ROSE BREED DETECTION USING TRANSFER LEARNING METHOD

BY

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project titled "**Rose Breed Detection Using Transfer Learning Method**", submitted by Amena Begum Farha, ID No: 183-15-11845 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on September 13, 2022.

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I hereby declare that; this project has been done by me under the supervision of **Mst. Eshita Khatun, Lecturer (Senior Scale), Department of CSE** Daffodil International University. I 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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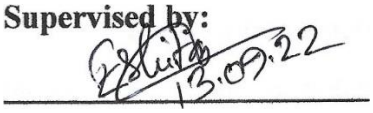

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ABSTRACT

For flower cultivation, flower creation and flower business, breed identification of a particular flower and providing the description of that breed with planting recommendation and maintaining ways are very beneficial. There are so many local flowers are available in Bangladesh, rose is one of the most common and wanted flower. Not only in Bangladesh roses are the most acceptable flower all over the world. Roses are most preferable flowers for decoration; besides that, it has many more uses. Rose breed identification will have impressive effect on floriculture and flower business because roses have largest involvement in flower business. Though floriculture is improving day by day, but there is no available approach for breed identification of specific flower rather than various flower recognition approaches. In this project, I presented a model based on transfer learning techniques to identify breed of roses from pictures. For image processing and classification of flowers, resources are not sufficient, so there was great necessity of a broad dataset with huge number of pictures to train the model. I have collected 1939 real pictures of five different breeds of rose and I have created 9306 and 388 images for training dataset and testing dataset accordingly. I have used four transfer learning techniques in my project, which are Inception V3, ResNet50, Xception and VGG16. VGG16 scored the maximum accuracy of 99%, which is an outstanding performance. Among all flower related works, breed detection of a particular flower is the first approach based on my knowledge.

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CHAPTER 1

Introduction

1.1 Introduction

Flower is the most adored thing in the world. Everyone loves flowers. Previously, People were involved in gardening and cultivating flowers for decorative purpose. But nowadays flowers are essential for both decorative and economic purposes. People are using flowers in almost every type of occasions like birthday, wedding, anniversaries, religious festivals and other social functions. In Bangladesh, flowers are the most precious presents of nature. It's a country of huge variety of flowers. That's why Bangladesh is familiar as the land of flowers. At recent, the floriculture occupied 10,000 hectares of land. More than 5,000 farmers and around 150,000 people who are involved in flower business for their livelihood [1]. To face the market demand farmers are cultivating many kinds of flowers. In present, there are many kinds of flowers have been seen in the country. The common Bangladeshi flowers are Rose, Lily, Bela, Marigold, Jasmine, Sunflower, Gardenia, Kadam and more. Among these flowers rose is the most popular flower not only in Bangladesh but also throughout the world. There are lots of tale about roses. For any kind of celebrations or occasions, the most wanted flower is roses. People are getting so many usages and products from roses. Rose water is of the most used and demanding products which people are getting from roses. They are using rose water for different purposes. There are lot of perfume which are manufactured by using roses. From rose petals people are getting potpourri apart from sweets. A fruit like rose-hip carries a great amount of vitamin C. Flower business in incomplete without roses in Bangladesh. Having knowledge about breeds of rose will be very beneficial as roses obtain a valuable place in flower business. In Bangladesh, Jashore district is famous for rose cultivation. In Jashore, there are many lands only for cultivating roses. All these roses came from Mughal dynasty. Many varieties of roses have in seen in Bangladesh except black roses. Due to the weather of Bangladesh black roses haven't shown yet. There are nine breeds of roses which are available in Bangladesh. These are Papa Meiland, Iceberg, Rose Gaujard, Bengali, Sunsilk, Queen Elizabeth, Julia's Rose, Dutch Gold, King's Ransom [2]. All these roses are different from each other. They have

different color, size, structure and also scent. These breeds different from each other from inner and outer parts. In flower cultivation and business breed identification will be very useful.

Breeds identification of roses will be very useful based on the demand and diversity of rose planting. To cultivate roses easily and to maintain rose plants and its flowers properly breed detection has a great impact. It will also help the flower analysts to analyze the breeds and creating more new breeds, which will suitable for the weather of our country.

Breed detection of roses will be profitable for business also. Flower cultivators will be able to know which kind of breeds are more profitable, like some are taking too much effort and expenses but cannot be able to give that much of profit. On the other hand, some are taking less effort and expenses and also giving enough profit. Cultivators will be capable to take decision according to their benefit.

Rose breed detection will play a vital role in rose cultivation. If cultivators will be aware about rose breeds, they will be educated about the cultivation of each breed. They will take action based on the characteristics of the breeds, like the amount of fertilizer they need, how many days they take to grow, the limitation of a breed, caring method and many more.

Rose breed identification has an extensive implementation. To extent rose business all over the world rose breed classification can play a remarkable role. Roses are the most wanted flowers throughout the world. Italy, Japan, Kenya, United States, Israel, Netherlands and Colombia, these countries are carrying on rose production. Now roses are everywhere, they are the most desirable and useful flowers. So, roses have a great hold in flower business not only in Bangladesh but also in other countries. Breed detection system will be demandable all over the world. By detecting the breed of roses cultivators, cultivators can invent better and perfect breeds which will be suitable for all countries and can supply those breeds to other countries, which will bring a great earning for them. Businessmen will earn are money from all over the world, which will very beneficial for the economic sector of Bangladesh.

Rose breed detection will increase the production of roses day by day, as it will be easier to produce roses on time by knowing the characteristics. If the it increases rapidly, there will be

a large number of roses in our country which will be more than our demands. It will be easier to supply rose breeds to other countries and to earn world remits which will have a great impact on our economy and our country will be benefited financially.

Flower Business has been generally avoided by large corporations despite having massive consumer base. There has been an escalation of rose breeds and a transfer learning-based breed detection can help consumers and cultivators to identify breeds of roses and taking action according to their benefit and choice. My research aims to proposed a significant framework to classify breed names of roses with the support of the transfer learning method.

1.2 Motivation

Considering the usefulness of roses, roses are the most demanding flower all over the world. Roses can be used in many ways. It can be used to produce some products like rose water, jam, and perfumes. Besides other things, people are using roses for different kind of occasions like birthday, wedding, anniversary, religious festival, national celebration etc. Rose is the most enjoyable and preferable flower to everyone for its variety, reasonable price, availability, reproduction and acceptance. The production of roses is really profitable at farm basis, but the production of roses has fettered duo to lacking of proper use of technology. Rose breeds detection can be a great use of technology for rose cultivation. However, there is no remarkable work to detect breed of a flower. Rose breed detection will be extremely helpful for the cultivators who cultivate roses. They will produce roses based on their breeds. They will take care of them according to their breeds. In addition, Breed recognition is a noticeable issue classifying, exploring and producing flowers. Breed classifying from images can build up the productivity vastly of the working people in this sector.

Suppose, BRAC Bangladesh wants to produce a new breed of rose, which will be suitable for all kind of weather and will be less scented so that animal cannot attack. In that case breed detection will be really essential. As breed detection work has not been presented previously, so the goal of my presented method is to detect flower breeds from images, enhance the proper cultivation of flowers and increase the number of new breeds.

1.3 Rationale of The Study

The importance of rose breed detection has been increased by the uprising of demand of roses and technology. Moreover, the identification of rose breed is amplifying the efficiency of many professional works which is related with flowers specially with roses. There are many approaches have been taken before to classify different type of flowers using CNN but the approach of detecting breed of the same kind of flower haven't taken yet. Therefore, I approached the Transfer Learning Method to detect breeds of rose. I have chosen Transfer Learning Method as it accelerates training and enhances the performance of my deep learning model. Moreover, I have used a data set of 1,939 images of different breeds of rose to achieve desired accuracy. As I have used massive and real time data, so it is a great improvement from the previous works which are similar to my work.

1.4 Research Questions

I have faced many challenges that I haven't expected to complete my project. I have gone through lots of challenges such as collecting data, build the accuracy rate which will be recommendable, selecting appropriate methodology. The paper aimed to answer the following questions:

- Why is breed detection needed?
- Who will be benefited from breed detection?
- How to collect data?
- How authentic the data are?
- What are the challenges in collecting data?
- Which methodology will be used to achieve the desired output?
- What are the challenges in obtaining the expected accuracy?
- Why use the transfer learning method instead of others?
- Which Transfer learning models have been used?
- What research limitation has been filled from previous works?
- Has adequate accuracy been achieved?

1.5 Expected Outcomes

This research project proposed a visual breed classification model using the Transfer Learning model to classify different breeds of roses. In the proposed algorithm, I have taken a model trained on ImageNet and use the learned weight in that model to initialize the training and classification of an entirely new dataset. I have worked with a data set of 1,939 images after performing several Transfer learning models, e.g., Inception V3, VGG16, Xception and ResNet 50. My expected outcome is to determine the best Transfer Learning model based on their accuracy level.

1.6 Report Layout

The first chapter consist of Introduction, Motivation, Rationale of the study, Research questions, Expected outcome, and Report layout of my thesis. The second chapter consist of Terminology, related works, comparative studies, and challenges. The third chapter consist of Data acquisition and processing, Training of images, Image Augmentation, Output generation, and Results and evaluation. The fourth chapter contains the details of my classification performance assessment and results. Lastly, the fifth chapter contains conclusion and future work.

CHAPTER 2

Literature Review

2.1 Terminologies

In this section, I will discuss equivalent researches performed before by various researchers and their proposed methods, the accuracy that they have obtained and the limitations of their work, and my approaches to fill up their limitations. Then a comparative study of the referenced work. Finally, in Comparative Analysis, I tried to demonstrate a comparative study of additional research that has been conducted over the past.

2.2 Related Works

Philipe A. Dias et al. [3] have presented a system based on CNN to detect apple flowers. They gathered 147 images apple trees. They used fully connected layer of CNN for feature extraction and identified the pictures by using SVM. They built a of CNN+SVM and it scored greater than 90% in terms of recall and precision.

Xiaoling Xia et al. [4] used transfer learning technics basically Inception-v3 model to classify flowers. They used two datasets of 17 species and 102 species. The two datasets contain 80 and 40-258 flower images for each species accordingly. Their proposed method got the accuracy of 95% for first dataset and 94% for the other one.

I.Gogul et al. [5] approached a flower identification system to identify flower species based on CNN. They used two datasets of 28 and 102 categories. The two datasets contain 2240 and 8189 flower images accordingly. For feature extraction, they used transfer learning techniques. They got 93.41% of accuracy.

Hazem Hiary et al. [6] identified flowers by using two step deep learning classifier. They built a model of binary classifier using fully convolutional neural network framework and a significant CNN classifier to detect different types flower. They used three datasets of 102, 17 and 102 categories. The datasets contain 8189 images from 102, 1360 and 612 flower images respectively. They achieved more than 97% score on three datasets.

M. Cıbuk et al. [7] developed a hybrid model using DCNN. They used combined AlexNet and VGG16 models for feature extraction. Lastly, they used mRMR technique to select more efficient features. By using the extracted features, they used SVM with RBF kernel to identify the flower species. They also used two datasets of 17 and 102 flower types. They achieved the accuracy of 96.39% and 95.70% the dataset accordingly.

Thi Thanh Nhan Nguyen et al. [8] presented the effectiveness of DCNN to classify flower species. They collected a flower dataset of 967 species from PlantCLEF 2015. And the accuracy was more than 90%.

Yuanyuan Liu et al. [9] built a model using CNN for flower classification. They made a dataset of 52,775 pictures from 79 flower species. They got 76.54% of accuracy on the dataset and they used their model on a known dataset and got more accuracy, which is 84.02%.

Saiful Islam et al. [10] created a local flower classification system to classify local flowers based on CNN. They collected a dataset of 6400 images from eight types of flower species. Their system got 85% of accuracy.

Busra Rumeysa Mete et al. [11] detected flowers by using DCNN and machine learning techniques. They used Deep CNN to extract features and to achieved good result. They presented usage of image augmentation. Lastly, they also compared some machine learning techniques. They used two datasets. They achieved the maximum accuracy 98.5% and 99.8% by using SVM and MLP respectively.

Yong Wu et al. [12] developed a model for flower detection by using CNN and transfer learning technic. They used DCNN for feature extraction. They merged neural network model with transfer learning techniques. They presented an excellent work by getting a good accuracy for flowers classification than traditional methods.

2.3 Comparative Analysis and Summary

TABLE 2.3.1: Comparison of related works

Authors	**Topic**	**Proposed Method**	**Dataset (Number of images)**	**Accuracy**	**Year**
Philipe A. Dias et al.	Apple flower detection	CNN+SVM	147	>90%	2018
Xiaoling Xia et al.	Classification of flowers of different species	Transfer learning technic based on Inception-v3 model	Not specified	95% and 94%	2017
I.Gogul et al.	Flower species recognition	CNN	8189	93.41%.	2017
Hazem Hiary et al.	Identification of flowers	CNN based on two step deep learning classifier	8189	>97	2018
M. Cıbuk et al.	Identification of flower species	DCNN based hybrid method	Not specified	96.39% and 95.70%	2019
Thi Thanh Nhan Nguyen et al.	Classification of Flower species	DCNN	Not specified	>90%	2016
Yuanyuan Liu et al.	Flower detection	CNN	52,775	76.54%	2016
Saiful Islam et al.	Identification of local flowers	CNN	6400	85%	2020
Busra Rumeysa Mete et al.	Recognition of flowers	DCNN+SVM+ MPL	Not specified	98.5% and 99.8%	2019
Yong Wu et al.	Detection of flowers	DCNN	Not specified	Not found	2018

2.4 Challenges

While working on this research project, I came across many challenges like selecting an accomplishable topic, collecting data, working with related works, searching theoretical basis as a support for my project, Finding and building the proper methodology. The first and the most difficult challenge was to select an accomplishable topic as there are many works in this field so building a completely new idea was really challenging. Then collecting data was the second most difficult and tedious task, I have collected different type of roses. Finding different type of roses wasn't so easy, I had to go different places like Golapgarm, Shahbag etc. as I had been very careful about data authenticity for qualitative research. So, it was a really laborious task. Collecting all the previous works which are nearly similar to my work, reading and analyzing their work, finding their achievement and limitation to gather the knowledge about related works was quite challenging and complicated. Searching theoretical basis and gathering all the theoretical basis to build a support for my project was another challenge. Finally, building an appropriate and suitable methodology for my project was my last and crucial challenge to achieve the desirable accuracy level.

CHAPTER 3
Research Methodology

3.1 Data Acquisition and processing

For a researched based work like this, data is the main and the central aspect to achieve a better outcome. So, I have collected every single data manually and carefully for my project, which was a really challenging task in my work. Firstly, I have collected different kind of roses from different places, as finding different roses at one place was quite difficult. I have visited Golapgram and Shahabg to collect rose flowers. Then I have taken pictures of those roses using OnePlus Node camera and then I have taken specific (200 x 100) image size. Mainly I focused on different breeds of a local flower in Bangladesh, And I have chosen rose as it is the most common and demanded flower in Bangladesh. I have collected 1939 images of five different categories. These five different categories are five different breeds of rose flower. There are nine breeds of roses have seen in Bangladesh, I have selected five breeds of rose for my project based on the popularity and availability.

Table 3.1: Selected breeds along with popularity and availability

No	Name of Breed	Number of Images
1	Papa Meilland	328
2	Iceberg	365
3	Kings Ransom	391
4	Queen Elizabeth	465
5	Bengali	390

These are the most popular and available breeds of rose in Bangladesh. Also, these breeds are highly demanded all over the country. Therefore, I tried to collect the most clean and authentic data while data collection, which convoyed a great benefit to my project in image processing. Also, it brought a great improvement in the outcome of my work.

Figure 3.1.0 Sample breeds from the dataset

3.2 Training of Images

Including InceptionV3, Xception, RestNet50 and VGG16, I have worked with some pre trained Transfer Learning methods. Among these four methods, VGG16 obtained the highest accuracy in my project, so I will focus on this method in rest of the report. I will discuss and build a comparative study in the result section which belongs to chapter 5.

Table 3.2.1 Distribution of training dataset

Name of the class	Collected Data (cd)	Generated Data (gd)	Applied Augmentation Type	Total Data per Class (cd + gd)
Papa Meilland	262	1310	5	1572
Iceberg	292	1460	5	1752
Kings Ransom	313	1565	5	1878
Queen Elizabeth	372	1860	5	2232
Bengali	312	1560	5	1872

Table 3.2.2 Distribution of testing dataset

Name of the class	Collected Data (cd)	Generated Data (gd)	Applied Augmentation Type	Total Data per Class (cd + gd)
Papa Meilland	66	66	1	132
Iceberg	73	73	1	146
Kings Ransom	78	78	1	156
Queen Elizabeth	93	93	1	186
Bengali	78	78	1	156

I have used 80% of total collected data as training dataset and rest of the 20% of the total data is taken for testing dataset. I have used augmentation. I have used five image generation

technique for training data processing and only one image generation technique for testing data. As I have collected different number of images for each breed so the total data is different for each breed.

3.2.1 Image Augmentation

I have used image augmentation on my training dataset to reduce overfitting issue. I also used it for maximum accuracy in prediction and for overfitting of data. I have used rescale, horizontal flip, vertical flip, shear and zooming methods to augment my data. I have applied these methods on my training dataset.

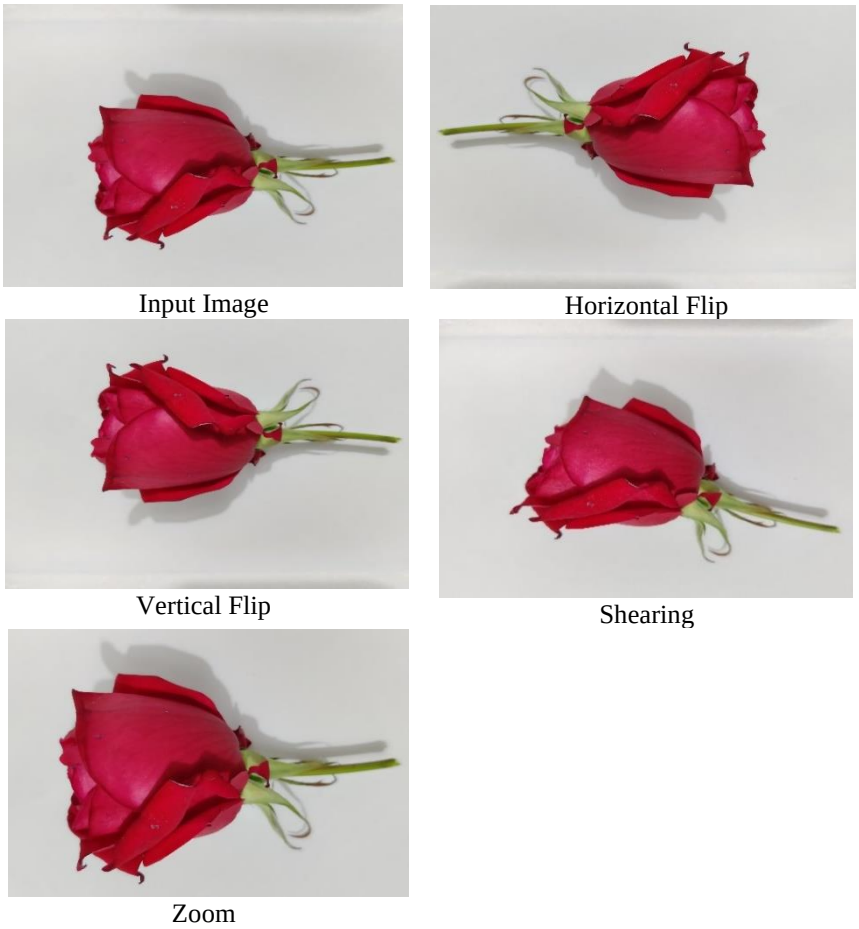

Figure 3.2.1.0 Images after augmentation

3.3 Proposed System

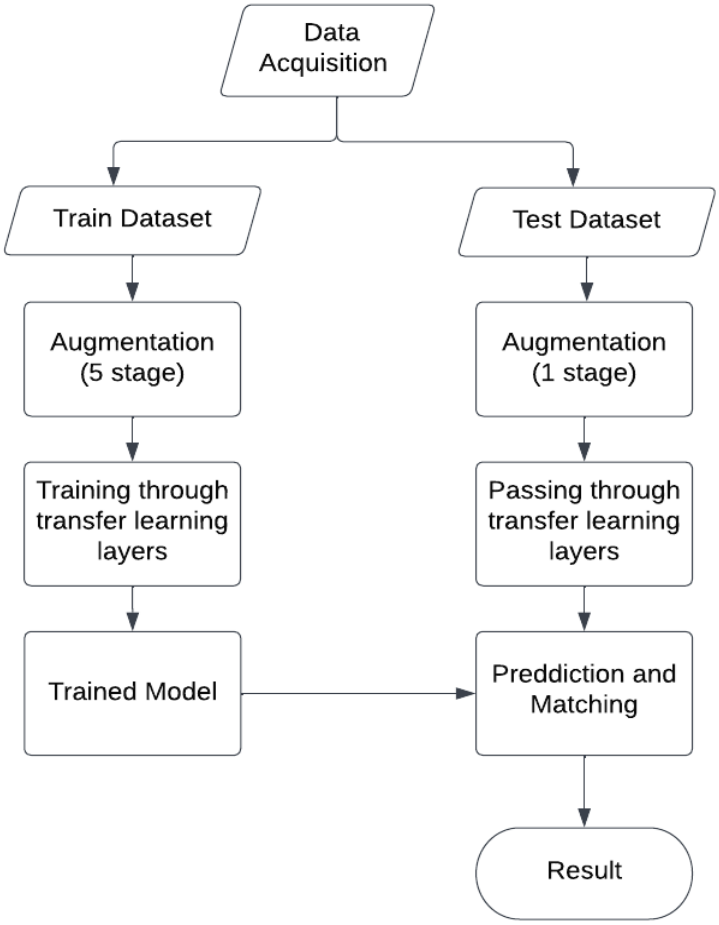

Figure 3.3.1 Proposed System Diagram

This is the system that I have proposed for my project. At first, I have divided my dataset into two parts, one for training and another one for testing. Then, by using 5 and 1 step respectively, I augment both training and testing dataset. Then, after processing my training dataset in transfer learning model layers, I verified the result by passing the testing dataset throughout the layers. Finally, my trained model has been built and now I can verify the outcome by using this model.

3.4 Implementation Requirements

To train my model, I have used a total number of 1550 images of five classes and to test my model I have used a total number of 387 images in my research. I have compared the confusion matrix of different algorithms to evaluate the accuracy. In my project, I have used four models. These are Inception V3, Xception, ResNet50 and VGG16. These are the most popular and used models in image identification and classification.

To get a comprehensive knowledge, I have researched and compared the outcome of each transfer learning models. For each model, I have tried 20 epochs.

3.4.1 Inception V3

Inception V3 is one of the prominent deep learning models based on the Convolutional Nural Network (CNN). From the previous model, which was Inception V1 & V2 of the same category, the latest version of inception – V3 has higher efficiency, is comparatively less expensive in terms of computation, and uses auxiliary Classifiers as regularizes. In addition, it has 42 layers and a lower error rate.

3.4.2 ResNet50

ResNet50 is a sub-model or a variant of the ResNet model, which contains 48-50 Convolution layers with 1 MaxPool and 1 Average Pool layer. It has one significant difference from the other variants like ResNet-34 and ResNet-101, which reduces the training time; it used a stack of 3 layers rather than 2. It ensures more accurate results in lesser time.

3.4.3 Xception

Xception stands for extreme inception. It is even better than inception v3. It is the reverse process of the inception; it first applies the filters on each depth map and then finally compresses the input space using 1x1 convolution by applying it across the depth. There difference between Inception and Xception, The presence or absence of a non-linearity after

the first operation. In the Inception model, both operations are followed by a ReLU non-linearity. However, Xception does not introduce any non-linearity.

3.4.4 VGG16

VGG16 is a simple and extensively used Convolutional Neural Network (CNN) model used for ImageNet, a large database project used in visual object recognition software research, organized according to the WorldNet hierarchy. The model achieves 92.7% top5 test accuracy in ImageNet, a dataset of over 14 million images belonging to 1000 classes. So, we can say that it is one of the most exemplary architectures for visual recognition.

The architecture of VGG16:

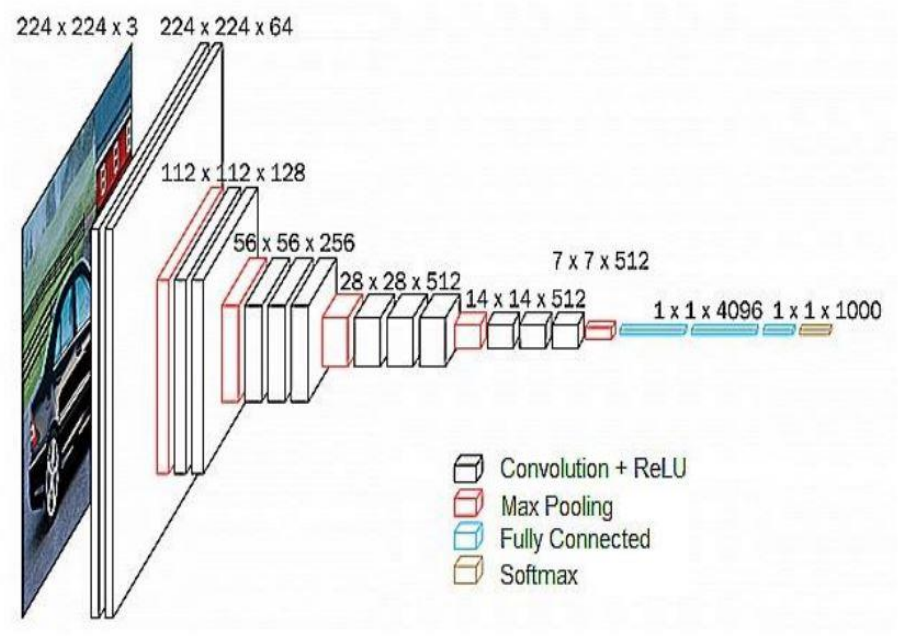

Figure 3.4.4.0 VGG16 Architecture

VGG16 has 16 layers, the input to cov1 layer is 224 x 224 RGB image, and its size is fixed. The convenient thing about VGG16 is that instead of having a large number of hyper-parameters, they focused on having convolution layers of a 3x3 filter with a stride one and always used the same padding and max pool layer of 2x2 filter of stride 2. It consistently follows this arrangement of convolution and max pool layers throughout the whole system. At last, it has two fully connected layers followed by a softmax for output. This model takes too much time to train, and it is a large network with about 138 million parameters.

CHAPTER 4

Experimental Results and Discussion

4.1 Experimental Results

I have applied four deep learning techniques to find out the best result to identify the rose breed in a successful manner. Accuracy and loss curves for all the four models are as follows:

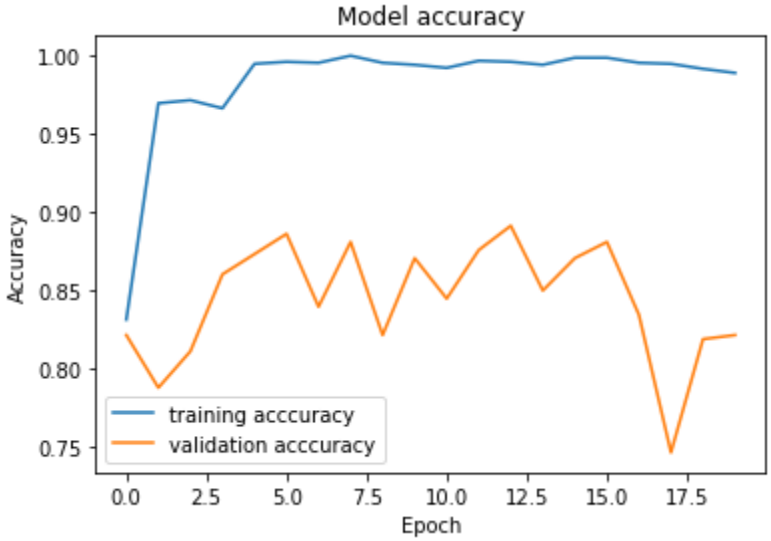

Figure 4.1.1: Model Accuracy for Inception V3

Figure 4.1.2: Model Loss for Inception V3

Figure 4.1.1 and Figure 4.1.2 show the accuracy and loss curves for the Inception V3 model. According to the accuracy curve it shows that accuracy increased with the increase of the number of epochs. At the beginning of the period the accuracy was just above 80% whereas at the end of the period the accuracy became 82.17%. In this model the model loss is 82.14%.

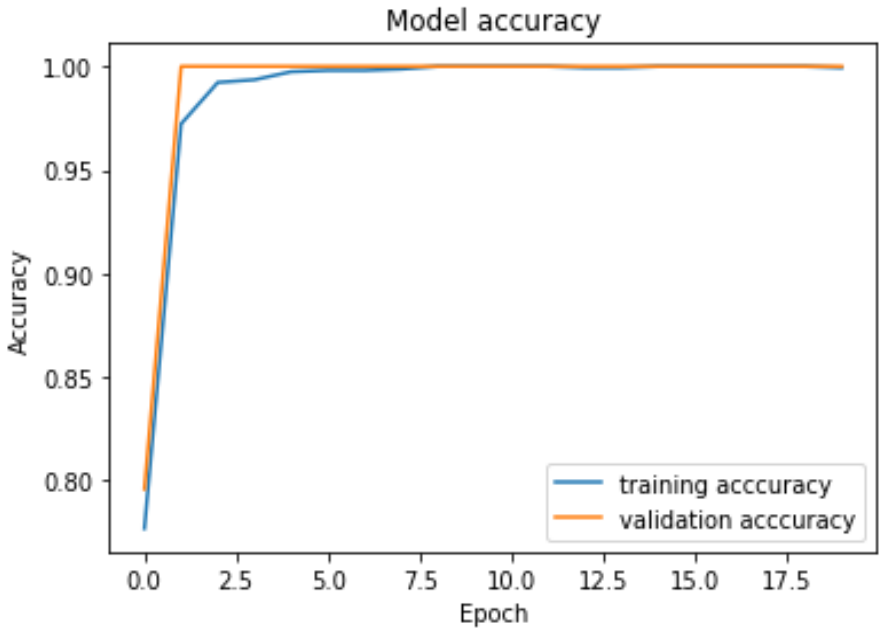

Figure 4.1.3: Model Accuracy for VGG16

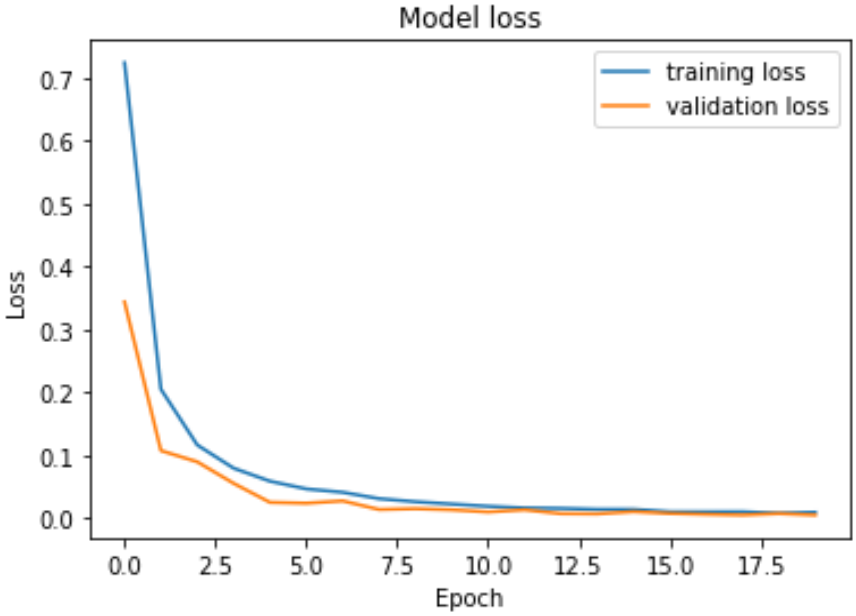

Figure 4.1.4: Model Loss for VGG16

Figure 4.1.3 and Figure 4.1.4 show the accuracy and loss curves for the VGG16 model. This is the best performed model in my experiment. According to the accuracy curve it shows that accuracy increased with the increase of the number of epochs. At the beginning of the period the accuracy was 98.94% whereas at the end of the period the accuracy became 99%. In this model the model loss is 0.55%.

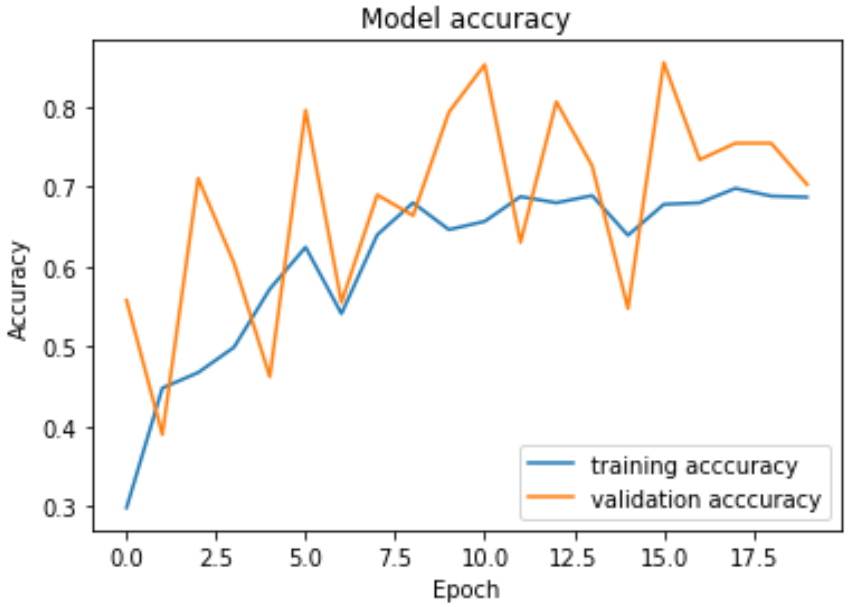

Figure 4.1.5: Model Accuracy for RESNET 50

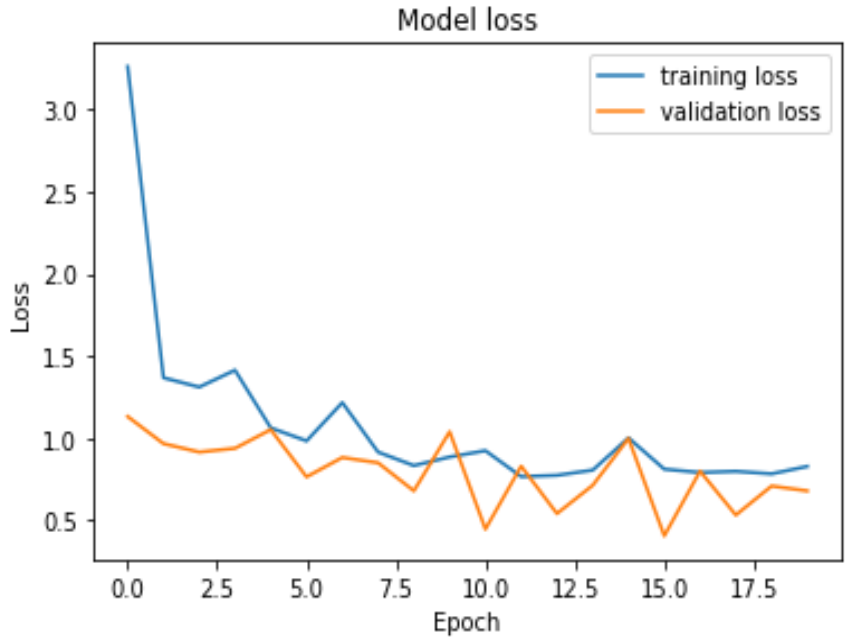

Figure 4.1.6: Model Loss for RESNET 50

Figure 4.1.5 and Figure 4.1.6 shows the accuracy and loss curves for the RESNET 50 model. According to the accuracy curve it shows that accuracy increased with the increase of the number of epochs. At the beginning of the period the accuracy was just above 68% whereas at the end of the period the accuracy became 70%. In this model the model loss is 68%.

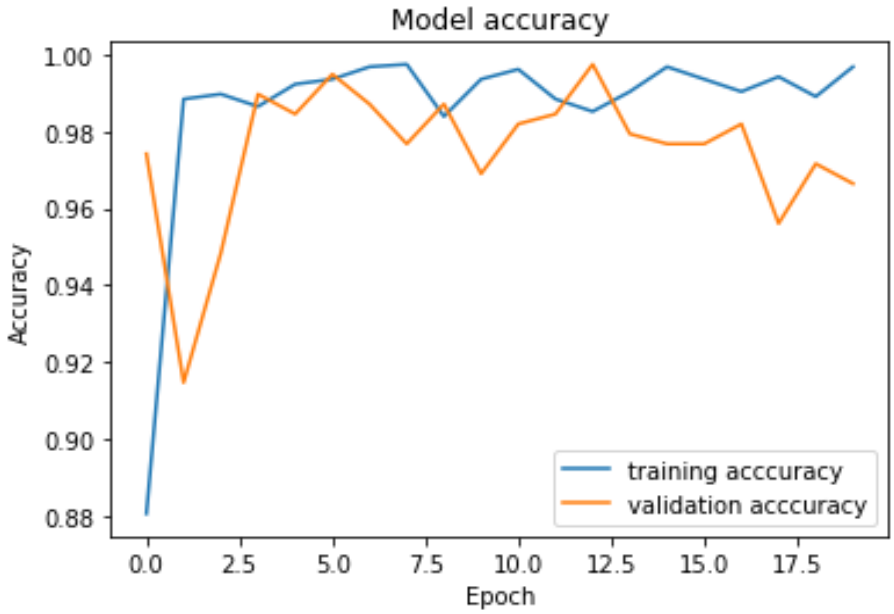

Figure 4.1.7: Model Accuracy for Xception

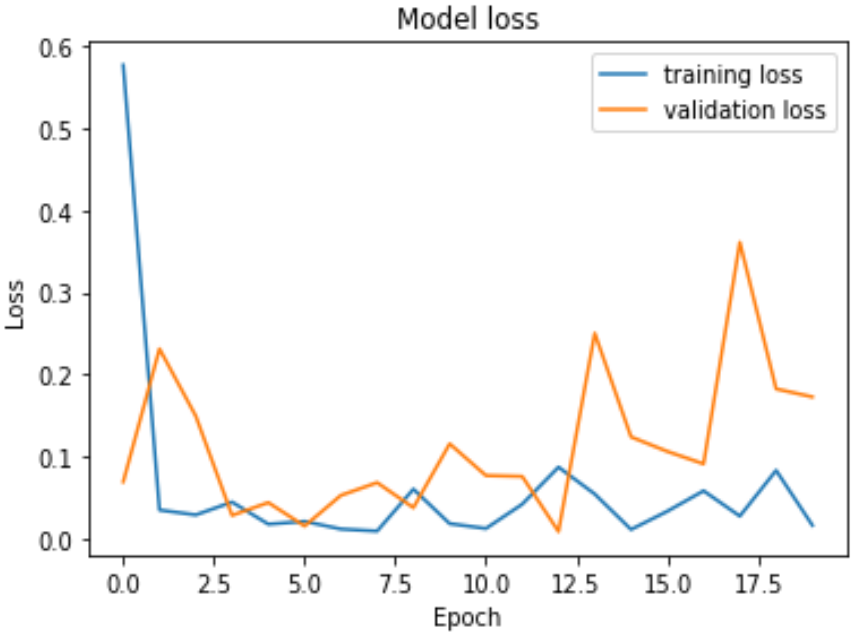

Figure 4.1.8: Model Loss for Xception

Figure 4.1.7 and Figure 4.1.8 show the accuracy and loss curves for the Xception model. The accuracy that I have found by applying this model is 96.64% and the model loss is 17.28%.

4.2 Performance Evaluation

To evaluate the performance of the models I have used confusion matrix. As there are a total five classes in my dataset, I have used 5x5 matrix to calculate,

- True Positive (TP): Correctly Detected the breed.
- True Negative (TN): Correctly discarded the breed.
- False Positive (FP): Erroneously Detected the breed.
- False Negative (FN): Erroneously discarded the breed.

Figure 4.2.1, Figure 4.2.2, Figure 4.2.3, and Figure 4.2.4 show the confusion matrix for the Inception V3, VGG16, Resnet 50, and Xception models respectively.

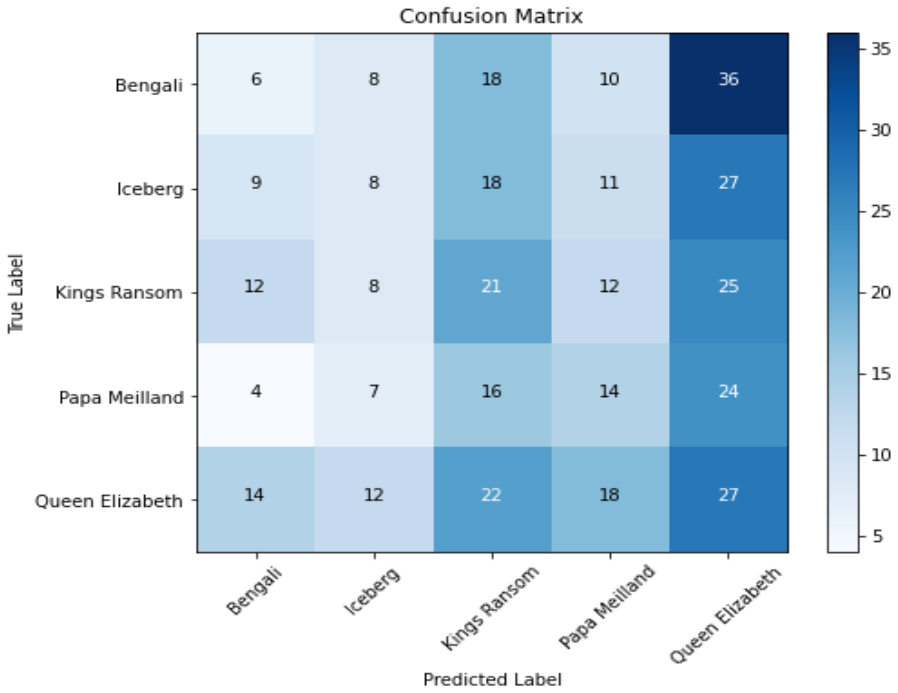

Figure 4.2.1: Confusion matrix for Inception V3

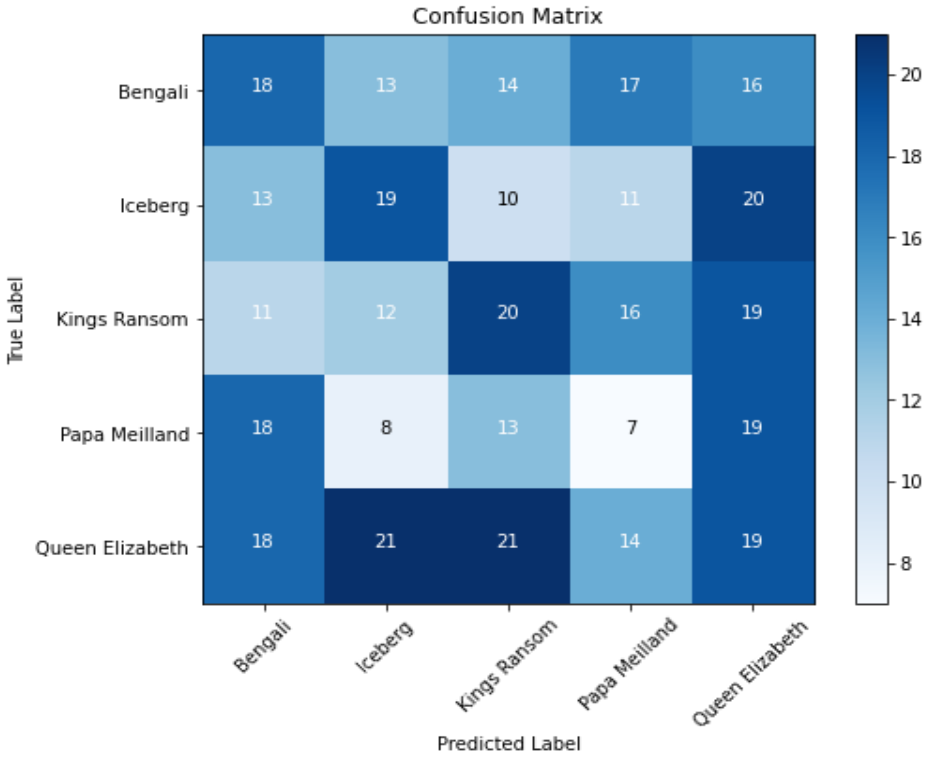

Figure 4.2.2: Confusion matrix for VGG16

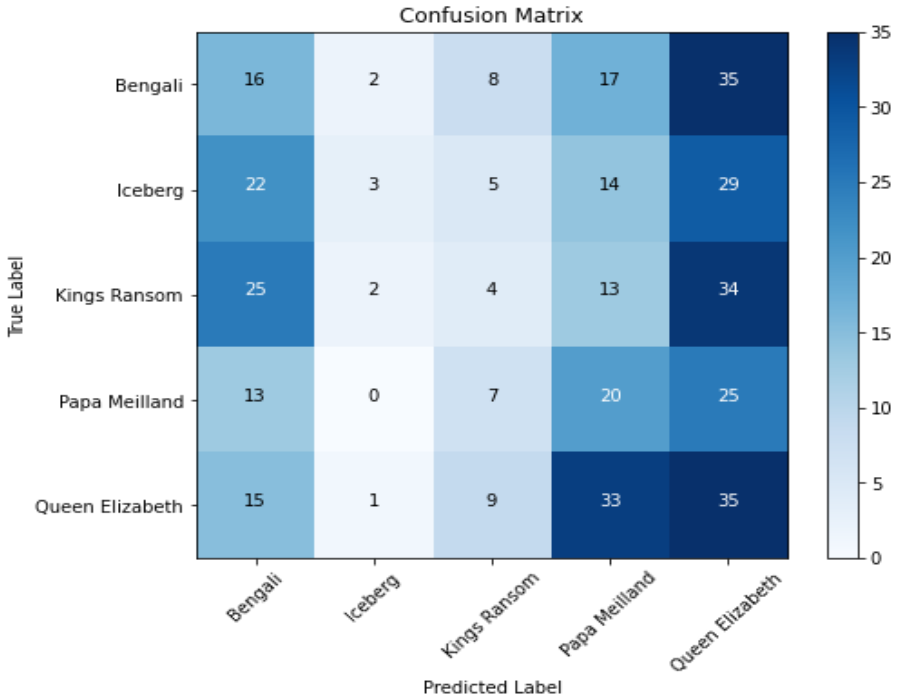

Figure 4.2.3: Confusion matrix for Resnet 50

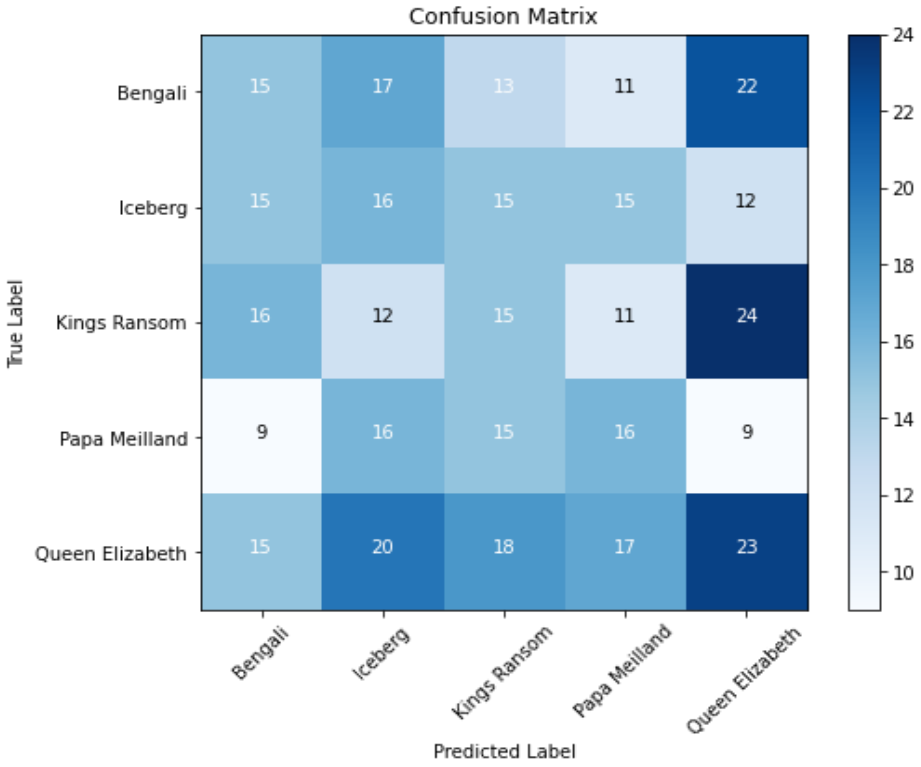

Figure 4.2.4: Confusion matrix for Xception

Table 4.2.1 shows the accuracy and loss comparison for all the four models that I have applied.

Table 4.2.1: Accuracy and loss comparison of the Transfer Learning Models

Model Name	Training Accuracy	Training Loss	Test Accuracy	Test Loss
Inception V3	98.90%	3.28%	82.17%	82.14%
VGG16	98.94%	0.98%	99%	0.55%
ResNet50	68.71%	82.97%	70.28%	68.08%
Xception	99.68%	1.63%	96.64%	17.28%

According to the Table 4.2.1 it is showed that VGG16 outperformed in terms of accuracy. This model shows the highest accuracy among the other three models. Figure 4.2.5, Figure 4.2.6, Figure 4.2.7, and Figure 4.2.8 shows the ROC curves for the Inception V3, VGG16, Resnet 50, and Xception models respectively.

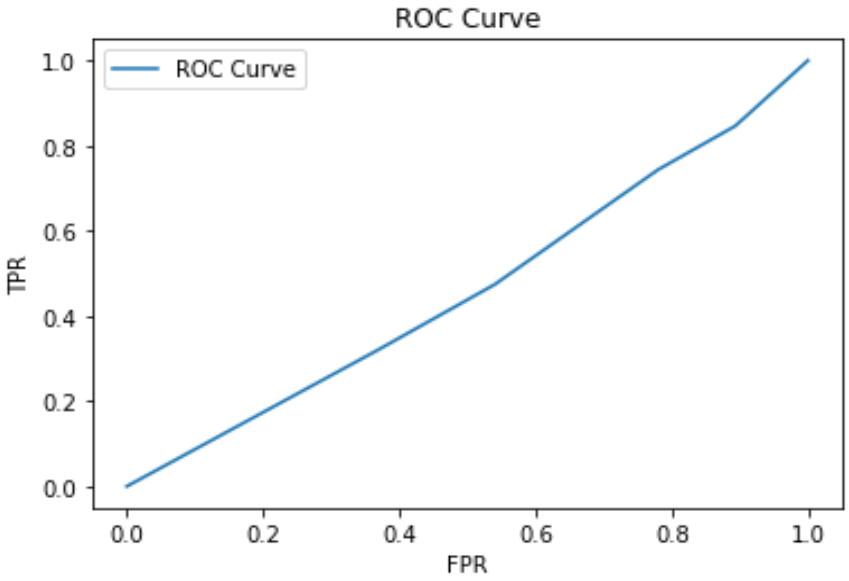

Figure 4.2.5: ROC curve for Inception V3

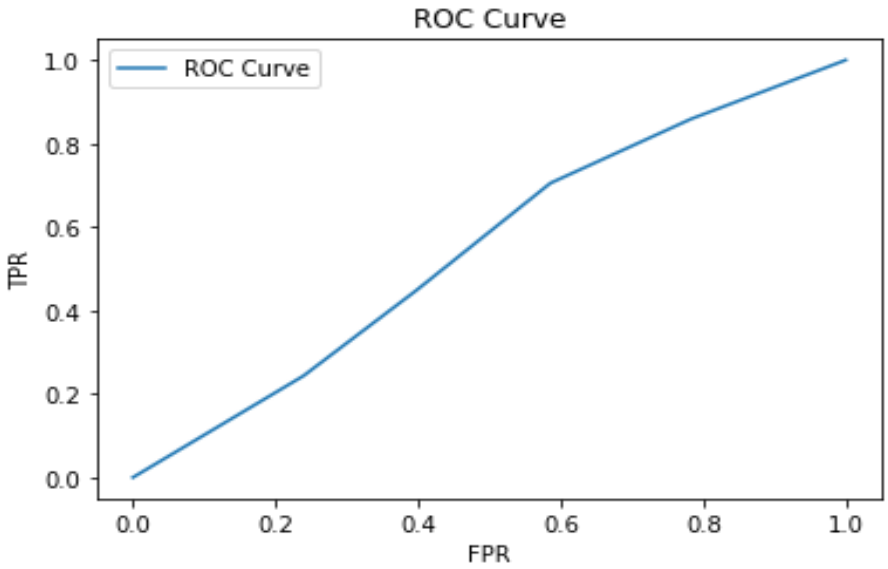

Figure 4.2.6: ROC curve for VGG 16

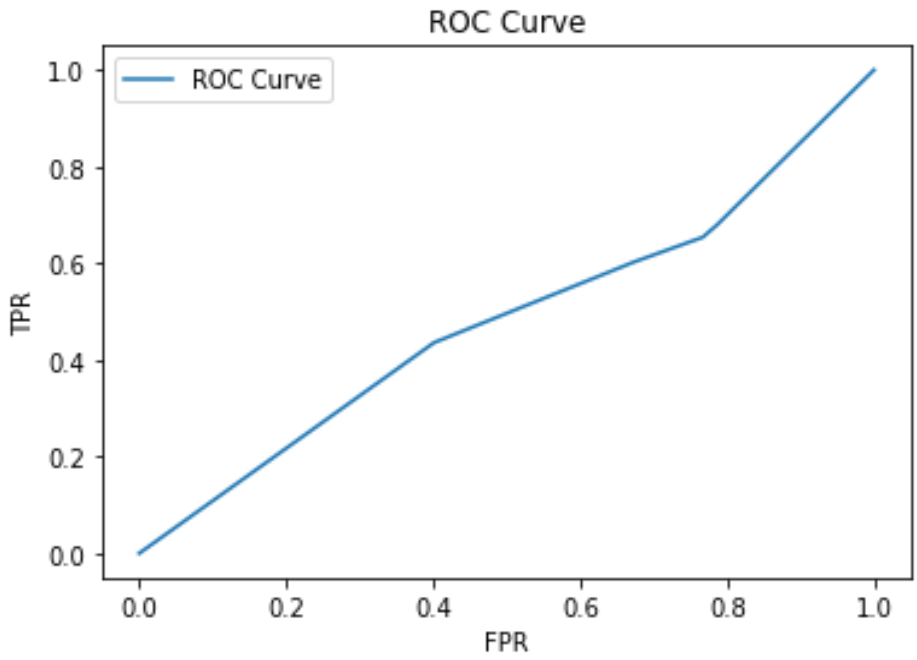

Figure 4.2.7: ROC curve for Resnet 50

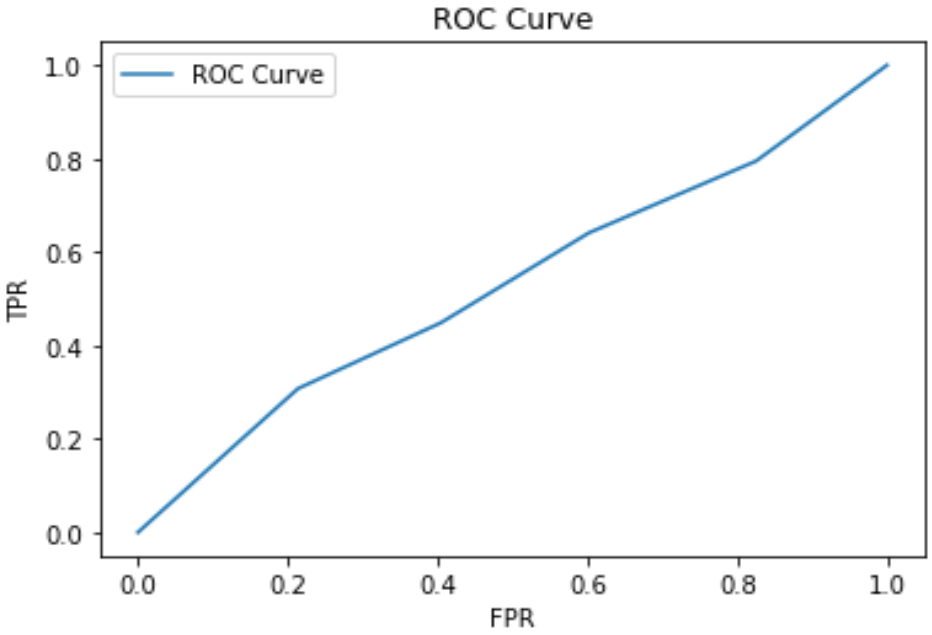

Figure 4.2.8: ROC curve for Xception

CHAPTER 5

Impact on Society, Environment and Sustainability

5.1 Impact on Society

Flowers are very important for the society. Among all flowers roses are the most accepted and desirable flower in the society. Rose breed detection can play a significant role in the society. Flower cultivation and business are the main source of earning for many people. People who are growing flowers are not capable to take right decision while cultivating flowers. Rose breed detection can help them out. By detecting breeds name and knowing the process of cultivating them, they will be able to cultivate and take care of them in an appropriate way. Flower business is growing widely day by day. Flower business is incomplete without roses. Rose breed detection will be very financially beneficial for businessmen. They will get to know about the breeds and also, they will get the idea about different breeds. Roses are famous throughout the world. Rose breed detection will extent the flower business all over the world and which will have great impact on social economy. Rose breed detection can bring world remittance and besides the farmers and businessmen, our social economy will be benefited.

People who love gardening, they will be benefited too. They will have some ideas about breeds and their cultivating process so that their gardening interest won't be faded. They will be able to keep their rose plants safe for a long time. This how our society will have more garden and greenery which will be very refreshing and eyes soothing. Rose cultivation will increase day by day and we will get more products like rose water, perfumes, rose oil, rose jam etc. which will have an essential impact on industrial business.

5.2 Impact on Environment

In Bangladesh, Farmers are not that much educated about the usage of chemical fertilizer. They use lots of amounts of fertilizer for flower cultivation, which has a negative impact on the environment. Using a huge amount of fertilizer is very harmful for the environment and a harmful environment harms the animals, human and insects. These chemical fertilizers cause water

pollution, air pollution and also soil pollution. These environmental pollutions are very dangerous for human, animals and insects. Rose breed detection will be very helpful to reduce these environmental pollutions. By detecting breeds and knowing the proper cultivation process farmers will use an appropriate amount of fertilizer which is required. Apart from this, breed detection will increase rose cultivation, which will have a positive impact on the environment.

5.3 Sustainability Plan

In Bangladesh, floriculture is increasing day by day. Poor farmers are getting opportunities through floriculture. They are cultivating flowers and earning for their livelihood. Floriculture is incomplete without rose cultivation. Rose breed detection will be very effective in flower business. Roses are the most popular and usable flower throughout the world. Rose breed detection will increase flower business and also will be very beneficial for businessmen and farmers. It will bring foreign remittance which will have a great impact on the economy and industrial business of our country. Rose breed detection will extend the floriculture which will have a positive impact on the society. Some unemployed people will be able to work which will be very profitable for our social economy. Rose breed detection will be a solution of environmental pollution issues. It will play a vital role not only by decreasing pollution but also by giving a refreshing and positivity to the environment.

CHAPTER 6

Conclusion and Future Work

6.1 Summary and Conclusion

In this project, to detect breeds I have approached and analysis about a remarkable method based on transfer learning. In addition, I have built a dataset of 19,39 images of five different breeds of rose. I have used most popular four Transfer Learning methods, which are Inception V3, VGG16, ResNet 50 and Xception. In these four techniques, the outcome of VGG16 is outstanding, which obtained the excellent accuracy of 99%.

6.2 Future Work

In future, I would like to develop a system using transfer learning techniques. Besides detecting the breeds of rose, it will give the facts about a specific breed. Also, this developed system will show the accurate ways of cultivation and maintenance of the breed.

The working process of the system will be very simple. After capturing a photo of a flower, users will upload it. Then, system will receive the picture and will process on it. Then, to compare the pictures with the breeds of stored dataset, it will interpret the input picture. If it detects that input data is closely matched with any of the breed in the database, it will show an outcome with the name of the breed of the rose and description of the that particular breed and also will give some standard cultivating and maintaining techniques of that breed.

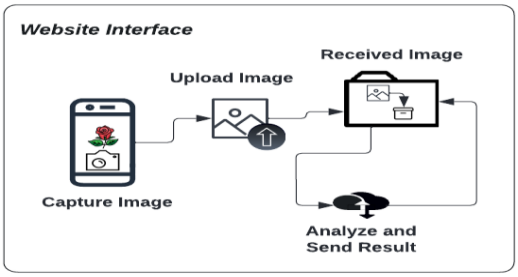

Figure 6.2.1 Presented web-based architecture for user

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