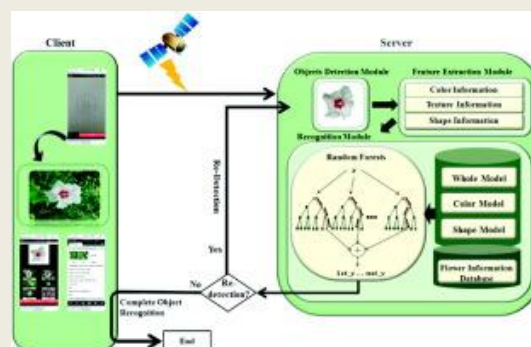


Automatic Detection and Classification of Flowers

In this study, we propose a method for the recognition and retrieval of a flower species in the natural environment based on a multi-layer technique, and we also suggest novel applications. First, the study suggests how to capture a flower object that is blooming in the natural environment, as well as the corresponding background. Secondly, an experimental analysis is conducted for the purpose of improving the optimal method of feature extraction for color, texture, and shape. Thirdly, the study will develop a flower-image automatic-recognition technology that can be utilized in a mobile environment.

Graphical Abstract

A method for the recognition and retrieval of a flower species in the natural environment based on a multi-layer technique (like CNN, Random Forest, SVM, etc).



Data

The data for this work is being collected using web scraping from google, kaggle, github repositories.

Quality of data to be collected:

<https://levity.ai/blog/create-image-classification-dataset>

What is Image Classification?

Classification between objects is a fairly easy task for us, but it has proved to be a complex one for machines and therefore image classification has been an important task within the field of computer vision.

Image classification refers to the labeling of images into one of a number of predefined classes.

There are potentially n number of classes in which a given image can be classified. Manually checking and classifying images could be a tedious task especially when they are massive in number (say 10,000) and therefore it will be very useful if we could automate this entire process using machine learning.

Steps involved in Image Classification

The main steps involved in image classification techniques are determining :

1. A suitable Classification System
2. Feature Extraction
3. Selecting good Training Samples
4. Image Pre-processing
5. Selection of appropriate Classification Method
6. Post-Classification Processing
7. Overall Accuracy

In this technique, the inputs are usually an image of a specific object, such as the rabbit in the above picture, and the outputs are the predicted classes that define and match the input objects.

What is Object Detection?

Object detection is a type of image classification technique, and besides classifying, this technique also identifies the location of the object instances from a large number of predefined categories in natural images.

How Object Detection Works?

The pipeline of traditional object detection models can be mainly divided into three stages:

1. Informative region selection
2. Feature Extraction
3. Classification.

Preprocessing Steps in Image Classification

The aim of pre-processing is an improvement of the image data that suppresses undesired distortions or enhances some image features relevant for further processing and analysis task.

There are 4 different types of Image Pre-Processing techniques and they are listed:

1. Pixel brightness transformations/ Brightness corrections
2. Geometric Transformations
3. Image Filtering and Segmentation
4. Fourier transform and Image restoration

<https://www.mygreatlearning.com/blog/introduction-to-image-pre-processing/>

Flower Detection and Classification

Machine learning algorithms are categorized into supervised, unsupervised and reinforcement learning. Classification algorithms are part of supervised learning approach where algorithm learns from the pre-labelled data. The algorithm learns and discovers the patterns from the data and assigns a new label automatically to the new and unseen data based on the learning. In classification, based on the dataset, a model is build and trained to predict the outcomes. There are variety of algorithms are available for classification and it is not possible to conclude the best among others. Classification is a technique to categorize the information into a definite and desired number of categories with label to each class. The most commonly used classification methods are:

1) k-nearest-neighbors;

<https://towardsdatascience.com/getting-acquainted-with-k-nearest-neighbors-ba0a9ecf354f>

2) Random Forest;

<https://www.section.io/engineering-education/introduction-to-random-forest-in-machine-learning/>

3) Artificial Neural Network;

<https://www.xenonstack.com/blog/artificial-neural-network-applications>

4) Convolutional Neural Network;

<https://towardsdatascience.com/a-comprehensive-guide-to-convolutional-neural-networks-the-eli5-way-3bd2b1164a53>

5) SVM;

<https://www.analyticsvidhya.com/blog/2017/09/understaing-support-vector-machine-example-code/>

Also look at:

<https://iq.opengenus.org/basics-of-machine-learning-image-classification-techniques/>

Applying these methods to classify flower image containing over 35,000 images of flowers, this dataset has been split into a training set containing 80% images, validation set.

Model Deployment

Deployment is the method by which you integrate a machine learning model into an existing production environment to make practical business decisions based on data.

Options for deployment of our Machine Learning Model

- **Algorithmia**
- **PythonAnywhere**
- **Heroku**
- **Google Cloud Platform**
- **Microsoft Azure Functions**
- **AWS Lambda**

Also see

<https://www.kdnuggets.com/2020/05/build-deploy-machine-learning-web-app.html>

How to deploy Machine Learning Models?

<https://www.kdnuggets.com/2021/04/deploy-machine-learning-models-to-web.html>