FARM FRESCIO

Minor Project Report

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DECLARATION

We hereby declare that the project work entitled “Farm Frescio” is an authentic record of our own work carried out at Punjab Engineering College (Deemed to be University), as a requirement of Minor Project for the award of degree of BTech (Computer Science and Engineering), under the guidance of Prof. Amandeep Kaur (Faculty, Department of Computer Science and Engineering) during August to December 2021.

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ACKNOWLEDGEMENT

We have taken a lot of deliberations in this venture. But it wouldn't have been possible without the help and backing of numerous people. We want to extend our true appreciation and thank them. We take this opportunity to express our profound gratitude and deep regards to our mentor Prof. Poonam Saini for her exemplary guidance, monitoring and constant encouragement throughout the course of this project. This project truly wouldn’t have been possible without her mentorship and guidance throughout every stage of our project.

ABSTRACT

Frescio is a website which aims to promote Smart Agriculture among farmers. It is a digital hub for farmers to learn more about farming, cultivating their crops and recommendation systems for various problems they might face and at the same time providing a platform to sell their produce at fair prices by connecting them directly to buyers. Frescio is being designed to help farmers at every step of their journey.

Through this project, we have made a system which is a one stop solution to help farmers through every aspect of their farming journey. Farm Frescio is an initiative for facilitating farmers to find a reliable buyer and sell their organic produce and promote organic farming and its benefits. This portal caters various stakeholders like local groups, individual farmers, buyers and input suppliers. It also provides various models like fertilizer recommendation, disease prediction, pest prediction and features to help farmers solve any problem they might face. The project is made multilingual to facilitate farmers from across the country to access our site and a chatbot to answer every query.

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INTRODUCTION

Frescio is a website which aims to promote Smart Agriculture among farmers. It is a digital hub for farmers to learn more about farming, cultivating their crops and recommendation systems for various problems they might face and at the same time providing a platform to sell their produce at fair prices by connecting them directly to buyers. Frescio is being designed to help farmers at every step of their journey.

Our Motivation:

1. Farming is one of the major sectors that influences India's economic growth. Agriculture alone contributes around 20 percent to India's GDP according to the Economic Survey 2020-2021.
2. More than 28 farmers and farm laborer's die by suicide in India every day, according to the 2021 State of India's Environment (SoE) report. Suicide among farmers has been a routine in India for the last 20 years and the suicide rate has been increasing over these years.
3. The rising cost of food in the past years is often blamed on a multi-layered system of middlemen involved in the distribution of produce from farmers to consumers. Over the years, several layers of intermediaries, by lengthening the supply chain, declined farmers from the fair income for their produce.
4. Another reason behind this is the slow upgradation in the Agriculture Sector, and also lack of awareness among Farmers about Modern Agricultural Practices.
5. We were also inspired by the recent events that happened to the farmers in our nation and wanted to do something which might be a thoughtful initiative towards a better future for the food providers of our country.

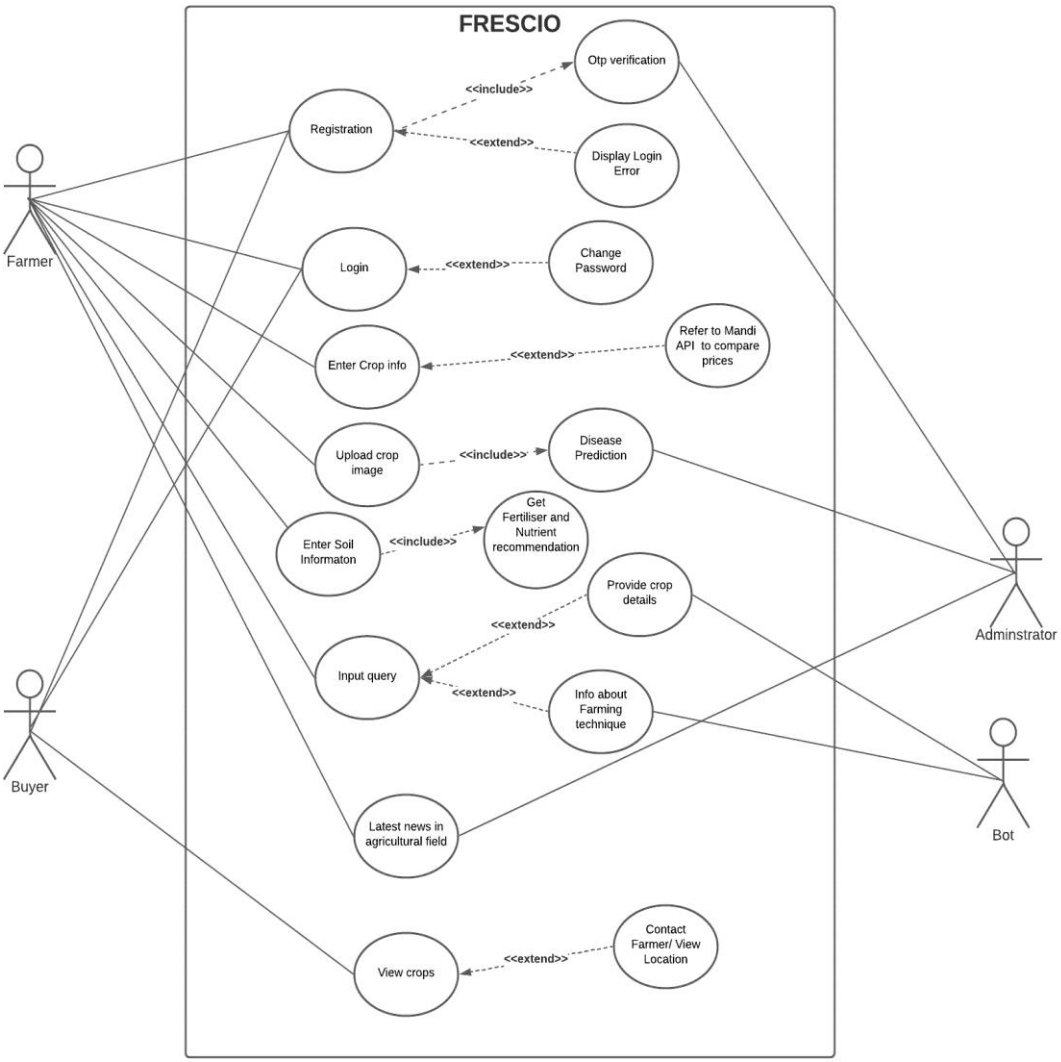
Our features:

1. **E-commerce :** Farmers can sell their agricultural produce and crops at a fair price by posting it on our E-commerce platform to catch the eyes of various buyers and agricultural traders. It will provide local prices from the Mandi API so that the farmers can put up appropriate and reasonable prices for their produce.
2. **Contract Farming :** Buyers can upload contracts and their deadlines and farmers can contact a buyer for the same.
3. Helping farmers at every stage of the farming process which will include f**ertilizer recommendation system, disease and pest prediction model and latest news about the farming sector.**
4. We are aiming to build a multilingual **chatbot** to help farmers answer their queries and any doubt relating to different farming practices.

UML Diagrams

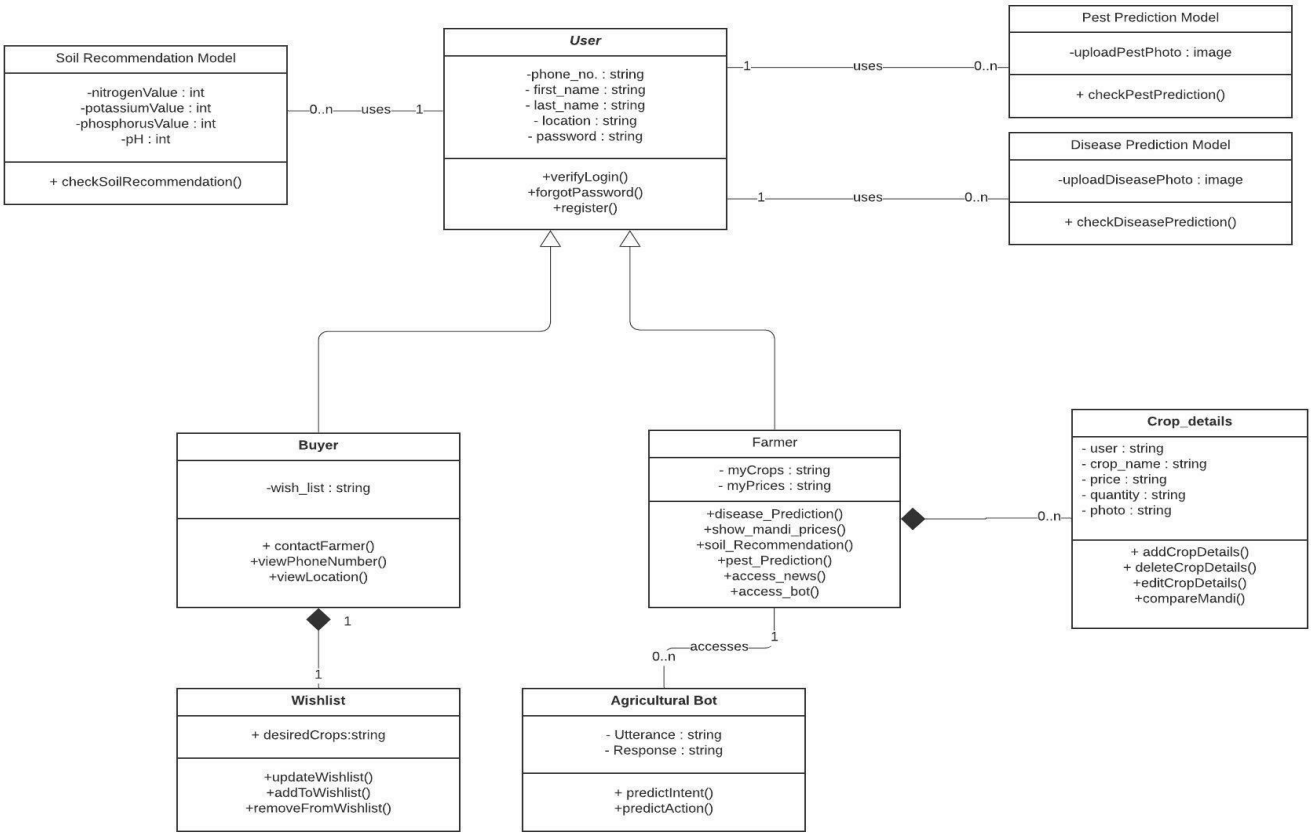
1. UML Use Case Diagram

Attached is the UML Case Diagram for our website, our website incorporates user registration and login as a farmer or a buyer. The user can access the latest news and articles on our homepage, the ecommerce platform provides four features namely, my crops, all crops, wishlist and mandi prices. Apart from that the website has an integrated chatbot to answer all agricultural queries and three models namely pest prediction, disease prediction and fertilizer recommendation which the user can access as per requirement.



2. Class Diagram

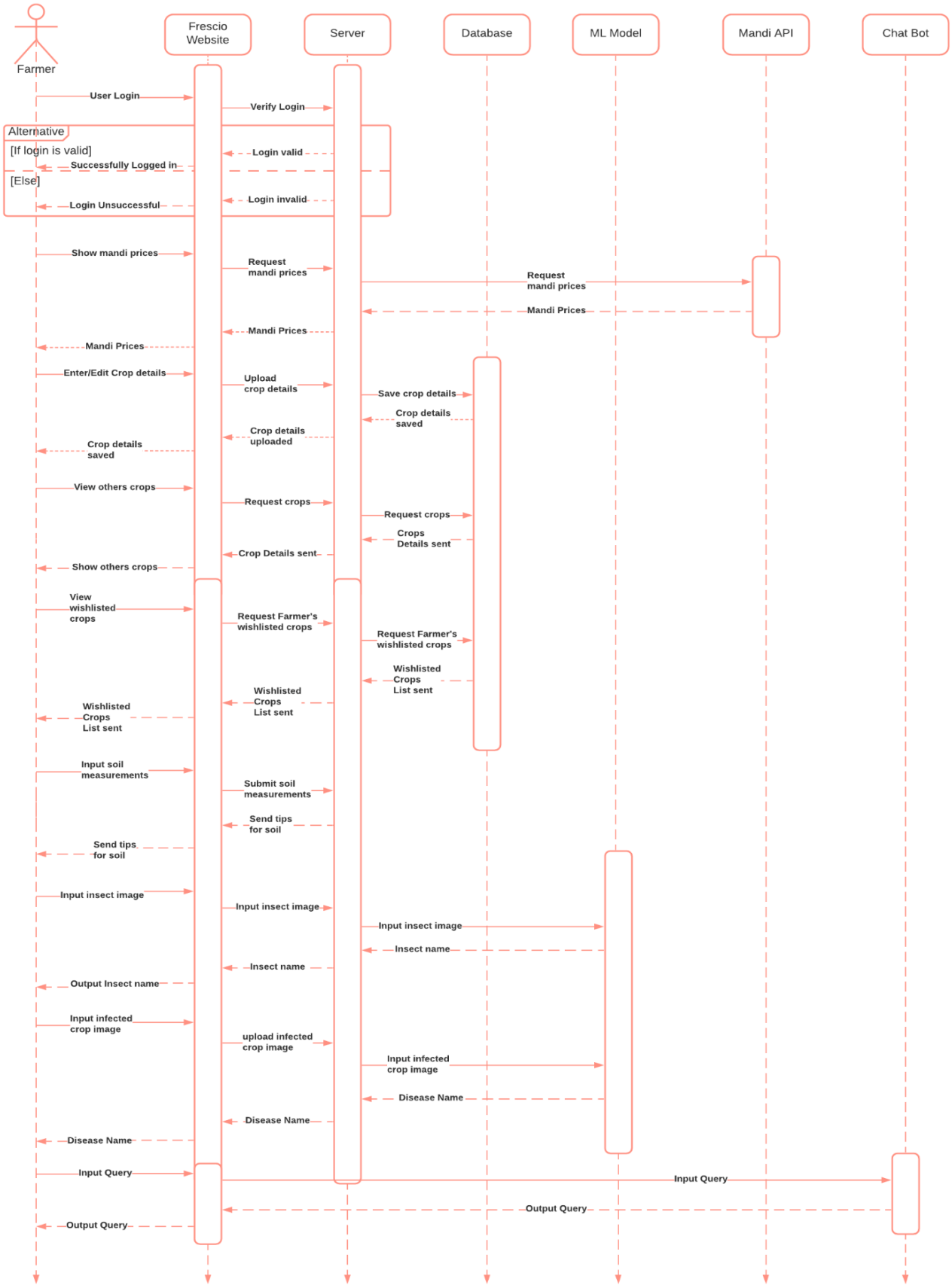
Shows the various components and interactions of various classes and their associated cardinality.



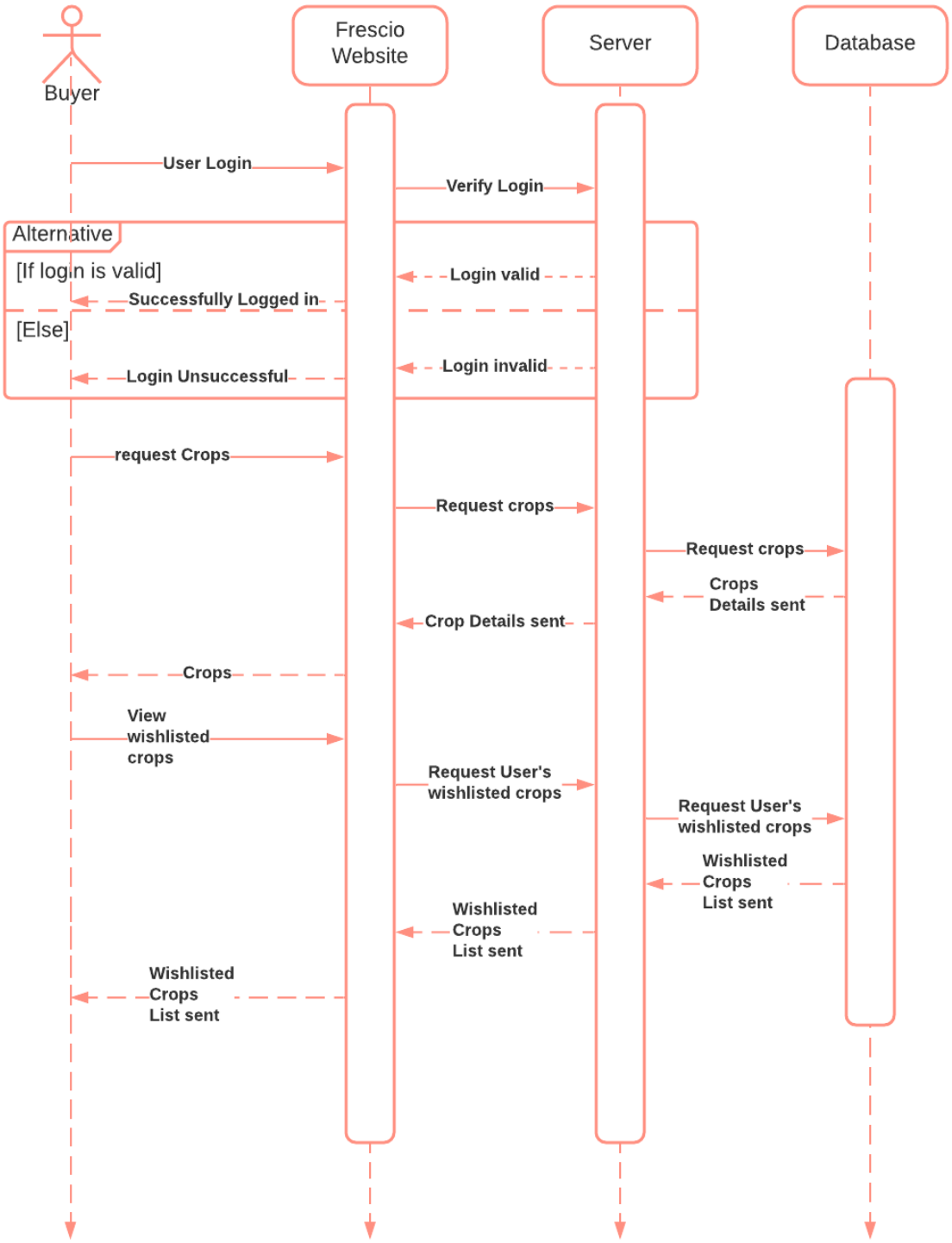
3. Sequence diagram

A sequence diagram is a type of interaction diagram because it describes how—and in what order—a group of objects works together.

a. For farmer

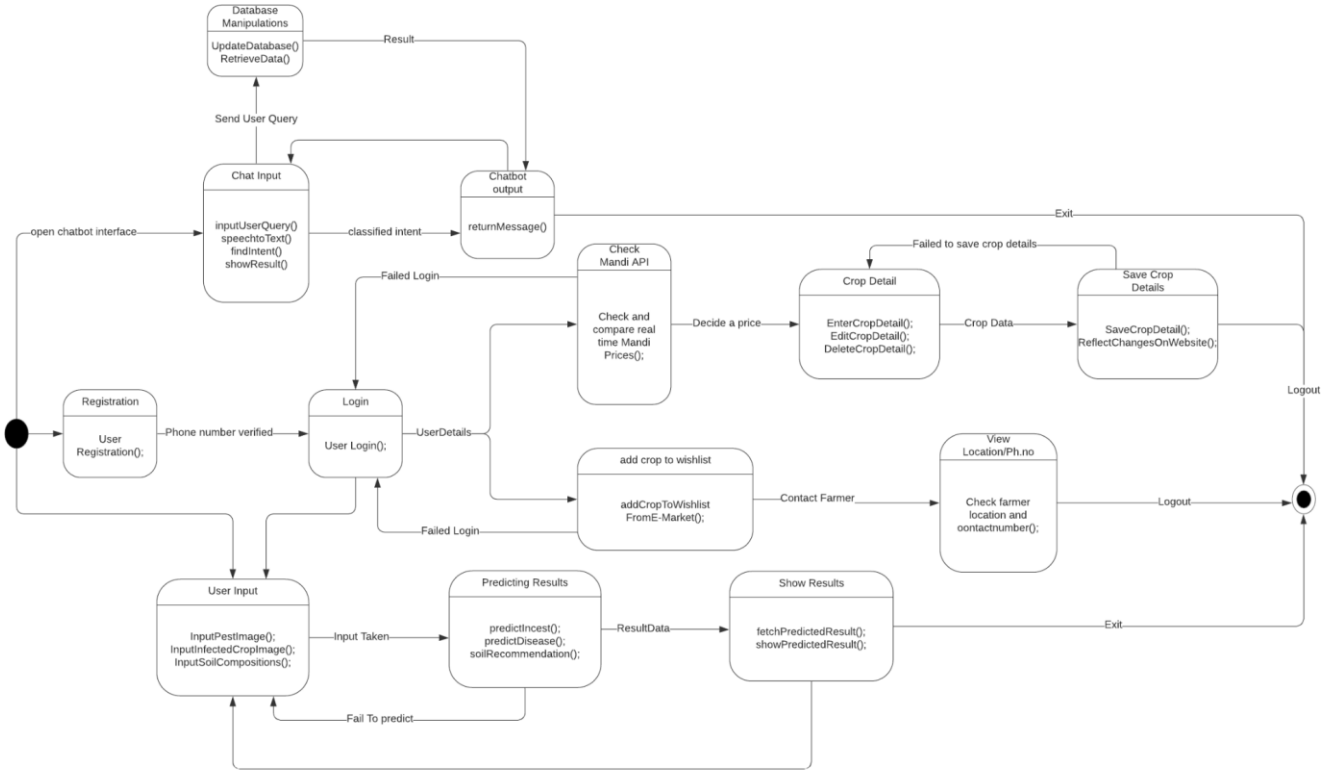

Farmer
Frescio Website
Server
Database
ML Model
Mandi API
Chat Bot
User Login
Verify Login
Alternative
[If login is valid]
Login valid
Successfully Logged in
[Else]
Login invalid
Login Unsuccessful
Show mandi prices
Request mandi prices
Request mandi prices
Mandi Prices
Mandi Prices
Mandi Prices
Enter/Edit Crop details
Upload crop details
Save crop details
Crop details saved
Crop details uploaded
Crop details saved
View others crops
Request crops
Request crops
Crops Details sent
Crop Details sent
Show others crops
View wishlisted crops
Request Farmer's wishlisted crops
Request Farmer's wishlisted crops
Wishlisted Crops List sent
Wishlisted Crops List sent
Wishlisted Crops List sent
Input soil measurements
Submit soil measurements
Send tips for soil
Send tips for soil
Input insect image
Input insect image
Input insect image
Insect name
Insect name
Output Insect name
Input infected crop image
upload infected crop image
Input infected crop image
Disease Name
Disease Name
Disease Name
Input Query
Input Query
Output Query
Output Query

b. For buyer


Buyer
Frescio Website
Server
Database
User Login
Verify Login
Alternative
[If login is valid]
Login valid
Successfully Logged in
[Else]
Login invalid
Login Unsuccessful
request Crops
Request crops
Request crops
Crops Details sent
Crop Details sent
Crops
View wishlisted crops
Request User's wishlisted crops
Request User's wishlisted crops
Wishlisted Crops List sent
Wishlisted Crops List sent
Wishlisted Crops List sent

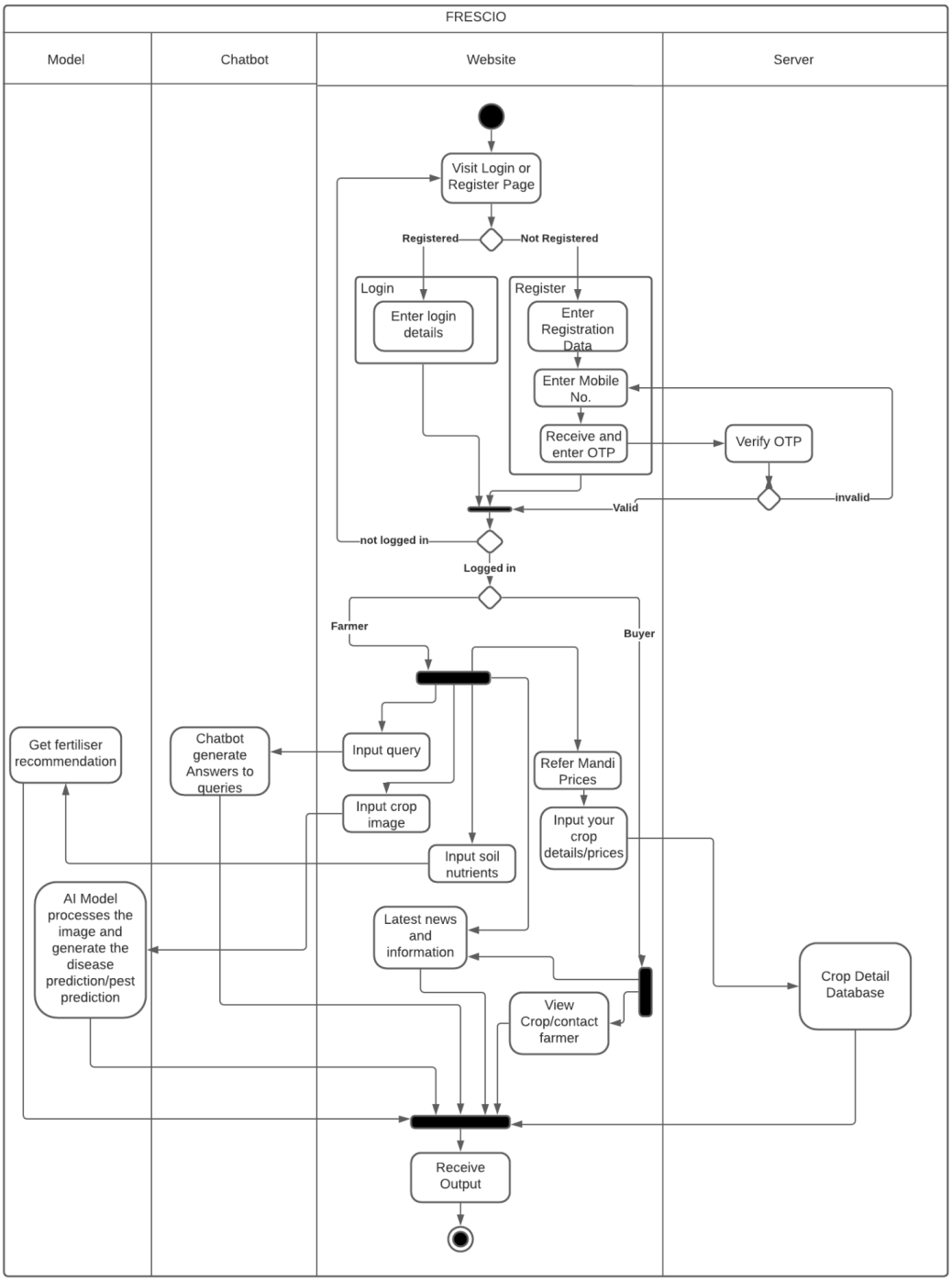
4. State Diagram

They are behavioral diagrams used to represent the conditions of the system or part of the system at finite instances of time.



5. Activity Diagram

An activity diagram is a behavioral diagram i.e. it depicts the behavior of a system.


FRESCIO
Model
Chatbot
Website
Server
Visit Login or Register Page
Registered
Not Registered
Login
Enter login details
Register
Enter Registration Data
Enter Mobile No.
Receive and enter OTP
Verify OTP
invalid
Valid
not logged in
Logged in
Farmer
Buyer
Get fertiliser recommendation
Chatbot generate Answers to queries
Input query
Input crop image
Input soil nutrients
Refer Mandi Prices
Input your crop details/prices
AI Model processes the image and generate the disease prediction/pest prediction
Latest news and information
View Crop/contact farmer
Crop Detail Database
Receive Output

Model/Workflow

1. E-commerce platform

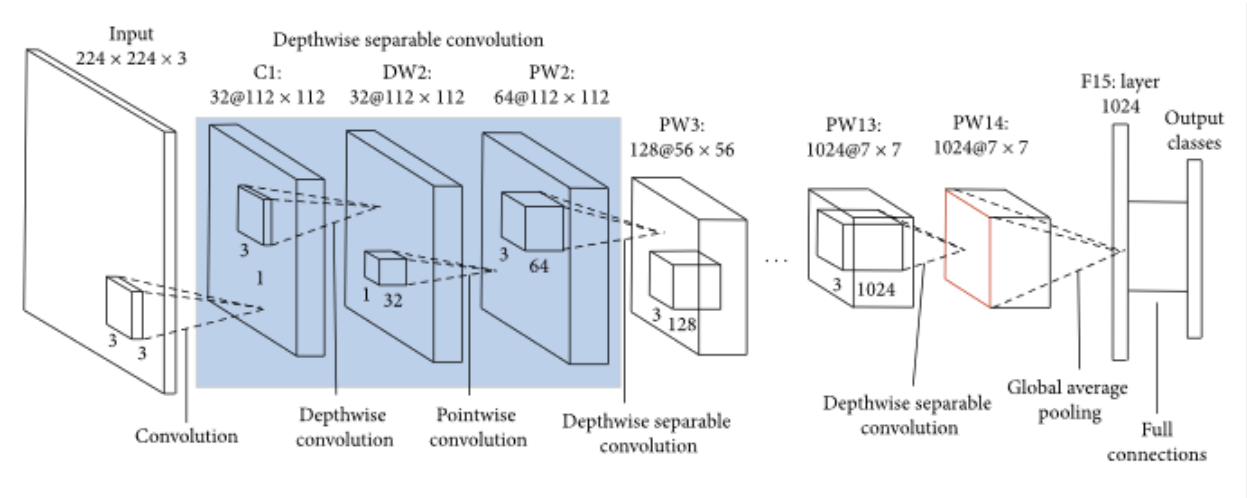
Our website incorporates an e-commerce platform. It provides four features namely my crops, all crops, wishlist and Mandi prices. The my crop page is only accessible if the user has registered as a farmer, it allows the farmer to add, edit, delete and set prices for his crops. The all crops page is available to both farmer and buyer where they can access all crops that have been uploaded on the website. It provides a filter to access specific crops. Wishlist is simply a feature where farmers and buyers can add their favorite or desired crops. Finally the Mandi Prices page fetches Mandi prices from Mandi price API and helps farmers decide the best price for their produce.

2. Contract Farming

For users that register on our website as buyers, we have provided a feature of contract farming. It provides two features namely my contracts and all contracts. The my contracts page is only accessible if the user as a buyer, it allows the buyer to add, edit and delete contracts along with the specified quantity of produce needed and the required deadline, The all contracts page is accessible to both farmers and buyers. A farmer can view these contracts and contact buyers according to their interest.

3. Pest Prediction Model

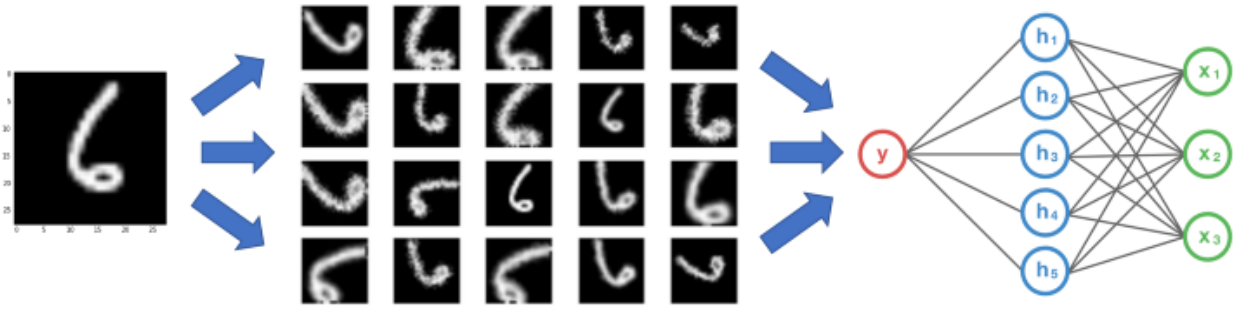
a. Mobilenet



MobileNets are based on a streamlined architecture that uses depth wise separable convolutions and point wise convolutions to build light weight deep neural networks. It significantly reduces the

number of parameters when compared to the network with regular convolutions with the same depth in the nets. This results in lightweight deep neural networks. MobileNet is a class of CNN that was open-sourced by Google, and therefore, this gives us an excellent starting point for training our classifiers that are insanely small and insanely fast.

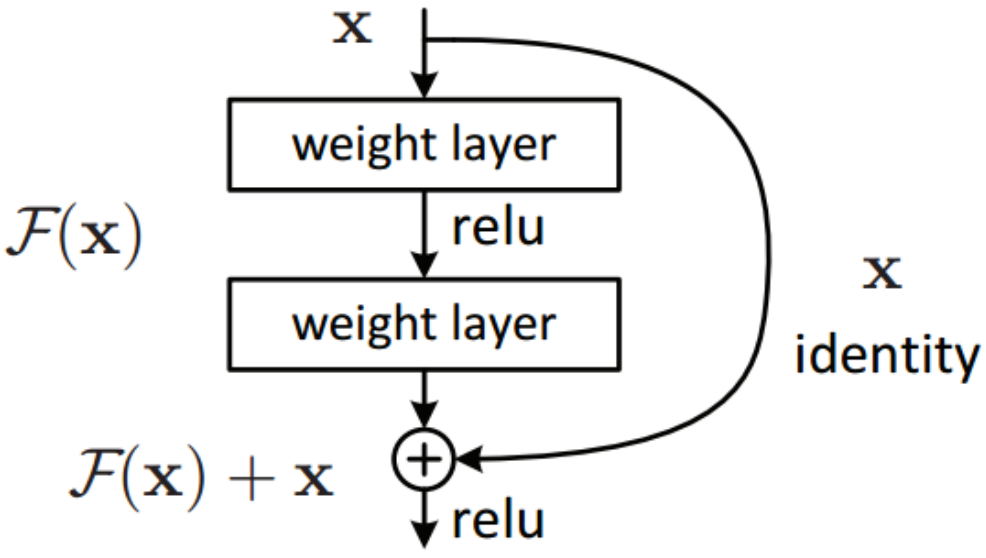
b. Data Augmentation



Data augmentation in data analysis are techniques used to increase the amount of data by adding slightly modified copies of already existing data or newly created synthetic data from existing data. It acts as a regularizer and helps reduce overfitting when training a machine learning model.

4. Disease Prediction Model

a. ResNet



ResNet uses a plain network architecture inspired by VGG-19 in which then the shortcut connection is added. These shortcut connections then convert the architecture into a residual network. The core idea of ResNet is introducing a so-called “identity shortcut connection” that skips one or more layers.

5. AI based voice recognition Chatbot

a. Sequential Neural Network using Tflearn

A Sequential model is appropriate for a plain stack of layers where each layer has exactly one input tensor and one output tensor. It employs 5 fully connected dense layers with Relu activation function followed by a regressor function which is implied on the output layer.

b. NLP

Natural language processing (NLP) refers to the branch of computer science—and more specifically, the branch of artificial intelligence or AI—concerned with giving computers the ability to understand text and spoken words in much the same way human beings can.
NLP combines computational linguistics—rule-based modeling of human language—with statistical, machine learning, and deep learning models.

c. Speech Recognition

Speech recognition, also known as automatic speech recognition (ASR), computer speech recognition, or speech-to-text, is a capability which enables a program to process human speech into a written format. Speech recognition focuses on the translation of speech from a verbal format to a text one. We have used PyAudio to implement Speech recognition.

6. Fertilizer Recommendation System

The fertilizer Recommendation System is built on a custom dataset which takes nitrogen, phosphorus, potassium and ph as inputs and the crop the farmer wishes to grow. Our model then compares the given values of NPK and pH to the required values and gives suggestions as to how to achieve optimal values to grow the desired crop.

Implementation Details

For the **Pest Prediction** model, the model was designed on the kaggle platform and achieved an accuracy of **94.6 percent**. The dataset included pest images which are common in and around Punjab and data augmentation was implied to increase the amount of data by adding slightly modified copies of already existing data. MobileNet neural networks were used to implement this object detection model to assist in faster and quicker and less computationally expensive training of the model.

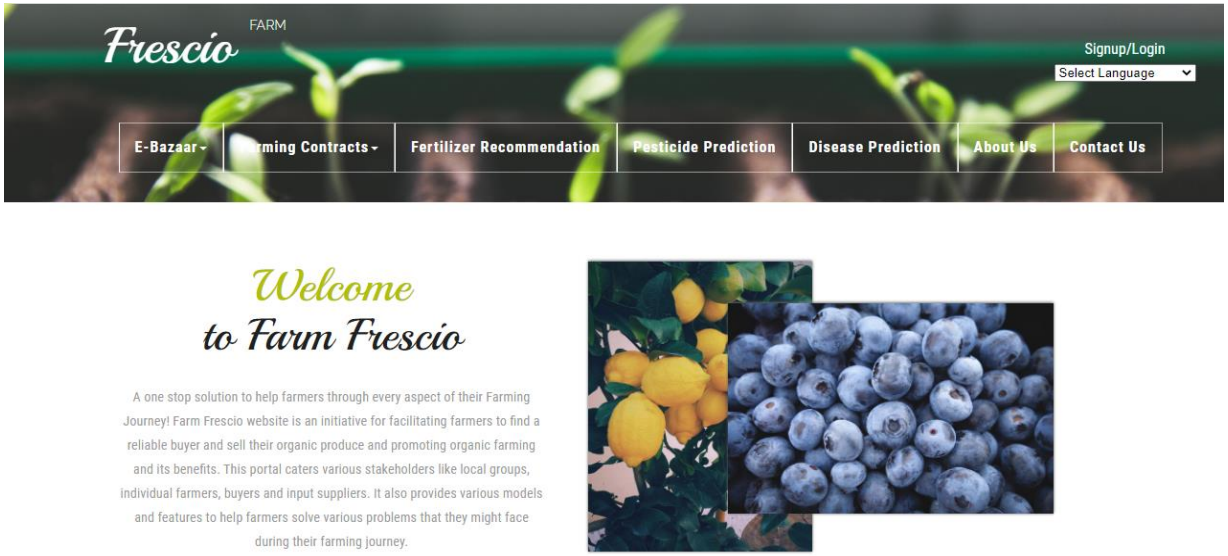
For the **Disease Prediction model**, the model was designed on the Collab platform and achieved an accuracy of **99.2 percent**. The dataset included infected crop images. We manually picked around 36 diseases of crops and collected data from different papers and websites.
Also data augmentation was implied to increase the amount of data by adding slightly modified copies of already existing data. ResNet Neural Networks were employed in order to train the model as it provides robust recognition for image analysis and at the same time reduces the problem of vanishing gradient thereby giving us a more accurate result.

Lastly, for our chatbot, **speech recognition** is employed using python's speech recognition module in order to recognize the person's speech and convert that speech to query text which can then be fed into the chatbot as query. Following this, natural language processing has been applied to an intents file and this has been trained using deep neural network. This helps our chatbot to give the most suitable answers to our queries.

Web Application:

1. Website Homepage

The website first opens up the homepage, which is the central point of use for the user. The homepage contains some description about our website.

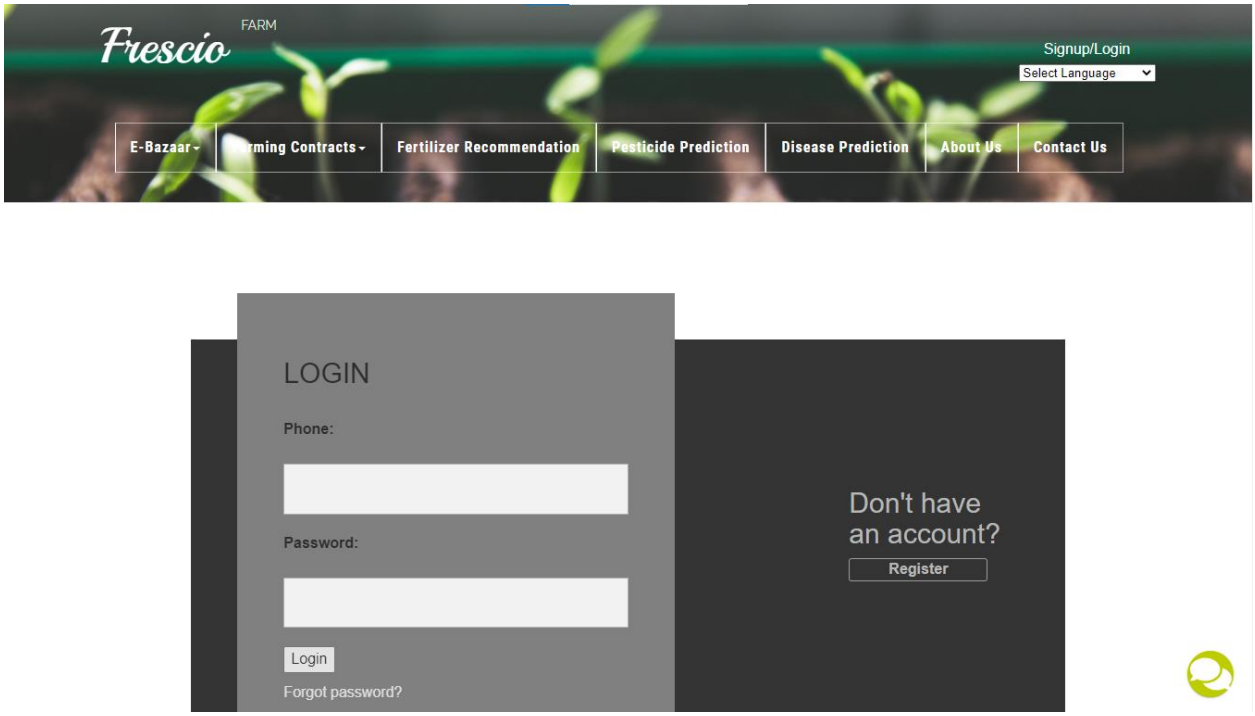


The homepage contains the latest agriculture news section, where users can view live news related to agriculture.

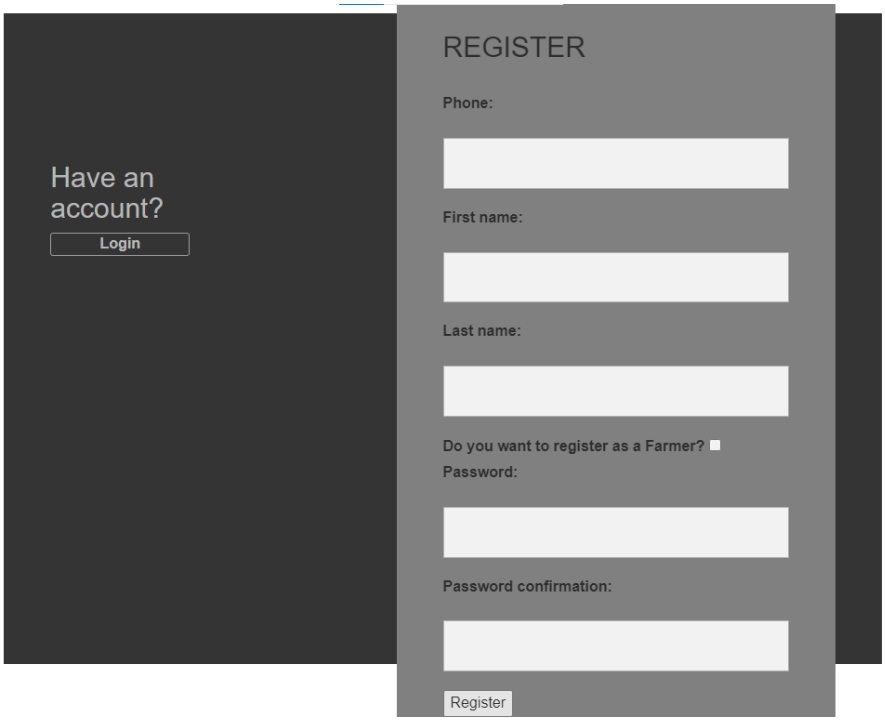
We have also made our website multilingual, user can select any language in which he wishes to view our website.

2. Login

The user can login with his Contact Number and Password.

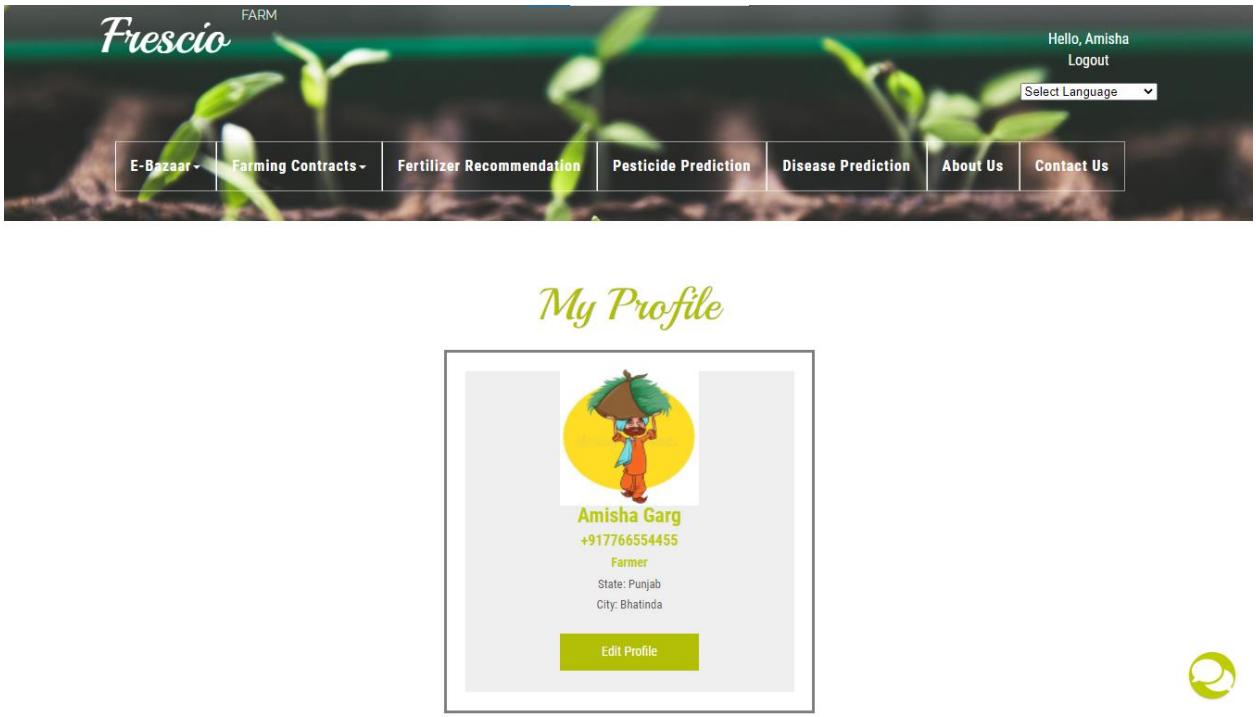


Also, they can sign up or register if they don't have an account already.



3. User's Profile Page

The user can view his details here, and can edit them as well.

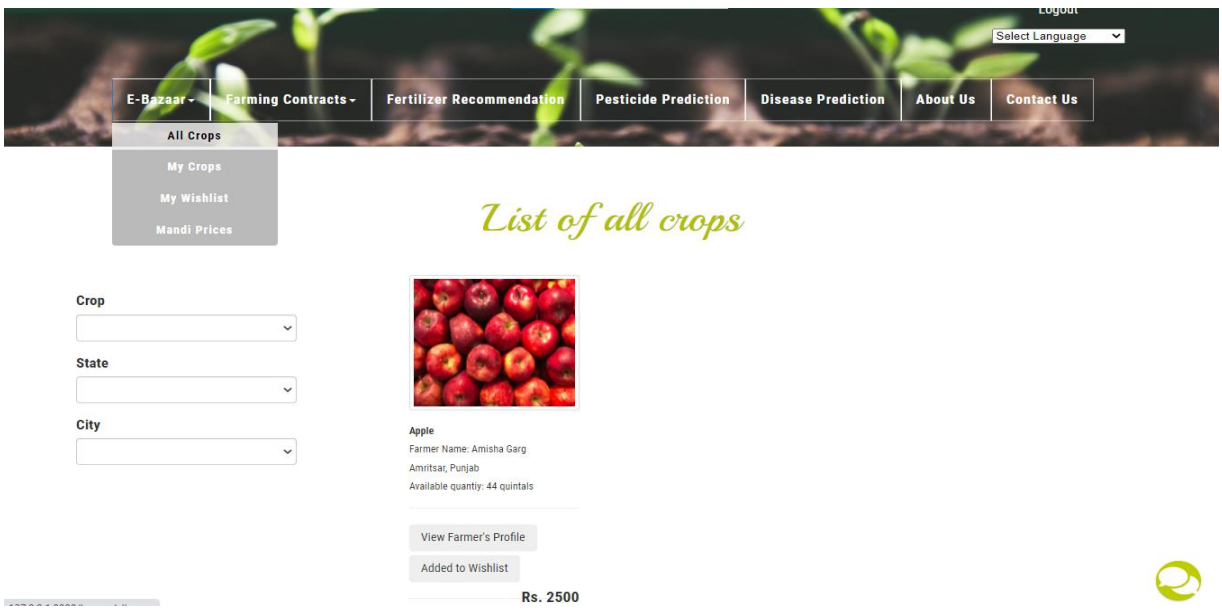


4. E-Commerce:

There are four options available under our e-commerce feature.

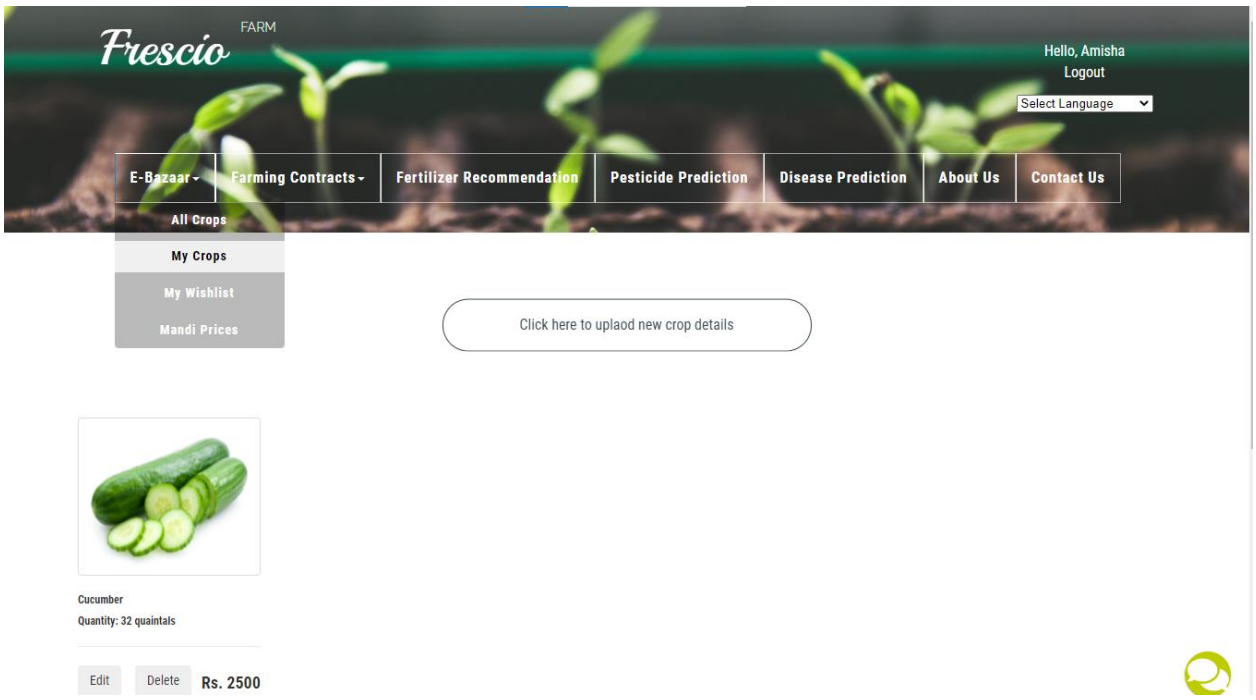
4.1. All Crops:

The user can view all the crops that have been added by various farmers across the country. The user can also filter them according to type of crop, state and city. User can also view a farmer's profile who have added a particular crop, and can also add them to his wishlist.

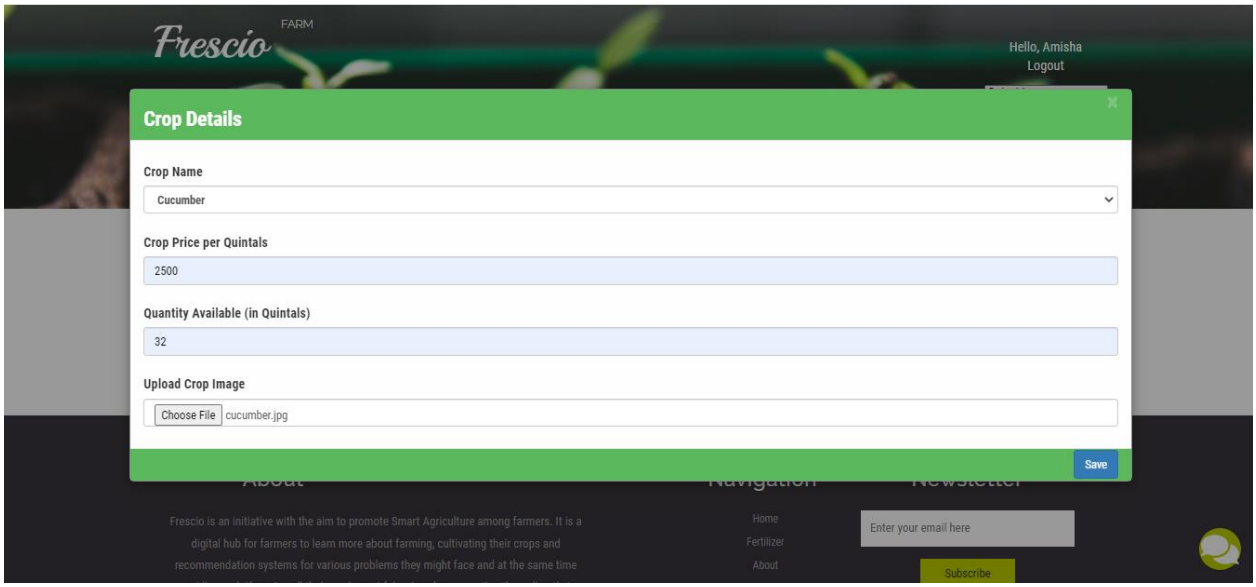


4.2. My Crops:

Farmers can view as well add any new crop details he wishes to sell. Farmers can edit the details and can delete any crop as well.

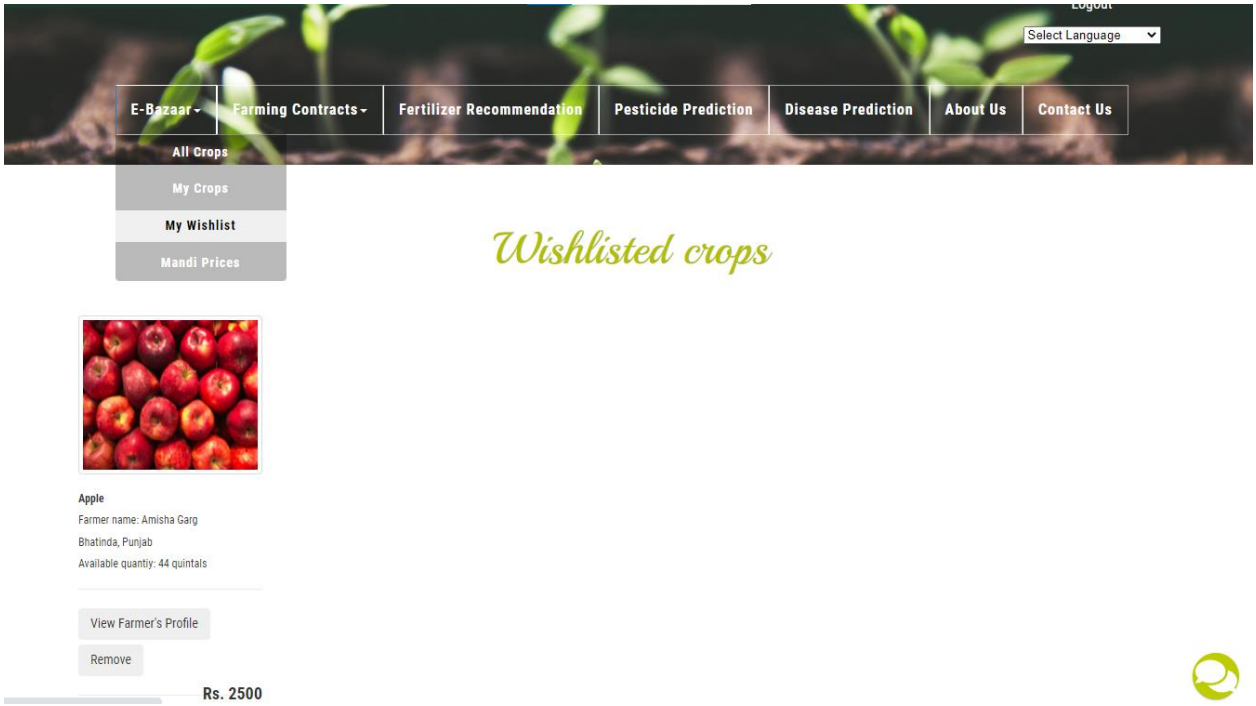


When farmer clicks on upload new crop details, a modal will open where farmer needs to enter details of his crop.



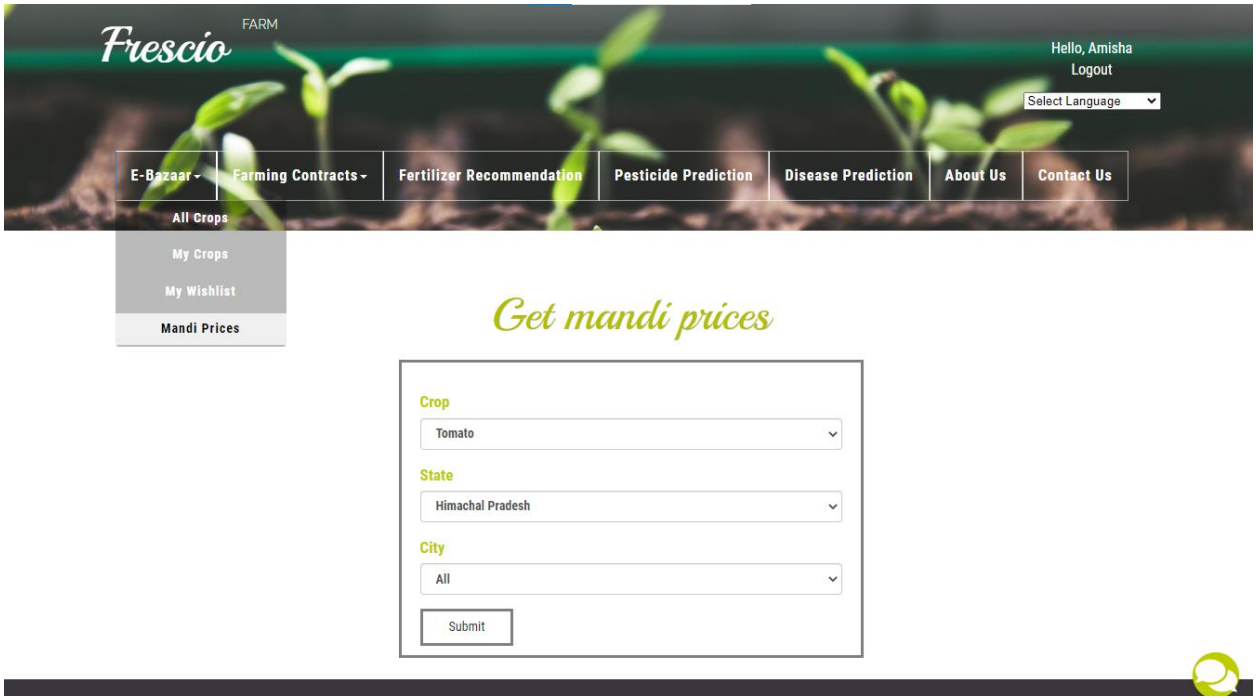
4.3. My Wishlist:

Users can view all the crops that he has added to his wishlist here.

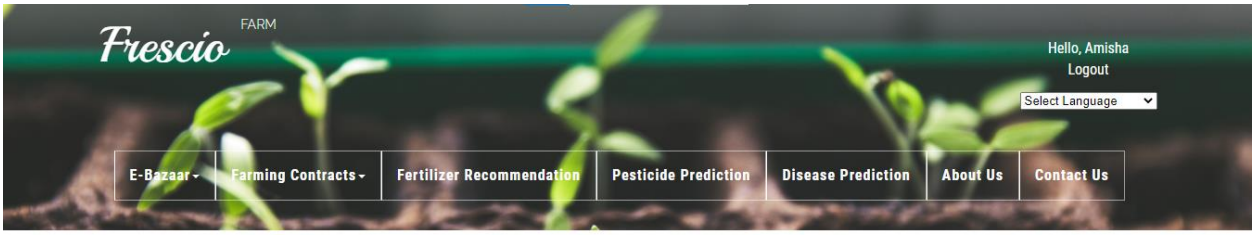


4.4. Mandi Prices:

Farmers can view the local prices of various commodities which are fetched using Mandi API, so that farmers can put up appropriate and reasonable prices for their produce.



Once the user submits the form, result will be displayed

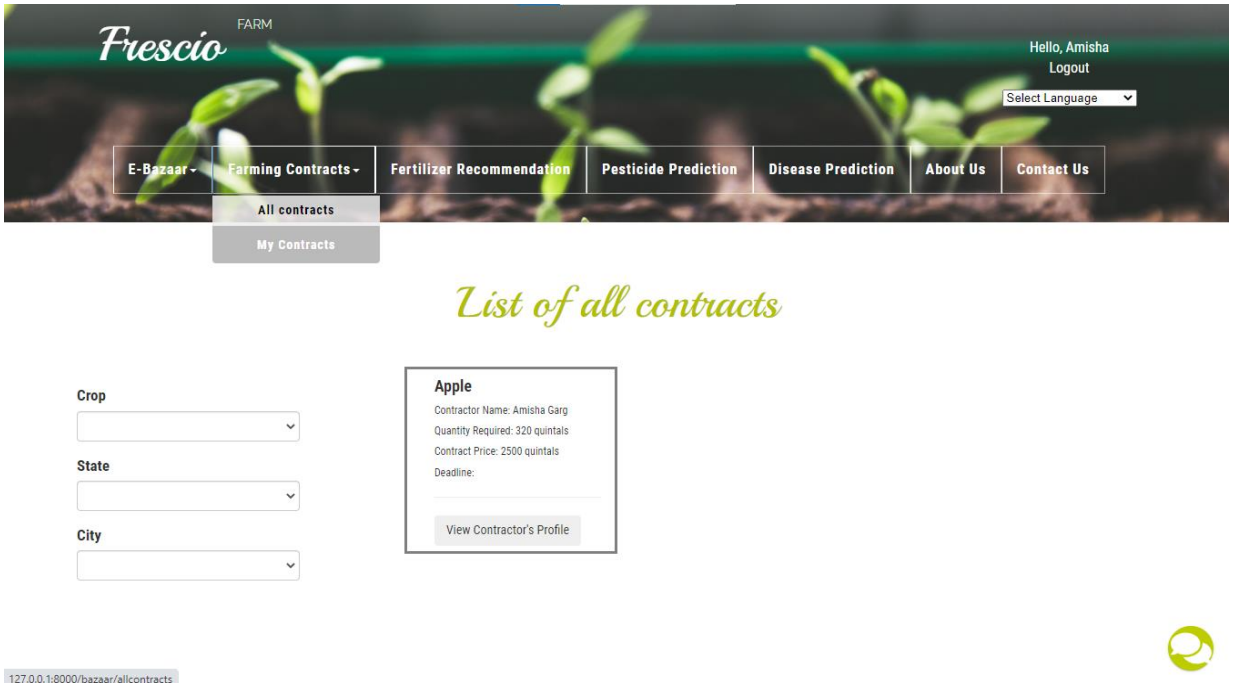


5. Contract Farming:

Our next feature is contract farming which allows buyers to upload contracts and farmers to contact the buyers when they fulfil the needs.

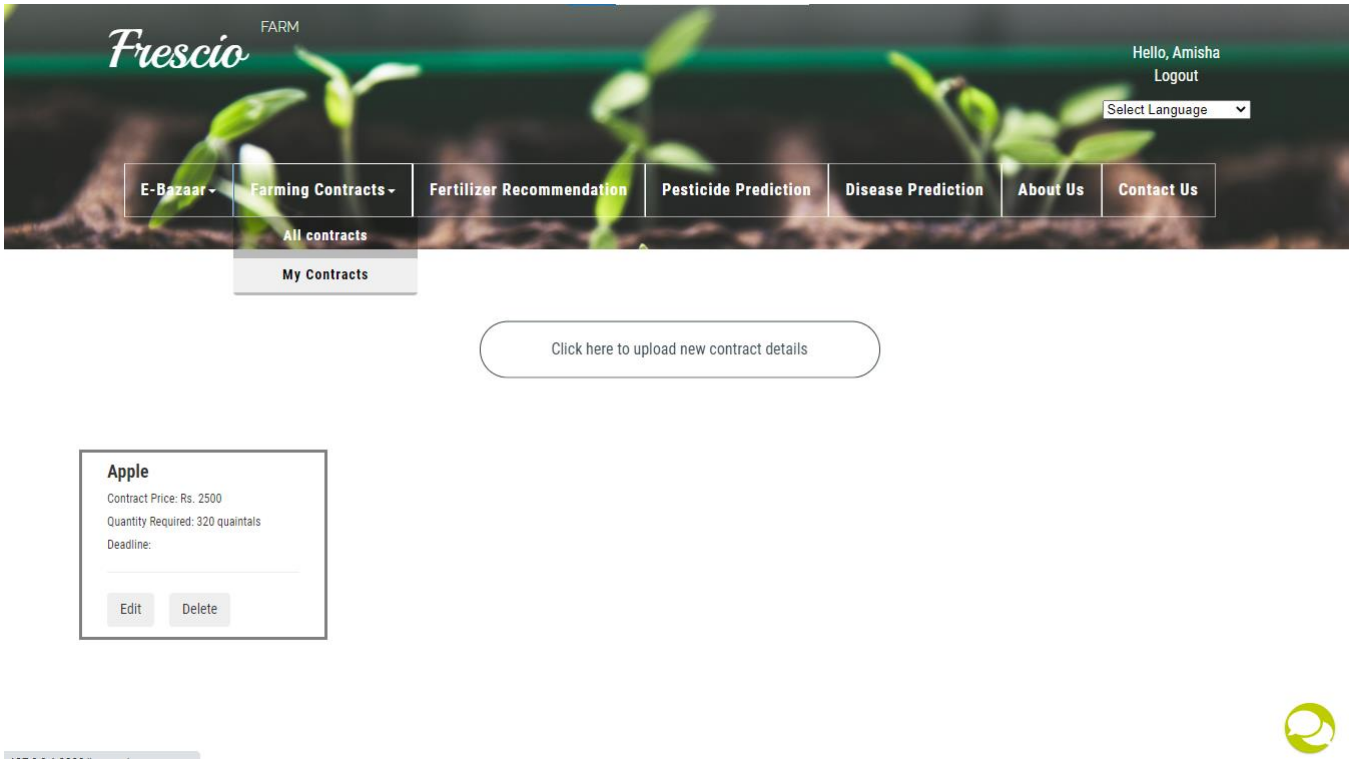
5.1. All Contracts:

In this section, farmers can view all the contracts added by various contractors across the country, and can filter them on the basis of crop, state, and city.

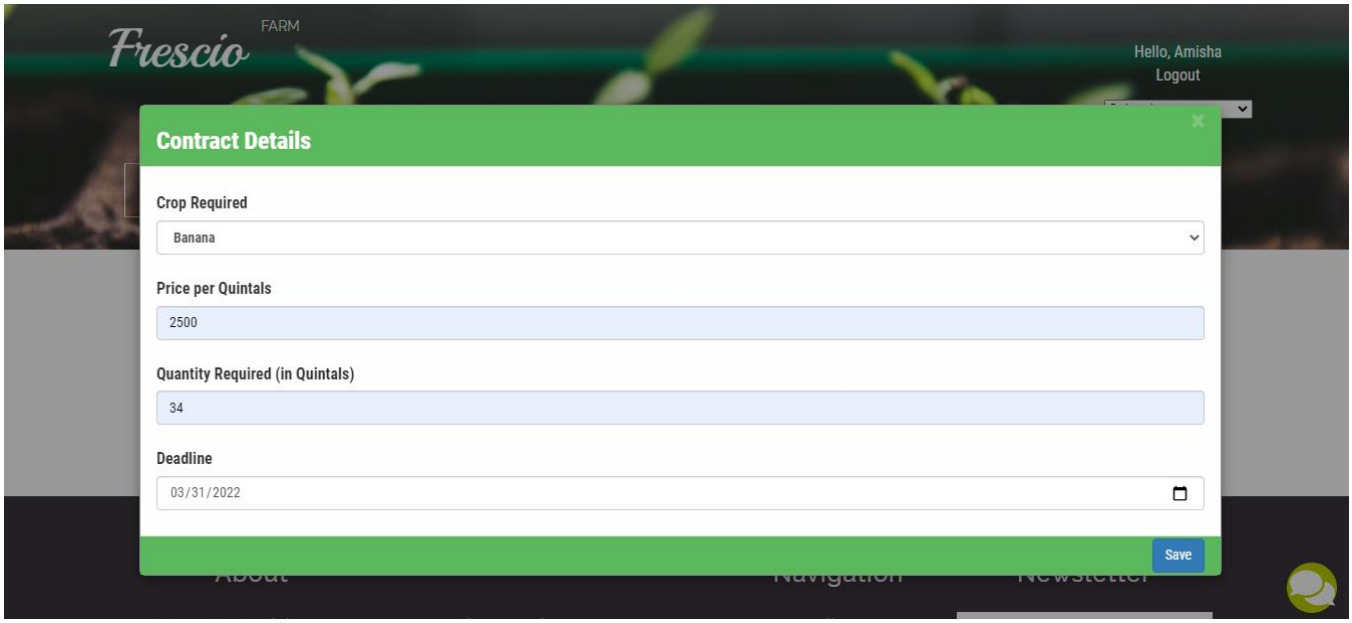


5.2. My Contracts:

Here, buyer can upload any new contract, and can also edit and delete already uploaded contract.

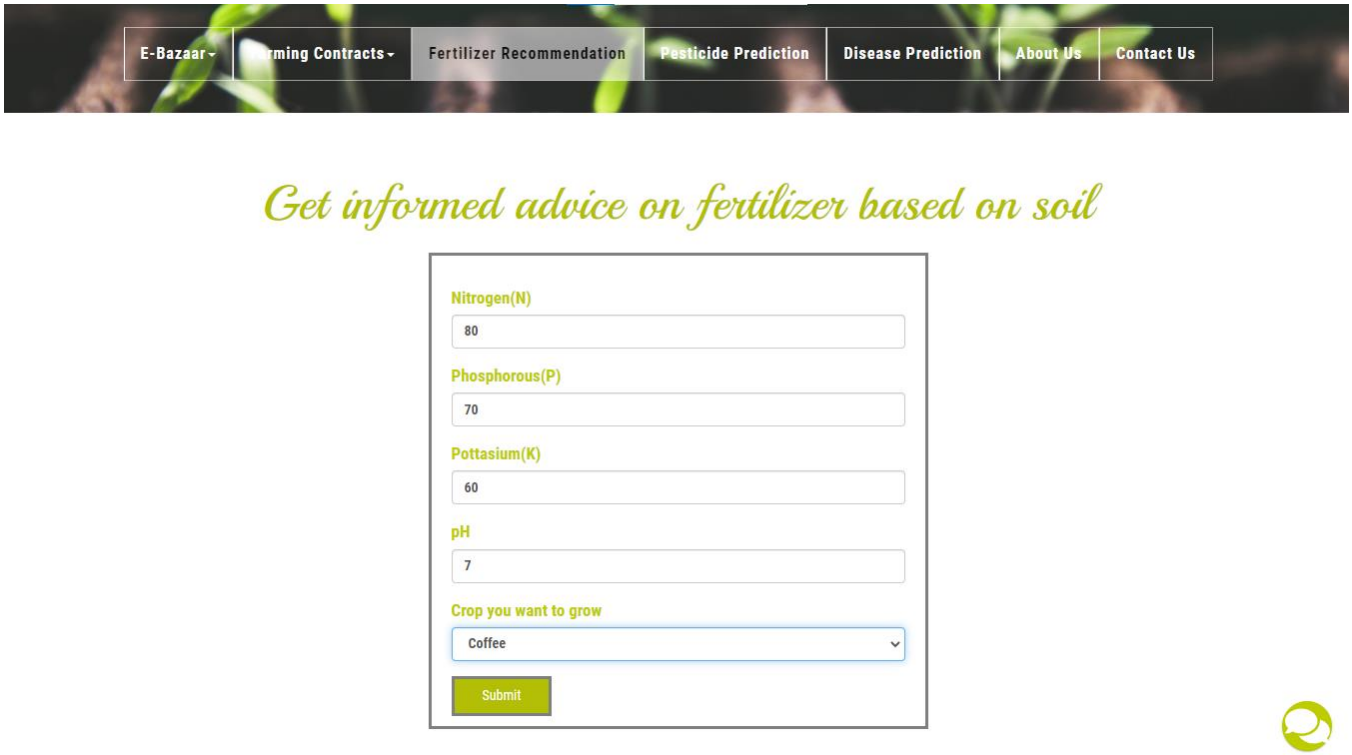


Once contractor clicks on upload new contract detials, a modal will open where he needs to fill the details of the contract.

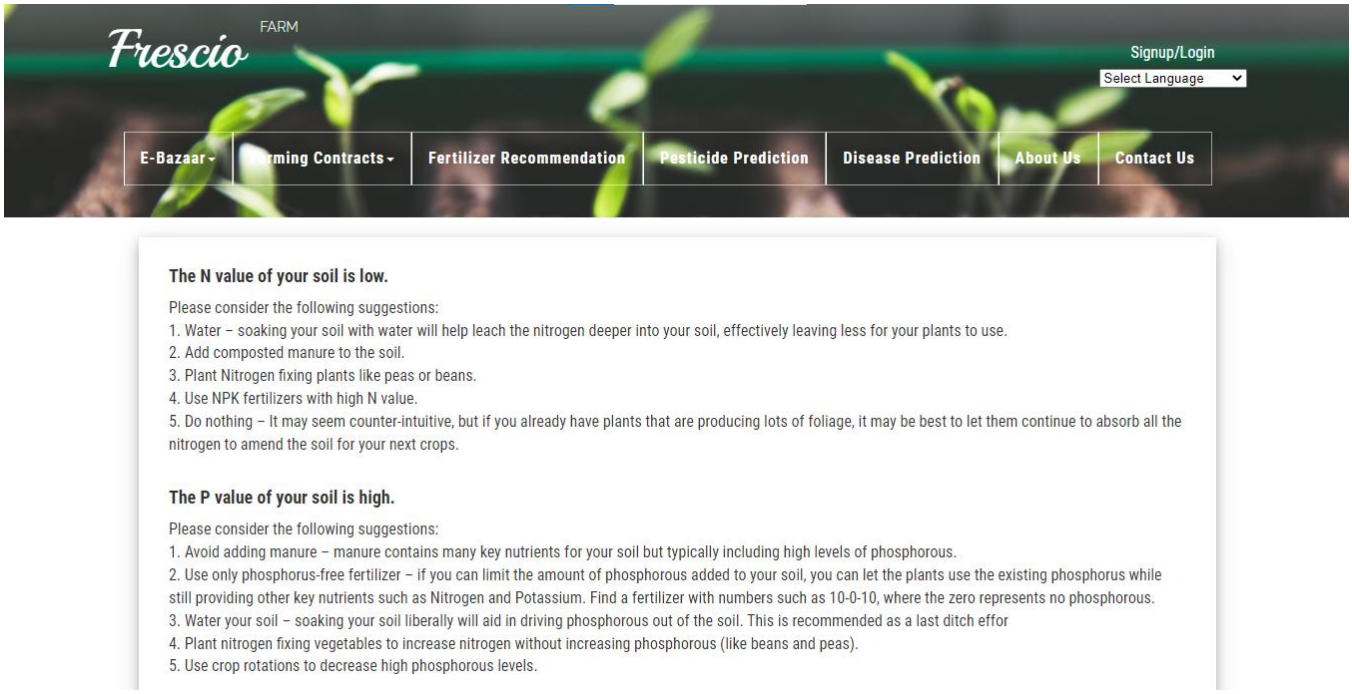


6. Fertilizer Recommendation:

Farmer can enter Nitrogen(N), Phosphorous(P), Potassium(K), pH of his soil, and the crop he wishes to grow.



Once the farmer submits the form, a detailed analysis will be done of the NPK, and pH values of the soil according to the crop user wants to grow. And various suggestions would be given to maximize farmer's produce.



The P value of your soil is high.

Please consider the following suggestions:
1. Avoid adding manure – manure contains many key nutrients for your soil but typically including high levels of phosphorous.
2. Use only phosphorus-free fertilizer – if you can limit the amount of phosphorous added to your soil, you can let the plants use the existing phosphorus while still providing other key nutrients such as Nitrogen and Potassium. Find a fertilizer with numbers such as 10-0-10, where the zero represents no phosphorous.
3. Water your soil – soaking your soil liberally will aid in driving phosphorous out of the soil. This is recommended as a last ditch effor
4. Plant nitrogen fixing vegetables to increase nitrogen without increasing phosphorous (like beans and peas).
5. Use crop rotations to decrease high phosphorous levels.

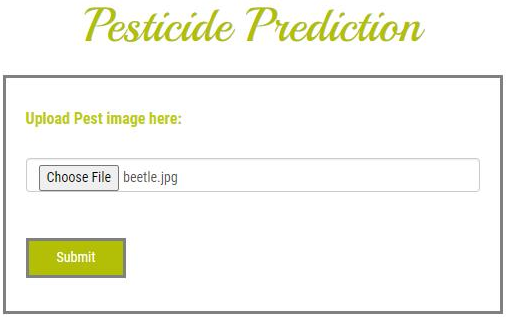
The K value of your soil is high.

Please consider the following suggestions:
1. Loosen the soil- deeply with a shovel, and water thoroughly to dissolve water-soluble potassium. Allow the soil to fully dry, and repeat digging and watering the soil two or three more times.
2. Sift through the soil, and remove as many rocks as possible, using a soil sifter. Minerals occurring in rocks such as mica and feldspar slowly release potassium into the soil slowly through weathering.
3. Mix crushed eggshells, crushed seashells, wood ash or soft rock phosphate to the soil to add calcium. Mix in up to 10 percent of organic compost to help amend and balance the soil.
4. Use NPK fertilizers with low K levels and organic fertilizers since they have low NPK values.
5. Grow a cover crop of legumes that will fix nitrogen in the soil. This practice will meet the soil's needs for nitrogen without increasing phosphorus or potassium.

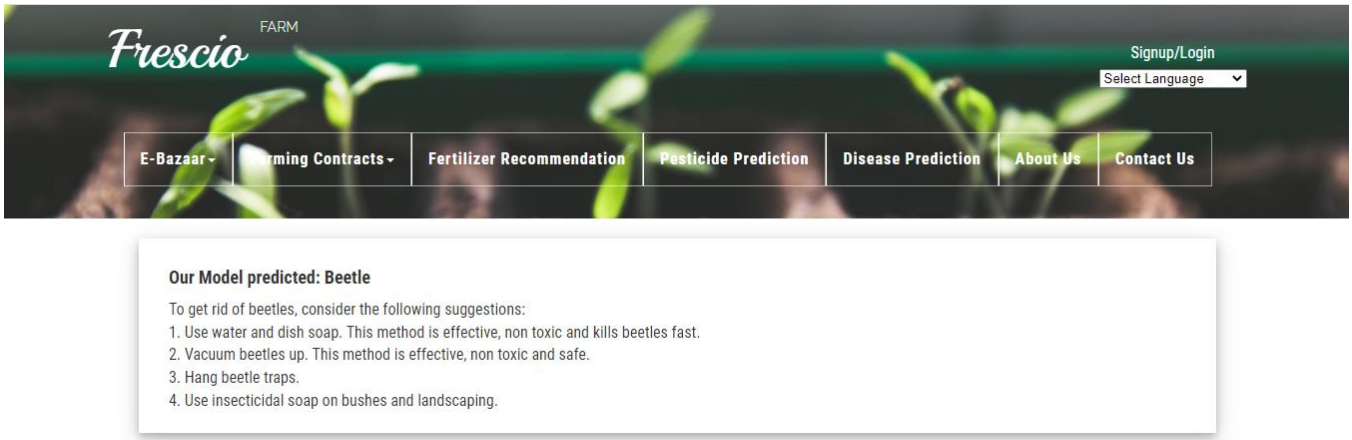
The pH value of your soil is within the optimal range.

7. Pesticide Prediction:

Here the farmer can input a pest image affecting his crop.

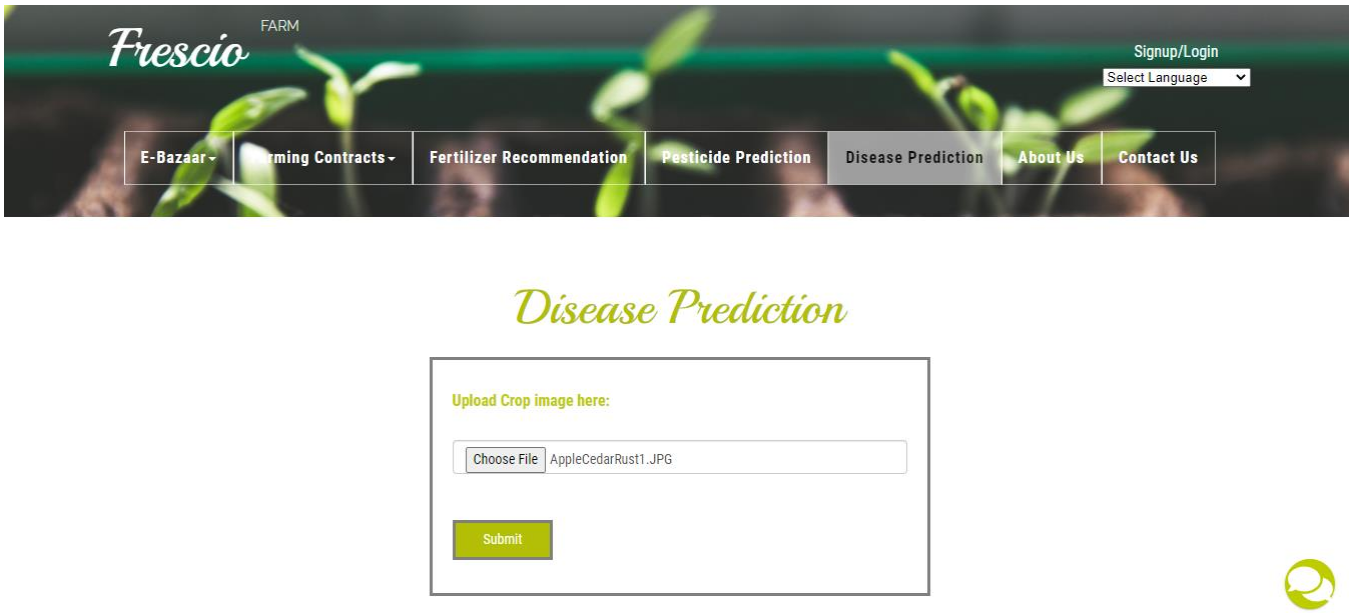


After farmer submits the image, our model will output the predicted pest and will also provide ways to get rid of them.

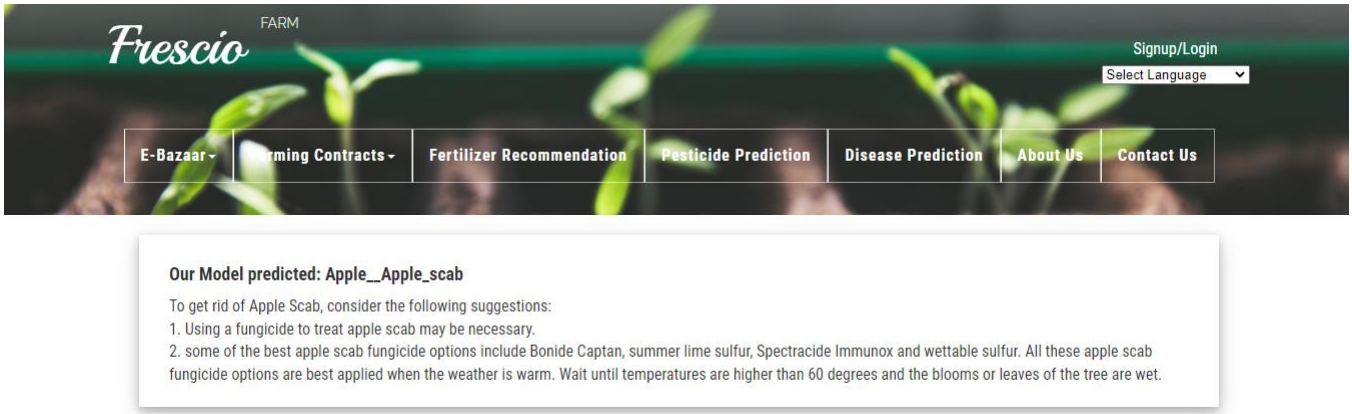


8. Disease Prediction:

Here the farmer can input an image of the affected leaf.

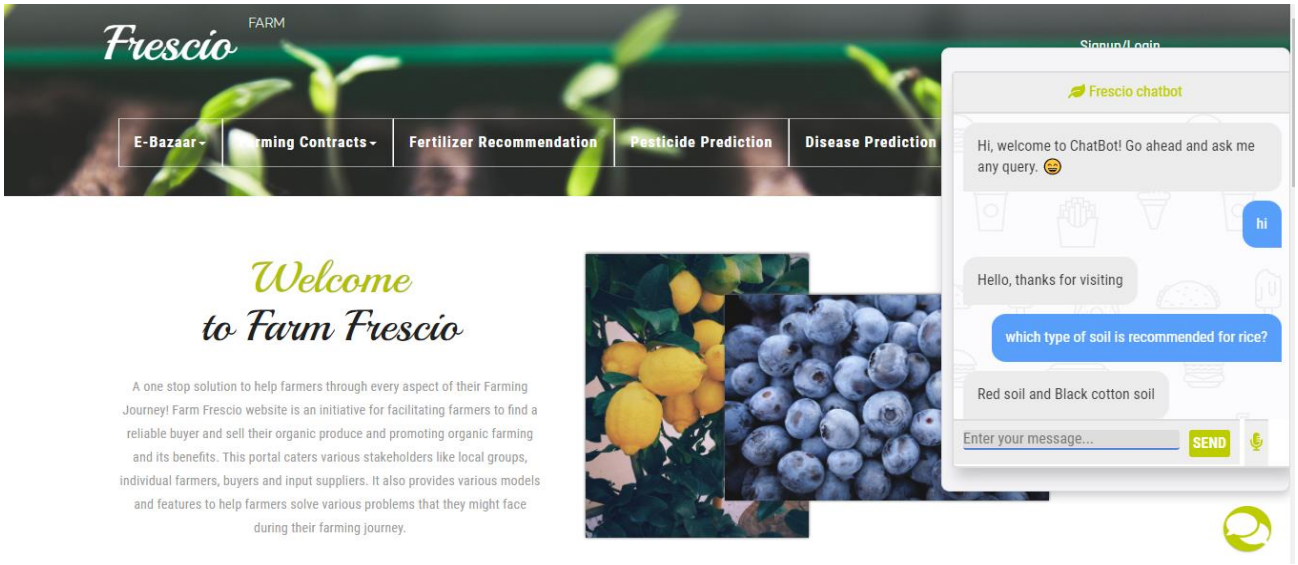


Once the farmer submits the leaf image, our model will predict the disease affecting the crop, and will also provide suggestions to get rid of them.



9. Chatbot:

An agricultural chatbot with voice recognition system to answer farming related queries.



Languages and other tools used

TensorFlow

TensorFlow is a Python library for fast numerical computing created and released by Google. It is a foundation library that can be used to create Deep Learning models directly or by using wrapper libraries that simplify the process built on top of TensorFlow. TensorFlow is an open source library for fast numerical computing. It was created and is maintained by Google and released under the Apache 2.0 open source license. The API is nominally for the Python programming language,although there is access to the underlying C++ API.

Python

Python is an interpreted high-level general-purpose programming language. Python's design philosophy emphasizes code readability with its notable use of significant indentation.

Django framework

Django is a high-level Python Web framework that encourages rapid development and clean, pragmatic design. Built by experienced developers, it takes care of much of the hassle of Web development, so you can focus on writing your app without needing to reinvent the wheel. It's free and open source.

HTML, CSS JavaScript

HTML provides the basic structure of sites, which is enhanced and modified by other technologies like CSS and JavaScript. CSS is used to control presentation, formatting, and layout. JavaScript is used to control the behavior of different elements.

Bootstrap framework

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.

PyTorch

PyTorch is an optimized tensor library primarily used **for Deep Learning applications using GPUs and CPUs**. It is an open-source machine learning library for Python, mainly developed by the Facebook AI Research team. It is one of the widely used Machine learning libraries, others being TensorFlow and Keras

Keras

Keras allows **users to productize deep models on smartphones** (iOS and Android), on the web, or on the Java Virtual Machine. It also allows use of distributed training of deep-learning models on clusters of Graphics processing units (GPU) and tensor processing units (TPU).

SQLite

SQLite is a popular choice as **embedded database software for local/client storage in application software such as web browsers**. It is arguably the most widely deployed database engine, as it is used today by

several widespread browsers, operating systems, and embedded systems (such as mobile phones), among others.

Google Cloud APIs

Google Cloud APIs are **programmatic interfaces to Google Cloud Platform services**. They are a key part of Google Cloud Platform, allowing you to easily add the power of everything from computing to networking to storage to machine-learning-based data analysis to your applications.

Results

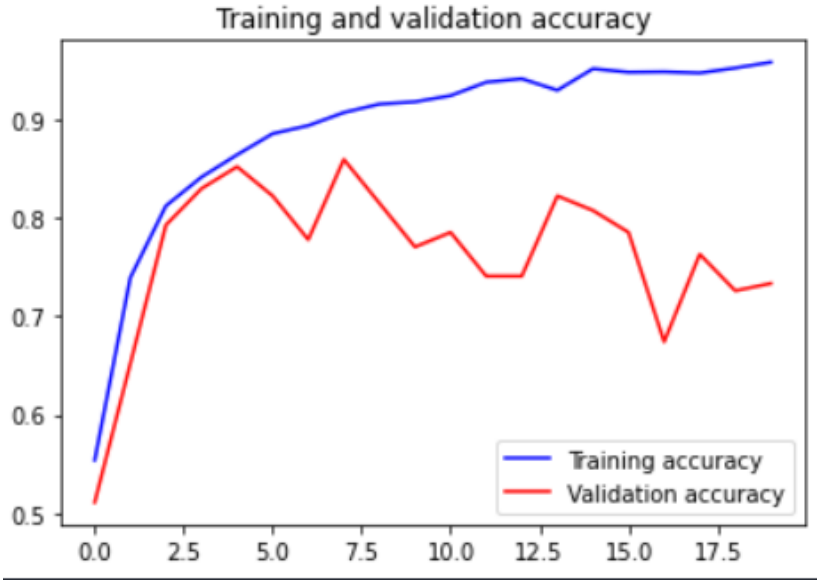
Pest prediction

The model achieved an accuracy of **94.6 percent**, using mobile net neural network. We have used Adam optimizer and SoftMax activation function. The loss function we have employed is categorical cross entropy. The user has to upload an image of a pest that might be attacking his field and our model will analyze the image and predict the pest and give reliable suggestions as to how to get rid of that particular pest.

Our mobilenet neural network:

```
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
mobilenet_1.00_224 (Function (None, 7, 7, 1024)        3228864
_________________________________________________________________
max_pooling2d (MaxPooling2D) (None, 3, 3, 1024)        0
_________________________________________________________________
flatten (Flatten)            (None, 9216)              0
_________________________________________________________________
dense (Dense)                (None, 512)               4719104
_________________________________________________________________
batch_normalization (BatchNo (None, 512)               2048
_________________________________________________________________
dense_1 (Dense)              (None, 1024)              525312
_________________________________________________________________
batch_normalization_1 (Batch (None, 1024)              4096
_________________________________________________________________
dense_2 (Dense)              (None, 512)               524800
_________________________________________________________________
batch_normalization_2 (Batch (None, 512)               2048
_________________________________________________________________
dense_3 (Dense)              (None, 9)                 4617
=================================================================
Total params: 9,010,889
Trainable params: 5,777,929
Non-trainable params: 3,232,960
_________________________________________________________________
```

Training and validation accuracy :



Training and validation loss

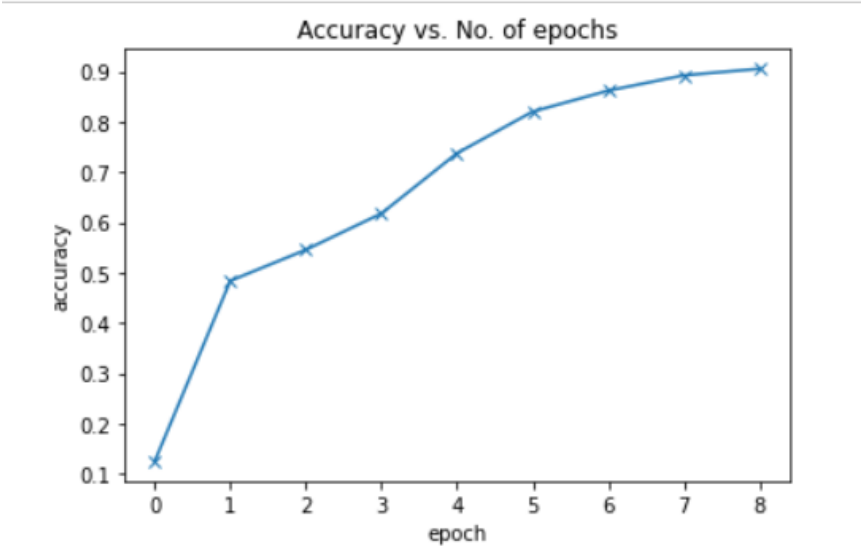
Disease Prediction:

The model achieved an accuracy of **99.2 percent,** using the ResNet neural network. We have used Adam optimiser and softmax activation function. The loss function we have employed is categorical cross entropy. The user has to upload an image of a disease that might be attacking his crops and our model will analyze the image and predict the pest and give reliable suggestions as to how to get rid of that particular pest.

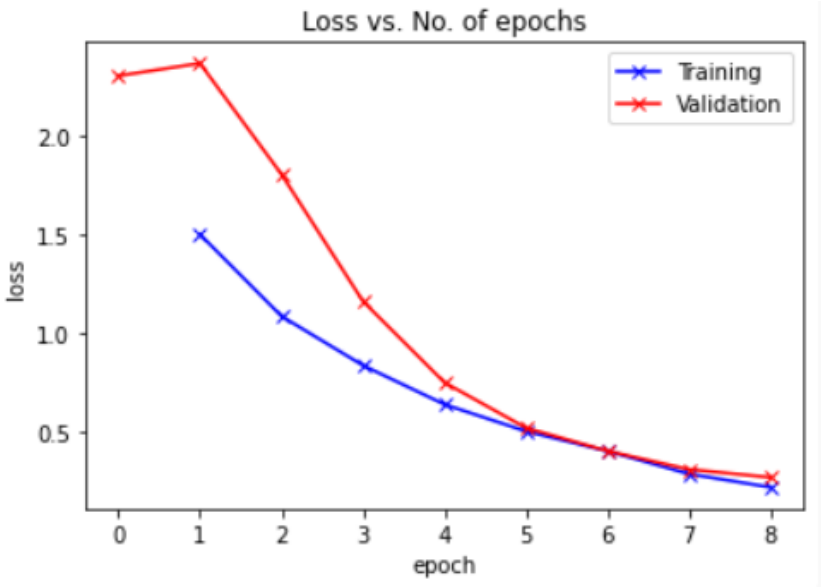
Our resnet architecture has the following custom built 9 layers :

```
ResNet9(
  (conv1): Sequential(
    (0): Conv2d(3, 64, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (1): BatchNorm2d(64, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
    (2): ReLU(inplace=True)
  )
  (conv2): Sequential(
    (0): Conv2d(64, 128, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (1): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
    (2): ReLU(inplace=True)
    (3): MaxPool2d(kernel_size=2, stride=2, padding=0, dilation=1, ceil_mode=False)
  )
  (res1): Sequential(
    (0): Sequential(
      (0): Conv2d(128, 128, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
      (1): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
      (2): ReLU(inplace=True)
    )
    (1): Sequential(
      (0): Conv2d(128, 128, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
      (1): BatchNorm2d(128, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
      (2): ReLU(inplace=True)
    )
  )
  (conv3): Sequential(
    (0): Conv2d(128, 256, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (1): BatchNorm2d(256, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
    (2): ReLU(inplace=True)
    (3): MaxPool2d(kernel_size=2, stride=2, padding=0, dilation=1, ceil_mode=False)
  )
```

The accuracy vs no. of epochs for our model :



Losses vs no. of epochs



ChatBot

Our chatbot uses speech recognition to convert speech to text and then this text is exposed to NLP techniques and fed into the Deep Neural Network for the chatbot to give the best possible answer to the given query based on the context as we can see in the screenshot. We custom designed an intents.json file for our project.

Discussion

Through this project, we have made a system which is a one stop solution to help farmers through every aspect of their farming journey. Farm Frescio is an initiative for facilitating farmers to find a reliable buyer and sell their organic produce and promote organic farming and its benefits. This portal caters various stakeholders like local groups, individual farmers, buyers and input suppliers. It also provides various models and features to help farmers solve any problem they might face.

Timeline

Week 0 (31 August 2021 – 7 September 2021)

Team formation and Mentor Selection:

- Team Member Formation.
- Choosing the field/technology of interest after a series of meetings with the team members.
- Selecting the appropriate mentor best suited for the technology to be used.

Week 1 (8 September 2021 -15 September 2021)

Project Idea Discussion and Synopsis Drafting:

Decided on three project ideas:

1. Fashion Recommendation System (Web development)
    - Object detection and recognition and then recommendation
    - Links to similar products on famous websites that sell the product. Requires training of a huge dataset for recognition and CNN or similar training for recommendation and will need APIs from several sites
2. Personality prediction system via CV analysis (Web Development)
    - Additions that can be made:
        - Feedback system based on mock interviews (this would include face recognition and body language check)
        - Previous interview experiences of different companies page
        - List of frequently asked company-wise questions
3. Farmer's portal
    - An e-commerce website for farmers to get reasonable price for their produce and eliminate middleman.
    - To incorporate a chatbot and several models that would help farmers through every aspect of their farming journey.

Finally, we decided to take up the third idea, as we found it to be a more practical and useful idea. And also, it was feasible according to our knowledge and skill set.

Week 2 (16 September 2021 - 23 September 2021)

Discovering Project Requirements:

- Looking onto the existing work in this related field, if done.
- Deciding the further contributions, we can make.
- Looking for availability of datasets for training purposes of our models to be able to predict the required output.
- Looking for platform to perform high end computations like web scraping and machine learning model training.
- Developing a user interface through which the user can access all the functionality easily and innovatively.

Week 3 (24 September 2021 - 30 September 2021)

Exploring datasets and websites for scrapping (if required):

- Looked up for the existing datasets on the internet.
- Found one dataset for pest prediction and one for disease prediction.
- Started designing a dataset for fertilizer recommendation, decided to make a custom built dataset because we couldn't find a good dataset online.
- Disease dataset was also custom built later.
- Could not find any other dataset related to the Recipe name along with ingredients and instructions. • Created the GitHub Repository for the project – Farm Frescio.

Week 4 (1 October 2021 – 7 October 2021)

1. Designing UML Diagrams:
    - Use Case Diagram
    - Class Diagram
    - Sequence Diagram
    - Activity Diagram
    - State chart Diagram

2. Started exploring and studying and researching about image classification datasets for pest and disease prediction.
3. Completed fertilizer recommendation model

Week 5 (8 October 2021 – 14 October 2021)

Started developing the Farmer Frescio Website:

- Started developing the website's front end using HTML, CSS, JavaScript and bootstrap.

- Website Layout designed before the start of actual implementation by team discussions and brainstorming.
- Designed the homepage and static pages like about us, contact us.

Week 6 (15 October 2021 – 21 October 2021)

Writing code for training the model, pest prediction:

- Drafted code in python using Kaggle for model training of pest prediction.
- Started using CNN for model but eventually shifted to mobile net to make it computationally inexpensive and get better accuracy.
- Tried 20 epochs and various hyperparameters until the best accuracy of 97.2 percent was achieved.

Week 7 (22 October 2021 – 28 October 2021)

Developing the Farm Frescio Website backend:

- Developing the websites backend using Django Framework of python.
- Started with the registration process and login for both frontend and backend.
- Continued with the frontend of the website.

Week 8 (29 October 2021 – 4 November 2021)

Writing code for training the model, pest prediction:

- Drafted code in python using Google Collab for model training of disease prediction.
- Performed pre-processing techniques on our custom-built dataset to make the dataset uniform.
- Started using CNN for model, then with mobile net but eventually shifted to ResNet to make it computationally inexpensive and get better accuracy.
- Tried 10 epochs and various hyperparameters until the best accuracy of 99.1 percent was achieved.

Week 9 (5 November 2021 – 11 November 2021)

Creating the frontend and backend for e-commerce feature:

- Started working on the three features of e-commerce namely my crop, all crops and Wishlist.
- Added Mandi API to our e-commerce section for farmers to compare prices.
- Took inspiration from already existing sites like jaivik_kheti to develop our e-commerce section.

Week 10 (12 November 2021 – 18 November 2021)

- Added News API feature to our homepage.

- Integrated fertilizer recommendation, pest prediction and disease prediction models.
- Fixed minor bugs in the e-commerce section.

Week 11-12 (19 November 2021– 25 November 2021)

- Made the frontend of the chatbot and integrated it to our website.
- Started working on the chatbot model. Manually created an intents.json file for farming and agricultural related questions.
- Employed NLP and simple deep neural network using tflearn to train the question answering model.
- Integrated the model to the frontend.

Week 13 (26 November 2021 - 2 December 2021)

- Added speech recognition feature to our chatbot.
- Added mobile number validation and other minor features to our website.

Week 14 (3 December 2021 – 9 December 2021)

- Started working on the two features of contract farming namely my contracts and all contracts.
- Designed the frontend, backend for the same.

Week 15 (10 – 12 December 2021, 19 – 20 December 2021)

- Made our site multilingual using google translate element.
- Fixed final minor bugs.

Conclusion

The project has been designed to assist farmers in every step of the farming cycle and clear all their queries and also help them at the same time by developing an ecommerce model which eliminates the middle man. Our project has successfully implemented several applications of the Artificial Intelligence domain including Natural Language Processing, Image Recognition, Speech Recognition and Conversion and have successfully implemented several models namely BERT, MobileNet and ResNet. The project successfully builds an Ecommerce platform for the farmer to register which will not only provide them a way to get the best price for their produce but also directly connect to buyers.

Future Work

1. In respect of Artificial intelligence, many more tools can be added like predicting the best price for their produce by analyzing the previous data from mandi and current prices of that crop by other farmers.
2. Also, we are not able to verify the phone and integrity of farmers because of funding and not proper data respectively.
3. We would like to develop a multilingual mobile application for the website which can be easier to use and operate anytime.

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