JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY NOIDA

B.tech,CSE
2019-20 (VIth Semester)

MINOR REPORT

AGRICULTURE ANALYSER

Project Members:	Mentor	Panel Members
Piyush Gupta (17103067)	Ms. Aditi Sharma	
Arpit Pundir (17103046)		
Gaur Jetharam (17103063)		

CERTIFICATE

Certified that minor project work entitled "**AGRICULTURE ANALYSER**" is a bonafide work carried out in the VIth Semester by

"Arpit Pundir, Piyush Gupta, Gaur Jetharam"

under the guidance of "**Ms. Aditi Sharma"** in partial fulfillment for the award of Bachelor of Computer Science and Engineering from **Jaypee Institute of Information Technology, Noida** during the academic year 2019-2020 .

Project Guide
(Ms. Aditi Sharma)

Coordinator,CSE Department

ACKNOWLEDGEMENT

First and foremost, we would like to thank the Head of the Department of Computer Science and Engineering, Jaypee Institute of Information Technology who gave us the opportunity to be involved in such work of producing something new by our own. And thanks a lot to "**Ms. Aditi Sharma"** ma'am who guided us through doing this project, provided invaluable advice, helped us in difficult periods and provided equipment for our projects. Her willingness to motivate us contributed tremendously to the success of these projects. Besides, we would like to thank all CSE staff members who helped us by giving advice and providing equipment which we needed.

Arpit Pundir
Piyush Gupta
Gaur Jetharam

Introduction

The agricultural land mass is more than just being a feeding sourcing in today's world. Indian economy is highly dependent on agricultural productivity. Therefore in the field of agriculture, detection of disease in plants plays an important role.

From the ancient period, agriculture is considered as the main and the foremost culture practiced in India. Ancient people cultivate the crops in their own land and so they have been accommodated to their needs. Since the invention of new innovative technologies and techniques in the agriculture field is slowly degrading. Due to these abundant inventions people have been concentrated on cultivating artificial products that are hybrid products where there leads to an unhealthy life. Nowadays, modern people don't have awareness about the cultivation of the crops at the right time and at the right place. Because of these cultivating techniques the seasonal climatic conditions are also being changed against the fundamental assets like soil, water and air which lead to insecurity of food.

For the better yield we need to consider soil type and soil fertility things and also one of the major factors rainfall and groundwater availability. If it is dry land it is better to go for cash crops and if it is wetland it is better to go for wheat and sugarcane. There are 15 agro-climatic regions in India; these regions are divided on the bases of a type of the land. Each agro-climatic region can grow some specific crops. Based on that we need to suggest the farmer which crop is best among those crops which belong to those climatic regions. Achieving the maximum crop at minimum yield is the ultimate Aim of the project. Early detection of problems and management of those problems can help the farmers for better crop yield.

Crop yield prediction is the important research which helps to secure food. For better understanding of the crop yield, we need to study the huge data with the help of machine learning algorithms so it will give the accurate yield for that crop and suggest the farmer for a better crop.

Along With this, Crop Diseases are also the major factor which indirectly influence the significant reduction of both quality and quantity of agricultural products. A number of varieties of pesticides are available to control diseases and increase the production. But finding the most current disease, appropriate and effective pesticide to control the infected disease is difficult and requires expert advice which is time consuming and expensive.

The presence of disease on the plant is mainly reflected by symptoms on leaves. So there is a need for an automatic, accurate and less expensive Machine Vision System for detection of diseases from the image and to suggest a proper pesticide as a solution.

Problem Statement or Application focused:

According to the 2011 census, Agricultural Census of India, an estimated 68.84% of the 833 million Indian population is rural and dependent on agriculture. The number of farming households is 118.7 million.

Every farmer thinks of the better production of his crop and even after such great advancement in technologies in various fields, agriculture practices are done by the same kind as they were done decades before. Farmers are unaware which conditions are favourable for which kind of crop. Due to this, they are not being able to gain that much profit from the farming as much they can get from it.

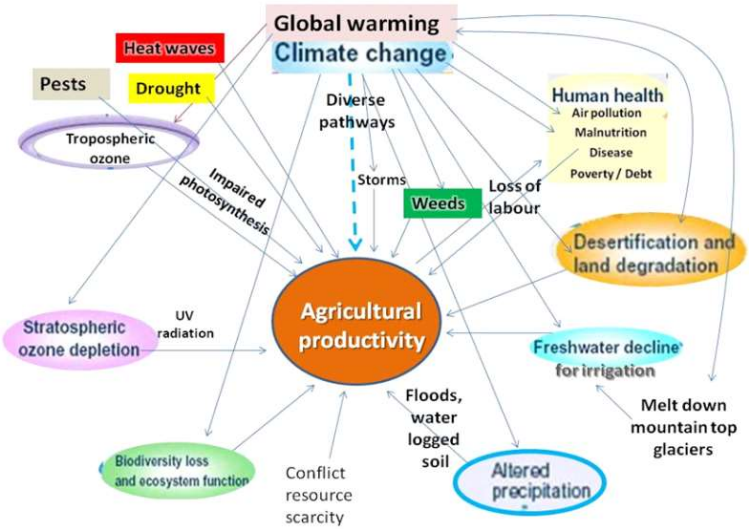


Fig 1. Factors that affects the agricultural Productivity

Related Research Work:

The literature has many reported walks in the domain.

[1] **Shivnath Ghosh, et al. (2014)** In this paper machine learning system is divided into three steps, first sampling (Different soil with same number of properties with different parameters) second Back Propagation Algorithm and third Weight updating.

[2] **P.Vinciya, et al. (2016)** This paper mainly focused on analyzing the agriculture analysis of organic farming and inorganic farming, time cultivation of the plant, profit and loss of the data and analyzes the real estate business land in a specific area. This work goes for finding reasonable information models that accomplish a high precision and a high consensus as far as yield expectation abilities.

[3] **Zhihao Hong, et al. (2016)** This paper proposes an information driven approach on structure PA answers for gathering and information demonstrating frameworks. Soil dampness, a key factor in the yield development cycle, is chosen for instance to exhibit the viability of our information driven methodology. On the accumulation side, a responsive remote sensor hub is built up that expects to catch the elements of soil dampness utilizing soil dampness sensor. The prototyped gadget is tried on field soil to show its usefulness and the responsiveness of the sensors. On the information examination side, a one of a kind, site-explicit soil dampness expectation system is based over models produced by the AI procedures Support Vector Machine and Relevance Vector Machine. The structure predicts soil dampness n days ahead dependent on a similar soil and natural characteristics that can be gathered by our sensor hub.

[4] **Sabri Arik, et al.(2016)** In this paper, we propose a method for predicting functional properties of soil samples from a number of measurable spatial and spectral features of those samples. The method used is based on SavitzkyGolay filter for preprocessing and a relatively recent evolution of single hidden-layer feed-forward network (SLFN) learning technique called extreme learning machine (ELM) for prediction.

[5] **Vaneesbeer Singh, et al. (2017)** This work presents an approach which uses different Machine Learning techniques in order to predict the category of the yield based on macronutrients and micro- nutrients status in the dataset. The dataset considered for the crop yield prediction was obtained from Krishi Bhawan (Talab-Tillo) Jammu. The parameters present in the data are Macronutrients (ph,Oc,Ec,N,P,K,S) and Micro Nutrients (Zn,Fe,Mn,Cu) present in samples collected from different regions of Jammu District .After analysis Machine learning algorithms are applied to predict the category of yield . The category, thus predicted will specify the yield of crops. The problem of predicting the crop yield is formulated as Classification where different classifier algorithms are used.

[6] **E.Manjula et al.(2017)** This paper chooses Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sulphur, Iron, Zinc, and so forth, nutrients for investigating the soil supplements utilizing Naïve Bayes, Decision Tree and hybrid approach of Naïve Bayes and Decision Tree. The performance of the classification algorithms are compared based on accuracy and execution time.

Work Done:

We have made a complete package of obligatory features required for a farmer so that he has not to go to any third party for consulting about his crop production and other things.
We have used deep learning and other Artificial Intelligence algorithms for making our project work.

It is basically an AI for Farmer for Crop and Fertilizer Recommendation, Pest recognition and proper guideline.

Tech Stack Used in the project:

FrontEnd

- **HTML -** Hypertext Markup Language which is the standard markup language for documents designed to be displayed in a web browser.
- **CSS** - Cascading Style Sheets is a style sheet language used for describing the presentation of a document written in a markup language like HTML. CSS is a cornerstone technology of the World Wide Web, alongside HTML and JavaScript.
- **Bootstrap** - Bootstrap is a free and open-source CSS framework directed at responsive, mobile-first front-end web development. It contains CSS- and JavaScript-based design templates for typography, forms, buttons, navigation, and other interface components.
- **Jquery** - jQuery is a JavaScript library designed to simplify HTML DOM tree traversal and manipulation, as well as event handling, CSS animation, and Ajax.
- **Javascript** - JavaScript, often abbreviated as JS, is a programming language that conforms to the ECMAScript specification. JavaScript is high-level, often just-in-time compiled, and multi-paradigm.
- **Ajax** - Ajax is a set of web development techniques using many web technologies on the client side to create asynchronous web applications. With Ajax, web applications can send and retrieve data from a server asynchronously without interfering with the display and behavior of the existing page.

BackEnd

- **Flask** - Flask is a micro web framework written in Python. It is classified as a microframework because it does not require particular tools or libraries. It has no database abstraction layer, form validation, or any other components where pre-existing third-party libraries provide common functions.

  ### Why used Flask?

  Flask is a minimalistic python framework for building web apps. It does not offer and bend you one way or another. Jinja2 is an awesome template framework, flask comes out of box support for that, but it does not force that way. You can pick a different template framework if you like. It relies on middlewares, a pluggable approach to add functionalities as needed. So not so bloated unlike django.

  No matter what you are building, a fully loaded web app or restful api, flask can be the one framework for you with the least learning curve.

  As said above it does not come fully baked with stuffs such as database support, deployment process, templating, session, user management, csrf out of box. These can be added as extensions or build upon.

Database

- **Firebase -** The Firebase Realtime Database is a cloud-hosted database. Data is stored as JSON and synchronized in realtime to every connected client. When you build cross-platform apps with our iOS, Android, and JavaScript SDKs, all of your clients share one Realtime Database instance and automatically receive updates with the newest data.

External Library

- **Chart.js -** Simple, clean and engaging HTML5 based JavaScript charts. **Chart.js** is an easy way to include animated, interactive graphs on your website for free.
- **Animate.js -** Animate.js is a lightweight Javascript animation library with a simple,yet powerful API. It works with CSS properties,SVG,DOM attributes and Javascript Objects.
- **Twilio -** Twilio allows software developers to programmatically make and receive phone calls, send and receive text messages, and perform other communication functions using its web service APIs.

Python Library

- **Keras -** Keras is an open-source neural-network library written in Python. It is capable of running on top of TensorFlow, Microsoft Cognitive Toolkit, R, Theano, or PlaidML. Designed to enable fast experimentation with deep neural networks, it focuses on being user-friendly, modular, and extensible.
- **Tensorflow -** TensorFlow is a free and open-source software library for dataflow and differentiable programming across a range of tasks. It is a symbolic math library, and is also used for machine learning applications such as neural networks.
- **Opencv -** OpenCV is a library of programming functions mainly aimed at real-time computer vision.
- **Numpy -** NumPy is a library for the Python programming language, adding support for large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays.
- **Pandas -** Pandas is a software library written for the Python programming language for data manipulation and analysis.
- **Scikit-learn -** Scikit-learn is a free software machine learning library for the Python programming language. It features various classification, regression and clustering algorithms including support vector machines.

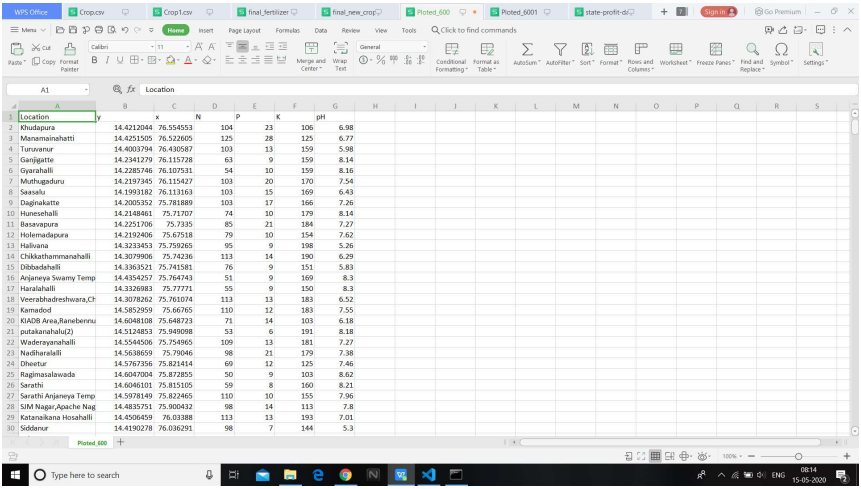
- **Pillow -** Python Imaging Library is a free and open-source additional library for the Python programming language that adds support for opening, manipulating, and saving many different image file formats.
- **Bs4 -** BeautifulSoup is a Python package for parsing HTML and XML documents. It creates a parse tree for parsed pages that can be used to extract data from HTML, which is useful for web scraping.
- **Pyrebase -** Pyrebase is a simple python wrapper for the Firebase API.
- **Firebase-admin -** The Admin SDK lets you interact with Firebase from privileged environments to perform actions like: Read and write Realtime Database data with full admin privileges. Programmatically send Firebase Cloud Messaging messages using a simple, alternative approach to the Firebase Cloud Messaging server protocols.

Key Features of the Application:

1. **Crop Yield Prediction:**
   Based on the value of Nitrogen(N) , Phosphorus(P) , Potassium (K) availability and pH value of soil, we have used the **K-nearest classifier** model for predicting the favourable crops that can be grown efficiently on that particular land area.
   We have analyzed the various related attributes like location, pH value from which alkalinity of the soil is determined. Along with it, percentage of nutrients like Nitrogen (N), Phosphorous (P), and Potassium (K) Location is used along with the use of third-party applications like APIs for weather and temperature, type of soil, nutrient value of the soil in that region, amount of rainfall in the region, soil composition can be determined. All these attributes of data will be analyzed, training the data with various suitable machine learning algorithms. The system comes with a solution to be precise and accurate in predicting favorable crop yield and deliver the end user with proper recommendations about required fertilizer ratio based on atmospheric and soil parameters of the land which enhance to increase the crop yield and increase farmer revenue.

   We have given the crop prediction to be done in two ways:
   -- **Region Wise** : Here users have to input its location only to get the favorable crop to be grown there.
   For this we have stored the data of about 600 locations with the availability of N,P,K,pH in the soil of that area.

Some data is as:

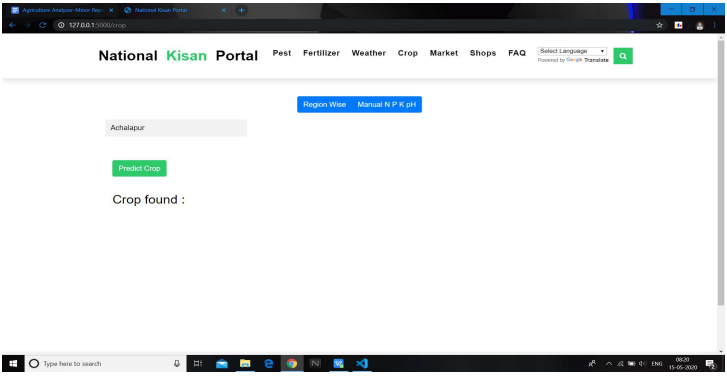


Location	y	x	N	P	K	pH	
Khudapura		14.4212044	76.554553	104	23	106	6.98
Manamainahatti		14.4251505	76.522605	125	28	125	6.77
Turuvanur		14.4003794	76.430587	103	13	159	5.98
Ganjigatte		14.2341279	76.115728	63	9	159	8.14
Gyarahalli		14.2285746	76.107531	54	10	159	8.16
Muthugadduru		14.2197345	76.115427	103	20	170	7.54
Saasalu		14.1993182	76.113163	103	15	169	6.43
Daginakatte		14.2005352	75.781889	103	17	166	7.26
Hunesehalli		14.2148461	75.71707	74	10	179	8.14
Basavepura		14.2251706	75.7335	85	21	184	7.27
Holemadapura		14.2192406	75.67518	79	10	154	7.62
Halivana		14.3233453	75.759265	95	9	198	5.26
Chikkathammanahalli		14.3079906	75.74236	113	14	190	6.29
Dibbadehalli		14.3363521	75.741581	76	9	151	5.83
Anjaneya Swamy Temp		14.4354257	75.764743	51	9	169	8.3
Haralahalli		14.3326983	75.77771	55	9	150	8.3
Veerabhadreshwara,Ch		14.3078262	75.761074	113	13	183	6.52
Kamadod		14.5852959	75.66765	110	12	183	7.55
KIADB Area,Ranebennu		14.6048108	75.648723	71	14	103	6.18
putakanahalu(2)		14.5124853	75.949098	53	6	191	8.18
Wadersyanahalli		14.5544506	75.754965	109	13	181	7.27
Nadiharalalli		14.5638659	75.79046	98	21	179	7.38
Dheetur		14.5767356	75.821414	69	12	125	7.46
Ragimasalawada		14.6047004	75.872855	50	9	103	8.62
Sarathi		14.6046101	75.815105	59	8	160	8.21
Sarathi Anjaneya Temp		14.5978149	75.822465	110	10	155	7.96
SIM Nagar,Apache Nag		14.4835751	75.900432	98	14	113	7.8
Katanaikana Hosahalli		14.4506459	76.03388	113	13	193	7.01
Siddanur		14.4190278	76.036291	98	7	144	5.3

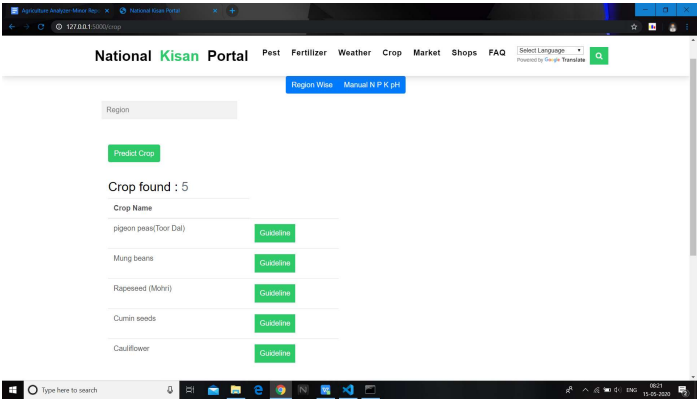
-- **Manual N,P,K,pH** : Here users have to enter the data values manually to get the information for crop prediction.

Screenshots from Project:

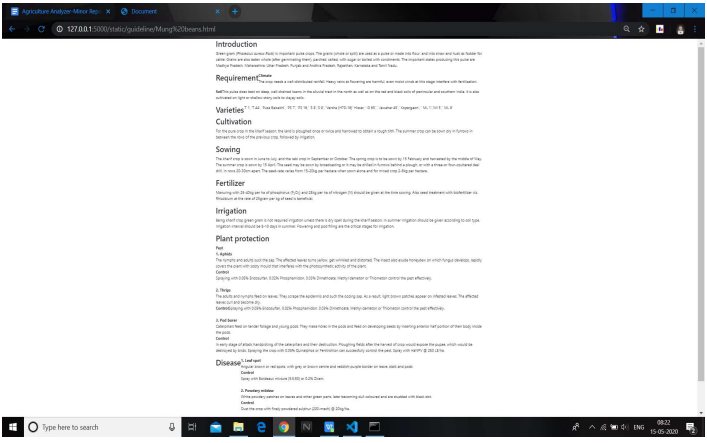
Region Wise Crop Prediction (For Achalpur) -



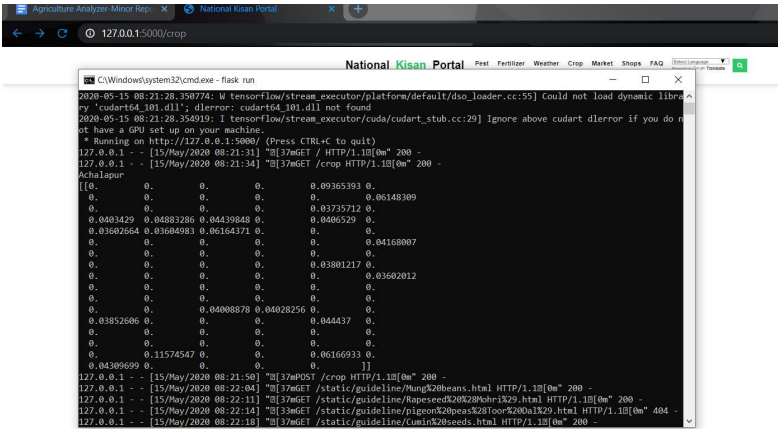
Following crops are found from the data favourable for that region:



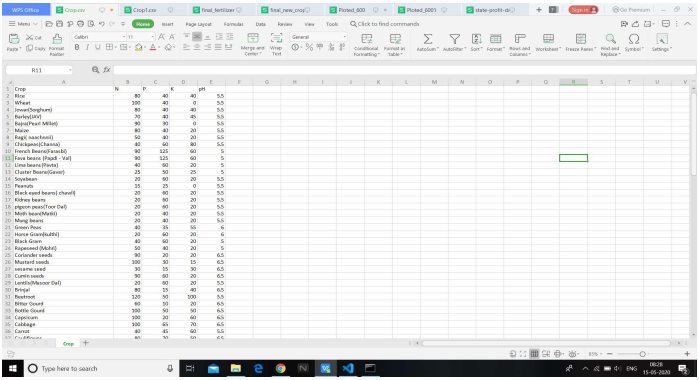
Along with this, We have attached some guidelines for its production as a static webpage.



Backend Functioning of the Algorithm:



We have taken 102 crops in consideration some of which are:



2. Pest Detection:

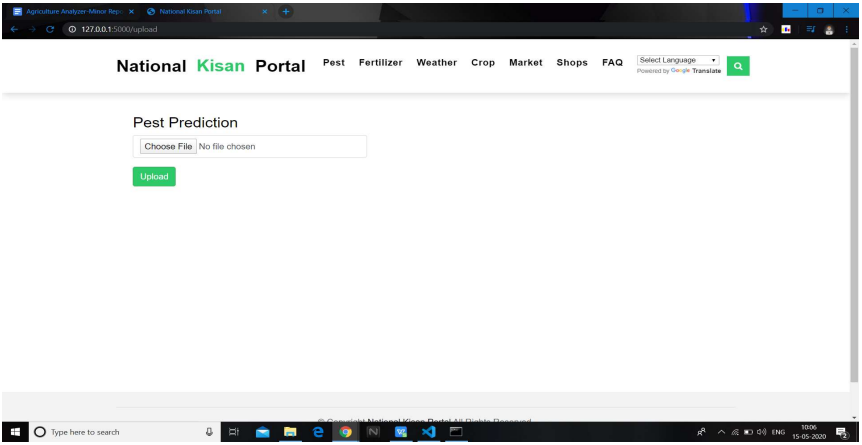
The pest prediction model is developed using Tensorflow library. The image visionary is analyzed using convolutional neural networks (CNN). The model can detect the pest on the uploaded image and give measures to be taken.

List of Plant State taken in Consideration:

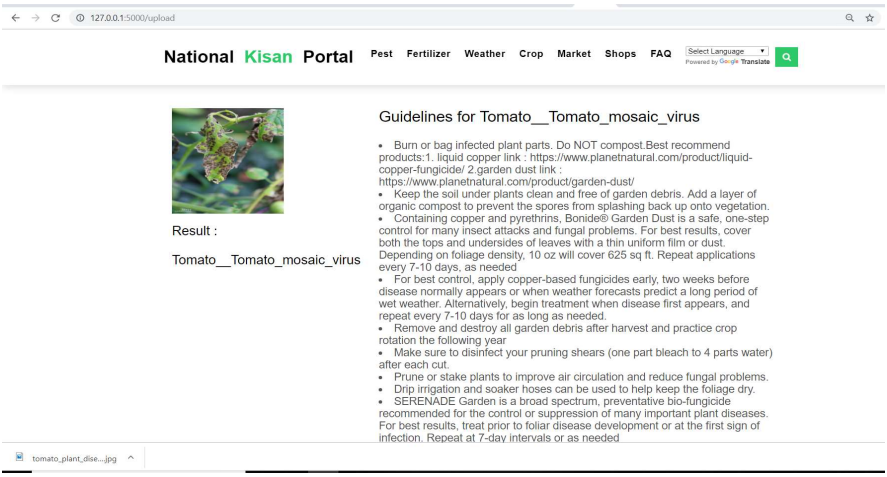
- Pepper__bell___Bacterial_spot
- Pepper__bell___healthy
- Potato___Early_blight
- Potato___healthy
- Potato___Late_blight
- Tomato__Target_Spot
- Tomato__Tomato_mosaic_virus
- Tomato__Tomato_YellowLeaf__Curl_Virus
- Tomato_Bacterial_spot
- Tomato_Early_blight
- Tomato_healthy
- Tomato_Late_blight
- Tomato_Leaf_Mold
- Tomato_Septoria_leaf_spot
- Tomato_Spider_mites_Two_spotted_spider_mite

Detection of a Tomato Disease:

Initially application asks for an image from users for detecting the disease.



Outcome of the Input Image:



CNN Model used:

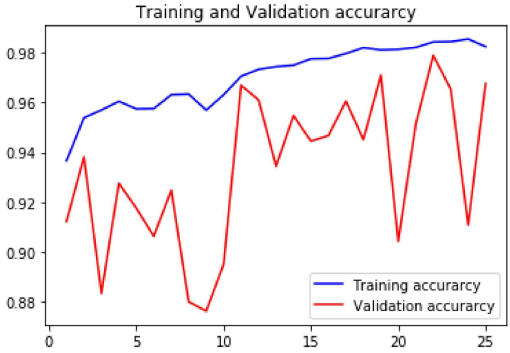
model.summary()

```
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d_1 (Conv2D)            (None, 256, 256, 32)      896
_________________________________________________________________
activation_1 (Activation)    (None, 256, 256, 32)      0
_________________________________________________________________
batch_normalization_1 (Batch (None, 256, 256, 32)      128
_________________________________________________________________
max_pooling2d_1 (MaxPooling2 (None, 85, 85, 32)        0
_________________________________________________________________
dropout_1 (Dropout)          (None, 85, 85, 32)        0
_________________________________________________________________
conv2d_2 (Conv2D)            (None, 85, 85, 64)        18496
_________________________________________________________________
activation_2 (Activation)    (None, 85, 85, 64)        0
_________________________________________________________________
batch_normalization_2 (Batch (None, 85, 85, 64)        256
_________________________________________________________________
conv2d_3 (Conv2D)            (None, 85, 85, 64)        36928
_________________________________________________________________
activation_3 (Activation)    (None, 85, 85, 64)        0
_________________________________________________________________
batch_normalization_3 (Batch (None, 85, 85, 64)        256
_________________________________________________________________
max_pooling2d_2 (MaxPooling2 (None, 42, 42, 64)        0
_________________________________________________________________
dropout_2 (Dropout)          (None, 42, 42, 64)        0
_________________________________________________________________
conv2d_4 (Conv2D)            (None, 42, 42, 128)       73856
_________________________________________________________________
activation_4 (Activation)    (None, 42, 42, 128)       0
_________________________________________________________________
batch_normalization_4 (Batch (None, 42, 42, 128)       512
_________________________________________________________________
conv2d_5 (Conv2D)            (None, 42, 42, 128)       147584
_________________________________________________________________
activation_5 (Activation)    (None, 42, 42, 128)       0
_________________________________________________________________
batch_normalization_5 (Batch (None, 42, 42, 128)       512
_________________________________________________________________
max_pooling2d_3 (MaxPooling2 (None, 21, 21, 128)       0
_________________________________________________________________
dropout_3 (Dropout)          (None, 21, 21, 128)       0
_________________________________________________________________
flatten_1 (Flatten)          (None, 56448)             0
_________________________________________________________________
dense_1 (Dense)              (None, 1024)              57803776
_________________________________________________________________
activation_6 (Activation)    (None, 1024)              0
_________________________________________________________________
batch_normalization_6 (Batch (None, 1024)              4096
_________________________________________________________________
dropout_4 (Dropout)          (None, 1024)              0
_________________________________________________________________
dense_2 (Dense)              (None, 15)                15375
_________________________________________________________________
activation_7 (Activation)    (None, 15)                0
=================================================================
Total params: 58,102,671
Trainable params: 58,099,791
```

Training using the dataset of 20,639 image files...

```
Epoch 1/25
73/73 [==============================] - 47s 644ms/step - loss: 0.1989 - acc: 0.9367 -
val_loss: 0.4419 - val_acc: 0.9122
Epoch 2/25
73/73 [==============================] - 39s 532ms/step - loss: 0.1316 - acc: 0.9538 -
val_loss: 0.2397 - val_acc: 0.9382
Epoch 3/25
73/73 [==============================] - 41s 557ms/step - loss: 0.1191 - acc: 0.9570 -
val_loss: 1.2767 - val_acc: 0.8832
Epoch 4/25
73/73 [==============================] - 39s 529ms/step - loss: 0.1093 - acc: 0.9605 -
val_loss: 0.5535 - val_acc: 0.9276
Epoch 5/25
73/73 [==============================] - 39s 531ms/step - loss: 0.1226 - acc: 0.9575 -
val_loss: 0.6102 - val_acc: 0.9175
Epoch 6/25
73/73 [==============================] - 39s 537ms/step - loss: 0.1196 - acc: 0.9577 -
val_loss: 0.5770 - val_acc: 0.9063
Epoch 7/25
73/73 [==============================] - 39s 530ms/step - loss: 0.1023 - acc: 0.9632 -
val_loss: 0.5210 - val_acc: 0.9248
Epoch 8/25
73/73 [==============================] - 40s 550ms/step - loss: 0.1026 - acc: 0.9633 -
val_loss: 1.7190 - val_acc: 0.8799
Epoch 9/25
73/73 [==============================] - 40s 550ms/step - loss: 0.1238 - acc: 0.9570 -
```

Training Accuracy and Loss:



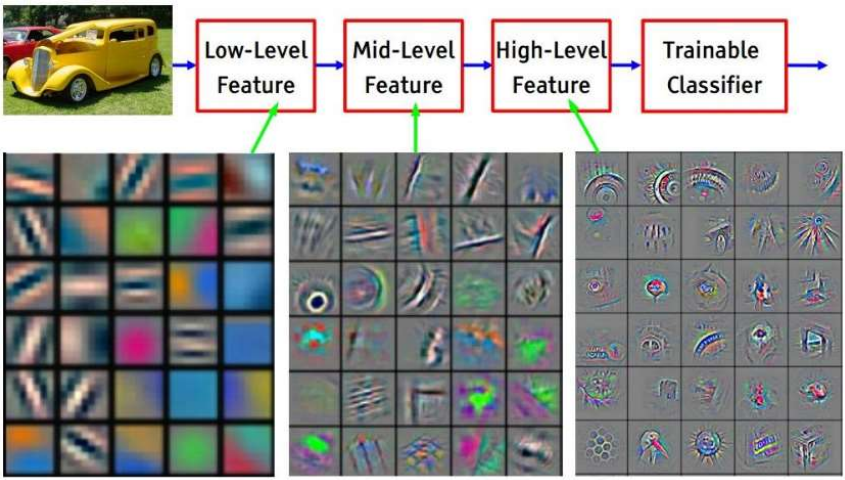
How Neural Network Works:

We have to design a model with an input layer and an output layer including some hidden layers which help in feature extraction.

What do the hidden layers learn??

The hidden layers in a CNN are generally convolution and pooling(downsampling) layers. In each convolution layer, we take a filter of a small size and move that filter across the image and perform convolution operations. Convolution operations are nothing but element-wise matrix multiplication between the filter values and the pixels in the image and the resultant values are summed.

The filter's values are tuned through the iterative process of training and after a neural net has trained for a certain number of epochs, these filters start to look out for various features in the image. Take the example of face detection using a convolutional neural network. The earlier layers of the network look for simple features such as edges at different orientations etc. As we progress through the network, the layers start detecting more complex features and when you look at the features detected by the final layers, they almost look like a face.



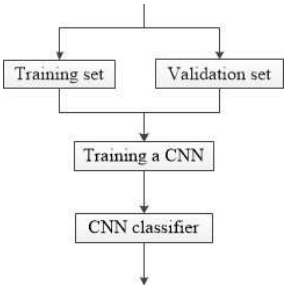
Now, let's move on to pooling layers. Pooling layers are used to downsample the image. The image would contain a lot of pixel values and it is typically easy for the network to learn the features if the image size is progressively reduced. Pooling layers help in reducing the number of parameters required and hence, this reduces the computation required. Pooling also helps in avoiding overfitting. There are two types of pooling operation that could be done:

- Max Pooling — Selecting the maximum value
- Average Pooling — Sum all of the values and dividing it by the total number of values

Average pooling is rarely used, you could find max pooling used in most of the examples.

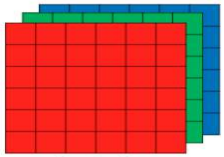
What is CNN?

A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. The pre-processing required in a ConvNet is much lower as compared to other classification algorithms. While in primitive methods filters are hand-engineered, with enough training, ConvNets have the ability to learn these filters/characteristics.

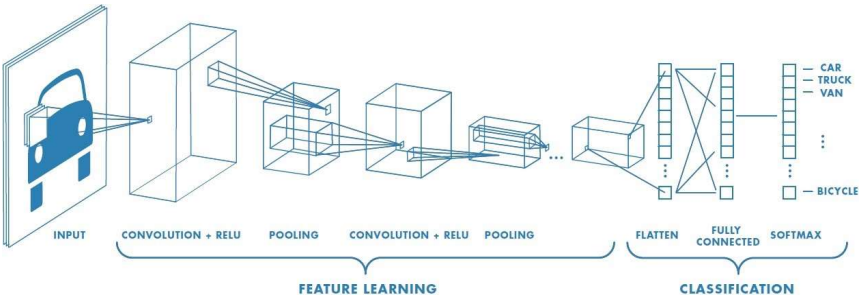


Working of CNN

CNN image classifications take an input image, process it and classify it under certain categories (Eg., Dog, Cat, Tiger, Lion). Computers see an input image as an array of pixels and it depends on the image resolution. Based on the image resolution, it will see h x w x d(h = Height, w = Width, d = Dimension). Eg., An image of 6 x 6 x 3 array of matrix of RGB (3 refers to RGB values) and an image of 4 x 4 x 1 array of matrix of grayscale image



Technically, deep learning CNN models to train and test, each input image will pass it through a series of convolution layers with filters (Kernels), Pooling, fully connected layers (FC) and apply Softmax function to classify an object with probabilistic values between 0 and 1. The below figure is a complete flow of CNN to process an input image and classifies the objects based on values.



A convolutional neural network (CNN) convolves an input image with a defined weight matrix to extract specific image features without losing spatial arrangement information. We initially evaluate different architectures to determine the best performing CNN for the binary classification task and aim to achieve literature reported performance levels. We then seek to train multi-class models that enhance sensitivities for the mild or early stage classes, including various methods of data preprocessing and data augmentation to both improve test accuracy as well as increase our effective dataset sample size.

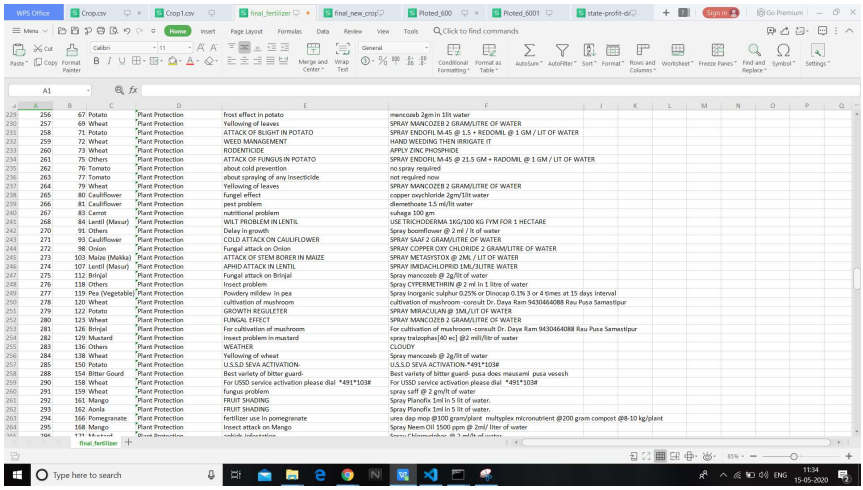
3. Fertilizer Recommendation:

The fertilizer recommendations are made to apply enough fertilizers to both meet the nutrient requirements of the crop and to build up the nutrient level in the soil to a critical soil test level over a planned time frame.

For this, we have created a .csv file which has the query corresponding to the plant along with a solution to cure it.

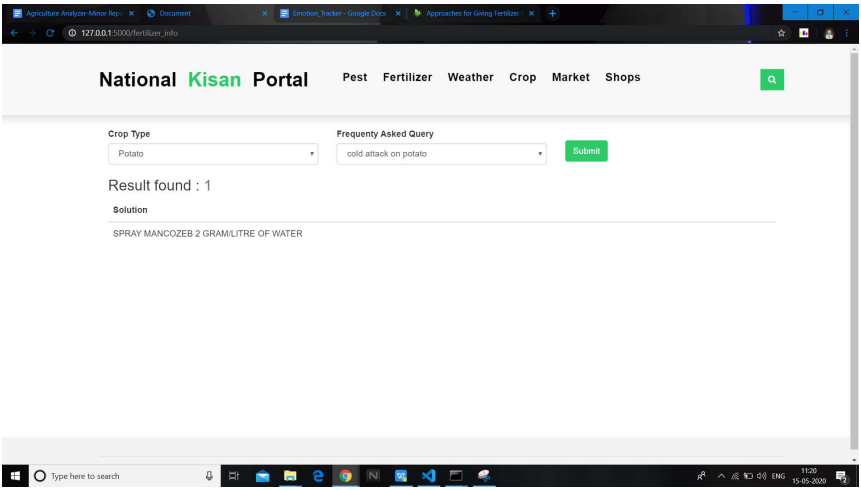
In the sufficiency approach, fertilizers are applied only to meet the nutrient requirements of the crop. The goal of this approach is to maximize profitability in a given year, while minimizing fertilizer applications and costs. Soil test level is maintained at, or above, the critical level by applying fertilizer rates that replace the nutrients removed by the crop.

Screenshot of .csv file with all information of fertilizers:



229	256	67	Potato	Plant Protection	frost effect in potato	mancozeb 2gm in 1lit water
230	257	69	Wheat	Plant Protection	Yellowing of leaves	SPRAY MANCOZEB 2 GRAM/LITRE OF WATER
231	258	71	Potato	Plant Protection	ATTACK OF BLIGHT IN POTATO	SPRAY ENDOFIL M-45 @ 1.5 + REDOMIL @ 1 GM / LIT OF WATER
232	259	72	Wheat	Plant Protection	WEED MANAGEMENT	HAND WEEDING THEN IRRIGATE IT
233	260	73	Wheat	Plant Protection	RODENTICIDE	APPLY ZINC PHOSPHIDE
234	261	75	Others	Plant Protection	ATTACK OF FUNGUS IN POTATO	SPRAY ENDOFIL M-45 @ 21.5 GM + RADOMIL @ 1 GM / LIT OF WATER
235	262	76	Tomato	Plant Protection	about cold prevention	no spray required
236	263	77	Tomato	Plant Protection	about spraying of any insecticide	not required now
237	264	79	Wheat	Plant Protection	Yellowing of leaves	SPRAY MANCOZEB 2 GRAM/LITRE OF WATER
238	265	80	Cauliflower	Plant Protection	fungal effect	copper oxychloride 2gm/1lit water
239	266	81	Cauliflower	Plant Protection	pest problem	diemethoate 1.5 ml/lit water
240	267	83	Carrot	Plant Protection	nutritional problem	suhage 100 gm
241	268	84	Lentil (Masur)	Plant Protection	WILT PROBLEM IN LENTIL	USE TRICHODERMA 1KG/100 KG FYM FOR 1 HECTARE
242	270	91	Others	Plant Protection	Delay in growth	Spray boomflower @ 2 ml / lt of water
243	271	93	Cauliflower	Plant Protection	COLD ATTACK ON CAULIFLOWER	SPRAY SAAF 2 GRAM/LITRE OF WATER
244	272	98	Onion	Plant Protection	Fungal attack on Onion	SPRAY COPPER OXY CHLORIDE 2 GRAM/LITRE OF WATER
245	273	103	Maize (Makka)	Plant Protection	ATTACK OF STEM BORER IN MAIZE	SPRAY METASYSTOX @ 2ML / LIT OF WATER
246	274	107	Lentil (Masur)	Plant Protection	APHID ATTACK IN LENTIL	SPRAY IMIDACHLOPRID 1ML/3LITRE WATER
247	275	112	Brinjal	Plant Protection	Fungal attack on Brinjal	Spray mancozeb @ 2g/lit of water
248	276	118	Others	Plant Protection	Insect problem	Spray CYPERMETHRIN @ 2 ml in 1 litre of water
249	277	119	Pea (Vegetable)	Plant Protection	Powdery mildew in pea	Spray Inorganic sulphur 0.25% or Dinocap 0.1% 3 or 4 times at 15 days interval
250	278	120	Wheat	Plant Protection	cultivation of mushroom	cultivation of mushroom -consult Dr. Daya Ram 9430464088 Rau Pusa Samastipur
251	279	122	Potato	Plant Protection	GROWTH REGULETER	SPRAY MIRACULAN @ 1ML/LIT OF WATER
252	280	123	Wheat	Plant Protection	FUNGAL EFFECT	SPRAY MANCOZEB 2 GRAM/LITRE OF WATER
253	281	126	Brinjal	Plant Protection	For cultivation of mushroom	For cultivation of mushroom -consult Dr. Daya Ram 9430464088 Rau Pusa Samastipur
254	282	129	Mustard	Plant Protection	Insect problem in mustard	spray tracoplus[40 ec] @2 ml/lit of water
255	283	136	Others	Plant Protection	WEATHER	CLOUDY
256	284	138	Wheat	Plant Protection	Yellowing of wheat	Spray mancozeb @ 2g/lit of water
257	285	150	Potato	Plant Protection	U.S.S.D SEVA ACTIVATION-	U.S.S.D SEVA ACTIVATION-*491*103#
258	288	154	Bitter Gourd	Plant Protection	Best variety of bitter guard-	Best variety of bitter guard- pusa does mausami pusa vesesh
259	290	158	Wheat	Plant Protection	For USSD service activation please dial *491*103#	For USSD service activation please dial *491*103#
260	291	159	Wheat	Plant Protection	fungus problem	spray saff @ 2 gm/lt of water
261	292	161	Mango	Plant Protection	FRUIT SHADING	Spray Planofix 1ml in 5 lit of water.
262	293	162	Aonla	Plant Protection	FRUIT SHADING	Spray Planofix 1ml in 5 lit of water.
263	294	166	Pomegranate	Plant Protection	fertilizer use in pomegranate	urea dap mop @100 gram/plant multiplex micronutrient @200 gram compost @8-10 kg/plant
264	295	168	Mango	Plant Protection	Insect attack on Mango	Spray Neem Oil 1500 ppm @ 2ml/ liter of water

Screenshot from the project:



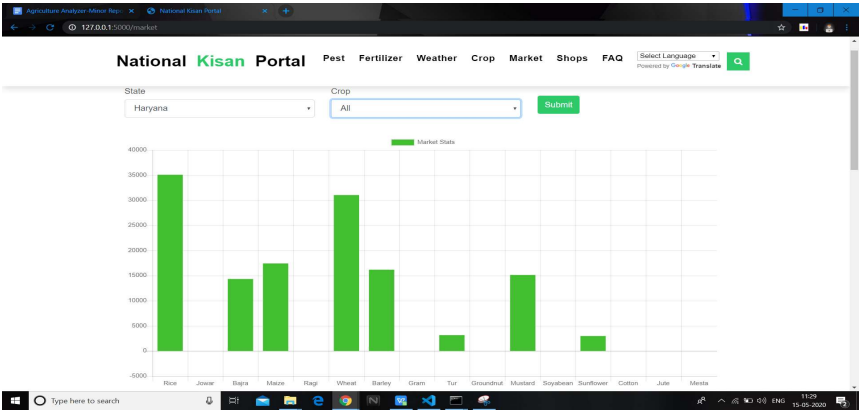
(Cold Attack on Potato) → (Spray Mancozeb 2gm/litre of water)

4. **Market Stats:**

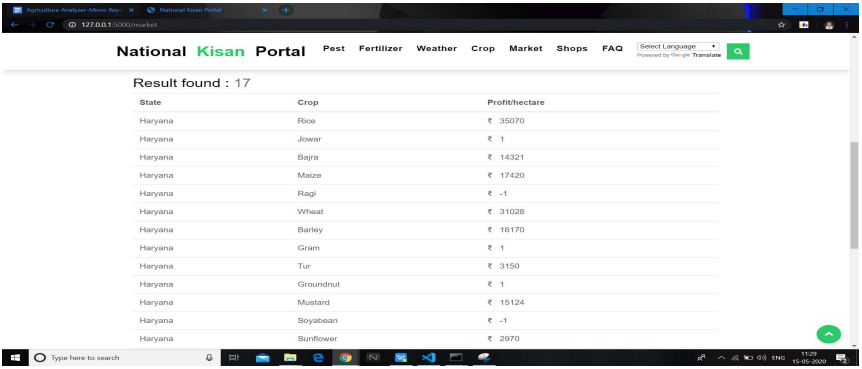
This feature is used to make farmers aware of the current market profit or loss for the crop they are going to grow in their state. It will help farmers to better understand the benefits he can get from the particular crop production.

Screenshot from the project:

Graph showing the profit/hectare which could be earned:



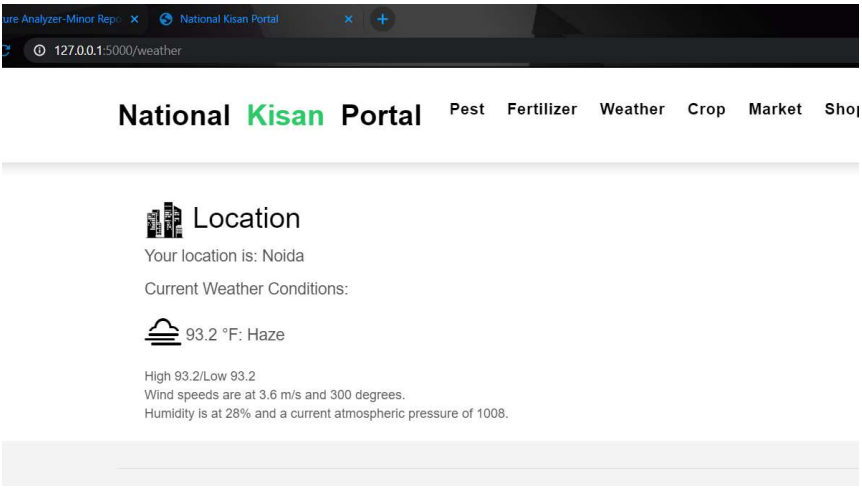
Numeric values for profit/hectare in the state Haryana for all Crops:



5. **Weather Prediction:**
   Two types of weather forecast done in the project.

   - Openweathermap Api give the real time forecast
   - Web Scraping using bs4 (python library) will give the 15 days weather forecast.

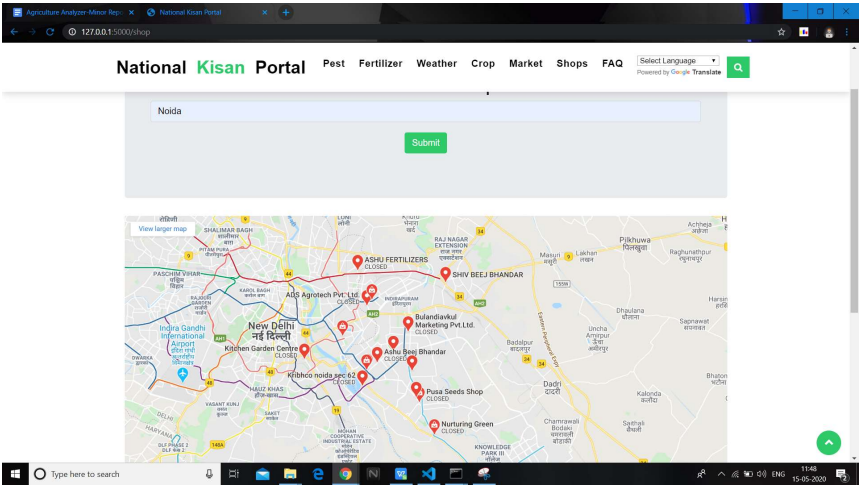
Weather Prediction for city Noida:



6. **Fertilizer Shops:**

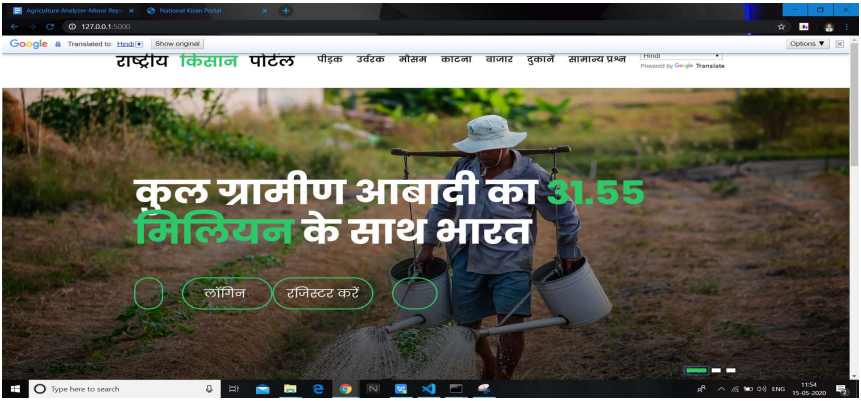
   Here we have used Google Map API for pointing the nearBy fertilizers shops so that it would be easy for the farmer to find the closest shop.

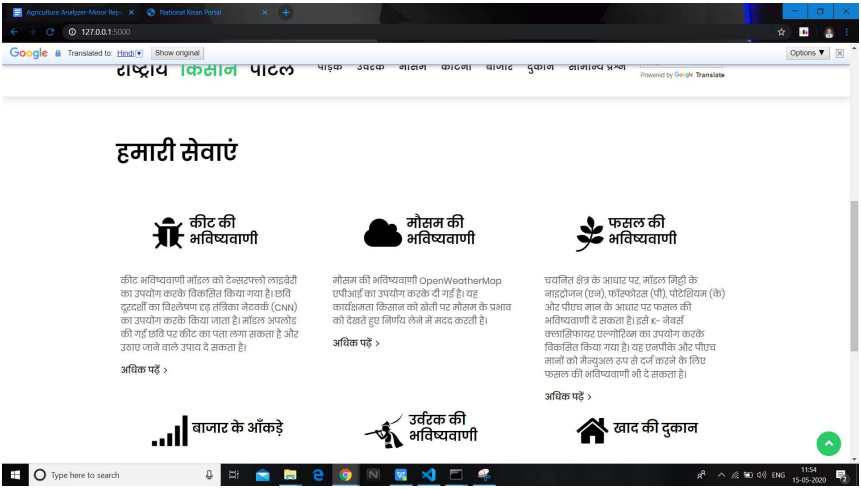
   Following Red point are indicating the fertilizers shop in Noida Area:



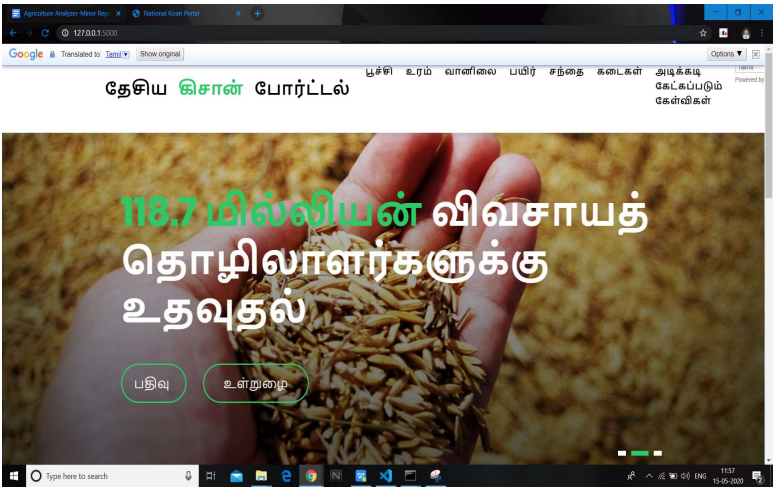
7. **Google Translation :**
   For making it easily understandable to every citizen and everyone could benefit from it, Google Translate API is used in the project to convert in any language.

   Examples:
   Hindi(हिन्दी) :





Tamil (தமிழ்):


தேசிய கிசான் போர்ட்டல்
பூச்சி உரம் வானிலை பயிர் சந்தை கடைகள்
அடிக்கடி கேட்கப்படும் கேள்விகள்
118.7 மில்லியன் விவசாயத் தொழிலாளர்களுக்கு உதவுதல்
பதிவு
உள்நுழை

Result Analysis:

National Kisan Portal is for the farmer just for their help in making farming more productive than ever before. Features like crop prediction and plant disease detection are helpful for the farmer so that his crops are not damaged due to non favorable conditions or any pest attack on it.

CNN model is used for Plant Disease Detection. The most essential building block for a CNN model is the underlying data used to train it and thus synchronous efforts for collecting data are required. In this field, crowdsourcing efforts such as Plantix, **Plant Village** and Digipathos need special mention.

Here we have used the **Plant Village dataset** for training our model which is providing good results with 96.77% of validation accuracy and 11.48% of validation loss.

K-Nearest Neighbour machine learning algorithm is used for favourable crop prediction. K-Nearest Neighbor(KNN) is a very simple, easy to understand, versatile and one of the topmost machine learning algorithms. KNN is used in a variety of applications such as finance, healthcare, political science, handwriting detection, image recognition and video recognition.

Other features like fertilizer recommendation and market stats are key components in making good profit from the crop prediction.

So, this application or portal is very beneficial for the farmers to enhance the productivity of crops and make good profit from the crop.

References:

[1] **Rushika G., Juilee K, Pooja M, Sachee N, and Priya R.L.(2018). Prediction of Crop Yield using Machine Learning, Issue 02 IRJET (pg 2337-2339).**

[2] **Ruchita T, Shreya B, Prasanna D, and Anagha C (2017). Crop Yield Prediction using Big Data Analytics, Volume 6, Issue 11, IJCMS.**

[3] **Monali P, Santosh K, Vishwakarma, and Ashok V (2015). Analysis of Soil Behaviour and Prediction of Crop Yield using Data Mining Approach, ICCICN 2015.**

[4] **Mrs. N. Hemageetha, and Dr. G.M. Nasira (2016). Analysis of Soil Condition based on pH value using Classification Techniques, IOSR-JCE, Issue 6, (pp.50-54).**

[5] **E. Manjula, and S. Djodiltachoumy (2017). Data Mining Technique to Analyze Soil Nutrients based on Hybrid Classification. IJARCS.**

[6] **Rohit Kumar Rajak, Ankit Pawar, Mitalee Pendke, Pooja Shinde, Suresh Rathod, and Avinash Devare (2017). Crop Recommendation System to maximize Crop yield using Machine Learning. Issue 12 IRJET.**

[7] **S. Veenadhari, Dr. Bharat Misra, Dr. CD singh (2014). Machine Learning Approach for Forecasting Crop Yield based on Climatic Parameters. ICCCI-2014**

[8]
https://www.sciencedirect.com/science/article/pii/S01681699173_14710
[Machine learning approaches for crop yield prediction and nitrogen status estimation in precision agriculture: A review]

[9]
https://towardsdatascience.com/build-your-own-convolution-neural-network-in-5-mins-4217c2cf964f
[Build Your Own Convolution Neural Network in 5 mins]

----------END----------
==========THANK YOU==========