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THAKUR COLLEGE OF SCIENCE & COMMERCE

AUTONOMOUS COLLEGE AFFILIATED TO UNIVERSITY OF MUMBAI

NAAC Accredited with Grade 'A' (3rd Cycle) & ISO 9001: 2015 Certified

Best College Award by University of Mumbai for the Year 2018-2019

CELEBRATING 25 YEARS OF GLORY

MUSIC GENERATION & RECOMMENDATION USING EMOTION DETECTION

Submitted By:

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BACHELOR OF SCIENCE DATA SCIENCE

2022-23

UNDER THE GUIDANCE OF

Asst. Prof. Neenu Johnson

Submitted in fulfillment of requirement for qualifying B.Sc.(Data Science)

Semester VI Examination

Thakur College of Science and Commerce, Thakur Village, Kandivali, Mumbai, Maharashtra-400101

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Certificate

This is to certify that the project entitled **"MUSIC GENERATION & RECOMMENDATION USING EMOTION DETECTION"** undertaken at the "Thakur College of Science and Commerce" by **Ms. DHRUVI SWADIA (3414)** in fulfilment of B.Sc. Data Science degree (Semester VI) Examination had not been submitted yet for other examination and does not form part of any other course undergone by the candidates.

It is further certified that we have completed all required phases of the project.

External Examiner

Internal Examiner

Project Guide

Signature

College Stamp

T.C. THAKUR COLLEGE OF SCIENCE & COMMERCE KANDIVALI (E)

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ABSTRACT

Emotions are reactions that human beings experience in response to events or situations. The type of emotion a person experiences is determined by the circumstance that triggers the emotion. Emotions have a strong influence on our daily lives. We choose activities and hobbies based on the emotions. Understanding emotions can help us navigate life with greater ease and stability. It is well known that humans make use of facial expressions to express more clearly what they want to say and the context in which they meant their words. More than 60 percent of the users believe that at a certain point of time the number of songs in their playlist are so many that they are unable to figure out the song they want to hear. By developing a music recommendation, it would assist a user to make a decision regarding which music one should listen helping the user to reduce his/her stress levels. The user would not have to waste any time in searching or to look up for songs and the best track matching the user's mood is detected, and songs would be shown to the user according to his/her mood. The focus of this bachelor thesis is also to generate appealing music segments algorithmically. Since its creation, the art of music has constantly evolved, developing new genres and styles over time. Computers have long been recognized for their potential in discovering new music, but a computer has yet to produce a truly appealing piece of music. In this paper, a genetic algorithm for making music compositions is presented. Position based representation of rhythm and relative representation of pitches, based on measuring relation from starting pitch, allow for a flexible and robust way for encoding music compositions. The created music would be diverse, original and could in many cases be considered to be appealing.

Keywords—Genetic; Recommendation; Music; Emotion.

1. Introduction

People tend to express their emotions, mainly by their facial expressions. Music has always been known to alter the mood of an individual. It lacks the kind of images and symbols that constitute language. Yet music clearly exerts great power over human emotions and actions, it is a language in itself. This is the paradox of music. Capturing and recognizing the emotion being voiced by a person and displaying appropriate songs matching one's mood can increasingly calm the mind of a user and overall end up giving a pleasing effect.

Technology has revolutionized the music industry, transforming the way music is created, recorded, distributed, and consumed. From recording software to streaming services, technology has opened up a whole new world of possibilities for musicians and music lovers alike. One of the most significant advancements in music technology is digital audio workstations (DAWs), which allow musicians to create and edit music using computers. DAWs offer a range of tools and effects, enabling artists to experiment with different sounds and styles. This has made music production more accessible, allowing anyone with a computer to create professional-grade music.

In addition, technology has made it possible for musicians to record and produce music without expensive studio equipment. Many musicians now use home studios, where they can record, mix, and master their music using software and digital interfaces.
Technology has also changed the way music is distributed and consumed. With the rise of digital music platforms like Spotify, Apple Music, and Tidal, consumers now have access to millions of songs from around the world. This has made it easier for new artists to reach a wider audience, and for listeners to discover new music.

We use algorithms for sound synthesis, sampling, recognition of musical works, as well as for music composition. In music composition, algorithms attempt to replace what so far has been considered to fall into the exclusive domain of human activity. Composing, as well as any other artistic activity includes free choice (of tones) by which a composer expresses his/her feelings, moods, intentions or inspiration.

Our music recommendation system is an innovative solution that leverages facial detection technology to detect the mood of users and suggest songs on YouTube and Spotify accordingly. By analyzing the user's facial expressions, our system can determine their emotional state and recommend music that matches their mood.

The system uses advanced machine learning algorithms to analyze facial expressions and map them to different emotions such as happiness, sadness, romantic, rock, etc. Based on this analysis, the system can recommend songs that match the user's current mood, helping to create a more personalized and engaging music listening experience.

For example, if the system detects that the user is feeling sad or melancholic, it might recommend slower, more introspective songs with lyrics that deal with themes of loss or heartbreak. Alternatively, if the user is feeling energetic and excited, the system might recommend upbeat, high-energy songs with driving beats and catchy melodies.
Our music recommendation system integrates with popular music streaming services like YouTube and Spotify, allowing users to access a wide range of songs and artists. Users can provide feedback on the recommendations they receive, helping to refine the system's recommendations over time and ensure that they remain relevant and accurate.

Overall, our music recommendation system represents a significant step forward in the field of music technology, offering a more personalized and engaging music listening experience for users. By leveraging facial detection technology to detect users' moods and recommend songs accordingly, we believe that our system has the potential to revolutionize the way people discover and listen to music online.

Our music generation system is an advanced software algorithm that uses a genetic algorithm to generate unique and original music compositions. The genetic algorithm is a powerful tool that mimics the natural process of evolution to generate new solutions to complex problems. The music generation system works by starting with an initial population of randomly generated music sequences. Each sequence is evaluated based on a set of fitness criteria, such as harmony, melody, and rhythm, and assigned a fitness score.

The system then uses the genetic algorithm to generate a new population of music sequences by selecting the fittest members of the current population and breeding them together to create new sequences. This process continues over multiple generations, with each new generation producing music sequences that are increasingly complex and refined.

The genetic algorithm allows the music generation system to explore a vast space of possible musical compositions, generating unique and original music that is unlike anything created before. This makes it an ideal tool for artists, musicians, and composers who are looking to push the boundaries of traditional music composition and explore new sonic possibilities.
The music generation system also offers a high degree of control over the generated music, allowing users to specify the genre, tempo, and other musical parameters. This makes it a versatile tool that can be used to create music in a wide range of styles and genres.

Since its creation, the art of music has constantly evolved, developing new genres and styles over time. Computers have long been recognized for their potential in discovering new music, but a computer has yet to produce a truly appealing piece of music. Position based representation of rhythm and relative representation of pitches, based on measuring relation from starting pitch, allow for a flexible and robust way for encoding music compositions. In this paper, a genetic algorithm for making music compositions is presented.

1.1 Objective and scope of the project

The Global music industry’s worth is estimated at 130 billion US dollars. With the rising popularity of several music streaming platforms such as Spotify, YouTube Music and Amazon music, the industry is expected to grow exponentially. With the ever-rising demand for online music streaming services, there comes the need of personalizing the user experience and providing users with what they are looking for.

The main purpose of the project is to create an application with the ability to generate original and appealing music segments. As appealing is a very subjective definition, the user should be given the ability to define it. By using music which the user considers appealing the application should be able to create new music with similar characteristics.

The specific objectives of this our Music Recommendation using facial Recognition module include:

1. Improving the accuracy and relevance of music recommendations: By incorporating facial detection technology, the system can generate more accurate and relevant music recommendations based on users' current mood and emotional state.

2. Enhancing user engagement and retention: By providing more personalized and engaging music recommendations, the system can help to increase user engagement and retention on YouTube and Spotify, helping to improve the overall user experience.

3. Expanding the range of music discovery: By recommending music based on users' current mood, the system can help users discover new songs and artists that they may not have otherwise found, broadening their musical horizons and introducing them to new and exciting music.

4. Improving the overall quality of the music listening experience: By providing music recommendations that match users' current mood and emotional state, the system can help users to connect more deeply with the music they are listening to, creating a more satisfying and enjoyable listening experience.

Certain streaming music company such as Spotify, Pandora, and YouTube are affording users with access to songs to their paid members. It is important that these companies need to maintain their members to keep a subscription to gain more revenue. The playlist is a special function of these streaming apps. Many users feel difficult to create a list from a long list of music. As a result, users tend to play next song by in a random mode or by recommendation. Hence, a successful personalized music recommendation technique has become key to stay their members from jumping to another service.

Our Second module, Music Generation using Genetic Algorithm works towards the following objectives:

1. Enhancing the creativity and innovation of music composition: By using a genetic algorithm to generate music, the system can explore new musical territories and push the boundaries of traditional music composition, allowing for greater creativity and innovation in music creation.

2. Providing a tool for artists, musicians, and composers to experiment with new musical ideas: The music generation system provides a versatile and powerful tool for artists, musicians, and composers to experiment with new musical ideas and create music in a wide range of styles and genres.

3. Enabling the creation of background music for multimedia projects: The system's ability to generate music that matches specific moods and emotions makes it an ideal tool for creating background music for videos, games, and other multimedia projects, enhancing their overall effectiveness and impact

4. Streamlining the music creation process: The music generation system can help to streamline the music creation process by providing a tool for generating music quickly and efficiently, saving time and resources for artists, musicians, and composers.

5. Encouraging collaboration and cooperation in music creation: The system can be used to facilitate collaboration and cooperation in music creation by providing a common platform for artists, musicians, and composers to work together and generate new and exciting music compositions.

Hence, the project aims to capture the emotion expressed by a person through facial expressions and to create an application with the ability to recommend songs based on the user’s mood and generate original, appealing and diverse music segments.

1.2 Theoretical Background

Human happiness completes the art of living and Music plays one of the vital roles in keeping an individual with a peace of mind and at ease. Music always turns out to be a stress and tensity reliever. It has always been a boon to an individual and its mindset. With advancement of technology, manual work tends to be in last line and automation has gained a lot of attention. Our system aims to predict the emotion of an individual which will be along with giving input by the end user in which the end user will be asked whether they want to listen to songs according to their current mood or for the betterment of their mood which will be followed by playing songs over YouTube. Our pure system takes the consideration of the respective individual mood i.e. Happy, Sad, Romantic, Chill, Rock,etc

Automated music composition has been a widely researched method of producing new music for many years now. Musicians or artists build on what is generated by the machine and produce their own original work. The music or art generated by software is also sometimes sold by the companies or individuals who designed them. They can be licensed to corporations and retail for use in advertising, shop music etc.

A music generation and recommendation system using emotion detection is a complex system that combines multiple technologies and concepts from different fields, including machine learning, music theory, emotion detection, and human-computer interaction. Here are some of the theoretical concepts that underlie such a system:

- Machine learning: Machine learning is a branch of artificial intelligence that involves training algorithms to learn patterns and relationships in data. In the context of a music generation and recommendation system, machine learning algorithms can be used to generate and recommend music based on user input and feedback.

- Music theory: Music theory is the study of the principles and elements of music, including melody, harmony, rhythm, and form. A music generation and recommendation system must incorporate these principles to generate and recommend music that is musically coherent and aesthetically pleasing.

- Emotion detection: Emotion detection is the process of identifying and analyzing emotional states in humans. In the context of a music generation and recommendation system, emotion detection algorithms can be used to analyze user input such as facial expressions, speech, or physiological responses to determine the user's emotional state.

- Human-computer interaction: Human-computer interaction is the study of how people interact with technology, and how technology can be designed to better meet human needs and preferences. A music generation and recommendation system must be designed to provide a user-friendly and intuitive interface for users to interact with the system and provide feedback.

- Music recommendation algorithms: Music recommendation algorithms are used to recommend music to users based on their preferences and listening history. Collaborative filtering, content-based filtering, and hybrid approaches can be used to generate recommendations based on user input and feedback.

- Music generation algorithms: Music generation algorithms can be used to generate music automatically based on user input and feedback. Techniques such as rule-based systems, Markov chains, and neural networks can be used to generate music in a wide range of genres and styles.

- Music similarity measures: Music similarity measures are used to determine how similar one piece of music is to another. Similarity measures can be based on factors such as tempo, key, harmony, and rhythm, and can be used to generate and recommend music that is similar to a user's preferred style.

- Sentiment analysis: Sentiment analysis is a subfield of natural language processing that involves identifying the emotional tone of written or spoken language. In the context of a music generation and recommendation system, sentiment analysis can be used to analyze lyrics to determine the emotional content of a song.

- Music emotion models: Music emotion models are theoretical frameworks that describe how different musical features are related to emotional responses in listeners. By incorporating these models into a music generation and recommendation system, the system can generate and recommend music that is more likely to evoke the desired emotional response in the user.

- Music feature extraction: Music feature extraction involves extracting meaningful features from audio signals, such as melody, harmony, and rhythm. These features can be used as input to machine learning algorithms for music generation and recommendation.

- Evaluation metrics: Evaluation metrics are used to evaluate the performance of a music generation and recommendation system. Metrics such as accuracy, precision, recall, and F1 score can be used to measure the system's ability to generate and recommend music that matches the user's emotional state and preferences.

Overall, a music generation and recommendation system using emotion detection requires a combination of theoretical concepts and practical techniques from multiple fields, including machine learning, music theory, emotion detection, and human-computer interaction. By incorporating these concepts and techniques, such a system can provide a highly personalized and engaging experience for users.

1.3 Problem Definition

- In this era of internet, all the music is now available on the commercial music services in abundance. The quantity of the available music pieces is in dozens of millions. This makes choosing an appropriate music piece out of this abundance a time-consuming task. Whenever users want to listen to music of specific genre, a need to find a music piece similar to what user likes to hear arises.
- The undefined nature of music in combination with its diversity makes musical analysis a very complex subject. To simplify the analysis, it becomes necessary to focus upon one single culture of music.
- Hence it is very important to develop a system that can select music to a user based on certain criteria and also makes Music Generation more interesting and convenient for Music Producers. It is also designed to recommend music to users according to their mood by recognizing their facial expressions using different algorithms.
- Currently, many music streaming services provide recommendations based on users' listening history or popular music charts, but these recommendations may not always match users' current mood or emotional state. Additionally, users may not always know what they want to listen to, and the traditional search function may not always provide relevant results. This can lead to frustration and a lack of engagement with the platform, potentially causing users to switch to a different service.
- Our music recommendation system aims to solve these issues by incorporating facial detection technology to analyze users' emotional states and recommend music that matches their mood. By providing more personalized and engaging recommendations, the system aims to improve the overall music listening experience for users and increase engagement and retention on YouTube and Spotify. However, there are also potential problems associated with this system, such as privacy concerns around facial detection technology and the accuracy of detecting mood solely through facial expressions. Additionally, users may

not want to have their emotions constantly monitored and analyzed, and may prefer to manually select their music without the system's recommendations. Therefore, it is important to ensure that the system is transparent in its use of facial detection technology and provides users with the option to opt out of using this feature.

- Traditional music composition methods rely on the knowledge and experience of the composer, limiting the range of possible compositions to what has been previously composed or within the composer's creative abilities. This can result in a lack of diversity and originality in music compositions, leading to a saturation of similar-sounding music in the industry. Additionally, the process of composing music can be time-consuming and require significant resources, limiting the ability of musicians and artists to create new music quickly.
- The music generation system using genetic algorithm aims to solve these issues by providing a powerful tool for exploring a vast space of possible musical compositions, allowing for greater creativity and innovation in music creation. The system can generate music that is unlike anything previously composed, introducing new and exciting musical ideas to the industry.
- However, there are also potential problems associated with this system, such as the subjective nature of musical composition and the difficulty in quantifying musical creativity. Additionally, the generated music may not always be immediately usable or may require further refinement by a composer or musician. Therefore, it is important to ensure that the system is flexible and can be adapted to the needs of individual users, allowing them to modify and refine the generated music to suit their specific needs and preferences.

1.4 User Requirement/SRS

Functional Requirements:

- The system will have a user-friendly and intuitive interface that allows users to provide input and feedback, view recommended music, and control the music playback.
- The system will include algorithms for emotion detection that can analyze user input and determine the user's emotional state.
- The system will include algorithms for music generation that can generate music based on user input and feedback. These algorithms should be able to generate music in a wide range of genres and styles.
- The system will include algorithms for music similarity measures that can determine how similar one piece of music is to another. These measures can be used to generate and recommend music that is similar to the user's preferred style.
- The system will incorporate music emotion models that describe how different musical features are related to emotional responses in listeners. By incorporating these models into the music generation and recommendation algorithms, the system can generate and recommend music that matches the user's emotional state and preferences.
- The system will support multiple languages to cater to a diverse user base.
- The system will be able to process user input and generate music in real-time, allowing for a seamless and interactive experience for the user.
- The system will be scalable to handle a large number of users and a large music database.

Overall, a music generation and music recommendation system using emotion detection requires a wide range of functional requirements to provide a personalized, interactive, and engaging experience for users. By incorporating these requirements, the system can generate and recommend music that matches the user's emotional state and preferences, providing a highly personalized and engaging experience for users.

Non-Functional Requirements:

Security:

- Asks user permission to access camera.
- The system will ensure the security and privacy of user data, such as user preferences, feedback, and emotional state, by implementing appropriate security measures, such as data encryption, access control, and secure data storage.

Performance:

- User can access the camera at any given time and detects emotion in 0.3 microsecond.
- The system should generate new sample within 3-5 seconds.
- The system should be able to respond to user input and generate music recommendations in a timely manner, with low latency and high throughput.

User Friendly:

- The system is very interactive, easily accessible for music professionals as well as music enthusiasts & gives rapid and accurate results.

Usability:

- The system will be easy to use, with a clear and intuitive interface, and should require minimal training for users to use effectively.
- The system will be optimized for performance and resource utilization, with minimal CPU and memory usage, to reduce operating costs and improve user experience.

Overall, non-functional requirements play a crucial role in the success of a music generation and music recommendation system using emotion detection. By ensuring high performance, reliability, scalability, and security, the system can provide a seamless and engaging experience for users, while also reducing maintenance and operating costs.

1.5 Feasibility study

- Feasibility study examines the viability or sustainability of an idea, project, or business. The study examines whether there are enough resources to implement it, and the concept has the potential to generate reasonable profits. In addition, it will demonstrate the benefits received in return for taking the risk of investing in the idea.
- A feasibility study is part of the initial design stage of any project/plan. It is conducted in order to objectively uncover the strengths and weaknesses of a proposed project or an existing business.
- The study analyzes the project's relevant factors, such as technical, economic and legal considerations, to assess whether the project is worth an investment.
- We are proposing the development of two music-related systems: a music recommendation system that uses facial detection to detect the mood of users and suggest songs on YouTube and Spotify and a music generation system that generates music using genetic algorithms. A feasibility study is necessary to assess the technical, operational, economic, and legal/ethical feasibility of these systems.

Music Recommendation System:

- Technical Feasibility:

  The system requires high-end facial detection technology and machine learning algorithms to analyze user emotions accurately. Integrating with YouTube and Spotify API is also essential for seamless operation. The technical feasibility of the system is achievable as there are established technologies available in the market to support facial detection and machine learning algorithms.

- Operational Feasibility:

  The system should be user-friendly and easy to navigate, with minimal user intervention required. It should also be scalable to accommodate a large number of users and adapt to changing user requirements and preferences. A user-friendly interface and sufficient server capacity are crucial to the system's success. The operational feasibility of the system is achievable with proper planning and implementation.

- Economic Feasibility:

  The costs of developing and deploying the system would be substantial. However, the potential revenue streams from the system could offset these costs, such as subscription-based models, targeted advertising, and licensing fees. The economic feasibility of the system is achievable with proper monetization strategies.

- Legal and Ethical Feasibility:

  The use of facial detection technology raises privacy concerns and ethical issues surrounding data collection and usage. It is essential to ensure that the system complies with data privacy regulations, provides users with the option to opt-out of the facial detection feature, and adequately safeguards user data. Legal and ethical feasibility can be achieved by adhering to relevant regulations and ethical principles.

Music Generation System:

- Technical Feasibility:

  The music generation system requires complex algorithms and a deep understanding of music theory. The system should be able to create unique and innovative music compositions that do not sound like existing pieces. The technical feasibility of the system is achievable with the right team of developers and experts in music composition and genetic algorithms.

- Operational Feasibility:

  The system should be user-friendly and easy to navigate, with minimal user intervention required. It should also be scalable to accommodate a large number of users and adapt to changing user requirements and preferences. The operational feasibility of the system is achievable with proper planning and implementation.

- Economic Feasibility:

  The costs of developing and deploying the system would be substantial. However, the potential revenue streams from the system could offset these costs, such as licensing fees, royalty agreements, and subscription-based models. The economic feasibility of the system is achievable with proper monetization strategies.

- Legal and Ethical Feasibility:

  The use of music compositions generated by the system raises legal and ethical issues surrounding ownership and originality. The system should ensure that the generated music is not plagiarized and adheres to copyright regulations. Legal and ethical feasibility can be achieved by implementing the right policies and ensuring that the system is transparent in its operation.

1.6 Details of hardware and software

1.6.1 Hardware Requirement: -

- Minimum space required is 20GB.
- Powerful processor, such as an Intel Core i7 or AMD Ryzen 7, to handle the computational requirements
- Sufficient storage capacity, such as 20 GB or more, to store music files, user preferences, and other data.
- RAM required is 8GB.
- Pen drive(64GB) or external HDD for backup.
- Minimum space required in HDD is 20GB.
- high-speed network interface, such as an Ethernet or Wi-Fi adapter, to enable fast and reliable data transfer between the system and remote servers. Windows 7, 8.1 or any higher version/ Mac OS above Mountain Lion
- high-quality input and output devices, such as a keyboard, mouse, speakers, and microphone, to facilitate user interaction and feedback.
- Works with both 32bit and 64bit Operating System.
- Devices: Laptop, Webcam

1.6.2 Software Requirement: -

- Python 3.9 and Python 3.10
- Visual Studio Code
- Ableton Software
- Draw.io

1.7 Tools and Technology

- **Python 3.10:**

Python is a high-level, general-purpose programming language. Its design philosophy emphasizes code readability with the use of significant indentation. Python is dynamically-typed and garbage-collected. It supports multiple programming paradigms, including structured (particularly procedural), object-oriented and functional programming. It is often described as a "batteries included" language due to its comprehensive standard library. Python's large standard library provides tools suited to many tasks, and is commonly cited as one of its greatest strengths. It includes modules for creating graphical user interfaces, connecting to relational databases, generating pseudorandom numbers, arithmetic with arbitrary-precision decimals, manipulating regular expressions, and unit testing. Some python Libraries used in this project are: Streamlit, CV2, Mediapipe, PyO, etc.

- **Genetic Algorithm:**

Genetic algorithms are a type of optimization algorithm inspired by natural selection and genetics. They are commonly used in various fields of engineering and computer science, including music generation. In the context of music generation, genetic algorithms use a population of musical sequences as individuals and evolve them through a process of selection, recombination, and mutation to generate new sequences. The process is repeated iteratively until a satisfactory musical piece is generated.

The first step is to create an initial population of musical sequences. These sequences are usually generated randomly or based on specific criteria such as harmony, rhythm, melody, or other musical characteristics.

Next, a fitness function is defined to evaluate the quality of each individual in the population. The fitness function is based on musical features such as harmony, melody, rhythm, and structure. Individuals with higher fitness scores are more likely to be selected for the next generation.

The selection process involves choosing the fittest individuals in the population to breed and generate offspring. This is done through techniques such as roulette wheel selection, tournament selection, or rank-based selection.

Once the selection process is complete, recombination is used to create offspring by combining the genetic information of two or more individuals. This is typically done through crossover, which involves exchanging genetic material between selected individuals to produce new sequences with different characteristics.

Finally, mutation is used to introduce randomness and diversity into the population by randomly changing some of the notes or musical features in the sequences. This helps to avoid premature convergence and increases the chance of finding a better solution.
The evolutionary process of selection, recombination, and mutation is repeated iteratively until a satisfactory musical piece is generated. The resulting music may sound entirely unique and innovative, or it may resemble existing music styles or genres depending on the initial population and fitness function used.

- **Ableton:**

Ableton AG is a German music software company that produces and distributes the production and performance program Ableton Live and a collection of related instruments and sample libraries, as well as their own hardware controller Ableton Push. Ableton Live is a flexible music production software for all types of music creation, especially electronic music. It comes with a wide range of effects, samples, instruments, and other features that make music production and performance feasible, even for first-time users. It allows you to move freely between musical elements and play with your ideas without stopping the workflow. Ableton is a popular music software used by music producers, DJs, and live performers to create and manipulate music in real-time. It is known for its user-friendly interface and innovative features, which allow users to experiment with different sounds and styles.

Ableton software provides two different interfaces: Arrangement view and Session view.

One of the unique features of Ableton is its ability to warp audio files in real-time, which allows users to match the tempo and pitch of different audio files to create seamless transitions between them. This feature is especially useful for DJs who need to mix tracks together without any noticeable gaps or changes in tempo.

Another innovative feature of Ableton is its instrument and effect plugins, including the Operator synthesizer, Simpler and Sampler samplers, and a wide variety of audio effects such as delay, reverb, and distortion. These plugins allow users to create and manipulate sounds in unique ways, making Ableton a popular choice for electronic music producers.

Ableton also has a large and active user community, with many resources and tutorials available online. This community provides a supportive environment for users to share their work, collaborate on projects, and learn new techniques.

2. System Analysis and Design

2.1 Detailed Life Cycle of the Project

The project life cycle is really just a highfalutin way of describing the life of a project. It describes the high-level process of delivering a project and the steps you take to make things happen. It's how projects happen; how the phases of a project conduct a team from brief through to delivery. Every project has a start and end; it's born, matures, and then "dies" when the project life cycle is complete.

A life cycle diagram with initiation, planning, execution, and closeout phases is another common model used in project management. It provides a structured approach to manage a project from beginning to end. The following are the four phases of this life cycle diagram:

1. Initiation:

   This phase marks the beginning of the project. In this phase, the project idea is conceived, and its feasibility is evaluated. The project's objectives and scope are defined, and the project team is assembled. This phase concludes with the approval of the project plan. This phase is where the project idea is conceptualized, and the purpose and goals of the project are established. The scope of the project is defined, and the stakeholders and their roles are identified.

2. Planning:

   In this phase, the project plan is developed in detail. The project team creates a comprehensive plan that outlines the project's objectives, deliverables, and timelines. The team also develops a risk management plan, a communication plan, and a quality plan. The planning phase concludes with the approval of the project plan by all stakeholders. This phase involves developing a detailed project plan. The project plan includes identifying project deliverables, creating a work breakdown structure, estimating resources and time required for each task, developing a project schedule, and identifying potential risks.

3. Execution:

   This phase is where the actual work of the project is carried out. The project team implements the project plan and performs the work required to achieve the project's objectives. The team communicates regularly with stakeholders to keep them informed of progress and to address any issues that arise. This phase concludes with the completion of all deliverables. This phase involves the actual implementation of the project plan. The project team carries out the work according to the project plan, and the project manager monitors progress, manages resources, and communicates with stakeholders.

4. Closeout:

   This phase marks the end of the project. The project team delivers the final product or service, and the stakeholders evaluate the project's success against its objectives. The team also completes a project review to identify lessons learned and areas for improvement. The closeout phase concludes with the transfer of project deliverables to the stakeholders and the formal closure of the project. This phase involves wrapping up the project, including delivering the final product or service to the customer, documenting lessons learned, and archiving project records. The project team conducts a final project review and evaluates project performance against the project plan.

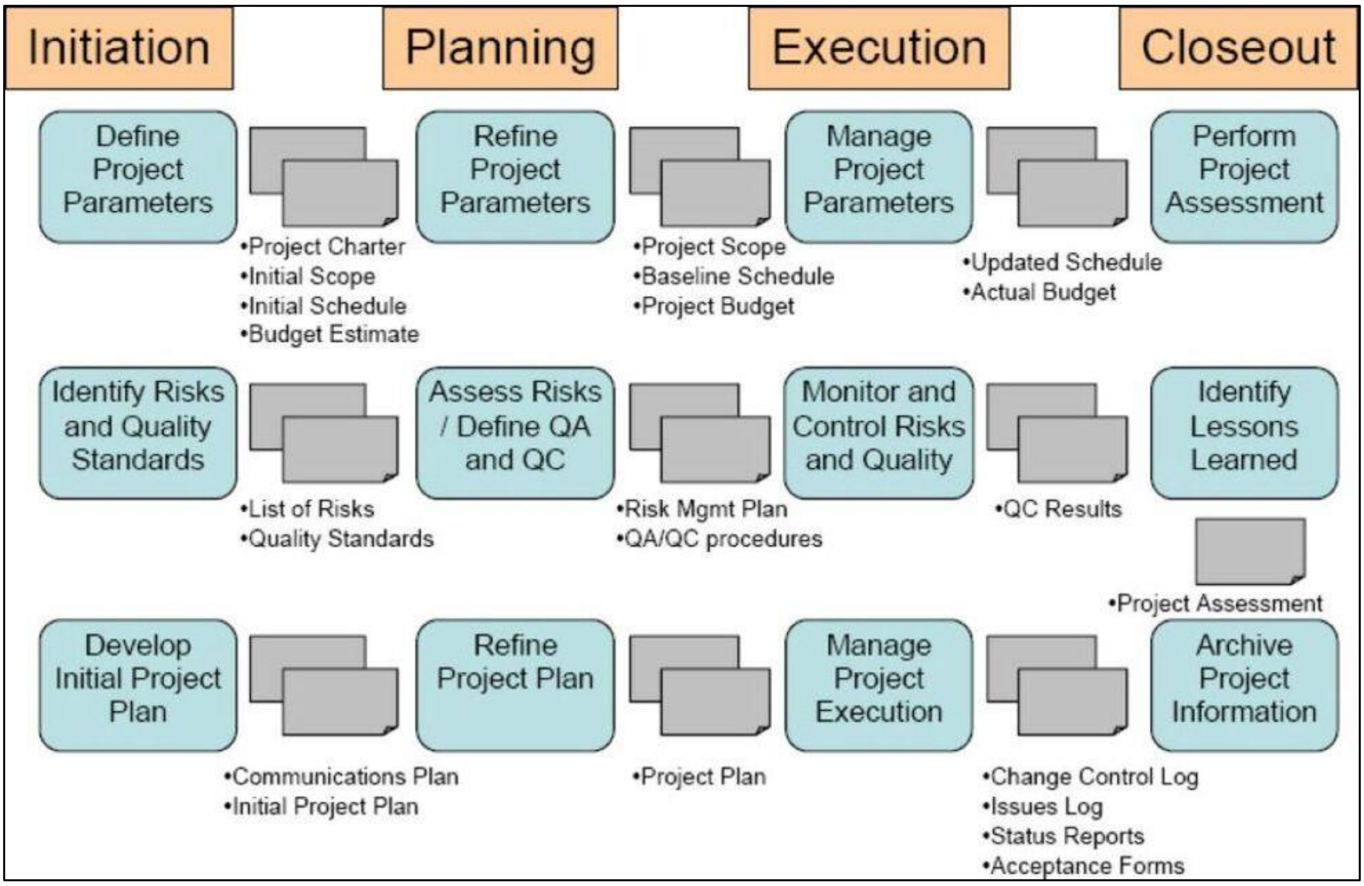


Figure 1.0 Detailed Life Cycle of the Project

2.2 Context Diagram

Also referred to as the Level 0 Data Flow Diagram, the Context diagram is the highest level in a Data Flow Diagram. It is a tool popular among Business Analysts who use it to understand the details and boundaries of the system to be designed in a project. It points out the flow of information between the system and external components. It is a visual representation of the relationship between data and business processes. This diagram has 3 main components which include external entities, system processes, and data flows.

It provides the factors and events you need to consider when developing a system. With it, you will be able to determine the scope, boundaries, and system requirements. It’s a great tool to help explain the system to business analysts, stakeholders, and developers.

The context diagram provides a high-level view of the music generation and music recommendation system using emotion detection and helps to identify the key stakeholders and requirements of the system. It can also be used as a starting point for more detailed system modeling and design.

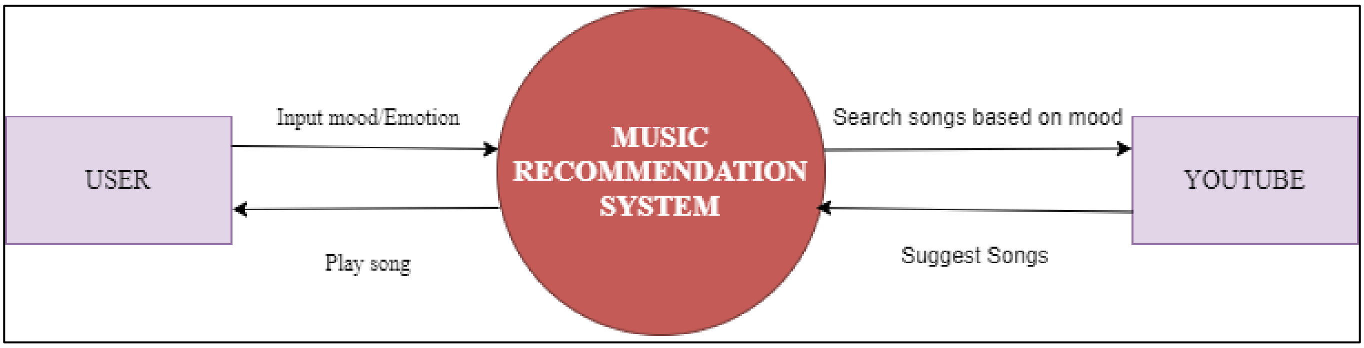


Figure 1.1 Context Level Diagram (Music Recommendation System)

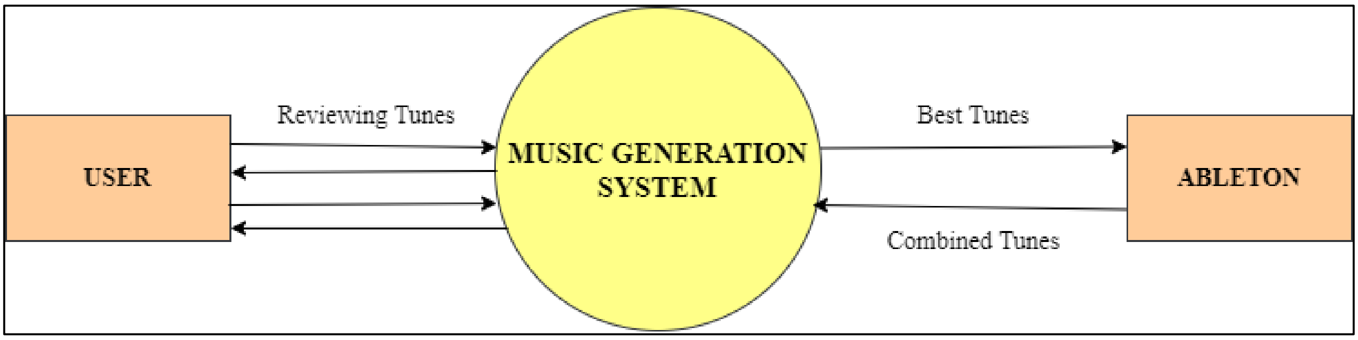


Figure1.2 Context Level Diagram (Music Generation System)

2.3 DFD level 1

- **Data Flow Diagram: -**

In Software engineering DFD (data flow diagram) can be drawn to represent the system of different levels of abstraction. Higher-level DFDs are partitioned into low levels-hacking more information and functional elements. Levels in DFD are numbered 0, 1, 2 or beyond. In 1-level DFD, the context diagram is decomposed into multiple bubbles/processes. In this level, we highlight the main functions of the system and breakdown the high-level process of 0-level DFD into subprocesses.

A data flow diagram (DFD) is a graphical representation of the flow of data through a system. It is a modeling technique used to visualize the inputs, processes, and outputs of a system, and to describe the flow of data between different components of the system. DFDs are commonly used in software engineering, system analysis, and business process modeling.

DFDs are made up of four basic elements: processes, data stores, data flows, and external entities. A process represents a transformation of data, such as a calculation or data manipulation. A data store represents a place where data is stored, such as a database or file system. A data flow represents the movement of data from one component of the system to another. An external entity represents an entity outside of the system that interacts with the system, such as a user or another system.

DFDs can be broken down into levels, where each level represents an increasingly detailed view of the system. Level 0 represents the highest-level view of the system, showing the major components and their interactions. Level 1 provides a more detailed view of the processes and data flows within each component, and so on.

DFDs are used to help understand the structure of a system, identify potential problems and inefficiencies, and to communicate requirements and design to stakeholders. They are often used in combination with other modeling techniques, such as use case diagrams, to provide a complete view of a system.

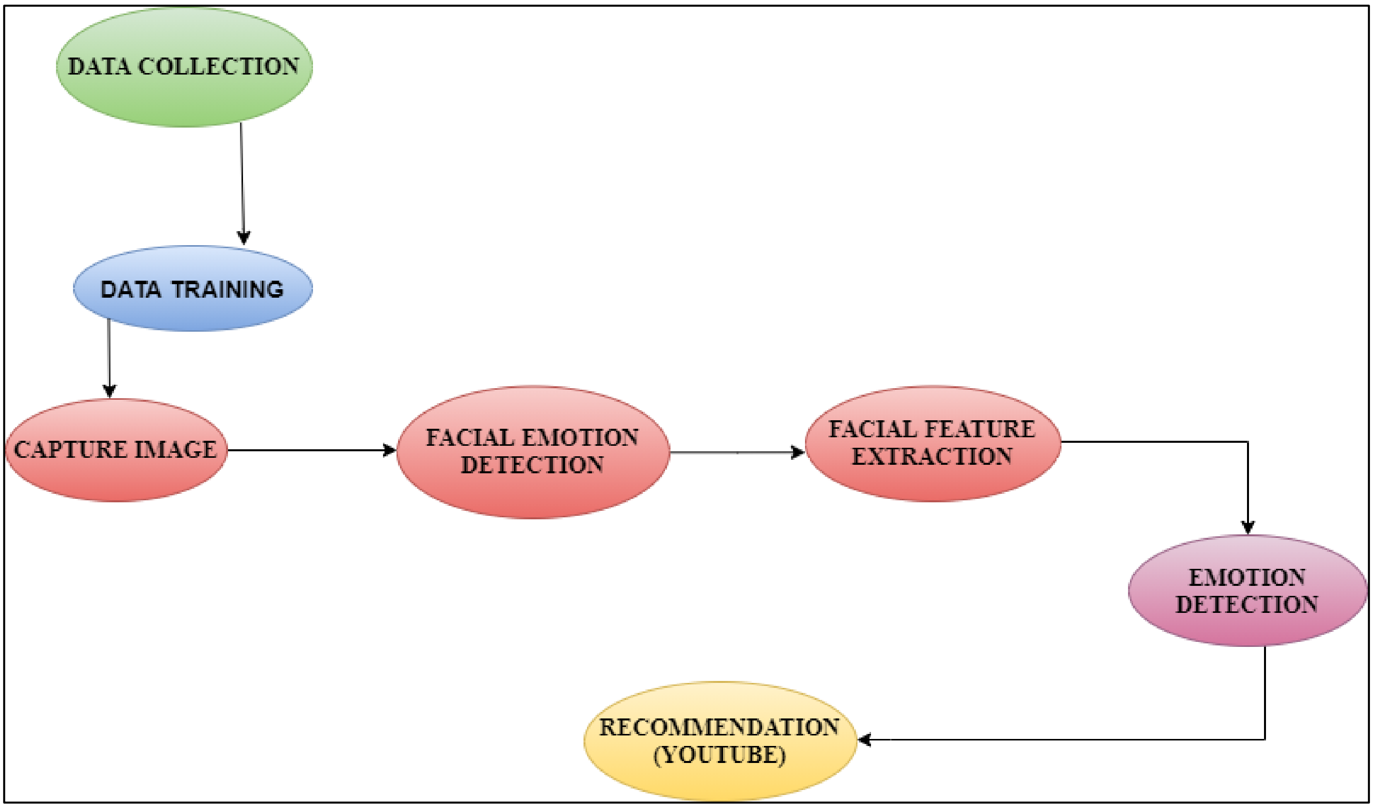


Figure 1.3 Data Flow Diagram Level 1(Music Recommendation System)

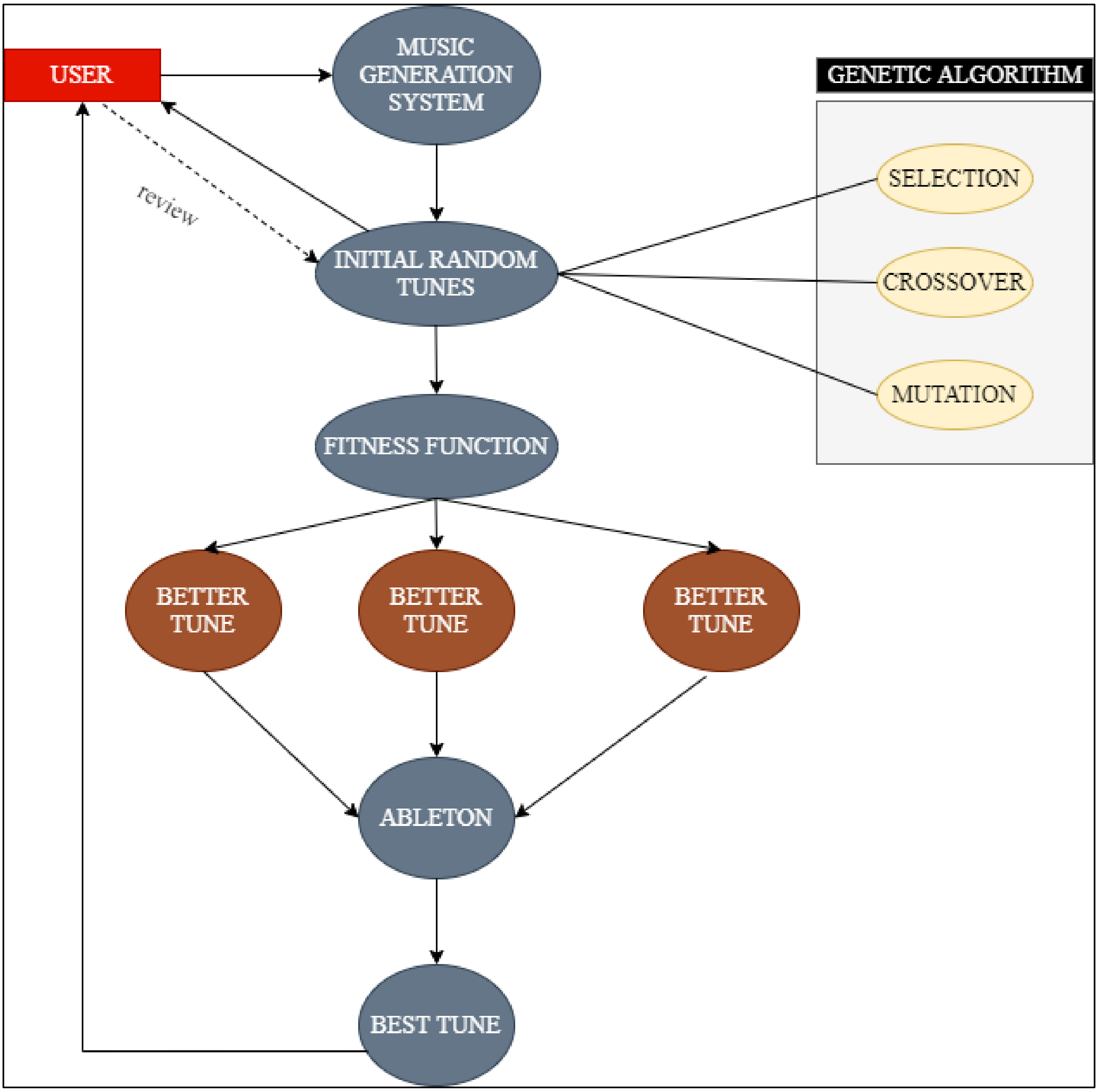


Figure 1.4 Data Flow Diagram Level 1(Music Generation System)

2.4 Use Case Diagram

A use case diagram is a dynamic or behavior diagram in UML. Use case diagrams model the functionality of a system using actors and use cases. Use cases are a set of actions, services, and functions that the system needs to perform. In this context, a "system" is something being developed or operated, such as a web site. The "actors" are people or entities operating under defined roles within the system.

To model a system, the most important aspect is to capture the dynamic behavior. Dynamic behavior means the behavior of the system when it is running/operating. Only static behavior is not sufficient to model a system rather dynamic behavior is more important than static behavior.

The purpose of use case diagram is to capture the dynamic aspect of a system. They are used to gather the requirements of a system including internal and external influences. These requirements are mostly design requirements. Hence, when a system is analyzed to gather its functionalities, use cases are prepared and actors are identified.

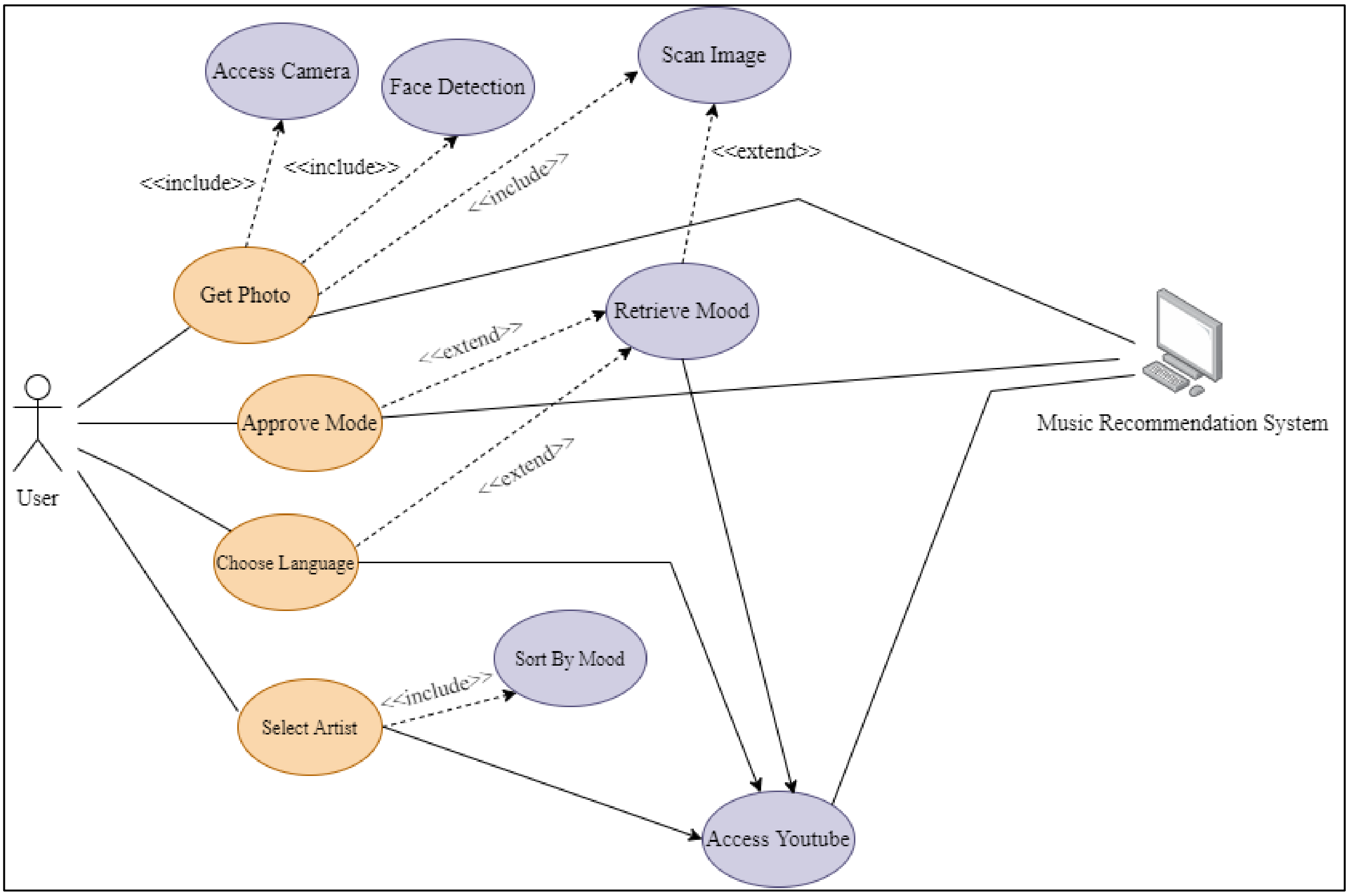


Figure 1.5 Use Case Diagram (Music Recommendation System)

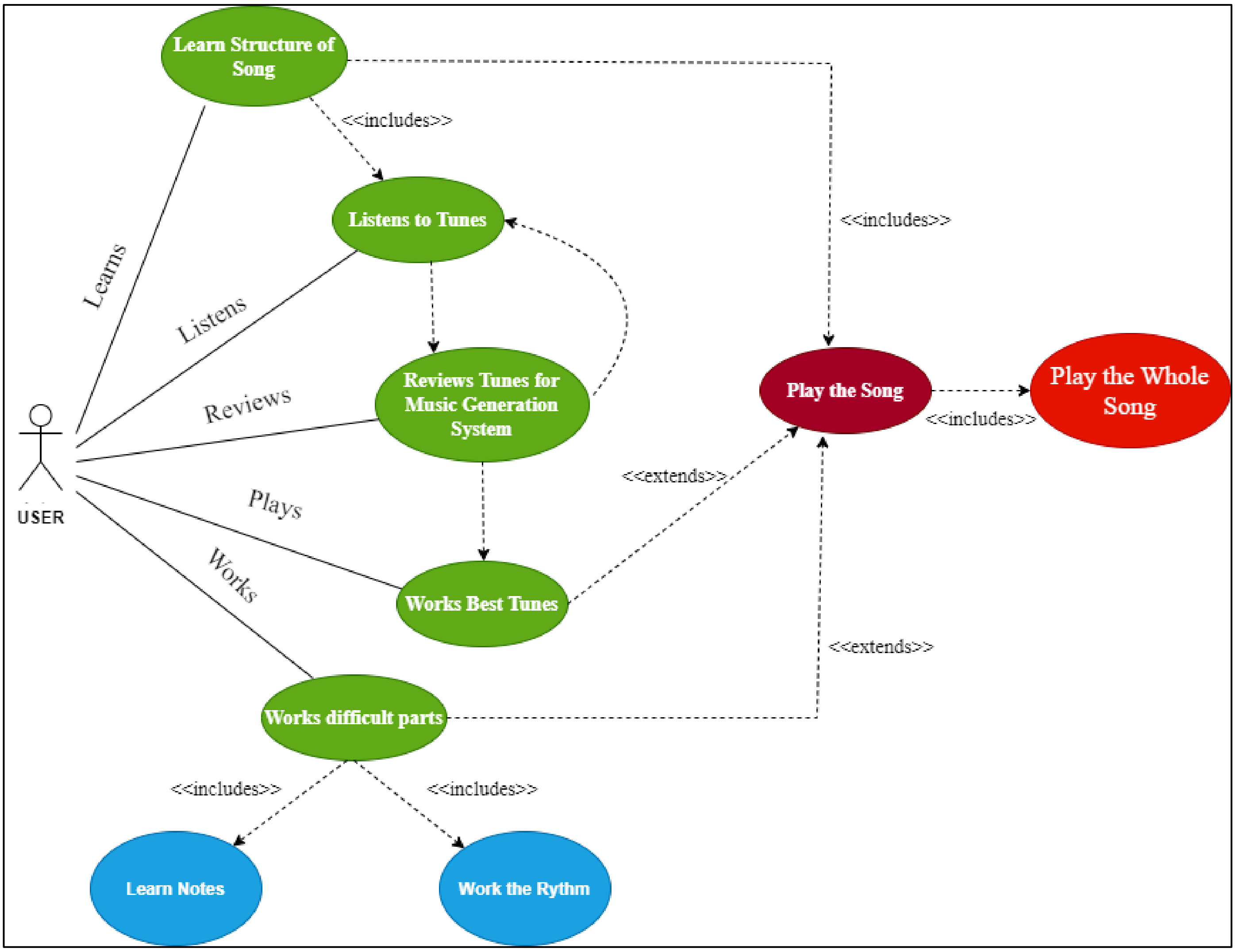


Figure 1.6 Use Case Diagram (Music Generation System)

2.5 Activity Diagram

An activity diagram visually presents a series of actions or flow of control in a system similar to a flowchart or a data flow diagram. Activity diagrams are often used in business process modeling. They can also describe the steps in a use case diagram. Activities modeled can be sequential and concurrent. In both cases an activity diagram will have a beginning (an initial state) and an end (a final state).

An activity diagram for our music recommendation system that uses facial detection to detect the mood of the user to suggest songs on YouTube and Spotify can be represented as follows:

1. User initiates the application
2. The system captures a facial image of the user
3. The system analyzes the facial image to detect the user's mood
4. The system retrieves a list of songs from the Spotify and YouTube APIs
5. The system filters the songs based on the user's detected mood
6. The system presents the list of recommended songs to the user
7. The user selects a song from the list
8. The system plays the selected song on the user's preferred music player (Spotify or YouTube)

The activity diagram shows the sequence of actions that occur within the system in response to the user's actions. It represents the flow of activities, decisions, and actions in a clear and concise manner. Activity diagrams are often used in software engineering to model workflows, use cases, and business processes. They help to visualize the flow of activities within a system, identify bottlenecks, and optimize performance.

An activity diagram for a music generation system that generates music using a genetic algorithm can be represented as follows:

1. User initiates the system
2. The system initializes the genetic algorithm parameters
3. The system generates an initial population of music sequences
4. The system evaluates the fitness of each music sequence in the population
5. The system selects the fittest music sequences to use as parents for the next generation
6. The system applies crossover and mutation operators to create a new generation of music sequences
7. The system evaluates the fitness of each music sequence in the new generation

8. The system selects the fittest music sequences to use as parents for the next generation
9. The system repeats steps 6-8 until a stopping criterion is met (e.g. a maximum number of generations or a satisfactory fitness level is reached)
10. The system presents the final generated music sequence to the user
11. The user can provide feedback on the generated music
12. The system logs the user's feedback for future generations.

The activity diagram shows the sequence of actions that occur within the music generation system in response to the user's actions. It represents the flow of activities, decisions, and actions in a clear and concise manner. Activity diagrams are often used in software engineering to model workflows, use cases, and business processes. They help to visualize the flow of activities within a system, identify bottlenecks, and optimize performance. In the case of a music generation system using a genetic algorithm, the activity diagram helps to demonstrate the process of generating new music sequences through iterative refinement and evaluation of fitness.

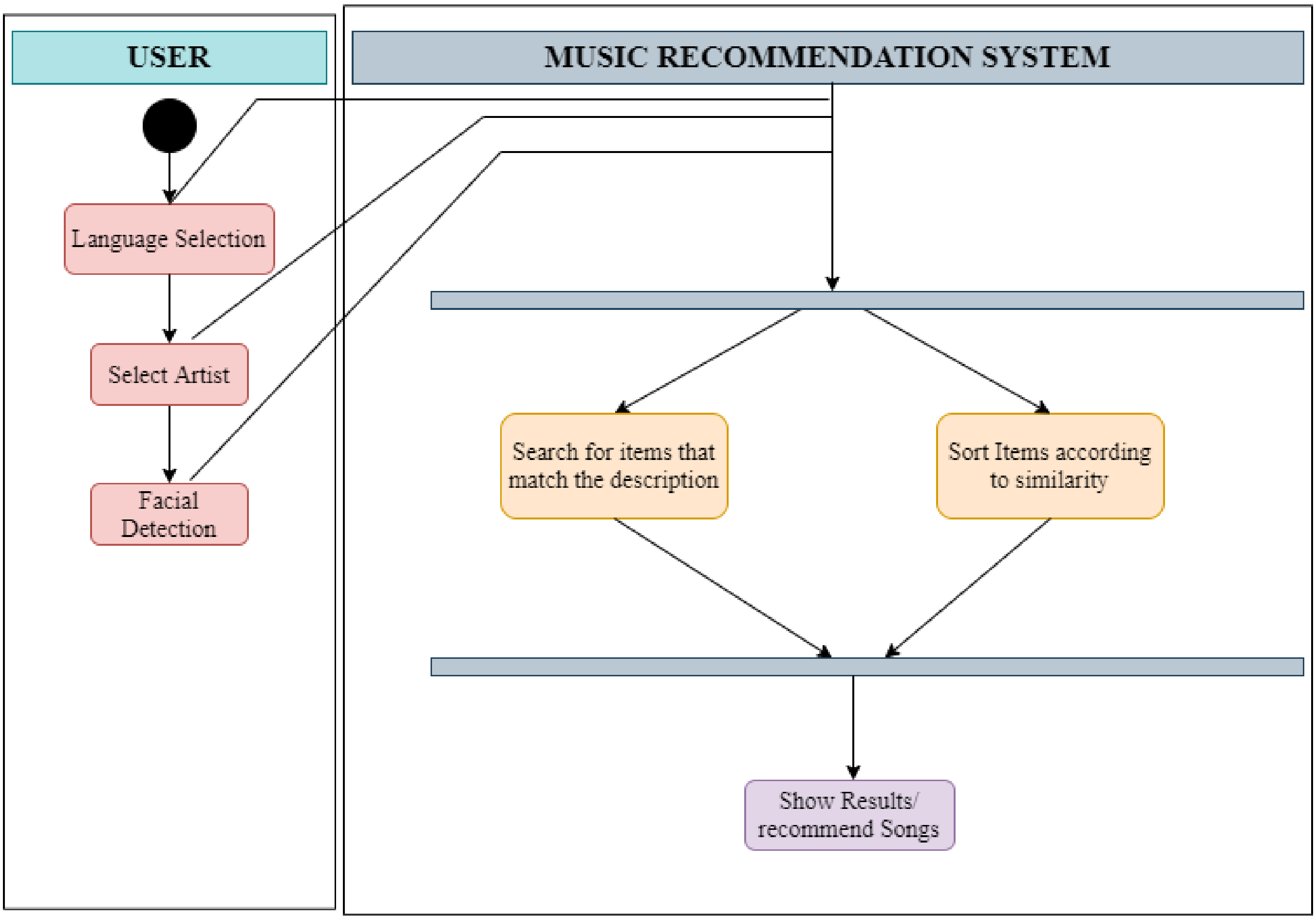


Figure 1.7 Activity Diagram (Music Recommendation System)

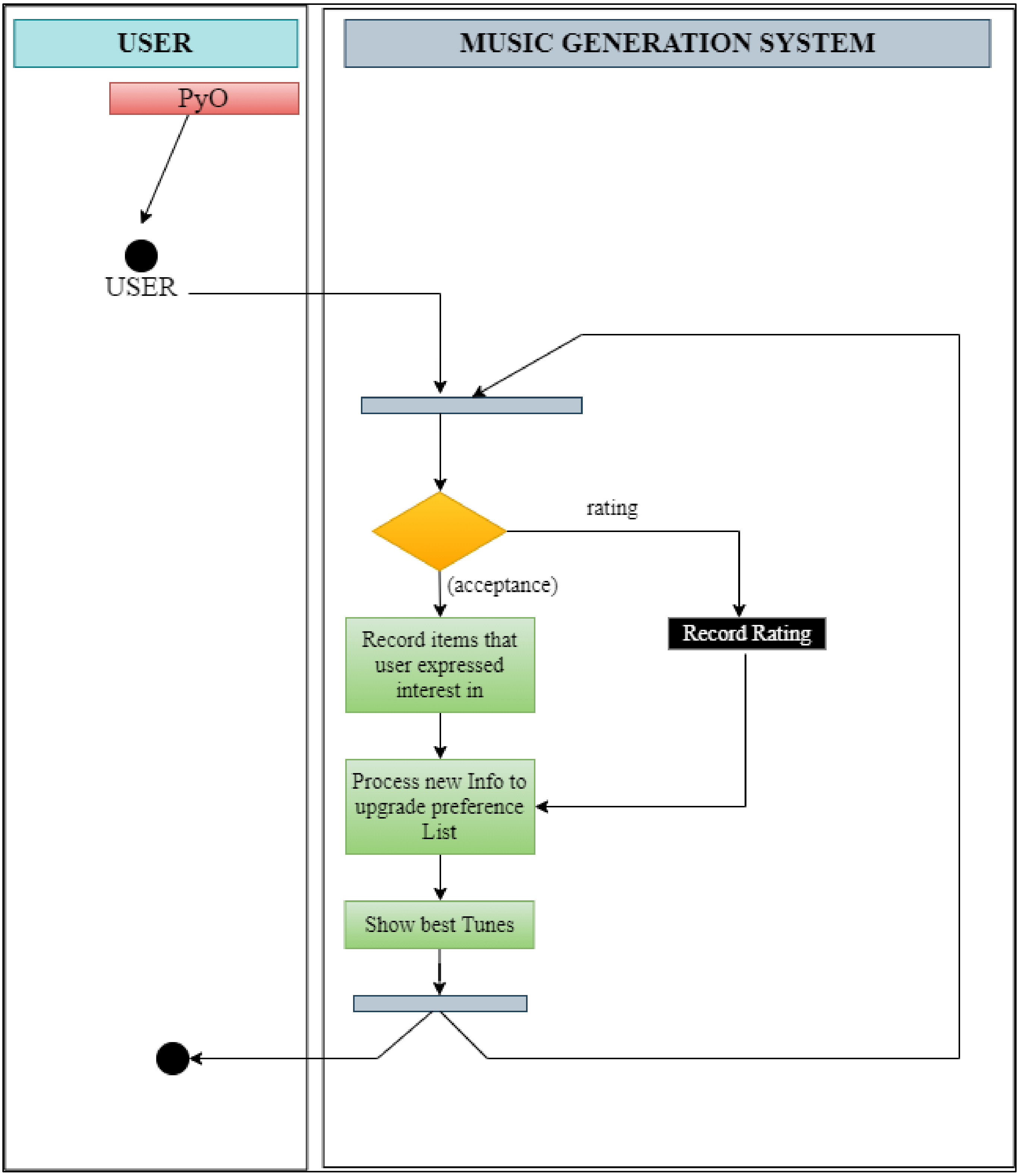


Figure 1.8 Activity Diagram (Music Generation System)

2.6 Architecture Design

The system architecture is the model that conceptually defines the views, structure, and behavior of the system. System architecture in other words is the representation and description of how the system works and communicates with other system components in general. The whole system is composed of the components and the subsystems that overall work together to make the system it should be in the first place.

Therefore, the aim is to combine the technological and the aesthetic, despite the general belief that architecture is only a technological task. In the same way, it mixes design, understood as the creative process, and architecture, which is based on the creation and presentation of solutions at a technical level. The system architecture is made by keeping business logic and needs in mind. This architecture can be both formal and detailed depending on the situation.

The software architecture diagram is a visual presentation of all of the aspects that constitute a system, either in part or whole. It is a depiction of a set of concepts that comprise architecture, such as its principles, components, and materials. It is also a system diagram used to abstract the general layout of the software system as well as the interactions, limitations, and limits between parts.

Also, an architecture diagram is a network map used to describe the general structure of a software program as well as the interactions, restrictions, and limits between elements. It is a significant tool since it offers a broader picture of the computer underlying physical installation as well as its development plan.

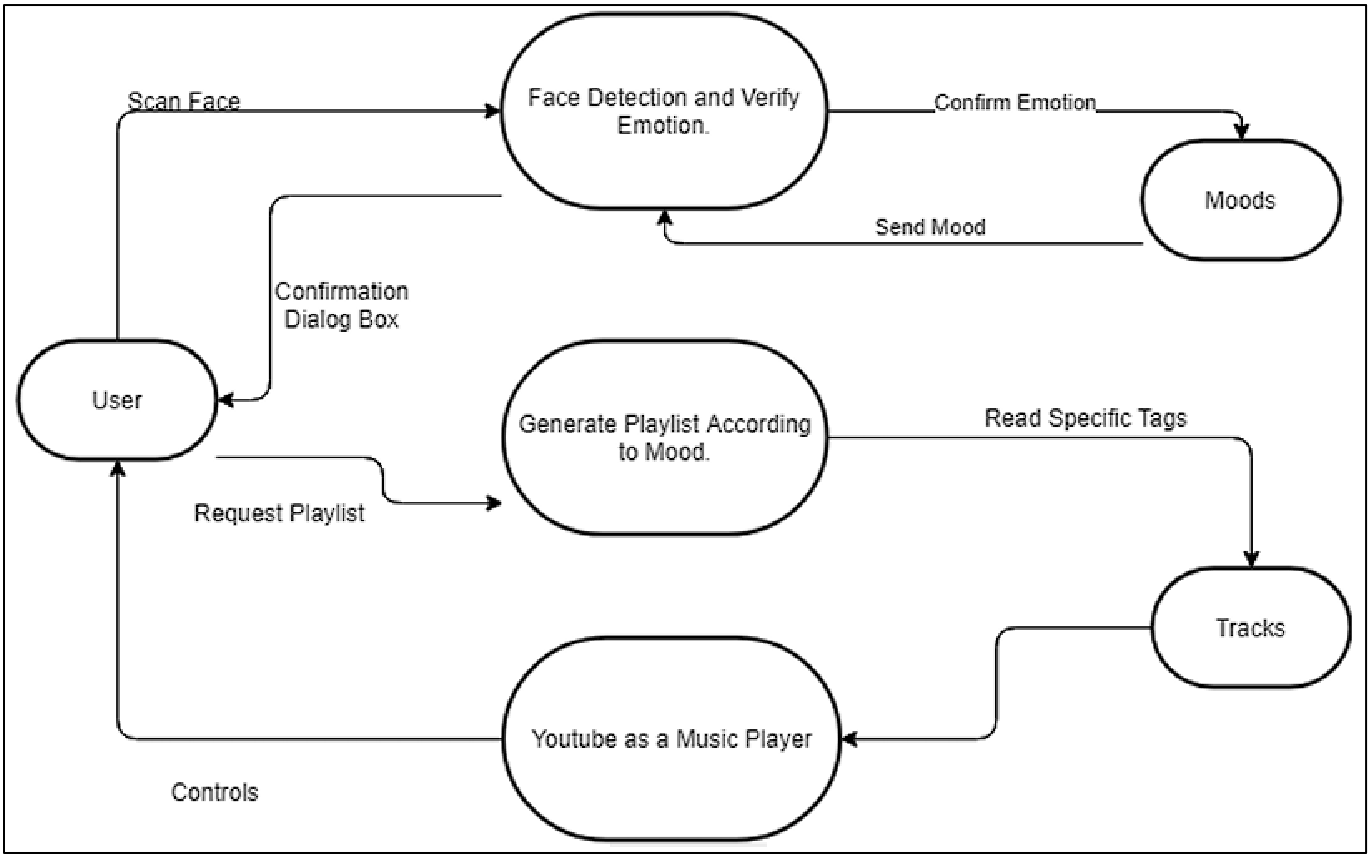


Figure 1.9 Architecture Diagram (Music Recommendation System)

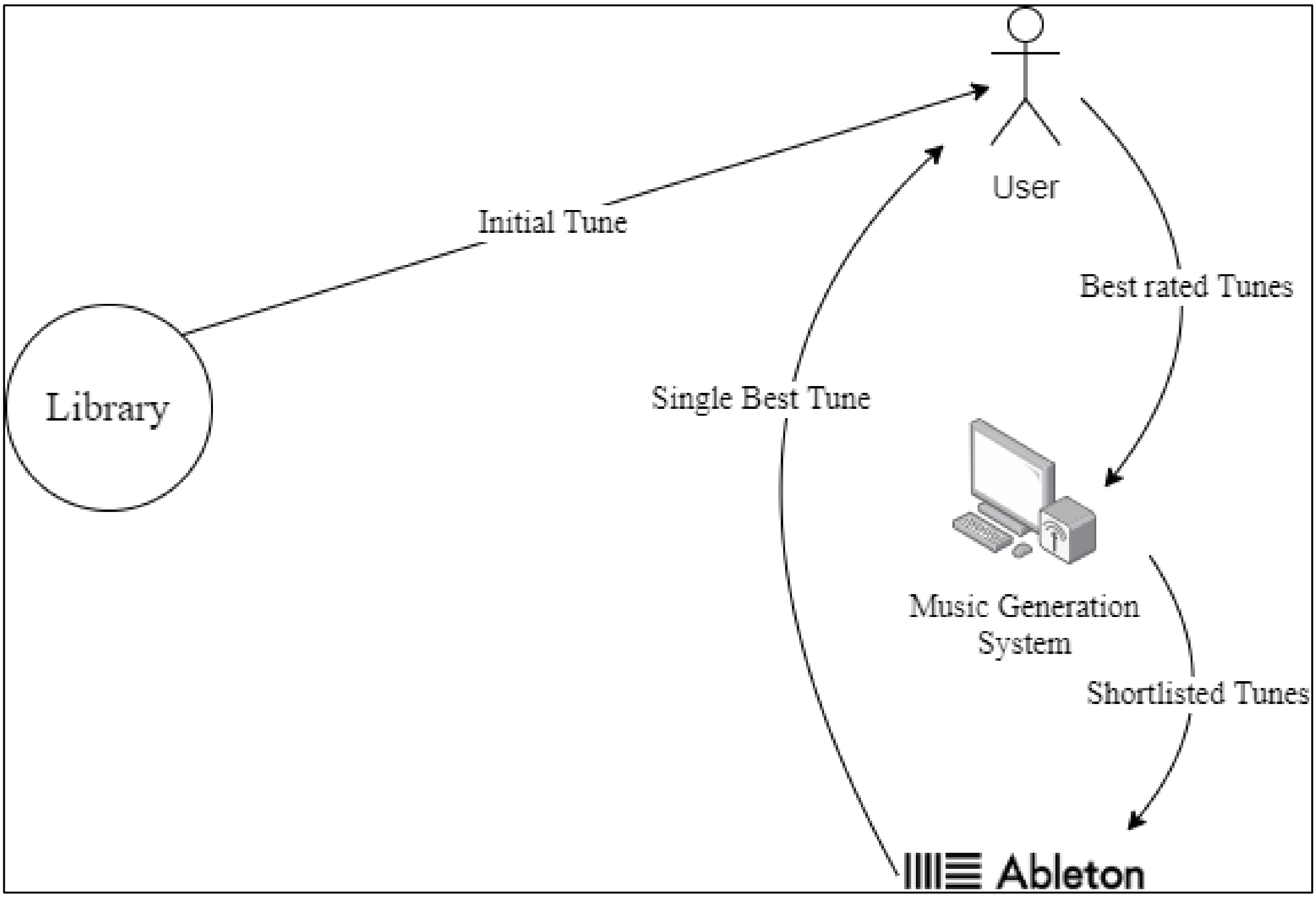


Figure 1.10 Architecture Diagram (Music Generation System)

2.7 Sequence Diagram

Sequence Diagrams are interaction diagrams that detail how operations are carried out. They capture the interaction between objects in the context of a collaboration. Sequence Diagrams are time focus and they show the order of the interaction visually by using the vertical axis of the diagram to represent time what messages are sent and when. Sequence Diagrams show elements as they interact over time and they are organized according to object (horizontally) and time (vertically).

Sequence diagrams are organized according to time. The time progresses as you go down the page. The objects involved in the operation are listed from left to right according to when they take part in the message sequence.

A sequence diagram for our music recommendation system that uses facial detection to detect mood of user to suggest songs on YouTube and Spotify can be represented as follows:

1. The user initiates the system by clicking on the "Recommend Music" button
2. The system displays a prompt asking the user for permission to access their camera for facial detection
3. The user grants permission and the system activates the camera to capture the user's face
4. The system processes the facial image and determines the user's mood
5. The system queries the YouTube and Spotify APIs for songs that match the user's mood
6. The YouTube and Spotify APIs respond with a list of matching songs
7. The system filters and sorts the list of songs based on the user's music preferences and history
8. The system presents the top recommended songs to the user
9. The user selects a song to listen to
10. The system plays the selected song on the respective platform (YouTube or Spotify)

The sequence diagram illustrates the sequence of events and interactions between the user, the system, and external APIs. It shows the flow of messages and the order in which they are sent and received. The diagram highlights the key steps involved in recommending music to the user based on their mood and music preferences. Sequence diagrams are commonly used in software engineering to model the interactions between objects or components within a system, and they help to identify potential issues or areas for optimization in the system.

A sequence diagram for our music generation system that generates music using a genetic algorithm can be represented as follows:

1. The user initiates the system by selecting the "Generate Music" option
2. The system prompts the user to enter the desired genre, tempo, and length of the generated music
3. The user inputs the desired parameters, and the system creates an initial population of music sequences based on the genetic algorithm
4. The system evaluates the fitness of each music sequence based on the user's input parameters and the genetic algorithm's fitness function
5. The system selects the fittest music sequences from the population and uses them to generate a new population of music sequences
6. The system repeats steps 4 and 5 for a specified number of generations
7. Once the specified number of generations is reached, the system selects the fittest music sequence from the final population
8. The system presents the generated music to the user for playback
9. The user can choose to save the generated music or generate a new music sequence

The sequence diagram highlights the interactions between the user and the music generation system. It shows the flow of messages and the order in which they are sent and received. The diagram illustrates the key steps involved in generating music using a genetic algorithm, including the creation and evaluation of initial and subsequent populations of music sequences. The sequence diagram can be used to optimize the performance of the music generation system and identify any potential issues or bottlenecks.

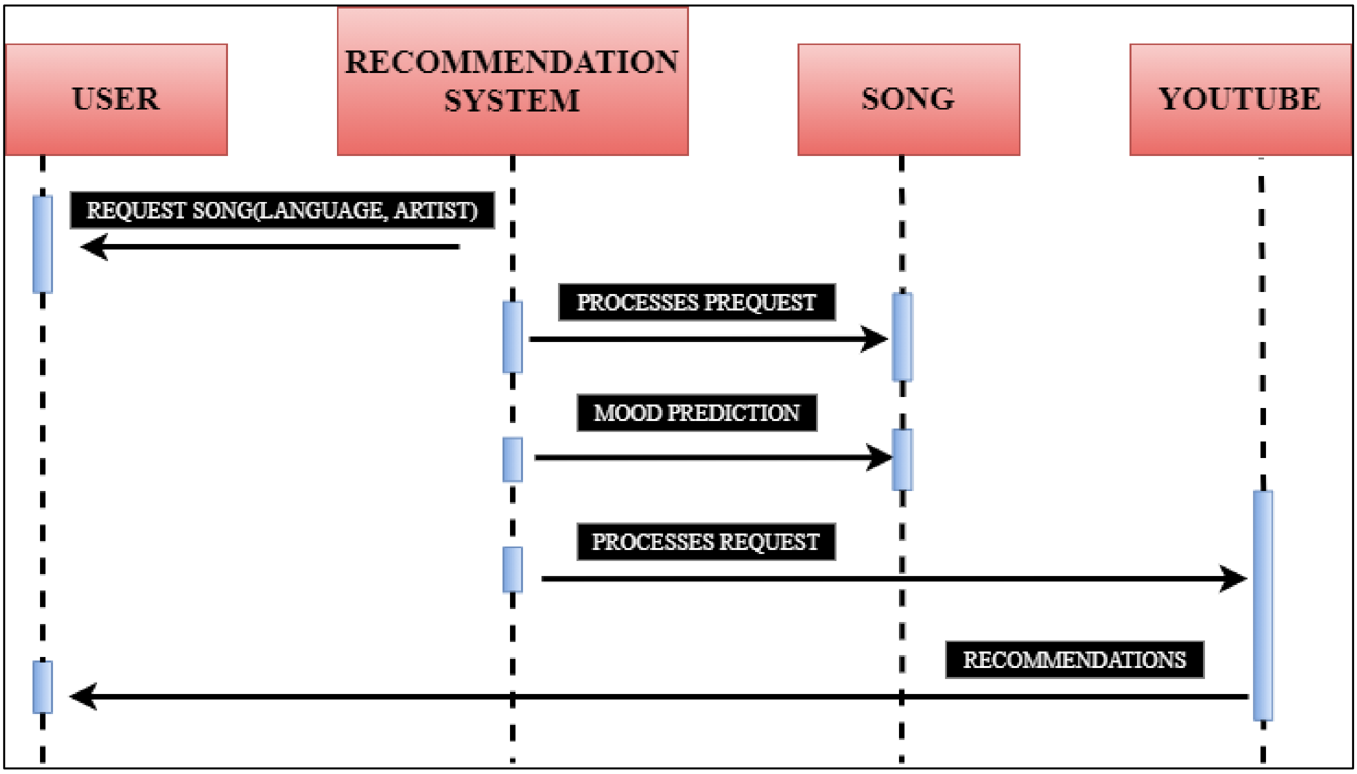


Figure 1.11 Sequence Diagram (Music Recommendation System)

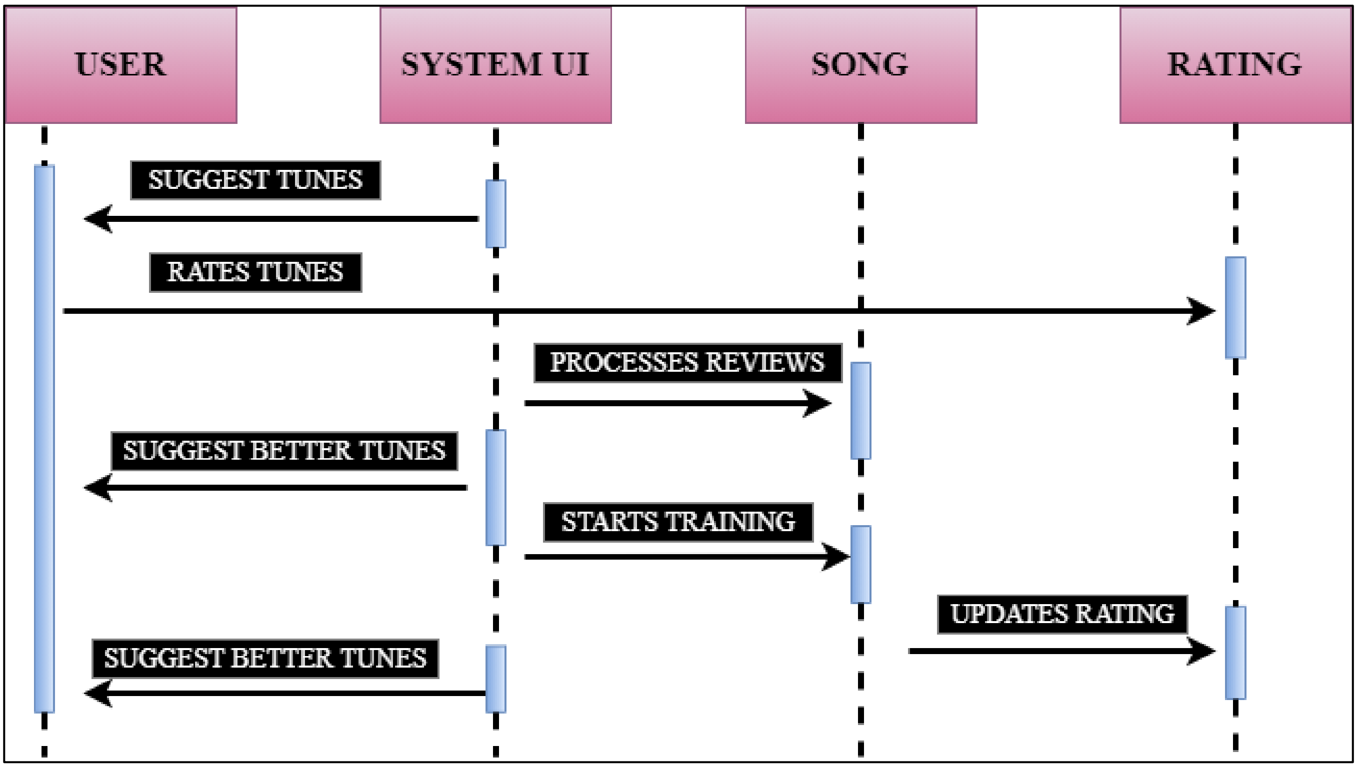


Figure 1.12 Sequence Diagram (Music Generation System)

2.8 Deployment Diagram

A UML deployment diagram is a diagram that shows the configuration of run time processing nodes and the components that live on them. Deployment diagrams is a kind of structure diagram used in modeling the physical aspects of an object-oriented system. They are often be used to model the static deployment view of a system (topology of the hardware). Graphically, a deployment diagram is a collection of vertices and arcs.

Deployment diagrams are used to visualize the topology of the physical components of a system, where the software components are deployed.

Deployment diagrams are used to describe the static deployment view of a system. Deployment diagrams consist of nodes and their relationships. The term Deployment itself describes the purpose of the diagram. Deployment diagrams are used for describing the hardware components, where software components are deployed.

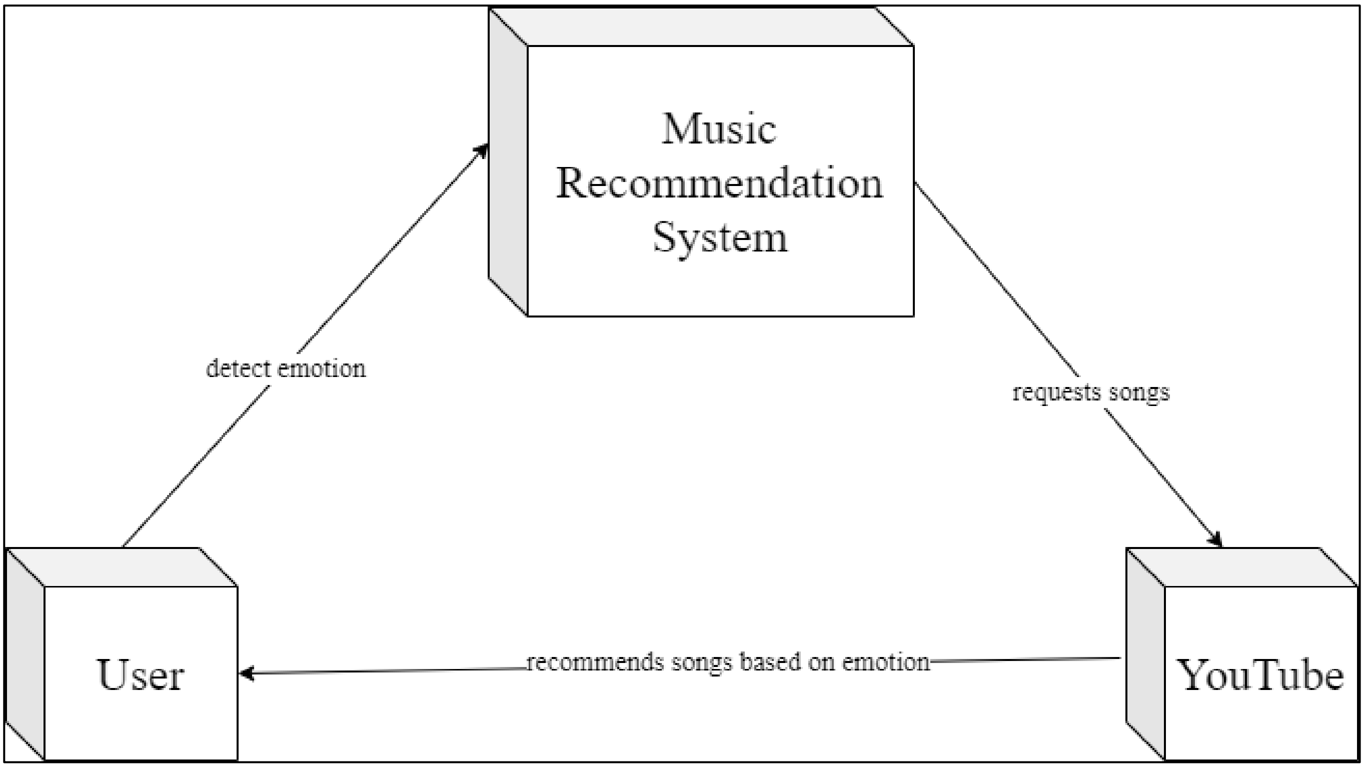


Figure 1.13 Deployment Diagram (Music Recommendation System)

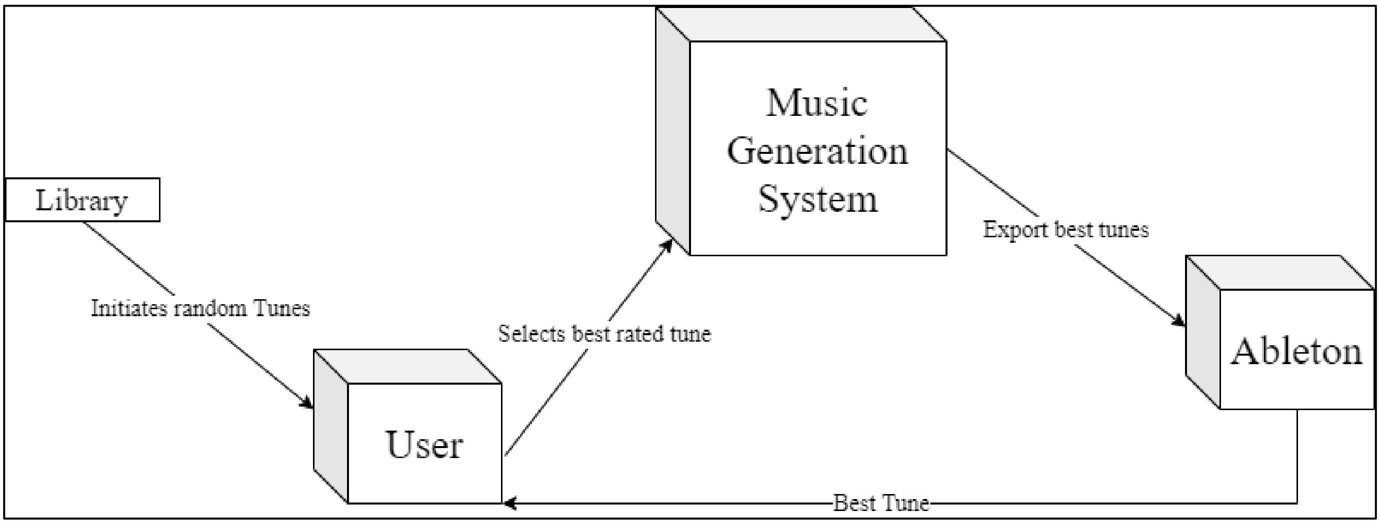
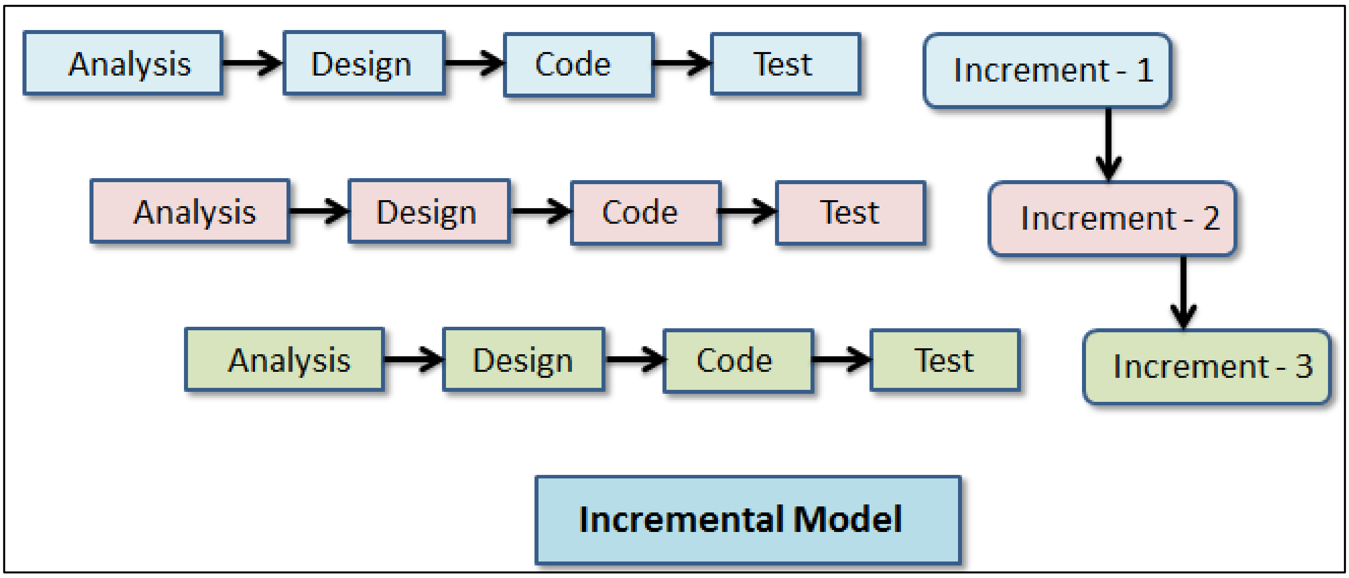


Figure 1.14 Deployment Diagram (Music Generation System)

2.9 Incremental Model

Incremental Model is one of the most adopted models of software development process where the software requirement is broken down into many standalone modules in the software development life cycle. Once the modules re the split then incremental development will be carried out in steps covering all the analysis, designing, implementation, carrying out all the required testing or verification and maintenance. In incremental models, each iteration stage is developed and hence each stage will be going through requirements, design, coding and finally the testing modules of the software development life cycle. Functionality developed in each stage will be added on the previously developed functionality and this repeats until the software is fully developed.

The main importance of the Incremental model is that it divides the software development into submodules and each submodule is developed by following the software development life cycle process SDLC like Analysis, Design, Code, and Test. By doing this model make sure that we are not missing any objective that is expected from the end of the software even though how minor objective it can be. Thus we are achieving 100% objective of the software with this model also since we are testing aggressively after each stage we are making sure of the end software is defect-free and also each stage is compatible with previously developed and future developing stages.



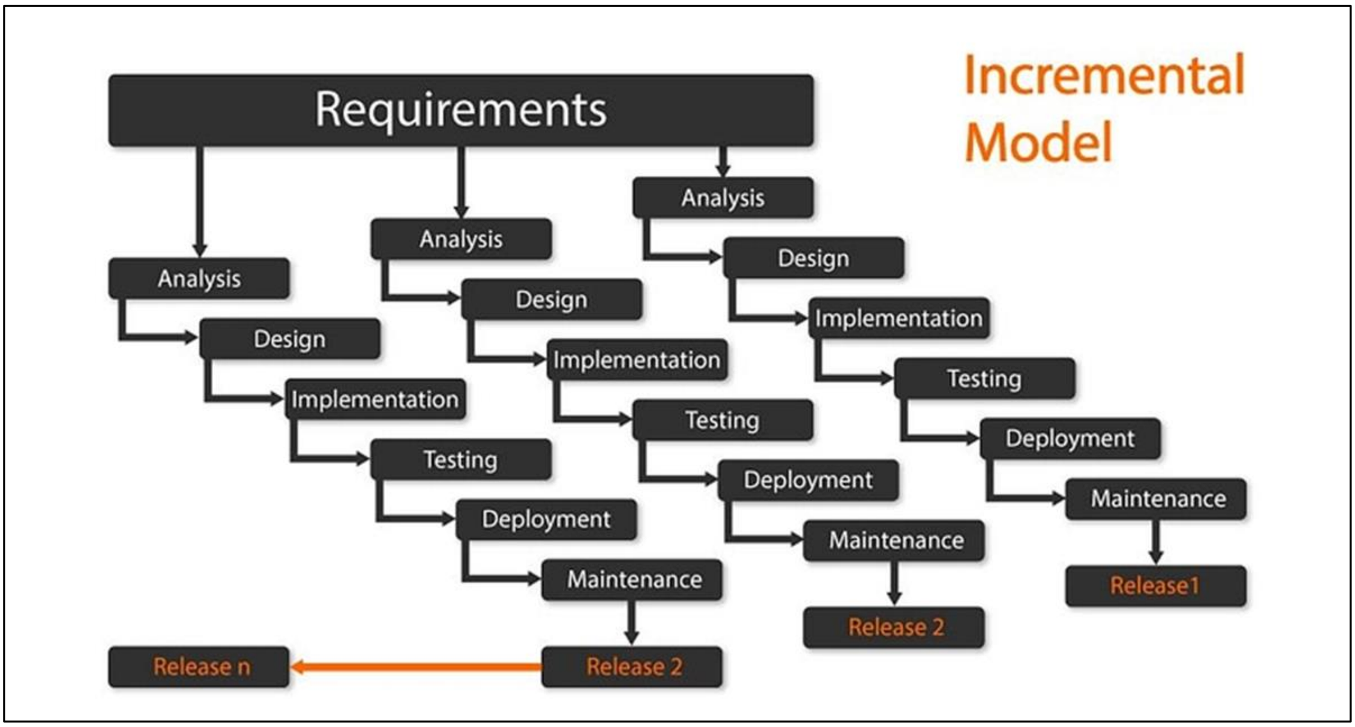


Figure 1.15 Incremental Model

3. System Planning and Design

3.1. Gantt Chart

A Gantt chart is a bar chart that provides a visual view of project tasks scheduled over time. A Gantt chart is used for project planning: it’s a useful way of showing what work is scheduled to be done on specific days. It helps project managers and team members view the start dates, end dates and milestones of a project schedule in one simple stacked bar chart.

A Gantt chart is a graphical representation of a project schedule that shows the timeline of tasks and their dependencies. It is a useful tool for project management as it allows stakeholders to visualize the project timeline, track progress, and identify potential issues and delays.

The Gantt chart provides a visual representation of the project timeline, including the start and end dates of each task and their dependencies. It can be used to track progress, identify potential issues, and adjust the project plan as necessary to ensure timely and successful completion of the music generation and music recommendation system using emotion detection.

Table Details | Gantt

PROJECT DETAILS	
Project Title	Music Generations and Recommendation using Emotion Detection
Project Manager	Aishani Anavkar
Project Duration	June 2022- January 2023

Sr No.	Tasks	Progress
1	Research	100%
2	Planning	100%
3	Synopsis	100%
4	Project Approval	100%
5	Designing	75%
6	Module 1 Implementation	70%
7	Documentation	25%
8	Module 2 Implementation	25%
9	Testing of Modules	0%
10	Integration of Modules	0%
11	Performance Testing	0%
12	Review Phase	0%
13	Final Implementation	0%

Figure 1.16 Table Details

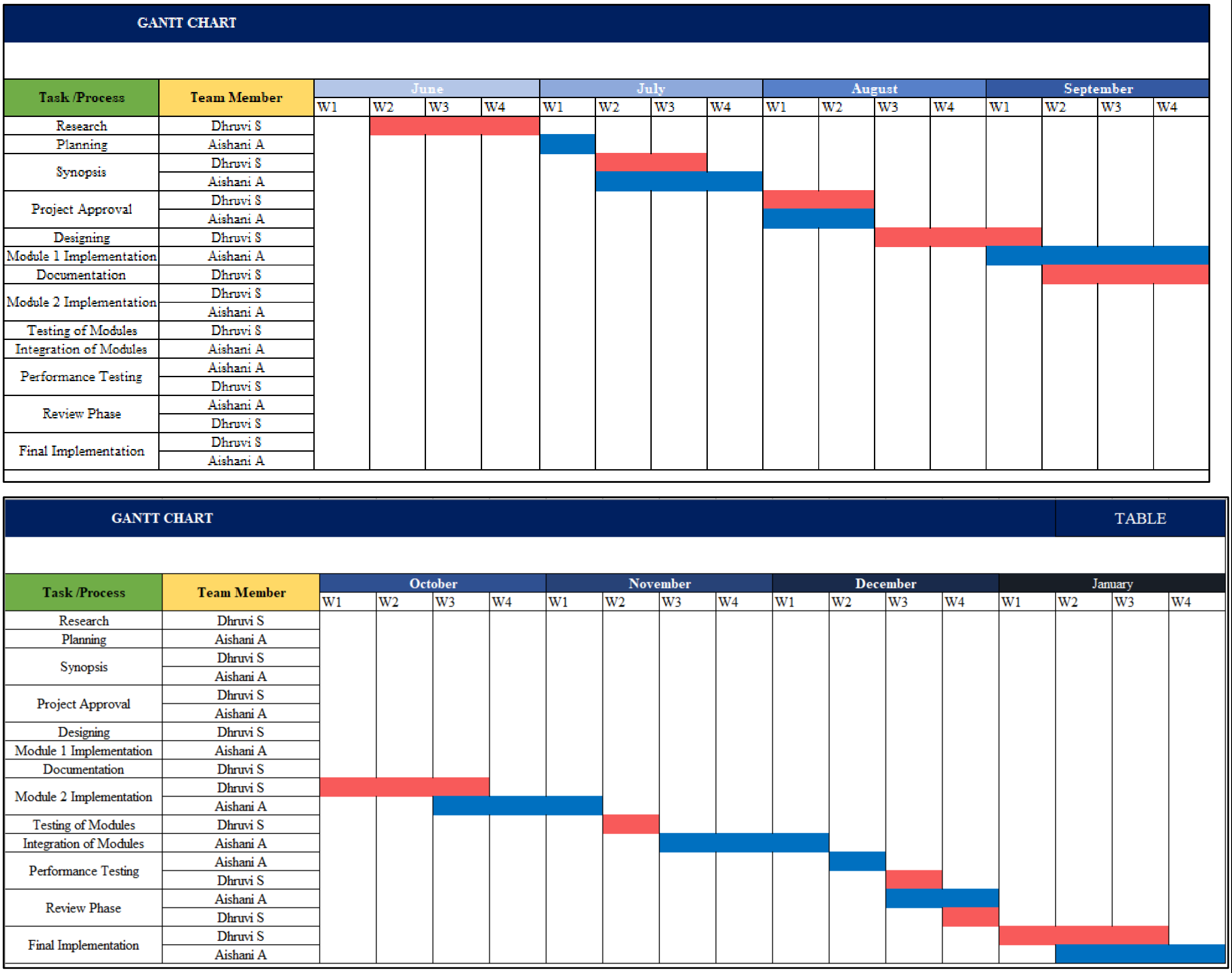


Figure 1.17 Gantt Chart

3.2. SWOT Analysis

A SWOT analysis is a strategic planning tool that helps to identify the strengths, weaknesses, opportunities, and threats of a project or organization. It can be used to evaluate the current state of the project and to develop a plan for future development and growth. For a music generation and music recommendation system using emotion detection, the SWOT analysis might include the following:

MUSIC RECOMMENDATION SYSTEM

- **Strength:**
  - Recommends song by facial emotion detection. The system can generate music based on user preferences and emotional state, providing a personalized and unique listening experience.
  - Provides personalized music recommendations based on user's emotional state and preferences, enhancing user experience.
  - Can improve user engagement and retention by providing relevant and enjoyable music selections.
  - The system can leverage existing music databases and emotion detection algorithms to reduce development time and costs.
  - Can be integrated with various music streaming platforms, expanding the selection of music available to users.

- **Weakness:**
  - User must turn on the camera for the system to detect the mood hence over dependency on webcam. The System will be able to suggest songs only from YouTube and no other music platform.
  - The accuracy of the emotion detection algorithm may be limited, potentially leading to inaccurate music recommendations.
  - The system may require significant computing resources and may not be suitable for low-powered devices.
  - The system may require a large database of music and user data to be effective, potentially raising privacy concerns.

- **Opportunities:**
  - The system can suggest songs using various other platforms like Spotify, Apple Music, etc and not just YouTube.
  - The market for music streaming services is growing, providing an opportunity for the system to gain market share.
  - The system can be expanded to include additional features, such as social media integration and playlist sharing, increasing user engagement and retention.
  - The system can be marketed to specific user groups, such as fitness enthusiasts or relaxation seekers, increasing the potential user base.

- **Threats:**
  - The system is limited to facial features only. Also, the system is highly dependent on the internet.
  - Competitors may already have established similar services, making it difficult to gain market share.
  - Changes in music licensing and copyright laws may impact the availability and cost of music for the system.
  - Security breaches or data leaks may damage the reputation of the system and erode user trust.

MUSIC GENERATION SYSTEM

- **Strength:**
  - The Music Generation System is very user friendly. There is a high probability of uniqueness. The artists can maintain their originality, all hail to the Genetic Algorithm.
  - Provides unique and original music content, allowing users to discover new and innovative music.
  - Can be customized to generate music based on user preferences and desired mood, enhancing user experience.
  - The system can be trained on existing music databases and AI technologies to reduce development time and costs.
  - Can be integrated with various music platforms, expanding the selection of music available to users.

- **Weakness:**
  - Dependency on another software for advance modification.
  - The generated music may not always be accurate or of high quality, potentially leading to user dissatisfaction.
  - The system may require significant computing resources and may not be suitable for low-powered devices.
  - The system may require a large database of music and user data to be effective, potentially raising privacy concerns.

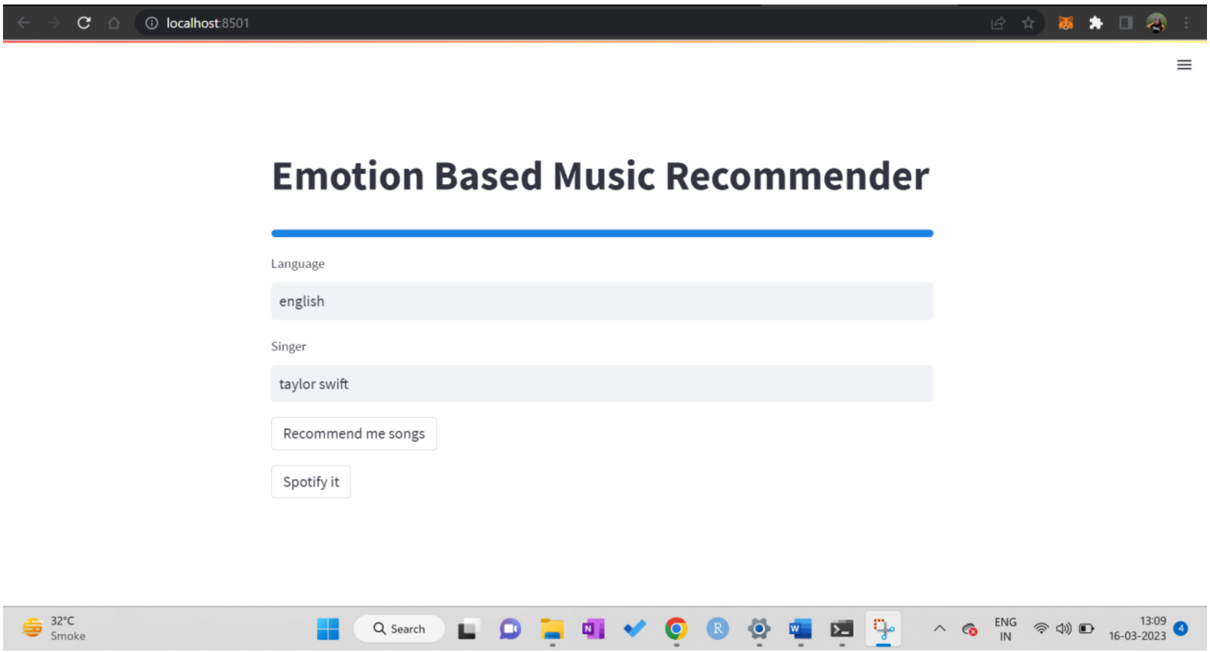
- **Opportunity:**
  - Generation of music based on facial emotion detection. Production of advance tunes without any interference of external software.
  - The market for personalized music services is growing, providing an opportunity for the system to gain market share.
  - The system can be expanded to include additional features, such as social media integration and playlist sharing, increasing user engagement and retention.
  - The system can be marketed to specific user groups, such as independent musicians or music enthusiasts, increasing the potential user base.

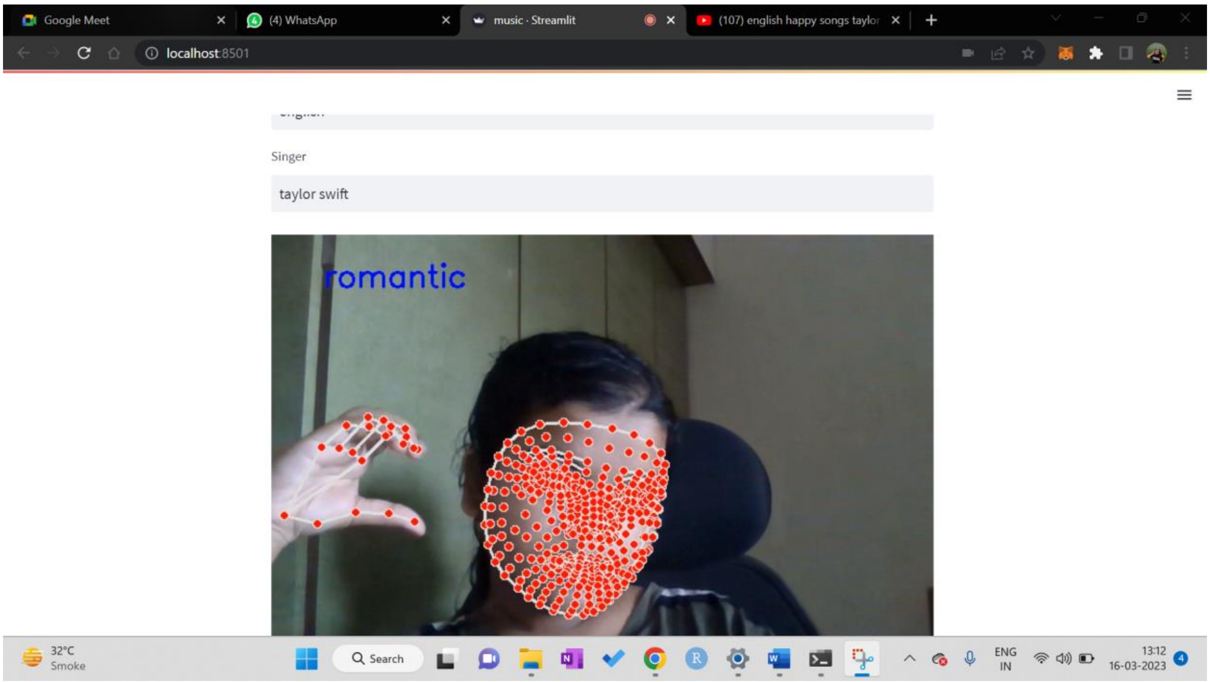
- **Threats:**
    - Other applications with similar features.
    - Competitors may already have established similar services, making it difficult to gain market share.
    - Changes in music licensing and copyright laws may impact the availability and cost of music for the system.
    - Security breaches or data leaks may damage the reputation of the system and erode user trust.

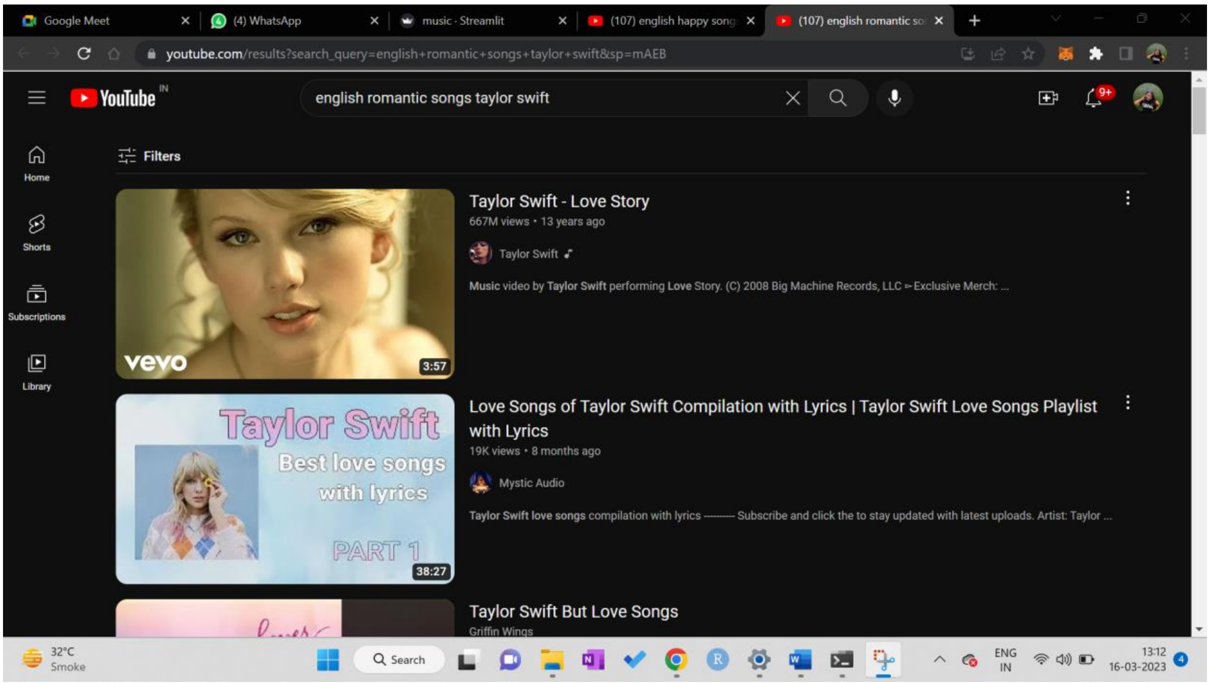
The SWOT analysis highlights the potential strengths, weaknesses, opportunities, and threats of this system. This information can be used to develop a strategy for addressing weaknesses and threats while leveraging strengths and opportunities to ensure the success of the project.

4. System Implementation

Music Recommendation System using Emotion Detection:



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Taylor Swift - Love Story
667M views • 13 years ago
Taylor Swift
Music video by Taylor Swift performing Love Story. (C) 2008 Big Machine Records, LLC ~ Exclusive Merch: ...
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Love Songs of Taylor Swift Compilation with Lyrics | Taylor Swift Love Songs Playlist with Lyrics
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Mystic Audio
Taylor Swift love songs compilation with lyrics ——— Subscribe and click the to stay updated with latest uploads. Artist: Taylor ...
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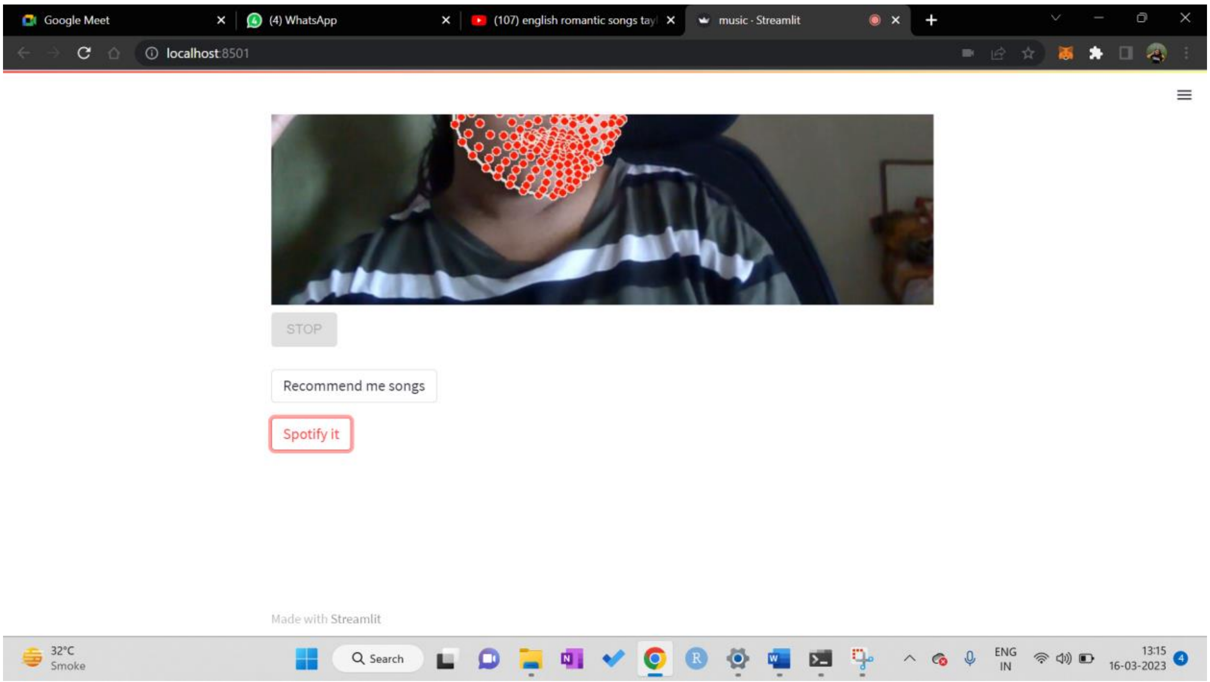
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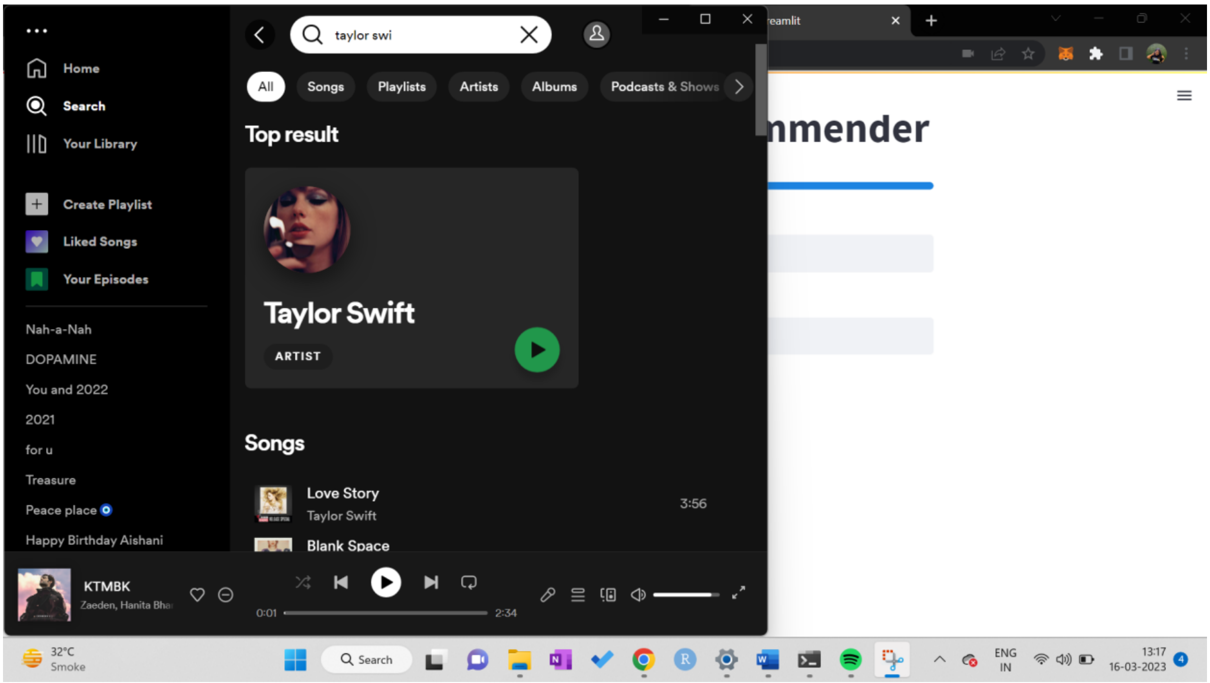
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Your Library
Create Playlist
Liked Songs
Your Episodes
Nah-a-Nah
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Treasure
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Happy Birthday Aishani
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Playlists
Artists
Albums
Podcasts & Shows
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Taylor Swift
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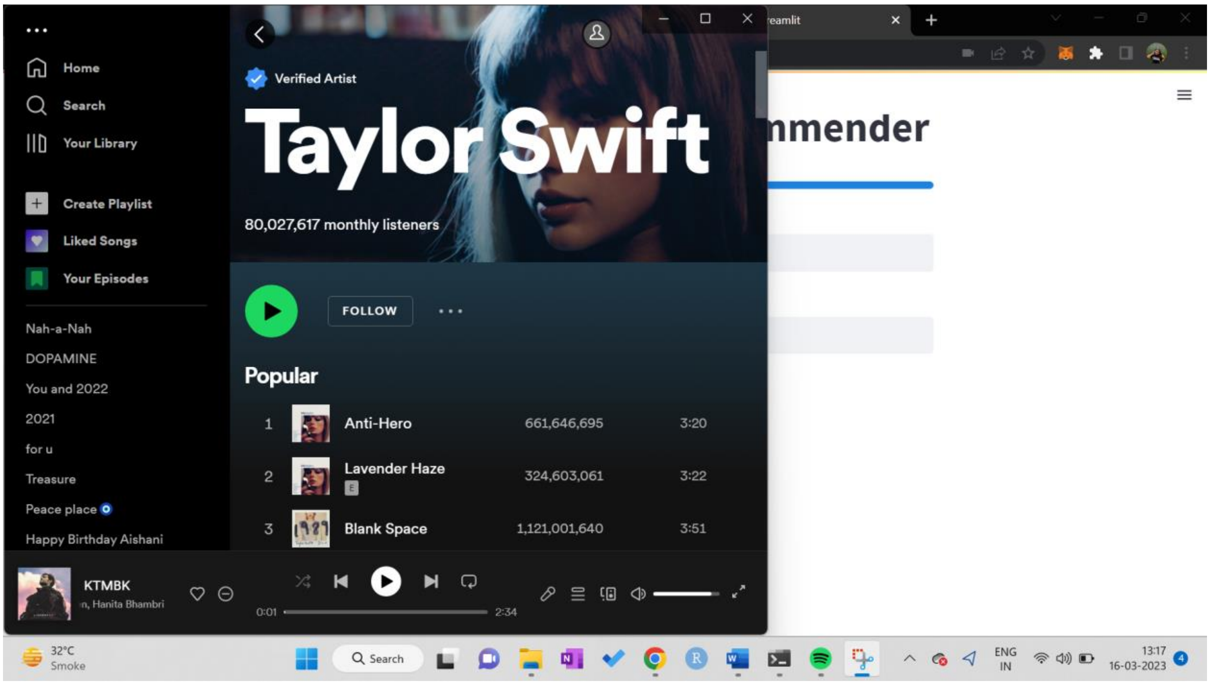
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Treasure
Peace place
Happy Birthday Aishani
Verified Artist
Taylor Swift
80,027,617 monthly listeners
FOLLOW
Popular
1
Anti-Hero
661,646,695
3:20
2
Lavender Haze
324,603,061
3:22
3
Blank Space
1,121,001,640
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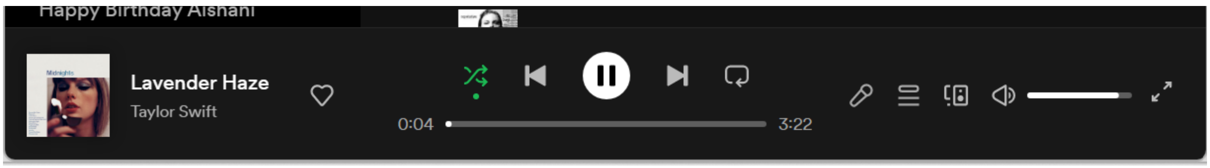
Lavender Haze
Taylor Swift
0:04
3:22

Music Generation System:

```
PS C:\Users\DELL\Desktop\Aavishkar\algorithms> py genetic.py
PS C:\Users\DELL\Desktop\Aavishkar\algorithms> py gen.py
Number of bars: [8]: 8
Notes per bar: [4]: 4
Number of steps: [1]: 1
Introduce Pauses? [True]: False
Key: (C, C#, Db, D, D#, Eb, E, F, F#, Gb, G, G#, Ab, A, A#, Bb, B) [C]: Bb
Scale: (major, minorM, dorian, phrygian, lydian, mixolydian, majorBlues, minorBlues) [major]: major
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1676363949	14-02-2023 14:10	File folder	
1678950803	16-03-2023 12:43	File folder	
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genetic.py	22-12-2022 12:29	PY File	5 KB

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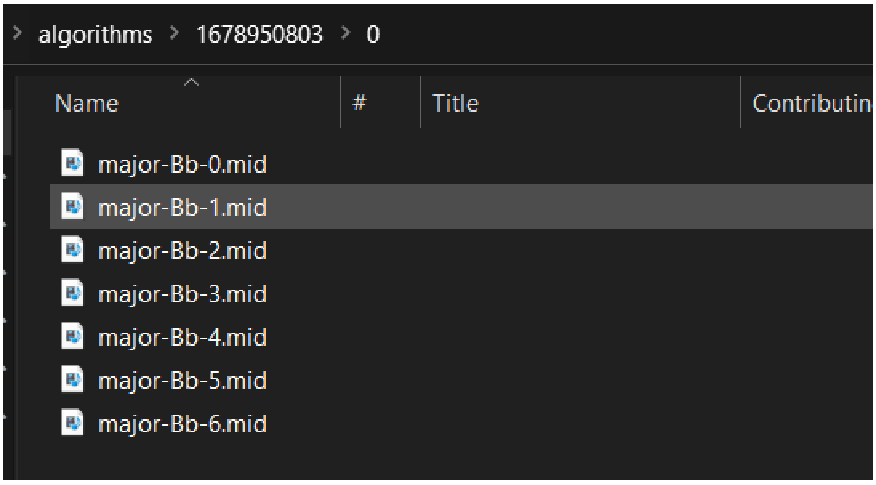
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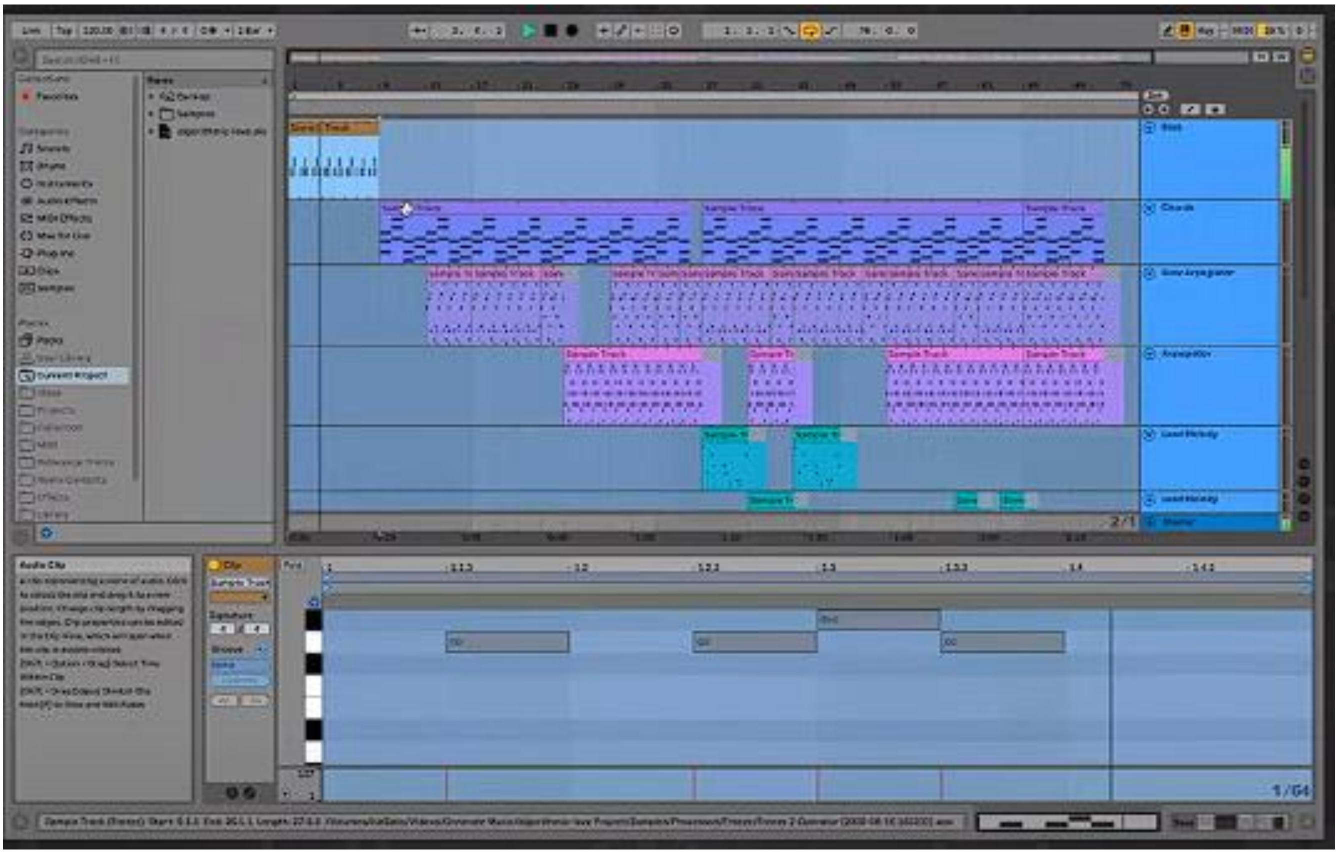


5. Cost Benefit Analysis

Cost-benefit analysis (CBA) is a method used to evaluate the potential costs and benefits of a proposed project, investment or decision. It is a technique that helps decision-makers weigh the costs and benefits of different options and make an informed choice.

The process involves identifying and quantifying the costs and benefits of a proposed project or decision, and comparing them to determine whether the project is financially feasible or not. The costs and benefits may be both tangible and intangible, and are usually expressed in monetary terms, where possible.

CBA is typically used in business, economics, and government policy-making to assess the economic viability of a proposed project or decision. The goal of a CBA is to determine whether the benefits of a project or decision outweigh its costs, and whether it is worth investing time, money and resources into it.

Overall, CBA is a useful tool for decision-makers as it provides a framework for evaluating the potential financial impact of a project or decision, helping them to make more informed choices and ensure better allocation of resources.

A cost-benefit analysis for a Music generation and music recommendation system using emotion detection can help assess the potential financial feasibility of the project. Here's an example of a cost-benefit analysis:

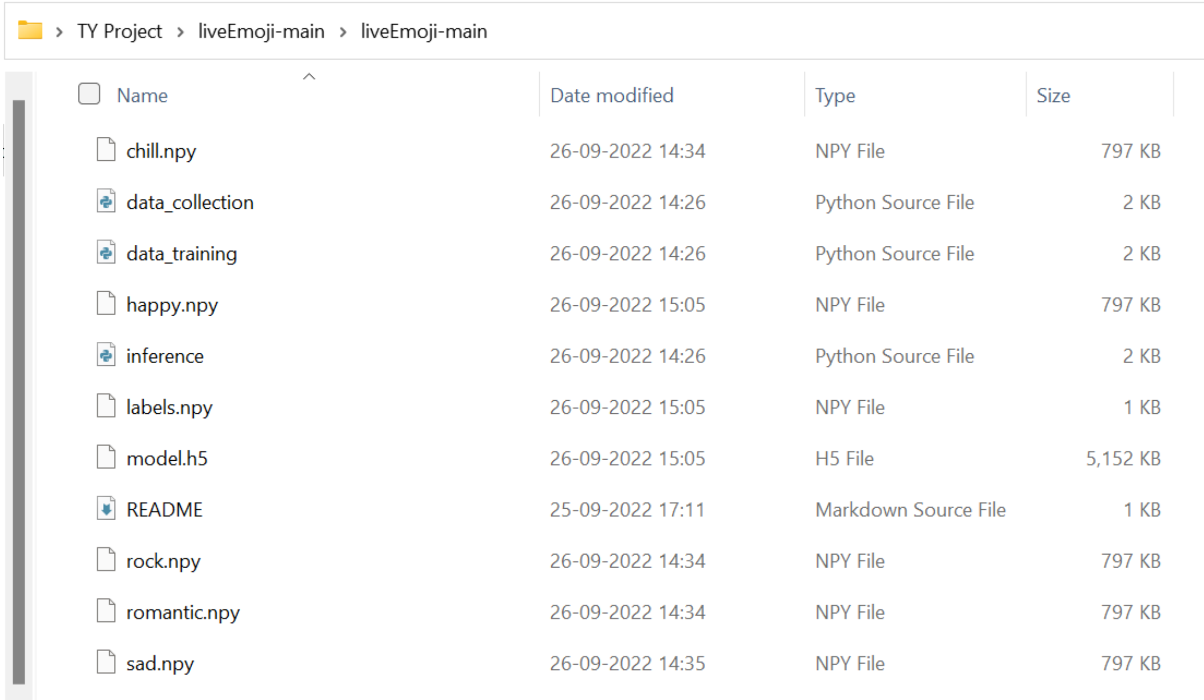
- **Costs:**
  - Development costs for the system, including hardware, software, and personnel.
  - Ongoing maintenance and support costs for the system.
  - Licensing costs for music databases and emotion detection algorithms.
  - Marketing and advertising costs to promote the system.
  - Legal and regulatory costs, including compliance with data privacy and protection laws.
  - Costs associated with integrating the system with existing music platforms and services.
  - Costs associated with building and maintaining partnerships with music labels and artists.

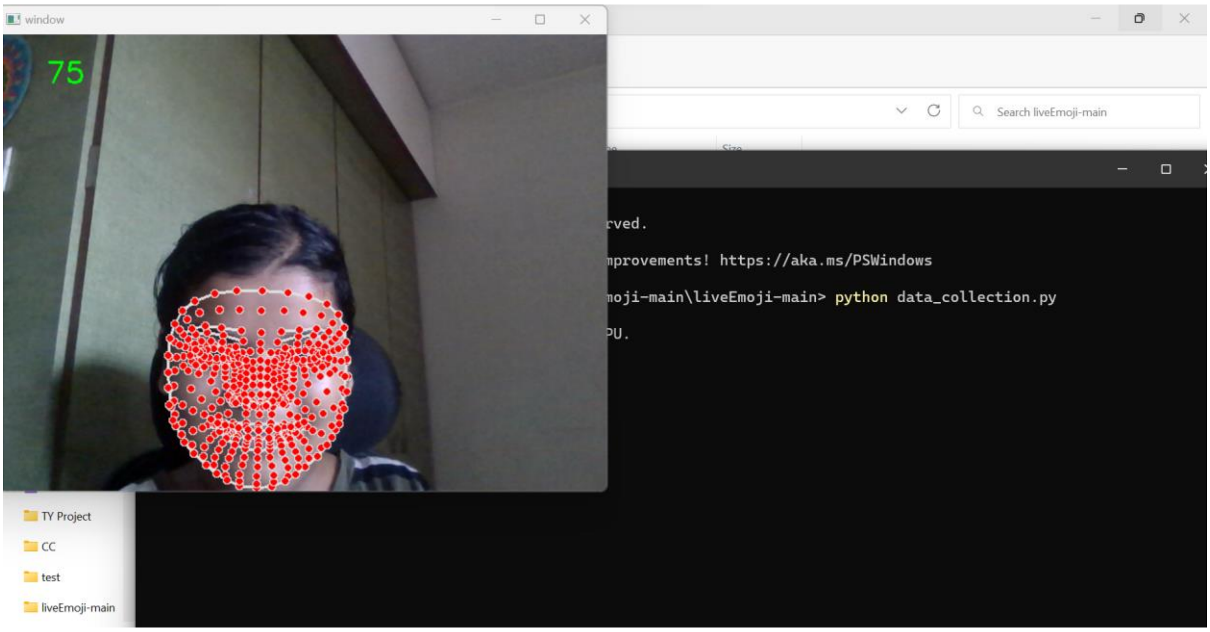
- Costs associated with ongoing updates and improvements to the system.
- Costs associated with training and educating users on how to use the system and its features.
- Costs associated with addressing potential technical issues and bugs in the system.
- Costs associated with customer service and support for users.
- Costs associated with building and maintaining the necessary infrastructure to support the system, including servers and data storage.

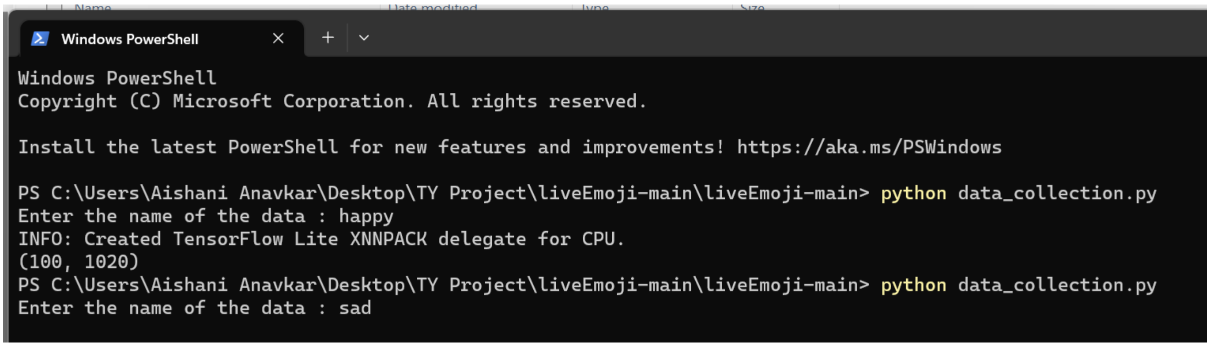
- **Benefits:**
  - Increased user engagement and retention, leading to higher revenue and profits.
  - Competitive advantage in the music industry by providing personalized and emotionally relevant music content to users.
  - Opportunities for expansion into new markets and integration with various music platforms.
  - Reduced development time and costs by leveraging existing music databases and AI technologies.
  - Increased user satisfaction and loyalty, leading to improved customer retention and reduced churn.
  - Improved user acquisition and conversion rates due to the unique and personalized music content offered by the system.
  - Opportunities for revenue diversification through partnerships with other industries such as fitness, wellness, and entertainment.
  - Improved brand reputation and market positioning through innovation and differentiation.
  - Increased revenue from premium subscriptions or ad placements due to the unique and personalized music content offered by the system.
  - Improved data collection and analysis capabilities, leading to better insights into user preferences and behavior.
  - Improved user engagement and social media sharing, leading to increased brand awareness and organic growth.
  - Reduced reliance on human music curators and editors, leading to reduced labor costs and potential for bias.

6. System Testing:

Here we are training and testing the emotions that the system will detect for the recommendation system



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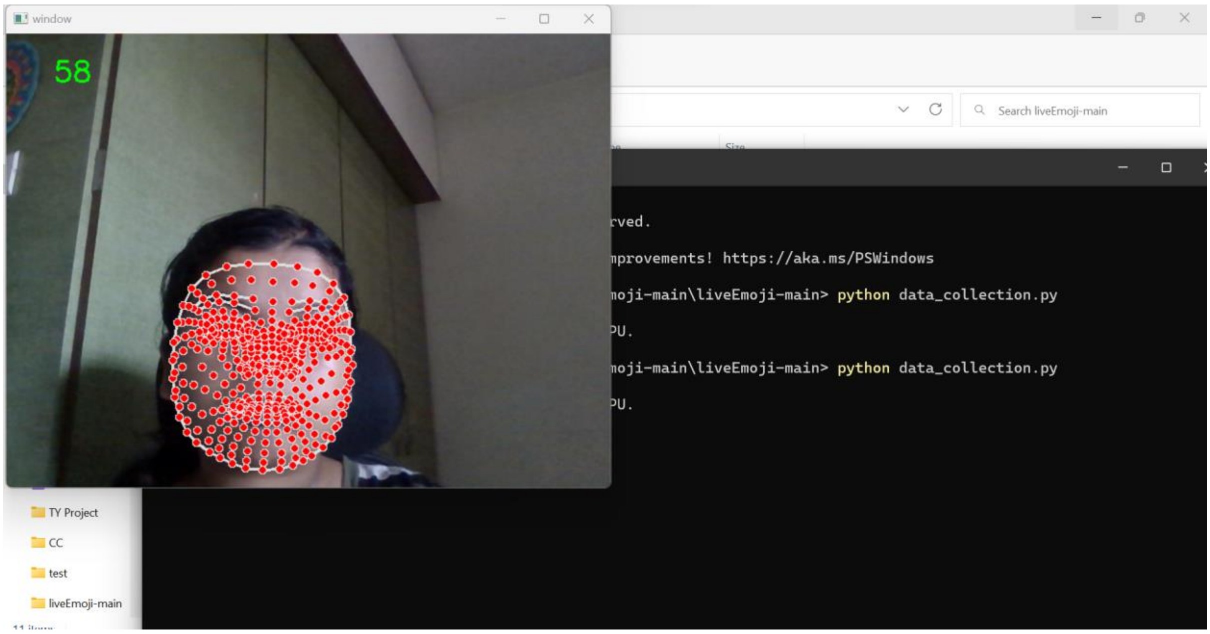
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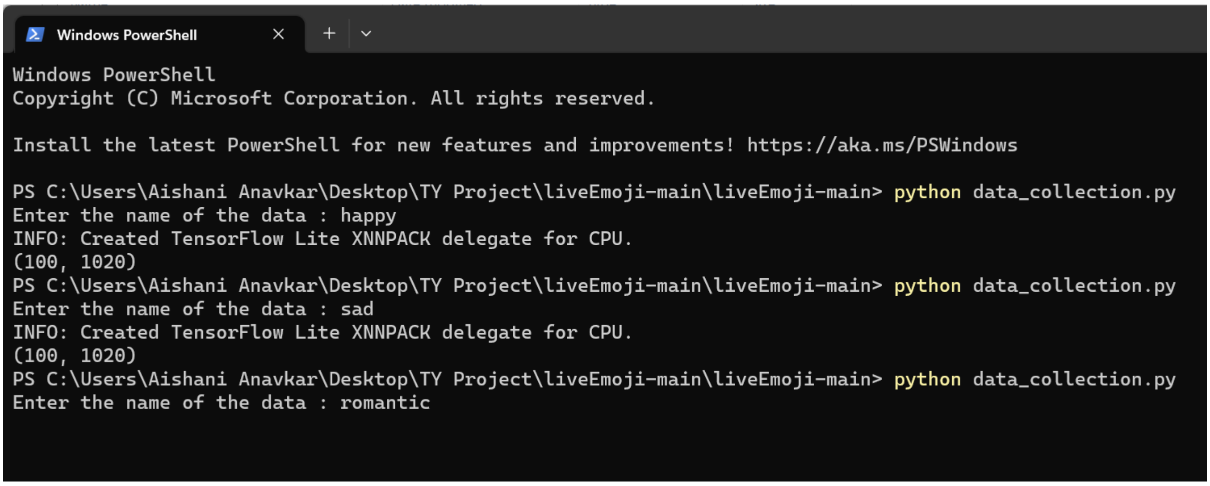
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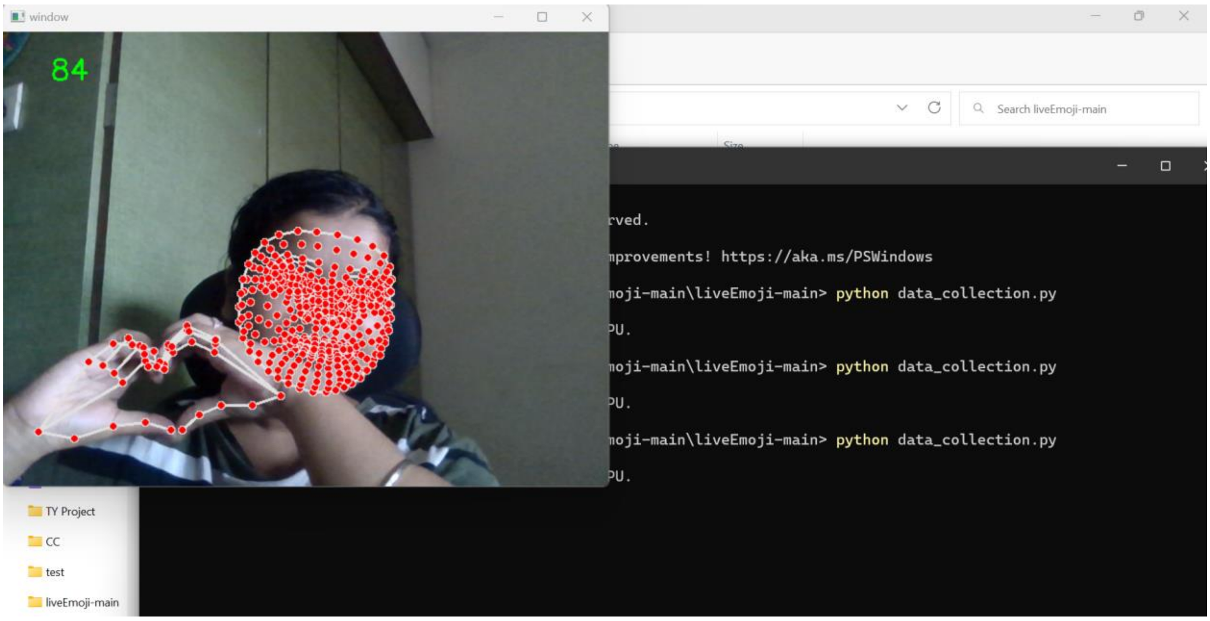
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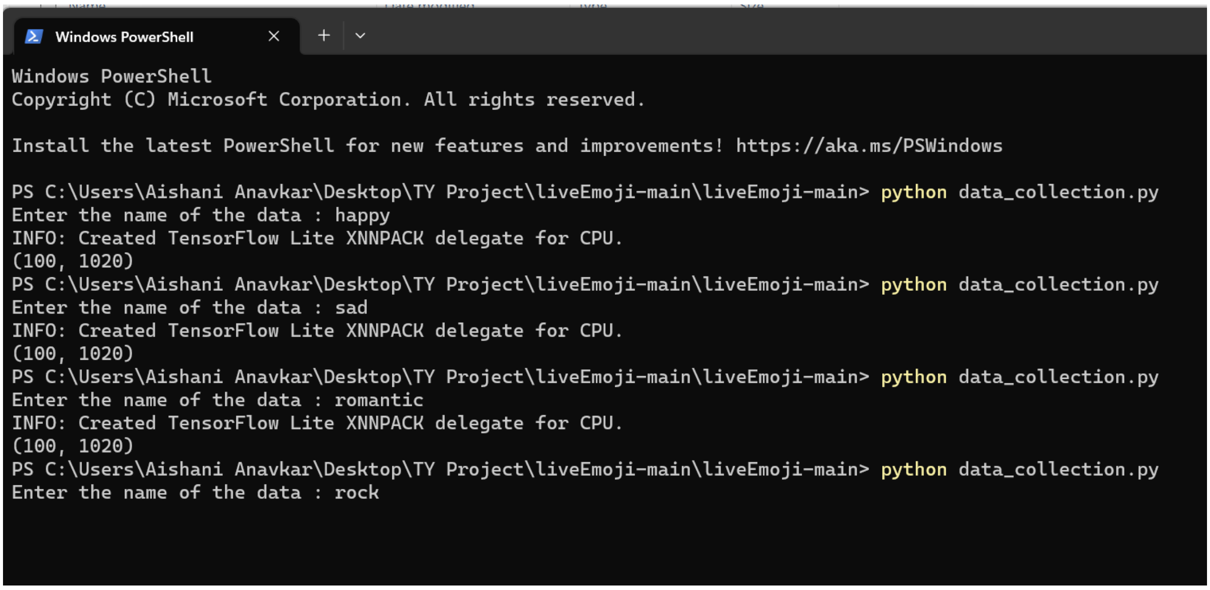
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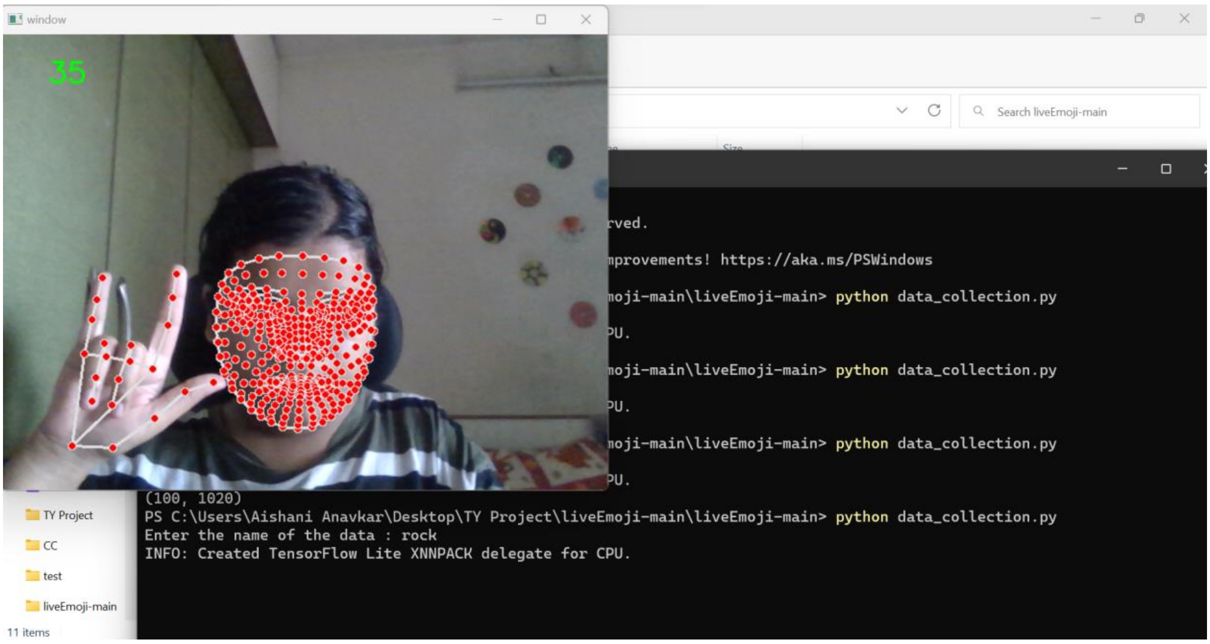
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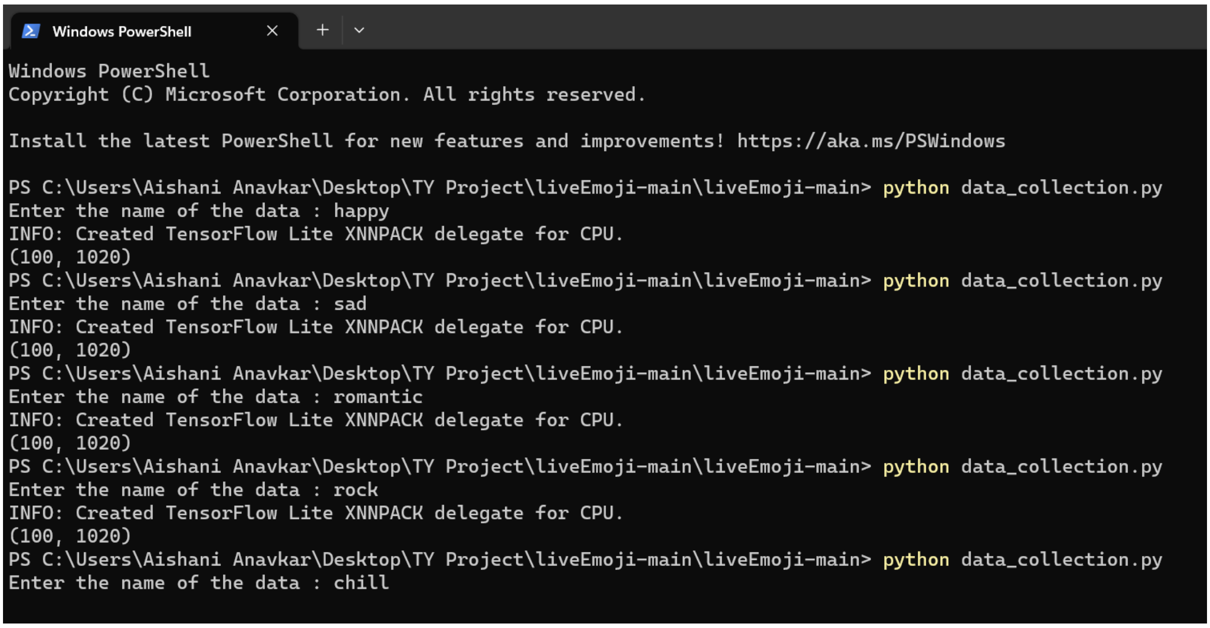
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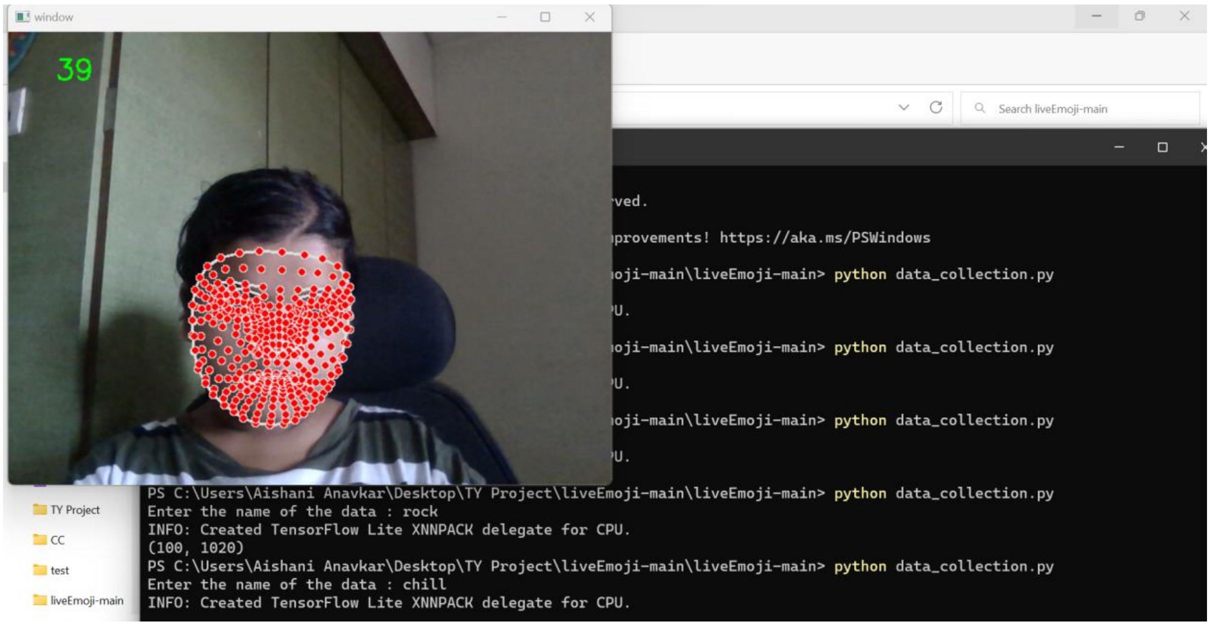
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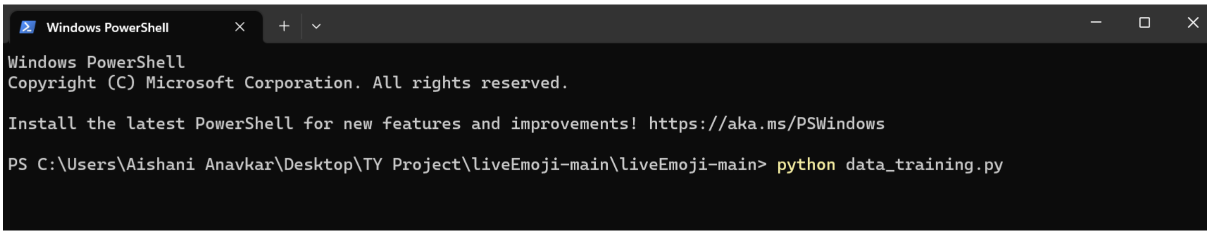
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2023-03-16 13:05:57.649795: W tensorflow/stream_executor/cuda/cuda_driver.cc:263] failed call to cuInit: UNKNOWN ERROR (
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2023-03-16 13:05:57.669351: I tensorflow/core/platform/cpu_feature_guard.cc:193] This TensorFlow binary is optimized wit
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To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
Epoch 1/50
16/16 [==============================] - 2s 17ms/step - loss: 1.5204 - acc: 0.3120
Epoch 2/50
16/16 [==============================] - 0s 16ms/step - loss: 1.1177 - acc: 0.6060
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16/16 [==============================] - 0s 16ms/step - loss: 0.8072 - acc: 0.7120
Epoch 4/50
16/16 [==============================] - 0s 16ms/step - loss: 0.6639 - acc: 0.7300
Epoch 5/50
16/16 [==============================] - 0s 16ms/step - loss: 0.5500 - acc: 0.7780
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16/16 [==============================] - 0s 12ms/step - loss: 0.1577 - acc: 0.9600
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Epoch 50/50
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PS C:\Users\Aishani Anavkar\Desktop\TY Project\liveEmoji-main\liveEmoji-main>
```

7. Future Scope

Emotion recognition using facial expressions is one of the important topics of research and has gathered much attention recently. It can be seen that 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 by the use of different kinds of features and image processing methods.

The current Recommendation system can be enhanced by adding more emotions and recommending songs from different platforms such as Spotify, Apple Music, Pandora, etc.

For Future enhancement of the Music Generation system, we aim to upgrade the system in such a way that it generates music based on emotions.

We also look forward to developing an application with the both the features i.e. Music Recommendation and Generation based on Emotions to make it a full-fledged Music Platform.

The future scope of a music recommendation system that uses facial detection to detect the mood of the user to suggest songs on YouTube and Spotify can be quite extensive. Some potential areas of expansion and improvement include:

1. Improved mood detection: With advancements in computer vision and facial recognition technology, the system could be improved to detect the user's mood with greater accuracy and precision.

2. Integration with other platforms: The music recommendation system could be integrated with other music streaming platforms like Apple Music, Amazon Music, etc., to provide users with a wider range of song suggestions.

3. Personalized recommendations: The system could be designed to provide personalized song recommendations based on the user's listening history, preferences, and mood.

4. Integration with wearables: The system could be expanded to integrate with wearable technology like smartwatches and fitness trackers to monitor the user's biometric data and suggest songs accordingly.

5. Integration with social media: The system could be integrated with social media platforms

to allow users to share their music preferences and mood with their friends and receive recommendations from them.

The future scope of a music generation system that uses genetic algorithms could be quite extensive. Some potential areas of expansion and improvement include:

1. Improved music generation: With advances in artificial intelligence and machine learning, the music generation process could be improved to create more complex and diverse musical pieces.
2. Integration with other software and platforms: The music generation system could be integrated with other music software and platforms, such as digital audio workstations (DAWs) and streaming services, to provide a more seamless music creation experience.
3. User customization and control: The system could be designed to allow users to customize the generated music to their preferences, providing them with more control over the music creation process.
4. Real-time collaboration: The system could be expanded to allow for real-time collaboration between multiple users, enabling musicians to work together to create music more efficiently.
5. Commercial applications: The music generation system could be developed for commercial applications, such as creating unique music for video games, movies, and other media projects.
6. Improved algorithm: With advancements in machine learning and artificial intelligence, the system could be improved to generate music that is more complex, diverse, and expressive, providing users with a more authentic and unique musical experience.
7. Collaboration with musicians: The system could be used to collaborate with musicians to generate music and inspire new compositions and musical ideas.

CONCLUSION

In this project, music recommendation model is based on the emotions that are captured in real time images of the user with a genetic approach for generating music compositions. The existence of reference individuals (or pre-defined parameters) improves the process of selecting and obtaining a relatively rhythmic and harmonious composition. By coding the composition by an array of tones and breaks, an effective and quick control of the composition, tones and its rhythm is provided.

The music generation and music recommendation system using emotion detection has the potential to revolutionize the music industry by providing personalized and emotionally relevant music content to users. By leveraging existing music databases and emotion detection algorithms, the system can reduce development time and costs while providing a high-quality user experience.

However, the accuracy of the emotion detection algorithm and the quality of the generated music remain critical factors in the success of the system. In addition, the system must be designed to handle large databases of music and user data while ensuring user privacy and security.

Despite these challenges, the system offers significant opportunities for growth and innovation, including the ability to expand into new markets and integrate with various music platforms. By leveraging strengths and opportunities while addressing weaknesses and threats, a music generation and music recommendation system using emotion detection can become a leading player in the music industry and enhance the overall user experience.

The application of Music Generation & Recommendation Using Emotion Detection has and will bring billions of revenues to several businesses and it will do the same to many music streaming businesses too. It will enhance the method of doing business and will give a better return on investment (ROI). With advanced machine learning and AI, we can proudly say that, this system will make customer retention and loyalty better than ever.

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