Visual Search

Computer Vision II

22/23

Overview

The goal of this project is the identification of the flower family from a picture by means of visual search.

Materials

A dataset adapted from 102 Oxford Flowers Dataset is provided for this assignment. It contains 1262 images from 24 flower categories. The images have scale, pose and light variations. In addition, there are categories that have large variations within the category and several very similar categories. Figure 1 shows some samples of images of the dataset and the associated categories.

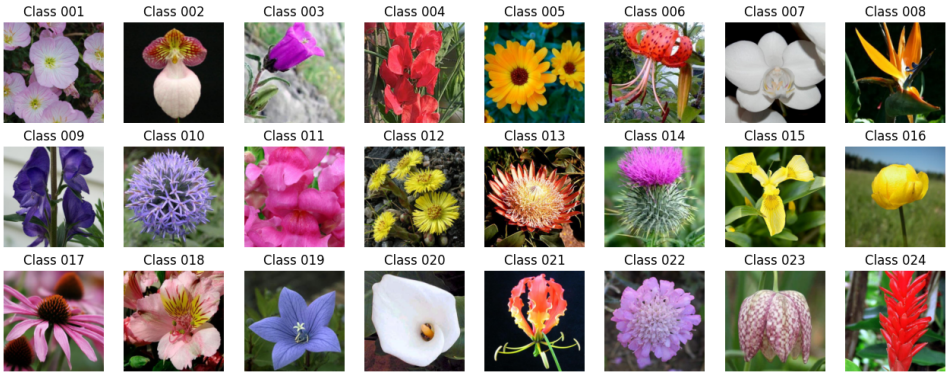

Figure 1: Sample dataset images with corresponding labels.

The dataset is divided into training, validation and test sets. A python script `dataloader.py` to load the image sets with the related categories is provided.

1 Methods

The objective of this assignment is the development of a method that, given a pair of images allows to decide if they belong to the same category or not (Figure 2), or given a query image, allows finding the k most similar images in a set of reference samples (Figure 3).

1.1 Task1: Visual search from pretrained CNN

- Compute embeddings for query image and reference set
- Compute similarity metric
- Rank the `k` most similar images
- Compute performance metrics

1.2 Task2: Learning an embedding

- Choose CNN architecture (same as used in Task 1).
- Choose a Loss function
  - Contrastive loss
  - Triplet loss
- Choose a data sampling method
- Train and repeat Task 1
- Compute performance metrics and compare with Task 1

The PyTorch Metric Learning library provides useful modules to tackle the tasks of this assignment such as `Losses` to apply various loss functions, `Distances` to compute pairwise distances or similarities between input embeddings, `Miners` that provides functions for mining informative data, or `AccuracyCalculator` to calculate several accuracy metrics given a query and reference embeddings, among others.

Figure 2: Examples of similarity analysis by pairs of images.

Figure 3: Samples of queries from test set and their k nearest neighbors (k=7).

Submission

The due date for this project is **May 28th, 2023**. Each student should submit before the deadline a compressed file with:

- The code written in `Python`.
- A brief report describing the proposed approach (a PDF created with an IEEE conference template [1], max. 4 pages). The report should include an introduction to the problem, the proposed methodology, the experiment description, the results and conclusions.

[1] `https://www.ieee.org/conferences/publishing/templates.html`