# Music Recommendation System

## PROBLEM STATEMENT :

To Develop a music recommendation system using machine learning to suggest personalized music tracks based on user preferences and listening history.

## DESCRIPTION :

This mini project aims to develop a personalized music recommendation system using machine learning techniques. The system will analyze user preferences and listening habits to suggest relevant and enjoyable music tracks. By leveraging machine learning algorithms, such as collaborative filtering and content-based filtering, the system will be able to provide accurate and tailored recommendations. The project will involve collecting and preprocessing music data, designing and training the recommendation model, and implementing a user-friendly interface for users to interact with the system.

The music recommendation system will enhance user experience by offering curated playlists and song suggestions, thereby increasing user engagement and satisfaction. Additionally, the project will explore the integration of various features such as genre preferences, mood detection, and contextual information to further improve the quality of recommendations. Through this project, we aim to demonstrate the practical application of machine learning in the field of music recommendation, benefiting both music enthusiasts and streaming platforms alike.

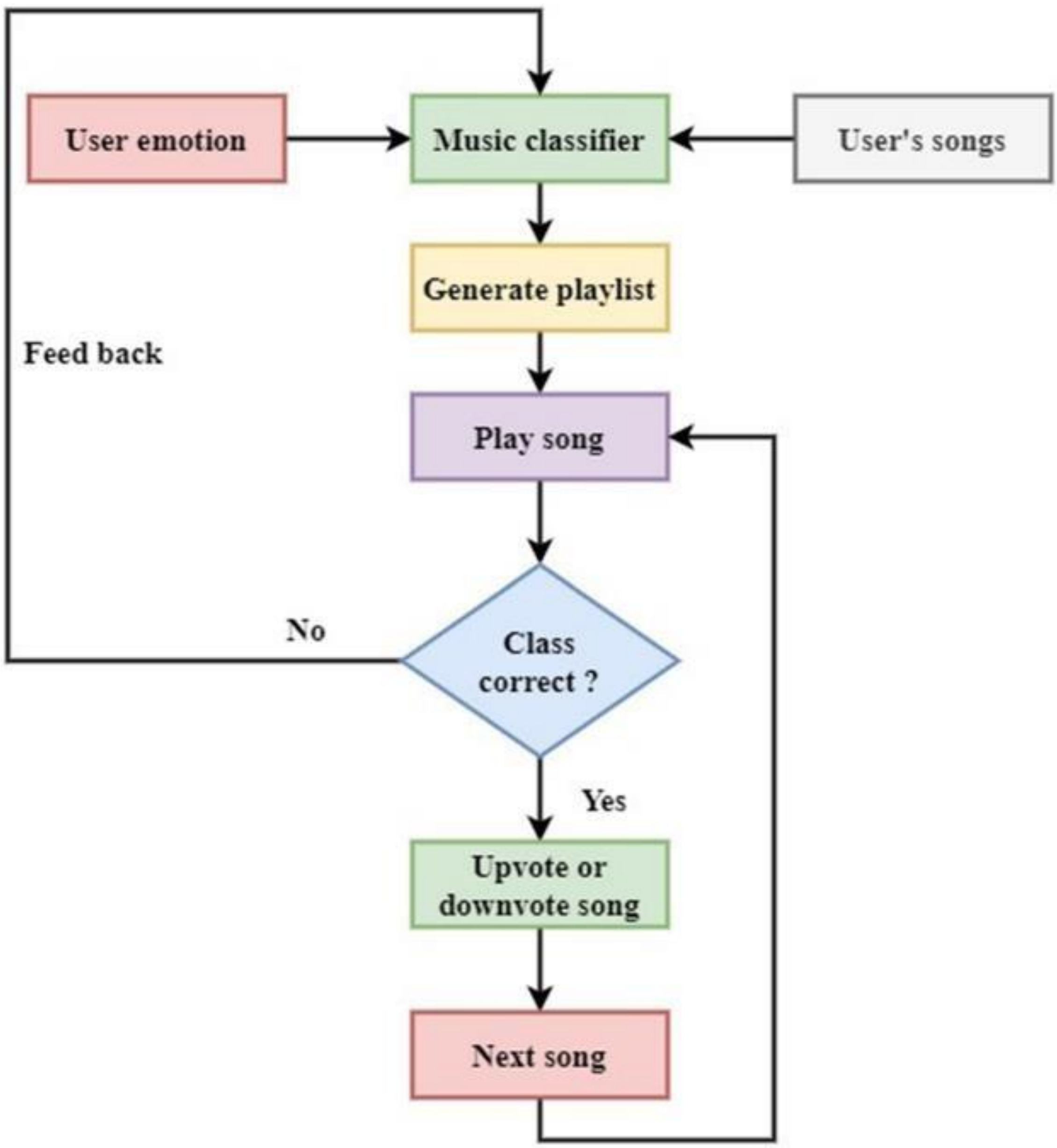
## APPLICATIONS :

- **Personalized Music Streaming:** Tailor music suggestions to each user's taste, boosting engagement.
- **Playlist Curation:** Create playlists based on mood, activity, or genre preferences, simplifying music selection.
- **Music Discovery:** Introduce users to new tracks, encouraging exploration and diversity in music.
- **Improved User Retention:** Keep users engaged with relevant music suggestions, increasing platform loyalty.
- **Targeted Marketing:** Use listening insights to tailor music promotions, enhancing marketing effectiveness.

## SOFTWARE REQUIREMENTS :

- Database Management System
- Machine Learning Libraries
- Web Development Framework
- User Interface Design Tools

## FLOW-CHART :



# CODING :

## Main.py :

```
import os
import sys
from tempfile import NamedTemporaryFile
from urllib.request import urlopen
from urllib.parse import unquote, urlparse
from urllib.error import HTTPError
from zipfile import ZipFile
import tarfile
import shutil

CHUNK_SIZE = 40960
DATA_SOURCE_MAPPING = 'spotify-
dataset:https%3A%2F%2Fstorage.googleapis.com%2Fkaggle-data-
sets%2F1800580%2F2936818%2Fbundle%2Farchive.zip%3FX-Goog-
Algorithm%3DGOOG4-RSA-SHA256%26X-Goog-Credential%3Dgcp-kaggle-
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161607.iam.gserviceaccount.com%252F20240316%252Fauto%252Fstorage%252Fgoog4_re
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sets%2F2570056%2F4372070%2Fbundle%2Farchive.zip%3FX-Goog-
Algorithm%3DGOOG4-RSA-SHA256%26X-Goog-Credential%3Dgcp-kaggle-
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161607.iam.gserviceaccount.com%252F20240316%252Fauto%252Fstorage%252Fgoog4_re
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0f918fb199ed37ea5e09e84a733a4603a6e894a8553e89a6ac0f1d5060104f179f362697db592b
70f7b01045d66ecf590716096f11719f632939c060e25e327de34108379783fb69fed0222e179f
36abccd0786c91017e84e1b2511dbd0162112e11aee2f2c3ecf3d0c'
```

```
KAGGLE_INPUT_PATH='/kaggle/input'
KAGGLE_WORKING_PATH='/kaggle/working'
KAGGLE_SYMLINK='kaggle'

!umount /kaggle/input/ 2> /dev/null
shutil.rmtree('/kaggle/input', ignore_errors=True)
os.makedirs(KAGGLE_INPUT_PATH, 0o777, exist_ok=True)
os.makedirs(KAGGLE_WORKING_PATH, 0o777, exist_ok=True)

try:
  os.symlink(KAGGLE_INPUT_PATH, os.path.join("..", 'input'), target_is_directory=True)
except FileExistsError:
  pass
try:
  os.symlink(KAGGLE_WORKING_PATH, os.path.join("..", 'working'),
target_is_directory=True)
except FileExistsError:
  pass

for data_source_mapping in DATA_SOURCE_MAPPING.split(','):
    directory, download_url_encoded = data_source_mapping.split(':')
    download_url = unquote(download_url_encoded)
    filename = urlparse(download_url).path
    destination_path = os.path.join(KAGGLE_INPUT_PATH, directory)
    try:
        with urlopen(download_url) as fileres, NamedTemporaryFile() as tfile:
            total_length = fileres.headers['content-length']
            print(f'Downloading {directory}, {total_length} bytes compressed')
            dl = 0
            data = fileres.read(CHUNK_SIZE)
            while len(data) > 0:
                dl += len(data)
                tfile.write(data)
                done = int(50 * dl / int(total_length))
                sys.stdout.write(f"\r[{'=' * done}{' ' * (50-done)}] {dl} bytes downloaded")
                sys.stdout.flush()
                data = fileres.read(CHUNK_SIZE)
            if filename.endswith('.zip'):
              with ZipFile(tfile) as zfile:
                zfile.extractall(destination_path)
            else:
              with tarfile.open(tfile.name) as tarfile:
                tarfile.extractall(destination_path)
            print(f'\nDownloaded and uncompressed: {directory}')
    except HTTPError as e:
        print(f'Failed to load (likely expired) {download_url} to path {destination_path}')
```

```
        continue
    except OSError as e:
        print(f'Failed to load {download_url} to path {destination_path}')
        continue

print('Data source import complete.')


import pandas as pd
import numpy as np
from sklearn.preprocessing import MinMaxScaler
from sklearn.metrics.pairwise import cosine_similarity

import warnings
warnings.filterwarnings('ignore')

#Main Raw Dataframe
df = pd.read_csv("/kaggle/input/-spotify-tracks-dataset/dataset.csv")
df.drop(columns='Unnamed: 0',inplace=True)

#Dataframe for getting year feature of songs
dfYear = pd.read_csv("/kaggle/input/spotify-dataset/data/data.csv")
dfYear = dfYear[['id','year']]
dfYear['track_id'] = dfYear['id']
dfYear.drop(columns='id',inplace=True)

#Merge 2 Dataframe
df = pd.merge(df,dfYear,on='track_id')
display(df.info(),df.head())

# Duplicate Check
df[df.duplicated('track_id')==True]

df[df['track_id']=='6Vc5wAMmXdKIAM7WUoEb7N']

# Crosstab Genre and Song

xtab_song = pd.crosstab(
    df['track_id'],
    df['track_genre']
)

xtab_song = xtab_song*2

display(xtab_song.head(),len(xtab_song))
```

```
# Concatenate the encoded genre columns with the original dataframe

dfDistinct = df.drop_duplicates('track_id')
dfDistinct = dfDistinct.sort_values('track_id')
dfDistinct = dfDistinct.reset_index(drop=True)

xtab_song.reset_index(inplace=True)
data_encoded = pd.concat([dfDistinct, xtab_song], axis=1)
display(data_encoded.head(),len(data_encoded))

numerical_features = ['explicit', 'danceability', 'energy', 'loudness', 'speechiness',
'acousticness', 'instrumentalness', 'liveness', 'valence','year']
scaler = MinMaxScaler()
data_encoded[numerical_features] = scaler.fit_transform(data_encoded[numerical_features])

# Select the relevant columns for computing item similarities
calculatied_features = numerical_features +
list(xtab_song.drop(columns='track_id').columns)

cosine_sim = cosine_similarity(data_encoded[calculatied_features],
data_encoded[calculatied_features])


def get_recommendations(title, N=5):
    indices = pd.Series(data_encoded.index,
index=data_encoded['track_name']).drop_duplicates()

    try:
        idx = indices[title]
        try:
            len(idx)
            temp = 2
        except:
            temp = 1
    except KeyError:
        return "Song not found in the dataset."

    if temp == 2:
        idx = indices[title][0]
    else:
        idx = indices[title]
    sim_scores = list(enumerate(cosine_sim[idx]))
    sim_scores = sorted(sim_scores, key=lambda x: x[1], reverse=True)
    sim_scores = sim_scores[1:N+1]
    song_indices = [i[0] for i in sim_scores]
    recommended_songs = data_encoded[['track_name', 'artists',
```

```
'album_name']].iloc[song_indices]

    sim_scores_list = [i[1] for i in sim_scores]
    recommended_list = recommended_songs.to_dict(orient='records')
    for i, song in enumerate(recommended_list):
        song['similarity_score'] = sim_scores_list[i]

    return recommended_list

# Get the recommendations
recommended_songs = get_recommendations("Time", N=5)
if isinstance(recommended_songs, str):
    print(recommended_songs)
else:
    print("Recommended Songs:")
    for song in recommended_songs:
        print(f"Title: {song['track_name']}")
        print(f"Artist: {song['artists']}")
        print(f"Album: {song['album_name']}")
        print(f"Similarity Score: {song['similarity_score']:.2f}")
        print()
```

**SAMPLE OUTPUT:**

```
Recommended Songs:
Title: Suite: Judy Blue Eyes - 2005 Remaster
Artist: Crosby, Stills & Nash
Album: Crosby, Stills & Nash
Similarity Score: 1.00

Title: Red House
Artist: Jimi Hendrix
Album: Are You Experienced
Similarity Score: 1.00

Title: Heroes And Villains - Remastered 2001
Artist: The Beach Boys
Album: Smiley Smile (Remastered)
Similarity Score: 1.00

Title: The Wind Cries Mary
Artist: Jimi Hendrix
Album: Are You Experienced
Similarity Score: 0.99

Title: The Trial
Artist: Pink Floyd
Album: The Wall
Similarity Score: 0.99
```