Precision Farming Recommendation

Problem Statement

Agriculture plays a predominant role in the economy and employment of a country. The common problem among farmers is that they do not choose the right crop based on the climate and the soil composition. Due to this, they face a serious setback when it comes to productivity. This problem of farmers can be addressed through the use of Precision Agriculture.

Precision Farming, also known as the site-specific crop management is a farming concept based on observing, measuring and responding to the inter and intra-field variability in crops. The goal of precision agriculture research is to define a decision support system for the whole farm management with the goal of optimizing returns on input while preserving resources.

There haven’t been many papers written on this topic, while the most recent paper for this, which was published in IEEE in 2016 could be improved by using simple Random Forest technique. Due to this, the challenge is how we would make the system work through the use of various sensors.

For the sake of convenience, let us consider the sensors with us to be Humidity, Soil Moisture, Temperature, Soil Color, depth, texture and pH value. We can add certain parameters from the outside like the price of certain crops per kilogram.

Certain crops grow well in a certain type of soil, but don’t do so well in other type of soil. So, here we can use the soil as the User as the soil would grow crops based on the parameters given to it. Now, the growth of the crop in that particular soil can be considered as the rating of that crop in that soil based on the parameters that we have. This is a standard way of going about things.

Solution

Usually, the user is defined as the person who uses the particular product and acts upon it. Here, there is no clear user as the farmer depends on various other factors for the growth of crops. So, we can consider soil as a possible user for the crops.

Soil in itself can help identify various crops that can be grown in it as the chemical composition for each type of soil is different. But we can go a step further and look at what other parameters can have an effect on the growth of a crop. Based on the points above, we identify certain environmental parameters that can have an effect on plant growth, but now, we do not know how they will work when we have a matrix of data for environmental parameters vs. crop growth. For this, we use a classification technique so that we get different classes of environmental parameters based on the crops. In this way, we can build a matrix by replacing the soil types with the classes of environmental parameters.

A matrix of crop growth vs. the environmental parameters can be built. But now, the crop growth is not the only parameter we are after. Precision farming is more about how much revenue can be obtained from a certain piece of land. So, we would need the current market value of the particular crop along with the crop yield. This would give us the market\*yield parameter. But now, this parameter may or may not be used individually. We can take this as a vector, or we can consider the market value as a constant and get a single numerical value. This would help identify the type of crop a farmer would want to plant on that particular piece of land.

We can use a Singular Value Decomposition on this to give us a good recommendation System.

Novelty

Recommendation on Precision Farming is a relatively new topic. There has been only one paper published on this in IEEE, which was in 2016. This paper talks about recommendation using Ensemble Learning, which is nothing but using a Random Forest to give the right idea of what crop needs to be planted.

Even though this is a new field, there are a lot of innovations going on in the field of agriculture and developing nations require a lot of inputs in this field. While this is an interesting and useful topic, the challenges going ahead will be that this will probably be the first of its kind.