLR) 2027</i> .
Conference Papers	[C9] Evaluating Zone-Guided Front Extraction for Glacier Calving-Front Delineation in SAR Imagery. Chhaya Kulkarni, <u>Emam Hossain</u> . <i>IEEE International Conference on Machine Learning and Applications (ICMLA)</i> . October 2026. Rochester, MI. [arXiv]
	[C8] Why Convolution Still Matters: Evaluating Inductive Biases in Cryospheric Image Classification. Chhaya Kulkarni, <u>Emam Hossain</u> . <i>IEEE International Geoscience and Remote Sensing Symposium (IGARSS)</i> . August 2026. Washington, DC. [arXiv] [code]
	[C7] Causal Time Series Modeling of Supraglacial Lake Evolution in Greenland under Distribution Shift. <u>Emam Hossain</u> , Muhammad Hasan Ferdous, Devon Dunmire, Aneesh Subramanian, Md Osman Gani. <i>IEEE International Conference on Machine Learning and Applications (ICMLA)</i> . pp. 1226–1233. December 2025. Boca Raton, FL. [doi] [arXiv] [code] [data]

- [C6] **TimeGraph: Synthetic Benchmark Datasets for Robust Time-Series Causal Discovery.** Muhammad Hasan Ferdous, [Emam Hossain](#), Md Osman Gani. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD)*. Vol. 2, pp. 5425–5435. August 2025. Toronto, Canada. [Datasets & Benchmarks Track; ~22% acceptance rate] [\[doi\]](#) [\[arXiv\]](#) [\[code\]](#)
- [C5] **Time Series Classification of Supraglacial Lakes Evolution over Greenland Ice Sheet.** [Emam Hossain](#), Md Osman Gani, Devon Dunmire, Aneesh Subramanian, Hammad Younas. *IEEE International Conference on Machine Learning and Applications (ICMLA)*. pp. 490–497. December 2024. Miami, FL. [\[doi\]](#) [\[arXiv\]](#) [\[code\]](#)
- [C4] **Glaucoma Detection Using Inception Convolutional Neural Network V3.** Tasnim Afroze[†], Shumia Akther, Mohammed Armanuzzaman Chowdhury, [Emam Hossain](#), Mohammad Shahadat Hossain, Karl Andersson. *International Conference on Applied Intelligence and Informatics (AII)*. Communications in Computer and Information Science, vol. 1435, pp. 17–28. Springer. July 2021. Nottingham, UK. [\[doi\]](#)
- [C3] **An Interactive Computer System with Gesture-Based Mouse and Keyboard.** Dipankar Gupta[†], [Emam Hossain](#), Mohammed Sazzad Hossain, Mohammad Shahadat Hossain, Karl Andersson. *International Conference on Intelligent Computing & Optimization (ICO)*. Advances in Intelligent Systems and Computing, vol. 1324, pp. 894–906. Springer. October 2020. Hua Hin, Thailand. [\[doi\]](#)
- [C2] **A Novel Deep Learning Approach to Predict Air Quality Index.** [Emam Hossain](#), Mohd Arafath Uddin Shariff, Mohammad Shahadat Hossain, Karl Andersson. *International Conference on Trends in Computational and Cognitive Engineering (TCCE)*. Advances in Intelligent Systems and Computing, vol. 1309, pp. 367–381. Springer. December 2020. Dhaka, Bangladesh. [\[doi\]](#)
- [C1] **A Digital Personal Assistant Using Bangla Voice Command Recognition and Face Detection.** Dipankar Gupta[†], [Emam Hossain](#), Mohammad Shahadat Hossain, Karl Andersson, Sazzad Hossain. *IEEE International Conference on Robotics, Automation, Artificial-intelligence and Internet-of-Things (RAAICON)*. pp. 116–121. November 2019. Dhaka, Bangladesh. [\[doi\]](#)

Journals

- [J6] **Greenland Ice Sheet Wide Supraglacial Lake Evolution and Dynamics: Insights From the 2018 and 2019 Melt Seasons.** Devon Dunmire, Aneesh Subramanian, [Emam Hossain](#), Md Osman Gani, Alison Banwell, Hammad Younas, Brendan Myers. *Earth and Space Science*. 12(2), e2024EA003793. February 2025. [\[doi\]](#) [\[EarthArXiv\]](#) [\[data\]](#)
- [J5] **A Survey on Causal Discovery Methods for I.I.D. and Time Series Data.** Uzma Hasan, [Emam Hossain](#), Md Osman Gani. *Transactions on Machine Learning Research (TMLR)*. September 2023. [Survey Certification] [\[OpenReview\]](#) [\[arXiv\]](#) [\[code\]](#)
- [J4] **Machine Learning with Belief Rule-Based Expert Systems to Predict Stock Price Movements.** [Emam Hossain](#), Mohammad Shahadat Hossain, Pär-Ola Zander, Karl Andersson. *Expert Systems with Applications*. 206, 117706. November 2022. [\[doi\]](#)
- [J3] **Foreign Exchange Currency Rate Prediction Using a GRU-LSTM Hybrid Network.** Md Saiful Islam[†], [Emam Hossain](#). *Soft Computing Letters*. 3, 100009. December 2021. [\[doi\]](#)
- [J2] **Comparative Analysis of Recurrent Neural Networks in Stock Price Prediction for Different Frequency Domains.** Polash Dey[†], [Emam Hossain](#), Md Ishtiaque Hossain, Mohammed Armanuzzaman Chowdhury, Md Shariful Alam, Mohammad Shahadat Hossain, Karl Andersson. *Algorithms*. 14(8), 251. August 2021. [\[doi\]](#)
- [J1] **A Review on Recent Advancements in FOREX Currency Prediction.** Md Saiful Islam[†], [Emam Hossain](#), Abdur Rahman, Mohammad Shahadat Hossain, Karl Andersson. *Algorithms*. 13(8), 186. July 2020. [\[doi\]](#)

Workshop Papers

- [W3] **Supraglacial Lake Fate Is Knowable Long Before the Season Ends.** [Emam Hossain](#), Md Osman Gani. *ACM SIGSPATIAL International Workshop on Polar Data Science (PoIDS)*. November 2026. Riverside, CA. [Accepted] [\[arXiv\]](#) [\[code\]](#) [\[data\]](#)
- [W2] **Learning What Matters: Causal Time Series Modeling for Arctic Sea Ice Prediction.** [Emam Hossain](#), Md Osman Gani. *IJCAI Workshop on AI for Time Series (AI4TS)*. August 2025. Montreal, Canada. [Refereed; non-archival] [\[arXiv\]](#) [\[code\]](#)

- [W1] **Correlation to Causation: A Causal Deep Learning Framework for Arctic Sea Ice Prediction.** Emam Hossain, Muhammad Hasan Ferdous, Jianwu Wang, Aneesh Subramanian, Md Osman Gani. *IEEE International Conference on Pervasive Computing and Communications Workshops (PerCom Workshops)*. pp. 62–67. March 2025. Washington, DC. [\[doi\]](#) [\[arXiv\]](#) [\[code\]](#)

Abstracts & Posters

- [P7] **Refining Partial Causal Graphs Through Interventional Representation Learning.** Emam Hossain, Md Osman Gani. *COEIT Research Day, UMBC*. May 2026. Baltimore, MD. [Doctorate Student Award]
- [P6] **Timeseries Classification of Greenland Ice Sheet Supraglacial Lake Evolution and Dynamics.** Devon Dunmire, Aneesh Subramanian, Emam Hossain, Alison Banwell, Md Osman Gani, Hammad Younas, Brendan Myers. *AGU Fall Meeting*. C33C-04. December 2025. New Orleans, LA. [\[abstract\]](#)
- [P5] **Time Series Classification of Supraglacial Lakes Evolution over Greenland Ice Sheet.** Emam Hossain, Md Osman Gani, Devon Dunmire, Aneesh Subramanian, Hammad Younas. *COEIT Research Day, UMBC*. April 2025. Baltimore, MD. [Doctorate Student Award (Honorable Mention)]
- [P4] **Identification of Causal Representation in Variational Autoencoders.** Emam Hossain, Md Osman Gani. *COEIT Research Day, UMBC*. April 2025. Baltimore, MD.
- [P3] **Causal Attention-based Time Series Classification of Supraglacial Lakes.** Emam Hossain, Devon Dunmire, Aneesh Subramanian, Md Osman Gani, Alison Banwell, Brendan Myers. *COEIT Research Day, UMBC*. April 2024. Baltimore, MD.
- [P2] **The Fate of Greenland Ice Sheet Supraglacial Lakes in a Warm and Cool Year.** Aneesh Subramanian, Devon Dunmire, Emam Hossain, Md Osman Gani, Alison Banwell, Brendan Myers. *EGU General Assembly*. EGU24-20925. April 2024. Vienna, Austria. [\[doi\]](#)
- [P1] **Incorporating Causality with Deep Learning in Predicting Short-Term and Seasonal Sea Ice.** Emam Hossain, Sahara Ali, Yiyi Huang, Nicole-Jeanne Schlegel, Jianwu Wang, Aneesh Subramanian, Md Osman Gani. *23rd Conference on AI for Environmental Science, 104th AMS Annual Meeting*. January 2024. Baltimore, MD. [\[abstract\]](#)

INVITED TALKS & PRESENTATIONS

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| Aug 2026 | Moving Beyond Correlation: Causal AI for Generalizable Climate Science
Position paper presentation, NSF HDR Ecosystem Conference 2026, <i>Chicago, IL</i> |
| Apr 2026 | Evaluating Reproducibility of Benchmark Algorithms for Supraglacial Lake Detection
Invited flash talk and poster presentation, FARR Workshop 2026, <i>Washington, DC</i> |
| Dec 2025 | Causal Time Series Modeling of Supraglacial Lake Evolution in Greenland under Distribution Shift [C7]
Conference paper presentation, IEEE ICMLA 2025, <i>Boca Raton, FL</i> |
| Nov 2025 | Causal Time-Series Modeling for Predicting Supraglacial Lake Evolution
Invited talk, iHARP All-Hands Meeting and ACM SIGSPATIAL PoIDS 2025, <i>Minneapolis, MN</i> |
| Mar 2025 | Correlation to Causation: A Causal Deep Learning Framework for Arctic Sea Ice Prediction [W1]
Workshop paper presentation, IEEE PerCom Workshops 2025, <i>Washington, DC</i> |
| Dec 2024 | Time Series Classification of Supraglacial Lakes Evolution over Greenland Ice Sheet [C5]
Conference paper presentation, IEEE ICMLA 2024, <i>Miami, FL</i> |
| Jun 2024 | Time Series Classification of Supraglacial Lakes Evolution
Invited talk, iHARP All-Hands Meeting 2024, <i>Fairbanks, AK</i> |
| Jan 2024 | Incorporating Causality with Deep Learning in Predicting Short-Term and Seasonal Sea Ice [P1]
Poster presentation, 104th AMS Annual Meeting, <i>Baltimore, MD</i> |
| Dec 2020 | A Novel Deep Learning Approach to Predict Air Quality Index [C2]
Conference paper presentation, TCCE 2020, <i>Dhaka, Bangladesh</i> |
| Nov 2019 | A Digital Personal Assistant Using Bangla Voice Command Recognition and Face Detection [C1]
Conference paper presentation, IEEE RAAICON 2019, <i>Dhaka, Bangladesh</i> |