

SOIL MOISTURE PREDICTION:

INSTITUTE: KLE TECHNOLOGICAL UNIVERSITY

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**PROBLEM STATEMENT:**

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Soil moisture is an important variable that affects the growth of crops and the overall health of agricultural lands. Predicting Soil Moisture beforehand can be very useful in various fields, from agriculture to natural disaster management and climate modeling. Predicting soil Moisture can help us in controlling droughts, they can help farmers in planning their irrigation schedules, seed planting, harvest timing, etc. The task is to predict soil moisture levels at a specific location based on the previous 8 months of soil moisture data along with temperature, and humidity values at the location.

**Task:**

We are required to build a machine-learning model that can predict soil moisture levels for March 2023, based on the previous 8 months of data. The model should take in daily soil moisture measurements from July 2022 to March 10, 2023, and output predicted soil moisture measurements for March 2023.

**Data:**

The dataset contains daily soil moisture measurements from July 2022 to March 10, 2023, at our Space Data Science Lab, IIT Dharwad. Each data point consists of a date, corresponding soil moisture measurement, and other attribute values.

**INTRODUCTION:**



The livelihood of most people in India is reliant upon agriculture. Soils in India.  
Not as productive in terms of micronutrients. Over the last few years, it has been observed that there is a correlation between soil health and the aforementioned topic. By maintaining the appropriate methods and techniques, the agriculture field can experience an improvement in both sustainability and current crop yield levels. Soil’s fruitfulness. The survival and growth of the inhabitants of Earth depend primarily  on water. Moisture levels in the soil serve a crucial function in keeping plants healthy and are also vital for maintaining adequate water supply. The systems of soil-plant-atmosphere that operate in a self-sustaining cycle.

**Importance of soil moisture:**

It's crucial to have knowledge of the quantity of soil water or moisture due to the following reasons:

1.Soil moisture acts as a chemical solution and brings essential nourishment to aid the  development of plants.

1. The amount of water available determines the crop yield.  
   3. Soil water functions as a nutrient component independently.  
   4. The movement of water in the soil determines the temperature of the soil.  
   5. Soil forming processes and weathering are dependent on the presence of soil water.  
   6. The metabolic functions of microorganisms rely on soil moisture.  
   7. Soil water aids in the chemical and biological processes occurring within the soil.  
   8. The growth of plants relies mostly on soil as its essential component.  
   9. Photosynthesis requires water as a vital component.

**Objective:**

1. To predict the soil moisture requirement, based on the previous 8 months of data by using the Machine Learning Algorithms.
2. To study the machine learning approach for detection of the patterns by using both supervised learning algorithms. i.e., Multivariate Regression.

**Description:**

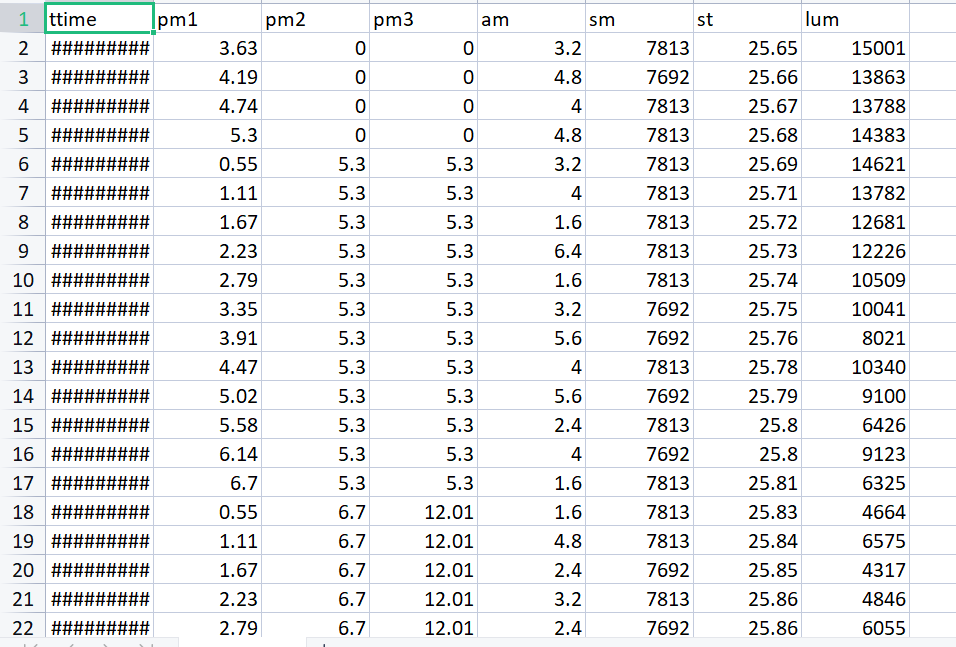
This piece of work aims to enhance the method of forecasting soil moisture utilizing a  technique based on machine learning. The dataset contains daily soil moisture measurements from July 2022 to March 10, 2023, at our Space Data Science Lab, IIT Dharwad. Each data point consists of a date, corresponding soil moisture measurement, and other attribute values. According to research, machine learning algorithms are capable of predicting the requirements for soil moisture in agriculture.  
The levels of temperature and atmospheric humidity have a significant impact on how  accurately the future years can be predicted. The Different machine learning algorithms have varying degrees of accuracy. Following the  data transformation, the degree of precision increased. converted for time series into a supervised learning format while retaining the same algorithm.

Avg is 1.  
Through the use of time\_series supervised learning data, an improvement in  trend prediction accuracy has been noted.

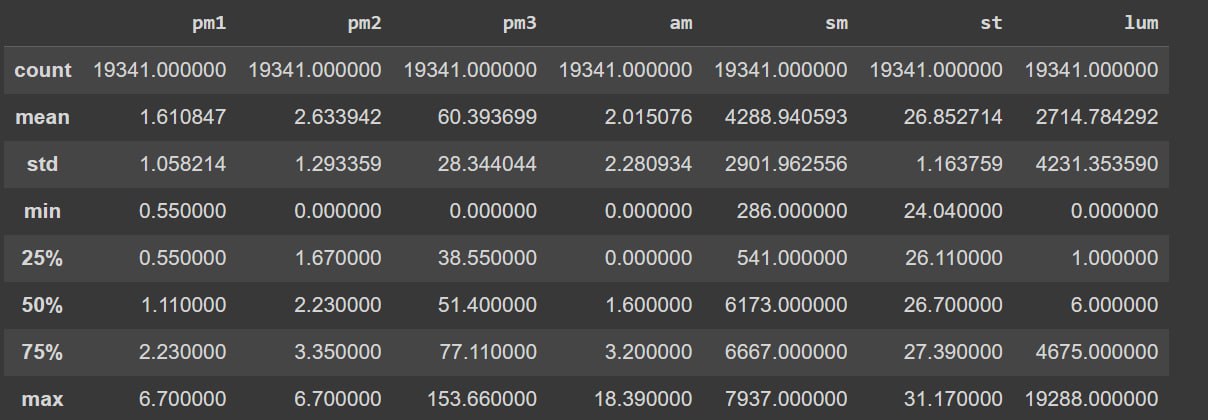
To enhance future research, it is recommended that the predictive system be expanded  to integrate precipitation predictions. Secured by this.  
To enhance water conservation, irrigation is optimized by utilizing the forecasted rainfall depths to their fullest potential.  
Creating models that are specific to each crop through the use of a comprehensive data-set gathered from areas with comparable soil properties will lead to...  
strengthen the implementation of soil moisture models that derive from collected data in  irrigation scheduling applications. A key objective for creating these models is to generate accurate Soil Moisture Content assessments. Information is here.  
Knowing the rough conditions of the fields is extremely beneficial for farmers and water  researchers, as it provides guidance on how to proceed.  
Make better and more effective decisions concerning farming techniques like using  fertilizers and watering crops.

**DATA ANALYSIS AND DESCRIPTION:**

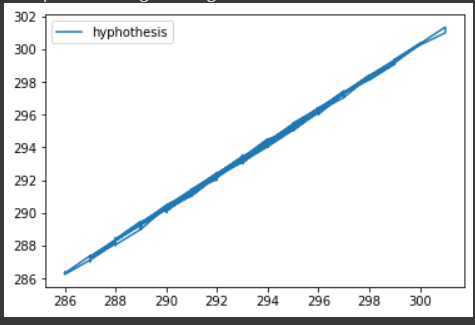
User1\_data: Dataset



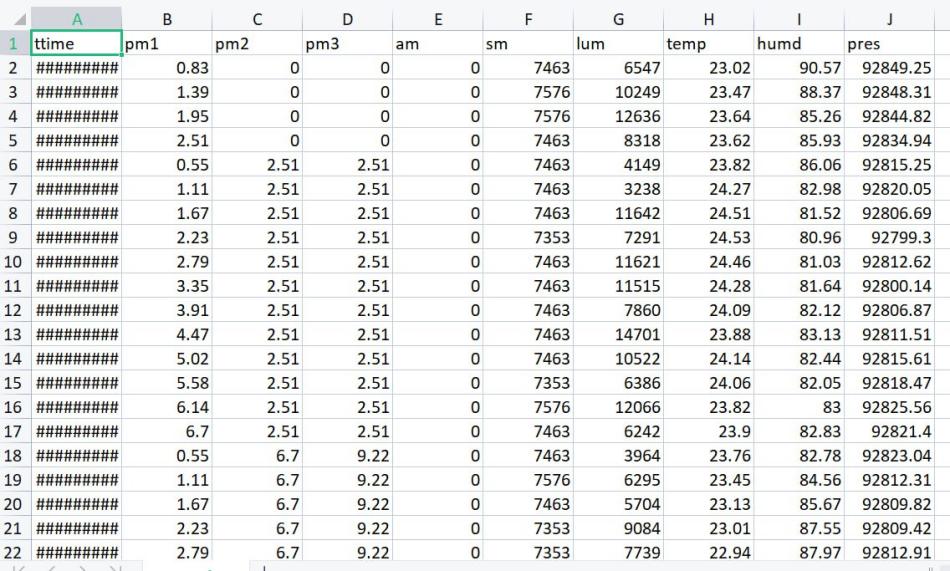
Description



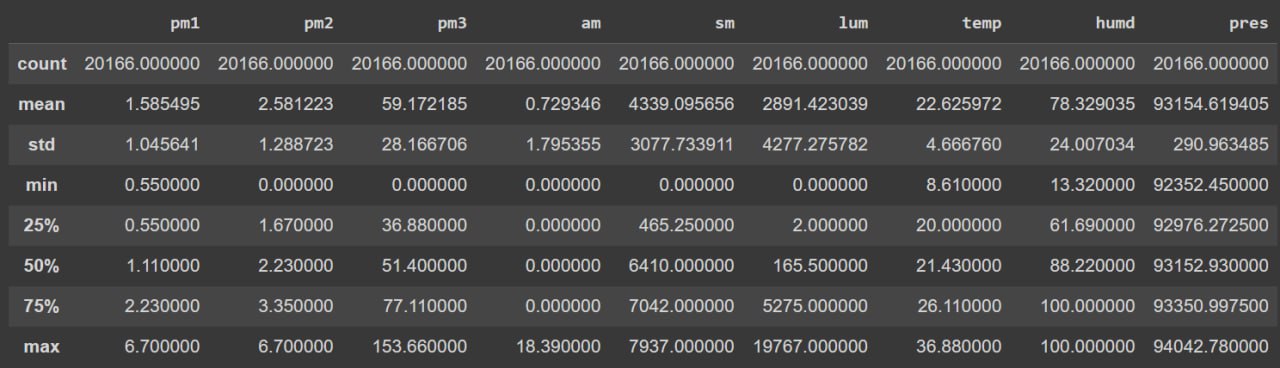
Graphical :



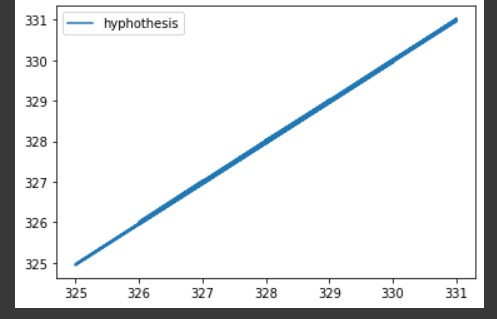
User2\_data: Dataset



Description

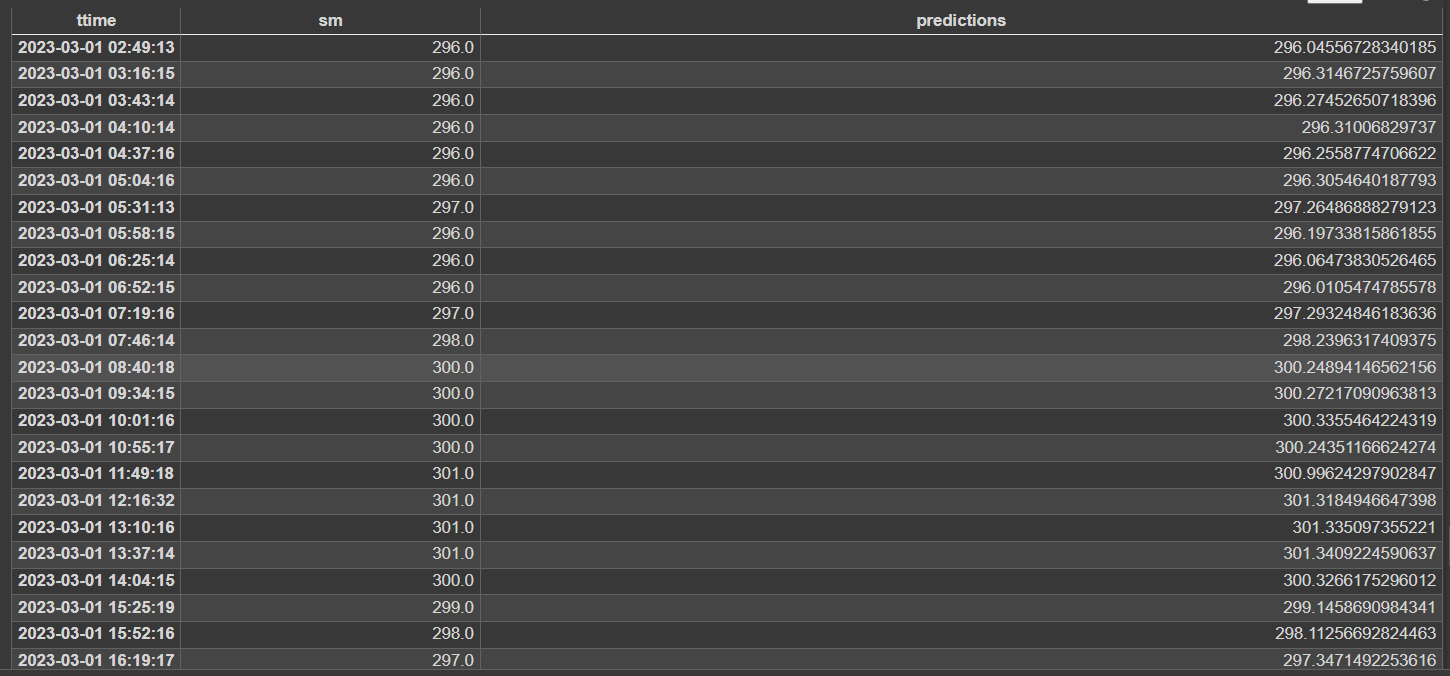


Graph:



**RESULTS AND DISCUSSION:**

**User1\_data:**



Mean Absolute Error : 0.2699708872885638

Mean Square Error: 0.08477646242950597

Root Mean Square Error: 0.292263978591914

**User2\_data:**

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Mean Absolute Error : 0.03205461216207105

Mean Square Error: 0.0013733256346747352

Root Mean Square Error: 0.037058408420690914

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