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# Masfiqur Rahaman

## Education

**2016 - 2021, Bangladesh University of Engineering and Technology (BUET)**
Bachelor of Science in Computer Science and Engineering

## Research Interests

My research interests encompass embedded systems, ubiquitous computing, and data mining in the application domain of healthcare, environmental sensing, and crowd guidance.

## Publications

- Md. Harunur Rashid Bhuiyan, Iftekhar Morshed Arafat, **Masfiqur Rahaman**, Tarik Reza Toha, and Shaikh Md Mominul Alam. Vibration Based Diagnosis of Circular Knitting Machine. *EAI MobiQuitous*, 2022. [Accepted] [PDF]

- Tarik Reza Toha, **Masfiqur Rahaman**, Saiful Islam Salim, Mainul Hossain, Arif Mohaimin Sadri, and A. B. M. Alim Al Islam. DhakaNet: Unstructured Vehicle Detection using Limited Computational Resources. *IEEE International Conference on Data Mining (ICDM)*, 2021. DOI: 10.1109/ICDM51629.2021.00172 [PDF]

- Saiful Islam Salim, Najla Abdulrahman Al-Nabhan, **Masfiqur Rahaman**, Nafisa Islam, Tarik Reza Toha, Jannatun Noor, Adnan Quaium, Aaiyeesha Mostak, Mainul Hossain, Md. Masum Mushfiq, and A. B. M. Alim Al Islam. Human-Survey Interaction (HSI): A Study on Integrity of Human Data Collectors in a Mass-Scale Hajj Pilgrimage Survey. *IEEE Access*, 2021. DOI: 10.1109/ACCESS.2021.3103046 [PDF]

- Saiful Islam Salim, Uday Kamal, Adnan Quaium, Mainul Hossain Yaad, **Masfiqur Rahaman**, Nazmul Hasan Sakib, Md Toki Tahmid, and A. B. M. Alim Al Islam. Long-Range Low-Cost Networking for Real-Time Monitoring of Rail Tracks in Developing Countries. *International Conference on Information & Communication Technologies and Development (ICTD)*, 2022. [Accepted] [PDF]

- Tarik Reza Toha, Najla Abdulrahman Al-Nabhan, Saiful Islam Salim, **Masfiqur Rahaman**, Uday Kamal, and A.B.M. Alim Al Islam. LC-Net: Localized Counting Network for Extremely Dense Crowds. *Applied Soft Computing*, Vol. 123, 2022. DOI: 10.1016/j.asoc.2022.108930 [PDF]

- Md. Harunur Rashid Bhuiyan, Iftekhar Morshed Arafat, **Masfiqur Rahaman**, Tarik Reza Toha, and Shaikh Md Mominul Alam. Towards devising a vibration based machinery health monitoring system. *Materials Today: Proceedings*, 2022. DOI: 10.1016/j.matpr.2021.08.270 [PDF]

- Md Shihabul Islam, **Masfiqur Rahaman**, and A. B. M. Alim Al Islam. Securing Firearms inside An Arsenal through Using A Remotely-Operated Sensor-Based Safety Mechanism. *International Conference on Networking, Systems and Security (NSysS)*, 2021. DOI: 10.1145/3491371.3491377 [PDF]

- Md. Masum Mushfiq, Tarik Reza Toha, Saiful Islam Salim, Aaiyeesha Mostak, **Masfiqur Rahaman**, Najla Abdulrahman Al-Nabhan, Arif Mohaimin Sadri, and A. B. M. Alim Al Islam. To Lane or Not to Lane? - Comparing On-Road Experiences in Developing and Developed Countries using a New Simulator RoadBird. [Under review] [PDF]

- **Masfiqur Rahaman**, Najla Abdulrahman Al-Nabhan, Jannatun Noor, Saiful Islam Salim, Nafisa Islam, Tarik Reza Toha, Adnan Quaium, Aaiyeesha Mostak, Mainul Hossain, Md. Masum Mushfiq, and A. B. M. Alim Al Islam. Ranking Major Problems and Vulnerable Pilgrims in Hajj. [Under review] [PDF]

- Adnan Quaium, Najla Abdulrahman Al-Nabhan, **Masfiqur Rahaman**, Saiful Islam Salim, Tarik Reza Toha, Jannatun Noor, Mainul Hossain, Md Shihabul Islam, Ishrat Jahan, and A. B. M. Alim Al Islam. Towards Associating Negative Experiences and Recommendations Reported by Hajj Pilgrims in a Mass-Scale Survey. [Under review] [PDF]

- **Masfiqur Rahaman**, MD. Nazmul Hasan Sakib, Nafisa Islam, Saiful Islam Salim, Uday Kamal, Raihan Rasheed, and A. B. M. Alim Al Islam. Let's Vibrate with Vibration: Augmenting Structural Engineering with Low-Cost Vibration Sensing. [Under review] [PDF]

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## Research Experience

- **Leveraging Multi-Sensor and Multi-Hop Networking for Devising A Long-Range Rail-Line Monitoring System**
  **Supervisor:** Dr. A. B. M. Alim Al Islam, Professor, Dept. of CSE, BUET
  - Designed an embedded hardware consisting of an array of piezoelectric sensors to collect vibration response of a rail track.
  - Integrated a LoRa module to the embedded hardware for multi-hop networking between nodes and train.
  - A conference paper is accepted in ICTD 2022.
- **Impact of Environmental Heat on Health of Rickshaw Pullers**
  **Supervisor:** (1) Dr. A. B. M. Alim Al Islam, Professor, Dept. of CSE, BUET; (2) Dr. Tauhidur Rahman, Assistant Professor, Halcolu Data Science Institute, UCSD; (3) Dr. Jamie T. Mullins, Assistant Professor, Dept. of Resource Economics, UMass Amherst; (4) Ariane Middel, Assistant Professor, School of Arts, Media and Engineering, Arizona State University
  - Developed an environmental sensing module to monitor different environmental parameters, such as temperature, humidity, particulate matters in the air, $CO_2$, $NO_x$, $O_3$, LPG, etc.
  - Developed a health condition sensing module to sense heart bit rate, oxygen saturation, electrodermal conductivity, body temperature, etc.
  - Working on data accumulation from rickshaw pullers and analyzing the data.
  - A poster has been submitted to NSysS 2022.
- **Human-Survey Interaction (HSI): A Study on Integrity of Human Data Collectors in a Mass-Scale Hajj Pilgrimage Survey**
  **Supervisor:** Dr. A. B. M. Alim Al Islam, Professor, Dept. of CSE, BUET
  - Performed a mass-scale data collection over 988 Hajj/Umrah pilgrims.
  - Recruited, trained, and managed 58 data collectors to conduct the survey perfectly.
  - Ensured the credibility of responses and integrity of the data collectors through quantitative and collaborative analysis.
  - A journal paper is published in IEEE Access (DOI: 10.1109/ACCESS.2021.3103046).
- **Unstructured Vehicle Detection using Limited Computational Resources**
  **Supervisor:** Dr. A. B. M. Alim Al Islam, Professor, Dept. of CSE, BUET
  - Prepared a traffic image dataset: captured and labelled street-view traffic images.
  - Qualitatively analyze the training and testing performance of a proposed Deep CNN architecture on the prepared dataset.
  - A conference paper is published in ICDM (DOI: 10.1109/ICDM51629.2021.00172).
- **Localized Counting Network for Extremely Dense Crowds**
  **Supervisor:** Dr. A. B. M. Alim Al Islam, Professor, Dept. of CSE, BUET
  - Deployed a Deep CNN-based crowd counting module (implemented on an embedded system) in the crowded streets of Dhaka.
  - A journal paper is published in Applied Soft Computing (DOI: 10.1016/j.asoc.2022.108930).
- **Image Dataset Preparation for Extremely Dense Crowd of Hajj Pilgrimage**
  **Supervisor:** Dr. A. B. M. Alim Al Islam, Professor, Dept. of CSE, BUET
  - Collected image data from highly crowded pilgrimage locations in Saudi Arabia.
  - Identified similar looking images with the help of human expertise.
  - Currently working on developing an automated tool to cluster similar looking images.
- **Leveraging Computer Vision Techniques to Identify Anomalous Crowd Behavior in Hajj Pilgrimage**
  **Supervisor:** (1) Dr. Sriram Chellappan, Professor, Dept. of CSE, University of South Florida; (2) Dr. A. B. M. Alim Al Islam, Professor, Dept. of CSE, BUET
  - Detect anomalous crowd near gates of different Hajj pilgrimage sites in Saudi Arabia.
  - A manuscript is submitted to Heliyon.
- **Data Poisoning Attacks against Linear Regression**
  **Supervisor:** Dr. Shohrab Hossain, Professor, Dept. of CSE, BUET
  - Performed data poisoning attacks on regression model for different poisoning rate.
  - Improved state-of-ther-art attack model and evaluated performance on 10 datasets.
  - A manuscript is under preparation.

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## Work Experience

**Research Assistant**
NeC Lab, Department of CSE, BUET, Bangladesh (March 2021 - Current)

## Achievements & Awards

- International AI-based Dhaka Traffic Detection Challenge, 2020, won 5th position among 29 teams from different universities.
- International Conference on Networking, Systems and Security (NSysS), 2021, Runner-up in Student poster presentation session
- Inter College Mathematical Olympiad, 2014, won 3rd position in regional stage
- ICT Fellowship, ICT Division, Government of Bangladesh, (2021-2022)
- Technical Scholarship, BUET, Bangladesh, (2016-2020)

## Skills & Expertise

- **Programming:** C, C++, Python, Java, Bash, PHP, SQL, HTML, CSS, Intel-8086 Assembly
- **Deep Learning Frameworks:** Tensorflow, Pytorch, Scikit-Learn
- **Software Design Tools & Frameworks:** Amazon EC2, MySQL, Apache, Laravel
- **Simulation & Design Tools:** MATLAB, Proteus, AutoCAD
- **Hardware:** PCB prototyping, Arduino, Raspberry pi
- **Research Proposal Writing:** Have experience in writing proposals for different local and international grants and awards (NIH, Wellcome, Google South & Southeast Asia Research Awards, etc.)

## Highlighted Undergrad Projects

- **Predicting Human Count Through Structural Vibration Sensing:** Developed a vibration sensing module for human occupancy estimation in closed environment. [Poster]
- **Vehicle Detection in Highly Congested Traffic of Dhaka City *(Computer Vision)*:** Classified 21 types of vehicle in the streets of Dhaka city. [Video] [Poster]
- **Stack Exchange Question Classification App *(NLP)*:** Collects post from Stack Exchange, Classify question to different category, i.e., Culture, Science, etc. [App, Github, Video]
- **Tough Game *(Reinforcement Learning)*:** Designed and implemented a 2D gaming environment, Trained the agent to avoid multiple enemy blocks. [Github, Video]
- **GSM Based Fire Alarm:** Implemented an MQ2 gas sensor circuit, Able to send message to phone on fire event. [Video]
- **C Compiler:** Developed a compiler for a subset of C language covering variables, conditions, functions, recursions and symbol table. Performed lexical analysis using Flex and syntactic analysis using Bison. [Github]
- **Line Following Bot:** Design and hardware implementation of a robot capable of following a black line using Arduino. [Video]
- **MIPS 4 Bit Processor:** Design and simulation of a 4bit computer capable of executing 12 different instructions using Logisim simulator.
- **4 bit Breadboard ALU:** Design and hardware implementation of a 4 bit Arithmetic and Logic Unit on breadboard.
- **File Compressor:** Implemented Huffman encoding for text file compression and decompression using C.

## References

- Dr. A. B. M. Alim Al Islam
  Professor, Dept. of Computer Science and Engg., BUET, Dhaka, Bangladesh
  Email: alim_razi@cse.buet.ac.bd
  Homepage: https://cse.buet.ac.bd/faculty/facdetail.php?id=razi

- Dr. Sriram Chellappan
  Professor, Dept. of Computer Science and Engg., University of South Florida, Florida, United States
  Email: sriramc@usf.edu
  Homepage: https://cse.usf.edu/~sriramc/

- Dr. Arif Mohaimin Sadri
  Assistant Professor, School of Civil Engineering & Environmental Sciences (CEES), University of Oklahoma, Oklahoma, United States
  Email: sadri@ou.edu
  Homepage: https://sites.google.com/site/arifmsadri/