

Emotion-Aware Nepali Music Recommender System

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With the availability of online music streams for listening to music, people are overwhelmed by the huge quantity of available songs. Music recommender systems play a crucial role in assisting users to find the songs according to their interest from such a large collection of songs. Many of such systems suggest songs based on users' favorite album / artists / music genre, or other characteristics of the songs frequently played by the users. However, recent studies (Wang, Xu, Ding, & Tang, 2021; Polignano, Narducci, de Gemmis, & Semeraro, 2021) advocate that music is strongly associated with emotion, and that music listening preference is directly influenced by the user's emotional state, rather than just other factors such as users' favorite artist, music genre etc. In this regard, this research work exploits the relationship between the emotion conveyed by the songs and the songs' audio features (e.g., tempo, valence, energy, acousticness etc.) to develop an emotion-based music recommender system for Nepali songs. The motivation behind this work is also the fact that no literature was found on the emotion-based Nepali music recommendation systems. To address this gap, we collected title, artist, and 11 audio features of Nepali songs using Spotify API. To include songs of as many genres as possible, various keywords, such as Nepali pop songs, Nepali gazal, Nepali adhunika songs, Nepali classical songs, Nepali Dohori song, Nepali folk song etc. were used to search Nepali songs available on Spotify. Metadata of a total of 3,307 songs were collected. Preprocessing of the collected dataset was required because some Hindi, and English songs were also present in the collection. For the data preprocessing step, songs of unfamiliar artists were also manually verified, and non-Nepali songs were removed. After data preprocessing, there is the metadata of a total of 2,600 Nepali songs. These songs were then annotated in terms of Russell's Mood Quadrant (Russell, 1980; Panda, Redinho, Gonçalves, Malheiro, & Paiva, 2021), where Q_1 indicates happiness, Q_2 tension/aggression, Q_3 sadness, and Q_4 calmness. Next, two emotion-based music recommendation models based on k-Nearest Neighbour (kNN) were developed, which we have named Model 2F and Model 6F, due to the fact the former model considers two audio features (i.e. valence and energy) whereas the latter model considers six audio features (i.e., valence, energy, danceability, mode, speechiness, and acousticness) for recommending songs. User selects one or more songs to listen to that match his/her current emotional state. The two models then apply the kNN algorithm to find 30 songs that are closest to (considering the above mentioned audio features) each song selected by the user. Among those 30 songs, the models recommend 10 songs fulfilling the proportion of the calculated emotion quadrant of the songs selected by the user.

To assess the performance of these recommendation models, online evaluation was performed. 102 evaluators participated in the evaluation process, where the evaluators were asked to choose some Nepali songs that they would listen to in the current emotion. Based on the selected songs, both models recommend 10 songs to the evaluator who then provides feedback on each recommended song whether it matches her current emotion or not. Figure 1 illustrates all these steps. From this experiment, we observed that on average 46.8% of the songs recommended by Model 2F match the users' current emotion, whereas this ratio was only 43.5% for Model 6F. This suggests that recommending songs considering only valence and energy performs better than recommending songs based on more audio features (i.e., valence, energy, danceability, mode, speechiness, and acousticness).

Keywords: *Emotion-aware music recommender, audio features, emotion-music relationship, emotion model, nepali song recommender*

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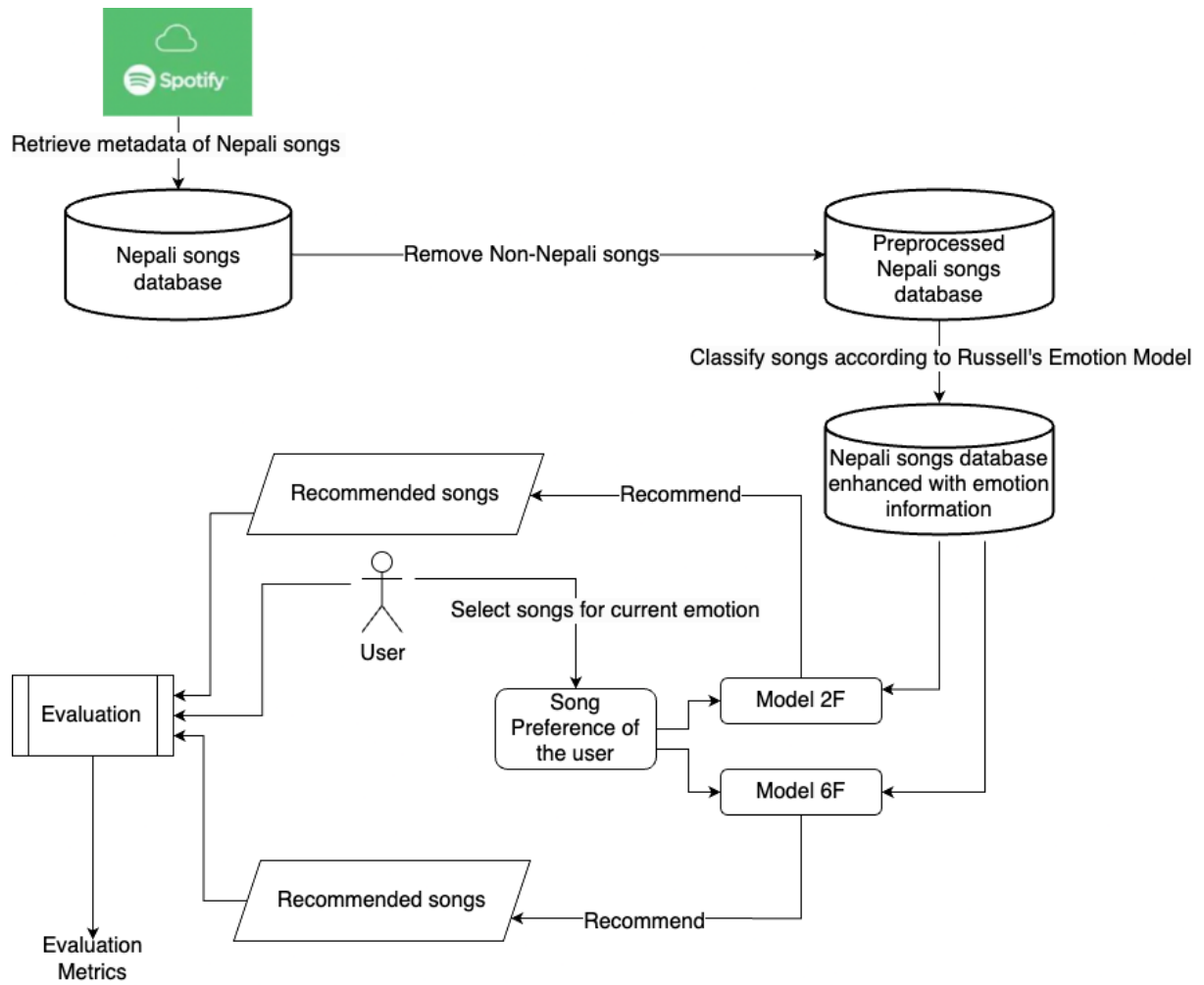


Figure 1: Methodology followed in this research work