M.KUMARASAMY
COLLEGE OF ENGINEERING
NAAC Accredited Autonomous Institution
Approved by AICTE & Affiliated to Anna University
ISO 9001:2015 & ISO 14001:2015 Certified Institution
Thalavapalayam, Karur – 639 113.

A Minor Project Report

On

EMOTION BASED MUSIC RECOMMENDATION SYSTEM

Submitted in partial fulfillment of requirements for the award of the

Degree of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

Under the guidance of

Dr.D.PRADEEP (Assistant Professor)/CSE

Submitted by

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING

(Autonomous)

KARUR – 639113

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(Autonomous Institution affiliated to Anna University, Chennai)

KARUR – 639113

BONAFIDE CERTIFICATE

Certified that his minor project report **"EMOTION BASED MUSIC RECOMMENDATION SYSTEM"** is the bonafide work of **"ABUBAKKAR A I (927621BCS005), ELAMARAN A (927621BCS029), JEEVANANTHAM P (927621BCS044) and JEYARAM R (927621BCS047)"** Who carried out the project work during the academic year 2022- 2023 under my supervision.

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VISION OF THE INSTITUTION

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- Professional associations.

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- To excel in academics through effective teaching and learning techniques.
- To promote search in the area of computer science and engineering with a focus on innovation.
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PROGRAM EDUCATIONAL OBJECTIVES(PEOs)

PEO1: Graduates will have a successful career in software industries and R&D divisions through continuous learning.

PEO2: Graduates will provide effective solutions for real-world problems in the key domain of computer science and engineering and engage in lifelong learning.

PEO3: Graduates will excel in their profession by being ethically and socially responsible.

PROGRAM OUTCOMES(POs)

Engineering students will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identity, formulate, review research literature, and analyzecomplexengineeringproblemsreachingsubstantiatedconclusionsusingfirstprinciplesof mathematics, the natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate public health, safety, and environmental considerations.
4. **Conduct investigations of complex problem sets:** Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineeringandITtoolsincludingpredictionandmodelingtocomplexengineeringactivities with an understanding of the limitations.
6. **The engineer and society:** App reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts ,and demonstrate the knowledge of ,and need for sustainable development.
8. **Ethics:** Apply ethical principles, and commit to professional ethics, responsibilities, and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member in a diverse team season multidisciplinary settings.
10. **Communication: Communicate effectively on complex engineering activities with the engineering** community and with society at large such as, being able to command write reports and designs and design do make effective presentations, and give and receive clear instructions.

11. **Project management and finance Demonstrate knowledge and understanding of the engineering management** principles in applying and apply to one's work, as a remember and leading team to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for preparation and the ability to engage in independent and life-learn learning in the context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSOs)

PSO1: Professional Skills: Ability to apply the knowledge of computing techniques to design and develop computerized solutions for problems.

PSO2: Successful career: Ability to utilize computing skills and ethical values in creating a successful career.

ABSTRACT

A user's emotion or mood can be detected by his/her facial expressions. These expressions can be derived from the live feed via the system's camera. A lot of research is being conducted in the field of Computer Vision and Machine Learning (ML), where machines are trained to identify various human emotions or moods. Machine Learning provides various techniques through which human emotions can be detected. People often use music as a means of mood regulation, specifically to change a bad mood, increase energy level or reduce tension. Also, listening to the right kind of music at the right time may improve mental health. Thus, human emotions have a strong relationship with music. In our proposed system, a mood-based music player is created which performs real time mood detection and suggests songs as per detected mood.

ABSTRACT WITH PO AND PSO MAPPING

ABSTRACT	POs MAPPED	PSOs MAPPED
A user's emotion or mood can be detected by his/her facial expressions. These expressions can be derived from the live feed via the system's camera. A lot of research is being conducted in the field of Computer Vision and Machine Learning (ML), where machines are trained to identify various human emotions or moods. Machine Learning provides various techniques through which human emotions can be detected. Thus, human emotions have a strong relationship with music. In our proposed system, a mood-based music player is created which performs real time mood detection and suggests songs as per detected mood.	**PO1(3)** **PO2(3)** **PO3(2)** **PO4(2)** **PO5(2)** **PO6(1)** **PO7(3)** **PO8(2)** **PO9(3)** **PO10(3)** **PO11(2)** **PO12(2)**	**PSO1(3)** **PSO2(2)**

Note: 1-Low, 2-Medium, 3-High

SUPERVISOR **HEAD OF THE DEPARTMENT**

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LIST OF ACRONYMS/ABBREVIATIONS

EBMRS	Emotion Based Music Recommendation System
ML	Machine Learning
API	Application Programming Interface
HTML	Hyper Text Markup Language
CSS	Cascading Style Sheet
GPU	Graphics Processing Unit
AI	Artificial Intelligence
WSGI	Web Server Gateway Interface
ANN	Artificial Neural Networks

CHAPTER 1

INTRODUCTION

Human emotions can be broadly classified as: fear, anger, surprise, sad, happy and neutral. A large number of other emotions such as cheerful (which is a variation of happy) and contempt (which is a variation of disgust) can be categorized under this umbrella of emotions. These emotions are very subtle. Facial muscle contortions are very minimal, and detecting these differences can be very challenging as even a small difference results in different expressions. Also, expressions of different or even the same people might vary for the same emotion, as emotions are hugely context dependent. While the focus can on only those areas of the face which display a maximum of emotions like around the mouth and eyes, how these gestures are extracted and categorized is still an important question. Neural networks and machine learning have been used for these tasks and have obtained good results. Machine learning algorithms have proven to be very useful in pattern recognition and classification, and hence can be used for mood detection as well. With the development of digital music technology, the development of a personalized music recommendation system which recommends music for users is essential.

Figure 1.1 Emotion Based Music Recommentation System

1.1 OVERVIEW

In our proposed system, emotion based music recommendation system is created which performs real time mood detection and suggests songs as per detected mood and selected singer in the particular language. An important benefit of incorporating mood detection is customer satisfaction. The objective of this system is to analyse the user's image, predict the expression of the user and suggest songs suitable to the detected mood. This can be achive by the library like keras and tensorflow which is available in the python language as a deep and machine learning libraries which are commonly used for building and training deep neural networks. They are often used together, with Keras providing a high-level API for building neural networks, and TensorFlow providing a powerful backend engine for running those network.

1.2 DOMAIN INTRODUCTION

HTML :

HTML is the standard markup language for documents designed to be displayed in the web browser. It is one of the most basic building blocks of every website, so it's crucial to learn if you want to have a career in web development. HTML elements are often used interchangeably with tags, but there is a small difference between the two. An element is a combination of the opening and closing tags and the content between them.

Figure 1.2 HTML Logo

CSS :

CSS is the language for describing the presentation of Web pages, including colors, layout, and fonts thus making your web page presentable to the users. CSS is designed to make style sheets for the web. It is independent of HTML and can be used with any XML-based markup language.

Figure 1.3 CSS Logo

PYTHON

ML LIBRARY USED :

Machine Learning, as the name suggests, is the science of programming a computer by which they are able to learn from different kinds of data. In the older days, people used to perform Machine Learning tasks by manually coding all the algorithms and mathematical and statistical formulas. This made the processing time-consuming, tedious, and inefficient. But in the modern days, it is become very much easy and more efficient compared to the olden days with various python libraries, frameworks, and modules. Today, Python is one of the most popular programming languages for this task and it has replaced many languages in the industry, one of the reasons is its vast collection of libraries. Python libraries that are used

- Numpy
- Keras
- TensorFlow

NUMPY : NumPy is a very popular python library for large multi-dimensional array and matrix processing, with the help of a large collection of high-level mathematical functions. It is very useful for fundamental scientific computations in Machine Learning. It is particularly useful for linear algebra, Fourier transform, and random number capabilities. High-end libraries like TensorFlow uses NumPy internally for manipulation of Tensors.

Figure 1.4 NumPy Logo

KERAS : Keras is a very popular Machine Learning library for Python. It is a high-level neural networks API capable of running on top of TensorFlow. It can run seamlessly on both CPU and GPU. Keras for ML beginners to build and design a Neural Network. One of the best thing about Keras is that it allows for easy and fast prototyping.

Figure 1.5 Keras Logo

TENSORFLOW : TensorFlow is a very popular open-source library for high performance numerical computation developed by the Google Brain team in Google. As the name suggests, Tensorflow is a framework that involves defining and running computations involving tensors. It can train and run deep neural networks that can be used to develop several AI applications. TensorFlow is widely used in the field of deep learning research and application.

Figure 1.6 TensorFlow Logo

PYTHON

FRAMEWORK USED :

FLASK : Flask is a web application framework written in Python. It is based on the Werkzeg WSGI toolkit and the Jinja2 template engine.

Figure 1.7 Flask Logo

- **WSGI -** The Web Server Gateway Interface (WSGI) has been used as a standard for Python web application development. WSGI is the specification of a common interface between web servers and web applications.
- **Werkzeug -** Werkzeug is a WSGI toolkit that implements requests, response objects, and utility functions. This enables a web frame to be built on it. The Flask framework uses Werkzeg as one of its bases.
- **Jinja2 -** jinja2 is a popular template engine for Python. A web template system combines a template with a specific data source to render a dynamic web page.

1.3 PROBLEM STATEMENT

In old-style music players, a user had to manually browse through the playlist and select songs that according to his mood. These systems only allow you to live a static user-experience as the system will give recommendation based on the history without regard to other parameters that might impact the prediction such as feeling or emotion. These recommendation systems will sometimes fail to give the correct output because their suggestions are based on outdated input. So, the user cannot be satisfied with the output as it doesn’t satisfy his emotion.

1.4 OBJECTIVE

The main objective of our music recommendation system is to provide suggestions to the users that fit the user's preferences. The analysis of the facial expression/user emotion may lead to understanding the current emotional or mental state of the user. This system analyze the user's image, predict the expression of the user and suggest suitable song according to the mood detected in the user’s image. This can be achive by the library like keras and tensorflow which is available in the python language.

CHAPTER 2

LITERATURE SURVEY

"Deep Learning-Based Music Emotion Recognition and Recommendation System" by Haoxiang Lin and Xiangzhan Yu (2019) - This paper proposes a music recommendation system that uses deep learning techniques to recognize emotions in music. The system is trained using a dataset of user ratings and emotions, and is able to make personalized recommendations based on the user's emotional state.

"Emotion-Based Music Recommendation System Using Machine Learning Techniques" by S. A. Sathish Kumar and V. Venkatachalam (2020) - This paper proposes a music recommendation system that uses machine learning techniques such as decision trees, random forests, and support vector machines to classify songs based on their emotional content. The system is trained using a dataset of user ratings and emotions, and is able to make personalized recommendations based on the user's emotional state.

"Emotion-Based Music Recommendation by Combining Acoustic Features and Lyrics" by Vasiliki Chatzigiannaki and Alexandros Potamianos (2017) - This paper proposes a music recommendation system that uses both acoustic features and lyrics to determine the emotional content of a song. The system is trained using a dataset of user ratings and emotions, and is able to make personalized recommendations based on the user's emotional state.

Renuka R Londhe et al. proposed a paper which focused on the study of changes in the curvatures of the face and the intensities of the corresponding pixels. The author used Artificial Neural Networks (ANN), which was used to classify the emotions. The author also proposed various approaches for a playlist.

CHAPTER 3

PROJECT METHODOLOGY

3.1 BLOCK DIAGRAM

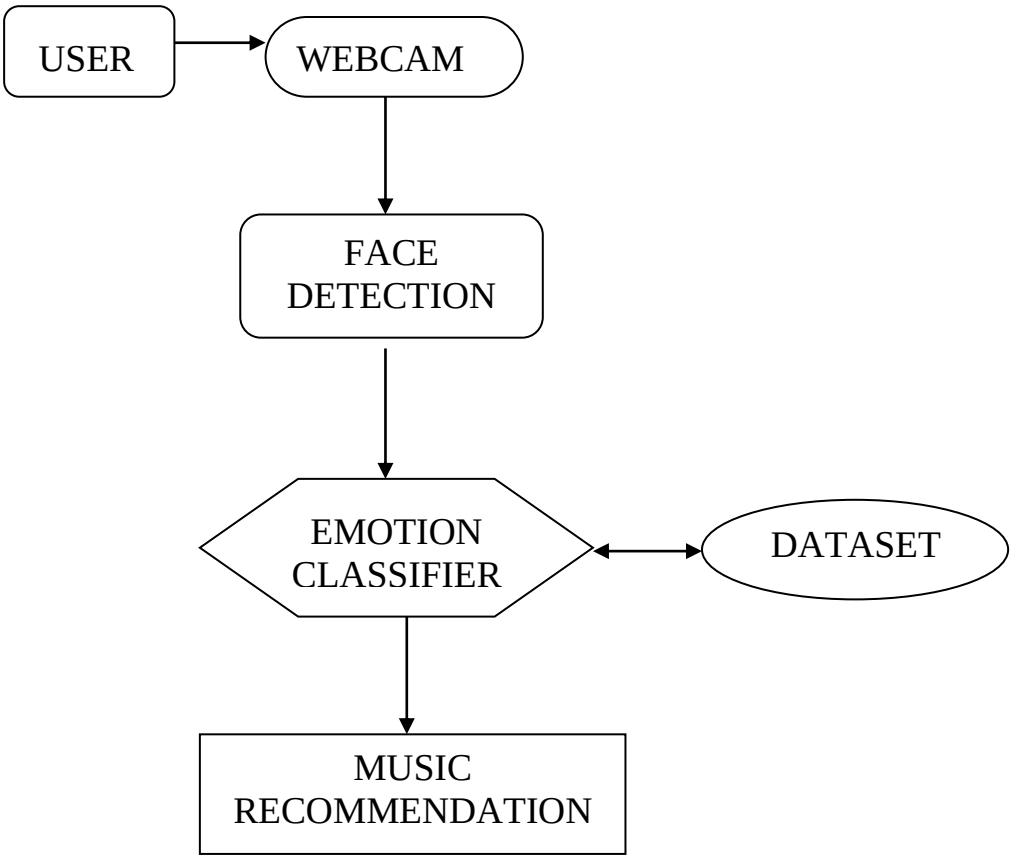

Figure 3.1 Block diagram of Emotion Based Music Recommendation System

3.2 MODULE DESCRIPTION

Selection of language :

- In this module user need to select the preferred language in which music will be recommended. According to the selection of the language the music recommendation will be done.

Selection of singer :

- In this module user need to select the preferred singer in which music will be recommended. This allows the music recommendation of the particular singer.

Detected emotion :

- In this module the detected emotion of the image is shown. The emotion can be detected by the facial expression of the user who used the system.

Recommendation of music :

- According to the selection of language, singer and the detected emotion the music will be recommended in the youtube search.
- This music recommendation of the current emotional or mental state of the user will lead to statisfy the user.

CHAPTER 4

RESULTS AND DISCUSSION

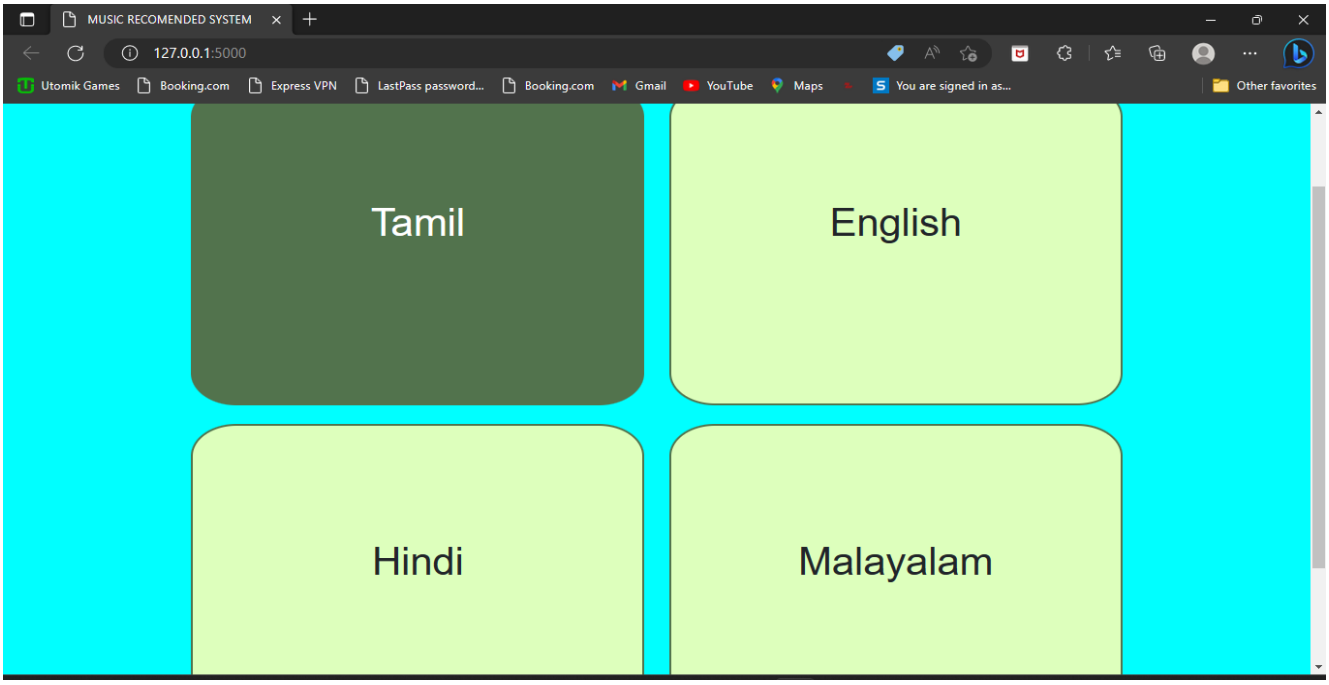

Figure 4.1 Screenshot of selection of preferred language

This figure deals with the selection of the preferred language which is selected by the user. There are some listed language option available and user need to select the preferred language from that. This page can developed by using the HTML and CSS language.

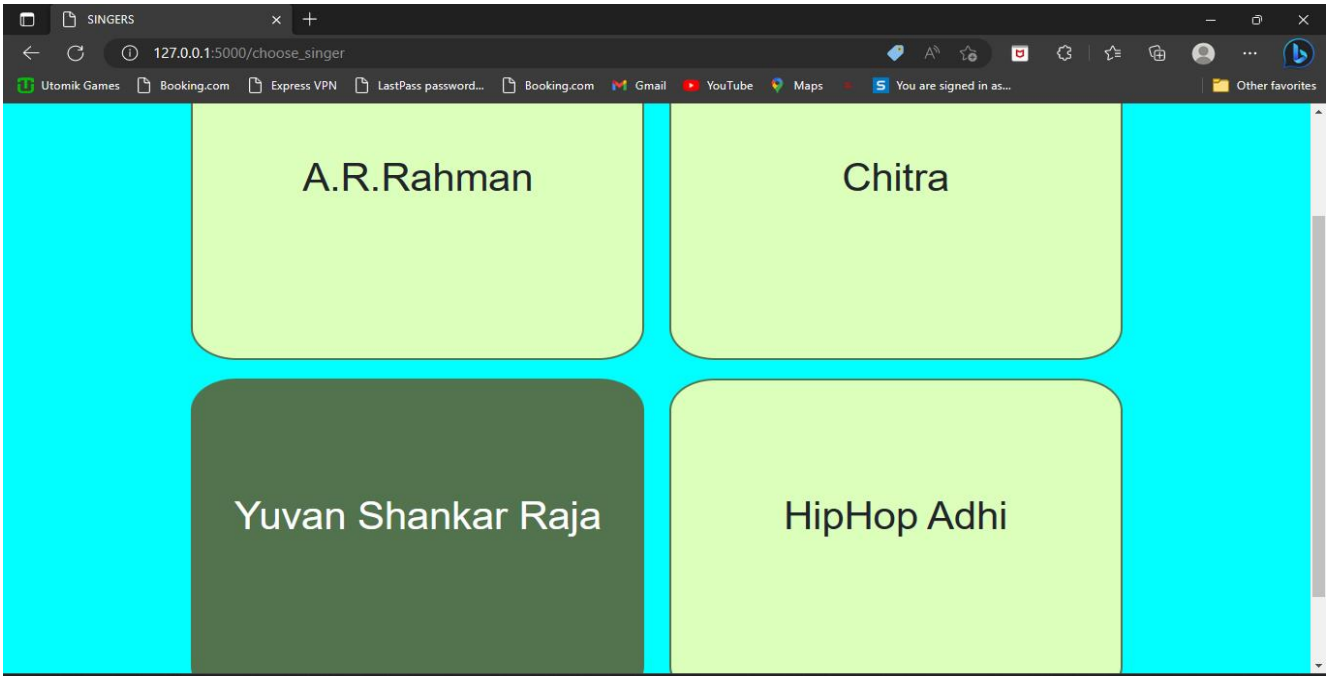

Figure 4.2 Screenshot of selection of preferred singer

This figure deals with the selection of the preferred language which is selected by the user. There are some listed singer option available according to the selection of the language and user need to select the preferred singer from that. This page can developed by using the HTML radio option and CSS language.

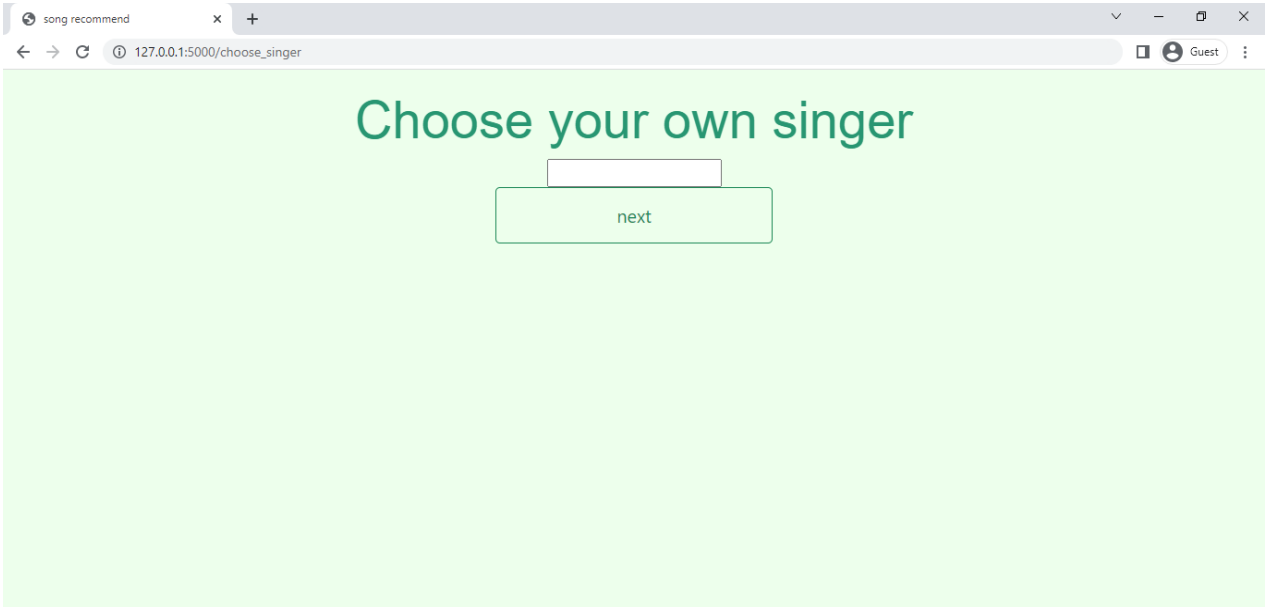

Figure 4.3 Screenshot of choosing own singer

This figure deals with choosing own singer by typing the name of the preferred singer. If the user want to select the own singer which is not listed in the given option then user need to type the name of the preferred singer and click next to proceed with the entered singer's name.

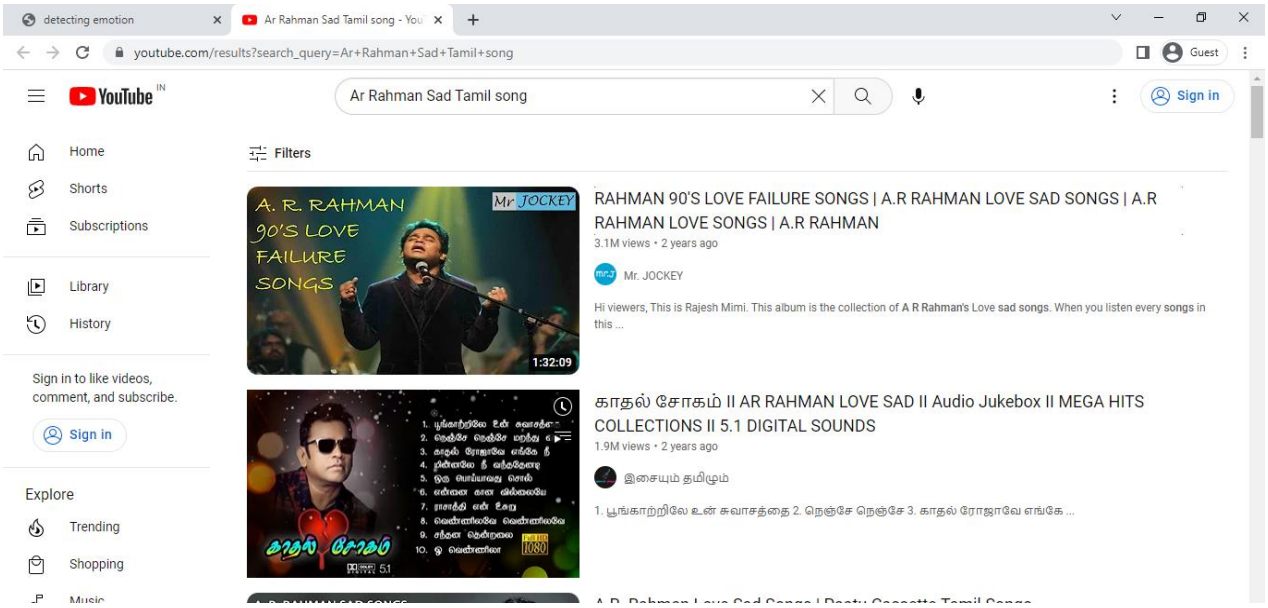

Figure 4.4 Example screenshot of recommending Sad Tamil song

This figure deals with the example screenshot of recommending sad Tamil song based on the user's sad emotion. It shows that the recommendation of the song Ar Rahman sad Tamil song which was selected by the user language -> Tamil and the singer -> Ar Rahman and the detected emotion as the sad.

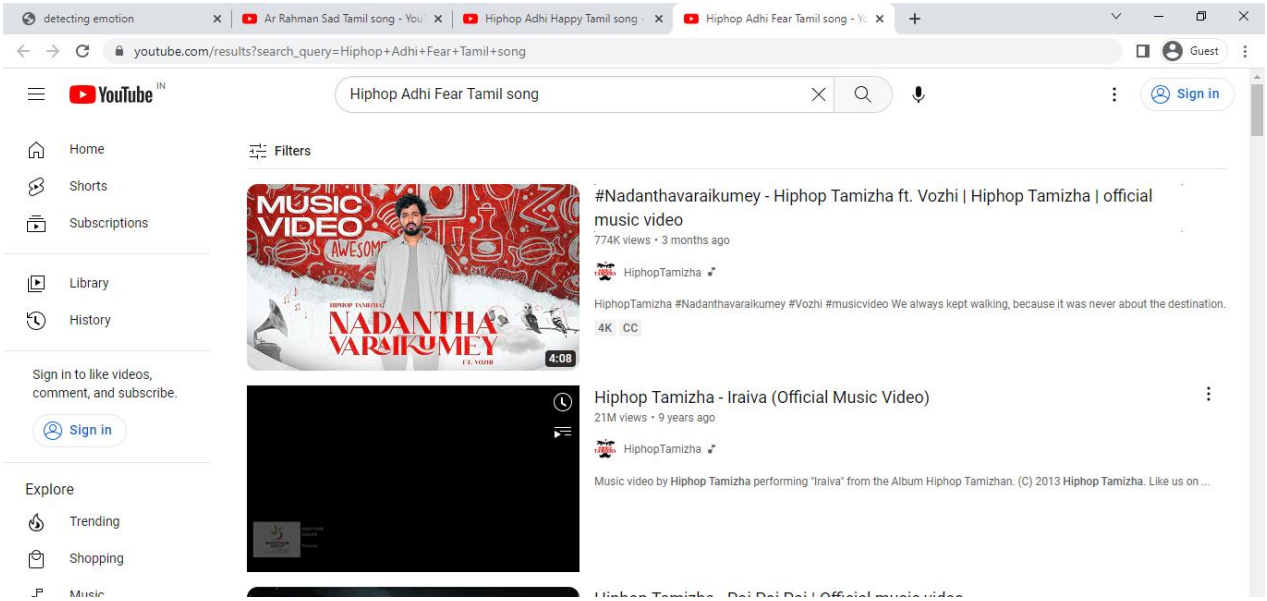

Figure 4.5 Example screenshot of recommending Fear song

This figure deals with the example screenshot of recommending fear Tamil song based on the user's fear emotion. It shows that the recommendation of the song Hiphop Adhi Fear song which was selected by the user language -> Tamil and the singer -> Hiphop Adhi and the detected emotion as the Fear.

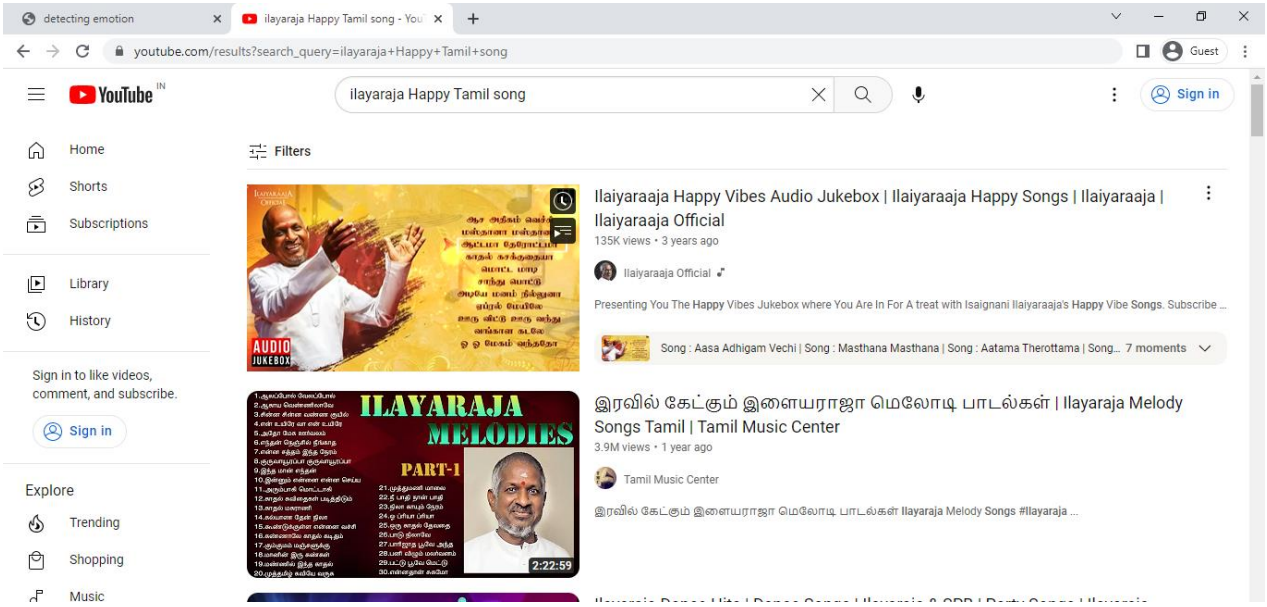

Figure 4.6 Example screenshot of recommending Happy Tamil song

This figure deals with the example screenshot of recommending happy Tamil song based on the user's happy emotion. It shows that the recommendation of the song Ilayaraja Happy Tamil song which was selected by the user language -> Tamil and the singer -> Ilayaraja and the detected emotion as the Happy.

CHAPTER 5

CONCLUSION AND SCOPE FOR FUTURE WORKS

The project “Emotion Based Music Recommendation System” is based on the emotions that are captured in real time images of the user. This project is designed for the purpose of making better interaction between the music system and the user. Because music is helpful in changing the mood of the user and for some people it is a stress reliever. Recent development it shows a wide prospective in the developing the emotion based music recommendation system. Thus the present system presents Face (expressions) based recognition system so that it could detect the emotions and music will be played accordingly.

For accurate detection of fear and disgust moods, additional parameters such as heart rate or body temperature must also be considered rather than solely depending on facial expressions, it can be considered as a future scope for our project.

REFERENCES

[1] Ramya Ramanathan, Radha Kumaran, Ram Rohan R, Rajat Gupta, and Vishalakshi Prabhu, an intelligent music player based on emotion recognition, 2nd IEEE International Conference on Computational Systems and Information Technology for Sustainable Solutions 2017. https://doi.org/10.1109/CSITSS.2017

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[4] Shlok Gilda, Husain Zafar, Chintan Soni, Kshitija Waghurdekar, Smart music player integrating facial emotion recognition and music mood recommendation, Department of Computer Engineering, Pune Institute of Computer Technology, Pune, India, (IEEE),2017. https://doi.org/10.1109/WiSPNET.2017.8299738

APPENDIX

SELECT LANGUAGE PAGE :

```
<!DOCTYPE html>
<html>
<head>
<title>music recommend</title>
<link rel="stylesheet" type="text/css" href="{{url_for('static',filename='style.css')}}">
<link
href="https://cdn.jsdelivr.net/npm/bootstrap@5.0.0beta3/dist/css/bootstrap.min.css"
rel="stylesheet"
integrity="sha384eOJMYsd53ii+scO/bJGFsiCZc+5NDVN2yr8+0RDqr0Ql0h+rP48cx
lpbzKgwra6" crossorigin="anonymous">
</head>
<body style="background-color: #2331b6;">
<div class="title">
<h1 class="display-4">Select Language</h1>
</div>
<form action="{{url_for('choose_singer')}}" method="POST">
<label><input type="radio" name="language" value="Tamil" checked="true"><div
class="box">Tamil</div></label>
<label><input type="radio" name="language" value="english"><div
class="box">english</div></label><br>
<label><input type="radio" name="language" value="hindi"><div
class="box">hindi</div></label><label><input type="radio" name="language"
value="Malayalam">
```

<divclass="box">Malayalam </label>

<input type="submit" name="btn" value="next" class="btn btn-outline-success btn-lg">
</form>
<script src="https://cdn.jsdelivr.net/npm/bootstrap@5.0.0-beta3/dist/js/bootstrap.bundle.min.js" integrity="sha384-JEW9xMcG8R+pH31jmWH6WWP0WintQrMb4s7ZOdauHnUtxwoG2vI5DkLtS3qm9Ekf" crossorigin="anonymous"></script>
</body>
</html>

SELECT SINGER PAGE:

<!DOCTYPE html>
<html>
<head>
<title>song recommend</title>
<link rel="stylesheet" type="text/css" href="{{url_for('static', filename='style.css')}}">
<link href="https://cdn.jsdelivr.net/npm/bootstrap@5.0.0-beta3/dist/css/bootstrap.min.css" rel="stylesheet" integrity="sha384-eOJMYsd53ii+scO/bJGFsiCZc+5NDVN2yr8+0RDqr0Ql0h+rP48ckxlpbzKgwra6" crossorigin="anonymous">
</head>
<body style="background-color: #edffec;">
<form action="{{url_for('emotion_detect')}}" method="POST">
{%if data == "Tamil"%}

```
<div class="title">
<h1 class="display-4">Tamil Singer</h1>
</div>
<label><input type="radio" name="singer" value="Ar Rahman" checked="true"><div
class="box">Ar Rahman</div></label>
<label><input type="radio" name="singer" value="Ilayaraja"><div
class="box">Ilayaraja</div></label>
<br>
<label><input type="radio" name="singer" value="SPB"><div
class="box">SPB</div></label>
<label><input type="radio" name="singer" value="Hiphop Adhi"><div
class="box">Hiphop Adhi</div></label>
{%elif data == "english"%}
<div class="title">
<h1 class="display-4">English singer</h1>
</div>
<label><input type="radio" name="singer" value="George Michael"
checked="true"><div class="box">George Michael</div></label>
<label><input type="radio" name="singer" value="Ed Sheeran"><div class="box">Ed
Sheeran</div></label>
<br>
<label><input type="radio" name="singer" value="Adele">
<div class="box">Adele</div></label>
<label><input type="radio" name="singer" value="Olivia Rodrigo">
<div class="box">Olivia Rodrigo</div></label>
{%else%}
```

```
<div class="title">
<h1 class="display-4">Choose your own singer</h1>
</div>
<input type="text" name="singer">
{%endif%}
<br>
<input type="submit" name="btn" value="next" class="btn btn-outline-success btn-lg">
</form>
</body>
</html>
```

EMOTION DETECT PAGE:

```
<!DOCTYPE html>
<html>
<head>
<title>detecting emotion</title>
<link rel="stylesheet" type="text/css" href="{{url_for('static', filename='style.css')}}">
<link href="https://cdn.jsdelivr.net/npm/bootstrap@5.0.0-
beta3/dist/css/bootstrap.min.css" rel="stylesheet" integrity="sha384-
eOJMYsd53ii+scO/bJGFsiCZc+5NDVN2yr8+0RDqr0Ql0h+rP48ckxlpbzKgwra6"
crossorigin="anonymous">
</head>
<body style="background-color: #edffec;">
<div class="title">
<h1 class="display-4">you looks like {{data}}</h1>
<h1><a href="{{link}}" title="">go to here</a></h1>
```

```
</div>
<img src="{{url_for('static', filename='face.jpg')}}"></body></html>
```

CONNECTION:

```
from flask import Flask, render_template, request
import numpy as np
import cv2
from keras.models import load_model
import webbrowser
app = Flask(__name__)
app.config['SEND_FILE_MAX_AGE_DEFAULT'] = 1
info = {}
haarcascade = "haarcascade_frontalface_default.xml"
label_map = ['Anger', 'Neutral', 'Fear', 'Happy', 'Sad', 'Surprise']
print("+"*50, "loadin gmmodel")
model = load_model('model.h5')
cascade = cv2.CascadeClassifier(haarcascade)
@app.route('/')
def index():
    return render_template('index.html')
@app.route('/choose_singer', methods = ["POST"])
def choose_singer():
    info['language'] = request.form['language']
    print(info)
    return render_template('choose_singer.html', data = info['language'])
@app.route('/emotion_detect', methods=["POST"])
```

```
def emotion_detect():
        info['singer'] = request.form['singer']
        found = False
        cap = cv2.VideoCapture(0)
        while not(found):
                _, frm = cap.read()
                gray = cv2.cvtColor(frm,cv2.COLOR_BGR2GRAY)
                faces = cascade.detectMultiScale(gray, 1.4, 1)
                for x,y,w,h in faces:
                        found = True
                        roi = gray[y:y+h, x:x+w]
                        cv2.imwrite("static/face.jpg", roi)
        roi = cv2.resize(roi, (48,48))
        roi = roi/255.0
        roi = np.reshape(roi, (1,48,48,1))
        prediction = model.predict(roi)
        print(prediction)
        prediction = np.argmax(prediction)
        prediction = label_map[prediction]
        cap.release()
        link  = f"https://www.youtube.com/results?search_query={info['singer']}+
{prediction}+{info['language']}+song"
        webbrowser.open(link)
        return render_template("emotion_detect.html", data=prediction, link=link)
if __name__ == "__main__":
        app.run(debug=True)
```