MoodTunes

An NLP-Driven Emotion-Based Music Recommendation System

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Motivation & Problem Definition

Motivation:

Music has a profound impact on human emotions, serving as a powerful medium for expressing and processing feelings. While modern music streaming services offer personalized recommendations, they primarily rely on user preferences and listening history.

The key limitation identified is that these traditional approaches often overlook the real-time emotional state of the listener, which can play a crucial role in music selection.

Motivation & Problem Definition

Problem Definition:

The goal is to bridge the gap between a user's current emotional state and music that resonates with or complements that emotional state.

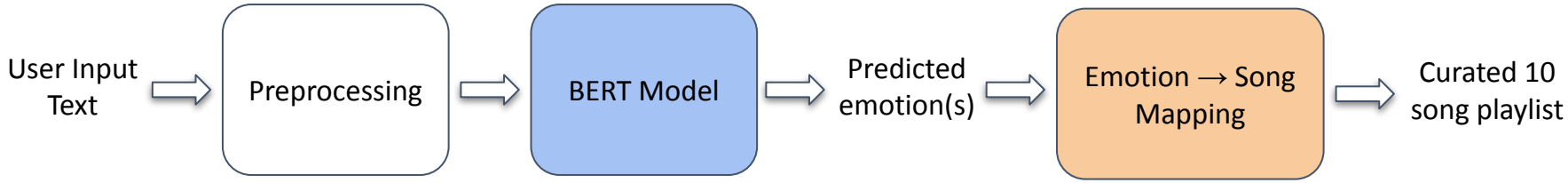
The solution will create a more emotionally intelligent music recommendation system than what's currently available.

Solution - Overview

1. Leveraged a pre-trained BERT model fine-tuned on the GoEmotions dataset to predict the emotion(s) from a user input text
    - GoEmotions maps each input (Reddit comments) to one or more emotions from a set of 28 possible labels

2. Generates a personalized playlist of 10 songs by matching predicted emotions to the lyrics of the songs in the Emotions4MIDI dataset (also trained using GoEmotions dataset)
    - Emotions4MIDI provides emotion scores for each song, enabling emotion-aligned music selection

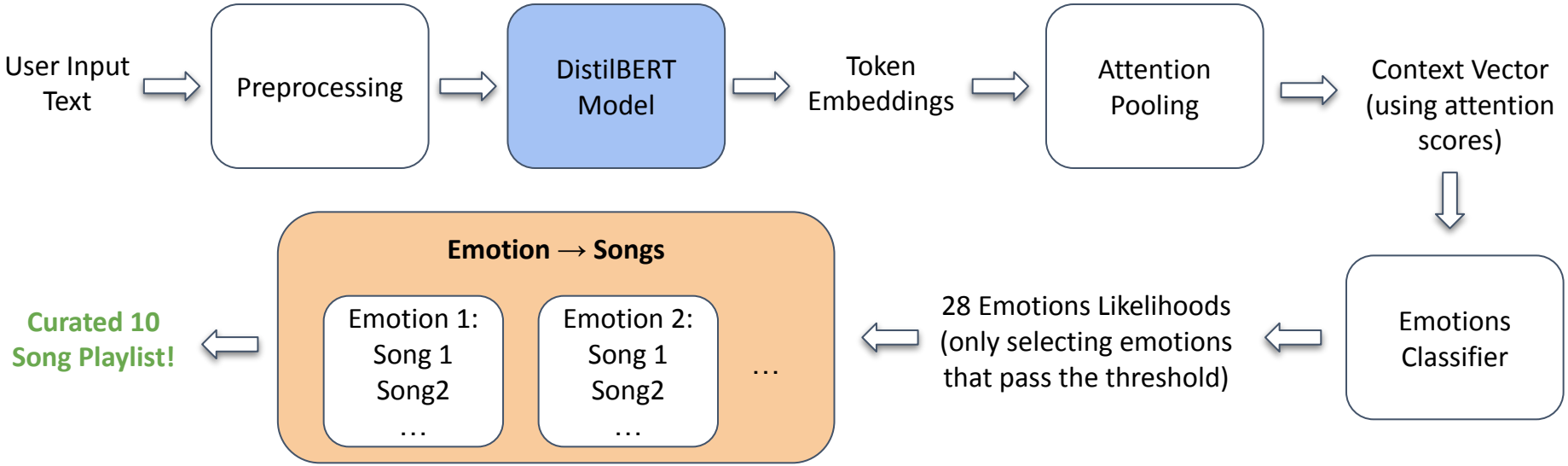
Solution: High-Level Architecture



Solution - Pre-processing

1. **Text Cleaning:** lowercase text, removed URLs/mentions, removed hashtags (kept text), normalized punctuation & whitespace
2. **Data Augmentation (20%):** Synonym replacement (WordNet), random word swaps, random word deletions
3. **Class Imbalance Handling:** Computed class frequencies and oversampled minority classes to 50% of majority class count
4. **Tokenization:** Used distilbert-base-uncased tokenizer (max length = 128, with padding/truncation)

Solution: In-Depth Architecture



Results

Hyper Parameters	Epochs	Batch Size	Max Length
#	3	32	128

Scores	Precision	Recall	F1-score
Average	0.54	0.62	0.58

- Even though the F1 score is not very high, the model does a great job at predicting emotions → see demo next

Example #1

1 Scenario: your girlfriend broke up with you

2 Tell the model about your troubles

```
Text to classify: my girlfriend broke up with me
```

3 Model classifies your words into emotions and selects emotions that surpass their thresholds

```
Text to classify: my girlfriend broke up with me

Emotion Classification Results:
==============================
Emotion          | Probability  | Threshold  | Prediction
-------------------------------------------------------
sadness          |    0.9920    |   0.7969   |     ✓
disappointment   |    0.7331    |   0.7520   |     X
neutral          |    0.3748    |   0.4656   |     X
love             |    0.1894    |   0.7578   |     X
grief            |    0.1275    |   0.8369   |     X
approval         |    0.1267    |   0.7324   |     X
remorse          |    0.1253    |   0.6489   |     X
disgust          |    0.0821    |   0.9561   |     X
annoyance        |    0.0772    |   0.7988   |     X
embarrassment    |    0.0716    |   0.8984   |     X
optimism         |    0.0635    |   0.8438   |     X
nervousness      |    0.0589    |   0.9336   |     X
joy              |    0.0586    |   0.7993   |     X
```

4 The model then curates a playlist with songs that the highest scores associated with the detected emotions

```
Detected emotions: sadness
{'title': 'True Love', 'artist': 'Joan Armatrading', 'score': 0.9298}
{'title': "I'm gonna miss you forever", 'artist': 'Aaron Carter', 'score': 0.9189}
{'title': 'You lost me', 'artist': 'Christina Aguilera', 'score': 0.9132}
{'title': 'Chere Amie (Toutes Mes Excuses)', 'artist': 'Marc Lavoine', 'score': 0.9013}
{'title': 'Sorry seems to be the hardest word', 'artist': 'Charles John', 'score': 0.9013}
{'title': 'Reflections of my life', 'artist': 'The Marmalade', 'score': 0.8941}
{'title': 'Help Me Make It Through The Night', 'artist': 'Sammi Smith', 'score': 0.8941}
{'title': 'Little child', 'artist': 'The Beatles', 'score': 0.8876}
{'title': "I can't be with you", 'artist': 'The Cranberries', 'score': 0.8765}
{'title': 'Jamaica farewell', 'artist': 'Belafonte', 'score': 0.857}
```

5 A song for your heartbreak

Example #2

1 Scenario: you are going to the gym and want to hit a personal record

2 Tell the model about your situation

```
Text to classify: i am going to the gym and want to hit a personal record
```

3 Model classifies your words into emotions and selects emotions that surpass their thresholds

```
Text to classify: i am going to the gym and want to hit a personal record

Emotion Classification Results:
================================
Emotion          | Probability  | Threshold  | Prediction
-------------------------------------------------------
desire           |    0.9962    |   0.8462   |     ✓
optimism         |    0.4190    |   0.8438   |     X
admiration       |    0.1648    |   0.8340   |     X
neutral          |    0.1532    |   0.4656   |     X
excitement       |    0.1525    |   0.8364   |     X
approval         |    0.1247    |   0.7324   |     X
curiosity        |    0.0833    |   0.6816   |     X
annoyance        |    0.0751    |   0.7988   |     X
gratitude        |    0.0544    |   0.8799   |     X
anger            |    0.0500    |   0.9385   |     X
love             |    0.0478    |   0.7578   |     X
disappointment   |    0.0450    |   0.7520   |     X
realization      |    0.0439    |   0.8359   |     X
disapproval      |    0.0368    |   0.8613   |     X
```

4 The model then curates a playlist with songs that the highest scores associated with the detected emotions

```
Detected emotions: desire
{'title': '(I Wish I Knew How It Would Feel To Be) Free/One', 'artist': 'Lighthouse Family',
{'title': 'I wish', 'artist': 'R Kelly', 'score': 0.7829}
{'title': 'Wish I could fly', 'artist': 'Roxette', 'score': 0.7808}
{'title': 'I wish it would rain down', 'artist': 'Phil Collins', 'score': 0.7685}
{'title': 'Ohh La La', 'artist': 'Rod Stewart feat the Corrs', 'score': 0.7498}
{'title': 'Barcelona', 'artist': 'Freddie Mercury And Montserrat Caballe', 'score': 0.7396}
{'title': 'Homeward Bound', 'artist': 'Simon & Garfunkel', 'score': 0.7393}
{'title': 'My Cherie Amour', 'artist': 'Stevie Wonder', 'score': 0.7154}
{'title': 'Keep It Dark', 'artist': 'Genesis', 'score': 0.67}
{'title': 'I wanna be a hippy', 'artist': 'Technohead', 'score': 0.6602}
```

5 Lyrics

I wish I knew how it would feel to be free
I wish I could break all the chains holding me
I wish I could say all the things that I should say
Say 'em loud say 'em clear
For the whole wide world to hear


```
Detected emotions: sadness
{'title': 'True Love', 'artist': 'Joan Armatrading', 'score': 0.9298}
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```