Video-Based Drove vs Bird Classification Using Feature Extraction and Ensemble Techniques

Bharathi Shankar (21PD04)

Krithika L (21PD19)

ACADEMIC GUIDE

Dr. G. Poonthalir

Associate Professor

SYNOPSIS

This project leverages the trajectories of "Drone" and "Bird" to extract key features, subsequently employing these features for classification. The unique motion patterns exhibited by these entities serve as a pivotal aspect of the classification process, enabling the accurate differentiation between "Drone" and "Bird" classes.

In this "Drone vs Bird" classification task, the process begins with video input, which is segmented into individual frames. These frames serve as the basis for subsequent analysis. Feature extraction techniques are applied to each frame, capturing relevant information such as angle,curvature,velocity,and acceleration. The extracted features from all frames are organized into a CSV format, creating a structured dataset.

To ensure a balanced dataset, data balancing techniques are employed, for addressing any class imbalance between "Drone" and "Bird" instances we have used SMOTE Analysis . Principal Component Analysis (PCA) is then utilized to reduce the dimensionality of the dataset, converting the extracted features into a more compact representation. Finally, a Support Vector Machine (SVM) with a non-linear kernel function is employed for classification, trained on the balanced dataset. This model is evaluated using standard metrics to determine its effectiveness in distinguishing between "Drone" and "Bird" with the goal of achieving a high classification accuracy.In order to achieve better classification we have constructed Ensembled Model which consists of several model for ie.random forest,adaboost,linear svm and polynomial svm.

In this project, our primary goal is to classify and differentiate between two distinct classes, "Drove" and "Bird," using video data as our primary input.

The initial step of the process entails taking video input, which is subsequently divided into individual image frames. To capture the distinguishing features of both "Drove" and "Bird," we employ a meticulous feature selection process. These selected features act as essential descriptors that will enable our model to differentiate between the two classes.

Once the features are chosen, the subsequent step is feature extraction. This includes the calculation of key visual characteristics, such as the angle of curvature, color distribution, texture patterns, and other pertinent attributes. These extracted feature values are diligently collected and stored in a CSV (Comma-Separated Values) file.

A significant challenge in classification tasks arises when the dataset for each class, "Drove" and "Bird," is limited. To address this issue, we employ data augmentation techniques. These techniques artificially increase the dataset size by generating new instances. Common augmentation methods include mirroring, rotation, and flipping, which add diversity to the dataset and enhance the model's ability to generalize.

The dimensionality of the feature space is then reduced to enhance computational efficiency and model performance. Principal Component Analysis (PCA) is applied to distill the numerous features into a more manageable set of two principal components.

For the actual classification task, we utilize a Support Vector Machine (SVM) with a non-linear kernel function. The reduced feature space from the PCA is employed as input to the SVM. SVM is a potent tool for classification tasks, particularly adept at handling non-linearly separable data.

Ultimately, through the careful integration of feature engineering, dimensionality reduction using PCA, SVM with a non-linear kernel function, and ensemble modeling, we aim to achieve a classification accuracy of 90%.

The evaluation of the classification model is a crucial phase, which includes the application of relevant metrics such as accuracy, precision, recall, and the F1-score. These metrics provide an in-depth assessment of the model's performance in distinguishing between "Drove" and "Bird."