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FLOWER RECOGNITION SYSTEM USING CNN

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Abstract - *Flowers are one of the beautiful creations of god and they exist in millions of different species and colors. Identifying each of them requires a botanist with immense knowledge and skills. In this rising era of technologies most of the impossible are made possible by incorporating artificial intelligence into real world problems. By introducing machine learning algorithms such as convolutional neural networks for identifying flower species with just an image would be a great help for industries like pharmaceuticals and cosmetics. Ancient Ayurveda recognizes several medicinal benefits in most of the flowers. This paper tries to introduce convolutional neural networks to efficiently identify a flower by just feeding an image of the flower to be recognized. In this system taking an image in your mobile camera, uploading it and just clicking the predict button is all that is needed to know more about a beautiful flower that you have just seen.*

Key Words: **convolutional neural network, Machine learning, Web application**

1. INTRODUCTION

Many times we see a flower and get curious to know more about it. But it is nearly impossible for a common man with less knowledge of flower species to accurately identify them. What makes it impossible is their existence in wide varieties of color and shape. It is just a matter of browsing on the internet to know more about a flower. But what if the link between the flower image and flower name is missing. Here comes the significance of involving machine learning algorithms in aiding such nature enthusiasts.

Flowers are the most attractive and distinguishing feature of a plant. Therefore flower recognition can help to know more about the plant. The two main common features of flowers are their color and shape. Those features can be used to train the model such that it can later identify an unknown flower.

Most of the existing systems provide inefficient results such as providing the probabilities of a few predicted flowers. Thus our objective is to help common people in easily identifying a flower that they have seen in a very efficient and accurate manner.

In this proposed system we develop an efficient model for flower image classification using convolutional neural networks. The previously collected images of several flowers and their corresponding labels will be used to train the model. Once trained, the model takes as input, the image of a flower and predicts the common name as well as the family name of the flower. It also displays the major uses of the identified plant thus increasing the functionality of the system.

2. BACKGROUND AND RELATED WORKS

Flower recognition is a very tedious task because of their existence in wide varieties of color and shape. Being able to identify a flower without the need of an expert botanist would be a great help for industries including pharmaceuticals and cosmetics. Due to this a lot of research has been done on this topic. Color is one of the most distinguishing features in a flower. This has been taken into consideration in the paper published by Avishiktha Lodh and Ranjan Parekh(2017)[1]. They considered color and GIST features for classifying the input image. A model which gave 85.93% accuracy was developed using SVM technique. A comparison of various models such as SVM, Random Forest, KNN and multi layer perceptron in flower image classification was done by Busra Rumeysa Mete and Tolga Ensari(2019)[2]. TanakornTiay, Pipimphorn Benyaphaichit and Panomkhawn Riyamongkol(2014) developed a flower recognition system based on image processing[3]. They used hu's seven moment and K nearest neighbour algorithms to design their model. Edge characteristics were extracted using Hu's seven moment algorithm and K nearest neighbour algorithm was used to classify the images.D S Guru, Y H sharath and S Manjunath(2010) used KNN classifier to identify the image of a flower[4]. The model extracted texture features using gray level co-occurrence matrix and Gabor responses for classification purpose. The input image was transformed into an HSV plane and intensity histogram corresponding to each channel was extracted. The flower was segmented based on the intensity values. The segmented flower was then

passed through GLCM, Gabor filter or combination of both are used to extract the features of the flower and then KNN classifier was applied to classify the flower images.

3. METHODOLOGY

The proposed flower recognition system is implemented by developing a convolutional neural network which is a very efficient model for image classification. CNN models are trained by initially feeding a set of flower images along with their labels. These images are then passed through a stack of layers including convolutional, ReLU, pooling and fully connected layers. These images are taken as batches. In the proposed system, a batch size of 32 was given. The model was trained using 150 epochs. Initially the model extracts small features and as the training process progresses more detailed features will be extracted.

Most of the preprocessing is done automatically which is one of the major advantages of CNN. In addition to that input images were resized. Augmentation is also applied which increases the size of the dataset by applying operations such as rotation, shear etc.

During the training process, the model discovers features and patterns and learns them. This knowledge is then used to later find the name of a flower when a new flower image is given as input. Categorical cross entropy is used as loss function. Initially the loss values would be very high but as the process advances the loss function is reduced by adjusting the weight values. Once the classification is done, the CSV file is imported and the major uses of that plant would be displayed.

To increase the user friendliness of the system, the model was deployed into a web application. Thus the user can take a picture of the flower in their mobile phone or camera. The user can then take the webapp and upload the image and click on the predict button. The model will be loaded and prediction is done. The common name, family name and major uses of that flower will be displayed for the user. Thus the process of knowing more about a beautiful flower that you have just seen is simplified by this system.

4. IMPLEMENTATION

The proposed system was implemented as follows:

Step 1: Image *acquisition*: This step involves collecting images that can be used to train the model so that later when it comes across an unknown image, it can identify the flower based on the knowledge acquired during the training phase.

Step 2: Image *Preprocessing*: Here the images collected in the previous step were resized and augmented to increase the efficiency of the model. During augmentation, the size of the dataset would be increased by performing operations such as rotation, shear etc. Then the image will be split into 75% training and 25% testing sets.

Step 3: Training *Phase*: This is the step where the actual training of the model takes place. In this phase the model extracts features such as color and shape of the flower used for training. Each of the training images will be passed through a stack of layers which includes convolutional layer, Relu layer, pooling layer and fully connected layer.

Step 4: Validation *phase*: Once the model completes its training from the training set it tries to improve itself by tuning its weight values. The loss function used is categorical cross entropy and the optimizer used is stochastic gradient descent.

Step 5: Output *prediction*: Once the validation phase is over, the model is ready to take an unknown image of a flower and predict its name from the knowledge it gained during training and validation phases. Once the classification is done by the model, it displays the common name as well as the family name of that flower.

Step 6: Benefits *Module:* Once the identity of the flower is found out, a previously created CSV file is imported and the benefits of the corresponding flower will be found out and displayed to the user.

Step 7: Web *Application*: Finally the developed model was deployed into a web application which further makes the system more user friendly.

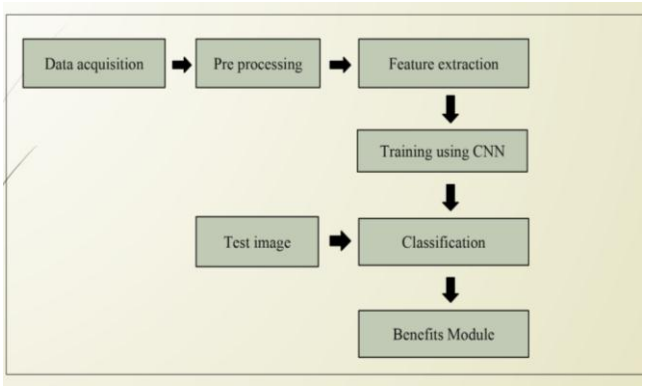

Fig -1: Flow chart

5. DATASET

A subset of Oxford 102 flowers dataset is used for training the CNN model. The original dataset consists of 102 classes with 40 to 200 images of each flower. Out of this a subclass of 24 flowers with 150 images of each class is used to train the model. Equal number of images of each class are given to implement an unbiased training.

6. RESULT AND ANALYSIS

The model was trained with batch size 32 and with 150 epochs.

The classification report obtained after the training and validation phase is shown in fig 2. The graph plots the training loss, validation loss, training accuracy and the validation accuracy for each epoch.

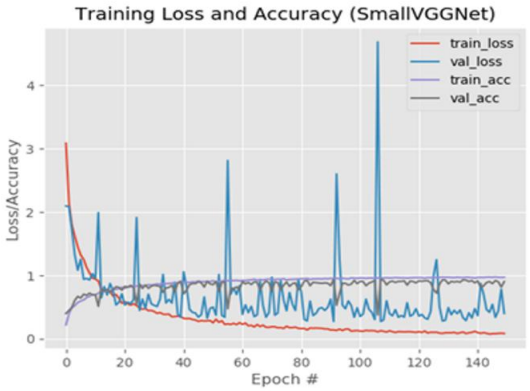

Fig -2: Loss/Accuracy plot

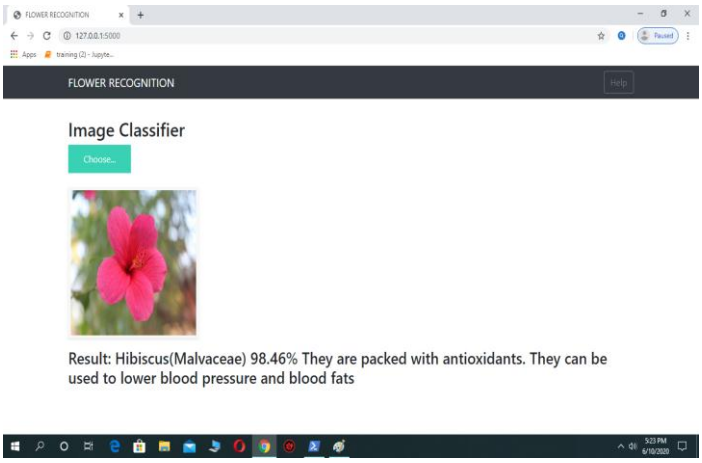

Fig -3: Final Result

The model attained an overall accuracy of 90%. When the model is fed with a real time image of hibiscus taken on a mobile camera, a correct prediction with 98.46% accuracy was obtained.

7. CONCLUSION

Flower being the most attractive part is the best way to identify a plant. Thus identifying the flower can help in knowing more about that plant. The proposed system takes as input, an image of a flower and displays the common name as well as the family name of the flower. Since the model is a convolutional neural network which has proven to be one of the most efficient image classification methods, the proposed system is highly reliable. A CSV file is imported after classification and the corresponding uses of the plant are displayed to the user thus making the system more useful. Further the model was deployed into a web application.

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