



Deep Q CNN for Predicting Flower Classification using TensorFlow

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Abstract

Development of the popularity of rare plant species is advantageous within the field akin to the pharmaceutical industry, botany, agriculture, and trade activities. It had been additionally terribly difficult that there's the diversity of flower species and it's very hard: to classify them once they will be very similar to one another indeed. Flower identification is a tedious method these days wherever there are many types and hybrids of flowers available. Classifying the flower is problematic where the image primarily based classification with deep learning strategies is implemented. It planned a hybrid methodology exploitation CNN method. CNN is employed for image identification and classification with multi-label classification. It attempts to explore a unique methodology for feature extraction and also the pertinency of representational process schemes together with totally different classification strategies for effective multi-label classification of flower species classification. The deep network classification model is trained to extract the characteristics of flower images mechanically. It's a straightforward structure, has few coaching parameters, and has achieved an honest recognition effect.

Keywords: Classification, Prediction, CNN, TensorFlow, Deep Learning

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1. Introduction

Flower classification is that the arrangement of flowers into teams associate degree classes for a transparent underneath standing, correct study and effective organization. A flower organization has prophetic price and provides an index to info storage and retrieval thereon flower. Flower classification is ground add

botanic studies, and in agro-forestry production and management. A classification of flowers with hi-fi exploitation engineering is of nice social benefits. Deep learning falls under the class of computer science wherever it will act or suppose sort of a human. The system itself are set with tons of or even thousands of computer file so as to create the coaching session to be additional economical and fast [1].



Recently, taxonomists started making an attempt to look out efficient ways to satisfy species identification wishes, like developing a digital image methodology and pattern recognition techniques. Flowers usually having bound morphological structures, admire Calyx, Corolla, reproductive structure or Pistil. Flowers are all over around us [2]. they're used as medicines for humans and a few animals. a decent understanding of flowers is crucial to assist in distinguishing new or rare species once came across. This can help the meditative industry to improve. This could be extended as a picture search resolution wherever icon may be taken as an input rather than text so as to induce additional info regarding the topic and search according for best matching results [3].

The flower identification is that the tedious method today where there are many sorts and hybrids of flowers are available. Classifying the flower is sort of problematic where the image primarily based classification with deep learning ways is implemented. The project planned hybrid methodology exploitation with multi-label classification. This project tries to explore a unique methodology for feature extraction and also the pertinency of {symbolic representation|symbol|symbolization|symbolisation|representational method} [3][4]schemes at the side of totally different classification ways for effective multi-label classification of flower species classification. This method helps in varied flower classification on laptop vision technology.

Computer vision techniques play a vital role in extracting meaningful information from pictures. A process of extraction, analysis, and understanding of knowledge from images could accomplish by an automatic process exploitation computer vision and machine learning techniques. Moreover, it makes systems able to improve bit by bit while not being expressly programmed supported experience. From a machine learning perspective, pictures are product of with pixels and contained knowledge} that may describe that image [5]. As this information is simply in depth and maze, it's inconceivable to be directly utilized by a machine learning algorithm. Image process techniques are used for feature extraction and machine learning algorithms are deploys these options to create a model. As data will increase in a very tremendous means it is necessary to organized them to extract the meaningful information within. Moreover, it's been determined that, prediction of multiple labels is very needed by today's classification issues and it is needed to integrate the approaches regarding multi-label classification.

2. Background

Digital image process could be a chop-chop growing space of engineering science since it had been introduced associated developed within the 1960's. several fields that historically used analog imaging approach are now wide shift to digital systems similar to medical photography and remote sensing. Digital image processing permits one to reinforce image options of interest and



extract helpful info from it. Image processing is a serial of sequence operation on image to boost the imperfections or quality of images. a vital goal of image processing is to know the contents of a picture and be able to mechanically gain an understanding of a scene, implying associate extraction and recognition of an object. However, the image process and therefore the method of translating a picture into a distribution of low-level options isn't a simple task [6].

These tasks are sophisticated since the nonheritable image information typically noisy, and target objects are influenced by lighting, intensity or illumination. Thus, there's a desire to automatize the image processing algorithms, for image smoothing, unsmooth image segmentation, object extraction, tracking, and recognition. Image processing depends on the sort of apparatus that generates the photographs and the characteristic of them. within the case of flower classification, image process could be a crucial step for computer-aided plant species identification. Classification is one among the foremost active analysis and application areas of information mining and most often encountered higher cognitive process tasks of human activity [7].

It is a method during which a gaggle of one thing or category it belongs to in step with their options by finding common traits or characters. the most objective of classification is to predict categorical class labels for brand new samples. There are 2 main classification schemes; unsupervised and supervised

Classification. unsupervised Classification performs clusters pixels in an exceedingly knowledge set primarily based solely on their statistics while not mistreatment previous knowledge regarding the spectral categories gift within the image [8]. On the opposite hand, supervised classification is that the process of using samples of famed identity or coaching data to classify pixels of unknown identity. Some of the foremost ordinarily used supervised classification ways are most Likelihood, Minimum Distance, Mahalanobis Distance, and Neural Networks.

3. Related works

Neural networks (NN) is supporting tools for image processing in any classification issues and it gift a doubtless appealing various in image processing field. NN are models that are designed to imitate the human brain through the employment of mathematical model. It consists of a series of processing units that are put together connected just like the synapses within the human brain. Since NN was designed to unravel advanced problems similar to pattern recognition and classification, thus NN plays a major role in classification process [9]. it's able to train and classify haphazardly} advanced datasets similar to flower images. thanks to time restrictions or procedure restraints, it's not continuously attainable to create a model from scratch regarding plant classification problem in real life, it'll compare the performance of ways and take a look at to seek out a pre-trained way for this type of problem. the matter is making an attempt to unravel is given



a picture of flowers, it wishes to see which sort it is (daisy, dandelion, rose, sunflower, tulip) in 4323 pictures.

It introduces integrative co-occurrence matrices as new options for color texture classification analysis and extra intensity freelance color textures. Classification results were improved by 20% for gray-scale texture analysis and 32% for color bar chart analysis. The system applied Gaussian mathematician random field model to explain the feel data of various picture element colours in an image. The experimental results show that the colour features is more meaning than the texture feature in recognizing different image. Texture filter was created supported texture features extracted from physicist rippling remodel to False Acceptance Rate [10].

S Kishore and B Mayurathan et al, Image primarily based totally class structures are accomplishing first-rate overall performance the usage of huge photo datasets and superior class strategies. Most of the flower instructions have equal shape, look or heritage facts which include plant leaves and grass. So, flower photo class continues to be hard task. The intention of this paper is to investigate the impact of a couple of nearby functions for flower photo class [11]. Shape, texture and shadeation functions are extracted from the flower snap shots to be able to describing unique components of flowers. The class overall performance of the proposed approach is likewise in comparison with today's flower class performances. Performance of the nearby characteristic descriptors which include SIFT, SURF, HSV, RGB and CTM in flower class is

likewise analyzed. According to the overall performance of the nearby descriptors, the mixed SURF + CTM offers higher overall performance than different mixture of functions withinside the context of flower photo class [12].

Bursa Rumeya Mete and Tolga Ensari et al, Development of the popularity of uncommon plant species may be superb with inside the subject which include the pharmaceutical industry, botany, agricultural, and alternate activities. It changed into additionally very hard that there may be variety of flower species and it's far very tough to categorize them once they may be very just like every different indeed. Therefore, this challenge has already grown to be crucial. In this context, this paper gives a class device for flower snap shots via way of means of the usage of deep CNN and information augmentation. Recently, deep cnn strategies have grown to be the modern day era for such problems [13].

However, the reality is that obtaining higher overall performance for the flower class is caught because of the shortage of classified information. In the study, there are 3 number one contributions: First, proposed a class version to domesticate the overall performance of classifying of flower snap shots via way of means of the usage of Deep CNN for extracting the functions and numerous gadget mastering algorithms for classifying purposes. Second, confirmed the usage of photo augmentation for accomplishing higher overall performance effects. Last, in comparison the performances of the gadget-mastering classifiers which



include SVM, Random Forest, KNN, and Multi-Layer Perceptron (MLP). In this study, we evaluated our class device the usage of datasets: Oxford-17 Flowers, and Oxford-102 Flowers. Divided every dataset into the education and take a look at units via way of means of 0.eight and 0.2, respectively. As a result received, the first-rate accuracy for Oxford 102Flowers Dataset is 98.5% usage of SVM Classifier. For Oxford 17-Flowers Dataset, it discovered the first-rate accuracy as 99.eight% with MLP Classifier. These effects are higher than others' that classify the equal datasets withinside the literature [14][15].

Yuanyuan Liu et al, deal with the trouble of herbal flower type. It is a tough project because of the non-inflexible deformation, illumination changes, and interclass similarity. Build a massive dataset of flower snap shots withinside the extensive with seventy nine classes and advise a singular framework primarily based totally on convolutional neural community (CNN) to clear up this trouble. Unlike different techniques the use of handmade visible capabilities, our approach makes use of convolutional neural community to robotically examine properly capabilities for flower type. The neural community includes 5 convolutional layers wherein small receptive fields are adopted, a number of which can be observed through max-pooling layers, and 3 fully-linked layers with a very last 79way SoftMax. Our technique achieves 76.54% type accuracy on our tough flower dataset. Moreover, take a look at our set of rules at the Oxford 102 Flowers dataset. It outperforms the preceding recognized techniques and achieves 84.02% type

accuracy. Experimental effects on a famous dataset and our very own dataset exhibit that our approach is pretty powerful in flower type.

Shubhra Aich and Chil-Woo et al, Investigate the type trouble of visually comparable objects, like flowers. It advises to alternative the decrease range of authentic schooling snap shots with their massive range of counterparts, artificially generated through manifold mapping. Since, the inter-elegance similarity could be very excessive in visually comparable item type problems; it attempts to imitate the take a look at snap shots withinside the low dimensional area with this massive range of manifolds snap shots. Until now, have in comparison our scheme with different techniques handiest for the bag-of- phrases shadeation capabilities on Oxford 17 elegance flower dataset. For this unmarried capability, with very low decision (64x64) manifold snap shots, it nearly attain the identical accuracy as that acquired with authentic decision snap shots (each row and column have dimensions greater than 500) withinside the latest literatures [16].

4. Proposed Methodology

The flower is split the use of a threshold primarily based totally technique, and texture choices, mainly the color texture moments (CTMs), grey stage co-prevalence matrix (GLCM), and scientist responses, unit of size are extracted. The accuracy and the time prediction are low. Detection of the classifiers is predicatively created with low instances.

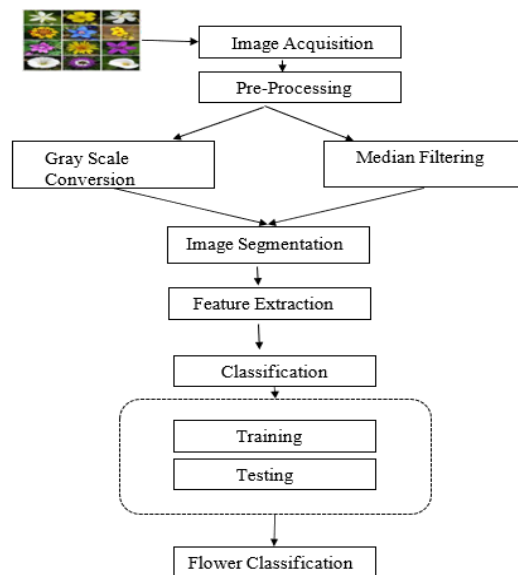
The proposed flower reputation machine is applied with the aid of using deep



studying technique that is a totally green version for picture classification. CNN fashions are skilled with the aid of using to start with feeding a hard and fast of flower pix at the side of their labels. These are systems in CNN and use Lenet CNN structure. This is a feed ahead neural network.

These pix are then handed thru a stack of layers along with fuzzy, ReLu, pooling and absolutely linked layers. These pix are taken as batches. In the proposed machine, a batch length of 32 becomes given. The version become skilled the use of a hundred and fifty epochs. Initially the version extracts small capabilities and because the schooling technique progresses greater precise capabilities may be extracted.

Most of the preprocessing is achieved mechanically that is one of the most important blessings of CNN. In addition, to that enter pix had been resized. Augmentation is likewise carried out which will increase the dimensions of the dataset with the aid of using making use of operations which include rotation, shear etc. During the schooling technique, the version discovers capabilities and styles and learns them.



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Figure 1. DeepQ CNN process

This information is then used to later locate the call of a flower while a brand-new flower picture is given as enter. Categorical pass entropy is used as loss feature. Initially the loss values could be very excessive however because the technique advances the loss feature is decreased with the aid of using adjusting the burden values. More than 25000 flower pix get recognized with the generated machine. The implementation is performed with the detection of extracted capabilities and all of the floras are pre-skilled values withinside the array storage. The accuracy of the machine is given over 95% in the machine.

Image acquisition is the system wherein the photograph may be the only wherein the photograph may be given ass enter to the device. In photograph processing, it's miles described because the motion of retrieving an photograph from a few supply, generally a hardware-primarily



based totally supply for processing. It is step one withinside the workflow collection because, without an photograph, no processing is possible. The photograph this is obtained is absolutely unprocessed.

Pre-Processing is the step wherein lessen the complexity of the photograph calculation. The device complements the photograph with the broader photograph cost analysis. Here the photograph may be analyzed with RGB photograph colour type device.

The photograph constitute the grayscale conversion. The photograph may be in

addition categorized with median filtering with undesirable noise removal device. The cropping of photograph is a step that introduce to make the flower item withinside the photograph clearer and to beautify the segmentation section via way of means of supplying the photographs with much less historical past objects. The following standards had been made to make sure the stableness and shape of Oxford flower 102 dataset, every of the subsequent precept can have a flower instance to make clear the idea.

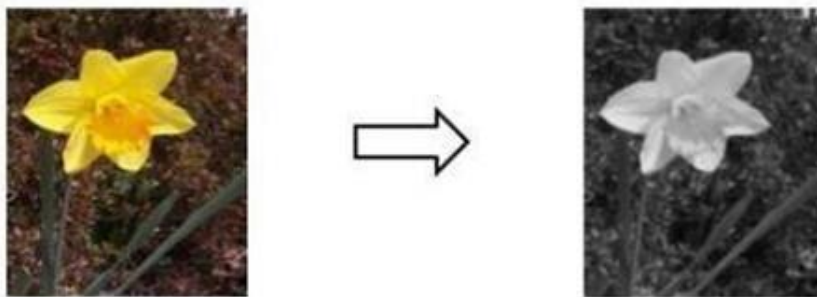


Figure 2. Grey Scale process

First, for quick processing the enter photograph is resize to half. Then for segmentation convert the colour photograph into grayscale. However, this binary photograph carries noise; hence, should do away with the noise. By the usage of most linked factor on binary photograph, get the binary photograph with out noise wherein foreground is white and historical past is black.

- ✓ After making use of essential photograph pre-processing strategies, segmentation is carried out on photograph for in addition processing.
- ✓ Removing the undesired historical past withinside the photograph is the second one step in flower identification.
- ✓ Images that carries flora are too incorporate elements of plant, leaves or grass withinside the historical past.
- ✓ In order to extract the best functions, it's miles required to split the flower photograph from its historical past.

- ✓ To do away with the historical past of photographs and enhance the exceptional of flower photograph foreground, segmentation strategies are used. There are many techniques to be had for photograph segmentation: break up and merge, region-primarily based totally approach, watershed-primarily based totally segmentation, threshold-primarily based totally, etc.
- ✓ Based at the test carried out, gadget pushed threshold-primarily based totally segmentation technique cited as Otsu's technique became carried out.
- ✓ It transforms the flower photograph right into a grayscale to binary for lowering the intricacy of the data.
- ✓ Further, to shop the segmented photographs, characteristic extraction operations. The photograph carries the final results of the Otsu method carried out on a flower photograph.

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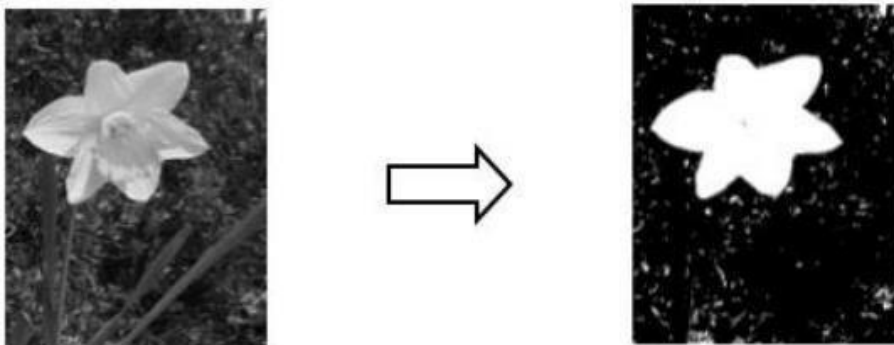


Figure 3. Image Segmentation - Otsu's technique

Chan-vese photograph processing segmentation method is used for segmented flora item (foreground) from the relaxation of photograph (historical past) so that it will simplify and beautify functions extraction system. The Chan-Vese Active Contour Model is a effective and bendy approach as brought in, it could phase many sorts of photographs taken into consideration as tough to phase in lots of classical segmentation strategies including thresholding or gradient segmentation.

Algorithm – DeepQ CNN

```
# construct the argument parse and parse the arguments
path="/content/drive/MyDrive/flowerclassification_k/"
dataset=path+"training_set"
model_name=path+"trained_model"
image=input("ENTER FILE NAME OF THE IMAGE TO BE PREDICTED:")
# load the trained convolutional neural network
print("[INFO] Loading Network...")
model_base=model_name+'.h5'
model = load_model(model_base)
# classify the input image
```



```
dir_predict = model.predict(image)[0]
print(dir_labels)
print(dir_predict)
for i in range(num_class) :
    var = 0
    for j in range(num_class) :
        if(dir_predict[i]>=dir_predict[j]) :
            var=var+1
    if(var==num_class) :
        label=dir_labels[i]
        proba=dir_predict[i]
    elif(var==num_class-1) :
        label2=dir_labels[i]
        proba2=dir_predict[i]
search=label
print(label)
if label=="daisy":
    search="Bellis perennis"
text=wikipedia.summary(search,auto_suggest=False)
label = "{}: {:.2f}%".format(label, proba * 100)
# draw the label on the image
output = imutils.resize(orig, width=400)
cv2.putText(output, label, (10, 25), cv2.FONT_HERSHEY_SIMPLEX,
0.7, (0, 255, 0), 2)
cv2.imwrite("Output.png",output)
output = cv2.cvtColor(output, cv2.COLOR_BGR2RGB)
plt.imshow(output)
plt.ion()
plt.pause(0.001)
plt.show()
tts = gTTS(text)
tts.save('1.wav')
sound_file = '1.wav'
Audio(sound_file, autoplay=True)
```

Texture function is extracted with the aid of using the usage of GLCM method. It is implemented on grayscale photo consequently it must convert the segmented color photo into grayscale photo. Texture function calculations approach to degree the variant in depth at fascinated pixel in an photo that may use the GLCM contents. Mainly steps are used for the extraction of Co-prevalence texture capabilities. First step is to create a GLCM with the aid of using the usage of spatial co-occurrences of pixels in pair, that's separated with the aid of using a specific angle, and distance.

The GLCM is a rectangular matrix of $M \times M$, in which M is the exceptional grey stages found in an photo. In 2d step, computed GLCM is used to calculate the exceptional assets of GLCM like correlation, contrast, power, neighborhood homogeneity, norm entropy, inverse distinction second, most probability, cluster prominence and cluster shade. It have used 4



capabilities contrast, correlation power and homogeneity. Formulas for function extraction strategies are given below.

$$\text{Contrast} = \sum |i - j| 2 i, (i), \tag{1}$$

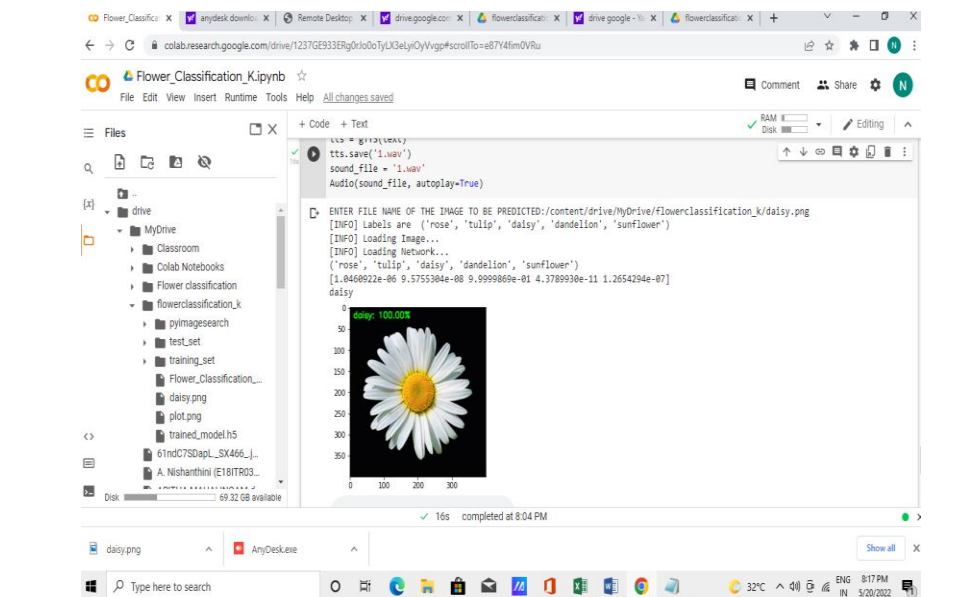
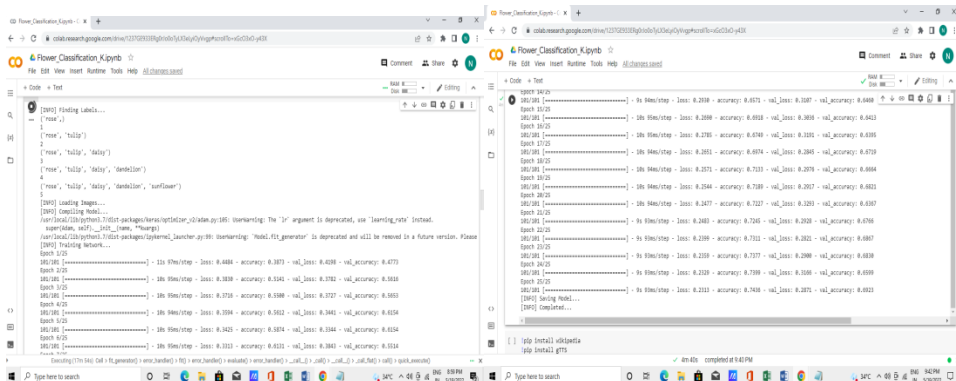
$$\text{Correlation} = \sum (i-\mu_i) (j-\mu_j) (i,) \sigma_i \sigma_j \tag{2}$$

$$\text{Energy} = \sum (i,) 2 i, \tag{3}$$

$$\text{Homogeneity} = \sum (i,) 1+|i-j| i \tag{4}$$

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Extracting plant life capabilities which include texture the usage of Gray Level Co-prevalence Matrices (GLCM), colour the usage of (HSV) Moments and form the usage of Hu Moments. Color, form and texture are the capabilities that use as feature descriptors, that allow you to distinguish among our flower object (foreground), and different inappropriate objects (background). Here in our flower popularity gadget will use the invariant second that defined in as our form function descriptor, the GLCM as a textures function extractor which proposed in and the HSV colour version as colour descriptor that provided with the aid of using further to RGB.



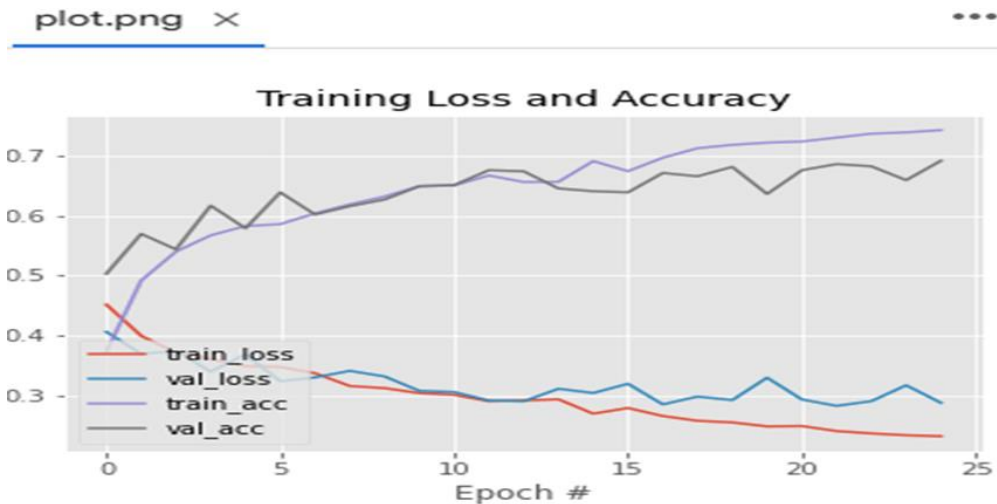


Figure 4: TensorFlow result of Classification and Prediction

Fuzzy regulations are greater widespread than traditional regulations and feature some of advantages. For example, traditional (non-fuzzy) regulations produce fashions with “sharp” choice limitations and, correspondingly, abrupt transitions among exceptional classes. This enables withinside the simplest distinction limitations of the flower detection.

Conclusion

Flower being the maximum appealing component is the high-quality manner to discover a plant. Thus, figuring out the flower can assist in understanding greater approximately that plant. The proposed device takes as enter, an photo of a flower and shows the not unusual place call in addition to the own circle of relatives call of the flower. Since the version is which has established to be one of the maximum green photo type methods, the proposed device is surprisingly reliable. A

dataset document is imported after type and the corresponding makes use of the plant are exhibited to the person for that reason making the device greater beneficial The flower type device primarily based totally on virtual photo processing takes the enter photo that's flower photo taken from dataset. In this device of flower type for fast processing the enter unique flower photo is resized. To collect flower component withinside the photo, that's foreground, threshold is used for segmentation. Texture characteristic and shadeation characteristic are extracted through the use of GLCM and shadeation second respectively. For flower type, neural community classifier is used. The accuracy of this flower type device is greater than 70%. The accuracy of device may be advanced through thinking about different features, together with side and form. Future works are available; like improving the output of segmentation method through editing parameters of



lively contour version or through the use of any other segmentation method, there are numerous shadeation, texture and form descriptor can be used as replacements of our used method or equal descriptor in deferent approaches.

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