



## Assignment 1 Flower Classification

### Objectives

1. Become familiar with CNNs models and transfer learning.
2. Applying fine-tuning and analyzing the performance of different classifiers on a large image dataset.

## 1 Problem Statement

You are given the petals to metals dataset, which is a dataset for flower classification. We're classifying 104 types of flowers based on their images drawn from five different public datasets. Some classes are very narrow, containing only a particular sub-type of flower (e.g. pink prim-roses) while other classes contain many sub-types (e.g. wild roses).

## 2 Data

### 2.1 Download the Dataset and Understand the Format

- (a) Download the dataset from the class's Microsoft Teams.
- (b) Write your own function that loads an image and visualize some images from different classes.
- (c) Display the number of samples in each class.

### 2.2 Split Data

- (a) Split the training data into 90% training and the rest for validation.
- (b) Use the validation data during training as validation set.
- (c) Use the test data only for model evaluation, don't introduce it at any step during training.

### 2.3 Data Preprocessing

The pixel values in images must be scaled prior to providing the images as input to a deep learning neural network model during the training or evaluation of the model.

Hint : Try to improve results using Image Augmentation Techniques



### 3 Build CNN Models

You are required to build your own network from scratch and use two or more famous architectures. It is also required to tune the hyper-parameters of these models on the validation set. You have to save your model after each epoch so it can be loaded later for further training or evaluation.

(a) **Simple model of your own**

Build a simple CNN model on your own using 2D convolutions, pooling layers, etc.

(b) **Famous CNN Architectures**

You may use any two of the following architectures:

(a) VGG

(b) ResNet

(c) GoogLeNet

(c) **Transfer Learning**

Use pretrained weights for the architecture instead of training the network from scratch. ImageNet is the mostly used dataset in pretraining CNN architectures.

(d) **Ensemble**

Integrating more than one model using ensemble could enhance the performance of classification.

### 4 Big Picture

Compare between the performance of the different models by realizing the following on the testing data.

- Compute the accuracy and Macro F-Score for each model.
- Plot the confusion matrices and find the most confusing classes.

### 5 Report

Your report should contain the following:

- (a) Plots of the performance results obtained in the evaluation part.
- (b) Comparison and analysis of the performance results across models and different hyperparameters.
- (c) Success and failure cases of the model should be presented as well. (Plot the images)



## 6 Bonus

Students with best 3 accuracy/F-Score values will get a bonus

## 7 Submission Notes

- (a) You can work in groups of 3.
- (b) You are required to submit a clear and detailed report [in PDF format] illustrating every step in the assignment in addition to your well commented code.
- (c) Success and failure cases of the model should be presented as well. (Plot the images)

### 7.1 Further Notes

- You may use Google Colab, make sure you are using the GPU and integrating the Google Drive mount feature so that you don't have to upload your data every time and that your saved models are stored correctly.
- Copied assignments will be severely penalized.

**Good Luck**