Farmer’s AI by ShoveAId

The Big Idea: *A Farmer’s Companion AI*

The Big Idea

Automation is the key to the future but it is replacing many jobs, leading to not a positive future for some people. At ShoveAId, we understand people, and we love farmers! We want to help use powerful tools like AI and Machine Learning to create a farmer of the new age. In today’s date, farmers in most parts of the world have access to a phone. Leveraging the power of Machine Learning, we will create a service that helps farmers maximise their yield.

The Technicalities

Our service has both a software and a hardware-based component.

We are using a Supervised Learning Model for our Machine Learning Algorithm using a support vector machine approach. It uses a Decision Tree – A Binary Tree based data structure that splits inputs into a series of true and false values. Our Model learns, predicts and corrects mistakes using a Gini Index, a numerical value we obtain from our sample size of users, using probability to fix inaccuracies. We are taking 5 basic input variable types, mentioned below. The ML Model is created using Python. Libraries include: NumPy, TensorFlow and Matplotlib. Outputs include tips for farmers to improve their seasonal produce.

We use a cloud database and maintain a set of data for every approximate location. We divide land by acres in a field, for which we have our set of conditions.

How the Service Works

1. Farmers send us a zip code which we store in our database.
2. For that zip code, we get an entry on our database about the conditions of that area. Using available Satellite Imagery, we estimate Wind, Rain and Temperature Levels. For other inputs, we send an employee to their area with a testing kit. The employee collects information from the farmer and his field.
3. After putting it through our machine learning model, we send the output to the farmer on their phone using SMS using a GSM based system covering a wide spectrum of farmers around the world without technology barriers.

Input Factors for Data Analysis

- Geographical Location (Determined by Zip Code entered by Farmer). Using publicly available data about geographical location over the past 25 years, we analyse Rain, Wind and Temperature patterns in the area.
- Physical: bulk density, infiltration, soil structure and macropores, soil depth, and water holding capacity => retention and transport of water and nutrients; habitat for soil microbes; estimate of crop productivity potential; compaction, plough pan, water movement; porosity; and tilth
- Chemical: electrical conductivity, reactive carbon, soil nitrate, soil pH, and extractable phosphorus and potassium => biological and chemical activity thresholds; plant and microbial activity thresholds; and plant available nutrients and potential for N and P loss
- Biological: earthworms, microbial biomass C and N, particulate organic matter, potentially mineralizable N, soil enzymes, soil respiration, and total organic carbon => microbial catalytic potential and repository for C and N; soil productivity and N supplying potential; and microbial activity measure
- Use of pesticides and fertilisers

Land Testing System

To measure Soil health, for every factor we need a sensor. A very big land will require a lot of sensors since factors are variable and it will be very costly.

Solution: We create a sensor array. For every acre of land, we place a module comprising of an Arduino board with a 5-sensor package covering every factor, connected by Satellite Wi-Fi and feed into the cloud database. We send over an employee with a kit with one module with a 5-sensor package covering the field of the farmer. Inputting the size of the field in the database, it will divide the area into $\sqrt{N} \times \sqrt{N}$ cells where N are the acres of the field dimensionally. This map of cells is used for analysis and prediction. The employee digs the ‘shovel’ into the ground for each cell and allows the sensors to collect the data. Using those values, we send the output to the farmer.

Step 1. Employee places kit in land

Step 2. Measured data is uploaded to online database via Wi-Fi.

Step 3. Machine learning model analyses data and provides output

Step 4. Output is sent via SMS to farmer

The Target Audience

India is growing, it is about time our business ideas grow too. ShoveAId envisions to help middle class farmers who sell commodity items diversify, branch out and sell higher end fruits and vegetables to turn higher profits.

These include hyper-local, boutique, export and contract-based farmers, selling exotic fruits, vegetables and flowers like sellers of Durian, Dragon Fruit, FL 2027 Potatoes for Lays Chips, certain Lillies and Chrysanthemum flowers. Their produce requires very sensitive and specialised care with the most pristine growth conditions. ShoveAId helps find and mitigate issues that cost these farmers a lot of money due to their extremely high economic yield every harvest, owing to the nature of their crops.

Our Hybrid Economic Model helps us to create an impact in the lives of farmers of all social-economic backgrounds while creating an cheap, expandable and Tech-Based product for the future.