# Mehedi Hasan

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## Research Interest

I am a **Software Engineer** specializing in Research at Chaldal. Outside of work, I am involved in academic research. My primary area of interest is **Human Computer Interaction**. I'm also passionate about **Visualization**, **VR/AR**, and **Ubiquitous** technologies. Through my work experience, I've gained expertise and interest in **Algorithms** and **Systems**, including **Networking**, **Distributed Systems** and **System Design**.

## Education

**BSc in Computer Science and Engineering** **May 2023**
Bangladesh University of Engineering and Technology (BUET), *Dhaka, Bangladesh*

Notable Courses:

CSE 305 - Computer Architecture
CSE 321 - Computer Networks
CSE 471 - Machine Learning
CSE 461 - Algorithm Engineering
CSE 313 - Operating System
CSE 405 - Computer Security
CSE 309 - Compiler
CSE 463 - Introduction to Bioinformatics
CSE 409 - Computer Graphics
MATH 247 - Linear Algebra
MATH 145 - Calculus and Coordinate Geometry
HUM 477 - Sociology for Science and Technology

## English Proficiency

**TOEFL iBT** **December, 2023**
*Reading: 25, Listening: 28, Speaking: 30, Writing: 29* *Total: 112*

## Publications

- Mubassira, T., **Hasan, M.**, Sharmin, S. (2024). **"Reading the Mind's Eye: Detecting Trauma-Vulnerability in Individuals by Analyzing Attention Through Eye-Tracking"**. In: Zaslavsky, A., Ning, Z., Kalogeraki, V., Georgakopoulos, D., Chrysanthis, P.K. (eds) Mobile and Ubiquitous Systems: Computing, Networking and Services. MobiQuitous 2023 (EAI Mobiquitous 2023). DOI: 10.1007/978-3-031-63992-0_28
- Mubassira, T., **Hasan, M.**, Mukta, J., Islam, A (2024). **"Enhancing EmoBot: An In-Depth Analysis of User Expectation and Satisfaction in An Emotion-Aware Chatbot"**. In: International Conference on Networking, Systems and Security, 2024. (Peer Reviewed)

## Research Experience

**Towards perceiving and resolving the impediments to reporting for the developing countries**
*Human Computer Interaction, Generic Reporting System* *Aug 2024 - Current*

- **DOI:** 10.1109/NSYSS2.2017.8267790
- **Live At:** ureporter.cse.buet.ac.bd
- **Supervisor:** Dr. A. B. M. Alim Al Islam, Professor, CSE, BUET
- **Collaboration:** With Tarik Reza Toha, University of North Carolina at Chapel Hill
- **Contribution:** Improved the system in collaboration with the research team

**Detecting Sentiment in Anonymous Submissions: A Study on User Report Data**
*Human Computer Analysis, Sentiment Analysis* *Sep 2024 - Current*

- **Supervisor:** Dr. A. B. M. Alim Al Islam, Professor, CSE, BUET
- **Contribution:** Performed sentiment analysis on crowd sourced anonymous reports

**Fine-Tuning GPT-2 for Bengali Auto Text Completion Using Literary Corpus: A Qualitative Analysis**
*Natural Language Processing, Machine Learning* *Jan 2023 - Mar 2023*

- **Presentation:** Slides
- **Supervisor:** Dr. Mohammed Eunus Ali, Professor, CSE, BUET
- **Contribution:** Fine-tuned GPT-2 with a Bengali literature corpus to improve auto text completion

## Industry Experience

**Chaldal Ltd.** **June 2023 – Present**
*R&D*

ASAP Delivery

- Designed an algorithm to **calculate geographical area overlapping a route**, through which a driver can detour for a specific slack time period without impacting other deliveries in the route
- **Impact:** Grocery delivery within 20 to 40 minutes in Dhaka

Last Mile Routing Algorithm

- Designed a new **routing algorithm** using different heuristic and probabilistic search methods
- **Impact:** Increased on-time delivery by 15%

Traffic Estimate

- Developed a **timeseries database** and supervised an interpolation project using **spatio-temporal models** to fill missing traffic speed data.
- **Impact:** Improved estimates for Dhaka roads by 53.53% for cycles, 28.83% for motorbikes, and 28.73% for vans

Automate Task Assignment

- Designed and deployed an algorithm for solving the **task assignment problem** via an API endpoint, integrated into a system for periodic task assignment within the warehouse.
- **Impact:** Increased on-time dispatch by 16%

*System Design*

Micro-services communication

- Designed and implemented a **gRPC-based communication system** across three services to transmit information at specific events, tested it in a QA environment, and oversaw its system-wide deployment.
- **Impact:** Decreased driver idle time by 7 minutes

Spatial Database Model

- Developed a **spatial database model** which can store polygonal area and query with intersecting geolocation
- **Impact:** Enhanced vehicle utilization by restricting certain vehicle types in specific areas

Re-Modeling Task Assignment system

- Designed a more efficient task assignment model, refactored existing models, redesigned the UI, and improved underlying logic.
- **Impact:** Increased picker's efficiency by 1.2x

## Achievements

- $5^{th}$/50 teams Code Samurai Hackathon 2022
- $8^{th}$/86 teams BUET CSE FEST IUPC 2019
- $10^{th}$/84 teams DUET IUPC 2019
- $13^{th}$/59 teams National Programming Contest
- Hackerrank: Problem Solving (Intermediate)
- Codeforces Max Rating: Expert (1871)

## Selected Projects

**Trapped (Game)**
*Unity Game Engine, C#*
Developed a 2D action and puzzle platformer

**P5js-Raycasting**
*Javascript, HTML*
Implemented raycasting using p5-js library for visualization

**xv6 Memory Management (OS)**
*Linux, C, bash, kernel programming*
Enhanced the xv6 operating system by adding support for memory management.

**Simple C Compiler**
*C, YACC, Bison*
Developed a C compiler capable of reading small C programs and generating corresponding machine code for execution.

**CNN from Scratch**
*Python*
A simple implementation of a convolutional neural network using Python and NumPy, trained on the NumtaDB dataset to recognize Bengali digits.

**Chaldaal (Web App)**
*django/python, oracle/sql, HTML/CSS, JS*
Created an online grocery shop similar to chaldal.com

**Smart Construction Work System (Web App)**
*Django, SQLite, HTML/CSS, JS*
Developed a citywide smart construction management system