

# Irtesam Mahmud Khan

LECTURER · CSE, UIU

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## Education

### Bangladesh University of Engineering and Technology(BUET)

Dhaka - 1000

M.SC. IN COMPUTER SCIENCE AND ENGINEERING

2021 - present

- Advisor: Dr. Mohammad Sohel Rahman

### Bangladesh University of Engineering and Technology(BUET)

Dhaka - 1000

B.SC. IN COMPUTER SCIENCE AND ENGINEERING

2016 - 2021

- CGPA: 3.87/4.00(Top 8% among a class of 143 graduating students)
- Major CGPA: 3.99/4.00
- Thesis Supervisor: Dr. Mohammad Sohel Rahman

### Chittagong College

Chittagong

HIGHER SECONDARY CERTIFICATE

2015

- GPA: 5.00/5.00

### Chittagong Collegiate School

Chittagong

SECONDARY SCHOOL CERTIFICATE

2013

- GPA: 5.00/5.00

## Professional Experience

2021-Present

**Lecturer**, Department of CSE, United International University

## Research Experience

### Prediction of Biophysical Properties of Therapeutic Antibodies from Antibody Sequences

Undergraduate Thesis

ADVISOR: DR. MOHAMMAD SOHEL RAHMAN

2019-2020

- We employed several classical techniques such as n-gram, n-gapped dipeptides, and PSF, to extract features from antibody variable region sequences.
- Feature selection techniques, such as SVM-RFE, were deployed and the selected features were used to train several machine learning models.
- Our models could predict three biophysical properties from only sequences with remarkably high accuracy.

### COVID-19 in China: Risk Factors and R0 Revisited

Acta Tropica

ADVISOR: DR. MOHAMMAD SOHEL RAHMAN, DR. UBYDUL HAQUE

2020-2021

- We employed the K-means clustering algorithm to divide all the prefectures in China into three different regions.
- For the COVID-19 pandemic, reproduction number  $R_0$  was calculated using the SIR model and Sequential Monte Carlo method.
- Finally,  $R_0$  of different regions were compared with respect to the variation of risk factors and temperature profile.

### A Computational Modeling Study of COVID-19 in Bangladesh

AJTMH

ADVISOR: DR. MOHAMMAD SOHEL RAHMAN, DR. UBYDUL HAQUE

2020-2021

- We considered the SIR model for modeling the pandemic situation in Bangladesh.
- We varied different parameters for simulating different situations such as stricter lockdowns, better treatment facilities, etc.

### An Agent-Based Modeling of COVID-19: Validation, Analysis, and Recommendations

Cognitive Computation

ADVISOR: DR. MOHAMMAD SOHEL RAHMAN

2020-2021

- We performed simulations of the pandemic using Agent-Based Modeling.
- My contribution involved calculating the effective reproduction number( $R_t$ ) using SIR model.

## The Disproportionate Impact of COVID-19 among Undocumented Immigrants and Racial Minorities in the US

IJERPH

ADVISOR: DR. MOHAMMAD SOHEL RAHMAN, DR. UBYDUL HAQUE

2021

- We proposed machine learning techniques to identify the relation between COVID-19 cases and socio-demographic factors.
- We used several machine learning models, such as Random Forest, XGBoost, etc. to train our model and later utilized the SHAP explainer to infer the association between different socio-demographic factors with COVID-19 cases/mortality.

## A Machine Learning-based Approach for Groundwater Mapping

Natural Resources Research

ADVISOR: DR. MOHAMMAD SOHEL RAHMAN

2019-2021

- We proposed a machine learning model to predict Ground Water Level(GWL) from relevant hydrogeological factors.
- We employed a two-stage approach, where we first employed a classification model to identify the suitable abstraction technology for the point of interest and subsequently predict the actual GWL using the appropriate Random Forest regressor.
- We achieved a remarkable AUC of 96% for classification, moreover, the regression model also performed reasonably well.

## Predicting protein-peptide binding sites: an LLM based approach

Graduate research

ADVISOR: DR. MOHAMMAD SAIFUR RAHMAN

2022

- We used ProtBert, a large language model pre-trained on billions of amino acids, to extract features from the sequences.
- Later, we trained a model, comprising both CNN and RNN, to predict the binding sites.
- Our results were on par with the state-of-the-art methods that take only sequence-related information as input, achieving an MCC score of 0.39.

## Attention-based Host Intrusion Detection System

Graduate research

ADVISORS: DR. MOHAMMAD SOHEL RAHMAN, DR. A. B. M. ALIM AL ISLAM

2022-2023

- We proposed a hierarchical attention model for detecting intrusion from system call traces.
- We stacked two bidirectional GRU layers to extract higher level features and achieved an AUC of 96%.

## Imputing missing ground water level data with deep learning

Graduate research

ADVISORS: DR. MOHAMMAD SOHEL RAHMAN

2023-Present

- We proposed a hybrid model, comprising 1D convolutions and stacked LSTM layers, to impute missing ground water levels.
- Our model has shown promising results so far, achieving an MAE of 0.20 for 25% missing data.

## Association of DNA Methylation with Smoking: A Deep Learning Based Approach

Graduate research

ADVISORS: DR. MOHAMMAD SOHEL RAHMAN

2023-Present

- We plan to understand the relation between smoking and DNA methylation(data obtained from Illumina 450k array). This work is currently at a preliminary stage.
- Our primary plan is to build a machine learning model and then use SHAP or some other technique for understanding association of different CpG sites with smoking phenotype.

## Publications

1. Zzaman, R. U., Nowreen, S., **Khan, I. M.**, Islam, Md. R., Ibtehaz, N., Rahman, M. S., Zahid, A., Farzana, D., Sharmin, A., & Rahman, M. S. (2021). A Machine Learning-based Approach for Groundwater Mapping. In *Natural Resources Research* (Vol. 31, Issue 1, pp. 281–299). Springer Science and Business Media LLC.  
<https://doi.org/10.1007/s11053-021-09977-4>
2. Hasan Bhuiyan, M. T., **Mahmud Khan, I.**, Rahman Jony, S. S., Robinson, R., Nguyen, U.-S. D. T., Keellings, D., Rahman, M. S., & Haque, U. (2021). The Disproportionate Impact of COVID-19 among Undocumented Immigrants and Racial Minorities in the US. In *International Journal of Environmental Research and Public Health* (Vol. 18, Issue 23, p. 12708). MDPI AG.  
<https://doi.org/10.3390/ijerph182312708>
3. Shamil, Md. S., Farheen, F., Ibtehaz, N., **Khan, I. M.**, & Rahman, M. S. (2021). An Agent-Based Modeling of COVID-19: Validation, Analysis, and Recommendations. In *Cognitive Computation*. Springer Science and Business Media LLC.  
<https://doi.org/10.1007/s12559-020-09801-w>
4. **Khan, I. M.**, Haque, U., Kaiser, S., & Rahman, M. S. (2021). A Computational Modeling Study of COVID-19 in Bangladesh. In *The American Journal of Tropical Medicine and Hygiene* (Vol. 104, Issue 1, pp. 66–74). American Society of Tropical Medicine and Hygiene.  
<https://doi.org/10.4269/ajtmh.20-0757>
5. **Khan, I. M.**, Haque, U., Zhang, W., Zafar, S., Wang, Y., He, J., Sun, H., Lubinda, J., & Rahman, M. S. (2021). COVID-19 in China: Risk Factors and R0 Revisited. In *Acta Tropica* (Vol. 213, p. 105731). Elsevier BV.  
<https://doi.org/10.1016/j.actatropica.2020.105731>

## Undergraduate Projects

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2016	Linear and Quadratic Equation Solver with C and IGraphics Library
2016	A Desktop Application for an E-commerce Site with Java JavaFX
2017	Online Marketplace with HTML/CSS/Javascript/PHP and Oracle SQL
2018	4-bit PC simulation with Logisim
2018	Smart Home Security System with ATmega32 and sensors
2019-2020	Automatic English Grammar Checker with Deep Learning: Website, Chrome Extension, Android App

## Grants

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2022-2024	<b>UIU Research Grant</b> , Institute for Advanced Research, UIU <i>Project Title: Design and development of an automated symptom checker for classifying OTC drug or doctor referral to promote rational use of medicine in Bangladesh</i>	BDT 5,00,000
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## Awards

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2020	<b>Champion</b> , Cisco Networking Academy Skills Competition
2017, 2018	<b>Dean's List Award</b> , Bangladesh University of Engineering and Technology
January 2018, July 2018, January 2019	<b>University Merit Scholarship</b> , Bangladesh University of Engineering and Technology
January 2016, January 2017, July 2017	<b>University Stipend Scholarship</b> , Bangladesh University of Engineering and Technology

## Teaching Experience

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### SELECTED INSTRUCTED COURSES

Data Mining	Fall 2023
Basic Graph Theory	Fall 2022 – Fall 2023
Software Engineering Laboratory	Spring 2023 – Fall 2023
Digital System Design	Spring 2021 – Fall 2023
Theory of Computation	Spring 2022, Summer 2022
Object Oriented Programming	Summer 2023
Structured Programming Language	Spring 2023
Structured Programming Language Laboratory	Spring 2023, Summer 2023

### MENTORING

I have mentored dozens of groups in various undergrad courses, particularly in the Software Engineering Lab, throughout my teaching career. Two of my advised groups were awarded as the best projects in the UIU CSE Project Show. I have also supervised students in their undergrad research.

## Academic Services and Development

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### DEVELOPMENT

Attended multiple workshops on Outcome Based Education(OBE).

PEER REVIEW The journals I have reviewed for:

- Scientific Reports
- BMC Public Health
- Journal of Biosafety and Biosecurity

## Skills

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**Programming Languages:** : C, C++, Java, Python, R, Javascript, HTML, CSS

**Tools:** : Git, Bash, Selenium, Proteus Circuit simulator

**Frameworks:** : PyTorch, Keras, Django, JavaFX

**Others:** : Latex, SQL, MySQL, MKDocs, ATMega32 Microcontrollers, etc.