Senior Project 1

Emolody

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Chapter 1 Introduction

1.1 Introduction

Music and podcasts have the power to shape our emotions, provide comfort, and enhance our daily experiences. However, finding the right content that truly resonates with our mood can often feel overwhelming. *Emolody* bridges this gap by using AI-powered facial recognition to detect emotions in real time, curating personalized music playlists and podcast recommendations that align with how users feel.

Whether you need an upbeat playlist to energize your day or a motivational podcast to lift your spirits, *Emolody* transforms listening into an intuitive and emotionally responsive experience. With seamless integration into popular streaming platforms and social sharing feature, it not only personalizes audio content but also fosters deeper connections through the shared experience of music and podcast.

1.2 Problem Definition

With the increasing pressures of daily life, many people struggle to manage their emotions. Constant exposure to stress, anxiety, and mental fatigue has made emotional well-being more important than ever. Music and podcasts have long been sources of comfort, yet traditional streaming platforms offer a generic listening experience, lacking the ability to truly connect with how users feel in the moment.

Most music apps operate on fixed playlists and recommendations based on past listening habits rather than real-time emotions. This leaves users with a disconnect—turning to music for comfort but having to manually search for songs or podcasts that match their mood. The absence of an intuitive, emotion-aware experience makes it harder for people to find the right content when they need it most, whether they're looking for a boost of energy, a sense of calm, or simply something that resonates with how they feel.

This disconnect between emotional state and content delivery creates frustration, especially for those seeking immediate comfort or support. Without a system that understands and responds to real-time emotions, users are left navigating an impersonal experience that fails to provide the emotional connection they seek. There is a growing need for a more intuitive and meaningful way to align music and podcasts with human emotions, ensuring that content is not just available but genuinely relevant to how people feel in the moment.

1.3 Aims & Objectives

Aims:

The primary aim of **Emolody** is to create a personalized, mood-driven music and podcast app that enhances emotional well-being by combining **real-time mood detection** and **music preferences integration**. The app will offer curated playlists and podcast recommendations based on the user's mood and listening habits, helping users feel supported and uplifted.

Objectives:

- Detect user mood using facial expressions with AI.
- Integrate with Spotify, Apple Music, and other streaming services to fetch music preferences.
- Generate personalized playlists based on mood and music preferences.
- Recommend mood-based podcast categories (Comedy, Motivational, etc.).
- Allow users to set preferences for music genres and podcasts.
- Use phone number authentication for easy login.
- Enable social sharing of playlists and podcasts.

1.4 Proposed Solution

The proposed solution is to develop Emolody, a mobile application that provides personalized music and podcast recommendations based on your current mood. This app will use AI to detect your emotions in real-time through facial expressions, ensuring the content matches how you feel. By integrating with platforms like Spotify and Apple Music, Emolody will create custom playlists and suggest podcasts tailored to your mood and preferences. Whether you're feeling stressed, sad, or in need of motivation, Emolody will deliver the right content instantly, eliminating the frustration of endless searching. With easy login via phone number and the ability to share playlists, Emolody ensures you feel understood and supported, making it easier to cope with life's challenges through music and podcast.

1.5 Novelty/Contribution

Emolody will revolutionize how users connect with music and podcasts by offering real-time mood detection and personalized recommendations. Unlike existing apps, Emolody is the only application that combines AI-powered facial expression analysis with music and podcast preferences to deliver content that truly matches your emotions. Additionally, Emolody ensures high accuracy in mood detection and recommendations by leveraging advanced AI technologies and integrating seamlessly with platforms like Spotify and Apple Music. This unique approach not only enhances emotional well-being but also provides a more intuitive and personalized listening experience compared to current solutions.

1.6 Methods/tools/Stakeholders

Tools:

- **Real-Time Mood Detection:**
  - MediaPipe by Google.
- **Camera:**
  - Device camera for capturing real-time video input for facial expression analysis.
- **Music Preferences Integration:**
  - Spotify API
  - Apple Music API
  - OAuth - This is essential for secure authentication and authorization with Spotify and Apple Music.
- **Personalized Playlist Generation:**
  - Spotify API
  - Apple Music API
- **Podcast Recommendations:**
  - Spotify Podcasts API
  - Apple Podcasts API
- **User Preferences & Settings:**
  - Firebase (for storing user preferences)
  - Phone Number Authentication (e.g., Firebase Authentication)
- **Basic Social Sharing:**
  - Firebase (for storing shared playlists)
  - Native Share Sheet (iOS): iOS provides a built-in **UIActivityViewController** that displays a share sheet with app logos (e.g., WhatsApp, Messenger, Instagram, Gmail, etc.).

No need to integrate specific APIs—just pass the content (e.g., playlist link) to the share sheet.

- **Fronted Development :**
  - Flutter.
- **Backend Development:**
  - Node.js
  - Java
- **Database:**
  a. Firebase

Methods:
1. Real-Time Mood Detection

Use facial recognition and emotion detection algorithms provided by MediaPipe.

Capture real-time video input from the user's device camera.

Analyze facial expressions to determine mood (e.g., happy, sad, bored).

2. Music Preferences Integration

Use OAuth for secure user authentication and authorization.

Fetch user music preferences (e.g., favorite artists, playlists) via Spotify and Apple Music APIs.

Store and sync user preferences across devices.

3. Personalized Playlist Generation

Analyze user preferences and listening history.

Use algorithms to generate playlists tailored to the user's mood and preferences.

Integrate with Spotify and Apple Music APIs to create and save playlists.

4. Podcast Recommendations

Fetch podcast recommendations based on user's based categories(Comedy- for happy mood and Motivational for sad mood).

Use APIs to suggest fetch suitable recommendations

5. User Preferences & Settings

Store user preferences (e.g., themes, music preferences) in Firebase.

Use Firebase Authentication for secure phone number-based login.

6. Basic Social Sharing

Store shared playlists in Firebase.

Use iOS's native share sheet to allow users to share playlists via apps like WhatsApp, Messenger, Instagram, etc.

7. Frontend Development

Use Flutter to design

Allow users to switch between light, dark, .

8. Backend Development

Use Java to build the backend logic for the application.

Handle API integrations, database management, and server-side operations.

9. Database

Store user data, preferences, and shared playlists in Firebase.

Ensure real-time synchronization and scalability.

Stakeholders:

- Developers .
- End-users .
- Data Scientists.
- Investors or Sponsors.
- Marketing and Community Managers.
- Mental Health Professionals.

1.7 Project Plan (Gantt chart)

This is the plan that we will follow to achieve the goals of our project as shown in Figure 1. The plan is divided into two academic terms. For now, we have only drawn up the plan for the first term. Our plan has been made based on agile development process, that's why we can notice the overlap between the different activities in the Gantt Chart
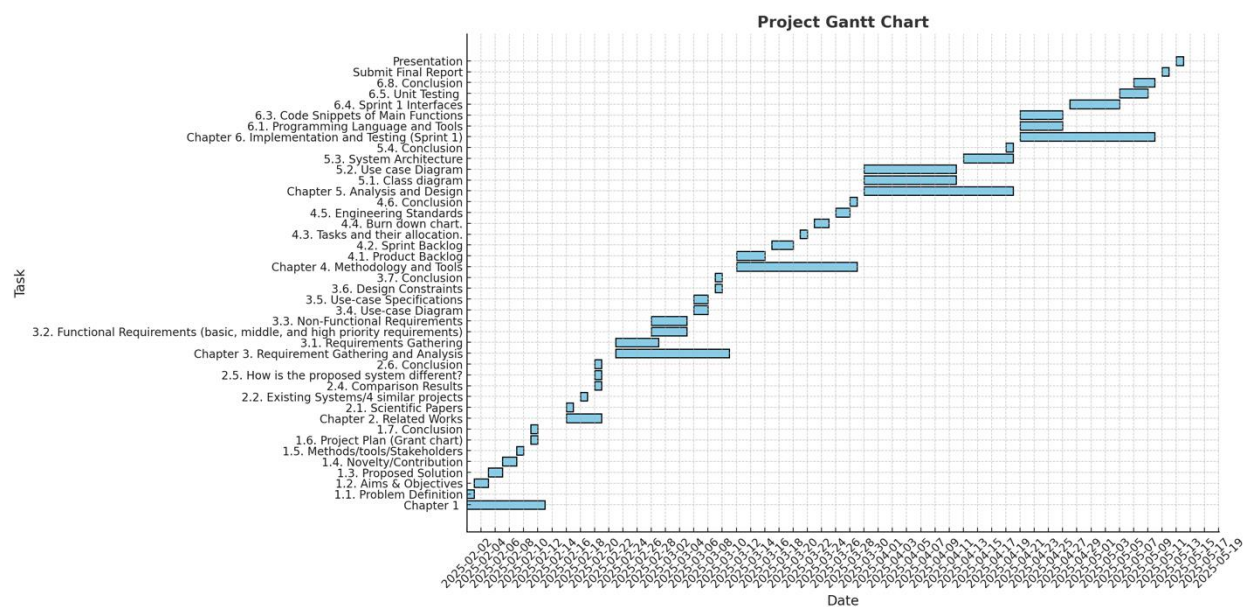

Figure 1 – The Proposed Plan

1.8 Conclusion

Emolody transforms how users interact with music and podcasts by delivering a seamless, emotion-aware listening experience. Using AI-powered facial recognition, the app provides personalized content recommendations based on the user's mood. Through real-time mood detection and seamless integration with streaming platforms, Emolody supports emotional well-being, making music and podcasts more meaningful and accessible

Chapter 2 Related Works

2.1 Introduction

Comparative studies of existing applications provide valuable insights into the strengths and weaknesses of current solutions. By analyzing these systems, developers can identify gaps in the market, avoid common pitfalls, and leverage best practices to create more efficient and user-friendly applications. Such comparisons also help in understanding user expectations and technological trends, which are crucial for the successful adoption of new systems [1]. Conducting a comparative analysis of existing systems is a critical step in the development of new applications. It allows developers to benchmark performance, understand user needs, and identify areas for innovation. By learning from the successes and failures of similar projects, new systems can be designed to address unmet requirements and deliver enhanced functionality[2].Hence, in this chapter we will discuss similar applications and comparison apps that provide similar service to our proposed one.

2.2 Scientific Papers

2.2.1 EMOPIA: A Multi-Modal Pop Piano Dataset for Emotion Recognition and Generation

Objective

EMOPIA is a dataset (audio + MIDI) for emotion recognition and music generation in pop piano, featuring 1,087 clips from 387 songs with emotion labels.

Methodology

- Clip-level emotion labels annotated by experts.

- Supports song-level analysis with multiple clips per song.

- Emotion classification in audio (mel-spectrograms) and symbolic (MIDI) domains.

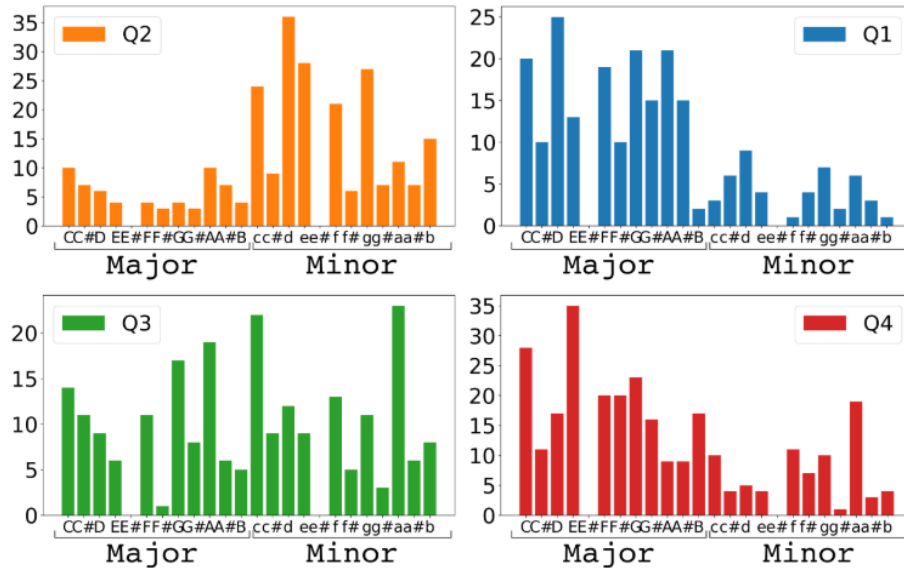- Enables emotion-conditioned music generation using Transformer models.

Figure 2 – Different Emotion Classes

Results

- Effective emotion classification using handcrafted features and deep learning.

- Improved emotion-conditioned music generation with pre-trained models.

- Provides pre-trained model weights for further research.

Conclusion

EMOPIA advances emotion-aware music research, offering open-source data and models for classification and AI-generated music

2.2.2 health app: What young people want

Objective

Design a music-based app to promote long-term engagement and help-seeking among young people, focusing on mood regulation and reducing stigma around mental health apps.

Methodology

-Participants: 24 young people (13-25) in focus groups.

- Procedure :Online discussions on app features (privacy, gamification, mood tracking) and feedback on designs.

- Analysis :Qualitative data analyzed for themes.

Table 1

Group number	Age group	Gender
G1, n = 7	<18	4 female; 3 male
G2, n = 4	18+	4 female
G3, n = 7	18+	5 Female; 2 male
G4, n = 6	<18	1 female; 5 male

Table 1. Summary of demographics for the four participant groups, N=24.

Figure 3 – Demographics

Results

-Privacy : Strong preference for anonymity and data security.

-Empowerment :Users want control over help-seeking, not forced actions.

-Engagement :Focus on ongoing interaction, not rewards or directive language.

Conclusion

Key to app success: privacy user empowerment ,and engagement .Involving young people in design ensures apps like MoodyTunes support mood management and encourage healthy help-seeking behaviors.

2.2.3 Minimal Setup for Spontaneous Smile Quantification Applicable for Valence Detection

Objective

Evaluate a minimal sEMG setup to measure spontaneous smiling (Zygomaticus Major muscle) in response to emotional stimuli, such as music videos, and explore its application in VR environments.

Methodology

1. Participants rated emotions (valence, liking, dominance) while watching music videos.

2. Single-channel sEMG tracked Zygomaticus Major activity.

3. Three key metrics were analyzed:

• ZygoNum: Total smiling time.

• ZygoLen: Average smile duration.

• ZygoTrace: High valence instances.

Results

1. Valence showed a strong correlation with smiling activity.

2. ZygoNum proved more effective than ZygoLen for valence quantification.

3. ZygoTrace identified high valence with 76% accuracy.

Conclusion

Minimal sEMG provides a reliable method for detecting emotional responses, particularly valence. It is well-suited for applications in VR and neuromarketing, offering a non-intrusive alternative to traditional methods.

2.2.4 13-dimensions-music-emotions

Objective

Compare emotional responses to instrumental music across U.S. and Chinese cultures to identify universal and culture-specific perceptions.

Methodology

1. Participants: Rated 1,841 music samples based on emotional responses.

2. Emotion Categories: Evaluated using 13 dimensions (e.g., joy, sadness, fear).

3. Analysis: Emotions assessed through:

• Valence (pleasantness).

• Arousal (energy).

Results

1. Universal Emotions: Joy and sadness were consistently recognized across cultures.

2. Cultural Differences: Certain emotions varied, highlighting cultural influences on perception.

Conclusion

1. Music emotions can be classified into 13 dimensions, expanding beyond traditional models.

2. Emotional responses are both universal and culture-specific, emphasizing cultural context.

3. Findings support applications in music classification, AI emotion recognition, and interactive music technologies.

2.2.5 Moods and activities in music

Objective

Improve music tagging by incorporating emotions and activities using the Geneva Emotional Music Scale (GEMS).

Methodology

• Collected data on music fragments based on moods and activities.

• Linked activities to moods, tagged tracks, and labeled fragments.

• Built a relational database connecting fragments, users, activities, and moods.

• Proposed studies to enhance GEMS, including testing across music types, identifying mood descriptors, and comparing with traditional tagging methods.

Results

• Developed a scientific model for describing emotions in music.

• Enhanced emotion categorization compared to traditional tagging methods.

Conclusion

Enhancing music search by focusing on emotions and activities provides a more intuitive tagging system. The approach benefits researchers and cross-cultural studies, reinforcing music as a universal emotional language.

2.3 Existing Systems/4 similar projects

This section reviews existing systems and projects that share similarities with Emolody, focusing on mood-based music and podcast recommendations. These examples provide inspiration for the development of Emolody while highlighting its unique features.

- ## Spotify

Spotify is a popular music streaming platform.Uses AI to create personalized playlists like "Discover Weekly" and is available on multiple devices, making it highly accessible. creates playlists for moods and activities like "Happy Hits," "Chill Vibes," or "Focus Flow." These playlists aren't necessarily customized for each person in real-time, however, but rather for general moods[4].

Similarities to Emolody:

It suggests music by mood but doesn't track emotions in real-time.
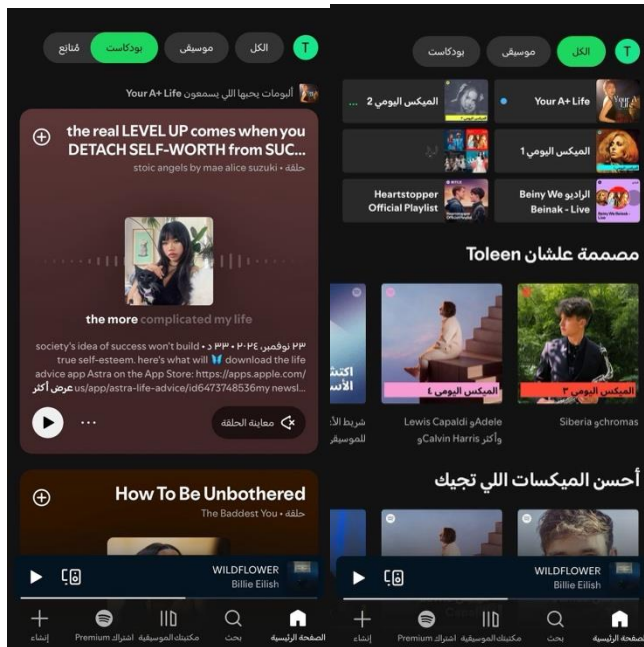
(a) Home page: Podcasts   **(b) Home page: All categories**

Figure 4 – Spotify Mobile Application UI

• Deezer

Deezer is a well-known music streaming platform, famous for its high-quality audio and its unique Flow feature. Flow creates personalized playlists tailored to each user's listening habits, offering a seamless music experience. One of Deezer's standout features is its focus on Hi-Fi lossless audio, which appeals to users who value superior sound quality. The platform offers curated playlists based on moods and genres, though it doesn't provide real-time mood analysis. Beyond music, Deezer also includes podcasts and live radio stations, giving users a wide range of content to explore. Offline listening is another key feature, allowing users to download tracks and enjoy them without an internet connection. While Deezer does offer some social features, such as sharing playlists, they are relatively limited compared to other platforms[5].

Similarities to Emolody:

- Both offer **personalized playlists** based on user preferences.
- They use **AI-powered recommendations** to suggest music.
- Both support **music and podcast streaming** for a complete listening experience.

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(a) Favorites page   (b) Home page

*Figure 5 – Deezer Mobile Application UI*

• Moodify by toasted.ai

Moodify is a smart music recommendation platform that personalizes playlists based on the user's mood. It leverages AI to analyze listening habits and preferences, creating a tailored music experience that adapts to emotional states.

Similarities to Emolody:

- **Mood-Based Music Recommendations:** Both Moodify and Emolody generate playlists that align with the user's emotional state.
- **AI-Powered Personalization:** Each app uses AI to refine and enhance music selection based on user preferences.
- **Seamless Music Integration:** Both platforms work with streaming services to provide a smooth and intuitive listening experience.
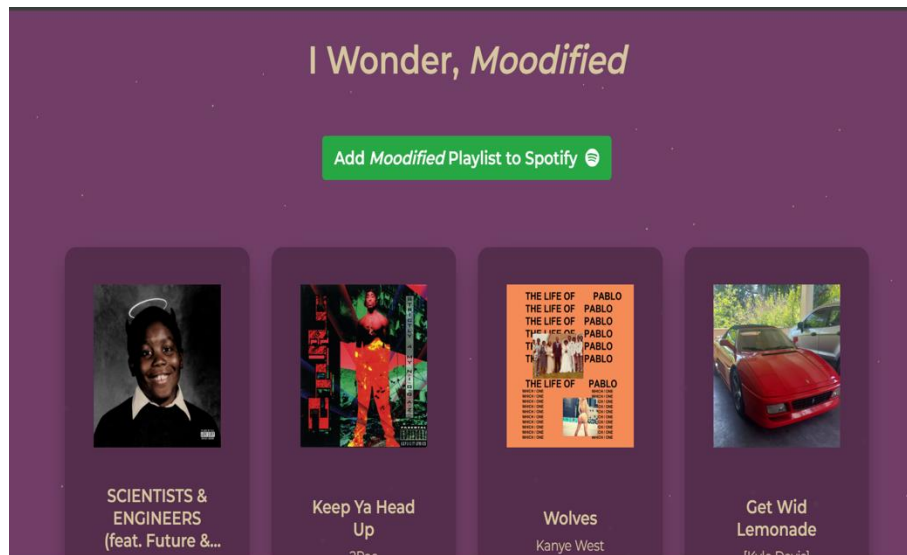
While Moodify focuses on AI-driven music recommendations, Emolody expands its features by incorporating podcasts and real-time mood detection for an even deeper emotional connection.
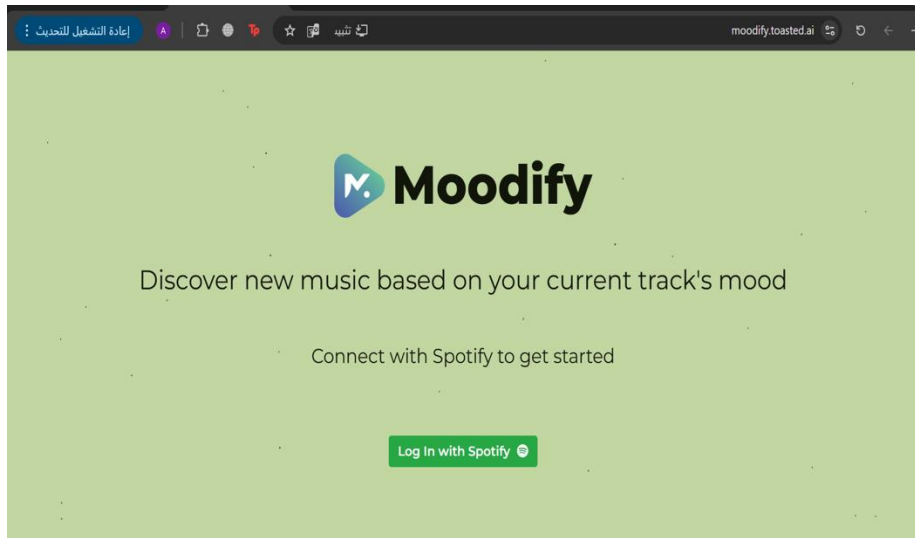
(a) HomePage
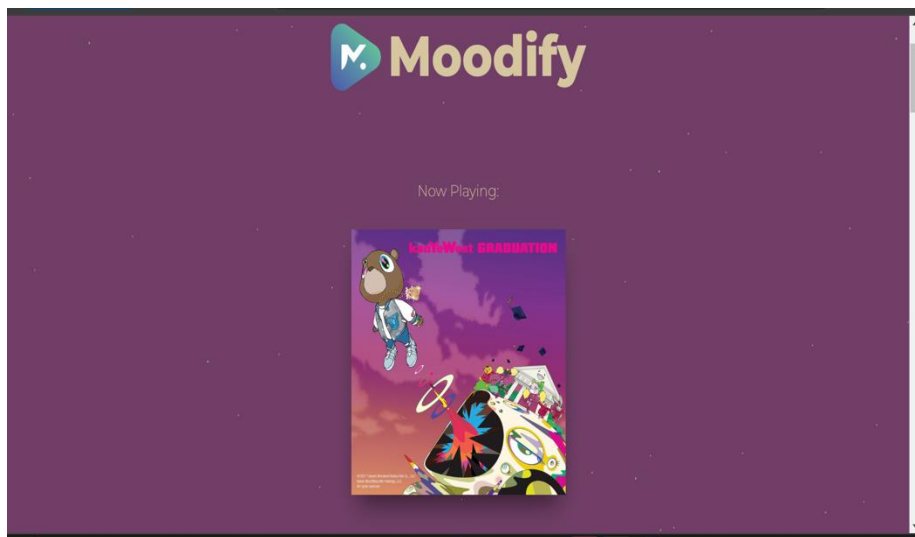
**(b) Detect**

(c) moodify playlist

Figure 6 – Moodify website UI

• Endel

Endel is an AI-powered app that generates personalized soundscapes to enhance focus, relaxation, and sleep. It adapts in real-time using factors like time of day, weather, and even biometrics (such as heart rate from wearable devices) to create an immersive, mood-based audio experience.

Similarities to Emolody:

- **Personalized Audio Experience** – Both Endel and Emolody tailor their audio content based on the user's state, creating a unique listening journey.
- **Mood-Adaptive Soundscapes** – While Endel focuses on ambient sounds and Emolody on music, both use AI to align audio with emotions or environmental factors.
- **Enhancing Emotional Well-Being** – Both platforms aim to improve users' mental state through sound, whether for relaxation, focus, or emotional support.
- **Seamless AI Integration** – Endel and Emolody utilize AI to generate real-time, adaptive audio experiences rather than offering static playlists.
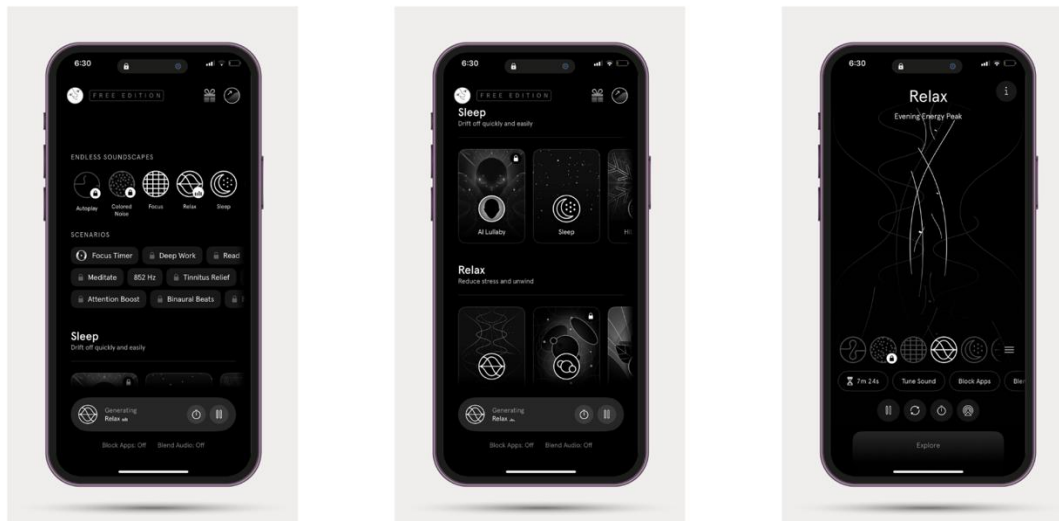
(a)Homepage   (b) categories   (c) Selection

Figure 7 – Endle Mobile Application UI

• Moodagent

Moodagent is a music recommendation app that creates personalized playlists based on the user's mood or emotional state. It analyzes the emotional and musical qualities of songs in the user's library or streaming service (e.g., Spotify) and generates playlists tailored to the user's preferences and current mood.

Similarities to Emolody:

- **Personalized Audio Experience:** Both Moodagent and Emolody tailor their audio content based on the user's mood, creating a unique listening experience.
- **Mood-Adaptive Playlists:** Moodagent generates playlists based on emotional qualities like tempo, intensity, and rhythm, while Emolody uses real-time emotion detection to recommend music and podcasts. Both apps align audio with the user's emotional state.
- **Enhancing Emotional Well-Being:** Both platforms aim to improve the user's emotional state through personalized music recommendations, whether for relaxation, motivation, or emotional support.

- **Integration with Streaming Services:** Moodagent and Emolody both integrate with external streaming platforms (e.g., Spotify) to provide seamless access to music and podcasts.

2.4 Comparison Results

Feature/Aspect	emolody	Spotify	Deezer	Moodifiy	Endel	Moodagent
Primary focus	Personalized music & podcast recommendations based on real-time mood detection	Music streaming with AI-curated playlists for moods and activities.	Music streaming with personalized playlists and Hi-Fi audio	Mood-based music recommendations using AI	AI-generated soundscapes for focus, relaxation, and sleep.	Mood-based music recommendations using emotional and musical qualities
Mood Detection	Real-time mood detection via facial expressions using AI.	No real-time mood detection; offers pre-curated mood-based playlists	No real-time mood detection; offers mood-based playlists	Mood-based recommendations but no real-time detection.	Real-time adaptation using factors like time, weather, and biometrics.	Mood-based recommendations but no real-time detection
Podcast Integration	Yes, mood-based podcast recommendations.	Yes, but not mood-specific.	Yes, but not mood-specific.	No podcast integration.	No podcast integration	No podcast integration.
Real-Time Adaptation	Yes, real-time mood detection and recommendations.	No real-time adaptation	No real-time adaptation	No real-time adaptation	Yes, real-time adaptation based on environmental and biometric factors.	No real-time adaptation
Streaming Service Integration	Integrates with Spotify, Apple Music, and others.	N/A (native platform).	N/A (native platform).	Integrates with streaming services like Spotify.	No direct integration with streaming services.	Integrates with streaming services like Spotify.
Social Sharing	Yes, users can share playlists and podcasts	Yes, users can share playlists and tracks	Limited social sharing features.	No social sharing features.	No social sharing features.	No social sharing features.
Login Method	Phone number authentication.	Email, social media, or phone number.	Email or social media.	Email or social media.	Email or social media.	Email or social media.
Unique Selling Point (USP)	Combines real-time mood detection with music and podcast recommendations.	Extensive music library and AI-curated playlists.	Hi-Fi audio quality and personalized "Flow" playlists.	AI-driven mood-based music recommendations.	Real-time adaptive soundscapes for focus, relaxation, and sleep.	Emotional and musical analysis for mood-based playlists
Emotional Well-Being Focus	Strong focus on emotional well-being through	Indirect focus through	Indirect focus through mood-based playlists	Focus on mood-based music for	Strong focus on emotional well-being through	Focus on mood-based music for

	personalized content.	mood-based playlists.		emotional well-being.	adaptive soundscapes.	emotional well-being.
AI Technology	Advanced AI for facial expression analysis and mood detection.	AI for playlist curation and recommendations.	AI for personalized playlists and recommendations.	AI for mood-based music recommendations.	AI for real-time soundscape adaptation.	AI for emotional and musical analysis.

Table 1 - Comparison Results

2.5 How is the proposed system different?

Emolody will revolutionize how users connect with music and podcasts by offering real-time mood detection and personalized recommendations. Unlike existing apps, Emolody is the only application that combines AI-powered facial expression analysis with music and podcast preferences to deliver content that truly matches your emotions. Additionally, Emolody ensures high accuracy in mood detection and recommendations by leveraging advanced AI technologies and integrating seamlessly with platforms like Spotify and Apple Music. This unique approach not only enhances emotional well-being but also provides a more intuitive and personalized listening experience compared to current solutions.

How Emolody Differs from Existing Systems:

1. **Real-Time Mood Detection**: Unlike traditional music apps that rely on past listening habits or manual mood selection, Emolody uses AI-powered facial recognition to detect the user's current emotional state in real-time. This ensures that the content recommendations are always aligned with how the user feels at that moment.
2. **Seamless Integration with Streaming Platforms**: While most apps offer generic playlists, Emolody integrates directly with popular streaming services like Spotify and Apple Music to fetch user preferences and generate personalized playlists and podcast recommendations based on real-time emotions.
3. **Emotion-Aware Recommendations**: Emolody goes beyond simple genre-based recommendations by analyzing the user's mood and suggesting content that matches their emotional state. For example, if the user is feeling sad, the app might recommend motivational podcasts or uplifting music, whereas if the user is happy, it might suggest upbeat playlists or comedy podcasts.
4. **Social Sharing Features**: Emolody allows users to share their mood-based playlists and podcast recommendations with friends and family, fostering a sense of connection and shared emotional experiences. This feature is not commonly found in traditional music apps.
5. **User-Friendly Authentication**: Emolody simplifies the login process by using phone number authentication, making it easier for users to access their personalized content without the hassle of remembering passwords or usernames.
6. **Advanced AI Technology:** Emolody leverages cutting-edge AI technologies, such as Google's MediaPipe for facial expression analysis, ensuring high accuracy in mood detection and content recommendations. This sets it apart from apps that rely on less sophisticated algorithms.
7. **Personalized User Experience**: Emolody allows users to set preferences for music genres and podcast categories, ensuring that the recommendations are not only mood-based but also tailored to individual tastes. This level of personalization is not typically offered by existing music and podcast apps.

By combining these innovative features, Emolody offers a unique and emotionally responsive listening experience that is not available in current market solutions. It bridges the gap between emotional well-being and content consumption, making music and podcasts more meaningful and accessible.

2.6 Conclusion

In this chapter, we conducted a comprehensive review of existing systems, scientific papers, and similar projects related to mood-based music and podcast recommendations. Through this analysis, we identified key strengths and weaknesses in current solutions, which provided valuable insights for the development of Emolody.

Existing platforms like Spotify, Deezer, Moodify, Endel, and Moodagent offer various features such as personalized playlists, mood-based recommendations, and AI-driven music curation. However, they often lack real-time emotion detection and fail to provide a truly personalized experience that adapts to the user's current emotional state. While some apps focus on mood-based music recommendations, they do not integrate podcasts or offer real-time emotional analysis, which limits their ability to fully support users' emotional well-being.

Emolody distinguishes itself by combining real-time mood detection through AI-powered facial recognition with seamless integration of music and podcast recommendations. This unique approach ensures that the content delivered is not only personalized but also emotionally relevant, providing users with a more intuitive and meaningful listening experience. Additionally, Emolody's social sharing features and user-friendly authentication methods further enhance its appeal, fostering a sense of connection and ease of use.

By addressing the gaps identified in existing systems, Emolody aims to revolutionize how users interact with music and podcasts, offering a solution that is not only technologically advanced but also deeply attuned to the emotional needs of its users. This chapter has laid the groundwork for understanding the competitive landscape and highlighted the innovative features that set Emolody apart, paving the way for its successful development and implementation.

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