Experiment and Analysis

The "Recognizing Bird Sounds" project involves a series of experiments to train and evaluate the machine learning models used for bird sound recognition. This section outlines the dataset used, the models employed, the experimental setup, and the analysis of the results.

Dataset Description

The dataset for this project consists of audio recordings of bird sounds from various sources. Each recording is labeled with the corresponding bird species. The dataset is preprocessed to ensure consistency in audio format and quality. Key attributes of the dataset include:

- Total recordings: 1,000 audio files
- Number of bird species: 50
- Duration of each recording: Varies between 5 to 30 seconds
- Sampling rate: 44.1 kHz
- Format: WAV files

Experimental Setup

The experiments are designed to train and evaluate the performance of different machine learning models on the bird sound dataset. The steps involved in the experimental setup are as follows:

1. Data Preprocessing:
   - Load the audio recordings and convert them to a uniform sampling rate and bit depth.
   - Apply noise reduction and normalization techniques to enhance audio quality.

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

3. Data Splitting:
   - Split the dataset into training (70%), validation (15%), and test (15%) sets to ensure robust model evaluation.

4. Model Training:
   - Train various machine learning models, including Support Vector Machine (SVM) and Convolutional Neural Networks (CNN), on the training set.
   - Perform hyperparameter tuning using grid search or random search techniques.

5. Model Evaluation:
   - Evaluate the trained models on the validation set using metrics such as accuracy, precision, recall, and F1-score.
   - Select the best-performing model based on these evaluation metrics.

6. Testing and Analysis:
   - Test the selected model on the unseen test set to assess its generalization performance.
   - Analyze the results and compare the performance of different models.