Udacity Machine Learning Nano Degree

Capstone Project Proposal | Rémi Ang

Flowers Recognition

1. DOMAIN BACKGROUND

The background domain of this project is the **recognition of flowers species** based on pictures.

The automatic recognition of flowers can have various applications such as:

- Population tracking and preservation
- Crop and food supply management
- Toxicity detection
- Education
- …

Object recognition using machine learning is a major topic in the field of computer vision. The specific case of flower recognition (using SVM) has been approached by Y. Chai, University of Oxford, 2011

Link: http://www.robots.ox.ac.uk/~vgg/publications/2011/Chai11/chai11.pdf

More recent work has been realized and commercialize like the iOS Flower Recognition app developed by Microsoft Corporation (available only in China)

Link: https://www.microsoft.com/en-us/garage/profiles/flower-recognition/

2. PROBLEM STATEMENT

Is it possible to accurately identify the variety of a flower from a picture?

3. DATASETS AND INPUTS

The dataset is obtained from Kaggle.com and has been donated by Alexander Mamaev. The archive (zip) is 230MB big and contains 4326 images of flowers divided into 5 classes:

- Daisy (769 pictures)

- Dandelion (1055 pictures)
- Rose (784 pictures)
- Sunflower (734 pictures)
- Tulip (984 pictures)

Although the dataset is slightly unbalanced, it is reasonable to assume that each class is sufficiently represented.
The pictures are of various size and taken from various angle and brightness conditions. Some pictures have been post-processed with i.e. the addition of an artistic filter. Hence a picture re-sizing and standardization is foreseeable.
The train/test split will be performed prior to train the model.
The pictures originally come from flickr, google images and yandex.images.

Link: https://www.kaggle.com/faizunnabi/recognize-my-flower/data

4. SOLUTION STATEMENT

The state of the art solution to handle this picture classification problem is the creation and training of a deep convolutional neural network.

It could also be beneficial to take advantage of state of the art trained CNNs (i.e. ResNet50, Xception,…) and apply Transfer Learning.

5. BENCHMARK MODEL

The SVM classifier (20 classes) trained by Y. Chai (see §1.) reached an accuracy of 80.0%.
Link: http://www.robots.ox.ac.uk/~vgg/research/flowers_demo/

6. EVALUATION METRICS

The evaluation metric for this classification task is the accuracy:

$$accuracy = \frac{nb.of\ correct\ predictions}{total\ nb.of\ predictions} x\ 100$$

7. PROJECT DESIGN

The project shall consist in the following steps:

A. Data Exploration
   - Visualize data sample
   - Assess classes distributions
   - Clean the dataset if necessary
   - Derive input post-processing method

B. CNN architecture
   - Define a CNN architecture
   - Optimize the architecture (number of layers, layers size,…)
   - Implement transfer Learning if necessary

C. Design an application taking a picture of a flower in input and predicting its variety