LAB -2

Image Classification using Feature Extraction and Machine Learning

Objective

The aim of this lab assignment is to classify images of dogs and cats using feature extraction techniques and machine learning classifiers. You will download the dataset, extract features using HOG and SURF, apply classification models, and compare their performances.

Tasks:

1. Dataset Collection

- Download the **Dogs vs Cats** dataset from **Kaggle.com**.
- Select **200 images of dogs** and **200 images of cats** (total **400 images**).
- Divide the dataset into 80% training data and 20% testing data

2. Feature Extraction

Extract features from the images using the following techniques:

- **Histogram of Oriented Gradients (HOG)**
- **Scale-Invariant Feature Transform(SIFT)**

Perform the extractions separately and convert images into numerical feature vectors.

3. Classification

Apply the following classification algorithms on the extracted features:

- **Logistic Regression**
- **Support Vector Machine (SVM)**

Train and test these classifiers on **both HOG and SIFT features separately**.

4. Performance Comparison

- Compare the accuracy of the **four combinations**:
    1. HOG + Logistic Regression
    2. HOG + SVM
    3. SIFT + Logistic Regression
    4. SIFT + SVM
- Analyse and discuss the differences in accuracy.

5. Feature Fusion & Classification

- Concatenate the **HOG and SIFT feature vectors** to create a new combined feature vector.
- Train and test the **Logistic Regression** and **SVM** classifiers on this combined feature set.
- Compare the accuracy of these models with the individual feature-based models.

6. **PLOT epoch vs accuracy graph for each combination for testing data**
(epoch-on x axis ,accuracy-on y axis)