FLOWER SPECIES RECOGNITION

***Abstract* - Flowers have been used for centuries to convey emotions and communicate messages, from expressing affection to offering condolences and sympathies. However, identifying the different flowers and their information is not an easy task.**

With the help of machine learning algorithms, it is possible to create a system that can accurately identify flowers and provide information about their meanings and uses. By analysing images of different flowers and their associated metadata, machine learning algorithms can learn to recognize the unique characteristics of each species and match them to their corresponding meanings.

Keywords---convolutional neural network, Deep learning, Flower classification

I. INTRODUCTION

Flower gardens are a source of beauty and inspiration for many people, but identifying the different flower species can be a challenge, especially for those who are new to gardening. Flowers come in a wide variety of colours, shapes, and sizes, making it difficult to know which flowers will work well together in a garden. By incorporating machine learning algorithms, it is possible to create a system that can identify different flower species and provide information about their characteristics and growing requirements. By analysing the unique features of each flower species, such as their petal shape, colour, and growth habits, machine learning algorithms can learn to distinguish between different species and provide accurate identifications. flower classification is an important tool in understanding and managing the natural world around us. One of the key benefits of flower classification using machine learning is that it can help identify rare and endangered species. Many rare flowers are difficult to identify and can easily be confused with other, more common species. With machine learning algorithms, it is possible to accurately identify these rare species and track their populations over time.

II. LITERATURE REVIEW

Some of the works related to flower species recognition are

TABLE I. Literature Review

Authors	Dataset	Details
Steven Puttemans et al	Dataset of Orchid flowers	They have used SVM For orchid flower detection.[1]
Yuanyuan Liu et al	79 categories of flowers and Oxford 102 dataset	They have used Cnn for 79 categories dataset they got 76.54% of accuracy and for Oxford 102 dataset they got 84.02% of accuracy.[2]
Shantala Giraddi et al	5 categories of flowers	They have used CNN and got 97.67% validation accuracy and testing accuracy of 95[3]
Mengxiao Tian et al	Oxford university Dataset	Accuracy of 83.64% based on evaluation standard of Pascal VOC2007 and 87.4% based on evaluation standard of Pascal VOC2012.[4]
Saiful Islam et al	Dataset of 10 local flowers	They have used CNN and got 85% accuracy.[5]
Isha Patel et al	102 categories of flowers	They have used MKL and SVM and got 76.92% accuracy.[6]

These are the existing methodologies used for classification of flowers.

III. EXISTING SYSTEM

Many current flower identification systems often provide limited and inaccurate results, leaving users frustrated and confused. Our goal is to create a user-friendly and efficient flower identification system that empowers individuals to easily and accurately identify any flower they come across.

IV. PROPOSED SYSTEM

Our proposed system aims to leverage the power of convolutional neural networks to create a highly efficient and accurate flower image classification model. By training on a database of flower images and their corresponding labels, our model will be able to quickly and accurately identify any flower that is inputted. Additionally, our system will provide users with detailed information about the identified flower, including its common name, family name. With this comprehensive functionality, our flower identification system will be an invaluable tool for both botanists and amateur nature enthusiasts alike.

V. DATASET AND DATASET VISUALIZATION

We have used the dataset available in Kaggle which consists 5 categories of flowers [7].The Five

categories are daisy, tulip, rose, sunflower, dandelion. In total there are nearly 4000 images in the dataset. The dataset is split into training validation and testing using splitfolders package. The training data is 80% of the total dataset, validation data is 10% of dataset and testing data is other 10% of the dataset.

Data visualization is an important tool for data analysis and communication that enables us to visually represent complex datasets and identify patterns and relationships within the data. Visualizations can take various forms, such as scatter plots, line charts, bar charts, histograms, heatmaps, box plots, tree maps, and many more. The choice of visualization technique depends on the type of data and the specific insights being communicated. The goal of data visualization is to communicate complex information clearly and effectively, making it easy for the audience to understand the key insights and trends in the data.

Data visualization can take many forms, including charts, graphs, maps, infographics, and other visual aids. It is often used in fields such as business, science, engineering, medicine, and social sciences to present data in a way that is accessible and easy to understand. The purpose of data visualization is to provide a clear and concise representation of complex data, allowing users to quickly and easily analyse and interpret large amounts of information. By utilizing data visualization techniques, organizations can better understand and make informed decisions based on their visual data, ultimately leading to improved performance and outcomes.

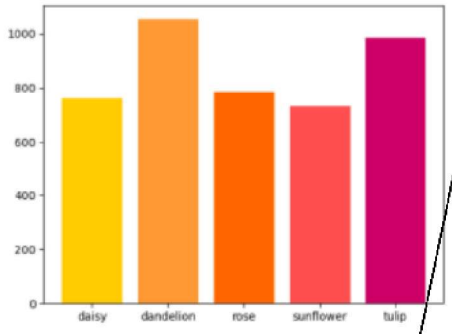

Fig. 1 Visualization of number of images in the dataset

VI. PREPEOCESSING

Preprocessing is an essential step in image processing and computer vision tasks, including flower recognition. It involves preparing and transforming raw input images into a suitable format that can be easily processed by the machine learning model.[8] Here are some common preprocessing steps for images:

Resizing: Images can be of different sizes, and resizing them to a fixed size is a common preprocessing step. Resizing ensures that all images have the same dimensions and reduces the amount of data that the model needs to process. We have resized our dataset to (224,224) images [9].

Normalization: Normalizing the pixel values of images can make the data more consistent and easier for the model to process. Common normalization techniques include scaling the pixel values to a fixed range, such as [0, 1], or standardizing the values to have zero mean and unit variance.

Data Augmentation: Data augmentation involves generating new training data by applying various transformations to the original images, such as flipping, rotating, or changing the brightness and contrast. Data augmentation can help prevent overfitting and improve the model's robustness to variations in the input data [10]. Some of data augmentation techniques used by us are

1. rotation
2. width shift
3. height shift
4. shear
5. zoom
6. horizontal flip

VII. SYSTEM ANALYSIS

Flowers can be difficult to distinguish from one another because of their intricate and diverse characteristics, including variations in colour, shape, texture, and scent, making flower recognition a complex and challenging task. The ability to recognize and classify flowers accurately and efficiently could have significant practical benefits in numerous fields, such as agriculture, environmental conservation, and floral design, as well as industries like cosmetics and perfumery that rely on natural plant materials.

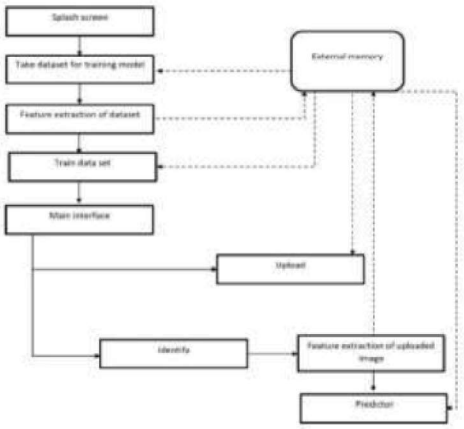

Fig.2 Dataflow Diagram

VIII. Methodology and Implementation

To develop an accurate and reliable flower recognition system, a deep learning approach is used. CNN models are ideal for image classification tasks as they can automatically extract relevant features from images and learn patterns from them. The process of training a CNN model involves feeding a large dataset of flower images with their corresponding labels into the network. The model then learns to recognize and classify different flower species based on the features it extracts from the images. With sufficient training data and proper tuning of the model's hyperparameters, the resulting model can achieve high accuracy and performance in recognizing different flowers. we have used a sequential model in which layers are stacked one after other [11][12].

Transfer learning is a machine learning technique that involves leveraging a pre-trained model to solve a new task. In transfer learning, the knowledge and insights gained from solving one problem are transferred to a new and different problem. The pre-trained model has already been trained on a large dataset and has learned to recognize relevant features and patterns that can be useful for solving other tasks. By using transfer learning, it is possible to significantly reduce the amount of data and computing resources required to train a new model for a specific task. We have used inception resnet v2 available in keras as first layer of our model. Flatten layer is used to convert spatial data into channel data. Two dense layers with Relu and Softmax activation functions are used as the last two layers of the model.

XI. Result and Analysis

We have trained the model for 25 epochs and validated each epoch using loss and accuracy. We have saved the models which have the best accuracy and loss. We got the best accurate model at 25th epoch which has a validation accuracy of 99.76%. After testing the accurate model we got a testing accuracy of 99.75%.

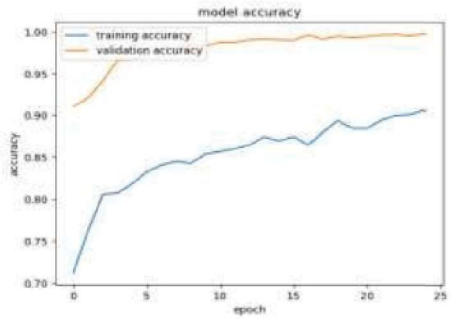

Fig.3 Graph representing training and validation accuracy at each epoch

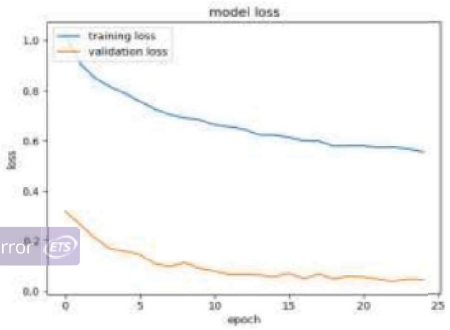

Fig.4 Graph representing training and validation loss at each epoch

X. Conclusion

With the help of modern machine learning techniques, flower classification has become a reliable and efficient process. Transfer learning, in particular, has proven to be an effective method for training convolutional neural networks to recognize a wide range of flower species. By analysing the unique visual features of flowers, these systems are able to accurately classify them and provide valuable information about the plant species.

Identifying the flowers of a plant can provide insights into the plant's taxonomy, morphology, and ecology. This information is crucial for many fields, including agriculture, horticulture, and ecology.

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