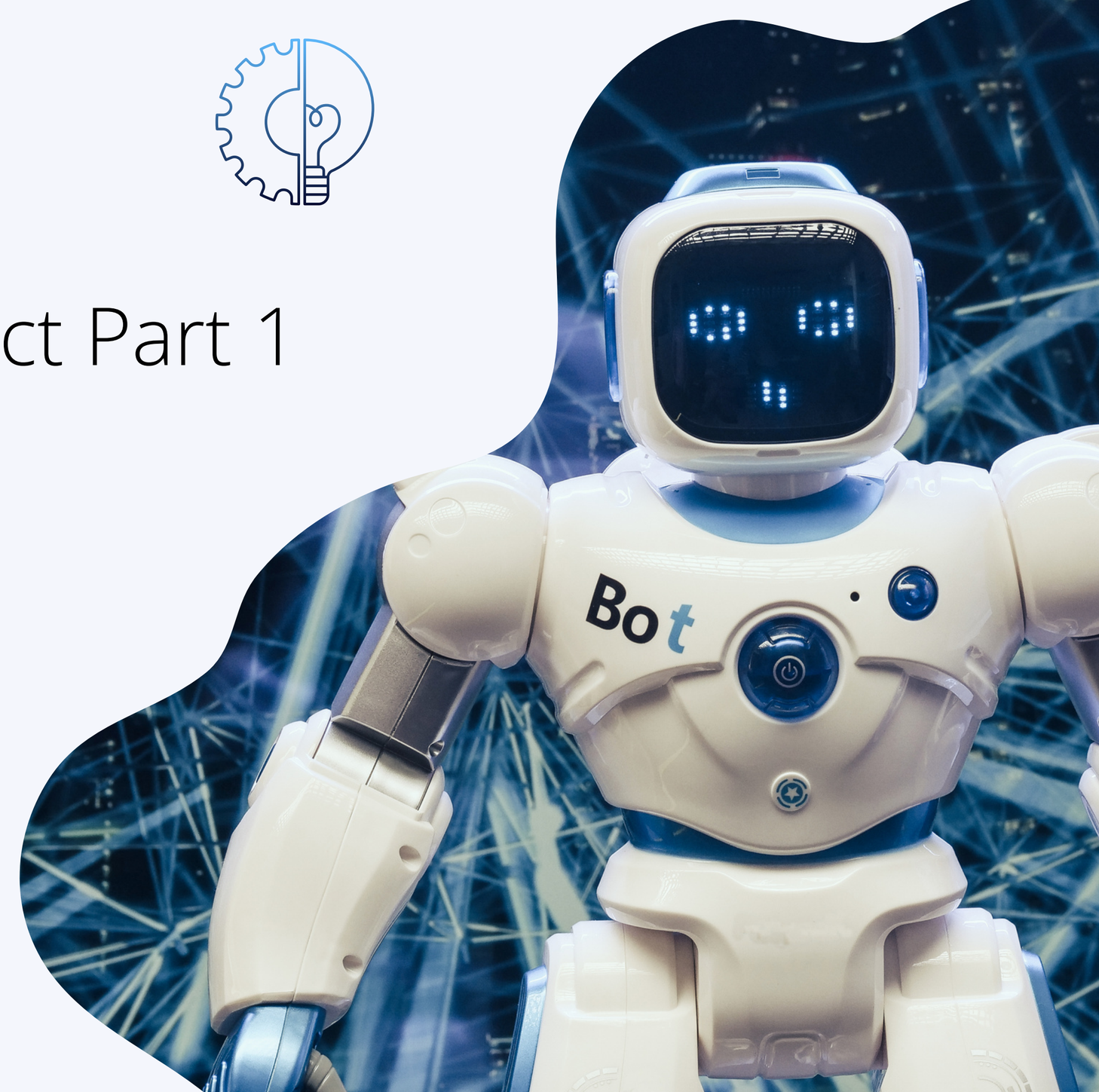
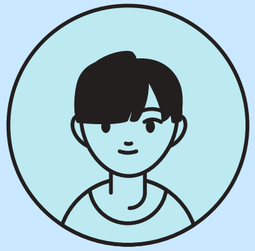
Green Algeria Project Part 1

Plant Species Identification

Team - 6



Contributors of the Project

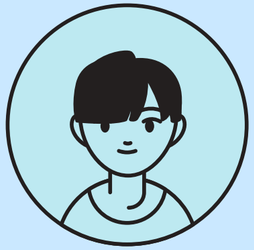


Team Lead
R Aditya

Contributions
Model Development - CNN Model
Model Deployment - Back-end

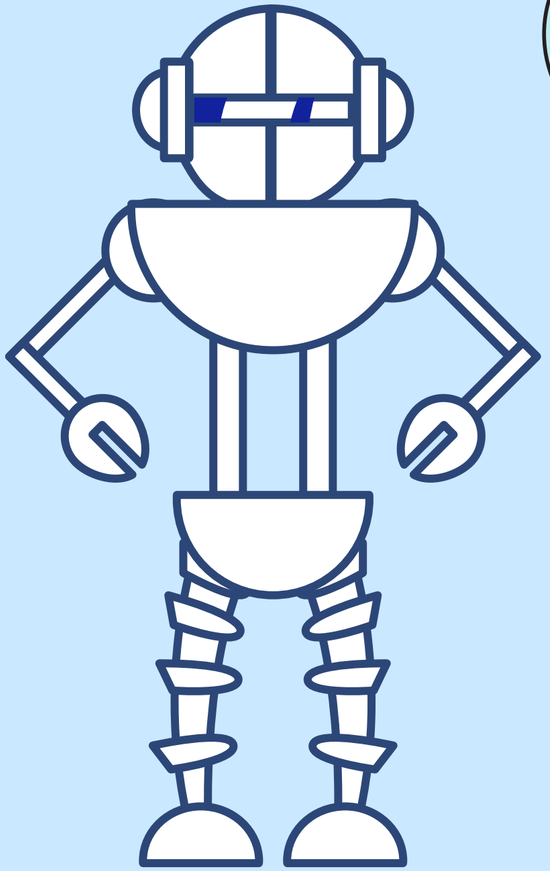
Vikash Sahni

Contributions
Data Preprocessing
Model Development - VGG16 Model



Argish Abhangi

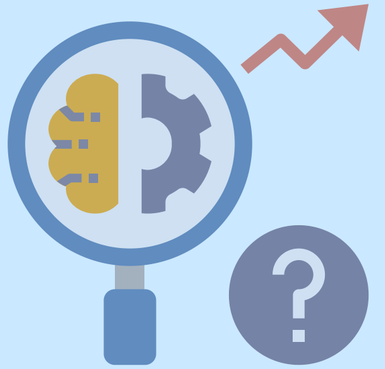
Contributions
Research on Subject
Data Cleaning - Filtering Dataset



Ahilya Kale

Contributions
Data Cleaning - Filtering Dataset
Model Deployment - Front end

Plant Species Prediction



Species knowledge is essential for protecting biodiversity. The identification of plants by conventional keys is complex, time consuming, and due to the use of specific botanical terms frustrating for non-experts. This creates a hard to overcome hurdle for novices interested in acquiring species knowledge.

To identify the species of a particular plant maybe an task for a botanist, but to identify multiple of such plants through conventional methods becomes quite complex and time consuming.

Having a system that could detect plant species automatically would not just make the task easy but time and cost effective as well.

Acquiring the Dataset

- The Leafsnap Data set was used to develop this project.
- The dataset consists of 30,866 leaf images, 23,147 of which were pictures directly clicked from farms, the rest were pictures that were captured in a lab.
- The pictures in the dataset belong to 185 plant species.

Get the LeafSnap Dataset from

http://leafsnap.com/dataset/

Cleaning and Preprocessing of the Data

01 The Data was originally available as lab images, field images and segmented images. We had to move all these images of different species in different folders

02 To simplify the process of development of machine learning models, we randomly selected 20 plant species to work with.

Model Development

Models Developed

Convolutional Neural Network

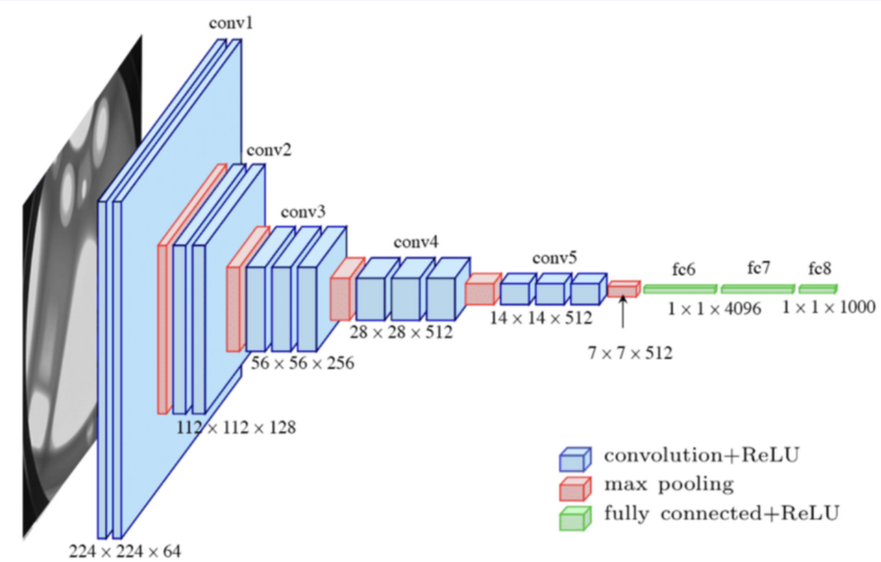
Traditional Convolutional Neural Network built using tensorflow.

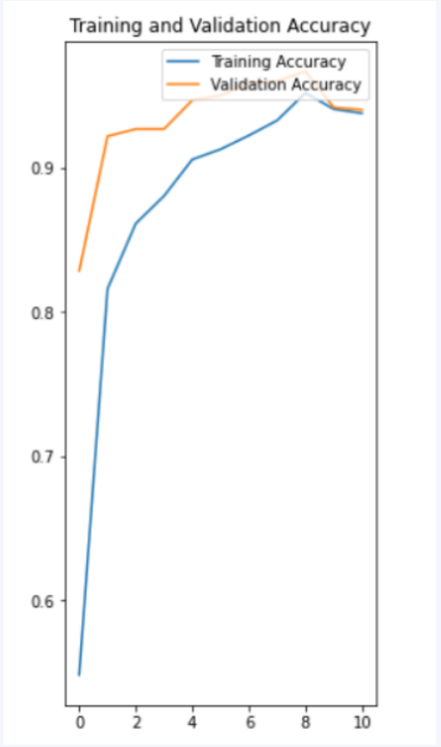
VGG16

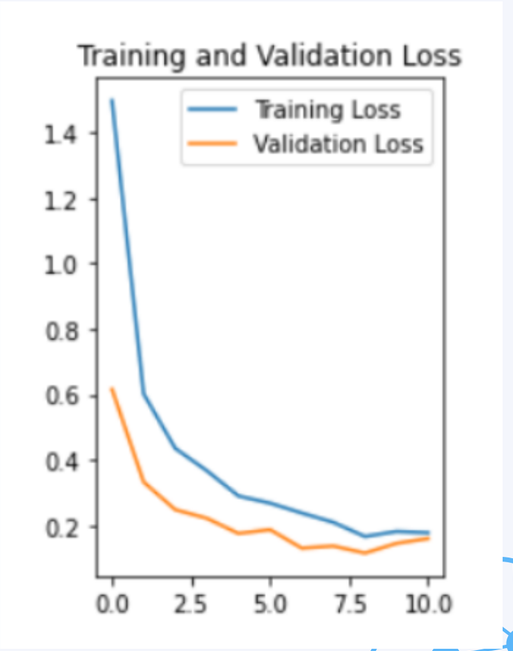
- Pretrained Model
- Convolutional Neural Network
- 16 layers deep
- Using transfer learning to use the pre-trained networks by tweaking them with application-specific data.

Model Development

The VGG16 Model

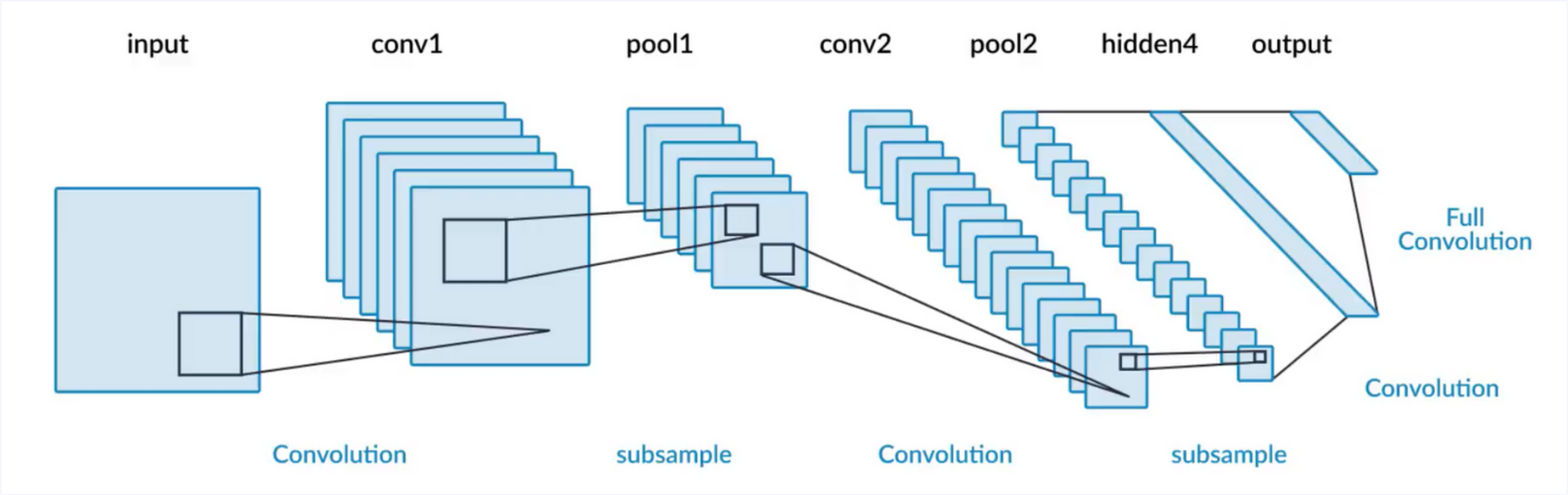


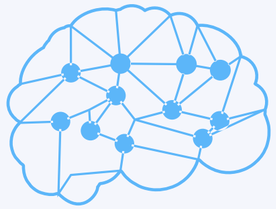




The Selected Model

Since the accuracy of the Convolutional Neural Network was higher, we selected that for our project.
The convolutional Neural Network was developed with four layers, two sets of convolution layer with 3x3 kernel and relu activation function and a maxpooling layer. After this we have a layer to flatten the matrix and then an output layer with 20 classes.

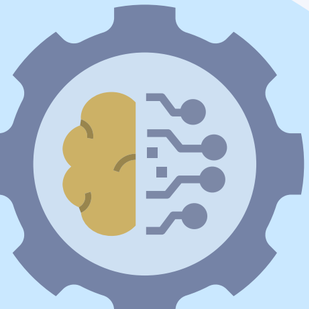




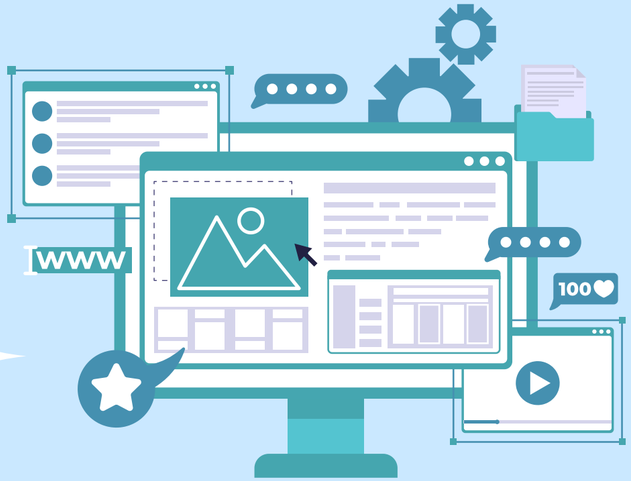
The Selected Model

Accuracy of the Convolutional Neural Network Model

```
Epoch 1/5
85/85 [==============================] - 125s 1s/step - loss: 0.0674 - accuracy: 0.9856 - val_loss: 0.4077 - val_accuracy: 0.8738
Epoch 2/5
85/85 [==============================] - 125s 1s/step - loss: 0.0311 - accuracy: 0.9915 - val_loss: 0.6412 - val_accuracy: 0.8173
Epoch 3/5
85/85 [==============================] - 124s 1s/step - loss: 0.0401 - accuracy: 0.9908 - val_loss: 0.5114 - val_accuracy: 0.8405
Epoch 4/5
85/85 [==============================] - 128s 2s/step - loss: 0.0504 - accuracy: 0.9886 - val_loss: 0.6966 - val_accuracy: 0.7940
Epoch 5/5
85/85 [==============================] - 124s 1s/step - loss: 0.0149 - accuracy: 0.9974 - val_loss: 1.1268 - val_accuracy: 0.7741
<keras.callbacks.History at 0x7fa64fed8c50>
```



Model Deployment



- Front-end: HTML, CSS
- Back-end: Python - Flask
- The TwigSee Application

TWIG SEE

"TwigSee" is an application that allows user to submit an image of the leaf of a plant and the identify the plant's species. This web application was developed using Flask.

Results


TWIG SEE
Choose File
No file chosen
Submit
The predicted species of the plant is:
Koelreuteria Paniculata

Conclusion

Through our project, we have developed a machine learning based application, which allows the user to input images of the leaves of a plant and in return obtain the species of the plant. In large scale, this system can be automated. Moreover, there is even more scope for improvement of the application, by implementing a machine learning model to predict plant species form other features of the plants such as their structures and flowers.

References

Plant Species Identification Using Computer Vision Techniques: A Systematic Literature Review

https://link.springer.com/article/10.1007/s11831-016-9206-z#:~:text=Building%20accurate%20knowledge%20of%20the,study%20and%20management%20of%20biodiversity.

Steps in building Convolutional Neural Network

https://medium.com/@PK_KwanG/

Thank You