NATIONAL FLAG RECOGNITION USING CNN

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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 thesis title **"NATIONAL FLAG RECOGNITION USING CNN**", submitted by Sazzad Mahamd and Salma Siddika and Nusrat Sony to the Department of Computer Science and Engineering of 'Daffodil International University' has been recognized as acceptable for the partial fulfillment of the requirement for the degree of B.Sc. in Computer Science and Engineering and permitted as to its stylishness and content. The presentation will be held on 9 December 2018.

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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Md. Tarek Habib, Assistant Professor, 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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This thesis titled **"NATIONAL FLAG RECOGNITION USING CNN**", submitted by Sazzad Mahamd, Salma Siddika, and Nusrat jahan Sony 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 (BSc) and approved as to its style and contents. The presentation has been held on **9 December 2018**.

First, we express our heartiest thanks and gratefulness to almighty God for His divine blessing makes us possible to complete the final year project/internship successfully.

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ABSTRACT

This thesis is on "**NATIONAL FLAG RECOGNITION OF USING CNN**". Present work suggests a procedure for recognition of national flags for the countries of SAARC for their digital image. Arithmetical structures take out from the color stations that are joint together to create the feature vector for discernment among the national flag.

For low accuracy, time consuming, and very slow performance we use CNN classification to recognized national flag of all countries of world. Albeit advances and vivid application of Artificial Intelligence and Computer Vision in different national flags of all countries of whole world there contains low effort in the application of computer vision recognition. With a goal to successfully applying computer vision techniques to predict a country name based on national flag image. This paper describes a novel Deep leaning based approach for recognizing national flag. we have used inception v3 and achieved an average of 96.6% accuracy rate which is the best of all previous.in Our data set, here we use 4000 images to test the performance of our classifier.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

A national flag is an ensign that represent a country. A national flag is the sign of independence, integrity, solidarity, sovereignty. a natonal flag is considered with exact connotation for its color and symbol. we are visualizing different type of flag. Such as (a)flying, (b)institution, (c)hand, (d)hanging flag, (e)roof flag. Also, there are three separate types of national flag aimed at use of 'land'. for usage at ocean through many countries use undistinguishable design for numerous of this type of national flag. In land-living here is different between civil flag, state flag, and war or military flag. Actual few nations use war-flag to make different from state-flag. At ocean the flag shows the nationality on vessel is named ensign. some protocol involves in the proper display of national flag. There is general rule that is the national flag should be flown in the position of honor. All the national flag is rectangular without the flag of Nepal. The maximum prevalent colors in national-flag are bloodshot. White, green, blue, yellow, light-blue, black, to the progress of computer knowledge like digital image processing one can discover the technique of instinctive national-flag recognition by a computer, this technique is mostly created on the distance, language, culture, in a word vary from country to country. Also, the other geographies of the national-flag to calculate the comparation among the flag of countries of world. Our classification technique is fully non-natural. the assignment is huge, and we badly need the expert operates who have a wealth of professional knowledge and practice to guide.

1.2 Motivation

Digital image processing deals with digital image through a computer. In this system signal particularly focus on image. The input of the system is digital image and the system process the image using CNN algorithm. we know that people can know everything through google. People can search google as name of the country and they can easily find the image of national flag. But there is no identifier about the national of the world.

1.3 Problem Statement

We know that our national flag recognition will help us to find the national flag of all countries of the world. But there are some problems of our young generation. Now a day's young generation is so lazy and unconscious. They want to stay online but they do not want to know about the nationality and national flag. So, we make national flag recognition. So, we take decision to make national flag recognition also which describe the nationality. For all these reason, young people can save their valuable time without browsing, they know about the name of the national flag of all countries of world.

1.4 Project Objective

Providing a right direction or way and also getting true information for doing the work properly.

- By providing the national flag image people can know the name of the country.
- It is very user-friendly classifier so that user can use and handle the recognition model very easily.
- The model won't be getting down any time.
- Saving their time from unnecessary browsing.
- Saving the valuable time and easily getting the proper direction, way and information.
- Basically, it helps those people like as Europe or America who do not know the all SAARC country. Not only the name of county they will know about the nationality of those country people.
- People will easily understand the algorithm of this classifier

1.5 Scope of the Project

- The best scope of the project is that we make a model of image processing where the people of all country of world can easily find the name of the country through image of national flag.
- Collecting data and information through google image.
- Also collecting data of all countries national flag image, we try to make an identifier like android application.
- In near future we will take around 40000 images of all countries of world and try to increase accuracy rate.
- Establishing new data and information, if we see any type of the change in our image processing algorithm of inception v3 using CNN.
- Try to increase our accuracy rate. And we will try to increase our data set.
- In near future we will take image of all countries of world and our classifier will sing the song of national flag of belonging country.

CHAPTER 2

2.1 Introduction

As we have stated keeping it in our mind that it will good for south Asian association for regional country people, we have decided to build a model of image processing through CNN. Using inception v3 algorithm we train and test data sate. we find 96.6% accuracy. Till now our accuracy is the best. Some people try to make a national flag recognition using support vector machine (SVM).

We follow their SVM model, there accuracy rate is under 88%. Also, basically we want to make the best accuracy rate. Hope fully we became success

2.2 Related Work

When we make a decision that we will make digital image processing classifier our final year project then we search in Google. We found that some there is no thesis as like as ours. Only in google there is a flag identifier. But after our decision one publish national flag recognition using SVM. But their accuracy rate is low. Main difference between with them is we take the image of all countries of the world. We use CNN classification using inception V3. we use here python. And our main diffidence is our accuracy rate. Our accuracy rate is 96.6%.

2.3 Country Name By Using Image

By using our implementation, we make such type of classifier. Where we insert the image of national flag of all countries of world and our classifier say the name of which country it is.

Figure 2.3: A Screen sort of some country national flag

In Figure 2.3, we take a screenshot of some country national flag.

2.4 Our Project Work

Here, we used the TensorFlow knowledge method to retrain the “Inception-v3 [8]” model of Tensor Flow [1] on for the dataset of 195 countries [Bangladesh, India, Pakistan, Nepal, Bhutan, Maldives, Sri Lanka, Afghanistan, and so one like all countries of world]. we satisfied as a well-organized national- flag identity model by using short training time and obtain a sophisticated correctness. The paper is organized in that way is, Details Convolutional Neural Network (CNN), and Incptionv3 model. This typical is conversed in Section II. the compare with other paper is discussed in the Section III. Dataset gathering and tanning are discussed in Section IV. Performance examination is completed in Section V. At last, consolation and some future effort possibilities is described in Section VI and Section VII.

2.5 Comparative Studies

These image classifiers have some problems, drawbacks and limitations. Most of the countries of the world is included. But here is some limitation we will add the language. User can find the all countries through this classifier. It is very help full for non-SAARC countries people, also with our research work here is some lacking, also we should build up national flag identifier. but we are hopeful that instead of having some lacking there is accurate result of our classification. But in our image processing algorithm we use we use the Inception-v3 [8] model of Tensor Flow [1]. In google if we search then we will see that there is a classifier but there is a lot of lacking. But it is true that there are all countries of the world. One makes an SVM image classifier of national flag. But accuracy rate is 88%. So, we are very confident that our classifier is so accurate.

2.6 Challenges

When any research or thesis anyone want to publish always, he or she is al to face some different types of challenges, and obstacles. As like this situation, our thesis has some different types of challenges, and obstacles too. Our thesis is about social helping types of thesis by providing information. But now-a-days all of us addicted with Facebook, What's App, Viber, Imo, Instagram, Snap-chat and many other social media applications. So, it is quite hard to reach Asian country people.

Main challenge of our thesis is making our accuracy 100%. But it is not possible for us. Another is challenge is we want to increase our data set. now in our data set there are 4000 images. In future we take 4000 images of national flag of all countries of the world. So, it our main challenge to increase accuracy rate. Now for completing our mission, all those things might be challenging for us.

CHAPTER 3

Requirement Specification

3.1. Our classifier accuracy

```
F:\other\shawon>python -m scripts.label_image --graph=tf_files/retrained_graph.pb
--image=b.jpg
2018-11-13 18:58:04.406186: I C:\tf_jenkins\home\workspace\rel-win\M\windows\PY\36
\tensorflow\core\platform\cpu_feature_guard.cc:137] Your CPU supports instructions
 that this TensorFlow binary was not compiled to use: AVX AVX2
2018-11-13 18:58:06.345958: W C:\tf_jenkins\home\workspace\rel-win\M\windows\PY\36
\tensorflow\core\framework\op_def_util.cc:334] Op BatchNormWithGlobalNormalization
 is deprecated. It will cease to work in GraphDef version 9. Use tf.nn.batch_norma
lization().

Evaluation time (1-image): 2.964s

bangladesh 0.957018
nepal 0.0172365
pakisthan 0.0142645
afghanstan 0.00475804
srilanka 0.00268217
```

Figure 3.11: screen shot of accuracy rate.

```
F:\other\shawon>python -m scripts.label_image --graph=tf_files/retrained_graph.pb
--image=in.PNG
2018-11-13 18:58:25.192752: I C:\tf_jenkins\home\workspace\rel-win\M\windows\PY\36
\tensorflow\core\platform\cpu_feature_guard.cc:137] Your CPU supports instructions
 that this TensorFlow binary was not compiled to use: AVX AVX2
2018-11-13 18:58:27.550810: W C:\tf_jenkins\home\workspace\rel-win\M\windows\PY\36
\tensorflow\core\framework\op_def_util.cc:334] Op BatchNormWithGlobalNormalization
 is deprecated. It will cease to work in GraphDef version 9. Use tf.nn.batch_norma
lization().

Evaluation time (1-image): 3.755s

india 0.991156
afghanstan 0.00281145
pakisthan 0.00223329
bangladesh 0.00165379
srilanka 0.000867387
```

Figure 3.1.2: screen shot of accuracy rate.

In the figure 3.1.1and 3.1.2, we take as input image as Bangladesh and our accuracy shows 95%. and in figure 3.1.2 we take as input image is India and our accuracy rate shown 98%.

3.2 Classifier Model

Basically, when we do anything like project then we can use water fall model. But our work is artificial intelligence, image processing. So, it is not like a project. But we can say that our classifier is like project. Here we take 4800 image of national flag and our model or classifier gives us output. For this purpose, we use a model like that,

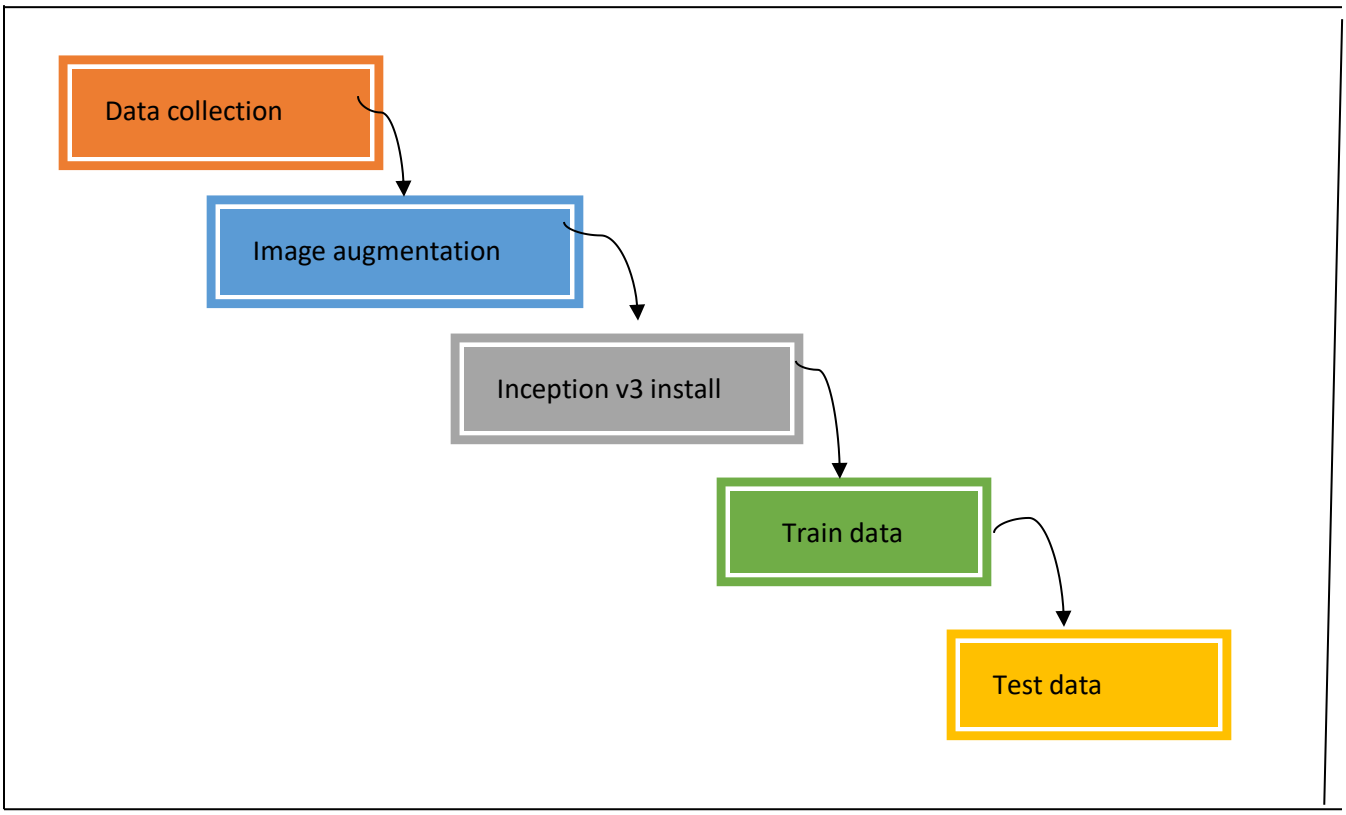

Figure 3.2: classifier model.

In figure 3.2 here we see the model of our classifier. In our inception v3 of TensorFlow we use in this model. First, we collect data, then augment the image then install inception v3 then train dataset then test dataset.

3.3 Requirement Collection and Analysis

Supplies analysis is also called as requirement engineering. That is the method of influential public imagine movements for a new classifier. This requirement, must be quantifiable, relevant and detailed. Requirements analysis includes frequent message with system user to control exact feature like prospects, resolve if conflict or ambiguity in requirements as demanded by numerous operators of user aviodance of feature sneak and certification of all aspect of the thesis progress procedure after start to national-flag. For the thesis improvement process, we find basically two types of requirement. Among them first one is the functional requirement and second one is the non-functional, requirement.

3.4 Functional Requirement

Functional necessities are those which are related to the technical functionality of the image classifier. At the point of view of our classifier, the classifier has numerous useful requirements as like maintaining data set like installing inception v3. Also augment the data set.

3.5 Non-functional Requirement

Non-functional requirement is an obligation which specifies standards that can be used to justice the operation of a system in particular circumstances, rather than exact activities as like as the application is how much effective, user-friendly, performance issue of the application etc. at the point of view of our system, the request takes numerous functional requirements as more as efficient, relevant, optimize performance, memory-consuming, flatter operation. Loading on quickly and parsing information from available as soon as likely. Request's User-interface is also so user friendly and beautiful for outstanding user experience.

CHAPTER 4

4.1 Background study

This experiment is based on the inceptionv3 [8] of models of Tensor Flow [1] stage and too used CNN [2]. Tensor Flow [1] is another generation machine learning system has got abundant interesting and representation in the field of artificial intelligence in all over the world. Tensor Flow [1] has classified primary in all aspect of deep learning and machine learning programs so far-off. Tensor Flow [1] has the benefits of high suitability and high facility and with the help of Tensor Flow scholars, ability of Tensor Flow is developed. Now a days, Google has opened number of trained models on the Tensor Flow's authorized website, to simplify the use of investigators in different sectors. Inceptionv3 [8] is one of the trained models on the Tensor Flow [1]. It is a reconsidering for the primary construction of computer apparition afterward Inceptionv1 [9], inception-v2 [9] in 2015. The Inception-v3 [8] model train on the image dataset, holding the evidence that can classify 1000 classes in Imagenet Inception-v3 [8] contains of two parts, Feature removal part with a convolutional neural network (CNN) and classification part with connected and softback layer [10]. Convolutional Neural Network (CNN) are a kind of Neural Network which have vindicated very effectively in that areas like as image classification and recognition. Nunnery's have been effective in classifying substances, expressions, and traffic. Typically,

three main types of layers are used to build Convent architectures:

Convolutional Layer,

Pooling Layer

and Fully-Connected Layer.

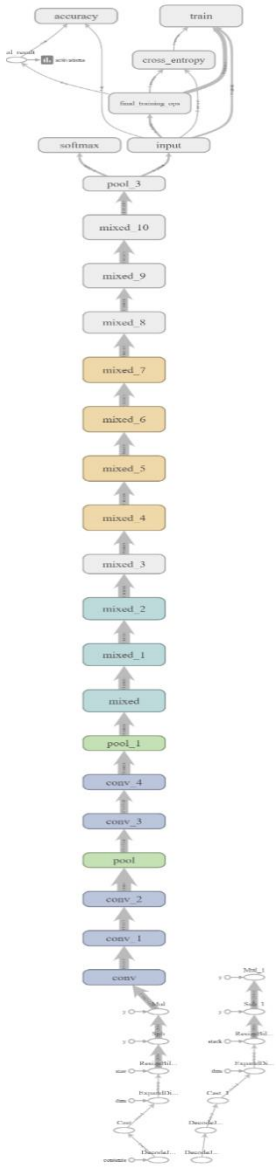

Figure: 4.1Main graph of Inception v3 model

4.2 Structure of convolutional neural network

A simplified picture of inceptinv3 model [2] is exposed in figure 1. Inceptionv3 [3] network model is a neural network. It is too difficult for us to train it straight with a little organized computer it may takes at least few days to train them. Tensor flow [1] delivers a lecture for us to reeducate Inception's final Layer for new groups using transfer learning. we use the transfer learning method that keep the parameter of the previous layer also remove that last layer of the Inception-v3 [2] model, then retrain a last layer. the number of output odes in the last layer is equivalent to the number of groups in the dataset.

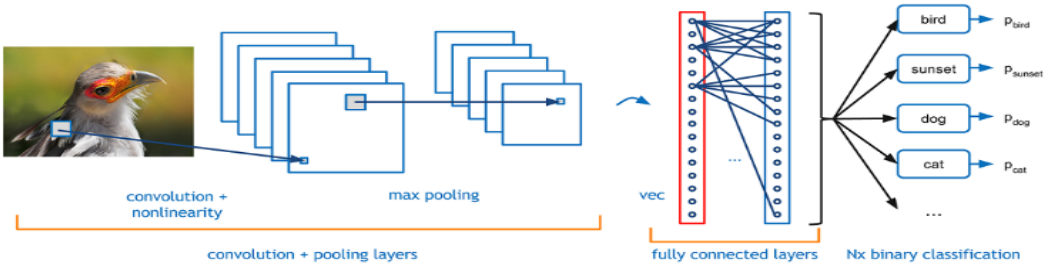

Figure 4.2 Structure of Convolutional Neural Network.

4.3 Methodology

In methodology section, the next part is as follows, at first, we make a chart [12] of our experiment, after that, we deliver a simple summary on the dataset, again we give about the data prepossing, then, we discuss about the model installation, finally, we introduce about the train model.

the chart [12] is a kind of drawing which represent workflow or a process. in flowchart [12] displays the steps of boxes, and their order by connecting the boxes with arrows. Flowcharts [12] are used in examining, scheming or managing a process.

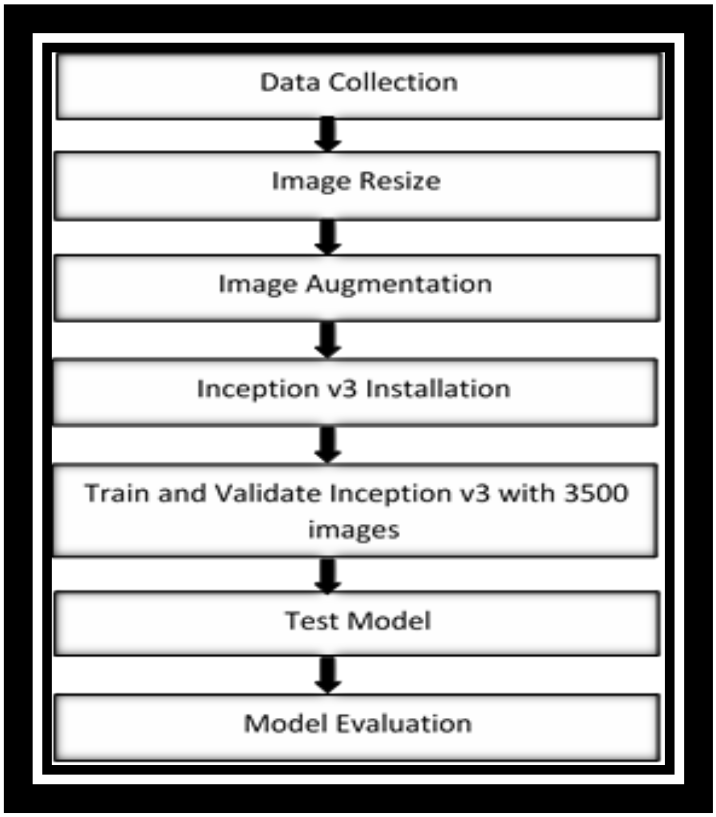

Figure 4. 3 Flowchart of the system model.

Implementation Requirements

4.4 Model installation

This research is created on the Inception-v3 [3] model of TensorFlow [1] platform. The processor is 2GHz intel i3, momory 4GB 1600MHz DDR3, System type: 64-bit Operating system, x-64 based processor.

At first, we have to download TensorFlow [1]. After that we have downloaded inceptionv3 [8] model. We have also used the transfer learning method which keeps the parameter of the previous layer, and we have uninvolved the final layer of the Inception-v3 [8] model, finally we retrain the final layer.

4.5 Dataset

There are many countries in this world and also many national flags. There is a similarity in the appearance of the image of national. For recognizing national flag, we have collected 4800 images of officially recognized countries of the world for our experiment. They are (Bangladesh, India, Pakistan, Nepal, Bhutan, Maldives, Sri Lanka, Afghanistan and all countries of the world).

Figure 4.5: dataset of our classifier

4.6 Data preprocessing

To promote the effect of image classification, image preprocessing is a very important. The learning method of convolution neural network belongs to observe and direct the execution of our activity in machine learning, so at the time of image preprocessing step we have to label the data. Then we have to resize the data. After collecting data for each class, we augment the dataset in 5 different methods, these methods given below

Rotate left -30 degree

Rotate right +30 degree

Flip horizontally about Y axis,

CHAPTER 5

Implementation and Testing

5.1 Train model

In this step, we should keep the parameters of the previous layer, then remove the final layer and input our dataset to retrain the new last layer. The last layer of the model is trained by back propagation algorithm, and the cross-entropy cost function is used to synthesize the weight parameter by calculating the error between the output of the SoftMax layer and the label vector of the given test category [5] [7].

We have also created Confusion Matrix for final accuracy. From Confusion Matrix, we have calculated Precision, Recall, Accuracy, and F1-Score. And finally, we have calculated Macro Average Accuracy of our experiment. Here is the Confusion Matrix of our model. From the following Confusion matrix of Table I, we can tell that our model has given a very high number of True Positive values.

TABLE:5.1 TRAIN MODEL

Dataset	Index	Performance
Dataset	the accuracy of the training set	96.6%
	the accuracy of the validation set	96%-98%
	the cross-entropy of the training set	0.24
	the cross-entropy of the validation set	0.41

Table shows the description of the two figures. For our data ‘set, the training accuracy can reach to 96.6%, and the validation accuracy can be maintained at 96% -98%.

5.2: Confusion Matrix

TABLE:5.2 CONFUSION MATRIX

Bangladesh	India	Australia	France	Germany	Italy	Canada	New Zeeland	Malaysia
Bangladesh	13	2	0	3	o	0	2	0
India	18	0	0	2	0	0	0	0
Australia	16	1	0	0	0	1	0	1
France	14	0	0	1	3	1	0	1
Germany	16	0	1	1	0	1	1	0
Italy	15	0	0	0	1	1	1	2
Canada	14	0	3	2	0	0	0	1
New Zeeland	15	0	0	0	2	0	3	0
Malaysia	3	0	2	2	4	5	3	3

5.3 Result analysis

Figure 5.3.1 and figure 5.3.2 show the variation in accuracy and cross-entropy based on our training dataset. The orange line represents the training set, and the blue line represents the validation set.

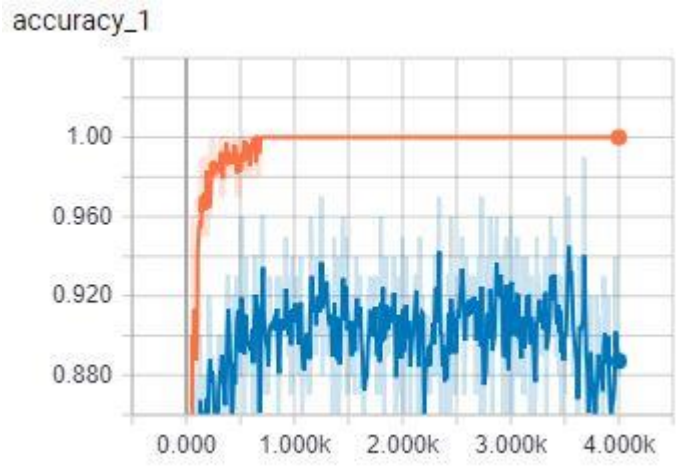

Figure 5.3.1 The variation of accuracy on the training dataset.

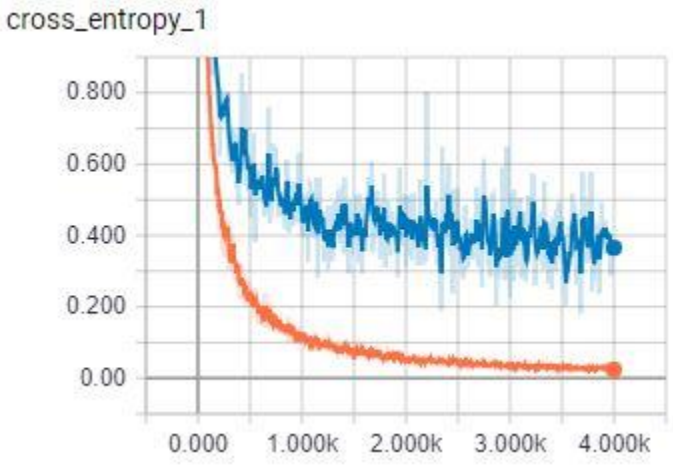

Figure 5.3.2 The variation of cross entropy on the training dataset.

5.4: Accuracy

TABLE 5.4: THE ACCURACY OF SOME COUNTRY

Country Name	**Accuracy**
Bangladesh	95%
India	97.67%
Australia	97%
Nepal	93.89%
Malaysia	97.72%
New Zeeland	96%
Japan	95.88%
Bhutan	94.03%
Maldives	98%
Afghanistan	96.8%
Ireland	97.2%
Sri Lanka	95.5%
Macro average	**96.6%**

Table shows the accuracy of the countries of the world. We take here few countries Form our dataset. The accuracy of Bangladesh is 95%, India is 97%, Pakistan is 97%, Nepal is 93%, Bhutan is 94%, Maldives is 98%, Sri Lanka is 95%, Afghanistan is 96%and the final accuracy is 96.6%.

5.5 Implementation of Python Code

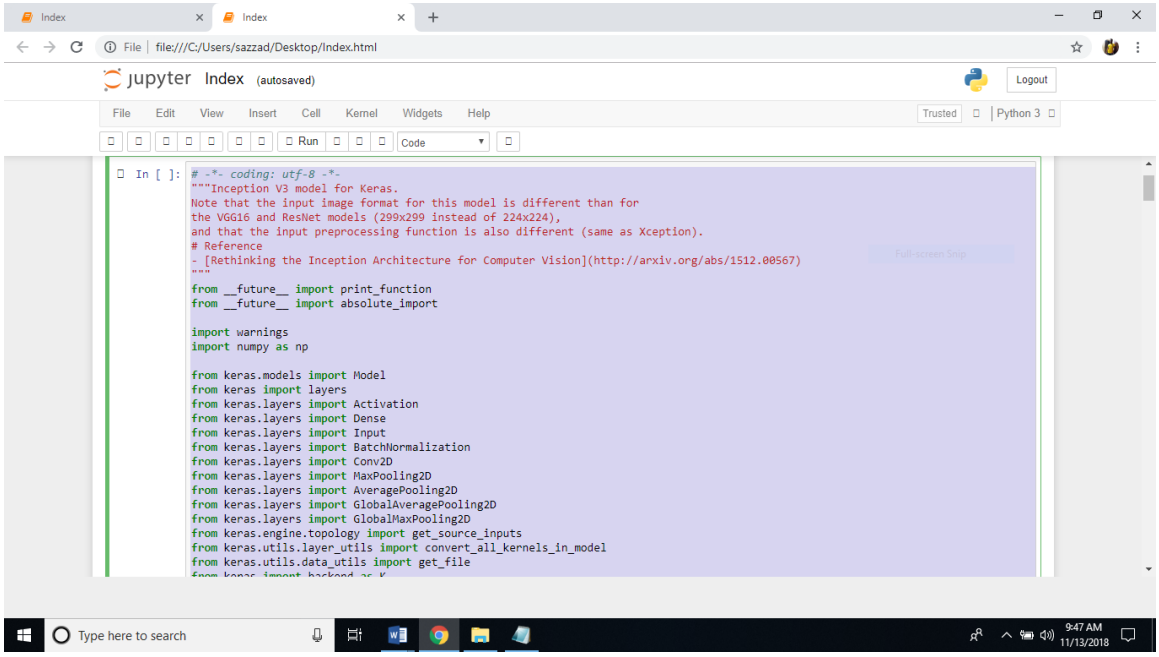

Figure 5.5.1: A Screenshot of python code.

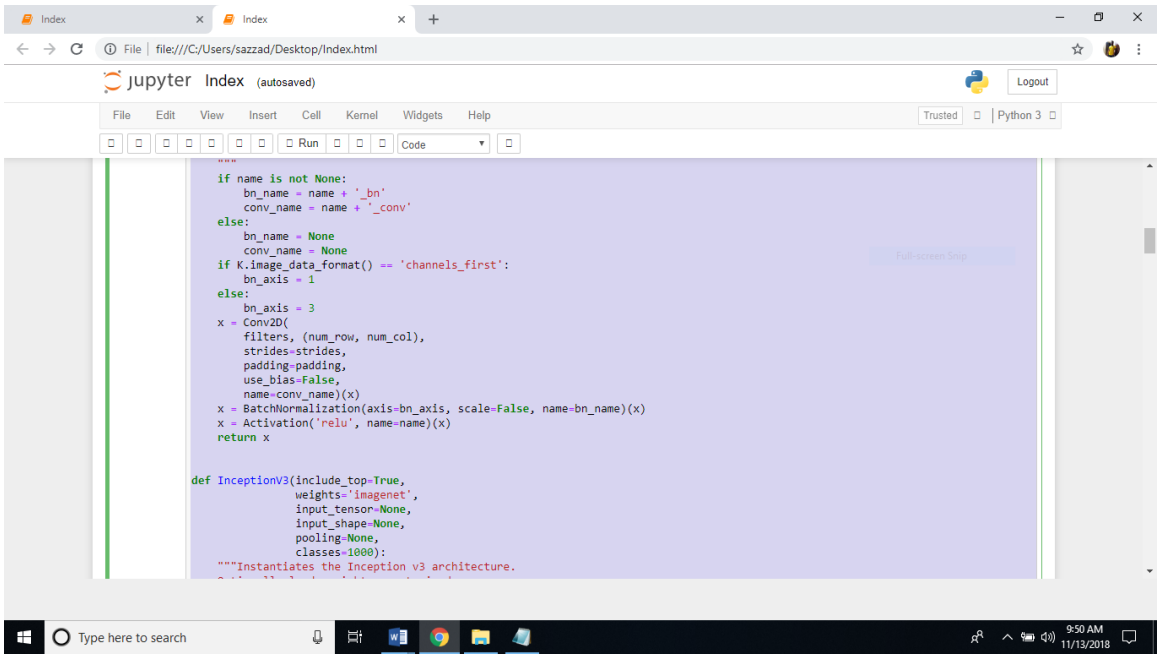

Figure 5.5.2: A Screenshot of python code.

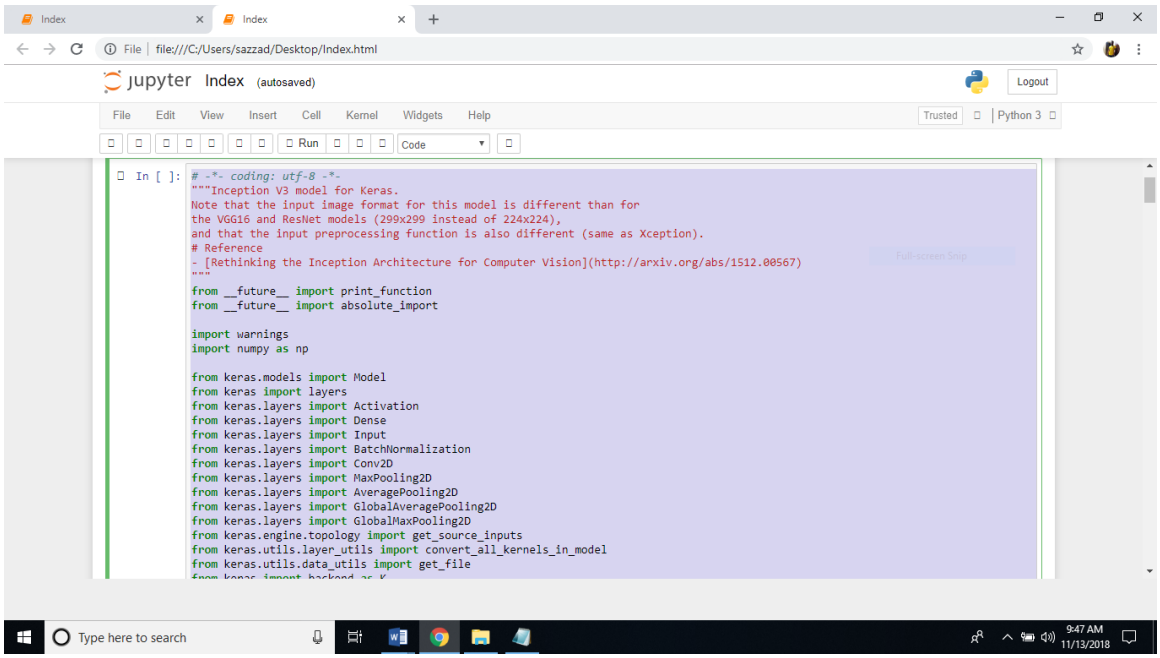

Figure 5.5.3: A Screenshot of python code.

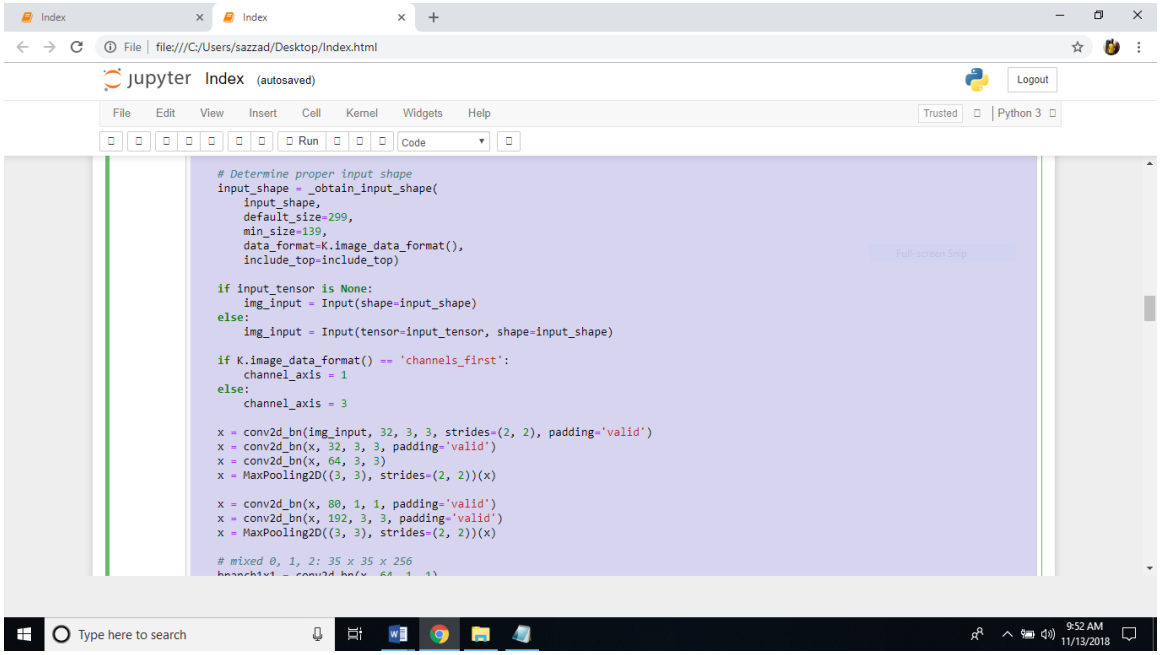

Figure 5.5.4: A Screenshot of python code.

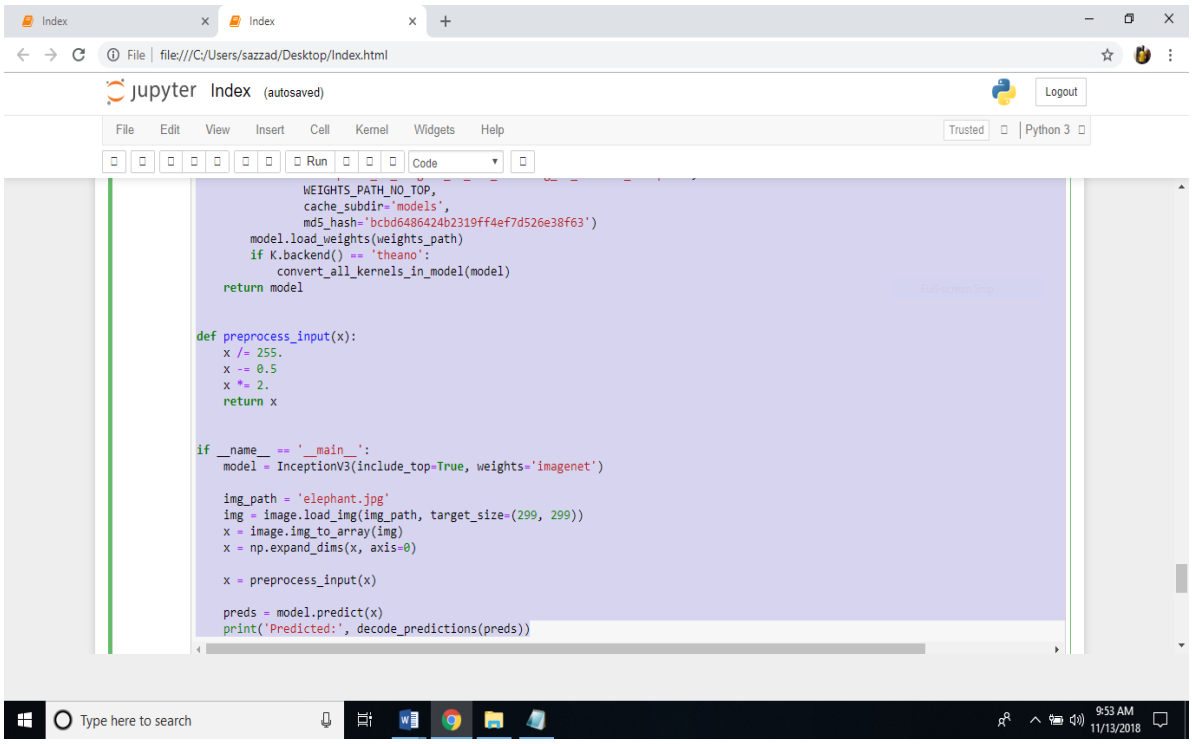

Figure 5.5.5: A Screenshot of python code.

5.6 Test Results and Reports

Test report is needed to reflect the result of testing the application in a formal way, which gives an opportunity to estimate the result of testing quickly. It is a document that records data obtained from a determine experiment in an organization manner, describe the classifier that show comparison of test results with objectives, which are so important for any types of classifier.

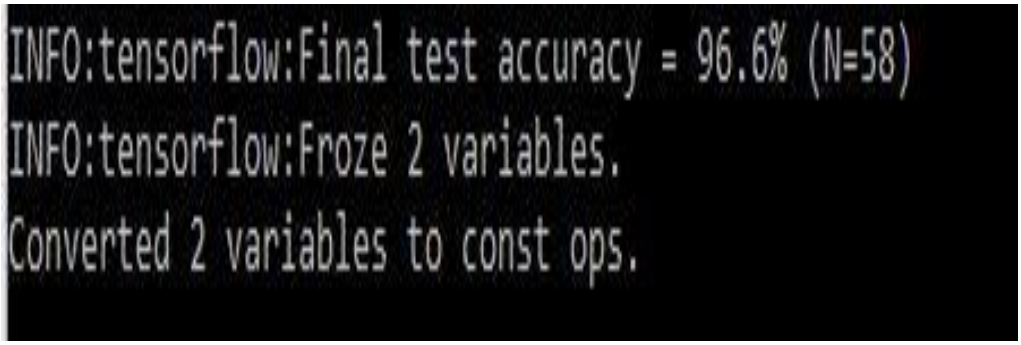

Figure 5.6: A Screenshot of accuracy test.

From figure we shown the test case, test input, expected output, actual output and finally we become success because. Our classifier accuracy rate is 96.6%

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 Discussion and Conclusion

In this paper, based on the Inception-v3 model of TensorFlow [1] platform, we use the transfer learning technology to identify the nationality of eight countries based on our dataset. And we get the accuracy of the model is 96.6%. Our classifier is very user friendly. We tried our best to make our classifier accurate. Our classifier is very fast. We hope that people of non-SAARC country will use our classifier to know about SAARC countries national flag.

6.2 Limitations of Our work

As like as every classifier, our classifier has also some limitation. We will overcome those limitations in future. Here, we want to mention that some of the main limitations of our classifier are given below:

In our classifier we take only 4000 images.

In our classifier we take all country national flag image. But we can't add language off all countries.

6.3 Scope of our future work

Our image classifier accuracy rate is more than all other. But here we take 4000 images of dataset but in near future we will take around 10000 images of data. Here we not take the country's national flag image but in future we will take all the countries of the world and we will take around 10000 images of national flag. Another future work is at present our accuracy rate is 96.6%. next we will try to increase accuracy rate. In future we will add the historical place and national flag image all over the world.so it is our main challenge to add all the countries of the world and the historical places of the world in our classifier.

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Appendix A: Data set of some countries national flag.

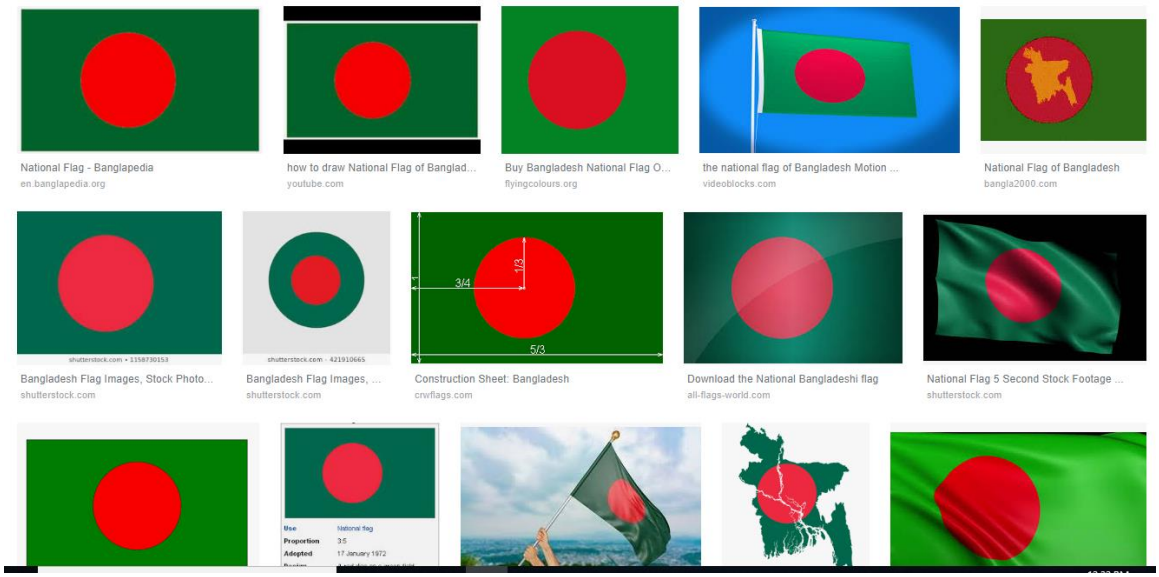

Figure A.1: Screen short of Bangladesh national flag.

Figure A.2: Screen short of India national flag.

Figure A.3: Screen short of Pakistan national flag.

Figure A.4: Screen short of Nepal national flag.

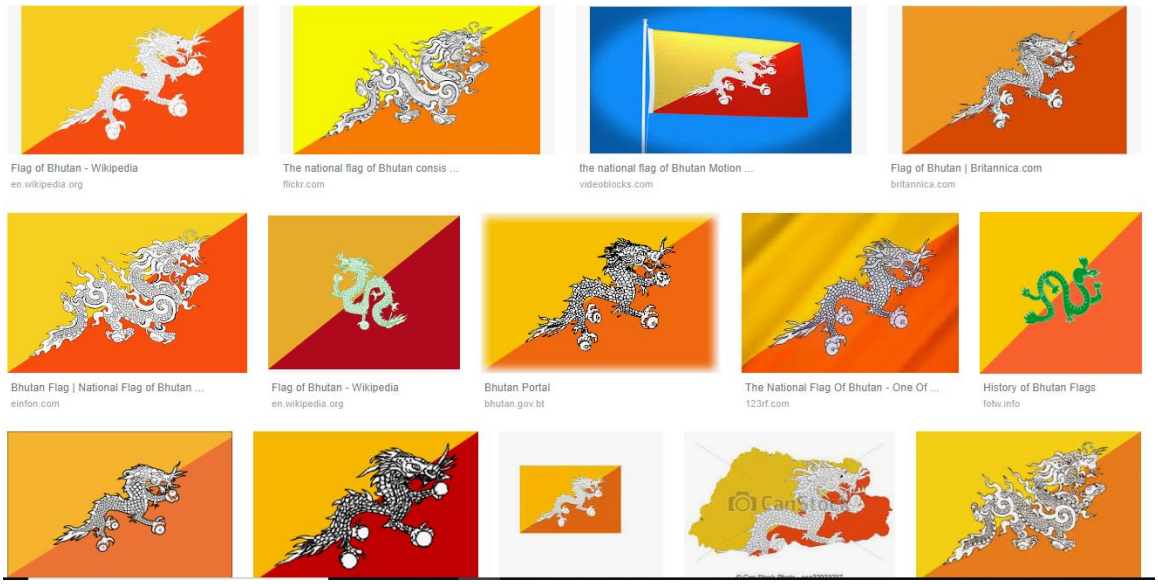

Figure A.5: Screen short of Bhutan national flag.

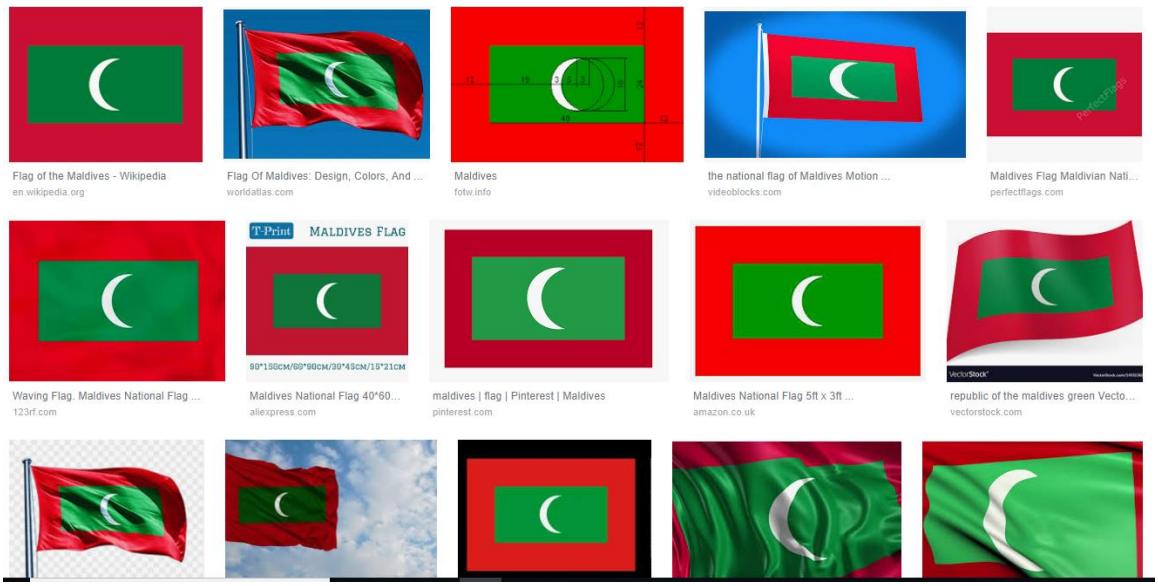

Figure A.6: Screen short of Maldives national flag.

Figure A.7: Screen short of Sri Lanka national flag.

Figure A.8: Screen short of Afghanistan national flag.

Appendix B: Data set of some countries national flag.

Figure B.1: Screen short of Australia national flag

Figure B.2: Screen short of Brazil national flag

Figure B.3: Screen short of Canada national flag

Figure B.4: Screen short of Denmark national flag

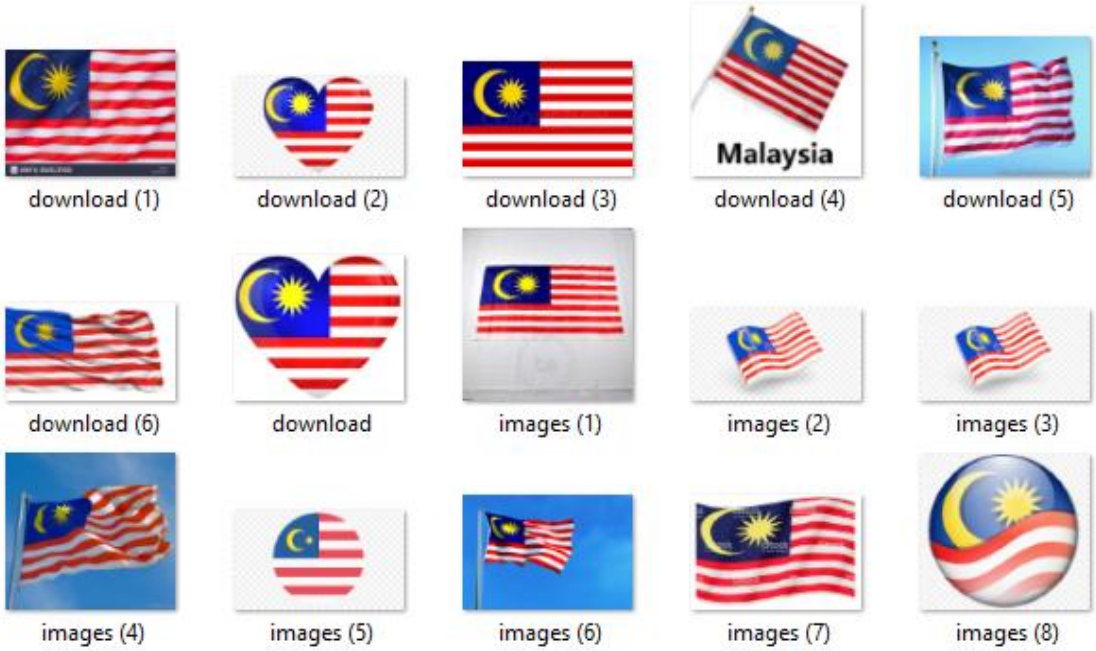

Figure B.5: Screen short of Malaysia national flag

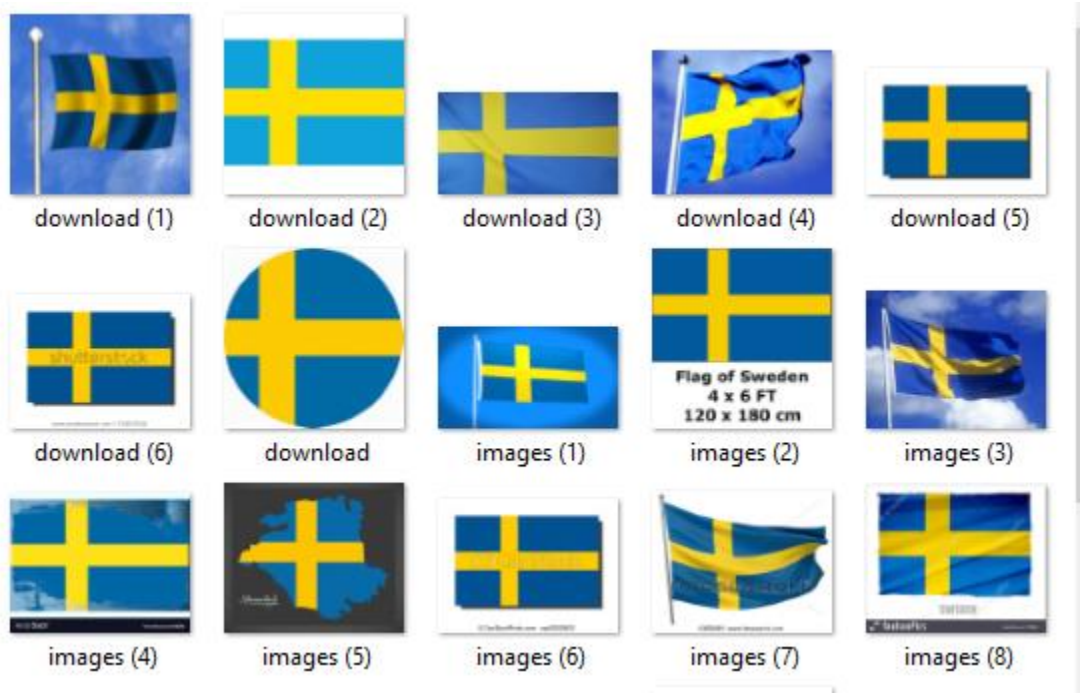

Figure B.6: Screen short of Sweden national flag

Figure: plagiarism Screen Short