A PROJECT REPORT

on

"JuMusic: Your Destination for Customized Melodies"

Submitted to

KIIT Deemed to be University

In Partial Fulfillment of the Requirement for the Award of

BACHELOR'S DEGREE IN

INFORMATION TECHNOLOGY

BY

GROUP MEMBER A	**2106316 Nyasijin Kuol**
GROUP MEMBER B	**2129160 Kafia Aden**
GROUP MEMBER C	**2106288 Urias Kermue**
GROUP MEMBER D	**2106040 Mouli Bose**
GROUP MEMBER E	**2106286 Manytuch Ruei**

UNDER THE GUIDANCE OF

Dr. Arup Abhinna Acharya

SCHOOL OF COMPUTER ENGINEERING

KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY

BHUBANESWAR, ODISHA - 751024

April 2024

KIIT Deemed to be University

School of Computer Engineering
Bhubaneswar, ODISHA 751024

CERTIFICATE

This is certify that the project entitled

"JuMusic: Your Destination for Customized Melodies "

submitted by

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GROUP MEMBER C   **2106288 Urias Kermue**
GROUP MEMBER D   **2106040 Mouli Bose**
GROUP MEMBER E   **2106286 Manytuch Ruei**

is a record of bonafide work carried out by them, in the partial fulfillment of the requirement for the award of Degree of Bachelor of Engineering (Computer Sci-ence & Engineering OR Information Technology) at KIIT Deemed to be university, Bhubaneswar. This work is done during the year 2023-2024, under our guidance.

Date: 08/04/2024

Dr. Arup Abhinna Acharya
Project Guide

Acknowledgements

2106316 Nyasijin Kuol
2129160 Kafia Aden
2106288 Urias Kermue
2106040 Mouli Bose
2106286 Manytuch Ruei

ABSTRACT

In the technological era filled with an abundance of streaming music platforms, music enthusiasts have both opportunities and challenges. Whilst the platforms allow them easy access to a full library of music, finding music that has been configured to meet certain moods, emotions, or occasions, mainly within non-mainstream genres, is an uphill battle. This paper introduces a user-centric app that manages this gap by providing personalized music recommendations based on the mood or occasion of a user, and main focus is on promoting non-mainstream music discovery.

The basic essence of this app is the simple working mechanism; it allows the users to articulate their current mood or occasion, region, artists and it generates a curated list of music recommendations. Unlike the traditional recommendation algorithms that focus on mainstream content, our approach focuses more on diversity and inclusivity, aiming to expose to the user lesser-known tracks that match his preferences and context.

What sets the app apart in success is that it is interactive. Involvement of the users and actual encouragement for them to participate in the recommendation process enables them to take charge of their musical discovery.

Hence, this research presents a feasible solution towards facilitating music exploration in the digital age. Having considered user preferences and diversity within music recommendations, our app thus provides for a unique and enriching experience for music lovers desiring personalized discovery and community engagement.

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Chapter 1

Introduction

Music matters a lot. It crosses lines, touches our feelings, and gives us a push. From the calm tunes of classic music to the high energy of a pop song, to the deep sounds of jazz, music has a strong pull on our hearts and sparks our creative minds. But in today's world, with music everywhere online, finding the right song can be too much. Here comes JuMusic, a new app on the way that could change how we find and connect with our music. It's more than just tips on what to listen to; it's your own path to music discovery. But what makes a music tip "good"? It's all about knowing what each person likes and how they feel. One might want deep lyrics that touch them, another might just want a fun tune for their day. JuMusic gets how different our music tastes can be and aims to make finding the perfect song easier.

With JuMusic, you can easily find playlists that fit your mood, whether you want a calm vibe for a quiet afternoon or something lively to start a busy day. JuMusic isn't just for listening; it's about finding new music. With cool features like making playlists with friends and tracking how you feel in real-time, it lets you dive into your music choices and find new bands and styles.

Fig.1.1 JuMusic Logo
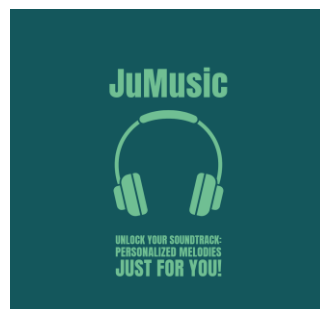
In a world with endless music options, JuMusic shines a simple and surprising light, leading you on a music adventure that's as unique and varied as you are. So, whether you're after a song that moves your heart or a beat that lifts you up, let JuMusic be your guide on a music trip like no other.

Chapter 2

Basic Concepts/ Literature Review

JuMusic system is designed to sense users' preferences and recommend music tracks to them that are desirable. It focuses on data processing and user interaction to predict preferences. The music recommendation system literature extensively covers every possible approach, including collaborative filtering, content-based filtering, and hybrid methods. In the design of JuMusic's recommendation engine, these base concepts have been reworked to match its uniqueness.

2.1   Front-end Technologies of JuMusic:

The user interface of JuMusic happens on the front end, which comes in response to the user's entry to the music library and the recommendation services. This is created by HTML, CSS, and JavaScript where, at the base level, in simplicity and dynamicity, these three technologies are knit together and weave together some of the most exceptional characteristics into that given user interface. HTML structures the content, CSS styles it and JavaScript adds interactivity, resulting in a visually appealing and highly functional user experience.

2.2.   Backend Technologies of JuMusic:

In essence, the backend in JuMusic is designed in finer, more crafty ways to handle complex data processing tasks while still serving the front end with critical information. Python comes with its practical, versatile functionality, along with a vast library, including Pandas and NumPy for data analysis, and scikit-learn and TensorFlow for machine learning. By using Python, JuMusic processes user data at high precision to extract meaningful insights to generate personalized music recommendations.

2.3   Integration with Spotify Developer Framework:

JuMusic has integrated with the Spotify Developer Framework to make their music recommendation service even better. By leveraging the extensive capabilities of Spotify's technology, JuMusic can now provide personalized music recommendations to users based on their listening behaviors and preferences. This integration makes JuMusic use the richness of the database with sophisticated audio analysis to offer recommendations on what the user should listen to. It is able to do that through a combination of the audio data from Spotify. This interaction between JuMusic's novel technology and the detailed framework by Spotify will give them a more accurate and fun discovery of music experience.
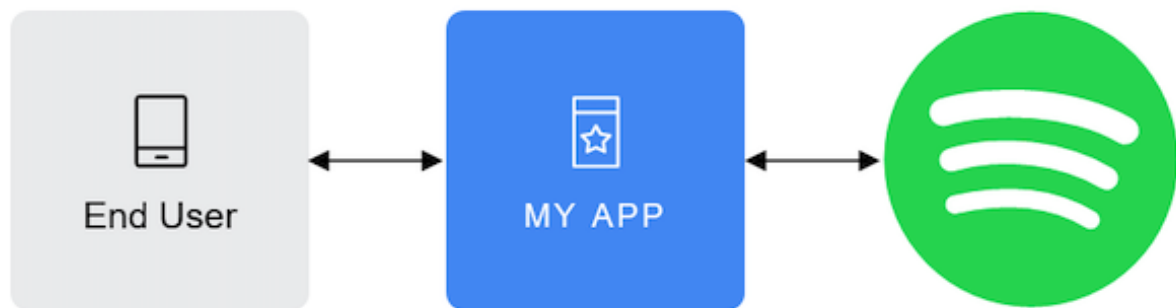

Fig.2.1 Spotify-App Client-Server Architecture

Furthermore, the integration with the Spotify Developer framework allows JuMusic to access detailed audio data and metadata from Spotify's extensive music catalog. This enables JuMusic to provide users with a wide range of music recommendations, including tracks from both popular and niche genres. By combining JuMusic's innovative technology with Spotify's rich music database, users can enjoy a more comprehensive and personalized music discovery experience

Chapter 3

Problem Statement / Requirement Specifications

3.1 Project Planning

The project planning phase involved defining the scope, objectives, and deliverables of the JuMusic app. The team identified user requirements and outlined the features to be developed, including

- Mood-based music Recommendations
- Genre selection
- Mode selection
- Tempo selection
- Integration with the Spotify Developer Framework.

3.2 Project Analysis

During the project analysis phase, the team reviewed the collected requirements to ensure clarity and consistency. Ambiguities and potential issues were identified and addressed to ensure smooth project execution.

3.3   System Design

3.3.1   Design Constraints

The JuMusic app was designed to run on various platforms, including web browsers and mobile devices. The software utilized HTML, CSS, and JavaScript for the front-end interface and Python for the back-end processing. The system architecture was designed to be scalable and flexible to accommodate future updates and enhancements.
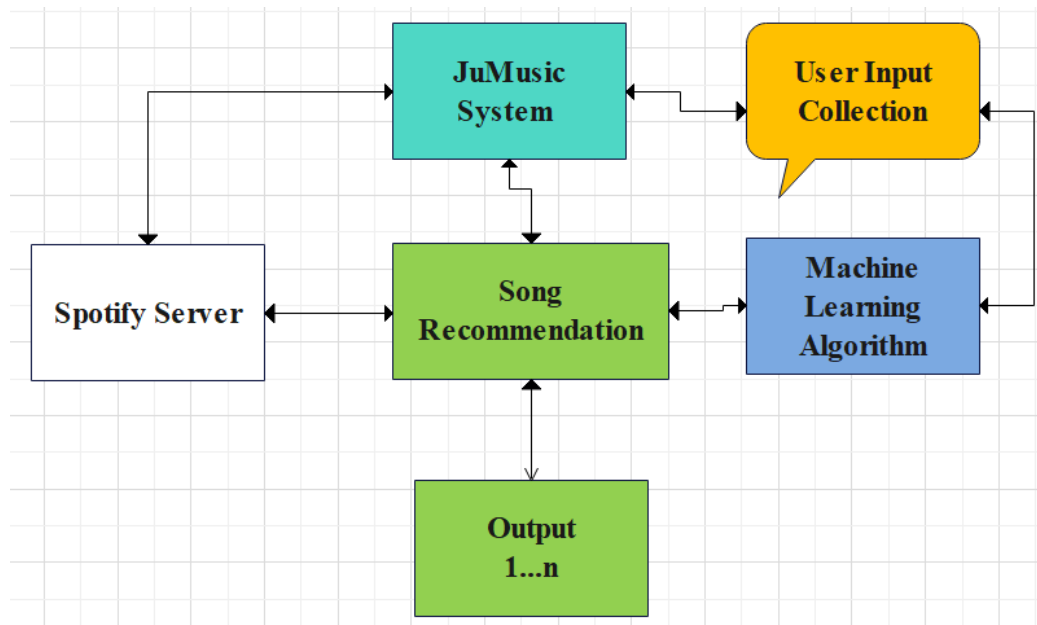
3.3.2 System Architecture

Fig.3.1 JuMusic System Architecture

The system architecture of JuMusic follows a client-server model, where the client interacts with the user interface, and the server processes requests and generates music recommendations. The architecture includes modules for user authentication, mood detection, music recommendation engine, and integration with third-party APIs such as Spotify.
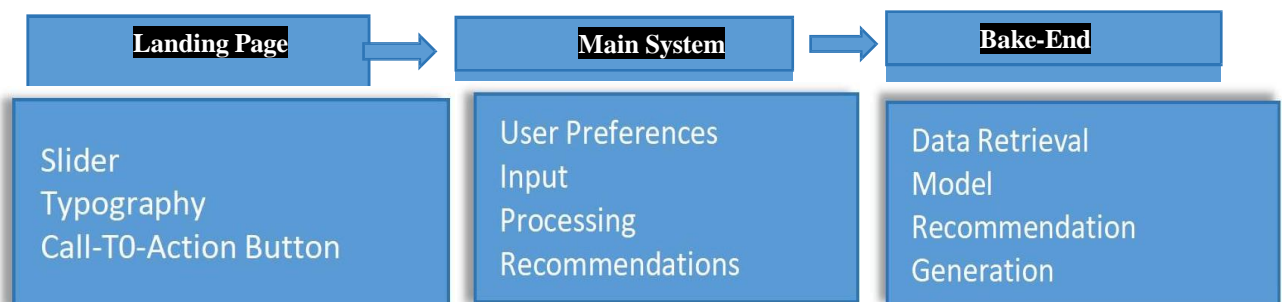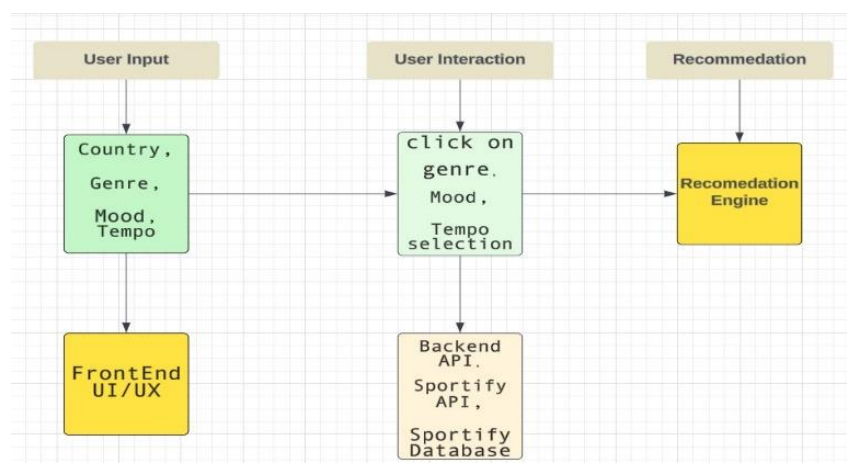

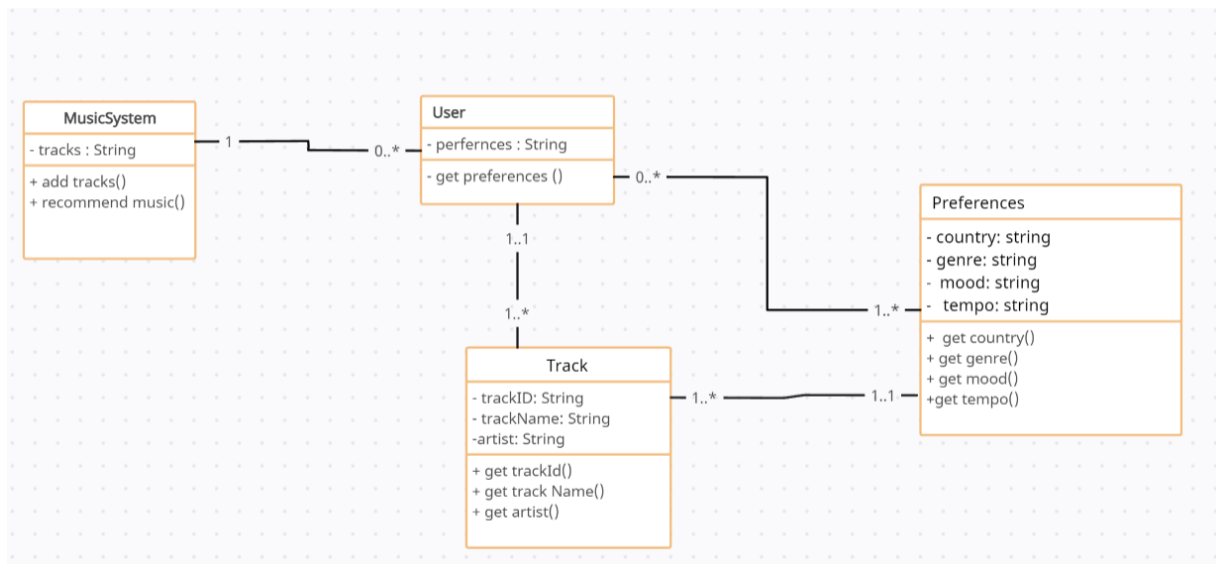## Fig.3.2   Block Diagram

Fig.3.3   Sequence Diagram

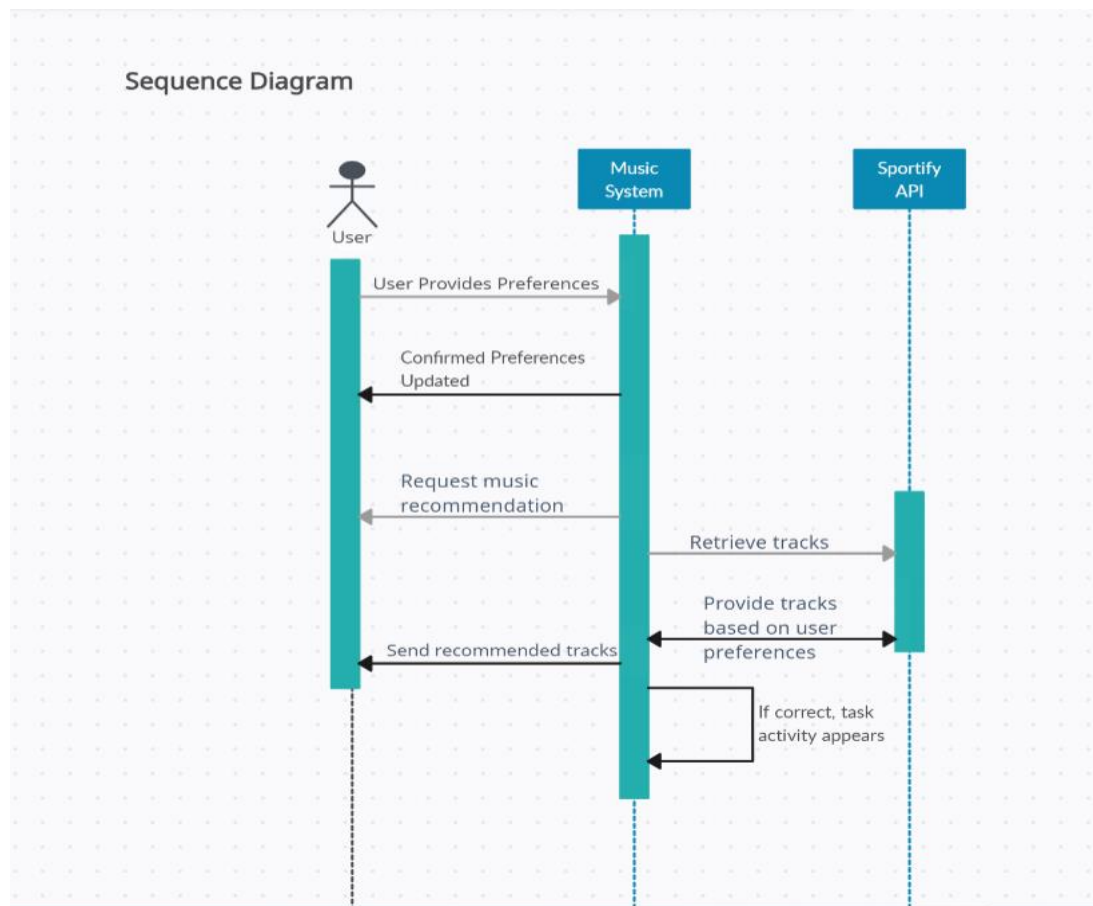**Fig.3.4   Class Diagram**

Fig.3.5   Sequence Diagram

3.3.3 Functional Requirements

Landing Page: Display a full-page slider with intriguing typography. Provide a "Get Started" call-to-action button.

Main System: Allow users to input their preferences for country, genre, mood, and tempo. Generate personalized music recommendations based on user preferences.

Back-end Operations: Implement back-end operations using Jupyter Notebook. Utilize a CSV format dataset for training, data cleaning, and processing. Use machine learning algorithms such as Tokenization, Vectorization and cosine similarity for recommendation generation.

3.3.4 Non-Functional Requirements Usability:

The user interface should be intuitive and visually appealing.

Performance:

The system should handle concurrent user requests efficiently.

Security:

User data should be stored securely and protected from unauthorized access.

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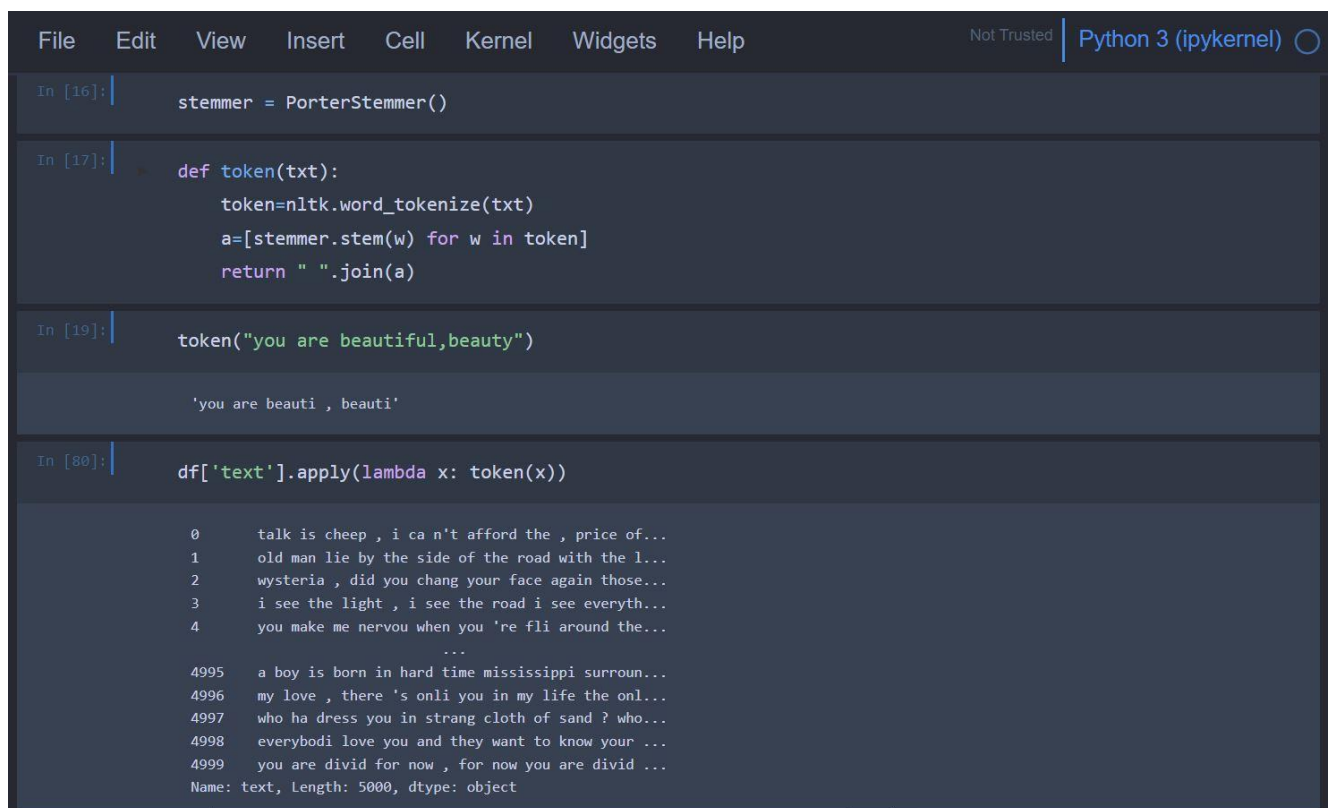
Chapter 4

Implementation

4.1 Methodology or Proposal

The project utilized a machine learning approach with classification, specifically Machine Learning Techniques like Tokenization, Vectorization and cosine similarity for recommendation generation. The model training and other backend operations were implemented using Python in Jupyter Notebook.

Below are some snippets from the training module on Jupyter Notebook:

Fig.4.1 Tokenization technique

```
File    Edit    View    Insert    Cell    Kernel    Widgets    Help                Not Trusted   Python 3 (ipykernel)

In [81]:   from sklearn.feature_extraction.text import TfidfVectorizer
           from sklearn.metrics.pairwise import cosine_similarity

In [82]:   tfid=TfidfVectorizer(analyzer='word', stop_words='english')

In [83]:   matrix=tfid.fit_transform(df['text'])

In [84]:   similar=cosine_similarity(matrix)

In [92]:   similar[0]

           array([1.        , 0.00546743, 0.0123294 , ..., 0.00746548, 0.03290475,
                  0.        ])

In [94]:   df[df['song']=='Living For The City'].index[0]

           4995
```

Fig.4.2 Vectorization Technique with Cosine Similarity

4.2   Testing or Verification Plan

The verification plan included testing the system with various test cases to ensure its functionality and performance.

Test Case ID	Test Case Title	Test Condition	System Behavior	Expected Result
T01	Input Validation	Invalid input provided	Error message displayed	Error message shown to user
T02	Recommendation Generation	Valid user preferences provided	Recommendations generated	Personalized music recommendations displayed to user
T03	Performance Testing	System under load	Concurrent user requests handled	System maintains performance under load

4.3　　　Result Analysis or Screenshots

The output of the project included personalized music recommendations generated based on user preferences. Screenshots of the system interface and recommendation results were captured to showcase the output.

4.3.1　Frontend output

The below screenshots show the frontend/user interface of JuMusic App. Designed with HTML, CSS & JavaScript, this section gives the user a great view while seamlessly interacting with the system.
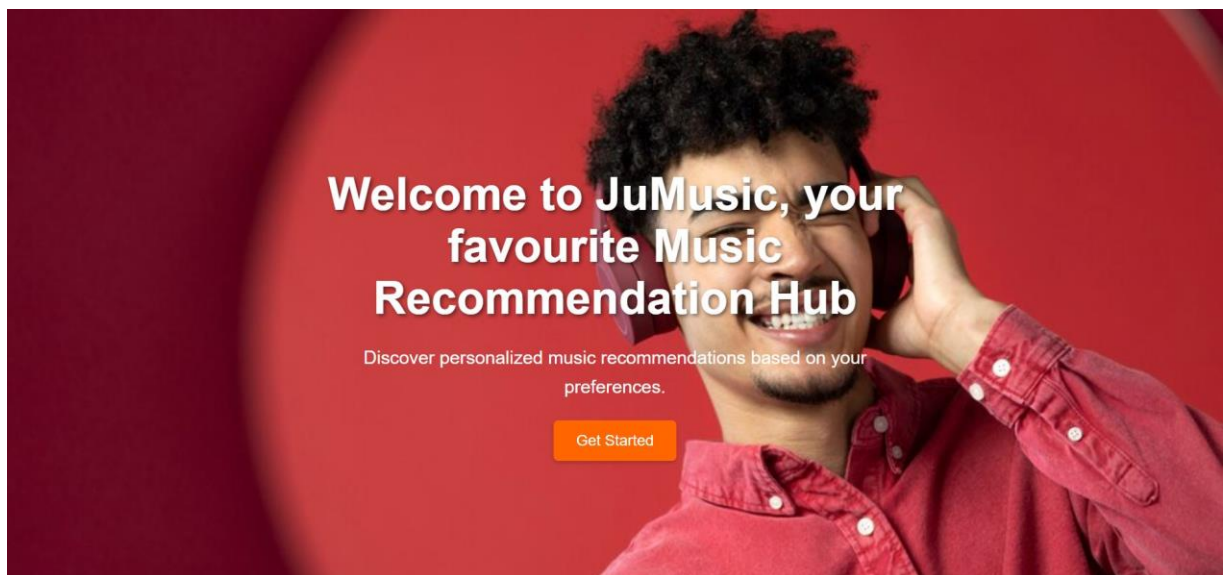
Fig.4.3　JuMusic UI1
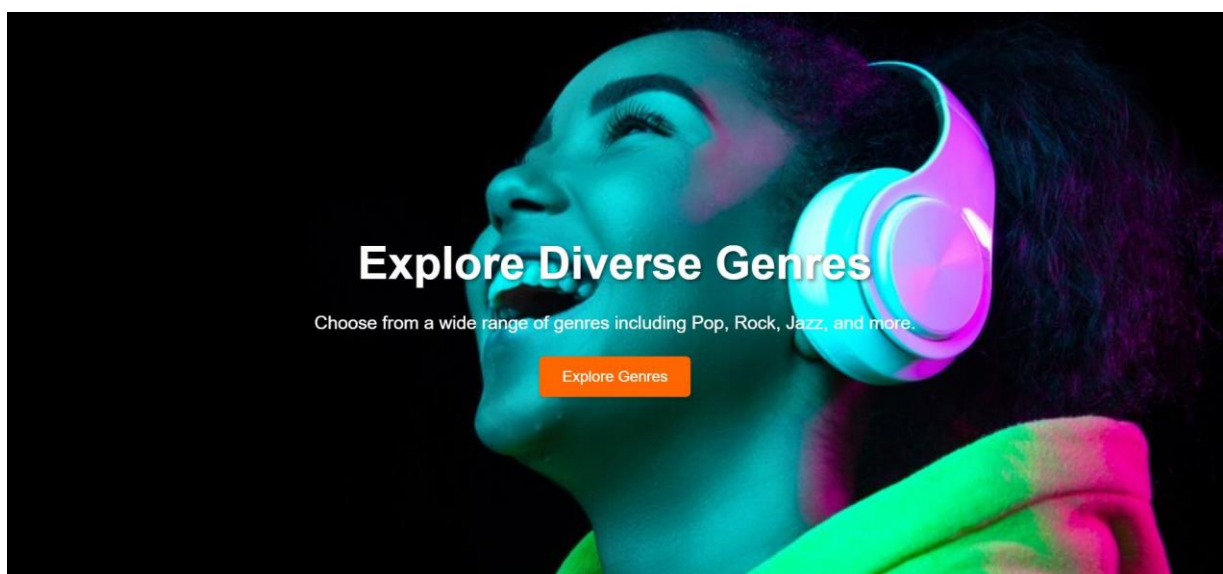
Fig.4.4　JuMusic UI2
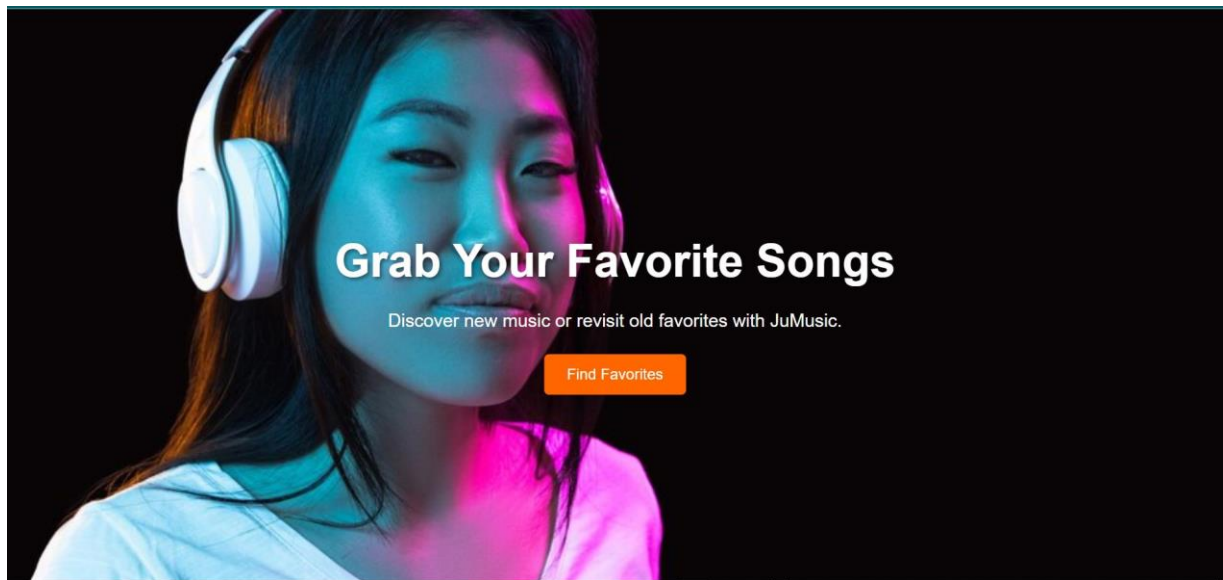
Fig.4.5   JuMusic UI3
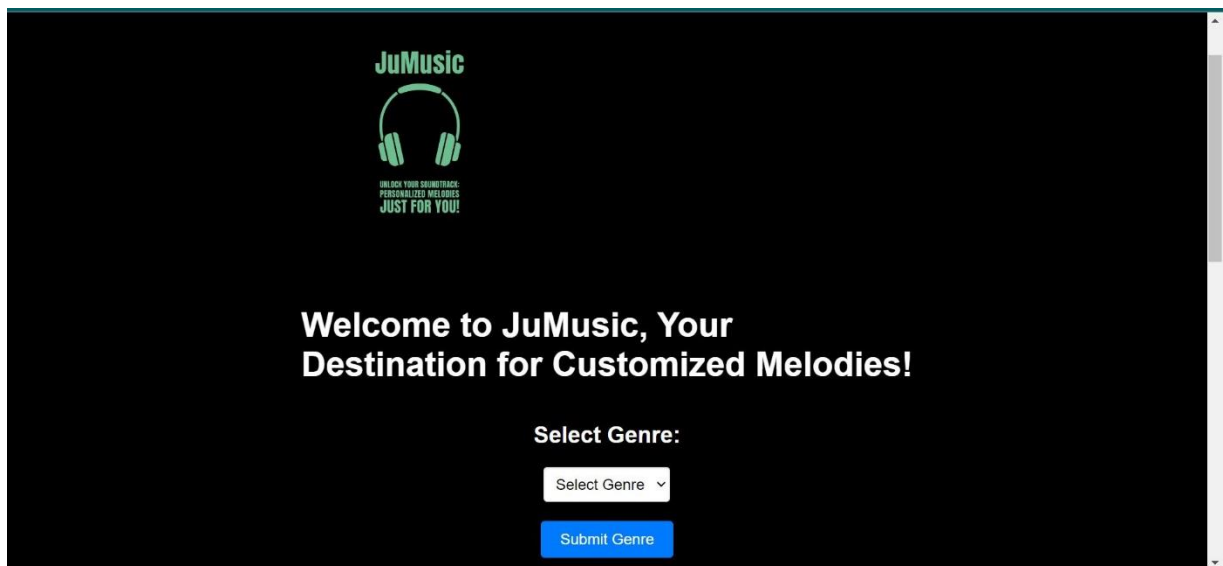
Fig.4.6   JuMusic UI4
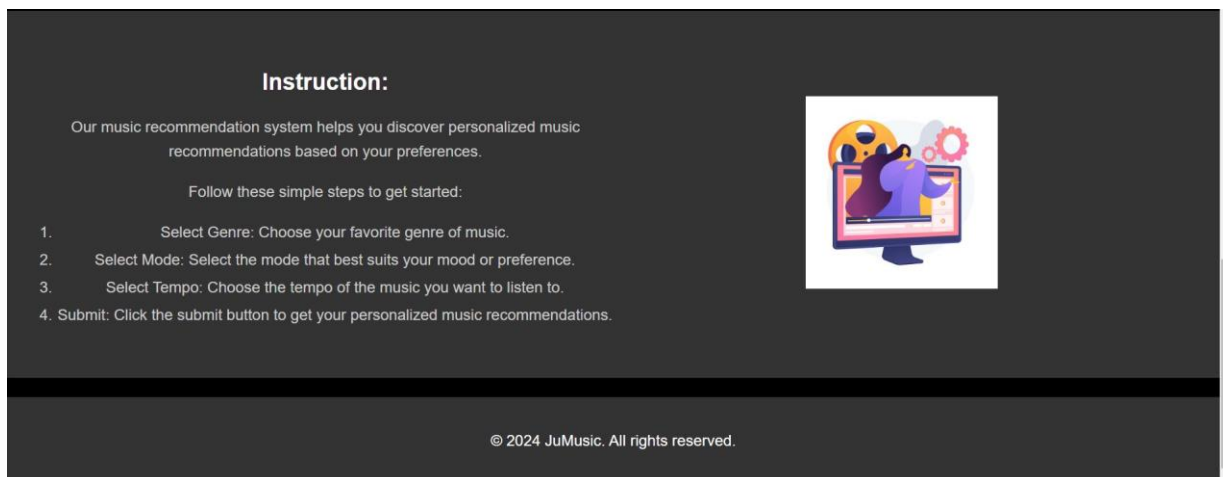
Fig.4.7   JuMusic UI5

4.3.2 Backend Output

The following screenshot shows the recommendation page of JuMusic App where the user gives an input and the songs are recommended accordingly. This part is integrated with Spotify Developer framework and uses client-server architecture.
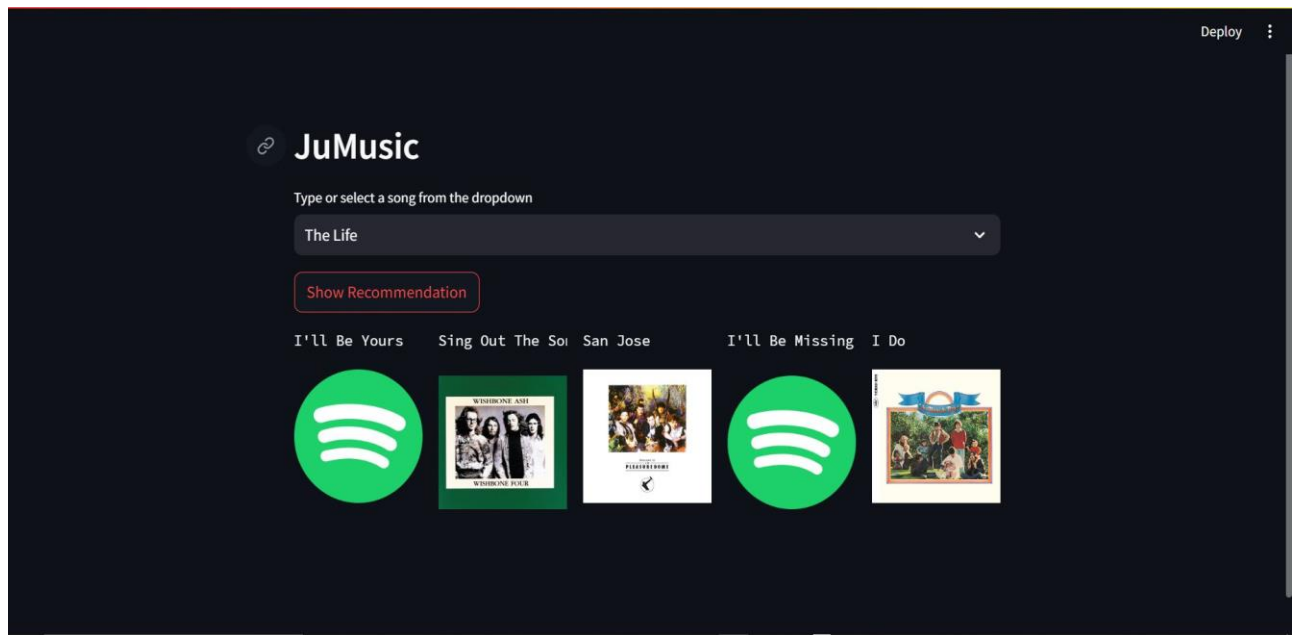
Fig.4.8   JuMusic Recommendation Page

4.4   Quality Assurance

Quality assurance measures were implemented throughout the development process to ensure the reliability and usability of JuMusic and adherence to standards and guidelines set forth by the School of Computer Engineering, KIIT, BBSR.

Code reviews, automated testing, and manual inspections were conducted to maintain high standards of software quality.

Chapter 5

Standards Adopted

5.1 Design Standards

In the development of JuMusic, adherence to established design standards is crucial for ensuring the robustness and scalability of the software architecture. Recognizing the significance of standardized practices, the project team incorporated guidelines from reputable organizations such as IEEE and ISO. These standards provide a framework for structuring the project's design elements, including system architecture, user interface layout, and database schema. By following these design standards, JuMusic maintains consistency, clarity, and extensibility, enabling easier maintenance and future enhancements.

5.2 Coding Standards

Coding standards play a pivotal role in maintaining code quality, readability, and maintainability throughout the software development process. To uphold these principles in JuMusic's codebase, the project team adopted a set of coding standards encompassing best practices and conventions. These standards encompass practices such as adhering to naming conventions, segmenting code into logical blocks, and employing consistent indentation. By adhering to these coding standards, JuMusic's codebase remains coherent, comprehensible, and conducive to collaboration among team members.

5.3 Testing Standards

Effective testing standards are essential for verifying the functionality, reliability, and performance of JuMusic. By establishing rigorous testing procedures, the project team can ensure that the software meets its requirements and operates flawlessly under various conditions. The testing standards

encompass a comprehensive set of test cases designed to validate different aspects of the application, including user interface interactions, data processing logic, and system behavior. Through systematic testing, JuMusic undergoes thorough validation, allowing for the identification and resolution of any defects or inconsistencies. This meticulous approach to testing ensures that JuMusic delivers a seamless and reliable user experience, meeting the highest quality standards.

Chapter 6

Conclusion and Future Scope

6.1 Conclusion

JuMusic represents a significant advancement in personalized music discovery, offering users a platform to explore and enjoy music tailored to their mood, preferences, and context. By leveraging innovative algorithms and integration with the Spotify Developer Framework, JuMusic delivers curated music recommendations that go beyond mainstream content, introducing users to lesser-known tracks and genres.

The success of JuMusic lies in its user-centric approach, empowering users to take control of their music exploration journey. The app's interactive features, intuitive interface, and seamless integration with third-party services create a compelling and enriching experience for music enthusiasts worldwide.

In today's digital age, where music has become ubiquitous but personalized discovery remains a challenge, JuMusic fills a crucial gap by providing a solution that is both accessible and inclusive. Whether users seek relaxation, motivation, or inspiration, JuMusic serves as a trusted companion, guiding them on a musical adventure tailored to their unique tastes and preferences.

6.2 Future Scope

The future of JuMusic holds exciting possibilities for expansion and enhancement, aimed at further enriching the user experience and extending the app's reach:

6.2.1   Social Sharing and Collaboration:

Introducing features that allow users to share their favorite playlists, collaborate on curated collections, and discover music together with friends and peers. This social dimension adds a new layer of engagement and community building to the JuMusic platform.

6.2.2   Advanced Mood Detection Algorithms:

Continuously refining and improving the mood detection algorithms to accurately capture users' emotional states and preferences. Incorporating machine learning techniques and user feedback to enhance the accuracy and relevance of music recommendations, ensuring a more personalized and tailored experience.

6.2.3 Integration with Additional Music Services:

Expanding the integration of JuMusic with other music streaming services beyond Spotify, such as Apple Music, YouTube Music, and SoundCloud. This broadens the app's access to diverse music catalogs and enables users to seamlessly transition between platforms based on their preferences.

6.2.4 Enhanced User Engagement Features:

Introducing gamification elements, challenges, and rewards to incentivize user engagement and participation. Encouraging users to explore new genres, artists, and playlists, fostering a sense of discovery and excitement within the JuMusic community.

6.2.5 Accessibility and Localization:

Improving accessibility features and language support to make JuMusic more inclusive and accessible to users worldwide. Customizing the app experience based on regional preferences, cultural nuances, and language preferences, ensuring a truly global and diverse user base.

Overall, the future of JuMusic is bright and full of potential, with endless opportunities for innovation, growth, and impact in the ever-evolving landscape of music discovery and consumption.

References

- **<u>Python Documentation</u>**

- **<u>Spotify for Developers Documentation</u>**

- **<u>IEEE</u>**

- **<u>W3School</u>**

- **<u>MDN</u>**

- **<u>Wed Docs</u>**

- **<u>Google</u>**

- **<u>Youtube</u>**

INDIVIDUAL CONTRIBUTION REPORT:

JuMusic: Your Destination for Customized Melodies

NYASIJIN KUOL MATHIANG
2106316

Abstract: The aim of the project "JuMusic: Your Destination for Customized Melodies" is to create a user-centric music discovery platform that provides personalized recommendations based on mood, occasion, and user preferences. The objective is to bridge the gap between music enthusiasts and non-mainstream genres, fostering a diverse and inclusive music exploration experience while leveraging innovative algorithms and integration with music streaming services like Spotify.

Individual contribution and findings: The student helped data collection and also with implementation of some backend parts, especially Web API development.

Individual contribution to project report preparation: She helped with preparation of chapter 3 and 4 of the report, that is Problem Statement/Requirements Specification and Implementation.

Individual contribution for project presentation and demonstration: The student helped with User Interface and Important Diagrams parts of the presentation.

Full Signature of Supervisor: Full signature of the student:

……………………………….   ……………………………….

INDIVIDUAL CONTRIBUTION REPORT:

JuMusic: Your Destination for Customized Melodies

URIAS KERMUE
2106288

Abstract: The aim of the project "JuMusic: Your Destination for Customized Melodies" is to create a user-centric music discovery platform that provides personalized recommendations based on mood, occasion, and user preferences. The objective is to bridge the gap between music enthusiasts and non-mainstream genres, fostering a diverse and inclusive music exploration experience while leveraging innovative algorithms and integration with music streaming services like Spotify.

Individual contribution and findings: The student helped with implementation of the frontend using HTML, CSS and JavaScript. He also contributed in linkage of the frontend and backend to complete the system.

Individual contribution to project report preparation: He helped with generation of UML, ER and System Architecture Diagrams for the report.

Individual contribution for project presentation and demonstration: The student helped with System Architecture and Workflow parts of the presentation.

Full Signature of Supervisor: Full signature of the student:

……………………………….   …………………………….

INDIVIDUAL CONTRIBUTION REPORT:

JuMusic: Your Destination for Customized Melodies

Mouli Bose
2106040

Abstract: The aim of the project "JuMusic: Your Destination for Customized Melodies" is to create a user-centric music discovery platform that provides personalized recommendations based on mood, occasion, and user preferences. The objective is to bridge the gap between music enthusiasts and non-mainstream genres, fostering a diverse and inclusive music exploration experience while leveraging innovative algorithms and integration with music streaming services like Spotify.

Individual contribution and findings: The student helped with project planning and also some part of implementation, especially in the frontend.

Individual contribution to project report preparation: She helped with preparation of both chapter 1 and 2 of the report that is, Introduction and Literature Review.

Individual contribution for project presentation and demonstration: The student helped with preparation of Project Overview part of the presentation.

Full Signature of Supervisor: Full signature of the student:

……………………………….   …………………………

INDIVIDUAL CONTRIBUTION REPORT:

JuMusic: Your Destination for Customized Melodies

KAFIA ADEN MOHAMED
2129160

Abstract: The aim of the project "JuMusic: Your Destination for Customized Melodies" is to create a user-centric music discovery platform that provides personalized recommendations based on mood, occasion, and user preferences. The objective is to bridge the gap between music enthusiasts and non-mainstream genres, fostering a diverse and inclusive music exploration experience while leveraging innovative algorithms and integration with music streaming services like Spotify.

Individual contribution and findings: The student helped with data cleansing and also implementation of some parts of frontend, especially design of UX/UI.

Individual contribution to project report preparation: She helped with preparation of Chapter 5 and 6 of the report, that is Standard Adopted, and Conclusion and Future Scope.

Individual contribution for project presentation and demonstration: The student helped with preparation of Evaluation and Results and Challenges Encountered parts of the presentation.

Full Signature of Supervisor: Full signature of the student:

……………………….   ………………………….

INDIVIDUAL CONTRIBUTION REPORT:

JuMusic: Your Destination for Customized Melodies

MANYTUCH MANGAR BENY RUEI
2106286

Abstract: The aim of the project "JuMusic: Your Destination for Customized Melodies" is to create a user-centric music discovery platform that provides personalized recommendations based on mood, occasion, and user preferences. The objective is to bridge the gap between music enthusiasts and non-mainstream genres, fostering a diverse and inclusive music exploration experience while leveraging innovative algorithms and integration with music streaming services like Spotify.

Individual contribution and findings: The student helped with training of the model and also implementation of the backend, especially integration with Spotify Developer framework.

Individual contribution to project report preparation: He helped with editing and finalizing of the report by integrating the work of each group member into the report.

Individual contribution for project presentation and demonstration: The student helped with preparation of Data collection and Machine Learning Techniques parts of the presentation.

Full Signature of Supervisor: Full signature of the student:

………………………….   ………………………

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