PRECISION FARMING

Team Name: PythonPandas

Team Members:
Sanjay K ,Sandheep NK ,Byri Manoj , Khaneeys MK

Project Domain:
Machine Learning , Deep Learning , Internet Of Things , App Development , Electronics .

Introduction:

The demand for food and agricultural products is projected to increase by more than 70% by 2050 . Given the limited availability of arable land, a significant part of this increased demand will be met through agricultural intensification, i.e., increased use of fertilizers, pesticides, water, and other inputs. However, intensified use of agricultural inputs also causes environmental degradation,including groundwater depletion, reduced surface flows, and eutrophication. Excessive and inefficient use of natural resources (e.g., soil and water), fertilizers, and pesticides for agricultural production cause economic losses as well as increased water and nutrient losses from agriculture that lead to environmental degradation. For an economically and environmentally sustainable production system, there is a need to develop techniques that can increase crop production through increased efficiency of inputs use and reduced environmental losses.

Abstract:

“It has become a trend that we use Machine Learning in every domain”, stated by many people out there in the society. But we would rather modify it as “It is necessary to use Machine Learning in every possible domain we can”, because it gives us the accurate result.

So we all know from the beginning of our lives that “Agriculture is the backbone of every country”, so shouldn’t we implement the cutting edge technologies to improve it to the maximum level we can!? We have collected the data such as nutrients(N,K,Na....), pH level of the soil required by the crops, we can also predict whether the crop can get damaged or not with various features that we collected over the time, fertilizers used for crops, temperature and humidity required are collected to improve the model’s prediction on various target variables.

With these data we are combining the power of machine learning and developing a business model to benefit the farmers in a much better way. How we are collecting the data and how we process it once we have come up with the analysis of the machine learning models are explained below. And we are not stopping by these, why not leverage the technology of computer vision, another cutting-edge technology on the market. We combine the drone and computer vision to monitor the crops and check for any disease content and if crops are noted with any diseases we send warnings to the farmers and alert them.

Approach

Sensors:

Sensors	**Function**
Location Sensors	Uses signals from satellites to determine the position (latitude,longitude and altitude) precisely within couple of inches
Optical Sensors	Uses light for measuring properties of the soil. They measure different frequencies of light reflecting of the surface of the soil and plant to determine the moisture content and organic matter present in the soil
Airflow Sensors	Used for measuring air permeability. We can study about the properties of soil by gushing an amount of air to a certain depth into the soil.
Electrochemical Sensors	Used for chemical mapping of the soil. They detect specific ions in the soil and we can obtain information on the minerals present in the soil,pH etc.…

The output data obtained from the above sensors are collected and the desired/specific data to be studied are fed into the Machine Learning model and processed.

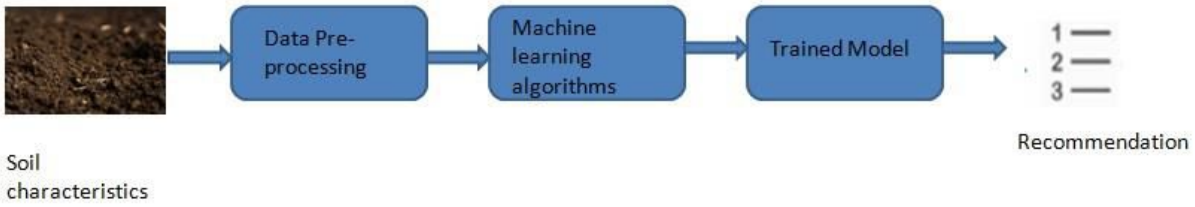
An auto irrigation system is also placed for irrigating the plants at an time interval and also when moisture content of the soil is less. This data is obtained from the optical/electrochemical sensors and an alert is give to the system whenever moisture content reaches below the threshold level

POWERING MECHANISM:

Instead of going with the traditional battery only approach for powering up the sensors and systems in our project we are going to rely on the most renewable energy, SOLAR. We will be using Solar panels to power all the sensors. An MPPT charge controller is used to manage the power going into the battery bank from the solar array.The solar panels also provide power to the irrigation pumps.

Crop Identification:

The sensors employed tracks the climatic and soil parameters such as temperature , humidity , ph(soil) and the percentage of nutrients present in the soil. These data helps in identifying the best crop to plant . We have used a deep learning model for this purpose.



The project proposes a model which can predict the crop based on the soil nutrient values (NPK values) , pH and climatic conditions given as the input.

A. Acquisition of training dataset:

For any algorithm to work with a high accuracy the model requires a good number of parameters . The N,P,K and pH values of the soil obtained by the sensors are combined together to form a dataset. This also includes the corresponding crop that can be grown as a label.

B. Data preprocessing:

The dataset created cannot be fed directly to the model. It contains a lot of missing values , which has to be either removed or handled properly . The missing values affect the accuracy of the modeland can reduce the performance. So, to solve this problem we replace these values with large negative values which will be treated as outliers by the model. The next step is to create the labels . Since we are using a supervised learning method, for each entry in the dataset there should be a class label which has to be created during this step

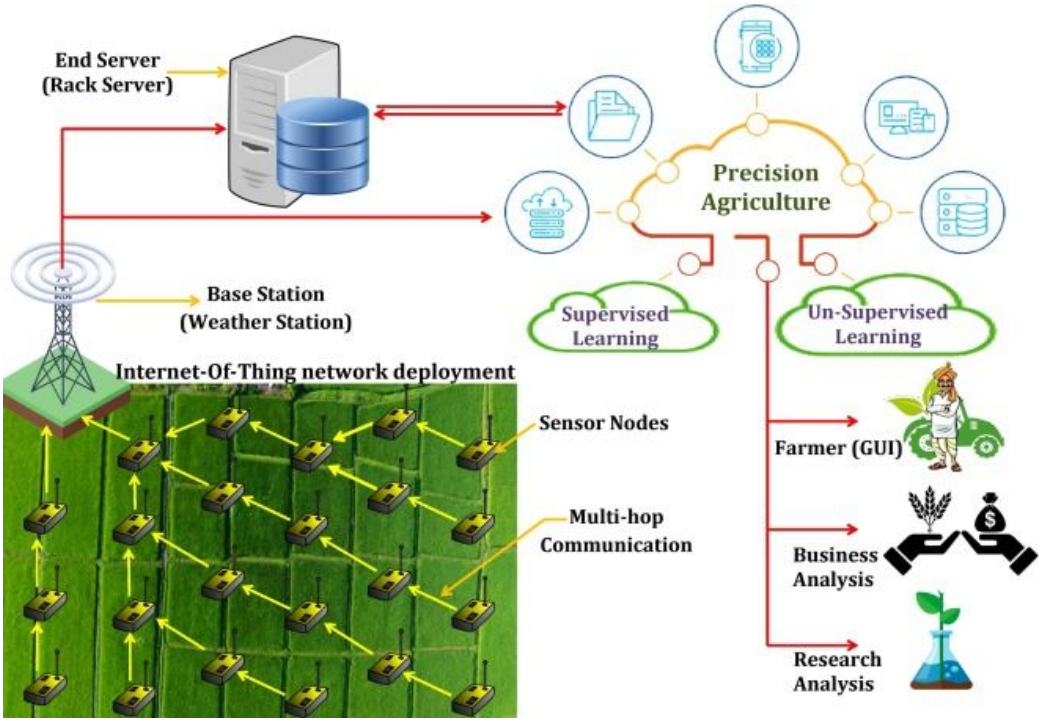
C. Algorithm to predict crop:

After testing a lot of models we decided to employ neural networks to do the job. Artificial neural networks have the ability to learn by themselves and produce the output that is not limited to the input provided to them. The input is stored in its own networks instead of a database, hence the loss of data does not affect its working.

D. Trained model:

The model is trained by applying the dataset to the neural network created. Soil properties such Nitrogen, Phosphorus, Potassium, pH value, etc. and climatic conditions such as Temperature , Humidity , rainfall ,etc. are given as input to the model. The algorithm will

look for a crop which will have the value closest to the inputted values. The output will be all the crops which are suitable for the inputted values.



Advantages of your Solution

The proposed method saves a lot of money and work for farmers . The automatic crop selection prevents the farmers from choosing a wrong crop and ending up in losses. The automatic irrigation helps in saving water .

Future Scope

The idea presently focuses on only a single farmland . But in future it can be upgraded to help a lot of farmers. Also we could use it to remotely control all the agri tasks like irrigation , sowing and harvesting . We could also build an app based service that remotely monitors and control various tasks.