Music Genre Classification using KNN

Team No: 03

Team Details:

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Abstract  
A machine learning system that automatically classifies music tracks into different genres using the K-Nearest Neighbors (KNN) algorithm. The system analyzes audio features like tempo, spectral characteristics, and rhythm patterns to categorize songs into genres such as rock, jazz, classical, hip-hop, and more.

Why This Project?  
Music streaming platforms handle millions of tracks, making manual genre classification impractical. This project provides an automated solution that:

* Helps organize large music libraries efficiently
* Enables better music recommendation systems
* Assists in music discovery and playlist generation
* Supports content creators in proper track categorization

Process

1. Data Collection & Preprocessing
   * Extract audio features using the Librosa library
   * Convert audio signals into numerical features (MFCCs, spectral centroid, chroma features)
   * Normalize and scale features for consistent processing
2. Model Implementation
   * Split dataset into training and testing sets
   * Apply KNN algorithm with optimal k-value
   * Train model using feature vectors and genre labels
3. Evaluation & Optimization
   * Measure accuracy, precision, and recall
   * Fine-tune hyperparameters
   * Cross-validate results

Required Technology & Algorithms

* Python 3.x
* Libraries: Librosa, Scikit-learn, NumPy, Pandas
* Audio processing techniques: FFT, MFCC extraction
* K-Nearest Neighbors algorithm
* Feature scaling and normalization methods

Conclusion  
The KNN-based music genre classification system provides a reliable solution for automated music categorization. With an accuracy of [X]%, it demonstrates the effectiveness of using audio feature analysis and machine learning for music classification tasks. The system's modular design allows for easy integration into larger music management systems.