Algorithms

The "Recognizing Bird Sounds" project utilizes various algorithms for processing audio data, extracting features, and training machine learning models to identify bird species based on their sounds. This section provides an overview of the key algorithms used in the project, including their implementation and significance.

SVM Algorithm

Support Vector Machine (SVM) is a supervised machine learning algorithm widely used for classification tasks. In the context of bird sound recognition, SVM is utilized to classify audio recordings based on extracted features.

Key Steps of the SVM Algorithm:

1. Feature Extraction:
   - Extract Mel-frequency cepstral coefficients (MFCCs), chroma features, and spectral contrast from audio recordings using the Librosa library.

2. Data Preparation:
   - Normalize and standardize the extracted features.
   - Split the dataset into training, validation, and test sets.

3. Model Training:
   - Train the SVM classifier on the training set using the extracted features.
   - Optimize the hyperparameters of the SVM (e.g., kernel type, regularization parameter) using grid search or other hyperparameter tuning techniques.

4. Model Evaluation:
   - Evaluate the trained SVM model on the validation and test sets using metrics such as accuracy, precision, recall, and F1-score.
   - Select the best-performing model based on the evaluation metrics.

5.Prediction:
   - Use the trained SVM model to predict the bird species for new audio recordings.

Advantages of SVM:
- Effective in high-dimensional spaces.
- Memory efficient, as it uses a subset of training points in the decision function (support vectors).
- Versatile, as it can be used with different kernel functions to handle non-linear classification tasks.

Modules

The project is divided into several modules, each responsible for specific tasks within the bird sound recognition pipeline. The key modules are described below: