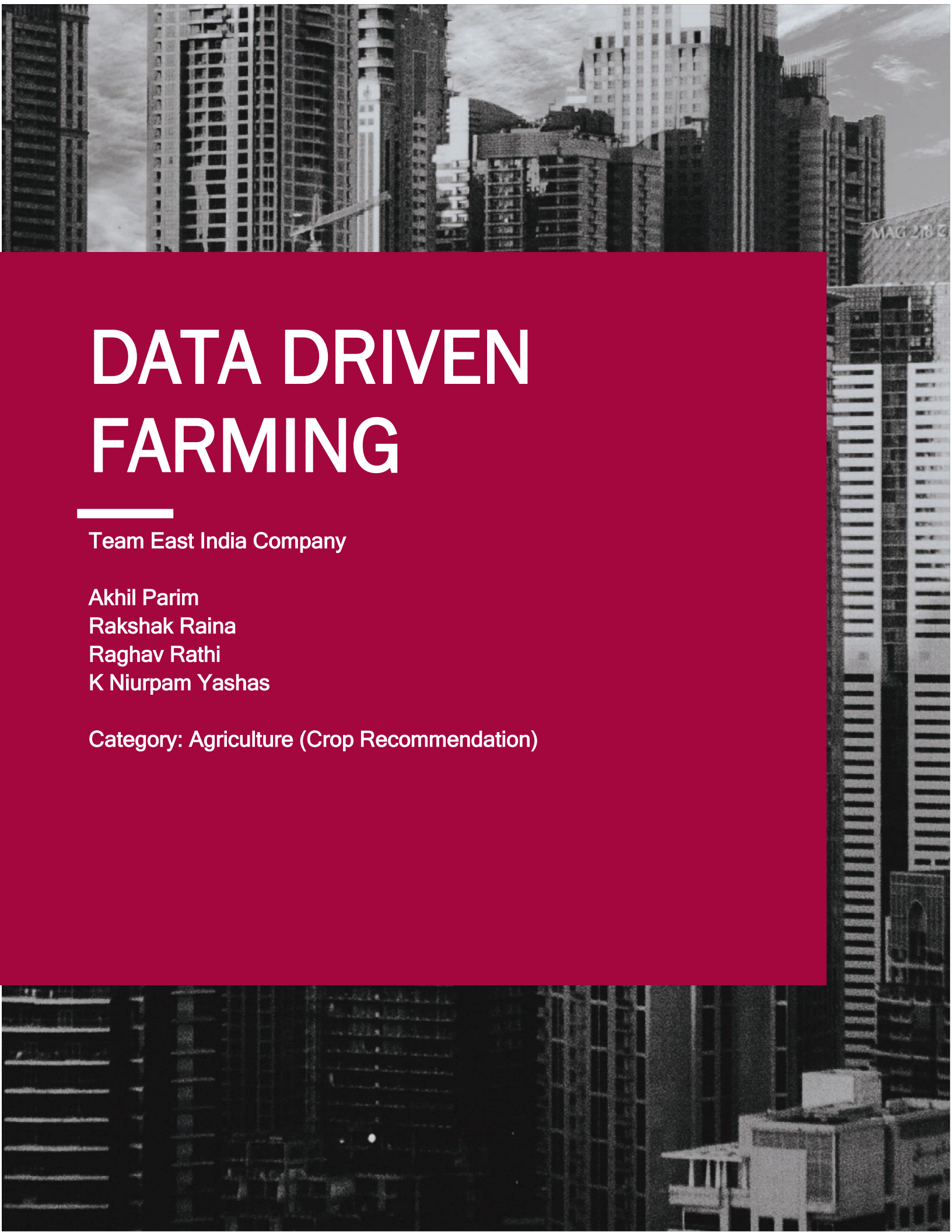

DATA DRIVEN FARMING

Team East India Company

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Category: Agriculture (Crop Recommendation)

DATA DRIVEN PRECISION AGRICULTURE

Recently Farmer Suicides and Protests are all over the news. They have been committing suicides under pressure because of debts. The main reason behind these problems is that they are not getting proper crop output, sometimes their whole crop is destroyed by pest diseases, and also because of using primitive techniques to irrigate the field which results in overuse of water. So as a result, a lot of freshwater also gets wasted. This has been our major objective behind the project.

Food Production: According to a stat available on the U.N. website, we have to increase the overall food production by at least 70% in the coming 10 years to meet the minimum basic needs of the population. As a result, doing Data Driven Agriculture (i.e. using Artificial Intelligence) in growing crops is no more a fancy thing rather it has become a need. Many farmers in India still do not possess enough education and expertise to grow the crops in a manner which gives them maximum output. Surprisingly, if they provide them the advice according to various parameters like NPK values, Temperature, weather, water availability, soil type, etc., they can get up to 60% of more yield which will make their life better and will ultimately improve their financial condition.

ABSTRACT

A web portal is designed which consists of various applications to solve all the problems faced by Farmers.

- AI based Alternate Crop or Crop Rotation system is made for providing suggestions for alternate crops which helps to farmers to utilize the available resources (land, labour, capital, water and other resources) effectively to maximize profit. For predicting the alternate crop rotation system, we have considered 8 most important parameters that are required to predict the crops. The parameters are:
    - Nitrogen Content
    - Phosphorous Content
    - Potassium Content
    - Temperature
    - PH value of Soil
    - Climate
    - Rainfall
    - Humidity

Other than these parameters we are also taking the input from the farmer about the current crop that is being grown by him so that similar category crops are not predicted which ensures the nutrient content and fertility of the soil. Based on the parameters entered by the farmer/user, we are using KNN (K Neighbors classifier) to get the nearest 3 to 4 crops which comes out divided into four categories according to 4 growing seasons so that the farmer can choose only one crop from each category for the whole year and doesn't repeat the same category crop next year. Hence by this, the crop rotation part is being taken care of.

SOULTION

An **IoT based hardware** is designed which helps the farmer in precision Irrigation and Data Collection. This hardware includes sensors which collects soil moisture, temperature, humidity, N P K values, rainfall measure and upload it to our cloud Server.

FUNCITON OF HARDWARE (PRECISION IRRIGATION): A water pumping motor is also attached to the sensor system which is designed accordingly to Irrigate the plants if the soil moisture level goes below the threshold level for that Soil profile and in parallel, we have also designed a Web Application which includes these features:

- ## PEST DETECTION
  According to U.N. Pests Diseases are the main reason in decreasing the overall yield of the farmer by at least 50%, so to counter this problem Pest Detection using CNN Image Processing is used to detect the diseases in Crop Leaves. The user has to just input the image of the Leaf or the vegetable/fruit and the algorithm will detect the disease and will also inform the farmer about the pesticide solution that they should use to counter that.

- ## MARKET STATISTICS
  A separate tab is created for the farmer where he can see the Profit/Hectare Statistics for each crop for any State in India. This ensures that the farmer can see the market statistics for the crop that he/she is growing.

- ## LOCAL LANGUAGE SUPPORT
  It is also ensured that the user can see all the data on the website in the language which he/she is capable of reading. All the data is of no use if we don't integrate local language support.

- ## WEATHER STATISTICS AND RAINFALL PREDICTION
  The user can also see the current humidity, temperature and wind speed of the current location and also the Forecast of last 15 days

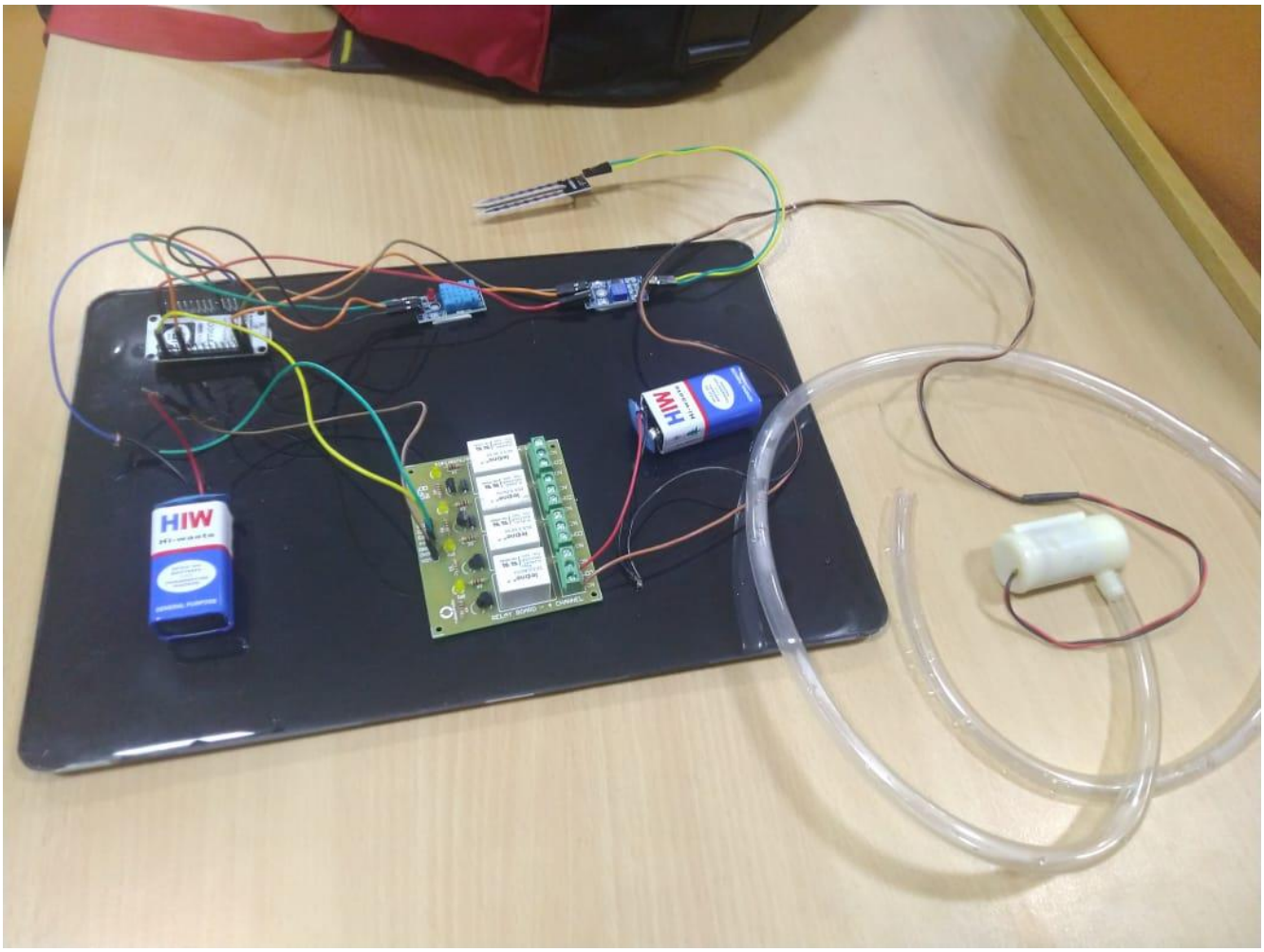
- ## FERTILIZER/PESTICIDE SOLUTION
  In the FAQ tab, the user can just select the problem he is facing from the drop-down menu for each crop and see the solution to it.

- ## NEAREST FERTILIZER SHOPS
  User can input his/location and through Google Maps API integration, he/she can see the nearest fertilizer crops to the location.

- ## COLLECTION OF OUTCOMES
  There is a separate tab where the user can input all the details like Cultivation, Yield, Pesticides, Crop etc. for the crops that he has sown and the data will be stored in a CSV file which can be later used by anyone for Analytics.

TECHNOLOGY

IoT BASED HARDWARE



Tech Stack:

- Node MCU
- Relay(5V)
- DHT Temperature and Humidity Sensor, Soil Moisture Sensor
- Water Pump
- Batteries

Frontend

- HTML
- CSS
- Bootstrap
- Jquery
- Javascript
- Ajax

Backend

- Flask

External Library

- Chart.js
- Animate.js

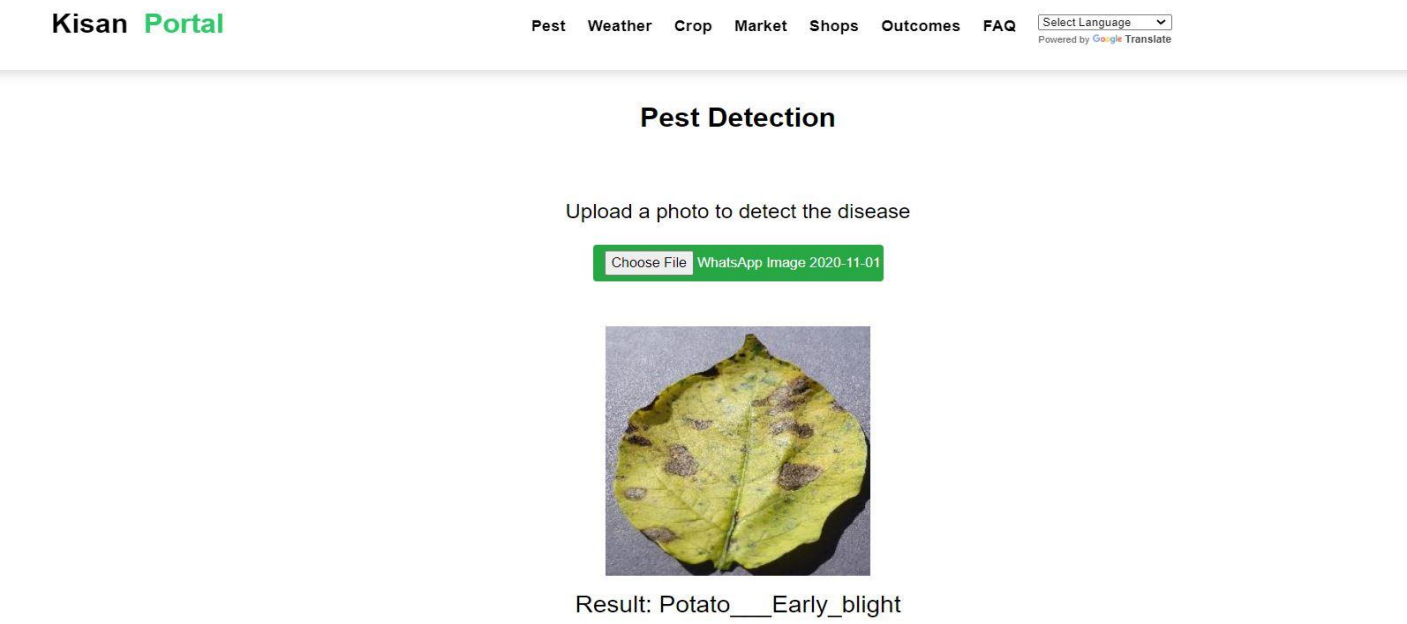
Python Library

- Keras
- Tensorflow
- OpenCV
- Numpy
- Pandas
- scikit-learn
- Pillow
- bs4
- requests
- OS
- OWA
- Flask

R Library

- Shiny
- GeoR
- Gstat
- Ap
- Automap
- Lattice
- Raster
- RGoogleMaps
- Leaflet

Pest Prediction CNN model



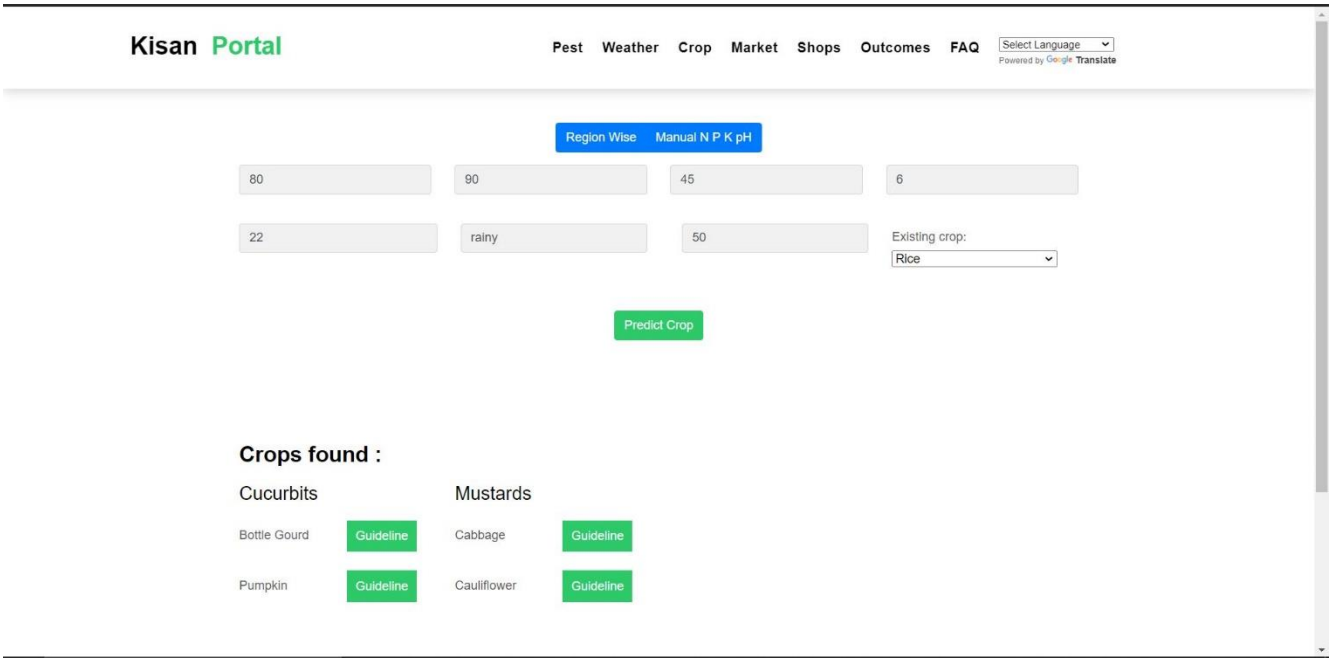
ML Implementation

- Keras
- TensorFlow
- Pillow
- NumPy
- OpenCV
- Build CNN trained on 10k image dataset provided Kaggle of different Healthy and Unhealthy plant image dataset.

Weather Prediction

- OpenWeatherMap
- Bs4
- Given Two type of weather forecast.
- Openweathermap Api give the real time forecast.
- Web Scarping using bs4 (python library) will give the 15 days weather forecast

Alternate Crop Recommendation



ML Implementation

- Pandas
- NumPy
- scikit-learn

Market Stats

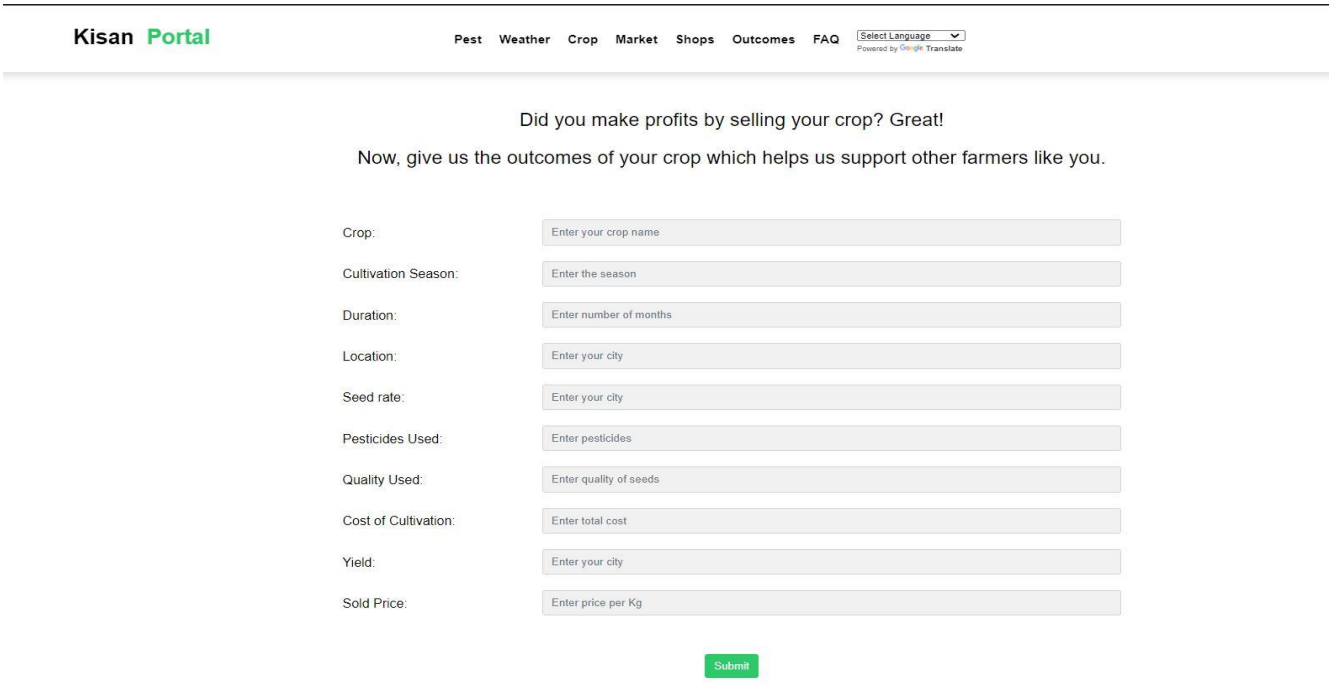
- Google Map API
- Chart.js
- Ajax

- JavaScript

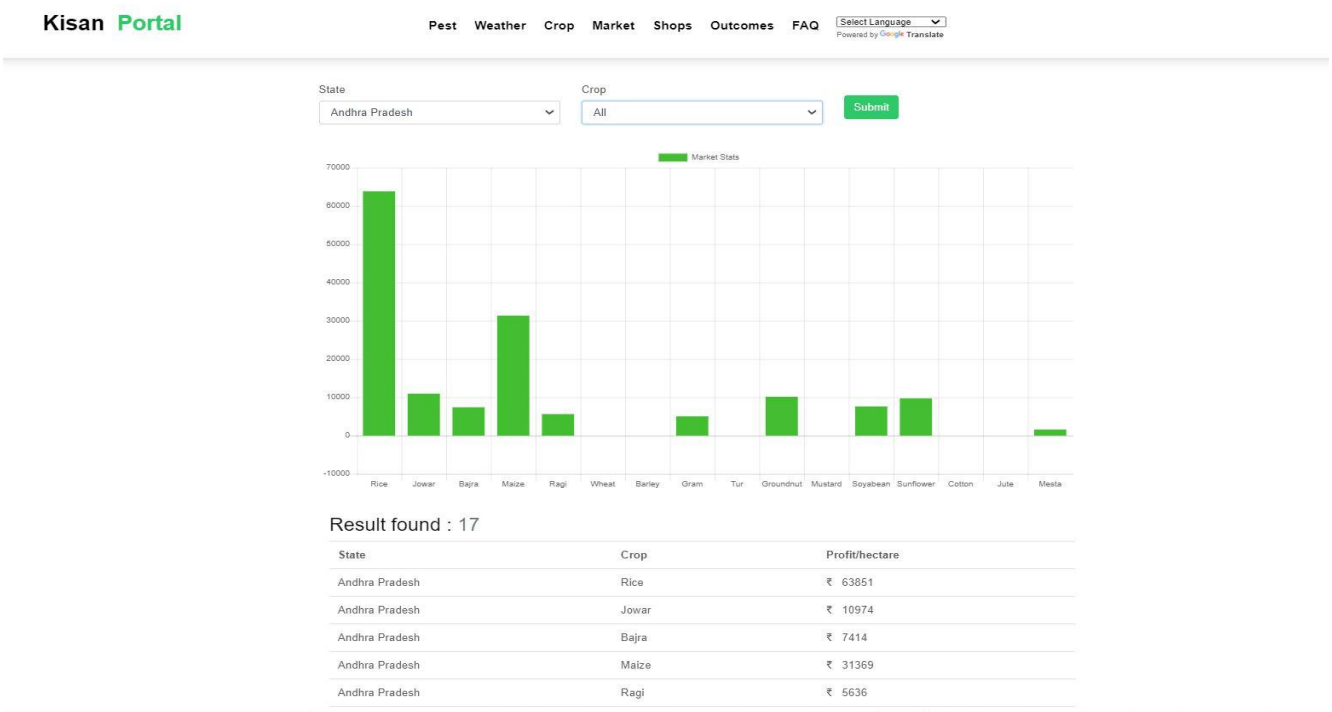
Multilanguage Support

- Google Translator API

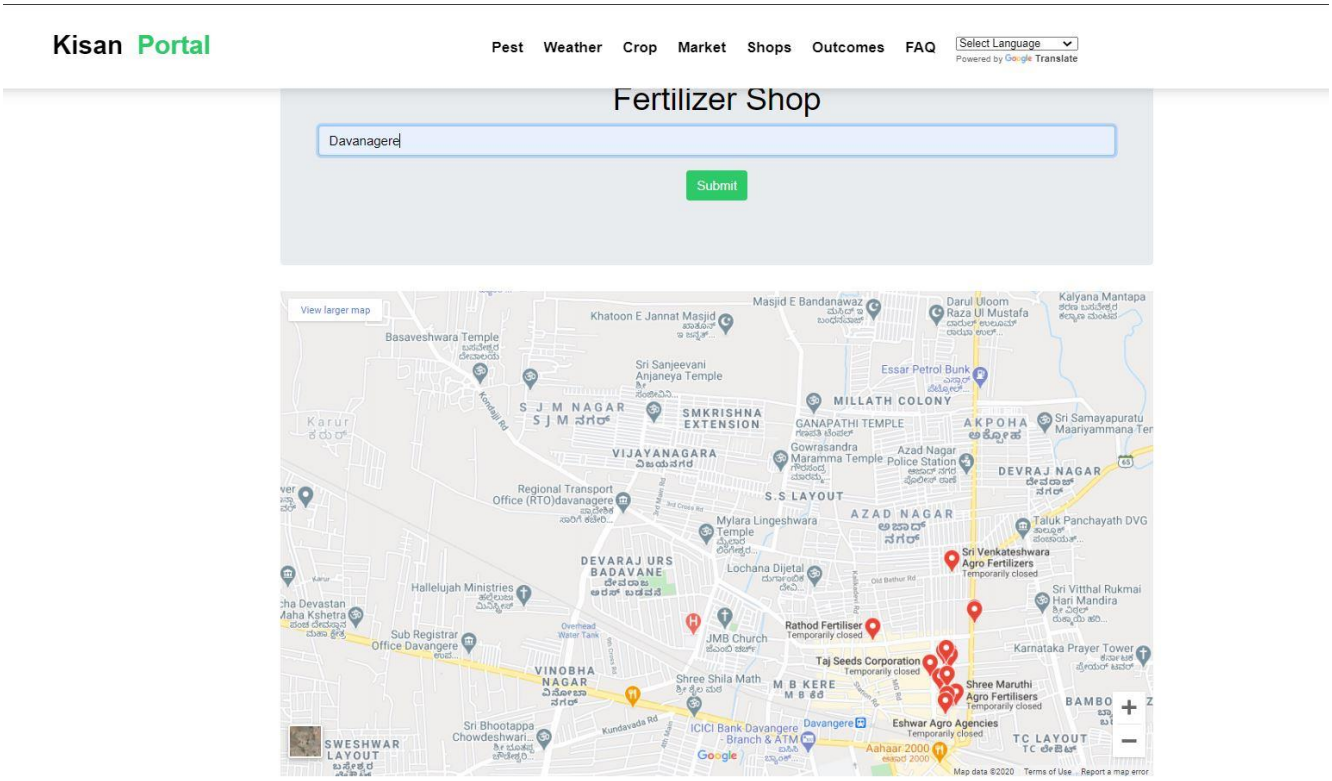
Data Collection



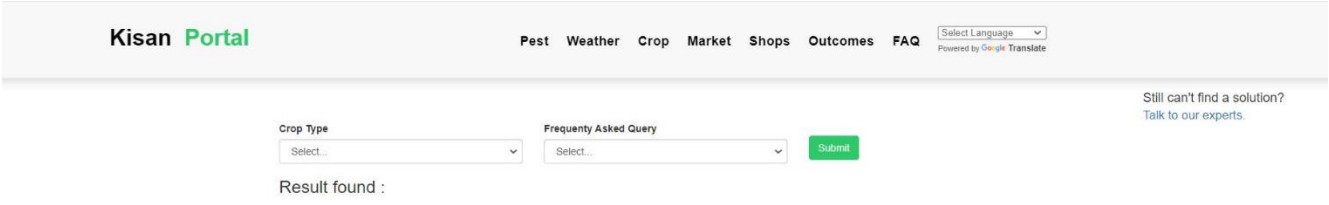
Market Statistics



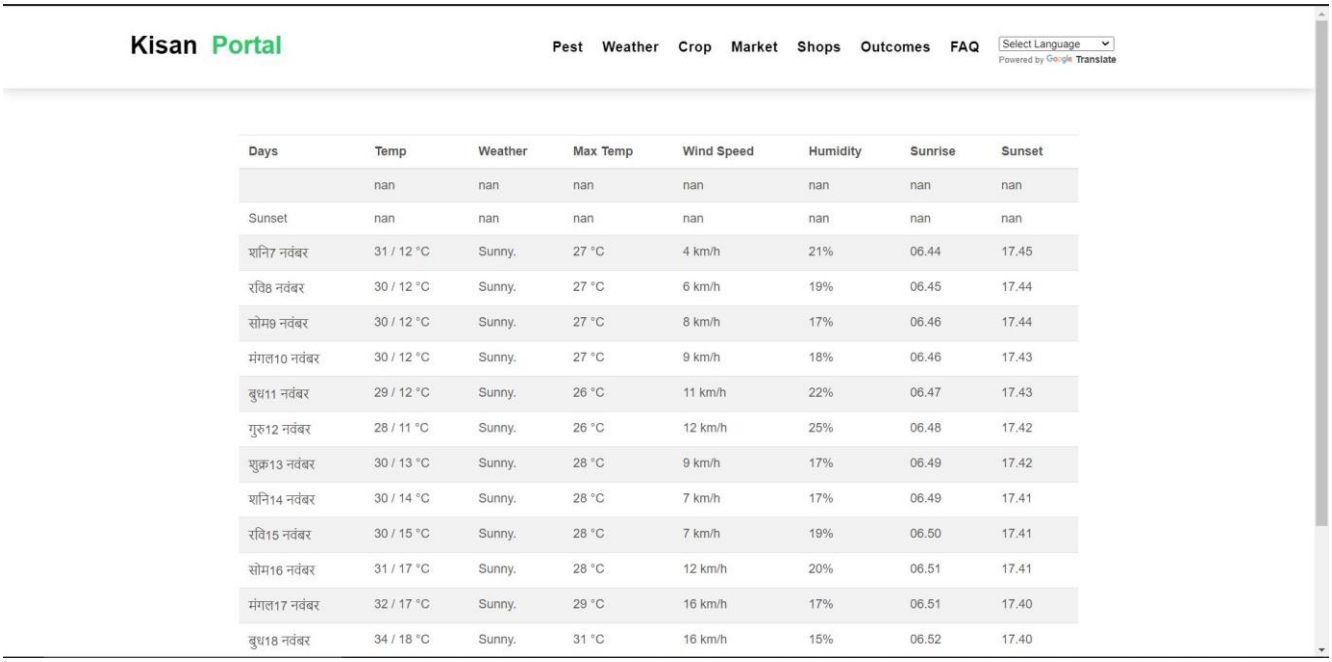
NEAREST FERTILIZER SHOPS



FAQ SECTION (FOR QUERIES)



WEATHER FORECAST FOR 15 DAYS



Kisan Portal

Pest Weather Crop Market Shops Outcomes FAQ Select Language Powered by Google Translate

Days	Temp	Weather	Max Temp	Wind Speed	Humidity	Sunrise	Sunset
	nan	nan	nan	nan	nan	nan	nan
Sunset	nan	nan	nan	nan	nan	nan	nan
शनि7 नवंबर	31 / 12 °C	Sunny.	27 °C	4 km/h	21%	06.44	17.45
रवि8 नवंबर	30 / 12 °C	Sunny.	27 °C	6 km/h	19%	06.45	17.44
सोम9 नवंबर	30 / 12 °C	Sunny.	27 °C	8 km/h	17%	06.46	17.44
मंगल10 नवंबर	30 / 12 °C	Sunny.	27 °C	9 km/h	18%	06.46	17.43
बुध11 नवंबर	29 / 12 °C	Sunny.	26 °C	11 km/h	22%	06.47	17.43
गुरु12 नवंबर	28 / 11 °C	Sunny.	26 °C	12 km/h	25%	06.48	17.42
शुक्र13 नवंबर	30 / 13 °C	Sunny.	28 °C	9 km/h	17%	06.49	17.42
शनि14 नवंबर	30 / 14 °C	Sunny.	28 °C	7 km/h	17%	06.49	17.41
रवि15 नवंबर	30 / 15 °C	Sunny.	28 °C	7 km/h	19%	06.50	17.41
सोम16 नवंबर	31 / 17 °C	Sunny.	28 °C	12 km/h	20%	06.51	17.41
मंगल17 नवंबर	32 / 17 °C	Sunny.	29 °C	16 km/h	17%	06.51	17.40
बुध18 नवंबर	34 / 18 °C	Sunny.	31 °C	16 km/h	15%	06.52	17.40

Dataset Links:

All the datasets that we have used are included in the GitHub Link that is given.