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Department of Computer Science and Engineering

Capstone Project
High Level Design and Project Methodology

Analyzing and Predicting the control of GHG Emissions from Agricultural Activities using Machine Learning Models.

Under the guidance of

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“Analyzing and Predicting the control of GHG Emissions from Agricultural Activities using Machine Learning Models”.

Abstract :

- Green house emission : Unorganized Agri Practices can be seen leading to the emission of greenhouse gases.
- Unpredictable weather patterns, droughts and extreme weather events are the primary effects of GHG emission and Global Warming.
- Main objective comes with people usually focus on all the other Factors affecting the Emission of GHG. But, the Agricultural sector remains Unchecked.
- Agricultural practices should be practiced in the way that controls the **emission of GHG**, **changes in climate**, **disease outbreaks**, **nutritional deficiency in crops and inefficient resource usage**.
- The Proper Management and change in the Agricultural Activities can Bring down the Emission of GHG.
- Projection of GHG emission will guide the government and policy makers to plan accordingly.

1. Introduction

This document outlines the high level diagram of working for a product that will use machine learning models to analyze and forecast how greenhouse gas (GHG) emissions from agricultural activities will be controlled. The product's objective is to assist agricultural stakeholders in reducing GHG emissions and mitigating climate change by offering precise forecasts and insights.

The creation and application of machine learning models that can assess and forecast GHG emissions from agricultural activities are prerequisites for this product. The models should be able to process sizable amounts of data from numerous sources, including weather, soil, and agricultural practices.

Additionally, the product needs to have user-friendly interfaces for data entry, model training, and prediction output. Farmers, decision-makers, and researchers should all be able to use the interfaces.

2. Current System

The Current systems used to predict the GHG emissions mostly focus on the most other factors of causes like production of electricity, real estate activities, mining and extraction of natural resource but very few researcher’s focus on agricultural activities while the entire emission contribution from this sector is around 20 to 24 % to the total emission of GHG.

3. Design Considerations

3.1. Design Goals

- The main goal of this Project is focus on Agricultural Activities, like Cattle Farming, Rice Production, Agricultural Waste Management etc.
- Since Agricultural Sector is the Main sector contributing for about the quarter of the total emission of GHG.
- In this project, if the model will be able to predict with the correct predictive approaches and accurate results, this will help us to focus on the agricultural activities with the proper steps and actions to reduce the emission.

3.2. **Constraints, Assumptions and Dependencies**

1. We are assuming that the user will take necessary precautions to reduce the emission by the estimated rate of decrease.
2. The system assumes that the user is any large organization or the policy maker.
3. The dataset the model is training on should contain the emission data related to all the different activities of Agriculture.

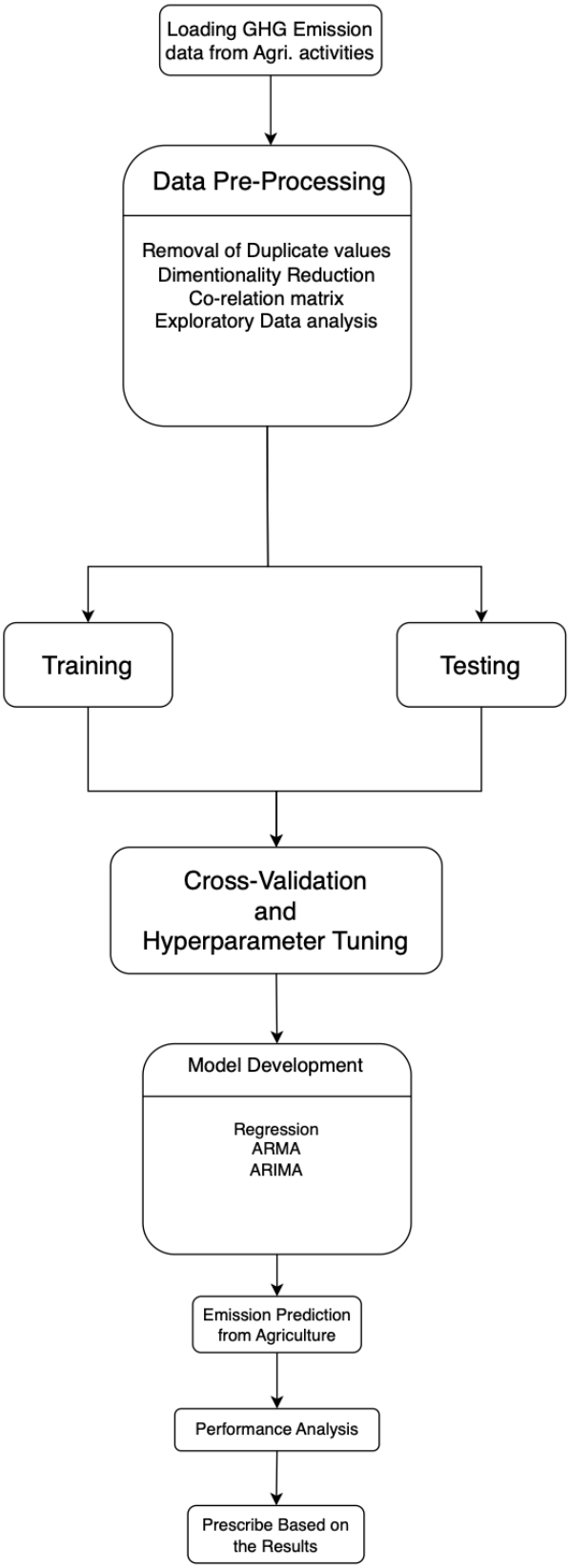
Risks

1. Building a Decentralised system and integrating federating learning into the project idea.

4. High Level System Design

This Design is the basic flow of the data and the stepwise working of the model, including few of the important steps like collecting the proper dataset, pre-processing of the data like removal of unwanted duplicate values and dimensionality reduction, and then the model selection and the right fit with best accuracy, and then the prescription for reducing the emission based on the emission rates and the impacts consideration.

High Level Diagram :



5. Design Description

The working of this model includes the Data collection which will have to deal with the Proper data collection as per to meet the project objectives requirement, and after the collection of datasets the pre-processing of data which includes Removal of Duplicate values, Dimensionality Reduction (Removal of Unrelated Columns) and Building the Co-relation matrix to understand the relation and dependency of all the different attributes on each other. After the pre-processing stage the data will be split into the calculated ratio's for Testing and Training purpose. Selected model will be used to Train with the Training data, and then the Testing will be done to check the Accuracy of the Models selected and choose the right model which fits with the dataset and gives the best accuracy considering the other models listed along with. Then after model selection with higher accuracy the criticality and the impacts of the Emission rates the Prescription will be provided to the user for the control the emission rates and reduce the impact, and to start the initiative to achieve the netzero emission of ghg.

6. Conclusion

Overall, the project aims for the build of machine learning models that will have the potential to be a valuable tool in controlling GHG emissions from agricultural activities, further improvement and research will help us to address these challenges and to ensure that the models are appropriately designed, calibrated, and interpreted.

By doing so, machine learning models could help mitigate the impact of agriculture on the environment and contribute to global efforts to combat climate change.