Tempo: A Context-Aware Music Application  
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**Goal**

- To develop an Android application that will recommend songs based on a user's contextual environment all packaged into a simple user interface and experience

**Methodology**

- Focused on the middle 45 seconds of every song (to avoid bias from the beginning and end of songs)
- Extracted mel spectrogram of each song and used that as our core feature for audio similarity
- Used convolutional neural networks based on the mel spectrogram of songs to predict weather, activity, and mood classification labels
- Built a song similarity graph based on cosine similarity of the mel spectrogram of songs, to determine the best songs to play after a user likes/dislikes a song (solely based on music similarity)

**Motivations and Objectives**

**Motivations**

- Too often we spend a large amount of time curating playlists of songs for various events and activities.
- As a result, we end up selecting songs more recently heard, ignoring older songs in our libraries.

**Objectives**

- Our Android app will observe your environment (weather, location, and activity) and play songs suited for it.
- Our algorithm will automatically refine itself based on user feedback.

**Design Challenges**

- Determining the most accurate numerical features to extract from an audio signal for use in the convolutional neural networks
- Gathering and classifying a diverse group of songs to initially train our neural networks
- Improving classification accuracy and fine-tuning our recommendation algorithm

**Results**

**Song classification accuracy based on mel spectrogram**

<table>
<thead>
<tr>
<th>WEATHER</th>
<th>ACTIVITY</th>
<th>MOOD</th>
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<tr>
<td>62.29%</td>
<td>57.14%</td>
<td>62.86%</td>
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- Convolutional neural net accuracy is not as well as we desired due to the subjective nature of context categories.
- In the future, we can attempt to reduce subjective labels by surveying a larger and more diverse group of participants.
- We could also use the lyrics of a song as data for better classification.

**References**