

■ Music Genre Classification Project Report

Abstract

This project focuses on building a machine learning model that can classify music into different genres based on audio features. Using the GTZAN dataset and techniques such as Mel-spectrogram feature extraction and Convolutional Neural Networks (CNNs), the system achieves high accuracy in predicting music genres. Additionally, a Streamlit application is developed for real-time audio classification, making the model more interactive and practical.

Introduction

Music plays a vital role in human life and emotion. With the increasing volume of digital music, automatic classification of songs into genres has become a significant challenge. Traditional methods relied on manual tagging, which is often time-consuming and inaccurate. This project leverages deep learning and audio signal processing techniques to automatically classify songs into genres such as rock, classical, jazz, pop, and more. The goal is to build an accurate, scalable, and user-friendly system that can be deployed for various real-world applications in music recommendation, streaming platforms, and audio analytics.

Tools Used

- **Python 3.8+** for programming - **TensorFlow / Keras** for building and training deep learning models - **Librosa** for audio feature extraction (spectrograms, mel scale) - **NumPy / Pandas** for data preprocessing - **Matplotlib / Seaborn** for visualization - **scikit-learn** for evaluation metrics and preprocessing utilities - **Streamlit** for building an interactive web app - **GTZAN Dataset** as the primary dataset for training and testing

Steps Involved in Building the Project

1. **Data Collection**: The GTZAN dataset was used, containing 10 genres with 100 audio files each.
2. **Preprocessing**: Audio files were split into smaller chunks and converted into Mel-spectrograms.
3. **Feature Extraction**: Extracted meaningful audio features such as frequency and energy distributions.
4. **Model Building**: Designed a CNN-based model to classify input spectrograms into genres.
5. **Training & Evaluation**: The model was trained on preprocessed data and evaluated using accuracy and loss metrics.
6. **Deployment**: A Streamlit app was created to upload audio files and predict their genre in real-time.

Conclusion

This project successfully demonstrates the use of deep learning and audio signal processing for music genre classification. By utilizing CNNs on Mel-spectrogram features, the model achieves reliable performance on the GTZAN dataset. The integration of a Streamlit web application adds practical usability, allowing real-time predictions for uploaded audio files. Future improvements could include expanding the dataset, adding mood/tempo classification, and deploying the system on cloud platforms for wider accessibility.