# Md Ashiqur Rahman

Researcher · Problem Solver · Mentor

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## Education

**Ph.D. Candidate, Computer Science (GPA: 3.75/4.00)**             *Aug 2016 - May 2022*
The University of Arizona, Tucson, AZ, USA
Dissertation topic: Data-centric Wireless Networks.

**Master of Science in Computer Science (GPA: 3.75/4.00)**             *Aug 2016 - May 2020*
The University of Arizona, Tucson, AZ, USA

**Bachelor of Science in Computer Science and Engineering (GPA: 3.60/4.00)**             *Feb 2011 - May 2015*
Khulna University of Engineering & Technology (KUET), Khulna, Bangladesh
Earned Dean's List award for academic year of 2014

## Skills

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|---|---|
| **Research** | Internet Architecture, Information-Centric Networking (ICN) with Named Data Networking (NDN), Probabilistic routing, Protocol design and performance optimization in wireless networks, Scheduling algorithms with network coding in RSU-based VANETs. |
| **Coding & Tools** | **C/C++** ; familiar with Scala, Python, Java ; Shell scripting, Lucene, GDB, Docker, Jenkins, NS-3, CSIM. |
| **Topics** | Computer Networks, Database Systems, Operating Systems, Information Retrieval, Algorithms, Data Structures, Object-oriented Design. |
| **Others** | Teaching, Project management. |

## Experience (Research)

**Graduate Research Associate (Ph.D. advisor: Dr. Beichuan Zhang)**             *Aug 2016 - Present*
Network Research Lab, Computer Science, The University of Arizona, Tucson, AZ, USA
- Studying NDN as a Future Internet Architecture and optimizing data-centric approach in wireless networks.
- Architectural differences between NDN and IP in mobile ad-hoc networks
- Performance optimization and NDN protocol design at the transport, network, and link layers in wireless networks.
- Analyzing application challenges and designing optimization techniques for NDN in Delay-tolerant Networks (DTN).

**Undergraduate Researcher (Thesis advisor: Dr. G.G. Nawaz Ali)**             *Apr 2014 - May 2015*
Computer Science and Engineering, Khulna University of Engineering & Technology (KUET),
Khulna, Bangladesh
- Studying applications of Network Coding in scheduling algorithms for Vehicular Ad-hoc Networks (V2I).
- Minimize wireless broadcast and Vehicle-to-RSU latency for better road-safety and infotainment.
  - Optimizing scheduling in multi-item query applications.
  - Designing passive cache-transfer policy in multi-RSU environment.
  - Optimizing maximal clique finding with dynamic threshold in heterogeneous data access.

# Experience (Teaching)

### Graduate Teaching Associate (Grading, Project management, discussion) *Aug 2016 - Present*
Computer Science, The University of Arizona, Tucson, AZ, USA
- CSC 452 Operating Systems: Fall 2019, 2020, 2021.
- CSC 425 Computer Networks: Spring 2017, 2020, 2021, Fall 2017.
- CSC 477/577 Introduction to Computer Vision: Fall 2016.

### Summer Instructor *Jun - Aug (2020-21)*
Computer Science, The University of Arizona, Tucson, AZ, USA
- **2021:** CSC 352 Systems Programming and UNIX,
    - Teaching basics of C programming, FILE I/O, memory management, UNIX commands, and Shell scripting.
- **2020:** CSC 210 Software Development,
    - Teaching fundamentals of algorithms, data structures, design, and unit-testing using Java.

### Lecturer *Sep 2015 - Jul 2016*
Computer Science and Engineering, Daffodil International University (DIU), Dhaka, Bangladesh
- CSE 221/222 Algorithms (Fall 2015, Spring 2016),
    - Searching, sorting, basic graphs traversal and dynamic programming.
- CSE 134/135 Data Structures (Fall 2015, Spring-Summer 2016),
    - Covered fundamental structures such as arrays, linked-lists, trees, heaps, hash-maps.
- CSE 122/123 Programming and Problem Solving (Fall 2015, Spring-Summer 2016),
    - C programming, solving ad-hoc problems with basic data types, arrays, strings.
- CSE 334 Wireless Programming (Fall 2015, Spring 2016),
    - Designing and implementing graphics logic with Unity for mobile applications.
- CSE 332 Software Engineering (Summer 2016),
    - Software development models, project management, testing and debugging.

# Key Projects

### NDN in wireless, ad-hoc, and delay-tolerant networks (C++, NS-3). *2016 - Ongoing*
- **Application and transport layer:** Implemented a dynamic interest lifetime (DIL) protocol alongside congestion window limit to reduce data redundancy and channel contention. Achieves 16.44% more throughput than TCP-IP.
- **Network layer:** Implemented a data-centric ad hoc forwarding (DAF) strategy that reduces network latency and overhead and improves application retrieval rate. Proves that NDN is better than IP in mobile ad hoc networks.
- **Link layer:** Implemented an Interest bundling technique (BLEnD) which improves channel availability for data flow. Improves throughput by 30% than "one Interest, one data" policy.

### Network Coded Data Dissemination in RSU-based Vehicular networks (C, CSIM). *2014 - 2019*
- Minimizing wireless broadcast and Vehicle-to-RSU latency for improving road-safety and infotainment.
- Achieved significant lower latency and wireless broadcast overhead with high data-retrieval rate.

### Supporting Multi-Level Annotations for Medical Literature (Python, Docker) *Aug - Dec 2018*
- Capturing higher context information near all hot-word neighbors.
- Near-SotA performance with significantly lower model training time.

### Implemented Heapfile manager, Buffer manager, B+ tree in a DBMS (C, MINIBASE). *Aug - Dec 2017*

### Software router with ARP and PWOSPF protocols for shortest path forwarding (C). *Aug - Dec 2016*

# Leadership

**Organizer, 11th NDN Hackathon (Virtual)**                                    *May 2021*

**Mentor: Competitive Programming (beginner and intermediate).**       *Sep 2015 - Jul 2016*
Computer Science and Engineering, DIU, Dhaka, Bangladesh
- Host training sessions on technical topics for fast programming.
- Organized intra and inter-university programming contests.
  - 2015 ACM ICPC Dhaka Regional, DIU, Dhaka, Bangladesh.
  - 2016 National Girls Programming Contest (NGPC), DIU, Dhaka, Bangladesh.

**Workshop Manager and Instructor**                                    *Feb 2012 - Apr 2015*
SGIPC (Special Group of Interest in Programming Contests), KUET, Khulna, Bangladesh
- Host workshop sessions on technical topics for ACM ICPC participation.
- Organized intra and inter-university programming contests.
  - 2012 GPIT CSE Festival Programming Contest, KUET, Khulna, Bangladesh.

**Chair, Workshop Manager and Instructor**                             *Feb 2014 - Apr 2015*
IEEE Student Branch, KUET, Khulna, Bangladesh
- Organize workshops, manage funding and student outreach program.
- Instructor of workshop on Introduction to Python (2014).

**Chair, Microsoft Student Campus Representative**                     *Aug 2014 - Apr 2015*
Microsoft Student, KUET, Khulna, Bangladesh
- Organize workshops, instructor, manage microsoft campus student accounts.
- Instructor of Introduction to Building Windows Phone Applications with Visual Studio (2014).

# Extracurricular

**Member, DREAM: A voluntary blood donation society.**                 *Feb 2011 - May 2015*
KUET, Khulna, Bangladesh

**Member, IEEE Student Branch, KUET**                                  *Aug 2012 - May 2015*
KUET, Khulna, Bangladesh

**Member, Microsoft Student Campus Representative**                    *Feb 2012 - May 2015*
KUET, Khulna, Bangladesh

**Member, Association for Computing Machinery (ACM)**                  *Nov 2013 - Oct 2015*
KUET, Khulna, Bangladesh

**Member, KUETPS: KUET Photographic Society**                         *Feb 2011 - Jun 2013*
KUET, Khulna, Bangladesh

# Honors & Awards

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|---|---|---|
| May 2021 | **Winner**, 11th NDN Hackathon | *Virtual* |
| Mar 2019 | **2nd Runners-up**, 8th NDN Hackathon at University of California, Los Angeles | *LA, CA, U.S.A* |
| May 2018 | **Winner**, 6th NDN Hackathon at Florida International University | *Miami, FL, U.S.A* |
| Mar 2017 | **Winner**, 4th NDN Hackathon at University of Memphis | *Memphis, TN, U.S.A* |
| Sep 2015 | **Best Research Poster Award**, University Day Poster Competition, KUET | *Khulna, Bangladesh* |
| Dec 2014 | **Position 75**, ACM ICPC 2014 Asia Regional Dhaka Site | *Dhaka, Bangladesh* |
| Jul 2014 | **Position 24**, IUT 6th National ICT Fest 2014 Programming Contest | *Dhaka, Bangladesh* |
| Jun 2012 | **2nd Runner-up**, GPIT CSE Festival 2012 Programming Contest, KUET | *Khulna, Bangladesh* |

# Presentations

**On the Analysis of Adaptive-Rate Applications in Data-Centric Wireless Ad-Hoc Networks**
2021 IEEE 46th Conference on Local Computer Networks (LCN), *Edmonton, Canada*, *October 2021*.

**On Data-centric Forwarding in Mobile Ad-hoc Networks: Baseline Design and Simulation Analysis**
30th International Conference on Computer Communications and Networks (ICCCN), *Athens, Greece*, *Jul 2021*.

**NB-Cache: Non-Blocking In-Network Caching for High-Speed Content Routers**
IEEE/ACM International Symposium on Quality of Service (IWQoS), *Phoenix, AZ, USA*, *Jun 2019*.

**Data-centric Forwarding for MANETs: A Baseline Design and Evaluation**
11th NDN Retreat, University of California, Los Angeles, *LA, CA, USA*, *Mar 2019*.

**On Accessing Heterogeneous Data Items Using Network Coding in Wireless Broadcast**
University Day Poster Competition, KUET, *Khulna, Bangladesh*, *Sep 2015*.

# Publications

**BLEnD: Improving NDN Performance Over Wireless Links Using Interest Bundling**
2021 Military Communications Conference (MILCOM) [Accepted], *San Diego, CA, USA*, *Nov - Dec 2021*.
- Md Ashiqur Rahman, Beichuan Zhang

**On the Analysis of Adaptive-Rate Applications in Data-Centric Wireless Ad-Hoc Networks**
2021 IEEE 46th Conference on Local Computer Networks (LCN), *Edmonton, Canada*, *Oct 2021*.
- Md Ashiqur Rahman, Beichuan Zhang

**On Data-centric Forwarding in Mobile Ad-hoc Networks: Baseline Design and Simulation Analysis**
30th International Conference on Computer Communications and Networks (ICCCN), *Athens, Greece*, *Jul 2021*.
- Md Ashiqur Rahman, Beichuan Zhang

**Enabling Named Data Networking Forwarder to Work Out-of-the-box at Edge Networks**
2020 IEEE International Conference on Communications Workshops (ICC Workshops), *Virtual*, *Jun 2020*.
- Teng Liang, Ju Pan, Md Ashiqur Rahman, Junxiao Shi, Davide Pesavento, Alexander Afanasyev, Beichuan Zhang

**Cooperative Cache Transfer-based On-demand Network Coded Broadcast in Vehicular Networks**
ACM Transaction on Embedded Computing Systems, *ACM*, *May 2019*.
- G. G. MD. Nawaz Ali, MD. Noor-A-Rahim, Md. Ashiqur Rahman, Beshah Ayalew, Peter H. J. Chong, Yong Liang Guan

**An Efficient Cross-layer Coding-assisted Heterogeneous Data Access in Vehicular Networks**
2018 IEEE International Conference on Communications (ICC), *Kansas City, MO, USA*, *May 2018*.
- GGM Nawaz Ali, Md Noor-A-Rahim, Md A Rahman, Syeda Khairunnesa Samantha, Peter HJ Chong, Yong Liang Guan

**Efficient Real-time Coding-assisted Heterogeneous Data Access in Vehicular Networks**
IEEE Internet of Things Journal, *IEEE*, *Apr 2018*.
- G. G. Md. Nawaz Ali, Md. Noor-A-Rahim, Md. Ashiqur Rahman, Syeda Khairunnesa Samantha, Peter Han Joo Chong, Yong Liang Guan

**Efficient coding based heterogeneous data access in vehicular networks**
2017 IEEE International Conference on Communications (ICC), *Paris, France*, *May 2017*.
- G. G. M. Nawaz Ali, Md. A. Rahman, S. K. Samantha, Yumeng Gao, Peter H.J. Chong, Y. L. Guan

**On Accessing Heterogeneous Data Items Using Network Coding in Wireless Broadcast**

2016 IEEE 84th Vehicular Technology Conference (VTC-Fall), *Montreal, QC, Canada*, *Sep 2016*.

- Md. Ashiqur Rahman, G. G. Md. Nawaz Ali, Yumeng Gao, Syeda K. Samantha, Peter H. J. Chong

**On Scheduling Real-Time Multi-item Query with Network Coding in Multi-RSU VANETs**

2016 IEEE 22nd Intl. Conf. on Embedded and Real-Time Computing Systems and Applications (RTCSA), *Daegu, S. Korea*, *Aug 2016*.

- Md. A. Rahman, G.G.M. Nawaz Ali, Peter H.J. Chong, S.K. Samantha, M.F. Muntasir, C. Chen

**On Efficient Data Dissemination Using Network Coding in Multi-RSU VANETs**

2016 IEEE 83rd Vehicular Technology Conference (VTC Spring), *Nanjing, China*, *May 2016*.

- G. G. Md. Nawaz Ali, Md. Ashiqur Rahman, Peter Han Joo Chong, Syeda Khairunnesa Samantha