Abdullah Al-Mamun

Computer Science | Purdue University

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Research Interests

Machine Learning for Database Systems: instance-optimized learned indexes for spatial and vector databases
Database Systems for AI Agents: instance-optimized indexing and query processing for agentic workloads

Education

May, 2027 **Ph.D., Computer Science, Purdue University, USA**
Thesis: *Instance-Optimized Learned Indexes for Multi- and High-Dimensional Spaces*
Advisor: Walid G. Aref
Committee: Elisa Bertino, Chris Clifton, and Jianguo Wang

2016 **M.Sc., Computer Science, Memorial University of Newfoundland, Canada**
Thesis: *Anomaly Detection from Time-Changing Environmental Sensor Data Streams*
Advisor: Antonina Kolokolova

2009 **B.Sc., Computer Science, Islamic University of Technology, Bangladesh**
Thesis: *Mining Data Streams from a Higher Level of Abstraction*
Advisors: Md. Rezwanul Huq, and M.A. Mottalib

Employment

Purdue University, USA

2025-present Graduate Student Programmer, Office of Research
2022-2023 Graduate Teaching Fellow, Department of Computer Science
2019-2020 Graduate Research Assistant, PI: Walid G. Aref
2017-2025 Graduate Teaching Assistant, Department of Computer Science

North South University, Bangladesh

2016-2017 Lecturer, Department of Electrical and Computer Engineering

Memorial University of Newfoundland, Canada

2013-2016 Graduate Research Assistant, PI: Antonia Kolokolova
2013-2016 Graduate Teaching Assistant, Department of Computer Science

University of Asia Pacific, Bangladesh

2010-2013 Lecturer, Department of Computer Science and Engineering

Publications

In Preparation/Under Submission

P1. **Abdullah Al-Mamun**, Yeasir Rayhan, and Walid G. Aref. *"iFVS: Towards Instance-Optimized Filtered Vector Search"* (arXiv/preprint), 2026. [Link].

P2. **Abdullah Al-Mamun**, Lu Xing, and Walid G. Aref. *"On the Extensibility of Learned Indexes From the One- to Multi-dimensional Spaces."*, 2026.

Published

P3. **Abdullah Al-Mamun**, Hao Wu, Qiyang He, Jianguo Wang, and Walid G. Aref. *"A Survey of Learned Indexes for the Multi-dimensional Space."* ACM Computing Surveys (CSUR), Volume 58, Issue 4, pp. 1-37, 2025. [Link].

P4. **Abdullah Al-Mamun**, Jianguo Wang, and Walid G. Aref. *"Learned Indexes From the One-dimensional to the Multi-dimensional Spaces: Challenges, Techniques, and Opportunities."* In Companion of the 2025 International Conference on Management of Data (SIGMOD, *Tutorial Track*), pp. 788-796, 2025. [Link].

P5. **Abdullah Al-Mamun**, Ch. Md. Rakin Haider, and Walid G. Aref. *"Query Processing Tradeoffs over an ML-Enhanced R-tree."* In Proceedings of the 8th ACM SIGSPATIAL International Workshop on AI for Geographic Knowledge Discovery (GeoAI@SIGSPATIAL), pp. 174-184, 2025. [Link].

P6. **Abdullah Al-Mamun**, Ch. Md. Rakin Haider, Jianguo Wang, and Walid G. Aref. *"The AI+R-tree: An Instance-optimized R-tree."* In proceedings of the 23rd IEEE International Conference on Mobile Data Management (MDM), pp. 9-18, IEEE, 2022. [Link].

P7. **Abdullah Al-Mamun**, Hao Wu, and Walid G. Aref. *"A Tutorial on Learned Multi-dimensional Indexes."* In proceedings of the 28th International Conference on Advances in Geographic Information Systems (SIGSPATIAL, *Tutorial Track*), pp. 1-4, 2020. [Link].

Pre-Doctoral

P8. SM Sarwar, and **Abdullah Al-Mamun**. *"Next Word Prediction for Phonetic Typing by Grouping Language Models."* In Proceedings of the 2nd International Conference on Information Management (ICIM), 73-76, 2016. [Link].

P9. UH Billah, SM Sarwar, and **Abdullah Al-Mamun**. *"Personalized Language Models for Computer-mediated Communication."* In Proceedings of the 3rd Workshop on Concept Discovery in Unstructured Data (CDUD@CLA), 2-12, 2016. [Link].

P10. **Abdullah Al-Mamun**, Antonina Kolokolova, Dan Brake. *"Detecting Contextual Anomalies from Time-Changing Sensor Data Streams."* In Proceedings of the Doctoral Consortium of the 25th ECML PKDD, p.13, 2015. [Link]. ***M.Sc. thesis-related.***

P11. SM Sarwar, MA Abedin, AHM Ullah, and **Abdullah Al-Mamun**. *"Personalized Query Expansion for Web Search Using Social Keywords."* In Proceedings of International Conference on Information Integration and Web-based Applications & Services (iiWAS), pp. 610-614, 2013. [Link].

P12. **Abdullah Al-Mamun**, MA Abedin, Md. Al Arman, MA Mottalib, Mohammad Rezwanul Huq. *"Mining Data Streams from a Higher Level of Abstraction: A Class Window Approach."* In proceedings of International Conference on Informatics Engineering and Information Science (ICIEIS), pp. 461-469, 2011. [Link]. ***B.Sc. thesis-related.***

Teaching Experience

2023 **Instructor**, Purdue University, USA
- CS 348: Information Systems [Course Page]
- Class size: 221 students
- Teaching staff: 6 graduate teaching assistants

2017-2024 **Graduate Teaching Assistant**, Purdue University, USA
- CS 348: Information Systems
- CS 448: Introduction to Relational Database Systems

2016-2017 **Lecturer**, North South University, Bangladesh
- CSE 225: Data Structures and Algorithms
- CSE 311: Database Systems

2013-2015 **Graduate Teaching Assistant**, Memorial University of Newfoundland, Canada
- COMP 2742: Logic for Computer Science
- COMP 4741: Formal Languages and Computability
- COMP 6902: Complexity of Computational Problems

2010-2013 **Lecturer**, University of Asia Pacific, Bangladesh
- CSE 105: Discrete Mathematics
- CSE 203: Object-Oriented Programming

Talks & Presentations

Tutorials

T1. **Abdullah Al-Mamun**, and Walid G. Aref. *Learned Indexes From the One-dimensional to the Multi-dimensional Spaces: Challenges, Techniques, and Opportunities (90 minutes)*, ACM SIGMOD, 2025. [Slides]

T2. **Abdullah Al-Mamun**, Hao Wu, and Walid G. Aref. *A Tutorial on Learned Multi-dimensional Indexes (60 minutes)*, ACM SIGSPATIAL, 2020. [Slides & Video]

Invited Talks

T3. Walid G. Aref, and **Abdullah Al-Mamun**. *Learning the Index vs. Indexing the Learned Models? A Tutorial on Learned Multidimensional Indexes (60 minutes)*, University of Maryland, Host: Hanan Samet, 2021. [Slides & Video]

Workshop/Conference Presentations

T4. **Abdullah Al-Mamun**. *Query Processing Tradeoffs over an ML-Enhanced R-tree (15 minutes)*, ACM SIGSPATIAL, 2025. [Slides]

T5. **Abdullah Al-Mamun**. *The AI+R-tree: An Instance-optimized R-tree (15 minutes)*, IEEE MDM, 2022. [Slides & Video]

Academic Service

2025, 2026 Journal Reviewer, **IEEE Transactions on Knowledge and Data Engineering (TKDE)**

2026 External Reviewer, **International Conference on Very Large Data Bases (VLDB)**

Mentorship

Purdue University

2026 **Nikhil Chitturi**, Undergraduate student

2023 **Tri Minh Tran**, Undergraduate student

2022 **Qiyang He**, Graduate (M.Sc.) student

2020 **Hao Wu**, Undergraduate student

Awards & Honors

2025 **Microsoft Fellowship** to attend the EDBT'25 **Summer School on AI & Data Management**

2023 **Graduate Teaching Award**, Department of Computer Science, Purdue University.

2022-2023 **Graduate Teaching Fellow**, Department of Computer Science, Purdue University.

2018 **Graduate School Summer Research Grant**, Purdue University.

2015 **Fellow of the School of Graduate Studies**, Memorial University of Newfoundland.

Last updated: November, 2026