



Major Task Project: Image Classifiers

Students are encouraged to work in groups. Each group has at most two 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 will be implemented and used to classify RGB images into 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, color histograms, local binary patterns histogram will be used. You may use OpenCV functions to implement these features.
- Traditional classifiers: 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)

An encoder decoder network used for face recognition:

- Use TensorFlow to build an encoder decoder network as a multilayer perceptron network. What will be the recognition accuracy?
- Use TensorFlow to build a CNN-based encoder decoder network. What will be the recognition accuracy?
- Implement the Eigen-Faces and compares with the results you obtain from the above techniques.

**Mechatronics Engineering and Mechatronics Engineering and
Automation Programs
CSE480: Machine Vision
Fall 2024**

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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.

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