Music Genre Classification

SYNOPSIS:

1. Introduction

- Overview of Music Genre Classification:

Music genre classification is a fundamental task in the field of music information retrieval (MIR), which involves categorizing music tracks into predefined genres based on their audio characteristics. This process plays a crucial role in organizing and recommending music in streaming services, developing music recommendations on systems, and aiding musicologists in research.

- Importance of Genre Classification:

Accurate genre classification enhances user experience by providing personalized music recommendations, enabling efficient music library management, and facilitating music analysis in various academic and commercial applications.

2. Background

- Evolu on of Music Genre Classification:

Initially, music genre classification was a manual process, dependent on human experts. However, with the advent of digital music and large

datasets, automated classification on using computational methods has gained prominence.

- Challenges:

The inherent subjectivity in defining genres, the overlap between genres, and the dynamic nature of music genres pose significant challenges in developing robust classification systems.

3. Problem Statement

- Key Problem:

Developing an automated system that can accurately classify music tracks into genres based on their audio features. The system must address challenges such as genre overlap, variability in music production, and differences in individual interpretations of genres.

4. Objective

- Primary Objective:

To design and implement a machine learning model that can accurately classify music tracks into genres by analyzing their audio features.

- Secondary Objectives:

- To explore different feature extract on techniques and identify the most effective ones for genre classification.

- To compare the performance of traditional machine learning models and deep learning models in genre classification.

- To evaluate the classification accuracy and identify potential improvements.

5. Literature Review/Research

- Overview of Exis ng Research:

- Early works focused on simple feature extraction methods like MFCCs and used classifiers such as k-NN or SVM.

- Recent advances involve the use of deep learning, particularly CNNs, which can automatically learn hierarchical features from raw audio data.

- Comparative Analysis:

- Comparison of traditional methods vs. deep learning approaches in terms of accuracy, computational complexity, and interpretability.

- Studies highlighting the challenges of genre classification due to genre overlap and dataset imbalance.

- Gaps in Research:

- Limited exploration of hybrid models that combine both traditional and deep learning features.

- A need for more diverse and larger datasets that represent emerging and fusion genres.

6. Methodology

- Data Collection:

- Selection of a comprehensive dataset (e.g., GTZAN, FMA) containing a wide range of genres.

- Feature Extraction:

- Extraction of audio features such as MFCCs, chroma features, spectral contrast, and others.

- Exploration of deep learning-based feature extraction using CNNs.

- Model Selection:

- Implementation of various models such as k-NN, SVM, Random Forest, and CNN.

- Use of techniques like data augmentation, transfer learning, and ensemble methods.

- Training and Validation:

- Splitting the dataset into training, validation, and test sets.

- Fine-tuning hyperparameters and evaluating the models using cross-validation.

7. Project Plan

- Phase 1: Literature Review and Data Collection

- Timeline: 2 weeks

- Ac vi es: Reviewing existing literature, selecting datasets, se ng up the environment.

- Phase 2: Feature Extras on and Model Development

- Timeline: 4 weeks

- Ac vi es: Extract ng features, developing machine learning and deep learning models.

- Phase 3: Model Training and Evaluation

- Timeline: 3 weeks

- Ac vi es: Training models, evaluation performance, refining models.

- Phase 4: Analysis and Documenta on

- Timeline: 2 weeks

- Ac vi es: Analyzing results, documenting the findings, and preparing the final report.

8. Expected Outcomes

- Development of a robust music genre classification system with high accuracy.

- Insights into the effectiveness of various features and models for genre classification.

- A comparative study of traditional machine learning and deep learning approaches.

9. Conclusion

- <u>Summary</u>:

    The project aims to contribute to the field of music information retrieval by developing a reliable genre classification system. Through the combination of traditional and modern techniques, the project seeks to address the challenges of genre overlap and dataset variability.

- <u>Future Work</u>:

- Exploration of real-me genre classification.

- Extension of the model to handle multi-genre tracks.

- Incorporated on of additional contextual features like lyrics and metadata for improved classification accuracy.

This outline provides a comprehensive structure for your music genre classification the project report.