Mechatronics Engineering Program
CSE480: Machine Vision
Fall 2022

Major Task Project: Image Classifiers

Students are encouraged to work in groups. Each group has at most three students.

Due Date: Milestone (1): TBD - Milestone (2):TBD

Objectives:
In this project students required to explore different techniques used in image classification. Different classifiers should be implemented and used to classify RGB images to different categories. The students should be able to compare the results of each classifier and decide which one has the best performance.

Description:

Image classification is one of the fundamental problems in computer vision. A traditional approach to tackle this problem is by a two-stage process. First features are extracted from the image and then a feature vector is passed to a machine learning technique to classify the images. One common configuration used is HOG feature with SVM classifier. Another state-of-the-art approach to classify images is using CNN. In this approach, neural network is used to do both the feature extraction and classification parts. As a training and testing dataset, choose any RGB images dataset with at least 100 classes. The project is divided into the following modules:

Milestone (1)

- Feature extraction: HOG feature can be extracted from image by OpenCV functions.
- Traditional classifier: In this module, KNN, K-means, and SVM classifiers are used to classify the images based on their feature vector. (Both KNN and K-means classifier should be implemented from scratch, Scikit-learn library can be used only in SVM classifier)

Milestone (2)

- CNN classifier:
  - Use TensorFlow to build a CNN network and train it to classify images.
  - Use a pretrained model that presents in the TensorFlow and tune-it to the classification task at hand.
- Compare the performance of the traditional and CNN classifiers choosing the classifier with the best performance.

The result should contain the performance metrics of each classifier (TP, TN, FP, FN) and samples of the classification results.

Important: You need to write a neat report for each milestone with the following contents:

- Problem definition and importance (1 Page).
- Methods and Algorithms (2-3 Pages).
- Experimental Results (samples of your trails) and discussions.
- Appendix with codes.

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Warnings: (1) Plagiarism is prohibited. (2) Assignments with no reports and or no presentations will not be graded.
