A convolution neural network based approach for detection of Tree from leaf Images

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APPROVAL

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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Shaon Bhatta Shuvo,Senior Lecturer, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

We are going through a time when global warming is a vital issue. No other living things but yes trees only can stand as opposition of global warming. Though computer aided plant recognition has gained much interest in recent years. Also this proved as a most important tool in such areas like pharmacological science, forestry and agriculture. There are 3.041 trillion plants all around the world. They are at least 60,065 different kinds. Many of the plants of rare kinds become extinct and rare plant identification through this investigation can be a contribution to save the existence of them. We have made a system that can identify those plants by their leaves. We take 5 usual leaves from our surroundings and our system can successfully identify those plants. Computer vision based plant recognition is a challenging problem due to the variable appearance of trees, high intra-class and small inter-class variability, complex geometry and multi-scale hierarchical structure. Our contribution through this project is identifying a plant by an image of a leave using computer vision technique deep learning. Extensions to related works are discussed including other object detection such as different kinds of bicycles (mountain bike, highway bike) detection.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Computer aided plant acknowledgment has increased a lot of enthusiasm for ongoing years. Likewise this demonstrated as a most significant device in such territories like pharmacological science, ranger service and horticulture. Huge numbers of the plants of uncommon sorts become wiped out and uncommon plant recognizable proof through this examination, can be a commitment to spare the presence of them. We have made a program that can recognize those plants by their leaves. We take 5 regular leaves from our environment and our program can effectively distinguish those plants. Computer vision based plant acknowledgment is a difficult issue because of the variable appearance of trees, high intra-class and small inter-class changeability, complex geometry and multi-scale various leveled structure. Our commitment through this venture is recognizing a plant by a picture of a leave utilizing Computer vision system. Expansions to related works are talked about including other article discovery.

1.2 Motivation

Right now is an ideal opportunity of innovative transformation. Technology makes our life so much easier and lazier. Every sector of study or practical works are directly dependent on technology. Use of mobile phones also the easiest thing to people all over the world. From the lands to the space technology is a major issue now. So, why don’t we take control over the trees or plants? Where trees are the most useful and common elements of the environment? But there are many mostly the children who don’t know the names of usual trees where rare trees are a minor. If one doesn't know the name of a tree how he could know about its usefulness? So, we think it could be an essential tool for our

day to day life. Besides in studies like pharmacological science, forestry and agriculture knowing about trees is a major issue. So, we are very hopeful to studying with this topic.

Image processing methods have been applied in this investigation for recognizable proof of 5 common trees. It is conceivable to make this an independent framework for plant distinguishing proof and giving proposals dependent on picture examination reports, that is the reason we have made this stride for their issues with respect to tree identification.

1.3 Rationale of the Study

As we already know that trees are the most important and valuable element in the environment. But the demand of the total growth of trees not fulfilled by its present ratio. Beside the growth is decreasing day by day. The existence of many rare plants is a threat already.

Humans are more attracted on technologies now a days than nature. Technologies can provide them oxygen also. And chemicals are now replacement for food or vitamins. For the increasing number of people all over the world it is very tough to grow interest about trees.

So it is high time to be concerned about study of trees with help to technologies. Otherwise we will get a generation without knowledge or concern for trees. But it is important for the existence of the balance of the environment. Through our study any one can know a tree by a picture of that's leave only. We take as a wish that will grow some interest at least.

1.4 Research Questions

So as to have sensible, precise and practical reaction to the issue, the specialist wishes to offer the accompanying conversation starters to empower him analyze the recognized issue.

- What is the primary components of leaf identification?

1.5 Expected Output

- Plants identify: We want to identify plants for developing our system.

- Grow Interests: Our system is based on learning purpose.So, we think our system grow interest with in people.

- To increase plantation: This is our most important target.In our system we detect plants.So, by any way we can teach people about plants and this way we can work to increase plantation.

1.6 Report Layout

There are five chapters in this research paper. They are: Introduction, Background, Research Methodology, Experimental Results and Discussion, AND Short note like Summary, Finishing Conclusion, Recommendation for our project and Implication for Future Research.

Chapter 1: Introduction; Introduction, Motivation, Rational of the study, Research Questions, Expected output, Report Layout.

Chapter 2: Background; Introduction, Related works, Research Summary, Scope of the problem, Challenges.

Chapter 3: Research Methodology; Introduction, Research Subject and Instrumentation, Data Collection Procedure, Statistical Analysis, Implementation Requirements.

Chapter 4: Experimental Results and Discussion; Introduction, Experimental Results, Descriptive Analysis, Summary.

Chapter 5: Summary, Conclusion, Recommendation and Implication for Future Research; Summary of the Study, Conclusions, Recommendations, Implication for Further Study.

CHAPTER 2

BACKGROUND

2.1 Introduction

Trees are the most significant and important component in nature. However, the interest of the all out development of trees not satisfied by its present proportion. Next to the development is diminishing step by step. The presence of numerous uncommon plants is a risk as of now.

People are more pulled in on innovations nowadays than nature. Advancements can give them oxygen too. What's more, synthetic substances are presently trade for nourishment or nutrients. For the expanding number of individuals everywhere throughout the world it is exceptionally difficult to develop enthusiasm about trees.

This paper works with five very usual trees Mango, Guava, Jackfruit, Litchi and Rose apple. Basically we work with their leaves. By categorise their leaves we have decided the trees.

2.1.1 Mango

Mango leaves are on the other hand orchestrated, long and tight formed, 6 to 16 crawls long, and weathered in surface. The leaves are pinkish, brilliant, or light green-tone when young and become diminish green at improvement. [1]

Figure 2.1: Leaves of a Mango tree

2.1.2 Guava

Guava leaves are curved to oval alive and well and ordinary 7-15 centimeters long and 35 centimeters wide. The leaves create in an opposite strategy, which means two leaves create at a comparative point on either side of the stem, and have short petioles, or stalks that join the leaf to the stem. [2]

Figure 2.2: Leaves of a Guava tree

2.1.3 Jackfruit

Simple, alternate, youthful jackfruit leaves are lobed yet they gotten whole when developed. The leaves are dull green and gleaming in adaxial side yet light green in

abaxial side. The leaves are circular obovate fit as a fiddle and measure around 20 cm long. [3]

Figure 2.3: Leaves of a Jack-Fruit tree

2.2 Related Works

The utilization of machine vision strategies have expanded comprehensively in the agriculture sector in most recent couple of years, particularly in the plant insurance field which eventually prompts crops the executives. In any case, there are very few applications that offer convenient arrangement that empowers the executives of Plant utilizing picture investigation methods.

The use of machine procedures has extended extensively in the Forestry and Pharmacological studies area in recent years. There are additionally not very many applications they can help Forestry and Pharmacological Sector.

This study can detect any kinds of trees by their leaves then he could arrange any kind of data of the tree. We wish that would be helpful for not only in agriculture, forestry and pharmacological sector but also for nature lovers and travelers.

2.3 Research Summary

Identification and portrayal of plant discovery together give the premise to what could possibly be done who is to do it so as to spare nature. The objective is exclusively to recognize any sort of trees by their leaves as it were. On the off chance that, for instance, explicit introduction sources can be connected to explicit advancements, it will help figure out what exceptional security measures are important to control the hazard for our future natural condition.

2.4 Scope of the Problem

- Users of this program are for nature lover, agriculturist, Forestry researcher, Pharmacologist.
- The prototype is developed by using Tensorflow.
- 100 samples each of the new, mid aged and old leaves had used on this project.

2.5 Challenges

The primary test towards us was gathering information on various leaves of different maturities. At that point we confronted a few challenges to coordinate tensorflow prepared model. As we don’t work with machine learning before, it was a critical task for us to integrate all these.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

Regarding what number of trees are hacked as the year advanced, IntactForests.org derives those immaculate woodlands scenes to 2000-2013 were diminished all around by 70,000 square kilometers for consistently an aggregate of 919,000 square kilometers. Concerning the "amount of trees" this addresses, it's hard to get a definite count. Tree thickness in fundamental forests varies from 50,000-100,000 trees for each square km, so the mathematics would input this amount at 3.5 billion to 7 billion trees hack as the year advanced. So this is time as of now we must be worried about trees. [4]

3.2 Research Subject and Instrumentation

As our objective is to identify leaf for tree detection utilizing tensorflow image classifier then we utilized Python to utilize it successfully and utilize it. We utilized convolutional neural network model to classify images dependent on various trees. We have prepared our convolutional neural network model more than 160 images on five different trees.

3.3 Data Collection Procedure

We have thought about regular trees of the various territories over the world as trial images. We have taken the images from our homesides. We have considered plant's leaves images with the natural parts. It has been seen that the proposed framework yield accuracy fluctuates regard to plants. We have additionally gathered images from web. More than 200 images have been downloaded on five distinct leaves which are Guava leaves, Mango leaves, Jackfruit leaves, Blackberry leaves, Litchi leaves.

3.4 Implementation Requirements

The fundamental necessity for our undertaking is Python and Tensorflow. We have prepared our image classifier utilizing convolutional neural networks. We prepared our classifier utilizing transfer learning method based on Inception-v3 model which is prepared for the Google Imagenet Large Visual Recognition. We have retrained our classifier by running Python content for five distinct plants. Utilizing this program anybody can test the leaves by transferring leaf's picture.

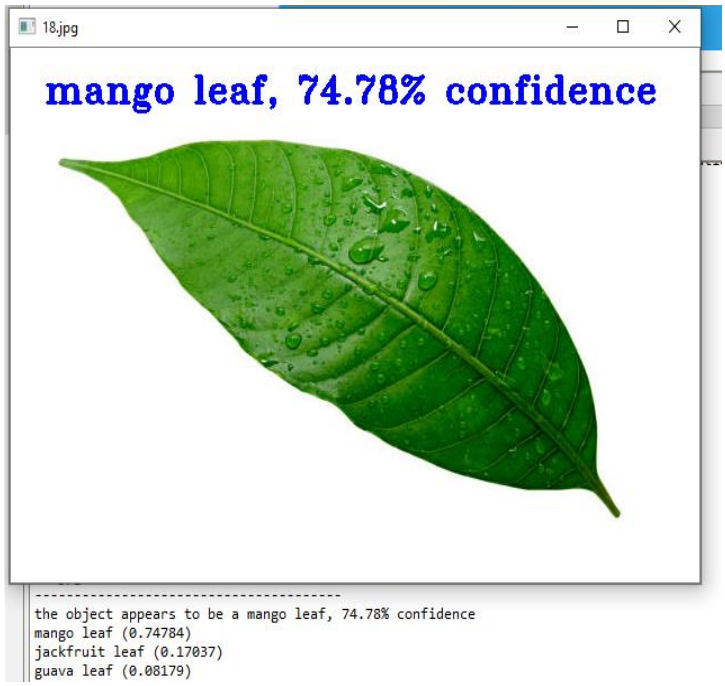

Figure 3.1: Result after predicting mango leaf

Figure 3.2: Result after predicting mango leaf

Figure 3.3: Result after predicting guava leaf

Figure 3.4: Result after predicting guava leaf

Figure 3.5: Result after predicting jackfruit leaf

Figure 3.6: Result after predicting jackfruit leaf

3.4.1 Retraining image classifier

Current image acknowledgment models have a great many parameters. Preparing them without any planning requires a lot of named getting ready data and a huge amount of figuring power (numerous GPU-hours or more). Move study is a system that easy routes quite a bit of this by taking a bit of a model that has just been prepared on a related assignment and reusing it in another model. In this instructional exercise, we will reuse the component extraction abilities from incredible image classifiers prepared on ImageNet and essentially train another order layer on top.

In spite of the fact that it's not on a par with preparing the full model, this is shockingly viable for some, applications, works with moderate measures of preparing information (thousands, not a great many marked images), and can be run in as small as thirty minutes on a PC without a GPU. This instructional exercise will tell you the best way to run the model content without anyone else images, and will clarify a portion of the alternatives you need to help control the preparation procedure.

At the point when the bottlenecks are done, the real planning of the top layer of the system begins. You'll see a movement of step yields, each one showing getting ready exactness, endorsement precision, and the cross entropy. [5] The readiness precision shows what percent of the images used in the present getting ready bundle were named with the correct class. The endorsement exactness is the accuracy on an indiscriminately picked assembling of images from a substitute set. The key qualification is that the readiness precision relies upon images that the system has had the choice to pick up from so the system can overfit to the upheaval in the arrangement data. A certifiable extent of the display of the system is to measure its introduction on an educational list not contained in the planning data - this is assessed by the endorsement precision. If the train precision is high anyway the endorsement exactness remains low, that infers the system is over fitting and recalling explicit features in the readiness images that aren't valuable even more generally. Cross entropy is a mishap work which gives an investigate how well the learning methodology is progressing. [5]

The readiness will likely make the disaster as meager as could sensibly be normal, so you can tell if the learning is working by keeping an eye out for whether the incident keeps floating downwards, disregarding the transient disturbance. [5]

As is normally done this substance will run 4,000 getting ready advances. Each step picks ten images carelessly from the arrangement set, finds their bottlenecks from the store, and feeds them into the last layer to get estimates. Those conjectures are then differentiated against the authentic imprints with update the last layer's heaps through the back-causing process. As the methodology continues with you should see the uncovered precision improve, and after all of the methods are done, a last test exactness appraisal is run on a great deal of images kept separate from the readiness and endorsement pictures. This test appraisal is the best measure of how the readied model will perform on the game plan task. You should see a precision estimation of some place in the scope of 90% and 95%, anyway the cautious worth will contrast from race to run since there's intervention in the readiness strategy. This number relies upon the percent of the images in the test set that are given the correct name after the model is totally arranged. [5]

A typical method for improving the consequences of image preparing is by misshaping, editing, or lighting up the preparation contributions to arbitrary ways. This has the benefit of extending the successful size of the preparation information because of all the potential varieties of similar images, and will in general help the system figure out how to adapt to every one of the twists that will happen, in actuality, employments of the classifier. The greatest inconvenience of empowering these contortions in our content is that the bottleneck reserving is never again valuable, since info images are never reused precisely. This implies the preparation procedure takes significantly more (numerous hours), so it's prescribed you attempt this as a method for cleaning your model simply after you have one that you're sensibly content with.

```
performing training . . .
INFO:tensorflow:2019-11-01 00:30:34.614890: Step 0: Train accuracy = 36.0%
INFO:tensorflow:2019-11-01 00:30:36.447782: Step 0: Cross entropy = 1.068632
INFO:tensorflow:2019-11-01 00:30:43.900293: Step 0: Validation accuracy = 22.0% (N=100)
INFO:tensorflow:2019-11-01 00:30:51.120885: Step 10: Train accuracy = 86.0%
INFO:tensorflow:2019-11-01 00:30:51.122860: Step 10: Cross entropy = 0.827353
INFO:tensorflow:2019-11-01 00:30:51.300848: Step 10: Validation accuracy = 91.0% (N=100)
INFO:tensorflow:2019-11-01 00:30:53.348726: Step 20: Train accuracy = 85.0%
INFO:tensorflow:2019-11-01 00:30:53.349727: Step 20: Cross entropy = 0.705560
INFO:tensorflow:2019-11-01 00:30:53.645708: Step 20: Validation accuracy = 89.0% (N=100)
INFO:tensorflow:2019-11-01 00:30:56.181556: Step 30: Train accuracy = 90.0%
INFO:tensorflow:2019-11-01 00:30:56.183555: Step 30: Cross entropy = 0.605235
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INFO:tensorflow:2019-11-01 00:30:58.574411: Step 40: Train accuracy = 92.0%
INFO:tensorflow:2019-11-01 00:30:58.576412: Step 40: Cross entropy = 0.546272
INFO:tensorflow:2019-11-01 00:30:58.737403: Step 40: Validation accuracy = 83.0% (N=100)
INFO:tensorflow:2019-11-01 00:31:00.461299: Step 50: Train accuracy = 91.0%
INFO:tensorflow:2019-11-01 00:31:00.463349: Step 50: Cross entropy = 0.455713
INFO:tensorflow:2019-11-01 00:31:00.629290: Step 50: Validation accuracy = 81.0% (N=100)
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INFO:tensorflow:2019-11-01 00:31:02.383183: Step 60: Cross entropy = 0.479547
INFO:tensorflow:2019-11-01 00:31:02.611170: Step 60: Validation accuracy = 87.0% (N=100)
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INFO:tensorflow:2019-11-01 00:31:04.496056: Step 70: Cross entropy = 0.462697
INFO:tensorflow:2019-11-01 00:31:04.667046: Step 70: Validation accuracy = 83.0% (N=100)
INFO:tensorflow:2019-11-01 00:31:06.583932: Step 80: Train accuracy = 95.0%
INFO:tensorflow:2019-11-01 00:31:06.584932: Step 80: Cross entropy = 0.365082
INFO:tensorflow:2019-11-01 00:31:06.757954: Step 80: Validation accuracy = 91.0% (N=100)
INFO:tensorflow:2019-11-01 00:32:10.991070: Step 430: Validation accuracy = 91.0% (N=100)
INFO:tensorflow:2019-11-01 00:32:13.388927: Step 440: Train accuracy = 100.0%
INFO:tensorflow:2019-11-01 00:32:13.389928: Step 440: Cross entropy = 0.151147
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INFO:tensorflow:2019-11-01 00:32:15.799784: Step 450: Train accuracy = 100.0%
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INFO:tensorflow:2019-11-01 00:32:25.505203: Step 499: Cross entropy = 0.123723
INFO:tensorflow:2019-11-01 00:32:25.664193: Step 499: Validation accuracy = 95.0% (N=100)
running testing . . .
INFO:tensorflow:Final test accuracy = 90.0% (N=40)
writing trained graph and labbels with weights
WARNING:tensorflow:From C:/Users/arafa/OneDrive/Documents/TensorFlow_Tut_2_Classification_Walk-through/retrain.py:
1229: convert_variables_to_constants (from tensorflow.python.framework.graph_util_impl) is deprecated and will be
removed in a future version.
```

Figure 3.7: Retraining image classifier from terminal.

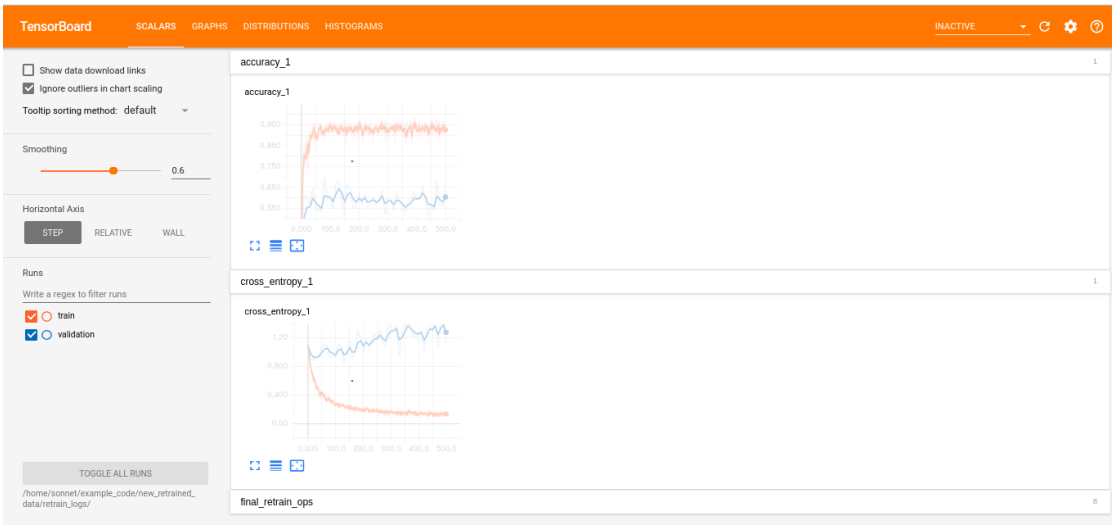

Figure 3.8: Tensorboard accuracy graph

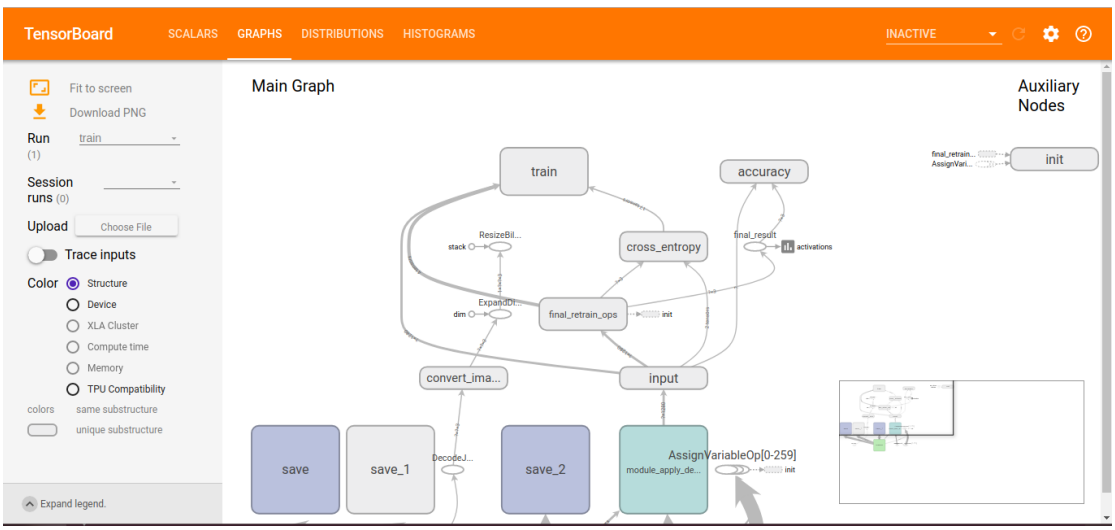

Figure 3.9: Main graph of Tensorboard

3.4.3 Activity Diagram

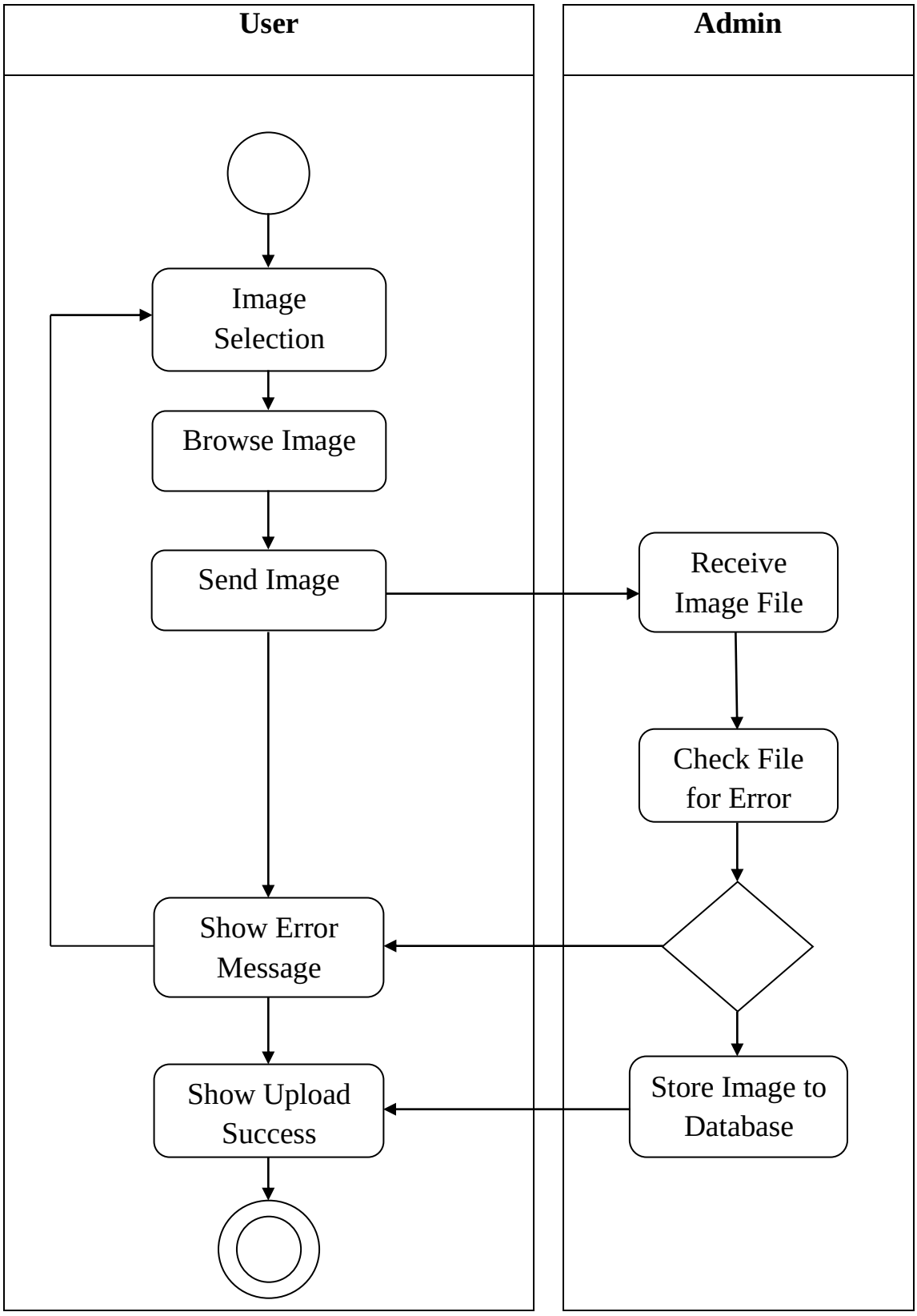

Figure 3.10: Image upload activity diagram.

CHAPTER 4

EXPERIMENTAL RESULTS AND DISCUSSION

4.1 Introduction

Trees are the most important part of our life. And in our daily life we are seeing many types of trees. But sometimes we can not recognise many types of trees. And we think this is not good for us and our future generation. It will keep a bad impression on our future generation. That's why we are trying to do something for detecting trees easily. Now a days in this whole world everything we try to think digitally. Because, we can find maximum think in web. So,that's why we also try to do something digitally. And in this process we think people can learn and identify trees easily.

4.2 Experimental Results

We have given very common trees of the different areas over the world as experimental images. We have taken images from different areas and also from google. We have considered leaf pictures with the natural parts. It has been seen that the proposed framework output accuracy shifts regard to leaf pictures.

So as to play a validation and experiment for any innate predisposition in the datasets, tests were go for a scope of training-testing information parts. During example training, 10% of the dataset was utilized to approve training steps, in this way 90% of the dataset was part into various training and testing dataset arrangements.

The test-training parts were as per the following: 80 to 10 (80 percent of dataset for training, 10 percent for testing separately), 60 to 30 (60 percent of dataset for training, 30 percent for testing individually), 50 to 40, (half of dataset for training, 40 percent for testing separately), 40 to 50 (40 percent of dataset for training, half for testing separately), and 20 to 70 (20 percent of dataset for training, 70 percent for testing

individually). For each test the general exactness is accounted for as the quantity of tests in all order that were comparative.

These outcomes show that datasets expected to manufacture move learning models for tree detection don't require huge training datasets (<200 pictures per class). The aerial accuracies revealed propose that varieties in foundation had slight impact on the forecast accuracy of the pattern. Segments of pictures contained the bike, leafs and other vegetation, yet forecasts in all image classes were incredibly over the likelihood of randomly guessing (16.7%). In the field almost certainly, an expansion laborer would utilize more than one image to anticipate the illness, in this manner improving the indicative exactness further. This investigation in this way shows move studying applied to the Inception v3 profound studying model offers a promising road for in-field tree location utilizing convolutional neural systems with generally little image datasets. [6]

4.3 Descriptive Analysis

Inspired by the classical AlexNet, GoogLeNet, and their presentation improvements, a profound convolutional neural network model is proposed to detection of Tree from leaf Images. The proposed CNN-based model and related parameters are shown in Figure 4.1 and Table 1. First of every one of the, a structure named AlexNet Precursor is designed, which is based on the standard AlexNet model. For the impression of the convolution kernel, a bigger sized the convolution kernel has a stronger capacity to separate the macro data of the image, and vice versa. A lesion is smaller than the entire image, and other data on the image can be understood as "noise" which needs to be sifted. As a consequence, the first convolutional layer is designed to be 96 kernels of size 9×9×3, which is not quite the same as the first convolutional layer's kernel size of 11 ×11 ×3 in the standard AlexNet. The second convolutional layer filters the noise with 256 kernels of size 5×5×48; response-standardization layers pursue the first two convolutional layers, which are themselves trailed by max-pooling layers. The third convolutional layer has 384 kernels with a size of 3×3×256 associated with the (standardized, pooled) outputs of the second convolutional layer. The fourth layer is separated with 384 kernels of size

3×3×192, and the fifth layer has 256 kernels with a size of 2×2×192 to improve the capacity to remove small features, which is also unique in relation to the standard AlexNet, and is then trailed by a maximum pooling layer. After AlexNet Precursor, an engineering named Cascade Inception is designed including twomax-pooling layers and two Inception structures. The first max-pooling layer is applied to filter the noise of highlight maps produced by AlexNet Precursor, and the two Inceptions at that point separate the ideal discrimination features from multidimensional analysis. Highlight maps before the first Inception are contribution to the second Inception's link layer, which prevents some of the features being filtered by these two Inceptions. In the interim, the sixth convolutional layer pursued by the Cascade Inception has 4096 kernels with a size of 1×1×736, which replaces the first two completely associated layers of the standard AlexNet. The completely associated layer is adjusted to foresee four classes of tree detection, and the final layer is a four-way Softmax layer. [7]

Table 1: Parameters of the convolutional neural network based model.

Type	Patch Size/Stride	Output Size
Convolution	9 × 9/4	96 × 55 × 55
Pool/Max	3 × 3/2	96 × 27 × 27
Convolution	5 × 5/1	256 × 27 × 27
Pool/Max	3 × 3/2	256 × 13 × 13
Convolution	3 × 3/1	384 × 13 × 13
Convolution	3 × 3/1	384 × 13 × 13
Convolution	2 × 2/1	256 × 14 × 14
Pool/Max	3 × 3/2	256 × 7 × 7
Pool/Max	3 × 3/2	256 × 3 × 3
Inception	-	256 × 3 × 3
Inception	-	736 × 3 × 3
Pool/Max	3 × 3/2	736 × 1 × 1
Convolution	1 × 1/1	4096 × 1 × 1
Fully Connection	-	4
Softmax	-	4

All the more specifically, the convolution layer, pooling layer, actuation capacity, and Softmax layer in the novel CNN-based model are described underneath.

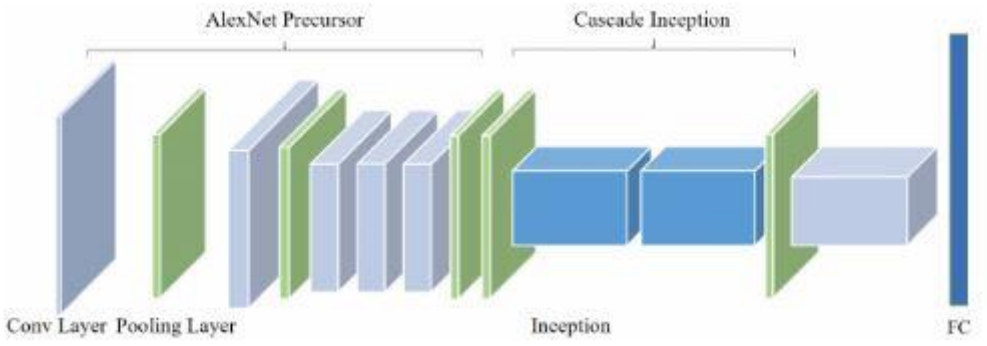

Figure 4.1: Structure of the CNN model.

4.4 Summary

The consequences investigation show that image acknowledgment with transfer learning from the convolutional neural network Inception v3 is a ground-breaking strategy for high accuracy automated tree recognition. This strategy avoids the complex and work serious advance of highlight expulsion from images so as to prepare models, and the model can be effectively prepared on a desktop and conveyed on a mobile device. Transfer learning is additionally fit for applying regular machine learning techniques by retraining the vectors delivered by the prepared model on new class data.

CHAPTER 5

SUMMARY, CONCLUSION, RECOMMENDATION AND IMPLICATION FOR FUTURE RESEARCH

5.1 Summary of the Study

So,our whole project we are trying to establish a tree detection system. In our project, trees are recognized by it's leafs. We used convolutional neural network inception V3,Python,Tensorflow in our system. And we also have a simple dataset. Now, we did a sample type project but in future we will try to extend it because we believe that it will be so helpful for people's learning and doing methods.

5.2 Conclusions

There is no confusion actually that trees are the most important element of nature and for nature. For balancing ecology there's nothing far better than trees. Ecological balance is the greatest issue right now for living elements. Moreover, the world is turning hotter day by day trees can make it colder. For all of the elements like soil, water, gasses there is only one option there cultivating trees. For cultivating it is very important to be concerned and knowing about them. There is no better way than to give them a technological service for concerning that they can use it with the help of mobile phones. Our study is just a start of the process and giving a promising result.

5.3 Recommendations

We have thought about not many confinements to the system. First disadvantage of this task is that we have restricted background in trees study, so understanding the issue or arrange a leaf was a test for us. Another disadvantage would be the algorithm which

drops the background for image examination of plants has confinements. In view of the undesirable background of the image, it probably won't show promising or exact outcomes. In the underlying improvement of this venture we confronted many tests with respect to this issue. In any case, it is important to consider applying background undoings techniques. Also, the system is developed in English which will be practically incomprehensible for a large portion of individuals over the world who doesn't know english.

5.4 Implication for Further Study

We have intended to refresh this system for execution of the venture, in actuality, . We have an arrangement that after redesigning this system the individuals particularly the individuals living in the remote zone will get help effectively and can take care of their concern with less exertion. The essential focal point of our venture is to conquer the restrictions of the current developed system. Our Background cancellation algorithms should be applied for the image handling to work for any image. Notwithstanding that, we additionally need to redesign this system that can identify any yield illness or plant malady utilizing just cell phones camera and web.

APPENDICES

Appendix A: Research Reflection

Target group of leafs

Figure A1: Mango leaf

Figure A2: Jackfruit leaf

Figure A3: Guava leaf

Figure A4: Blackberry leaf

Figure A5: Lychee leaf

Method of analysis

Various trees leafs.

Appendix B: Related Issues

Bicycle Detection: Bicycle can be detected with the same algorithm and the same procedure.

Figure B1: A bicycle.

Leaf Disease Detection: Leaf disease or skin disease also will follow the same procedure.

Figure B2: Disease on mango leaf

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