DIP Project Two: Classification on CIFAR-10

1. Introduction

Project Two is about a task called “Classification on CIFAR-10”. Specially, in this part, we only select **5 classes: airplane, automobile, bird, cat and deer** to train and test the model. Given an input image, the purpose is to output a proper class of it. In other words, you can regard this task as an image multi-classification task.

2. Framework

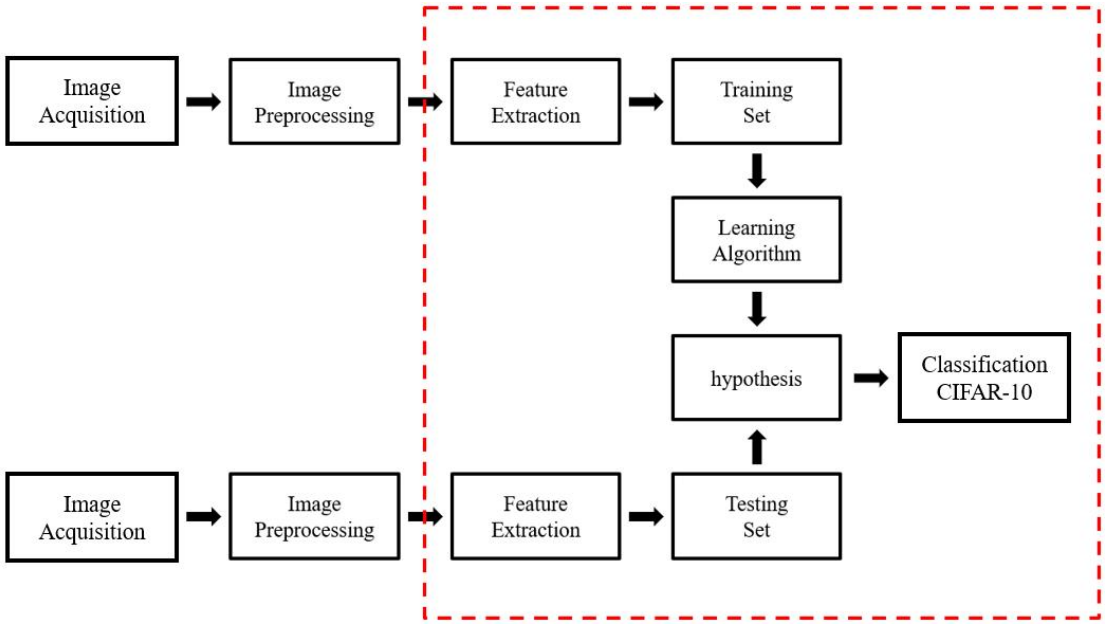

Figure 1. Recognition Framework

Figure 1 is a typical framework for classification on CIFAR-10. Now, we have done image acquisition and images preprocessing for you, all you need is to do feature extraction and implement an algorithm to do classification.

3. Feature Extraction

3.1 Texture Feature Extraction

Texture feature is one of the most important features in this task since different things will produce unique texture. Moments, Local Binary Pattern (LBP) and Gabor filters are common algorithms to extract texture feature. Also, you can try other texture feature as well such as Histogram of Gradient (HoG) and so on.

3.2 Feature reduction and feature fusion

Once you have done texture feature extraction, you may find it difficult to utilize it directly to do classification since the feature dimensionality is relatively high. Therefore, you should do feature reduction by some common methods such as Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA), etc.

In addition, feature fusion is also a feasible idea to improve classification accuracy. If you have extracted more than one feature, try to sum, multiply, concatenate them to get a fused feature. You may try other feature fusion methods, but do not waste much time on it, focusing on feature extraction step will be more helpful.

4. Classification

After getting proper feature vectors of input images, you should implement an algorithm to complete classification task. You can choose any multi-classification algorithm you known, such as K-Nearest Neighbors (KNN), etc., for unsupervised method or Logistic Regression (LR), Support Vector Machine (SVM), etc., for supervised method.

In the end, you should utilize your algorithm to give each image in test dataset a predicted class label, and evaluate your algorithm by computing classification accuracy.

5. Dataset

There are 300 images in total, we have already split them into train set and test set. For both train set and test set, we offer you a ".txt" file which contains corresponding class labels, the number 0,1,2,3,4 represents 5 classes "airplane", "automobile", "bird", "cat", "deer" separately.

Please use the images in folder "./dataset/train" for training classification algorithm and recognize the images in folder "./dataset/test" and give your recognition accuracy.

Attention

(1) The programing language is not limited and this time you **can** call third party functions.

(2) Besides aforementioned feature extraction, feature reduction, feature fusion and classification methods, you can try any other methods you want to improve your recognition accuracy. If you **refer to** others' papers, please **attach your references list** at the end of your report.

(3) Although Neural Networks seem to perform well in feature extraction, please **DO NOT** use any NN-related method to do feature extraction.

(4) Take it easy and Have fun! Most important: Do it by yourself!