# Md. Moynul Hasan

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## Research & Work Experience

**Research Assistant** (Full–Time)                                                     [Oct, 22 – Jul, 23]
Bangladesh University of Engineering & Technology (BUET)
Department of Naval Architecture & Marine Engineering (NAME)

- Analyzed the effect of wedge tail thickness on NACA 0021 airfoil performance, revealing that 12.5% chord length wedge tail increased lift coefficients by 60-100%.
- Predicted scantling requirements for cargo and container ships across various classification societies using ANN, achieving an impressive $R^2$ value of 0.998.
- Currently employing deep learning to predict flow field around airfoils with wedge tail sections.

**Undergraduate Research Work**                                                     [Apr, 21 – May, 22]
Thesis Title: *"Predicting Aerodynamic Characteristics of Airfoils Using Artificial Neural Network"*

- Used ANN to predict lift coefficient ($C_L$) and drag coefficient ($C_D$) of five NACA airfoils.
- Achieved high prediction accuracy with *RMSE* < 0.12 for $C_L$ and < 0.025 for $C_D$.
- Validated results using RANS-CFD simulations and experimental data, demonstrating agreement in stall shape and aerodynamic characteristics at angle of attacks ranging from 0° to 30°.

**Machine Learning Engineer Intern**                                                     [Aug, 21 – Oct, 21]
Animo.Ai

- Conducted Principal Component Analysis (PCA) and T-distributed Stochastic Neighbor Embedding (t-SNE) on datasets to extract relevant features and visualize data patterns.
- Conducted time series analysis on datasets using machine learning algorithms.
- Applied techniques such as auto-regressive integrated moving average (ARIMA), long short-term memory (LSTM), and other models to make time series predictions.

## Publications

1. **Md. Moynul Hasan**, Md. Mashiur Rahaman and N. M. Golam Zakaria. "Fast aerodynamics prediction of wedge tail airfoils using multi-head perceptron network", Arabian Journal for Science and Engineering, 2023. **(Submitted)**
   - Developed an MHP network method to predict the aerodynamics of wedge tail airfoils
   - Achieved high prediction accuracy with $R^2$ score close to 1 on test data
   - Significantly improved prediction speed by 125 times compared to conventional computational fluid dynamics (CFD) techniques
2. **Md. Moynul Hasan**, Md. Mashiur Rahaman and N. M. Golam Zakaria. "The Effects of Wedge Tail Thickness on NACA 0021 Airfoil Performance", Journal of Maritime Research (JMR), 2023. **(Accepted)**
   - Analyzed effects of wedge tail thickness on NACA 0021 airfoil performance through two-dimensional RANS-CFD simulations using ANSYS
   - Determined the highest $C_L$ increase (60% ~ 100%) for a 12.5% wedge tail thickness
3. **Md. Moynul Hasan**, Mohammad Fahim Faisal, Md. Mashiur Rahaman and N.M. Golam Zakaria. "Predicting Aerodynamic Characteristics of Airfoils Using Artificial Neural Network", Journal of Aerospace Engineering, 2022. **(Under Review)**
   - Developed an ANN-based method to predict the aerodynamic characteristics of airfoils, including NACA 0012, NACA 0015, NACA 0018, NACA 0021, and NACA 0025
   - Trained the ANN model to achieve an *RMSE* of less than 0.12 for $C_L$ and 0.025 for $C_D$
4. Md. Latifur Rahman, Nusrat Binta Nizam, Prasun Datta, **Md. Moynul Hasan**, Taufiq Hasan, and Mohammed Imamul Hassan Bhuiyan. "A Wavelet-CNN Feature Fusion Approach for Detecting COVID-19 from Chest Radiographs". In Proceedings of the 11th International Conference on Electrical and Computer Engineering (ICECE), 2020.
   - Proposed an automatic chest x-ray image classification model for detecting COVID-19
   - SVM classifier achieved high accuracy (97.73%), sensitivity (97.84%), specificity (97.73%), F1 score (97.73%), and precision (98.79%) with a wavelet and MobileNetV2 feature

## Poster Presentation

**Title:** Aerodynamics Prediction of Airfoil using Artificial Neural Network                                                     [ISCMT, 22]
Authors: **Md. Moynul Hasan**, Md. Mashiur Rahaman and N. M. Golam Zakaria

- Used ANN to predict lift coefficient ($C_L$) and drag coefficient ($C_D$) of NACA 0012 airfoil.

- Achieved high prediction accuracy with *MSE* of 0.0144 and 0.00062 for $C_L$ and $C_D$, respectively.
- Validated results using RANS-CFD simulations and experimental data, demonstrating agreement in stall shape and aerodynamic characteristics at angle of attacks ranging from 0° to 30°.

## Education

| | |
|---|---|
| BSc in Naval Architecture & Marine Engineering (NAME) | [Feb, 17 – Aug, 22] |
| Bangladesh University of Engineering & Technology (BUET) | CGPA: 2.93/4.00 |

## Projects

**Title:** Ship Scantling requirements prediction                                            [Oct, 22 – Present]
- Developed an Artificial Neural Network (ANN) model to predict structural strength requirements for cargo & container vessels using ships' rule length, breadth, and draft.
- Predicted scantling requirements for cargo and container ships across various classification societies using ANN, achieving an impressive $R^2$ value of 0.998.
- Improved the speed compared to the empirical formula used by classification societies.

**Title:** Speaker Recognition System                                            [Jun, 22 – Jul, 22]
- Generated a voice record dataset to train a machine learning model.
- Achieved almost 99% accuracy in speaker recognition with the trained model.

**Title:** Design of a General Cargo Ship Of 2500 Tonnes Cargo Capacity                    [Jul, 19 – Dec, 20]
- Designed a 2500-tonne general cargo ship for Dhaka-Chittagong-Dhaka route.
- Carried out the structural calculations and constructed different structural plans for construction.
- Performed Hydrostatic calculation, Scantling, Tank capacity calculation.
- Submitted the project to the Department of Naval Architecture & Marine Engineering, BUET as a requirement for the Ship Design Project and Presentation course.

**Title:** Obogoto: An app to inform about COVID-19                                            [Mar, 20 – Mar, 20]
- Participated in the Obogoto app project promoting COVID-19 awareness in Bangladesh.
- Contributed to data collection and data analysis tasks for the project.

## Industrial Training

Industrial Trainee, Khulna Shipyard Ltd                                            [Jan, 20 – Feb, 20]
- Gained comprehensive experience in industrial practices, including engineering project management, product fabrication, shipbuilding techniques, and ship-repairing processes.

## Technical Skills

- **Engineering software:** AutoCAD, Rhinoceros 3D, ANSYS, OpenFoam
- **Languages:** Python, MATLAB, C++, Fortran
- **ML library:** TensorFlow, Keras, Scikit-learn, OpenCV
- **Data analysis:** NumPy, Pandas, MS Excel
- **Data visualization:** Matplotlib, Seaborn, OriginPro, Paraview, Tecplot
- **Writing:** LaTeX, MS Word

## Test Scores

| **GRE** | Quantitative | Verbal | AWA | |
|---|---|---|---|---|
| Score | 161 | 143 | 3.0 | |

| **TOEFL**[iBT] | Total | Reading | Listening | Speaking | Writing |
|---|---|---|---|---|---|
| Score | 96 | 23 | 27 | 20 | 26 |

## Honors & Awards

- General Scholarship in Higher Secondary Certificate examination                    [2017 – 2022]

## Online Courses

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|---|---|
| - Machine Learning | DeepLearning.Ai |
| - Deep Learning Specialization | DeepLearning.Ai |
| - TensorFlow Developer Professional Certificate | DeepLearning.Ai |
| - A Hands-on Introduction to Engineering Simulations | CornellX |
| - MATLAB and Octave for Beginners | EPFLx |