Abdullah Al Raqibul Islam

Homepage: biqar.github.io
Email: aislam6@uncc.edu
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Research Interest

My research aims to build a high-performance dynamic graph processing system to support trillion-edge scale graphs in heterogeneous memory/storage architecture. To this end, my research focuses on the following three key aspects:

- Developing data structures to support graph insertions and queries in dynamic graphs efficiently.
- Exploiting emerging storage technologies (e.g., Persistent Memory) to store large-scale graphs in a single machine.
- Making intelligent data placement in the heterogeneous memory hierarchy.

Education

University of North Carolina at Charlotte
Doctor of Philosophy in Computer Science — 2019 - Present
College of Computing and Informatics
CGPA: 4.00 in a scale of 4.00 (Expected: Spring, 2024)
Specialization: Dynamic graph processing systems.
Advisor: Prof. Dong Dai

University of Dhaka, Bangladesh
Bachelor of Science in Computer Science & Engineering — 2009-2012
CGPA: 3.59 in a scale of 4.00

Publications

Kamat, Saisha and Islam, Abdullah Al Raqibul and Zheng, Mai and Dai, Dong. *"FaultyRank: A Graph-based Parallel File System Checker,"* In 37th IEEE International Parallel & Distributed Processing Symposium (IPDPS), 2023.

Youssef, Karim and Islam, Abdullah Al Raqibul and Iwabuchi, Keita and Feng, Wuchun and Pearce, Roger. *"Optimizing Performance and Storage of Memory-Mapped Persistent Data Structures,"* In IEEE High Performance Extreme Computing Conference (HPEC), 2022. **[Outstanding Student Paper Award]**

Islam, Abdullah Al Raqibul and York, Christopher and Dai, Dong. *"A Performance Study of Optane Persistent Memory: From Storage Data Structures' Perspective,"* CCF Transactions on High Performance Computing (CCF THPC), Springer, Volume 4, 2022.

Islam, Abdullah Al Raqibul and Dai, Dong and Cheng, Dazhao. *"VCSR: Mutable CSR Graph Format Using Vertex-Centric Packed Memory Array,"* In 22nd IEEE International Symposium on Cluster, Cloud and Internet Computing (CCGrid), 2022.

Islam, Abdullah Al Raqibul and Dai, Dong and Narayanan, Anirudh and York, Christopher. *"A Performance Study of Optane Persistent Memory: From Indexing Data Structures' Perspective,"* In 36th International Conference on Massive Storage Systems and Technology (MSST), 2020.

Posters / WiPs / Brief Announcements

Islam, Abdullah Al Raqibul and Dai, Dong. *"A Framework for Large Dynamic Graph Analysis on Persistent Memory,"* In 21st USENIX Conference on File and Storage

Technologies (USENIX FAST), 2023.

Zhang, Duo and Gatla, Om Rameshwar and Islam, Abdullah Al Raqibul and Dai, Dong and Zheng, Mai. *"On the Scalability of Testing the Crash Consistency of PM Systems,"* In 21st USENIX Conference on File and Storage Technologies (USENIX FAST), 2023.

Islam, Abdullah Al Raqibul and Dai, Dong. *"POSTER: Understand the overheads of storage data structures on persistent memory,"* In 25th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP), 2020.

Research Experience

University of North Carolina at Charlotte
Research Assistant, Data Intelligence Research (DIR) Lab — Aug 2019-Present

- Graph Storage:
  - Leading a research project on system design for large-scale dynamic graph data processing on emerging storage system technologies.
  - Designing data structures to efficiently store dynamic graphs without scarifying the efficiency in running graph analysis.
  - Build system from scratch in C++; Use parallel programming; Do performance optimization and analysis with *Intel VTune* and *Linux perf tool*.
- Persistent Memory:
  - *pmemids_bench*: C++ version of YCSB based benchmark suite. It includes,
    - Seven commonly used indexing data structures
    - Four persistent modes (by using PMDK's libvmem and libpmemobj libraries)
    - Four parallel settings

Google
CS Research Mentorship Program (CSRMP) - Mentee — Sep 2022 – Present

- Selected to join this 3-month research program by Google.
- Matched with my mentor at Google Dr. Marisa Ferrara Boston. Currently exploring research and professional opportunities in computer science research pathways.

Lawrence Livermore National Laboratory
Computing Graduate Student Intern - Summer — May 2022 – Aug 2022

- **Privateer 2.0:** Integrated several C++ standard template library (STL) containers (e.g., vector, list, deque, map, set, etc.) with *Privateer 2.0* to evaluate storage space optimization of these data structures in the incremental snapshot setting.
- **Snapshotable:** Designed and implemented a new *hash table* aiming to reduce the storage footprint in the de-duplication based snapshot model.

Software Engineering Experience

TigerIT Bangladesh Ltd.
Principal Software Engineer — 2019-2019
Software Engineer — 2014-2019

- Machine Learning: Led a couple of ML engineering projects including (i) hybrid recommendation engine (used in a mobile application named KinderMate), (ii) proof-of-concept development of a video analytics system, and (iii) inventory forecasting system.
- Databases: Developed a pseudo-real-time data synchronization module, syncing incremental changes in third-party databases to local databases (i.e., Oracle, Elasticsearch, etc.).
- Server Side Programming: Implemented several backend modules to support (i) payment system bookkeeping, (ii) FCM based personalized notification management, (iii) advanced text search, etc.

Therap (BD) Ltd.
Junior Software Engineer 2013-2014

- Appointed as full stack software developer for the web-based service portal, used different java technologies (i.e. Spring, Java EE, Hibernate, etc).

Honors and Awards

- ❑ SciAuth Student Fellowship, Fall 2022
- ❑ Outstanding Student Paper Award, 27th Annual IEEE High Performance Extreme Computing (HPEC 2022)

Competitive Programming & Problem Solving (Selected)

Contest Participation

- Lucid Programming Competition, 2021
  Individual (Place: 5th in UNC Chapel Hill Leaderboard)
- ACM ICPC Regionals, 2011 (Asia, Dhaka Site)
  Team: DU Army Ants Reloaded, Place: 9th

Problem Setter & Judge

- SUB Inter University Programming Contest, 2017, State University of Bangladesh
- Cybernauts'16 National Programming Contest, 2016, North South University
- Bangladesh Informatics Olympiad, 2016, National Round
- IUT 6th-9th ICT Fest Programming Contest, 2014-2017, Islamic University of Technology

Professional Service

- ❑ External/Sub Reviewer: IPDPS'23, ICPP'22, BigData'22, IPDPS'22, CCGrid'22, ISPA'21, IPDPS'20, ICPP'20.
- ❑ Artifact Evaluation Committee: EuroSys'23, OSDI'22, ATC'22
- ❑ Student Volunteer: ISSRE'22, SC'21

Technical skills

Language: C/C++, Java, Python, Bash
Frameworks: Apache Spark, Apache Kafka, Spring, Java EE
Databases: Oracle, PostgreSQL, Elasticsearch
Miscellaneous: Git, LaTeX, Intel VTune, perf (Linux)

References

Dr. Dong Dai
Assistant Professor of Computer Science
University of North Carolina at Charlotte
Woodward 410G
dong.dai@uncc.edu