

ABU KAISAR MOHAMMAD MASUM

Ph.D. Candidate

Quantum Machine Learning & Emerging Computing
University of Louisiana at Lafayette

DAC Young Fellow (2025)

NASA Beyond the Algorithm Challenge - Winning Team (2025)

 [abu-kaisar-mohammad-](https://github.com/abu-kaisar-mohammad-masum)

[masum.github.io](https://github.com/abu-kaisar-mohammad-masum)

 [abukaisar24](https://www.linkedin.com/in/abukaisar24)

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 [GitHub](#)

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RESEARCH INTERESTS

My research lies at the intersection of **quantum machine learning**, **hyperdimensional computing**, **hardware-efficient AI**, **large language models**, and **emerging computing systems**. I design algorithms and architectures that reduce computation and memory cost while improving robustness and deployability across edge, in-memory, accelerator, and quantum platforms, with applications in efficient inference, biomedical data processing, and resource-constrained intelligent systems.

EDUCATION

Ph.D. in Computer Science	2024–Present
University of Louisiana at Lafayette	
Master of Science in Computer Science	2026
University of Louisiana at Lafayette	
Bachelor of Science in Computer Science and Engineering	2020
Daffodil International University, Bangladesh	

PUBLICATIONS

25 selected peer-reviewed publications, 1 U.S. provisional patent application, 940+ citations, h-index 16.

1×DAC (**A***), 1×AAAI (**A***), 3×DATE (**A**), 2×ISLPED (**A**), 1×ICTAI (**B**), 4×GLSVLSI, 2×ISCAS (**C**), 1×ICCD (**C**), 1×QCE, 1×MWSCAS, 1×IEEE VIS (**A**), 2×ICMLA (**C**), 1×AAAI Symposium; 1×IEEE TBME (**Transactions**), 1×IEEE TVLSI (**Transactions**), 1×IEEE Embedded Systems Letters (**Letters**), 1×npj Unconventional Computing (**Nature**).

Conference Publications (Selected)

1. **Abu Kaisar Mohammad Masum**, Mehran Shoushtari Moghadam, Fabio Cumbo, M. Hassan Najafi, and Sercan Aygun. **Q-HyDRA: Quantum HyperDimensional Representation for Efficient Machine Learning**. In *IEEE International Conference on Tools with Artificial Intelligence (ICTAI)*, 2026. Acceptance rate: 21%.
2. Sabrina Hassan Moon, **Abu Kaisar Mohammad Masum**, Sercan Aygun, and Dayane Reis. **XL-HD: Extended Learning in Hyperdimensional Computing via Deterministic Projections for In-Memory Accelerators**. In *IEEE/ACM International Symposium on Low Power Electronics and Design (ISLPED)*, 2026. Acceptance rate: 22.5%.
3. Tanha Tasfia, **Abu Kaisar Mohammad Masum**, Mehran Moghadam, M. Hassan Najafi, and Sercan Aygun. **DAIQUIRI: Dynamic Quantization with Layer-wise Sensitivity Ranking for Hardware-Efficient LLMs**. In *Design, Automation, and Test in Europe (DATE)*, 2026. Acceptance rate: 25%.
4. Colin Eddy Dupuis, Emilien J. Meyer, **Abu Kaisar Mohammad Masum**, and Sercan Aygun. **POSEiDON: Pose Estimation in Dynamic On-device Networks via Hyperdimensional Computing**. In *Design, Automation, and Test in Europe (DATE)*, 2026. Acceptance rate: 25%.
5. Ahmed Mamdouh, Sabrina Hassan Moon, **Abu Kaisar Mohammad Masum**, Emilien J. Meyer, Sercan Aygun, and Dayane Reis. **SP-HD: Stochastic Projection-Based HyperDimensional Architecture for Near-Sensor Image Classification**. In *Design, Automation, and Test in Europe (DATE)*, 2026. Acceptance rate: 25%.
6. **Abu Kaisar Mohammad Masum** and Sercan Aygun. **Deterministic Hyperdimensional Learning with Rank Refinement** (Student Abstract). In *AAAI Conference on Artificial Intelligence (AAAI)*, 2026. Acceptance rate: 25%.
7. **Abu Kaisar Mohammad Masum**, Mehran Shoushtari Moghadam, Sabrina Hassan Moon, Ahmed Mamdouh Mohamed Ahmed, M. Hassan Najafi, Dayane Reis, and Sercan Aygun. **On-the-Fly Hadamard Hypervector Processing for Efficient Hyperdimensional Computing**. In *Design Automation Conference (DAC)*, 2025. Acceptance rate: 22.6%.

8. Mehran Moghadam[†], Abu Kaisar Mohammad Masum[†], Sercan Aygun, and M. Hassan Najafi. **ID-VSA: Independent and Dynamic Vector Symbolic Architecture for Energy-Efficient Edge AI**. In *IEEE/ACM International Symposium on Low Power Electronics and Design (ISLPED)*, 2025. [†]Equal contribution. Acceptance rate: 22.5%
9. Emilien Meyer, Abu Kaisar Mohammad Masum, Mehran Moghadam, Lida Kouhalvandi, Gourav Datta, Sercan Aygun, and M. Hassan Najafi. **GAN-BiLSTM-HDC: A Hybrid Framework for Robust and Hardware-Efficient Malware Detection**. In *IEEE International Conference on Computer Design (ICCD)*, 2025.
10. Abu Kaisar Mohammad Masum, Mehran Shoushtari Moghadam, Lida Kouhalvandi, M. Hassan Najafi, Arman Roohi, and Sercan Aygun. **Quantum-Based Random Numbers: Entropy, Efficiency, and Practicality**. In *IEEE International Conference on Quantum Computing and Engineering (QCE)*, 2025.
11. Abu Kaisar Mohammad Masum, Naveed Mahmud, M. Hassan Najafi, and Sercan Aygun. **A Hybrid Classical-Quantum Fine-Tuned BERT for Text Classification**. In *AAAI Symposium on Quantum Information & Machine Learning (QIML)*, 2025.
12. Abu Kaisar Mohammad Masum, Mehran Shoushtari Moghadam, Lida Kouhalvandi, M. Hassan Najafi, and Sercan Aygun. **Quantum Image Processing: A Comparative Study of NEQR and FRQI Encoding Schemes with Hybrid Processing**. In *Great Lakes Symposium on VLSI (GLSVLSI)*, 2025. Acceptance rate: 26%
13. Abu Kaisar Mohammad Masum and Sercan Aygun. **ParaHDC: Leveraging GPU Acceleration for Scalable Hyperdimensional Learning**. In *Great Lakes Symposium on VLSI (GLSVLSI)*, 2025. Acceptance rate: 26%
14. Mehran Shoushtari Moghadam, Abu Kaisar Mohammad Masum, Sercan Aygun, and M. Hassan Najafi. **Robust Data Processing for Vector Symbolic Computing**. In *Great Lakes Symposium on VLSI (GLSVLSI)*, 2025. Acceptance rate: 26%
15. Sabrina Hassan Moon, Ahmed Ahmed, Abu Kaisar Mohammad Masum, Sercan Aygun, and Dayane Reis. **ReX-HD: A Deterministic ReRAM-Based Hyperdimensional Computing Framework for Edge Computing**. In *Great Lakes Symposium on VLSI (GLSVLSI)*, 2025. Acceptance rate: 26%
16. Colin Dupuis, Abu Kaisar Mohammad Masum, M. Hassan Najafi, Ulkuhan Guler, and Sercan Aygun. **tiny Machine Learning on Android Devices: Continuous Health Monitoring with Wearables**. In *IEEE Midwest Symposium on Circuits and Systems (MWSCAS)*, 2025.
17. Abu Kaisar Mohammad Masum, Reeti Pradhananga, Jonas I. Schmidt, Mehran Shoushtari Moghadam, M. Hassan Najafi, Ulkuhan Guler, Bige Unluturk, and Sercan Aygun. **AMS-HD: Acute Mountain Sickness Detection with Hyperdimensional Computing**. In *IEEE International Symposium on Circuits and Systems (ISCAS)*, 2025.
18. Mehran Shoushtari Moghadam, Shelby Williams, Abu Kaisar Mohammad Masum, M. Hassan Najafi, Sercan Aygun, and Magdy Bayoumi. **TRUE-BSG: A True Random Bit-Stream Generator for Fast and Efficient Stochastic Computing**. In *IEEE International Symposium on Circuits and Systems (ISCAS)*, 2025.
19. Abu Kaisar Mohammad Masum and Naveed Mahmud. **QuanText: Text Data Visualization in Quantum Computing**. Poster, *IEEE Visualization Conference (IEEE VIS)*, 2024.
20. Abu Kaisar Mohammad Masum, Nusrat Badhon, SM Saiful Islam Badhon, Nushrat Jahan Ria, Sheikh Abujar, Muntaser Mansur Syed, and Naveed Mahmud. **Comparative Evaluation of Transfer Learning for Classification of Brain Tumor Using MRI**. In *International Conference on Machine Learning and Applications (ICMLA)*, 2023.
21. Abu Kaisar Mohammad Masum, Anshul Maurya, Dhruthi Sridhar Murthy, and Naveed Mahmud. **Hybrid Quantum-Classical Machine Learning for Sentiment Analysis**. In *International Conference on Machine Learning and Applications (ICMLA)*, 2023.

Journal Publications

1. Abu Kaisar Mohammad Masum, Mehran Moghadam, M. Hassan Najafi, Bige Unluturk, Ulkuhan Guler, Beth A. Beidleman, and Sercan Aygun. **AMS-HD: Hyperdimensional Computing for Real-Time and Energy-Efficient Acute Mountain Sickness Detection**. *IEEE Transactions on Biomedical Engineering (TBME)*, 2026.
2. Mehran Moghadam, Abu Kaisar Mohammad Masum, Sercan Aygun, and M. Hassan Najafi. **Independent and Dynamic Vector Symbolic Architecture for Hardware-Efficient Edge AI**. *IEEE Transactions on Very Large Scale Integration Systems (TVLSI)*, 2026.
3. Fabio Cumbo, Rui-Hao Li, Bryan Raubenolt, Jayadev Joshi, Abu Kaisar Mohammad Masum, Sercan Aygun, and Daniel Blankenberg. **Quantum Hyperdimensional Computing: A Foundational Paradigm for Quantum Neuromorphic Architectures**. *npj Unconventional Computing, Nature Portfolio*, 2026.
4. Colin Eddy Dupuis, Emilien J. Meyer, Abu Kaisar Mohammad Masum, and Sercan Aygun. **Single-Pass Learning Android Malware Detector for Mobile Computing Platforms**. *IEEE Embedded Systems Letters*, 2026.

Patents

- (a) **Abu Kaisar Mohammad Masum**, Mehran Moghadam, Sabrina Hassan Moon, Ahmed Mamdouh Mohamed Ahmed, M. Hassan Najafi, Dayane Alfenas Reis, and Sercan Aygun. **On-the-Fly Hadamard Hypervector Processing for Efficient Hyperdimensional Computing**. U.S. Provisional Patent Application No. 63/975,724

AWARDS, FUNDING & RECOGNITION

- **Winner, NASA Beyond the Algorithm Challenge - Novel Computing Architectures for Flood Analysis**, 2025. Winning team; project grant: **\$100K**.
- **DAC Young Fellow Award**, Design Automation Conference, 2025. Travel support approximately \$1.4K.
- **Quantum Ideas Summer School**, Duke University, 2024. Full travel support approximately \$2.5K.
- **AAAI Travel Award**, 2025. Travel support approximately \$1.04K.
- **IEEE Computer Society Student Travel Award**, 2025. Travel support approximately \$1K.
- **IEEE Circuits and Systems Society Student Travel Grant**, 2025. Travel support \$1K.
- **GLSVLSI Student Volunteer / Service Travel Award**, 2025. Travel support approximately \$1K.
- **Academic Excellence Award**, University of Louisiana at Lafayette, 2025.
- **Leaf Award**, University of Louisiana at Lafayette, 2025.
- **Peer Tutoring Excellence Awards**, Florida Institute of Technology, Fall 2023 and Spring 2024.
- **Outstanding Student of the Year**, Florida Institute of Technology, 2023.
- **Best Performing Faculty and Best Researcher**, Daffodil International University, 2021.

PROFESSIONAL EXPERIENCE

Graduate Research / Teaching Assistant , <i>University of Louisiana at Lafayette</i>	2024–Present
Research on quantum machine learning, hyperdimensional computing, hardware-efficient AI, and emerging computing architectures.	
Graduate Research / Teaching Assistant , <i>Florida Institute of Technology</i>	2023–2024
Supported research and teaching activities in computer science and machine learning.	
Lecturer , <i>Daffodil International University</i>	2021–2023
Taught undergraduate courses in Artificial Intelligence, Machine Learning, and Natural Language Processing; supervised student projects and undergraduate research.	
Research Assistant , <i>Apurba-DIU Research and Development Lab</i>	2020–2021
Worked on Bengali text processing and spell-checking research under the supervision of Sheikh Abujar.	
Instructor (Part-time) , <i>DIU NLP & ML Research Lab</i>	2020–2021
Taught machine learning and natural language processing tools and libraries to undergraduate students.	

TEACHING EXPERIENCE

- **Teaching Assistant, Machine Learning** (CMPS 422 / CSCE 598), University of Louisiana at Lafayette - Spring 2025, Fall 2025, Spring 2026, Fall 2026.
- **Teaching Assistant, Introduction to Computer Science** (CMPS 150), University of Louisiana at Lafayette - Fall 2024.
- **Lecturer**, Daffodil International University - 2021–2023. Courses included Machine Learning, Natural Language Processing, and Artificial Intelligence.

EXPERIENCE WITH RESEARCH GRANTS

Assisted in proposal preparation for the following research grants

- **Collaborative Research: SHF: MADE: Memory-Centric Architectures for Distributed Edge Intelligence** (team member), National Science Foundation (NSF). Funded amount: approximately \$601,569 2026–2029
- **EPSCoR Research Fellows: Quantum-Inspired Vector Symbolic Architectures for Biomedical Big Data Processing** (team member), National Science Foundation (NSF). Funded amount: \$299,927 2026–2028
- **NASA Beyond the Algorithm Challenge: Novel Computing Architectures for Flood Analysis** (team member), NASA. Project: *tML-ECT: Quantum Hyperdimensional Computing for Surface Water Signatures*. Award amount: \$100,000 2025

ADVISING & MENTORING

- **Jabir Al Nahian**, B.Sc., Daffodil International University. Current: Lead Data Scientist, Infinimind Inc., Japan.
- **Afraz Ul Haque**, B.Sc., Daffodil International University. Current: M.S., University of Technology Sydney.
- **Subrina Sirajee**, B.Sc., Daffodil International University. Current: M.S., University of Fukui.
- **Nusrat Jahan Badhon**, B.Sc., Daffodil International University. Current: M.S., Central Queensland University, Melbourne.

ACADEMIC SERVICE

Conference Reviewer	GLSVLSI 2026; LREC 2022, 2026; ICMLA 2023, 2024, 2025, 2026; WACV Workshop on Vision-Based Understanding for Low-Resource Languages 2024.
External Reviewer	ISLPED 2025, 2026; DAC 2024, 2025, 2026; DATE 2024, 2025, 2026; AAAI 2025; ICLR 2025, 2026; ICML 2026.
Journal Reviewer	IEEE Transactions on Quantum Engineering (2026); Engineering Applications of Artificial Intelligence (2022); BMC Medical Informatics and Decision Making (2022); The Imaging Science Journal (2021); Cybernetics and Systems (2021).
Professional Service	Secretary, IEEE Computer Society, Lafayette Section, 2026–2027.

PRESENTATIONS & TALKS - SELECTED

Conference Talk	<i>On-the-Fly Hadamard Hypervector Processing for Efficient Hyperdimensional Computing</i> , Design Automation Conference (DAC), 2025.
Conference Talk	<i>From Vectors to Qubits: Tiny AI with HDC, SC, and QC</i> , Design Automation Conference (DAC), 2025.
Conference Talk	<i>ParaHDC: Leveraging GPU Acceleration for Scalable Hyperdimensional Learning</i> , GLSVLSI, 2025.
Conference Talk	<i>A Hybrid Classical-Quantum Fine-Tuned BERT for Text Classification</i> , AAAI Symposium on Quantum Information & Machine Learning, 2025.
Conference Talk	<i>Quantum-Based Random Numbers: Entropy, Efficiency, and Practicality</i> , Quantum Week, 2025.
Conference Talk	<i>Quantum Image Processing: A Comparative Study of NEQR and FRQI Encoding Schemes with Hybrid Processing</i> , GLSVLSI, 2025.
Conference Talk	<i>Robust Data Processing for Vector Symbolic Computing</i> , GLSVLSI, 2025.
Workshop Talk	<i>Pseudo-Random versus Quasi-Random Number Generation using Quantum Circuits</i> , 1st AR-QTEC Workshop at HPCA, 2025.
Poster	<i>QuanText: Text Data Visualization in Quantum Computing</i> , IEEE VIS, 2024.
Conference Talk	<i>Comparative Evaluation of Transfer Learning for Classification of Brain Tumor Using MRI</i> , ICMLA, 2023.
Conference Talk	<i>Hybrid Quantum-Classical Machine Learning for Sentiment Analysis</i> , ICMLA, 2023.

PROFESSIONAL MEMBERSHIPS

IEEE; IEEE Circuits and Systems Society (CASS); IEEE Council on Electronic Design Automation (CEDA); IEEE Quantum Technical Community; AAAI Student Member; ACM Student Member.