A PRELIMENERY REPORT ON

"Machine Learning Based Music Recommendation System Using Facial Expressions"

SUBMITTED TO THE SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
IN THE PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE

Of

BACHELOR OF COMPUTER ENGINEERING

SUBMITTED BY

Samiksha Deshmukh (BCOA21)
Pavan Rengade (BCOA28)
Pooja Kedari (BCOA25)

DEPARTMENT OF COMPUTER ENGINEERING

DR. D. Y. PATIL INSTITUTE OF TECHNOLOGY
PIMPRI, PUNE 411018

SAVITRIBAI PHULE PUNE UNIVERSITY
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CERTIFICATE

This is to certify that the Project Entitled

Machine Learning Based Music Recommendation System Using Facial Expressions

Submitted by

Samiksha Deshmukh (BCOA21)
Pavan Rengade (BCOA28)
Pooja Kedari (BCOA25)

is a bonafide students of Dr. D. Y. Patil Institute of Technology and the work has been carried out by them under the supervision of Mr. Sharad Adsure (Asst. Professor) and Mrs. Deepika Jaiswal (Asst. Professor), it is approved for the partial fulfillment of the requirement of Savitribai Phule Pune University, for the award of the degree of Bachelor of Computer Engineering.

Mr. Sharad Adsure
(Internal Guide)

Dr.Vinod Kimbahune
(Head of the Department)

External Examiner
.

Mrs.Sunita Patil
(Project Coordinator)

Dr. Lalit Kumar Wadhwa
Principal,
Dr. D. Y. Patil Institute of Technology,
Pimpri, Pune – 411018

Date:

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Samiksha Deshmukh (BCOA21)

Pavan Rengade (BCOA28)

Pooja Kedari (BCOA25)

ABSTRACT

Music plays a significant role in improving and uplifting the mood as it is one of the important sources of entertainment and inspiration to move forward. Recent studies have shown that people respond and respond to music very positively and that music has a great influence on human brain activity. Nowadays, people often prefer to listen to music according to their mood and interests. This work focuses on a system that suggests songs to users based on their state of mind. In this system, computer vision components are used to determine the user's emotions through facial expressions. Once an emotion is recognized, the system will suggest a song for that emotion, saving the user a lot of time in manually selecting and playing songs. The conventional way of playing music depending on a person's mood requires human interaction. The transition to computer vision technology will enable the automation of such a system. To achieve this goal, an algorithm is used to classify human expressions and play a music track according to the currently detected emotion. It reduces the effort and time required to manually search for a song from the list. The proposed system detects emotions, if the subject has a negative emotion, then he will be presented with a specific playlist that contains the most suitable types of music. On the other hand, if the detected emotion is positive, an appropriate playlist will be provided that will include different types of music that will enhance the positive emotion. The person's expressions are detected by extracting facial features using the Haar-Cascade algorithm and the CNN algorithm. A built-in camera is used to capture a person's facial expressions, which reduces system design costs compared to other methods.

KEYWORDS : Recommender System, Convolution Neural Network (CNN), image processing, Machine Learning, Classification etc

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1 INTRODUCTION

1.1 OVERVIEW

Facial expressions are one of the natural means of communicating emotions, and these emotions can be used in entertainment and Human Machine Interface (HMI). In today's world, with the advancement in technology, various music players are deployed with features such as media flip, fast forward or streaming playback with multicast streams. Although these features satisfy the basic requirements of the user, it is still necessary to manually surf for a song from a large set of songs, according to the current situation and mood. This is a time-consuming task that requires some effort and patience. The main goal of this work is to develop an intelligent system that can easily recognize a facial expression and accordingly play a music track based on that particular expression/emotion. The three universally classified emotions are Happy, Sad and Neutral. The main goal of this work is to develop an intelligent system that can easily recognize a facial expression and accordingly play a music track based on that particular expression/emotion. The seven universally classified emotions are Happy, Sad and Neutral. The algorithm used in the development of this system is the Haar Cascade algorithm which is used to extract facial features. The proposed algorithm is very efficient due to shorter computing time, which increases the system performance.

Depending on the type of application and the dataset available, certain types of machine learning techniques are better suited than others for different applications. The main types of learning algorithms include supervised learning, unsupervised learning, semi-supervised learning, and reinforcement learning.A neural network (NN) is a machine learning technique that is generally effective in extracting critical features from complex datasets and inferring a function or model that expresses those features. The NN uses the training data set to first train the model. After training the model, the NN can be applied to new or previously unseen data points and classify the data based on the previously trained model.

1.2 Motivation

- Our effort is an initial step to bridge the gap between the traditional music browsing system and the users' needs.
- This work proposes a CNN based approach to recommend music by analyzing the multi-modal emotional information captured by facial movements and semantic analysis of the speech/text interactions of the user, thus, intensifying the decision of the system on recognized emotions in real-time.

1.3 Problem Definition

- To develop an intelligent system that can easily recognized the facial expression and accordingly play a music track based on that particular expression/emotion recognized.

1.4 Objective

- The main objective of this work is to develop an intelligent system that can easily recognize the facial expression and accordingly play a music track based on that particular expression/emotion recognized.
- The underlying objective of this work is to design an accurate system that would yield a list of songs in conformance with a user emotional state.
- The system designed, requires less computational time and reducesthe cost incurred in employing additional hardware.

2 LITERATURE SURVEY

- STUDY OF RESEARCH PAPER

1.**Paper Name**: An Emotional Recommender System for music [1]

Author: Vincenzo Moscato, Antonio Picariello and Giancarlo Sperl´ [1]

Description: Recommender systems have become essential for users to find "what they need" in large collections of items. Meanwhile, recent studies have shown that user personality can effectively provide more valuable information to significantly improve the performance of recommenders, especially considering behavioral data captured from social network logs. In this work, they describe a new music recommendation technique based on the identification of personality traits, moods and emotions of a single user, based on solid psychological observations recognized by the analysis of user behavior in a social environment. In particular, users' personalities and moods have been incorporated into the content filtering approach to achieve more accurate and dynamic results.

2. Paper Name: Music Recommender System for users based on Emotion Detection through Facial Features [2]

Author: Ahlam Alrihaili, Alaa Alsaedi, Kholood Albalawi [2].

Description:Facial emotion detection has received tremendous attention due to its applications in computer vision and human-computer interaction. In this research, they propose an emotion recognition recommendation system that is able to detect the user's emotions and suggest a list of suitable songs that can improve his mood. A short search was done on how music can affect a user's mood in the short term to gain knowledge and allow us to provide users with a list of music tracks that work well to improve the user's mood. The proposed system detects emotions, if the subject has a negative emotion, then he will be presented with a specific playlist containing the most suitable types of music that will improve his mood. On the other hand, if the detected emotion is positive, an appropriate playlist will be provided that will include different types of music that will enhance the positive emotion. The proposed recommendation system is implemented

using the Viola-Jonze algorithm and PCA (Principal Component Analysis) techniques.

3. Paper Name: Emotional Detection and Music Recommendation System based on User Facial Expression.[3]

Author: S Metilda Florence, M Uma [3]

Description: Music plays a significant role in improving and uplifting the mood. It is often confusing for a person to decide what music to listen to from the vast collection of existing options. Analyzing the user's facial expression/emotions can lead to an understanding of the user's current emotional or mental state. This work focuses on a system that suggests songs to users based on their emotional state. The user's image is captured using a web camera. A snapshot of the user is taken and then according to the user's mood/emotion, a suitable song from the user's playlist is displayed to match the user's request.

4. Paper Name: Facial Expression Based Music Player [4]

Author: Sushmita G. Kamble, Asso. Prof. A. H. Kulkarni [4]

Description:The conventional way of playing music depending on a person's mood requires human interaction. The transition to computer vision technology will enable the automation of such a system. To achieve this goal, an algorithm is used to classify human expressions and play a music track according to the currently detected emotion. It reduces the effort and time required to manually search for a song from a list based on a person's current state of mind. A person's expressions are detected by extracting facial features using the PCA algorithm and the Euclidean Distance classifier. In this paper, they use an embedded camera that is used to capture a person's facial expressions, which reduces the system design cost compared to other methods.

5. Paper Name: Music Recommendation System Using Facial Expression Recognition Using Machine Learning. [5]

Author: B. Nareen Sai, D. Sai. Vamshi, Piyush Pogakwar, V. Seetharama Rao, Y. Srinivasulu [5]

Description: The study of human emotional responses to visual stimuli such as photographs and movies, known as visual sentiment analysis, has proven to be a fascinating and difficult problem. Attempts to understand high-level information from visual data. The development of powerful algorithms from computer vision is responsible for the success of current models. Most existing models attempt to overcome the problem by recommending either robust features or more sophisticated models. Key suggested inputs are mainly visual elements from the entire image or video. Local areas have received less attention, which we believe is important for people's emotional response to the whole picture. Image recognition is used to find people in photos, analyze their emotions, and play emotion-related tunes based on their feelings. This repository achieves this goal by leveraging Google's Vision services. Given an image, it would search for faces, identify them, draw a rectangle around them, and describe the emotions it found.

3 SOFTWARE REQUIREMENT SPECIFICATION

3.1 NTRODUCTION

Project Scope

Recommendation is about extending listeners music universe beyond what they know and like. It empowers listeners once they have exhausted all their songs/artists searchcapabilities with further navigation celerity

Assumption and dependencies

Domain: Machine Learning
Input: Users' Face

3.2 FUNCTIONAL REQUIREMENT

Proposed system consists of 4 modules:

- User Registration: Firstly, user need to register in the system.
- Login: After successful registration, user can login into the system.
- Feature point extraction: Feature points of each user's face gets detected.
- Feature correspondence matching: Matching of selected feature points across various image frames in database and display playlist.

3.3 EXTERNAL INTERFACE REQUIREMENT

User Interface

- Machine Learning Based Music Recommendation System Using Facial Expressions

Hardware Interfaces:

- Hardware: Intel i5 Processor
- Speed: 2.80 GHz
- RAM: 8GB
- Hard Disk: 64 GB
- KeyBoard: Standard Windows Keyboard

Software Interfaces:

- Operating System: Windows 10(64 Bit) and Above.
- IDE: Spyder
- Programming Language: Python version 3.7,3.8

3.4 NON-FUNCTIONAL REQUIREMENT

Performance Requirements

- The performance of the functions and every module must be well. The quality of the camera should be well resolved.
- The application is designed in modules where errors can be detected easily. This makes it easier to install and update new functionality if required.

Safety Requirement

- The application is designed in modules where errors can be detected and fixedeasily. This makes it easier to install and update new functionality if required.

Software Quality Attributes

- Our system has many quality attributes that are given below:

  1. Adaptability: This system is adaptable by all users.

  2. Availability: This system is freely available to all users. The availability ofthe system is easy for everyone.

  3. Maintainability: After the deployment of the project if any error occurs then itcan be easily maintained by the software developer.

  4. Reliability: The performance of the system is better which will increase the reliability of the Software.

  5. User Friendliness: Since, the system is a GUI application; the output generated is much user friendly in its behavior.

  6. Integrity: Integrity refers to the extent to which access to system or data by unauthorized persons can be controlled.

  7. Security: Users are authenticated using many security phases so reliable security is provided.

  8. Testability: The system will be tested considering all the aspects

3.5 SYSTEM REQUIREMENTS

Database Requirements

Browser for SQLite (DB4S) is a high quality, visual and open-source tool to create, design, and edit database files compatible with SQLite. DB4S is for users and developers who want to create, search, and edit databases. DB4S uses a familiar spreadsheet-like interface, and complicated SQL commands do not have to be learned. Controls and wizards are available for users to:

- Create and compact database files. Create, define, modify and delete tables. Create, define, and delete indexes. Browse, edit, add, and delete records, Search records.
- Import and export databases from/to SQLite dump files.
- Issue SQL queries and inspect the results.

Software Requirements

- Anaconda Navigator: Anaconda Navigator is a desktop graphical user interface (GUI) included in Anaconda distribution that allows you to launch applications and easily manage anaconda packages, environments, and channels without using command line commands.
- Anaconda.org or in a local Anaconda Repository. It is available for Windows, macOS, and Linux. In order to run, many scientific packages depend on specific versions of other packages. Data scientists often use multiple versionsof many packages and use multiple environments to separate these different versions.
- The command-line program conda is both a package manager and an environment manager. This helps data scientists ensure that each version of each package has all the dependencies it requires and works correctly.
- Navigator is an easy, point-and-click way to work with packages and environments without needing to type conda commands in a terminal window. You can use it to find the packages

you want, install them in an environment, run the packages and update them – all inside Navigator.

Hardware Requirements

- RAM: 8 GB As we are using Machine Learning Algorithm and Various High-Level Libraries Laptop RAM minimum required is 8 GB.
- Hard Disk: 64 GB
- Processor: Intel i5 Processor

3.6 ANALYSIS MODELS: SDLC MODEL TO BE APPLIED

User Interface

SDLC Models stands for Software Development Life Cycle Models. In this report, we explore the most widely used SDLC methodologies such as Agile.Each software development life cycle modelstarts with the analysis. Also, here are defined the technologies used in the project. One of the basic notions of the software development process is SDLC models which stands for Software Development Life Cycle models. SDLC – is a continuous process, which starts from the moment, when it's made a decision to launch the project, and it ends at the moment of its full remove from the exploitation. There is no one single SDLC model. They are divided into maingroups, each with its features and weaknesses

- Requirement gathering and analysis: In this step, we identify what are various requirements are needed for our project such are software and hardware required, database, and interfaces.
- System Design: In design phase we design the system which iseasily understood for end user i.e., user friendly. We design some UML diagrams and data flow diagram to understand the system flow and system module and sequence of execution.

- Implementation: In implementation phase of our project, we will implement various module required for successfully getting expected outcome at the different module levels. With inputs from system design, the system is first developed in small programs called units, which are integrated in the nextphase. Each unit is developed and tested for its functionality which is referred to as Unit Testing.

- Testing: The different test cases are performed to test whether the project module is giving expected outcome in assumed time. All the units developed in the implementation phase are integrated into a system after testing of each unit. Post integration the entire system is tested for any faults and failures.

- Deployment of System: Once the functional and non-functional testing is done, the product is deployed in the customer environment or released into the market

- Maintenance: There are some issues which come up in the client environment. To fix those issues patches are released. Also, to enhance the product some better versions are released. Maintenance is done to deliver these changes in the customer environment. All these phases are cascaded to each other in which progress is seen as flowing steadily downwards like a waterfall through the phases. The next phase isstarted only after the defined set of goals are achieved for previous phase and it is signed off.

Project Resource

Well configured Laptop, Anaconda Navigator, 64 GB RAM.

3.7 SDLC MODEL

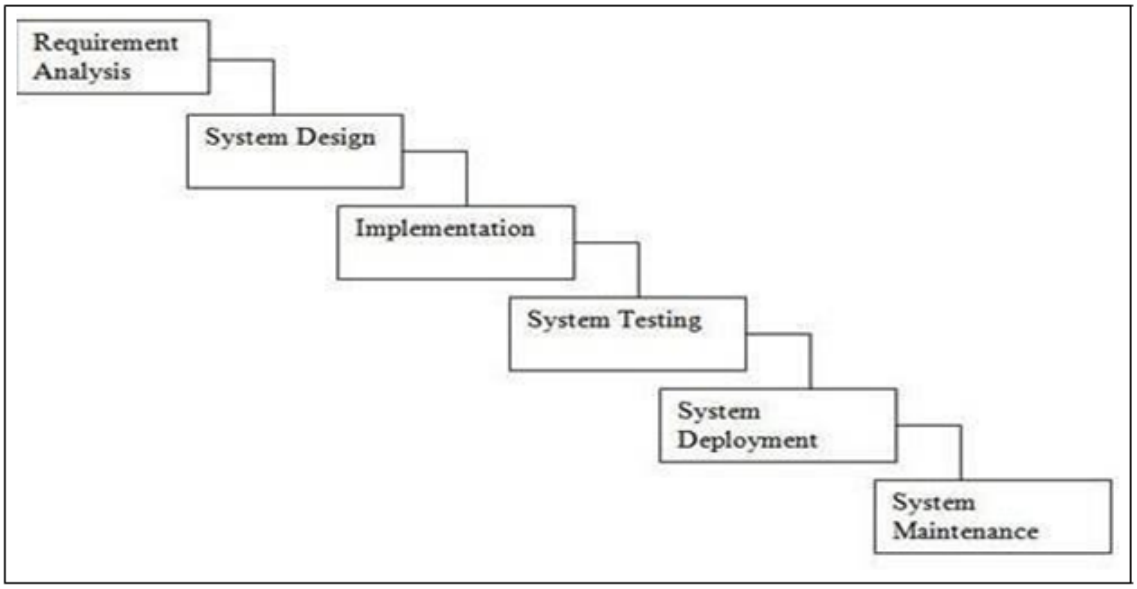


Figure 1: SDLC MODEL

4 SYSTEM DESIGN

4.1 SYSTEM ARCHITECTURE

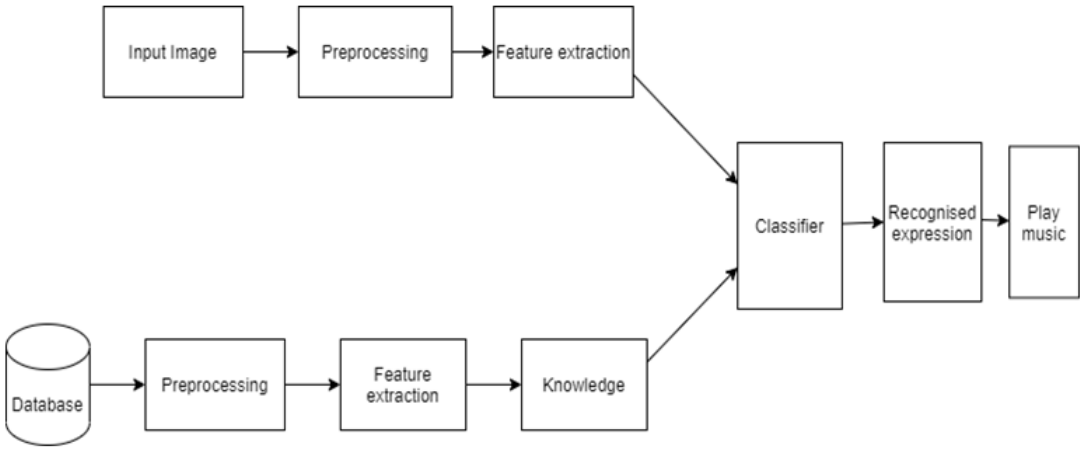


Figure 2: System Architecture

Explanation

Steps involved to design the system, training dataset and test images are considered for which the following procedures are applied to get the desired results. The training set is the data which has large amount of data stored in it and the test set is the input given for recognition purpose. The whole system is designed in 5 steps:

1. Image Acquisition: In any of the image processing techniques, the first task is to acquire the image from the source. These images can be acquired either through camera. The images considered here are user dependent i.e., dynamic images.

2. Pre-processing: Pre-processing is mainly done to eliminate the unwanted information from the image acquired and fix some values for it, so that the value remains same throughout. During pre-processing, eyes, nose and mouth are considered to be the region of interest. It is detected by the cascade object detector which utilizes Haar Cascade Feature.

3. Facial Feature Extraction: After pre-processing, the next step is feature extraction. The extracted facial features are stored as the useful information during training phase and testing phase. The following facial features canbe considered —Mouth, forehead, eyes, cheek and chin dimple, eyebrows, nose and wrinkles on the face‖. In this work, eyes, nose, mouth and fore-head are considered for feature extraction purpose for the reason that these depict the most appealing expressions.With the wrinkles on the forehead or the mouth being opened one can easily recognize that the person is either surprised or is fearful. But with a person's complexion it can never be depicted. To extract the facial features Haar feature technique is used.

4. Expression Recognition: To recognize and classify the expressions of a person Convolution Neural Network. classifier is used. It gets the nearest match for the test data from the training data set and hence gives a better match for the current expression detected.Face detection is a non-trivial computer vision problem for identifying and localizing faces in images. Face detection can be achieved using a Multi-task Cascade CNN.

5. Play Music: The last and the most important part of this system is the playing of music based on the current emotion detected of an individual. Once the facial expression of the user is classified, the user's corresponding emotional state is recognized. Severalsongs from various domains pertaining to a number of emotions is collected and put up in the list. Each emotion category has a number of songs listed in it. When the user's expression is classified with the help of CNN algorithm, songs belonging to that category are then played.

5 ALGORITHM

5.1 Convolutional Neural Networks (CNN):

Convolutional Neural Networks, a type of deep learning algorithm, are very good at analyzing images. Best algorithm for automatic processing of images. The image contains RGB combination data. You can use matplotlib to import an image from a file into memory. A convolutional neural network is a special type of neural network that helps machines learn and classify images.

A convolutional neural network has three types of layers:

1) Convolutional Layer: Each input neuron in a typical neural network is connected to the following hidden layer. Only a small fraction of the CNN's input layer neurons are connected to the hidden layer of neurons.

2) Pooling Layer: The dimensionality of the feature map is reduced using a pooling layer. Within the hidden layers of a CNN, there are many activation and pooling layers.

3) Fully-Connected layer: The last few layers of the network are known as fully connected layers. The output of the final pooling or convolutional layer is fed to the fully connected layer and flattened before being applied.

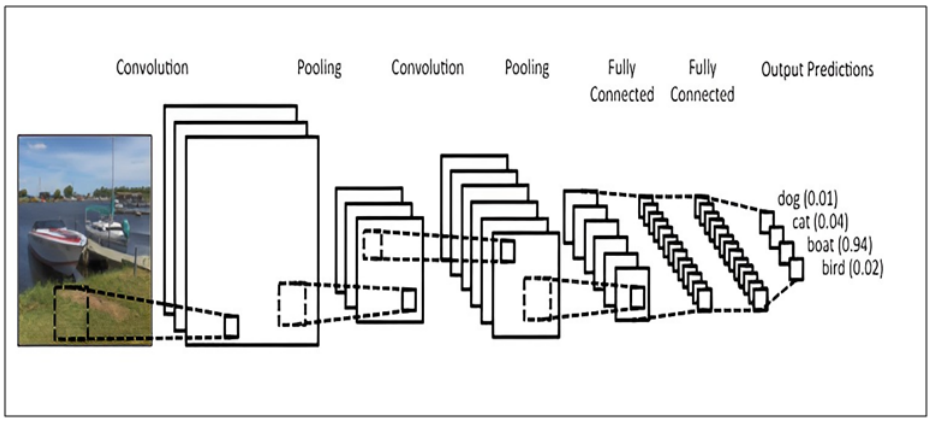


Figure 3: CNN Algorithm

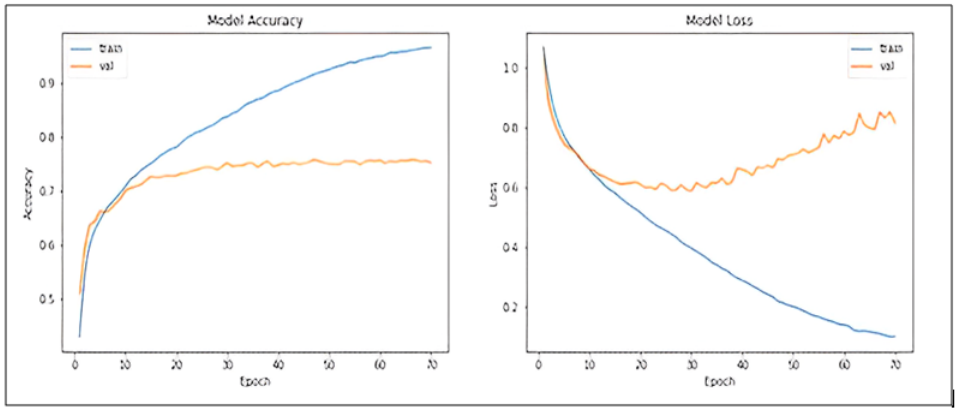


Figure 4: Model Accuracy and loss graph

5.2 Haar Cascade Feature

This is an object detection algorithm used to identify faces in real-time images or videos. This algorithm uses the edge or line detection feature proposed by Viola and Jones in year 2001 research paper, “Rapid Object Detection using a Boosted Cascade of Simple Features”. This algorithm contains many positive image planes and many negative images that have not been added.

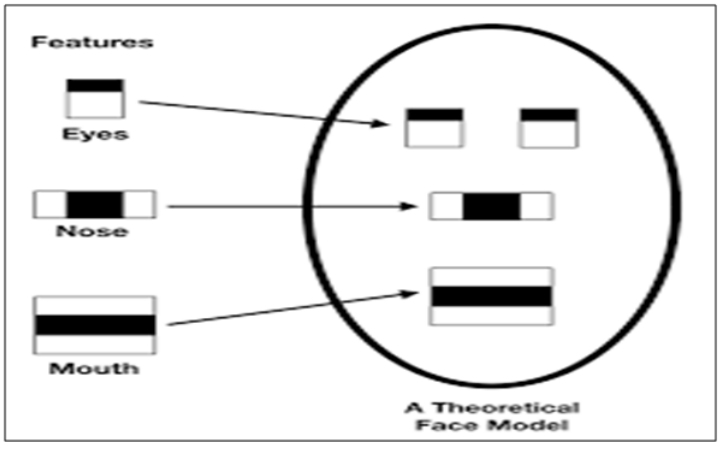


Figure 5: Haar Cascade Feature

6 DIAGRAMS

6.1 Data Flow Diagram

In Data Flow Diagram, we Show that flow of data in our system in DFD0 we show that base DFD in which rectangle present input as well as output and circle show our system. In DFD1 we show actual input and actual output of system input of our system is text or image and output is rumor detected likewise in DFD 2 we presentoperation of user as well as admin.

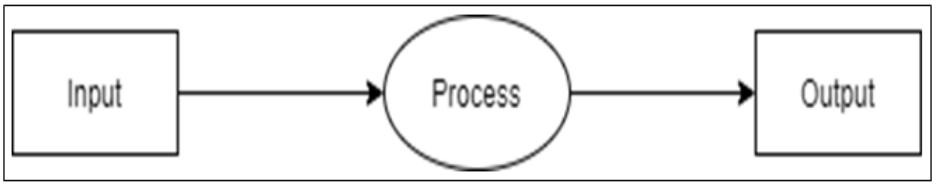


Figure 6: Data Flow diagram-0

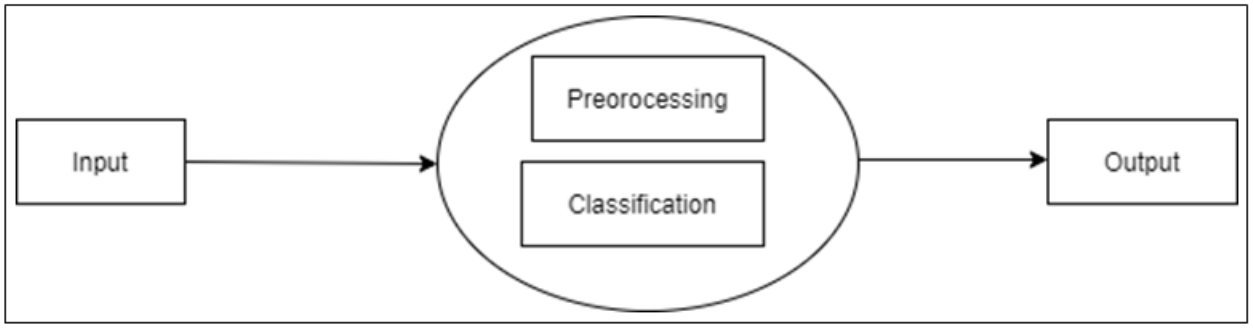


Figure 7: Data Flow diagram-1

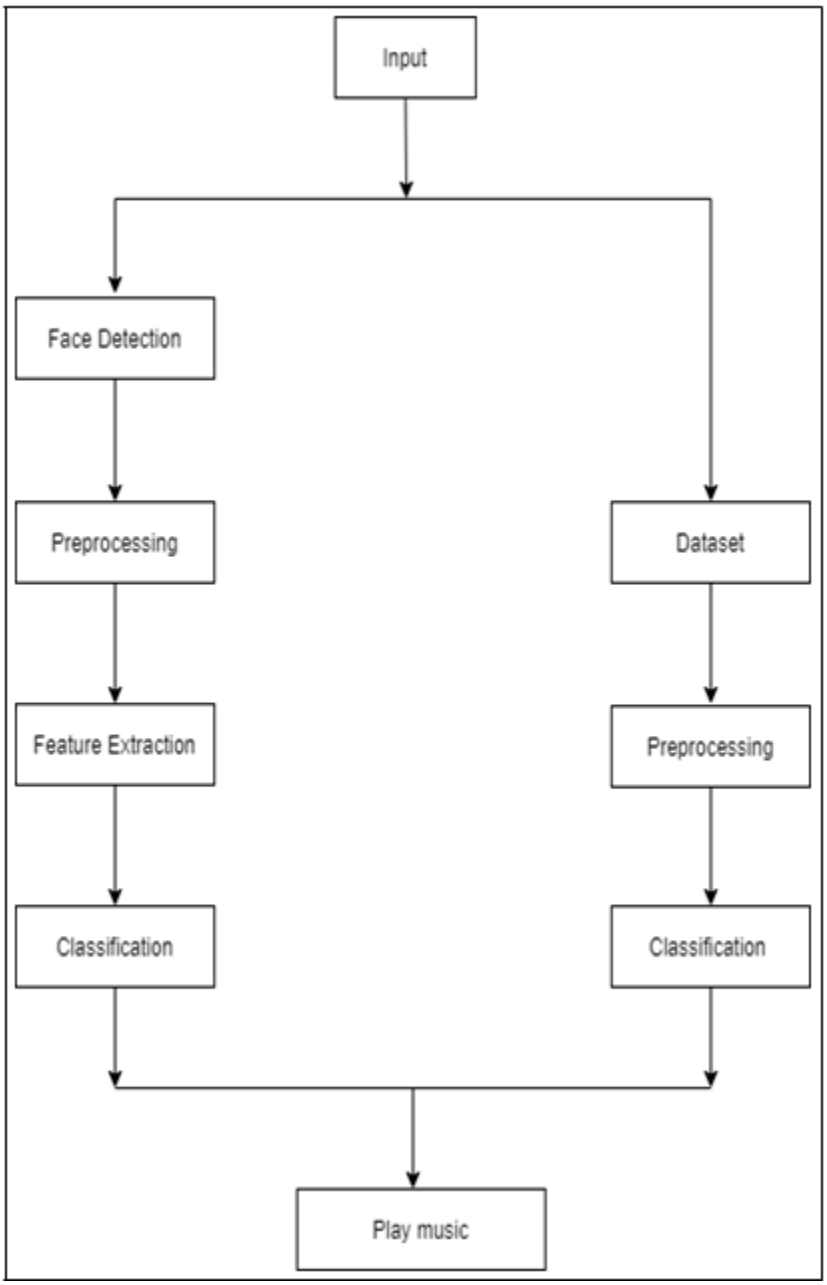


Figure 8: Data Flow diagram-2

6.2 UML DIAGRAMS

Unified Modeling Language is a standard language for writing software blueprints. The UML may be used to visualize, specify, construct and document the artifacts of a soft- ware intensive system. UML is process independent, although optimally it should be used in process that is use case driven, architecture centric, iterative and incremental. The Number of UML Diagram is available.

- Use case Diagram.
- Component Diagram.
- Activity Diagram
- Sequence Diagram.

6.3 Use Case Diagram

A use case diagram in the Unified Modelling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted.

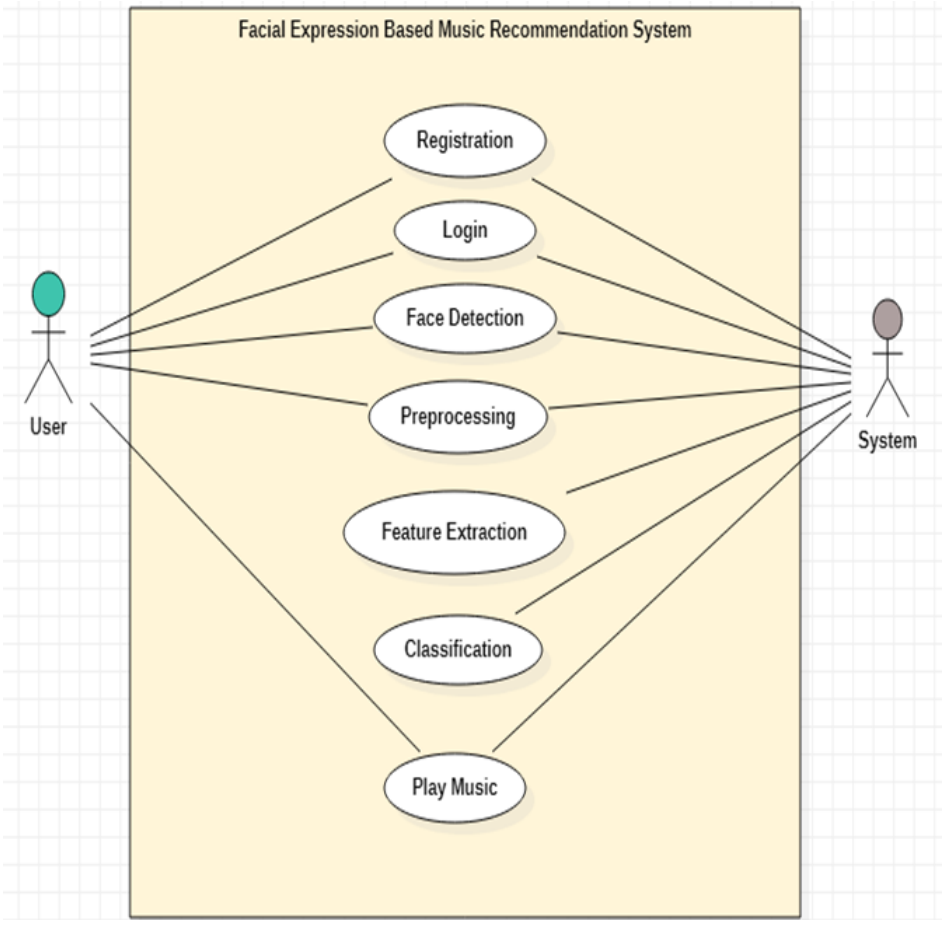


Figure 9: Use case Diagram

6.4 Activity Diagram

An activity is particular operation of the system. An activity diagram is intended to represent stepwise work-flow of activities or actions that can take place in the system. It shows overall flow of control and models computational and organizational processes. Activity diagrams are used to model dynamic aspects of the system.

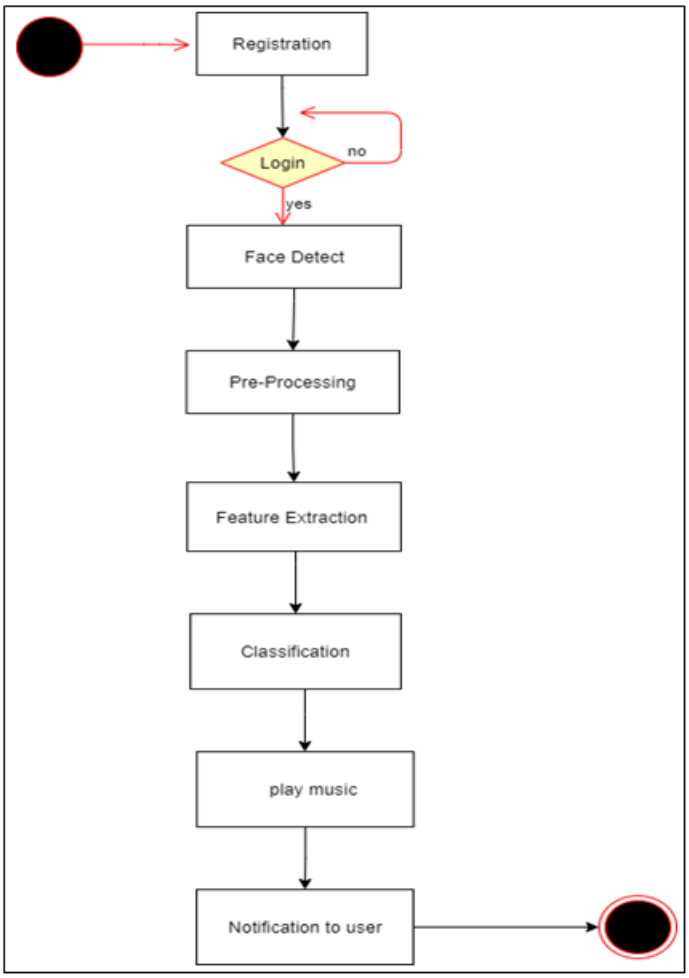


Figure 10: Activity Diagram

6.5 Sequence Diagram

Sequence diagram shows how objects communicate with each other in terms of a sequence of messages. It also indicates the lifespans of objects relative to those messages.

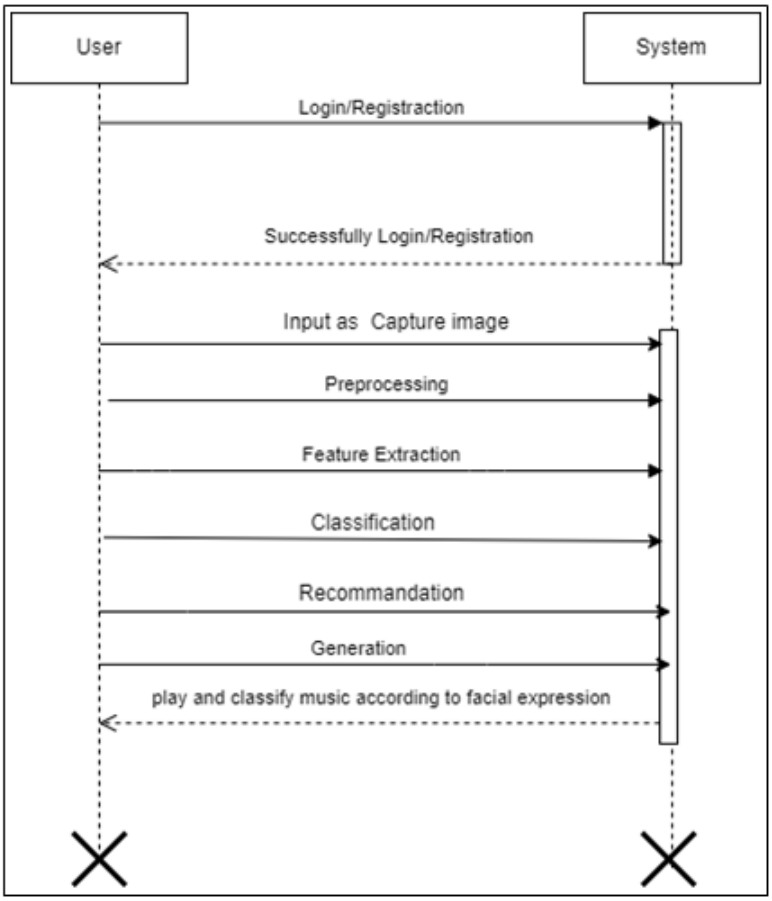


Figure 11: Sequence Diagram

6.6 Class Diagram

Class diagram describes the structure of a system by showing the system's classes, Their attributes, and the relationships among the classes. Proposed system contains five different types of classes and each posses their own attributes and methods. Main Classes of the proposed system are ND-SRRC, FP Tree, Apriory, Sanitised DB each have different functionalities.

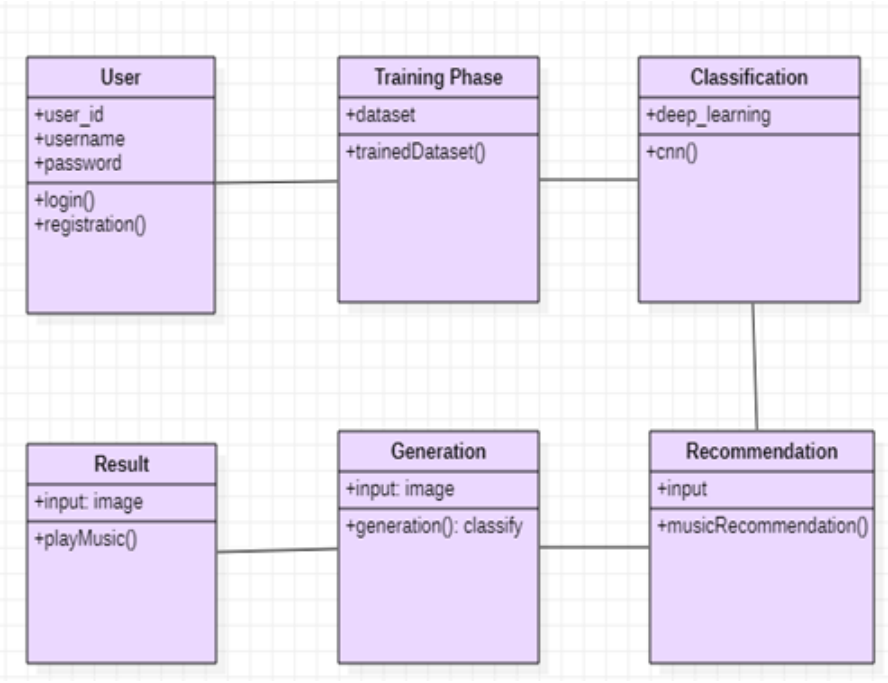


Figure 12: Class Diagram

6.7 Entity Relationship Diagrams

Class diagram describes the structure of a system by showing the system's classes, Their attributes, and the relationships among the classes. Proposed system contains five different types of classes and each posses their own attributes and methods. Main Classes of the proposed system are ND-SRRC, FP Tree, Apriory, Sanitised DB each have different functionalities.

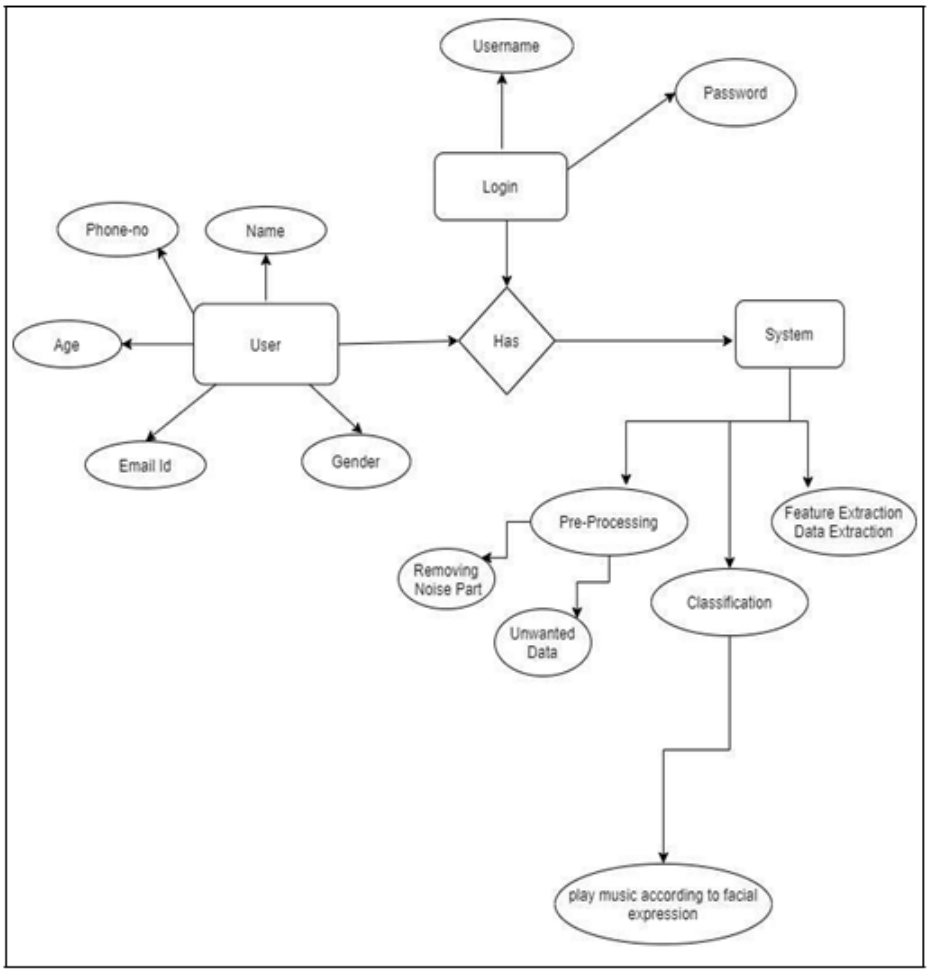


Figure 13: Entity Relationship Diagram

7 Project Estimation and Project Plan

In this chapter we are going to have an overview about how much time does it took to complete each task like- Preliminary Survey Introduction and Problem Statement, Literature Survey, Project Statement, Software Requirement and Specification, System Design, Partial Report Submission, Architecture Design, Implementation, Deployment, Testing, Paper Publish, Report Sub- mission and etcetera. This chapter also focuses on the stakeholder list which gives information about project type, customer of the proposed system, user and project member who developed the system.

7.1 PROJECT ESTIMATES

MATHEMATIC MODEL

1. Let S be the system that detects Sample Space

   S= .....

2. Identify input as I

   S= I....

   I= Vi — where vi is input transactional DB from user

3. Identify output as O

   S= I, O, ...

   O= Vo — where Vo is sanitized DB for given DB by user

4. Identify the Processes as P

   S= I, O, P, ...

   P= BN, DB, CS, A, HS

- BN as Binarization
- DB as derive association rule from DB
- CS as Calculate sensitive rules
- A as Analyze sensitivity of the RHS of element
- HS hide the sensitive rule

5. Identify the failure case F

   S= I, O, P, F, ...

   F= failure occurs when a sensitive rule remains visible

6. Identify the success case s

   S= I, O, P, F, s, . . .

   s= success means when a correct sensitive rule is identified and get hide

7. Identify the initial condition

   S= I, O, P, F, s, IC

   IC= Initial condition is that DB in transactional DB

7.2 RISK MANAGEMENT

1. In appropriate dataset -To overcome this risk we are trying to use a well organized and complete dataset.
2. Security- To overcome and improve security we use multilevel security like access permissions of users.

Risk Identification

1. Are end-users enthusiastically committed to the project and the sys- tem/product to be built? Ans-Not known at this time.
2. Are requirements fully understood by the software engineering team and its customers? Ans-Yes
3. Does the software engineering team have the right mix of skills? Ans-yes
4. Is the number of people on the project team adequate to do the job? Ans-Not applicable
5. Do all customer/user constituencies agree on the importance of the project and on the requirements for the system/product to be built? Ans-Not applicable

Risk Analysis

The risks for the Project can be analyzed within the constraints of time and quality.Risk analysis for a malware detection system using SVM involves assessing potential vulnerabilities, threats, and potential impacts. Here's an overview of the risk analysis process:

- **Identify system vulnerabilities:** Identify the vulnerabilities in the malware detection system that could be exploited by attackers. This could include weaknesses in the SVM implementation, data storage, network communication, or any other component of the system.
- **Threat identification:**: Identify potential threats that the system may face. This can include external threats, such as attackers attempting to bypass the detection system or exploit vul-

nerabilities, as well as internal threats, such as insider attacks or unintentional misuse of the system.

- **Impact assessment:** Evaluate the potential impact of a successful attack or system failure. Consider the consequences in terms of data compromise, system downtime, financial losses, reputational damage, or any other relevant factors. This step helps prioritize risks based on their potential impact.

- **Risk evaluation:** Combine the impact and likelihood assessments to determine the level of risk associated with each identified threat. This can be done by assigning risk levels, such as low, medium, or high, or by using a numerical risk scoring system. This step helps prioritize risks for mitigation efforts.

- **Risk mitigation :**Develop strategies and measures to mitigate the identified risks. This may include implementing security controls, applying patches and updates, enhancing system monitoring and logging, conducting regular security assessments, or training system users to minimize human errors.

- **Monitoring and review:** Regularly monitor the malware detection system and review the effectiveness of implemented risk mitigation measures. Stay updated on the evolving threat landscape and adjust risk mitigation strategies accordingly. It's important to note that risk analysis should be an ongoing process, continuously adapted to address emerging threats and changes in the system and its environment. Regular risk assessments and updates to the malware detection system are essential to maintain a robust security posture.

Risk Mitigation Risk Monitoring and Risk Management

Risk ID	1
Risk Description	Description 1
Category	Development Environment.
Source	Software requirement Specification document.
Probability	Low
Impact	High
Response	Mitigate
Strategy	Strategy
Risk Status	Occurred

Risk ID	2
Risk Description	Description 2
Category	Requirements
Source	Software Design Specification documentation review.
Probability	Low
Impact	High
Response	Mitigate
Strategy	Better testing will resolve this issue.
Risk Status	Identified

7.3 PROJECT SCHEDULE

Project Task Set

Major Tasks in the Project stages are:

1. Task 1: correctness
2. Task 2: availability
3. Task 3: integrity

SR.NO	TASK	Start Date	END Date
1	Group Formation	15/06/22	17/06/22
2	Decide Area Of Interest	18/06/23	20/06/23
3	Search Topic	21/06/23	30/06/23
4	Topic Selection	31/06/23	5/07/23
5	Sanction Topic	6/07/23	8/07/23
6	Search Related Information	10/07/23	20/07/23
7	Understanding Concept	21/07/23	27/07/23
8	Search essential Document (IEE)	27/07/23	05/08/2023
9	Problem Definition	06/08/23	15/08/23
10	SRS	16/08/23	25/08/23
11	Project Planning	26/08/23	10/09/2023
12	Modelling Design	16/09/23	05/10/23
13	Cost estimation	10/10/23	30/10/23
14	Model Implementation	10/01/23	15/03/23
15	Model Testing	26/03/23	15/04/23
16	Model Updation	20/04/23	1/05/23
17	Report	10/05/23	20/05/23

7.4 Timeline Chart

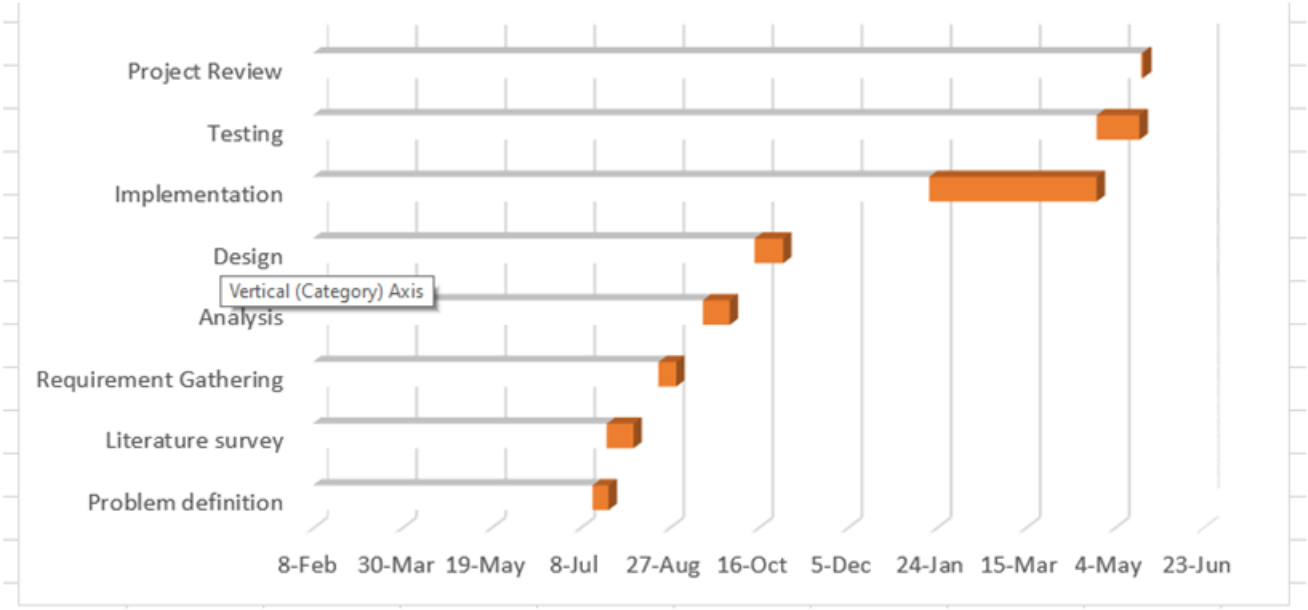


Figure 14: Timeline Chart

8 OTHER SPECIFICATION

8.1 ADVANTAGES

- The main advantage of our music recommendation system is to provide suggestions to the users that fit the user's emotions.

- The analysis of the facial expression/user emotion may lead to understanding the current emotional state of the user

8.2 APPLICATIONS

- This system helps user to play songs automatically according to their mood.

- Redirection of page to the music website once song is played.

9 RESULT

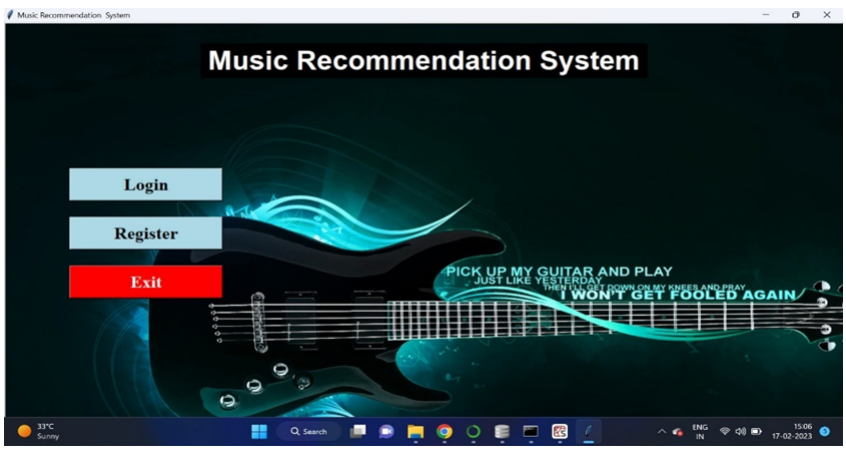


Figure 15: GUI Main Page

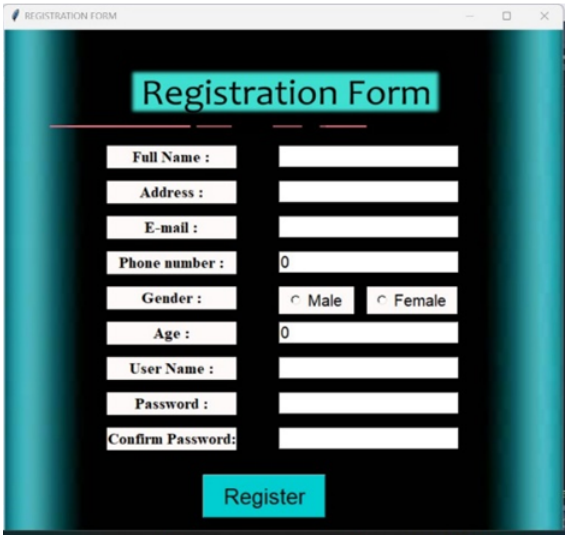


Figure 16: Registration Page

Figure 17: Login Page

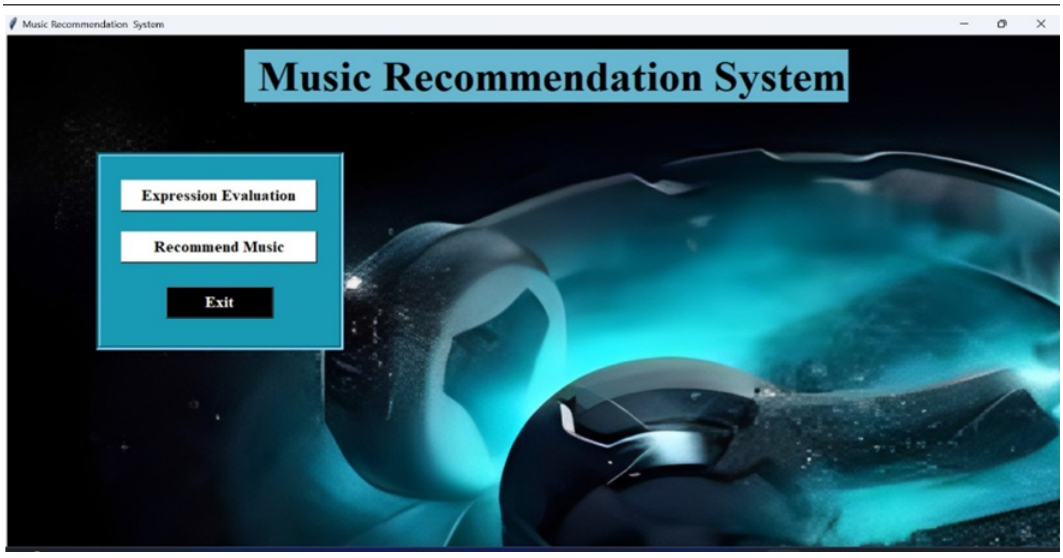


Figure 18: Home Page

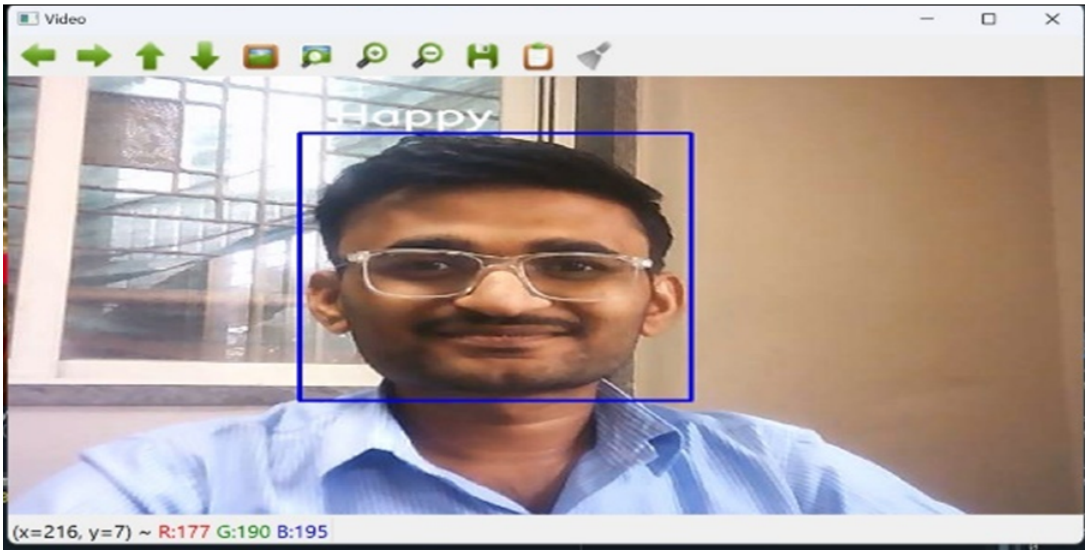


Figure 19: Happy Face Detected

Figure 20: Happy Song List

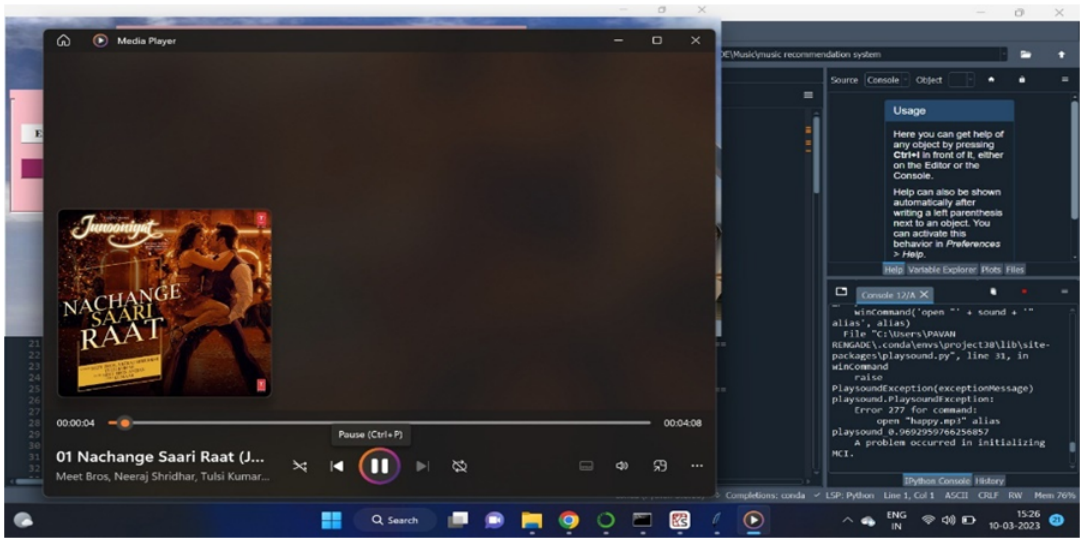


Figure 21: Happy Song Play

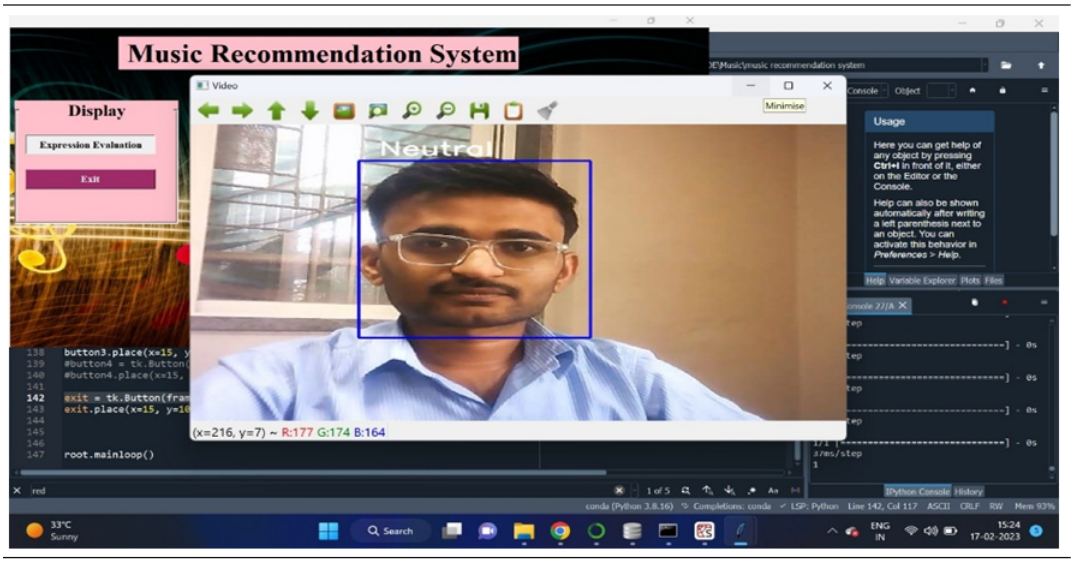


Figure 22: Neutral Face Detected

Figure 23: Neutral Song List

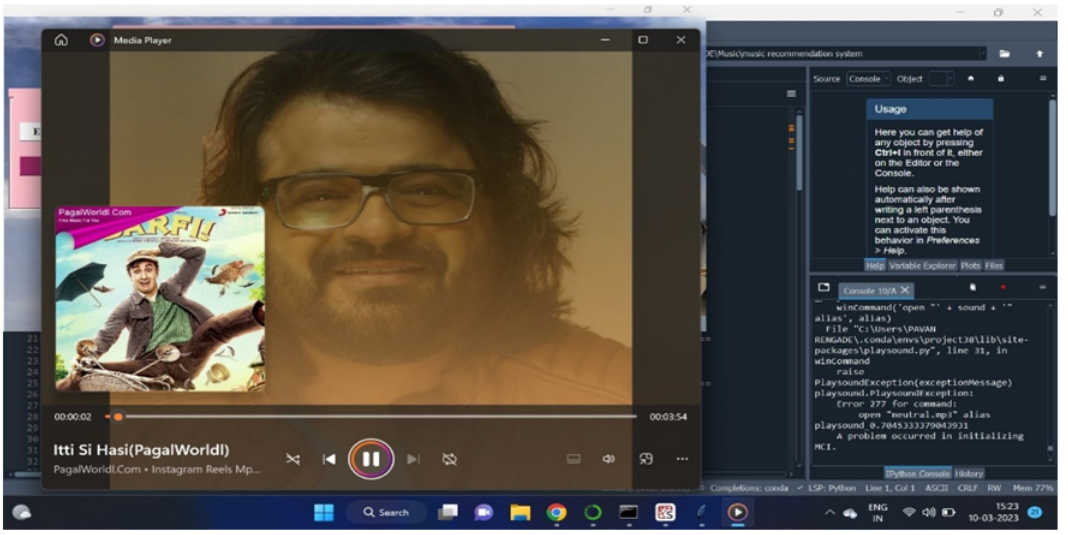


Figure 24: Neutral Song Play

Figure 25: Sad Song List

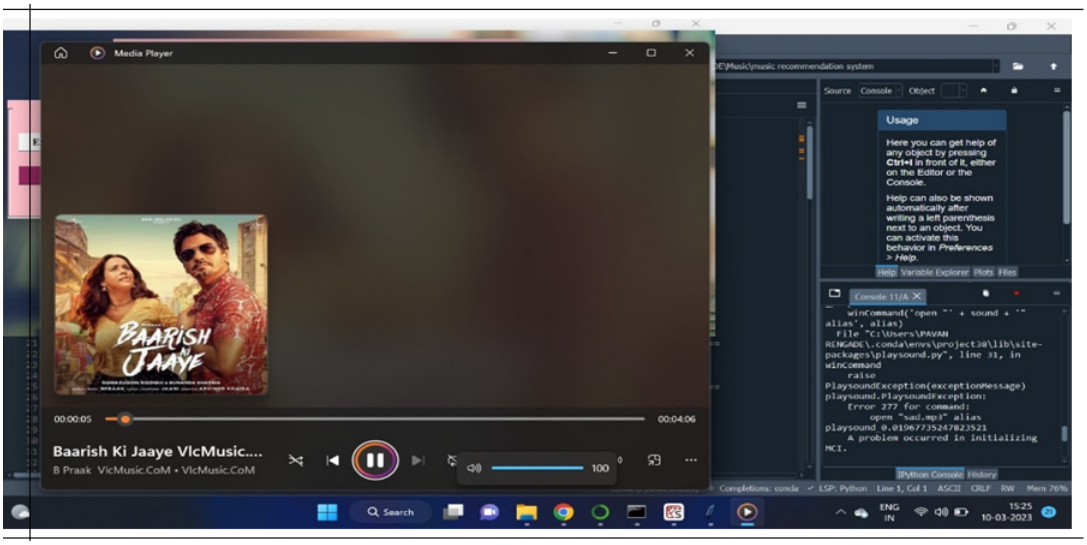


Figure 26: Sad Song Play

10 TESTING

10.1 Introduction

Testing is an important part of software development life cycle. It is performed to ensure quality of the developed system. Testing includes a set of investigative activities that can be planned in advance and conducted systematically, to assure the stakeholder that system fulfils all the requirements gathered during requirement gathering phase. Software testing is one of the key elements in software projects that is often referred to as verification and validation. Verification refers to the set of activities that ensure that software correctly implements specified functionality. Validation refers to a set of activities built around traceability matrix which ensure that the functionality implemented by the system is traceable to customer requirements

Tests are the individual tests specified in a test plan document. Each test is typically described by

- An initial system state.
- A set of actions to be performed.
- The expected results of the test.

10.2 Implementation

Test cases are planned in accordance to the test process and documented with detailed test descriptions. These test cases use cases based on projected operational mission scenarios. The testing process also includes stress or load testing for stability purpose (i.e., at 95use, system stability is still guaranteed. The test process thoroughly tests the interfaces and modules. Software testing includes a traceable white box testing, black box testing and other test processes verifying implemented software against design documentation and requirements specified.

10.3 Objective

The software test plan (STP) is designed to test each module to measure its performance, to uncover bugs in the system, to set aright any flaws in logic that may be present, and to check logical flow from one module to another within system.

- All field entries must work properly.
- Pages must be activated from the identified link.
- The entry screen, messages and responses must not be delayed.

10.4 Testing Strategy

A strategy outlines what to plan, and how to plan it. A successful strategy is your guide through change, and provides a firm foundation for ongoing improvement. Unlike a plan, which is obsolete from the point of creation, a strategy reflects the values of an organization - and remains current and useful. When an organization tests its products or its tools, it tries to compare them against its expectations and values. By its nature, testing introduces change as problems are identified and resolved. A test strategy is necessary to allow these two impulses to work together. Furthermore, testing can never be said to be 'complete', and a core skill in testing is the justified management of conflicting demands; without a strategy, these judgements will be inconsistent to the point of failure.
Software development is a creative process. A test strategy is a vital enabler to this process keeping focus on core values and consistent decision-making to help achieve desired goals with best use of resource.

10.5 Types of Testing:

1. White Box Testing: A level of white box test coverage is specified that is ap propriate for the software being tested. The white box and other testing uses automated tools to instrument

the software to measure test coverage.

2. Black Box Testing: A black box test of integration builds includes functional, interface, error recovery, stress and out-of-bounds input testing. All black box software tests are traced to control requirements. In addition to static requirements, a black box of a fully integrated system against scenario sequences of events is designed to model field operation. Performance testing for systems is integrated as an integral part of the black box test process.

10.6 Unit Testing

Unit testing is used to check the execution path of the module, function, and procedure of the system. Test is conducted with the help of normal data and abnormal data. This testing includes the different factors like statement coverage, branch coverage, loop processing, abnormality, and circulation etc. With the help of this Unit testing we check that all the statement in the code is executed or not so it avoids the dead code statement. It checks all the branches and execution path of the code. It ensures that all the internal method of program are executed and properly integrated with program.

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application .it is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

10.7 Integrated system

In integrated testing, all the modules are checked together to ensure that all the modules are executing together according to the program specification. Once all the mod ules have been tested individually, the most legitimate question can be asked is that when all the modules are working properly, why there is need of integrated testing.

The answer is, though all modules are working properly problem may occur while interfacing individual module. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

10.8 Functional test

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals. Functional testing is centered on the following items: Valid Input: identified classes of valid input must be accepted. Invalid Input: identified classes of invalid input must be rejected. Functions: identified functions must be exercised. Output: identified classes of application outputs must be exercised. Systems/Procedures: interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields, predefined processes, and successive processes must be considered for testing. Before functional testing is complete, additional tests are identified and the effective value of current tests is determined.

11 Test Cases

11.1 GUI Test Cases

Test case	Login Screen- Sign up
Objective	Click on sign up button then check all required/ mandatory fields with leaving all fields blank
Expected Result	All required/ mandatory fields should display with symbol "*". Instruction line "* field(s) are mandatory" should be displayed
Test case	Create a Password >>Text Box Confirm Password >>Text Box
Objective	Check the validation message for Password and Confirm Password field
Expected Result	Correct validation message should be displayed accordingly or "Password and confirm password should be same" in place of "Password mismatch".

Figure 27: GUI Testing

11.2 Registration Test Cases

Test Case ID	Test Case	Test Case I/P	Actual Result	Expected Result	Test case criteria(P/F)
001	Enter the number in username, middle name, last name field	Number	Error Comes	Error Should Comes	P
001	Enter the character in username, middle name, last name field	Character	Accept	Accept	p
002	Enter the invalid email id format in email id field	Kkgmail.com	Error comes	Error Should Comes	P
002	Enter the valid email id format in email id field	kk@gmail.com	Accept	Accept	P
003	Enter the invalid digit no in phone no field	99999	Error comes	Error Should Comes	P
003	Enter the 10 digit no in phone no field	9999999999	Accept	Accept	P

Figure 28: Registration Testing

11.3 Login Test Case

Test Case ID	Test Case	Test Case I/P	Actual Result	Expected Result	Test case criteria(P/F)
001	Enter The Wrong username or password click on submit button	Username or password	Error comes	Error Should come	P
002	Enter the correct username and password click on submit button	Username and password	Accept	Accept	P

Figure 29: Login Testing

11.4 System Test Cases

Test Case ID	Test Case	Test Case I/P	Actual Result	Expected Result	Test case criteria(P/F)
001	Store Xml File	Xml file	Xml file store	Error Should come	P
002	Parse the xml file for conversion	parsing	File get parse	Accept	P
003	Attribute identification	Check individual Attribute	Identify Attributes	Accepted	P
004	Weight Analysis	Check Weight	Analyze Weight of individual Attribute	Accepted	P
005	Tree formation	Form them-Tree	Formation	Accepted	P
006	Cluster Evaluation	Check Evaluation	Should check Cluster	Accepted	P
007	Algorithm Performance	Check Evaluation	Should work Algorithm Properly	Accepted	P
008	Query Formation	Check Query Correction	Should check Query	Accepted	P

Figure 30: System Testing

12 CONCLUSION

The proposed work presents facial expression recognition system to play a song according to the expression detected and classify music Type. It uses CNN approach to extract features. We are Developing a system to recognize user emotion based on facial expression using Python. We Integrate the python code into the web service and play the music based on the facial expression like happy, sad, or neutral. It is very good entertainment for the users. Emotion recognition using facial expressions is one of the important topics of research and has gathered much attention in the past. The problem of emotion recognition with the help of image processing algorithms has been increasing day by day. Researchers are continuously working on ways to resolve this using different kinds of features and image processing methods.

ANNEXURE A

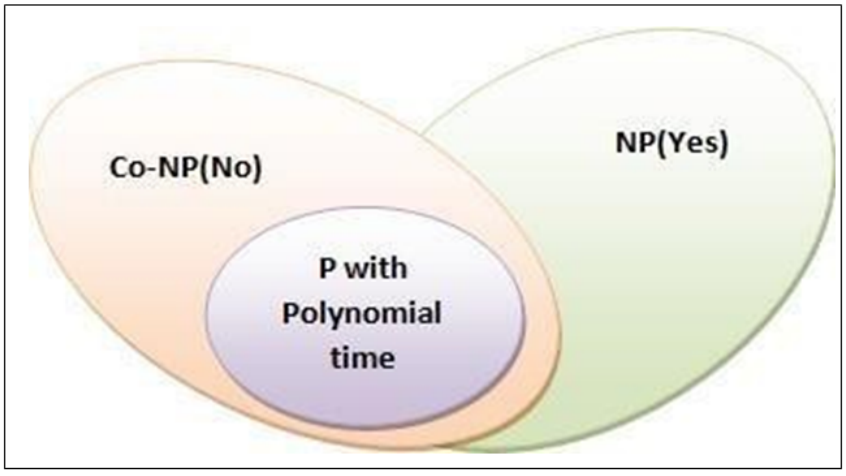
APPENDIX A

What is P?

- P is set of all decision problems which can be solved in polynomial time by a deterministic.
- Since it can be solved in polynomial time, it can be verified in polynomial time.
- P is a subset of NP.

P:

A novel abstractive multi-document summarization system based on chunk-graph (CG) and recurrent neural network language model (RNNLM). A CG which is basedon word-graph is constructed to organize all information in a sentence cluster, CG can reduce the size of graph and keep more semantic information than word-graph. System outperforms all baseline systems and reach the state-of-art systems, and thesystem with CG can generate better summaries than that with ordinary word-graph.



What is NP?

NP means we can solve it in polynomial time if we can break the normal rulesof step-by-step computing.

What is NP Hard?

A problem is NP-hard if an algorithm for solving it can be translated into onefor solving any NP-problem (nondeterministic polynomial time) problem. NP-hard therefore means at least as hard as any NP-problem, although it might, in fact, beharder.

Np-Hard:

A CG which is based on word-graph is constructed to organize all information in a sentence cluster, CG can reduce the size of graph and keep more semantic informa-tion than word-graph. We use beam search and character-level RNNLM to generatereadable and informative summaries from the CG for each sentence cluster, RNNLMis a better model to evaluate sentence linguistic quality than n-gram language model.the system with CG can generate better summaries than that with ordinary word- graph.

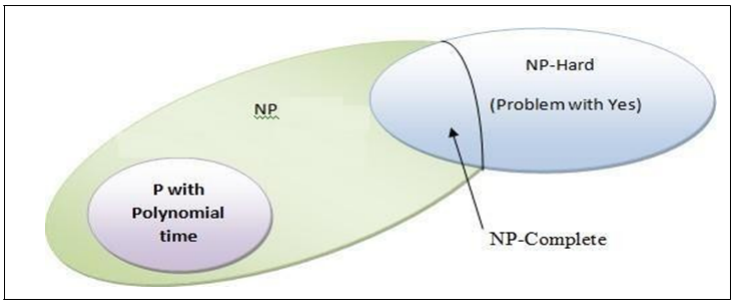


Figure 31: NP complete

What is NP-Complete?

- Since this amazing N computer can also do anything, a normal computer can, weknow that P problems are also in NP.
- So, the easy problems are in P (and NP), but the really hard ones are only in NP, and they

are called NP-complete.

- It is like saying there are things that People can do (P), there are things that Super People can do (SP), and there are things only Super People can do (SP- complete).

NP-Complete:

As our system is in developing state so we can't say that our system is currently inNP complete state

Ideas of pattern-growth in uncertain environment:

The ideas of pattern-growth in uncertain environment, two alternative algorithms aredesigned to discover all the STP candidates with support values for each user. That provides a trade-off between accuracy and efficiency. The user-aware rare pattern concerned here is a new concept and a formal criterion must be well defined, so thatit can effectively characterize most of personalized and abnormal behaviors of Inter-net users.

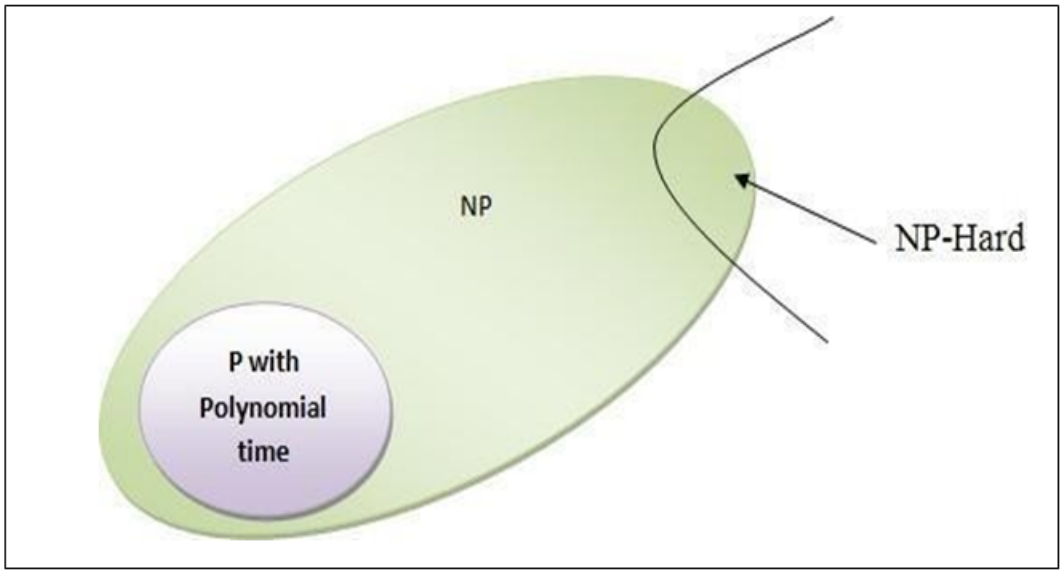


Figure 32: NP Hard

ANNEXURE B

APPENDIX B

Details of paper publication: international Journal for Research in Applied Science and Engineering Technology(IJRASET)

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
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Volume 11 Issue V May 2023- Available at www.ijraset.com

Machine Learning Based Music Recommendation System Using Facial Expression

Pooja Kedari[1], Pavan Rengade[2], Samiksha Deshmukh[3], Mr. Sharad Adsure[4], Mrs. Deepika Jaiswal[5]
[1, 2, 3, 4]*Computer Engineering, Dr. D. Y. Patil Institute of Technology, Pimpri, Pune, India*
[5]*Asst. Professor, Dr. D. Y. Patil Institute of Technology, Pimpri, Pune, India*

Abstract: ***Music plays a key role in improving your well-being, as it is one of the key sources of entertainment and inspiration to keep you going. Recent studies have shown that people respond very positively to music and that music has a great effect on a person's brain activity. It is often better to listen your favorite music these days. This job focuses on systems that suggest songs to users based on their state of mind. This computer vision system uses components to determine a user's emotion from facial expressions. When an emotion is detected, the system will suggest songs with that emotion, saving users a lot of time manually selecting and playing songs. It enables the migration of computer vision techniques for such systems to automation. To achieve this goal, we use the algorithm to classify human expressions, game play, and music tracks according to their currently detected emotions. Reduces the effort and time required to manually search for songs in the list. Recognize human facial expressions by extracting facial features using Haar Cascade and CNN algorithms.***

Keywords: Recommender System, Convolution Neural Network (CNN), Image Processing, Machine Learning, Classification etc.

I.INTRODUCTION

Facial expressions are one of the verbal means of conveying emotions, and those feelings can be exploited through verbal exchange and Human-Machine Interface (HMI). In contemporary technologically advanced world, exceptional music players are utilized in capabilities like flip Media, speedy ahead, Flow Multicast Streams and greater. While these features meet basic person needs, you still should manually look for the current temper amongst a massive variety of songs. That is a time-ingesting undertaking that calls for a few attempt and endurance. The main purpose is to develop an smart system that can without problems apprehend facial expressions and play music tracks based on a particular expression/emotion. Emotions generally categorized into three- glad, sad, and neutral. The principle intention of this work is to expand a clever system which can easily understand facial expressions and play tracks primarily based on them. The three feelings which might be usually categorised are glad, sad and neutral. The algorithm, Haar Cascade used for the face extraction characteristic. The proposed algorithm could be very beneficial due to the fast calculation time, which improves the system overall performance. This system has been carried out in diverse fields. Human-Computer Interaction (HCI), healing methods in healthcare, and extra. Virtual tune is generally categorized as created based on attributes consisting of artist, genre, album, language, and reputation[7]. A number of the available on line tune streaming offerings use collaborative filter out-based pointers to suggest music primarily based in your choices and listening history. but, these suggestions might not fit your current temper. This approach proposes a CNN-primarily based tune recommendation technique that uses data from multimodal sentiment analysis captured by using facial actions to improve the machine's selection making on emotions detected in actual time. Machine getting to know has to end up very famous in recent years. Some styles of machine studying strategies are extra appropriate than others, depending on the character of the application and the datasets available. For a ramification of the principle forms of studying algorithms encompass supervised, unsupervised, semi-supervised and reinforcement getting to know. Neural networks (NNs) are machine getting to know and generally green techniques for extracting critical capabilities from complicated datasets and inferring functions or models that represent the ones functions[4]. The NN makes use of the schooling facts set to teach the model first. After the model is skilled, the NN may be implemented to new or previously unseen records factors to classify the records primarily based on the previously educated fashions.

II.LITERATURE REVIEW

1) An Emotional Recommender System for music [1]: Recommender systems have become essential for users to find "what they need" in large collections of items. Meanwhile, recent studies have shown that user personality can effectively provide more valuable information to significantly improve the performance of recommenders, especially considering behavioral data captured from social network logs. In this work, they describe a new music recommendation technique based on the


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(International Peer Reviewed and Refereed Journal)
Good luck for your future endeavors
Editor in Chief, iJRASET


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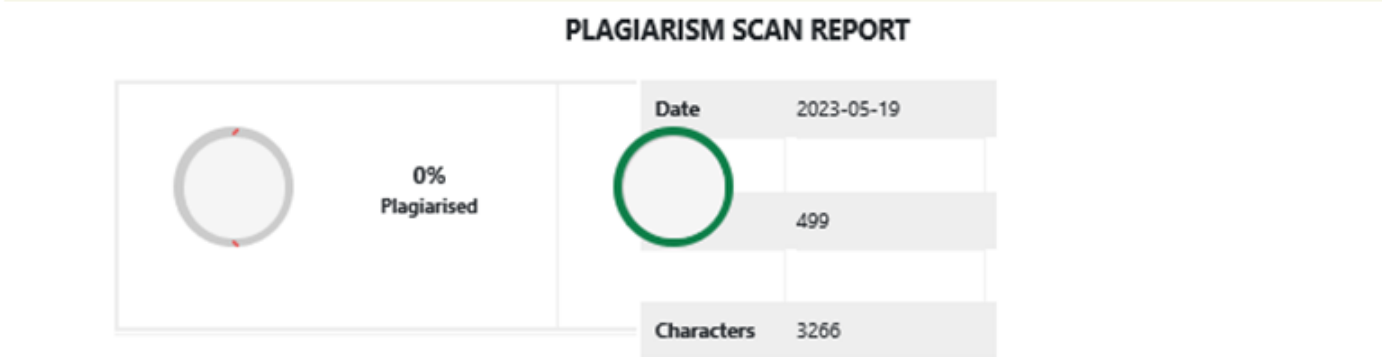
ANNEXURE C

APPENDIX C

Plagarism Report:



REFERENCES

1. Vincenzo Moscato, Antonio Picariello and Giancarlo Sperli. An Emotional Recommender System for Music. October 01,2020 at 17:32:18 UTC from IEEE Xplore.

2. Ahlam Alrihaili, Alaa Alsaedi, Kholood Albalawi, Liyakathunisa Syed. Music Recommender System for users based on Emotion Detection through Facial Features. une 22,2020 at 07:44:06 UTC from IEEE Xplore.

3. Metilda Florence, M Uma. Emotional Detection and Music Recommendation System based on User Facial Expression. IOP Conf. Series: Materials Science and Engineering 912 (2020) 062007.

4. Sushmita G. Kambale, Asso. Prof. A.H. Kulkarni. Facial Expression based Music Player. Conference on Advances in Computing, Communications and Informatics (ICACCI), Sept. 21-24, 2016.

5. B. Naren Sai, D. Sai. Vamshi, Piyush Pogakwar, V. Seetharama Rao, Y. Srinivasulu. Music Recommendation System Using Facial Expression Recognition Using Machine Learning. ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538 Volume 10 Issue VI June 2022.

6. Ziyang Yu1, Mengda Zhao1, Yilin Wu1, Peizhuo Liu1, Hexu Chen, Research On Automatic Music Recommendation Algorithm Based On ”Facial Micro-Expression Recognition”, Proceedings Of The 39th Chinese Control Conference July 27-29, 2020.

7. Dr. Sunil Bhutada, Ch. Sadhvika, Gutta.Abigna, P. Srinivas Reddy, ”Emotion Based Music Recommendation System”, Jeter April 2020.

8. Mikhail Rumiantcev, Oleksiy Kiriyenko, ”Emotion Based Music Recommendation System”, Proceeding of the 26th Conference of Fruct Association.

9. Krupa K S, Kartikey Rai, Ambara G, Sahil Choudhury, ”Emotion Aware Smart Music Recommender System Using Two Level CNN”, Third International Conference On Smart Systems And Inventive Technology (Icssit 2020).