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Project ID : TMP – 2023 – 24 – 065

Important instructions to students:

1. **According to the comments given by the supervisor, make the necessary modifications and finally, get the approval from the Supervisor and the co-supervisor.**

2. **If the project topic is rejected, identify a new topic, and follow the process as before.**

3. **The approved form must be submitted to the folder (will be notified later) on or before 10th July 2023.**

(Students should ensure that they complete all sections ranging from 1 to 7. Then, download the form and email to your supervisor before 26th June 2023. Please note that the corresponding supervisor of the project is responsible for completing sections 8 to 10.)

1. Topic (12 words max)

Personalized Music Recommendation System

2. Research area the project belongs to

Computing for Inclusive and Equitable Society (CIEC)

3. Team member details

Student Name	Student ID	Specialization
Leader: Sumanasekara H. P.	IT20665616	IT
Member 2: Gunasekara C. M.	IT20665852	IT
Member 3: Sithmini L. W. E.	IT20656874	IT
Member 4: Dhananjaya W. K. S.	IT20667078	IT

4. Brief description of the research problem including references (200 – 500 words max) – references not included in word count

Nowadays music recommendation plays a major role in the society despite of age or gender, with the rapid increment of digital music platforms and streaming services music such as Spotify, iTunes, and Alexa. There are algorithms which are already implemented such as collaborative filtering, content filtering and hybrid ways. The main goal of this proposed system is to provide more intuitive music recommendations, reducing the cold start problem and playlists to each user's unique preference and current mood, allowing users to interact with the music recommendation system through voice commands to enhance their music experience and satisfaction.

- Personal data-based music recommendation Reducing cold start problem.

  The cold start problem means when we first sign into a music streaming service the algorithms does not have any inputs to run. Either the user must give preferences by using a form or must 'play around' the application. So, I address the gap by predicting and recognizing the age, gender, and the geographical area [2] of the user by capturing and processing an image of the user. The novelty is to collect that information through an image processing mechanism so the cold start problem will be reduced.

- Music Recommendations based on environmental sound recognition and capturing image view of environment.

  Environmental sound recognition and capturing image view of environment [4] Involves analyzing the acoustic features of the user's surroundings to identify the context in which they are listening to music. By capturing and analyzing environmental sounds such as traffic noise, nature sounds, or crowd noise, and also the picture of the environment. The system can gain insights into the user's current situation and preferences. This information can then be used to recommend music that aligns with the user's mood, location, or activity [3].

- Post impact assessment after listening to recommended music by voice recognition.

  In emotion-based music recommendation systems recommend songs or playlists based on user emotion [5]. But there is no method to measure how the given recommendation will impact the user to help change his emotional state after listening to the recommended songs or playlists and whether his emotional state will be better or worst. Sometimes recommendation systems not personalized according to the user [6]. Another problem is the accuracy of the recommendation is low and sometimes not fitted to the user.

- Music recommendation systems by analyzing the emotional state of the user's voice.

  This approach involves capturing and interpreting various acoustic features from the user's voice, such as pitch, intensity, and speech patterns, to determine their emotional state [2]. By analyzing the user's voice, the system can identify emotions such as happiness, sadness etc. This information is then used to recommend music that aligns with the user's emotional state, enhancing their music listening experience while changing the mood for the better.

In conclusion the research gap of personalized music recommendation systems based on speech recognition, focuses on developing algorithms and techniques to enable users to interact with music recommendation systems through voice commands to enhance the user experience and provide more intuitive and hands-free recommendation experience.

References

[1] HORSBURGH, B., CRAW, S., and MASSIE, "Cold-Start Music Recommendation Using a Hybrid Representation," in OpenAIR@RGU, 2012.

[2] J. Jayakumar and P. Supriya, "CNN based Music Recommendation system based on Age, Gender and Emotion," *2022 6th International Conference on Electronics, Communication and Aerospace Technology*, Coimbatore, India, 2022, pp. 1356-1359, doi: 10.1109/ICECA55336.2022.10009391.

[3] Kim, H., Yoon, S., Han, K. J., & Seo, J. (2019). "Kitchen Sound Recognition for Music Recommendation". Proceedings of the *ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*, 3(3), 1-20.

[4] Zhen, Y., Zhu, Y., Li, J., Wang, S., & Yang, Y. (2021)." Exploring Soundscape for Music Recommendation in Different Transportation Contexts". In Proceedings of *the International Society for Music Information Retrieval Conference* (ISMIR), 2021.

[5] Kim TY, Ko H, Kim SH, Kim HD. "Modeling of Recommendation System Based on Emotional Information and Collaborative Filtering". Sensors (Basel). 2021 March.

[6] Salunke, A., Kukreja, R., Kharche, J., & Nerurkar, A. (2020). "Personalized Suggestion For Music Based On Collaborative Filtering". *International Journal of Engineering and Computer Science*, 9(05), 25047–25051.

5. Brief description of the nature of the solution including a conceptual diagram (250 words max)
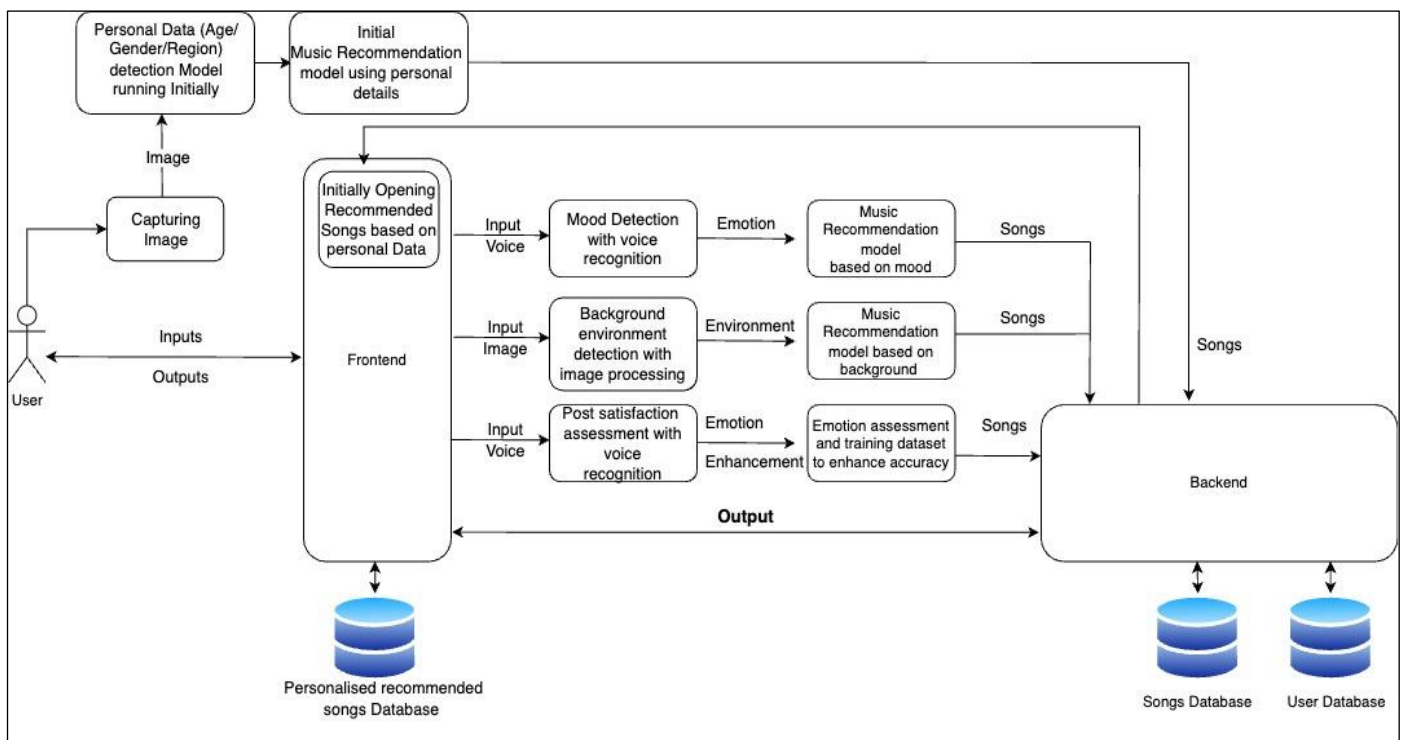
A personalized music and song recommendation system aims to provide users with customized music suggestions based on their emotion. The nature of the solution revolves around exploiting user data, advanced algorithms, and machine-learning techniques to deliver a tailored music experience.

As the very first step, user must capture an image of the face to collect facial specifications to predict the age, gender, geographical location (county / island), region, nationality in order to give the very first high-level music recommendation to reduce the cold start problem. Then the application typically collects user data through various means, including speech recognition, image processing to extract the mood / the emotion and the background environment. Then there is a new aspect to assets the post emotions after listening to the recommended songs to enhance the accuracy of the recommendation in future. After integrating all these models, algorithms and subcomponents, ultimately there will be a personalized play lists for different moods and occasions for the user.

6. Brief description of specialized domain expertise, knowledge, and data requirements (300 words max)

Identified specialized Domain Expertise are expert knowledge in image processing to analyze and predict data of a given face. Need to have the knowledge of computer vision algorithms, facial recognition, and image classification. To accurately extract the necessary data of a user. The other area is machine learning and pattern recognition, particularly deep learning, Convolutional Neural Networks (CNN) and feature extraction. It is used to create models to extract the emotion of the user through speech recognition. And the other crucial aspect is learning of music recommendation algorithms like collaborative filtering, content filtering and hybrid methods to give a personalized experience to the user. It plays a major role in filtering songs and collect it to a playlist. Furthermore, proficiency in speech recognition is also vital fact to identify and analyze the emotions / mood of the user.

Considering data collection and management, first and foremost we need to have a data set for music metadata including song titles, name of artists, genres, released dates etc. Then for image processing subcomponents, there should be User Image Data collection which cover a diverse personal data like age, gender, geographical location, song preferences etc. Moreover, we need to have data sets for voice, environmental details as well.

7. Objectives and Novelty

Main Objective
To give user a personalized play list according to his or her current mood / emotion, personal data like age, gender, nationality and according to the current location / background using voice recognition and image processing.

Member Name	Sub Objective	Tasks	Novelty
Sumanasekara H P	Main goal is to reduce the cold start problem by allowing user to capture image of the face and analyze and identify personal details such as age, gender, which region of the world etc. Based on that information, the system will provide initial recommendations when user first register to the application.	• Analise facial specialties by using image processing and get data. • Based on that information, give a initially recommended playlist to the user.	Without 'playing around' the system or providing user inputs manually (by forms), using a facial recognition perdition to reduce cold start problem.
Dhananjaya W K S	Develop the monitoring system to identify the post emotion assessment of user after listening to the recommended songs. Whether the user is being happy, still sad, he is interested or not interested about recommended songs or playlists and to collect data to a training algorithm to enhance the accuracy of future recommendations.	• Detect the voice and analyze it using deep learning techniques. • Give the feedback to the training algorithm for better recommendation in future.	Post satisfaction assessment for the enhancement of accuracy of future recommendation.

8. **Supervisor checklist (supervisors should fill sections from 8 to 10)**

   1. Is this research problem valid?

Yes		No	

   2. Is the proposed research group, correct?

Yes		No	

   3. Is the proposed research area, correct?

Yes		No	

   4. Do the proposed sub-objectives match the students' specialization?

Yes		No	

   5. Is the required domain expertise, knowledge, and the data available either through the supervisor or external supervisor?

Yes		No	

   6. Is the scope of the solution practical?

Yes		No	

   7. Do all sub-objectives have sufficient novelty?

Yes		No	

9. Your final decision:

Acceptable: Mark/Select as necessary

Topic Accepted	
Topic Accepted with minor changes (should be followed up by the supervisor) *	
Topic to be Resubmitted with major changes*	
Topic Rejected. Topic must be changed	

* Detailed comments given below

Comments

10. Supervisor details

	Title	First Name	Last Name	Signature
Supervisor	Mr.	Thusithanjana	Thilakarathne	
Co-Supervisor	Mr.	Darshana	Kasthurirathne	
External Supervisor	-	-	-	-
Summary of external supervisor's (if any) experience and expertise -				