Music Genre Classification Using Deep Learning

**Objective**
Classify music into eight genres using deep learning.
- Use an approach that does not require lots of prior knowledge to hand-tailor the features.
- Simplify task into an image classification problem to take advantage of CNNs.

**Dataset**
- Free Music Archive (FMA) [http://freemusicarchive.org/](http://freemusicarchive.org/)
- Used the fma_small data set described in table below and in [1]

<table>
<thead>
<tr>
<th>Label</th>
<th>Genre</th>
<th>Number of Tracks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Electronic</td>
<td>1000</td>
</tr>
<tr>
<td>1</td>
<td>Experimental</td>
<td>1000</td>
</tr>
<tr>
<td>2</td>
<td>Folk</td>
<td>1000</td>
</tr>
<tr>
<td>3</td>
<td>Hip-Hop</td>
<td>1000</td>
</tr>
<tr>
<td>4</td>
<td>Instrumental</td>
<td>1000</td>
</tr>
<tr>
<td>5</td>
<td>International</td>
<td>1000</td>
</tr>
<tr>
<td>6</td>
<td>Pop</td>
<td>1000</td>
</tr>
<tr>
<td>7</td>
<td>Rock</td>
<td>1000</td>
</tr>
</tbody>
</table>

- Use SoX to get raw spectrograms from audio at 50ps/s.
- Split each spectrogram into 128x128 pixels slices (2.5s of audio) resulting in about 80k images.
- Split dataset into Train/dev/test in the ratio 0.90/0.05/0.05.
- Use 5.12a audio clips as augmented data (Zoom out).

**Pipeline**
- Input Song (4096x1024)
- Spectrogram of Entire Song (256, 512)
- 128x128 spectrogram Slides
- Deep Learning Classifier (CNN)
- Classification Score
- Confidence Threshold
- Predict genre

**CNN Architecture**

**Results**
Deep model: No regularization except dropout in FC layer (DR = 0.8)
Fusion: Searched Dropout rates and picked 0.6
WD: Added L2 regularization by searching weight decay values. Used Weight decay value of 1e-5
Best: See design choices above

**A Future Direction**
- Modify the cost function to penalize misclassification (See confusion table).
- Figure out the jumps in the dev learning curve.
- Multi-genre classification of Music.
- Attempt Music Style Transfer between two genres.

**References**

**Source Code**
The source code can be found in our Github repository at [https://github.com/jonalkn/cs230_final_project](https://github.com/jonalkn/cs230_final_project)