**Autonomous Reforestation Robot**

**(Machine learning model for crop prediction via Area analysis)**

**PDE4433 – Machine Learning for Robotics**

**Coursework 01**

N. G. Jayashanka Anushan

MISIS – M01037028

MSc in Robotics

Middlesex University Dubai

# Table of Contents

[Table of Contents 2](#_Toc192600996)

[1). Introduction 3](#_Toc192600997)

[2). Used Dataset 3](#_Toc192600998)

[3). Analysis 4](#_Toc192600999)

[3.1). Machine Learning for Robotics 4](#_Toc192601000)

[3.2). Methodology 4](#_Toc192601001)

[3.3). Used ML model and effectiveness 4](#_Toc192601002)

[3.3.1). First Stage: Image Processing Model 5](#_Toc192601003)

[3.3.2). Second Stage: Crop Type Prediction Model 5](#_Toc192601004)

[3.4). Model Evaluation 5](#_Toc192601005)

[4). Conclusion 5](#_Toc192601006)

[5). Future improvements. 5](#_Toc192601007)

[6). Live Demonstration 5](#_Toc192601008)

[7). References 5](#_Toc192601009)

***List of figures***

**No table of figures entries found.**

***List of tables***

**No table of figures entries found.**

# 

# ****Introduction****

This project focuses on the development of an Autonomous Reforestation Robot utilizing machine learning techniques. The primary objective is to develop a machine learning model that can integrate a robot which can analyze a given area by scanning it comprehensively and collecting essential environmental data through various sensors.

The robot will gather key parameters such as soil moisture, humidity, nitrogen, potassium, and phosphorus levels, along with photographic images of the soil. These collected data points will then be analyzed to determine the most suitable crop type for the specified area. The analysis will primarily focus on identifying the soil type based on an average of the captured images, followed by aggregating the sensor data to derive meaningful insights. The final predictions will be generated through a comprehensive reanalysis of all collected information.

To achieve accurate predictions, the project will incorporate image processing techniques using a pre-trained VGG16 model with additional training data. The output from this model will then be processed using a supervised learning model, which will predict the optimal crop type based on the analyzed soil and environmental conditions.

This approach aims to enhance precision in crop recommendation, thereby contributing to efficient and sustainable agricultural practices.

\*\*\*Consider to develop watering part once done all the phases of scanning and crop prediction.

# Used Dataset

3- dataset description with screenshots of sample images/ rows. this includes discussion of the variable (inputs and output) and any pre-processing.

Explain sources – Types – Differences – Include SS

Kaggle datasets;

-----

crop\_and\_soil\_dataSet.csv = crop types and soil conditions (8000 Samples)

plant\_growth\_dataSet.csv = Plant growing conditions (193 Samples)

crop\_recommendation.csv = crop types and soil conditions (2200 Samples)

There are some images of soil type below - 144 Images

https://www.kaggle.com/datasets/matshidiso/soil-types

1555 images

https://www.kaggle.com/datasets/jhislainematchouath/soil-types-

881 images

https://www.kaggle.com/datasets/kurniaaisyah/soil-types-dataset

1360 images

https://www.kaggle.com/datasets/thirishag/soil-types

----

\*Once able to clarify the correct dataset – enter the sources officially\*

# Analysis

## Machine Learning for Robotics

This project consists of two main tasks: collecting real-time environmental data and processing the data to generate accurate predictions.

The first task involves data collection, which is carried out using a robotic mechanism. The robot is designed to navigate through the designated area autonomously, utilizing attached sensors to gather essential environmental data. This includes parameters such as soil moisture, humidity, and nutrient levels, along with image data of the soil. The robot's ability to scan and understand the area enables efficient data collection.

The second task focuses on data processing and analysis. The collected data is analyzed to predict the most suitable crop type for the given area. To achieve this, a trained machine learning model is employed, capable of making accurate predictions based on the acquired data. Machine learning techniques are used to enhance the model's predictive capabilities, ensuring reliable and data-driven decision-making for the project.

By integrating machine learning into robotics, this project aims to develop an intelligent system that can autonomously collect, process, and analyze environmental data, contributing to more efficient and precise agricultural planning.

## Methodology

In this project, multiple types of data and models will be utilized to achieve the desired outcome. The data sources include images, text, and numerical data, which will be processed through different machine learning models.

## Used ML model and effectiveness

What I used? – VGG16 and so on

Why use

Justify answer

4- your analysis which include the machine learning model that you have selected, the evaluation in terms of accuracy. screenshots of some scenarios.

### First Stage: Image Processing Model

For image-based analysis, a pre-trained VGG16 model from TensorFlow will be used. The pre-trained layers of the model have been disabled, and the model has been retrained using newly acquired data from various sources. This approach ensures improved accuracy in image-based classification, allowing the processed data to be effectively utilized in the subsequent model.

### Second Stage: Crop Type Prediction Model

The second model is responsible for predicting the most suitable crop type based on the analyzed data. To achieve optimal performance, multiple machine learning algorithms will be tested, and the best-performing model will be selected for the final implementation. The models considered for this phase include:

1. Linear Regression
2. Decision Tree
3. Random Forest

By evaluating these models, the most accurate and efficient algorithm will be integrated into the project to enhance prediction reliability.

## Model Evaluation

# Conclusion

5- conclusion and

# Future improvements.

How to improve this

# Live Demonstration

6- link to demo.

# References

**There are no sources in the current document.**