Bodruzzaman Khan

Sylhet, Bangladesh

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EDUCATION

Master of Science, Agricultural Construction and Environmental Engineering, **Feb. 2024**
Sylhet Agricultural University, Sylhet

- **3.962/4 CGPA**
- **Thesis Title: Design of Sylhet City as A Sponge City to Control Flood Water** *(This thesis was recognized by the **Ministry of Science and Technology**, Government of the People's Republic of Bangladesh, and awarded the prestigious **NST Fellowship**).*
  - Implemented custom machine learning models for land use and land cover (LULC) classification using satellite imagery over three decades (2003–2023) and prediction for the next decade.
  - Digitalized the layout of the study area (roads, canals, drains).
  - Analyzed hydrological parameters and design storm events.
  - Conducted geospatial analysis to understand spatial patterns and trends.
  - Simulated urban runoff and assessed potential flooding scenarios.
  - Examined the effect of LULC change on stormwater runoff and drainage systems.
  - Evaluated the performance of existing and projected stormwater drainage systems.
  - Assessed the performance of sponge/low impact development (LID)/nature-based solutions in managing urban flooding.
  - Designed a modified stormwater drainage system to control floodwater.
  - Designed an eco-friendly landscape for the study area to facilitate ecological benefits and sustainable water management.
  - **Tools employed:** *Google Earth Engine, SketchUp, Python, Machine learning, Ensemble learning, Artificial Neural Network, Pandas, Matplotlib, Numpy, Seaborn, EPA SWMM 5.2, MOLUSCE, ArcMap, QGIS, Grass GIS, Google Earth Pro, Google Earth, Microsoft Excel*
- **Coursework:** *Advanced AutoCAD, Advanced Environmental Modeling And GIS, Advanced Engineering Mathematics, Advanced Statistics, Design of Hydraulic and Foundation Structure, Construction Management, Soil Engineering, Advanced Concrete Technology, Water and Wastewater Treatment, Packaging and Storage Structure Engineering*

Bachelor of Science, Agricultural Engineering and Technology, **Jan. 2022**
Sylhet Agricultural University, Sylhet

- **3.846/4 CGPA**
- **Project Title: Effect of soil texture on the performance of agricultural machinery in Sylhet**
  - Field and laboratory-based research on the performance of agricultural machinery on various land types.
  - Gathered relevant qualitative and quantitative data and samples from different agricultural fields in Sylhet, Bangladesh.
  - Interpreted soil textural classes in terms of machine performance.
  - Implemented a Python program for soil textural classes using the Pandas module, getTexture library, and spreadsheet application.
  - Developed a user-friendly graphical user interface (GUI) for the classification of soil textural classes
  - **Machines and Tools employed:** *Combine harvester, Hydrometer analysis, Python, Pandas, Tkinter, Custom Tkinter*
- **Coursework:** *Engineering Mathematics, Differential Equations, Vector calculus, Numerical analysis, Computer Programming (C, HTML, CSS), DBMS, AutoCAD, Engineering Mechanics, Electrical Engineering, Agricultural Power, Agricultural Machinery, Agricultural Mechanization, Strength of Materials, Materials and Cost Estimation, Soil Mechanics, Foundation Engineering, Environmental Engineering, Fluid Mechanics, Irrigation and Drainage Engineering, Groundwater Engineering, Hydraulics, Meteorology, Soil Science, Economics, Statistics, Food Science and Engineering*

PUBLICATIONS

Peer-reviewed Articles

1. **Khan, Bodruzzaman**, et al. "Bayesian optimized multimodal deep hybrid learning approach for tomato leaf disease classification." ***Scientific Reports*** 14.1 (2024): 21525. https://doi.org/10.1038/s41598-024-72237-x
2. Designing **sponge landscape** using **machine learning, remote sensing, and hydrologic-hydraulic simulation**: A sustainable flood mitigation approach for Shahjalal Uposhahar (1st Author) *Manuscript Writing Phase*
3. Integrated analysis of **soil physical properties** and combine harvester efficiency: A composite model from correlation trends (3rd Author) | *Smart Agricultural Technology* *In Review*

4. A **hybrid deep learning** model for power outage prediction (2nd Author) | *Journal to submit: IEEE Transactions on Smart Grid Under Manuscript Writing*
5. Prediction of **flash floods** to avoid devastating impact on rice **(**Submitted to "*Computers and Electronics in Agriculture" journal)*
6. Comparing different **machine learning** models for forecasting temperature and rainfall pattern of the Sylhet region.

On-going Research

1. A novel **vision transformer** framework for fish species identification (from scratch) Coding Stage
2. **Physics informed machine learning** for prediction of battery cycle life. Data Collection Stage

Book Chapter Contribution

- Book: **Annals of Biosolar** | **Co-author** | Contributing Chapter: **Application of ML in Biosolar** *Writing Phase*

I am currently doing collaborative research with esteemed researchers from **Cornell University**, **Columbia University** in The City of New York, and the **University of Science and Technology of China**.

WORK EXPERIENCE

Product Development Executive **March 2024–June 2024**
Staff Asia - Sylhet

- Supported product development by conducting comprehensive market and competitor analyses to drive the creation of innovative product strategies.
- Applied strategic thinking to develop and refine product concepts, ensuring they met market demands and aligned with market needs and organizational objectives.
- Collaborated across departments in a corporate setting to execute product strategies, enhancing overall business growth and product performance.

Research Assistant **July 2019–Feb. 2024**
Sylhet Agricultural University - Agricultural Construction and Environmental Engineering Lab

- Pioneered the establishment of hydrological information and comprehensive geographic shapefiles for Sylhet City, addressing a significant gap in the region's information infrastructure.
- Designed an environmentally friendly landscape plan for Sylhet city, meticulously addressing the potential challenges within its drainage system.
- Implemented sustainable flood mitigation strategies by incorporating various green infrastructure concepts to adeptly manage urban flooding in Sylhet.
- Employed supervised classification in the development of land cover models, integrating indices such as EVI, NDVI, NDBI, and MNDWI.
- Established a robust forecasting system for climatic parameters through time-series analysis for the Sylhet region.
- Conducted an in-depth analysis of soil physical properties, including soil texture, porosity, bulk density, moisture content, and soil bearing capacity, to assess their impact on the performance of agricultural machinery. Utilized laboratory methods to accurately identify these soil attributes and subsequently correlated them with machine performance.
- Identified and addressed challenges hindering effective machinery operation in Sylhet, Bangladesh.

SKILLS & INTERESTS

- **Programming Languages:** Python (Advance), HTML, CSS, SQL, C, JavaScript, Matlab (Basic), Object Oriented Programming
- **Data science and Artificial Intelligence:** Machine Learning (Supervised & Unsupervised Learning), Ensemble Learning, Deep Learning (CNN, RNN, LSTM, Transformer, Vision Transformer), Hybrid Learning, Computer Vision, Image Processing
- **Tools:** Numpy, Pandas, Seaborn, TensorFlow, Keras, OpenCV, SciPy, Matplotlib, Plotly, Jupyter Notebooks, Google Colab, GitHub, Power BI, Office Suite
- **Remote sensing and GIS:** Google Earth Engine, ArcGIS, QGIS, Grass GIS, Google Earth Pro, Google Earth
- **Design and Engineering application:** EPA SWMM, AutoCAD, SketchUp
- **Internet of Things:** Arduino
- **Graphics Software:** Adobe Photoshop, Adobe Illustrator, Canva
- **Soft Skills:** Problem Solving, Critical Thinking, Communication, Creativity, Team work, Project Management, Writing skill, Leadership, Analytical skill
- **Language Skills:** Bengali and English Language (IELTS overall band-7.0; Listening-8.0, Reading-7.5, Writing-6.5, Speaking-6.5)
- **Interests:** Exploring new things daily, Programming, Mathematical problem solving, Designing, Traveling

PROJECTS

***Plant leaf disease classification* system** **March 2023**

Coded a custom CNN model from scratch in Python to develop intuitive and highly functional classification systems. Rigorously validated these models using diverse evaluation metrics and loss curves, facilitating a reliable identification process for potential plant diseases.

Automated soil texture identification system

Developed a user-friendly UI in Python for the Windows operating system, enabling accurate calculation of soil particles and textural classes. Incorporated various calibration measures to enhance precision. This development is expected to significantly contribute to the research community by automating the identification of soil properties, ultimately streamlining and expediting the research process.

ACHIEVEMENTS & CERTIFICATIONS

National Science and Technology Fellowship 2022–2023, Ministry of Science and Technology, Government of the People's Republic of Bangladesh.
Supervised Machine Learning: Regression and Classification
Excel Skills for Business: Intermediate II
Excel Skills for Business: Intermediate I
Excel Skills for Business: Essentials

EXTRACURRICULAR ACTIVITIES

Volunteer Experience BADHAN-A Volunteer Blood Donor's Organization, Sylhet Agricultural University Unit, Sylhet, Bangladesh • *Joint Convener* October 23rd, 2020–October 23rd, 2021at Abdus Samad Azad Hall, Sylhet Agricultural University, Sylhet, Bangladesh • Performed free blood grouping campaign

Sylhet Agricultural University Photographic Society, Sylhet Agricultural University, Sylhet, Bangladesh • *Vice-President* (December 31st, 2021–May 25th, 2023) • Arranged 3rd National Photography Exhibition and Competition

REFERENCE

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