TensorFlow For Music Recommendation

Team 15 – Shuyu Sui, Ishwarya Ravikumar, Aparajitha Chappa, Niharika Kunta, Hui Dong

ABOUT TENSORFLOW

TensorFlow is an open-source software library for machine learning across a range of tasks, and developed by Google to meet their needs for systems capable of building and training neural networks to detect and decipher patterns and correlations, analogous to the learning and reasoning which humans use.

TensorFlow API provides a Python API, as well as C++, Haskell, Java, Go, and Rust APIs. In addition, there are 3rd party packages for Julia, R, and Scala
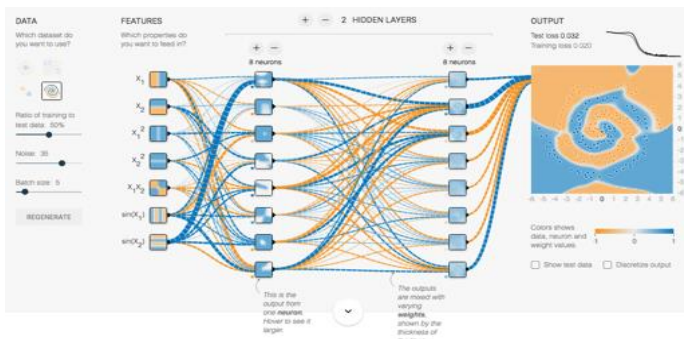
WHY TensorFlow?

- o Backend with Python & C++
- o TensorFlow can run on multiple GPU's
- o Visualizations
- o Debugging – Retrieve the results of discretionary data on any edge of the graph visualization
- o Ensured Continued Support from Google

THE COMPUTATIONAL GRAPH

You might think of TensorFlow Core programs as consisting of two discrete sections:

Section 1. Building the computational graph.

Section 2. Running the computational graph.

TENSOR BOARD

To Make it easier to analyze and optimize TensorFlow, Tensor Board can be used for visualizing TensorFlow Graphs.

It can be used for debugging and comparison of Training models. For example, if you have trained a model, then tuned with some parameters and trained it again. Both these runs can be displayed at Tensor Board simultaneously to compare differences
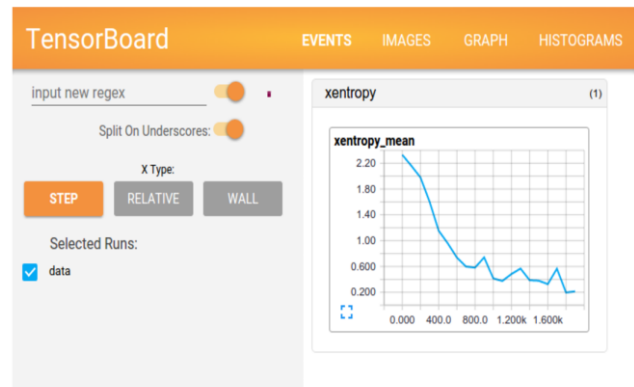
FEATURES

- o Visualize Images
- o Visualize Embeddings
- o Speech Recognition
- o Play Audio

In other technologies like pytorch, one must integrate Neural Networks with matplotlib and seaborn to visualize

WORLD'S BEST ARTIFICIAL INTELLIGENCE FRAMEWORK!!

- • TensorFlow is the master engine behind recognizing spoken words, improving search results and integral framework for other Google applications

- • Convolutional Neural Network works better on GPU computing supporting systems, which is supported by TensorFlow as compared to other libraries.

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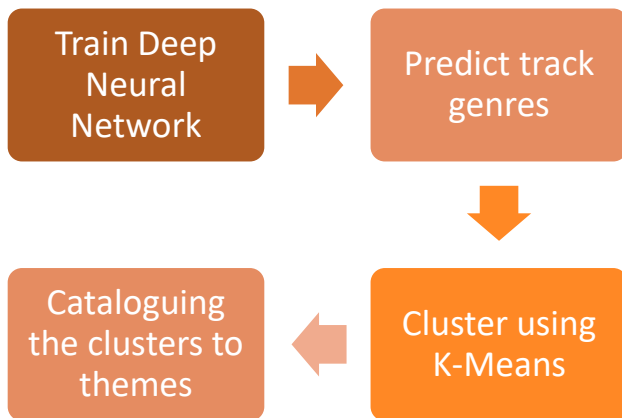
ANALYSIS

Dataset Description

We used Free Music Archive (FMA), an interactive library of high-quality, legal audio downloads and an open and easily accessible dataset which can be used to evaluate several tasks.

- The data set has 8,000 tracks from 8 top genres, balanced with almost 1,000 tracks per genre, 1 genre per track ; together with full length, high-quality audio files.
- Audio features extracted by Echonest(Spotify) are provided for 13,129 tracks, but we only considered tracks in the dataset.
- These features include 8 high-level audio features (acousticness, danceability, energy, instrumentalness, liveness, speechiness, tempo, valence).

Approach

```
Train Deep Neural Network  →  Predict track genres
                                      ↓
Cataloguing the clusters to themes  ←  Cluster using K-Means
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- Considered the Echonest features for the identifying theme of the tracks.
  The 8 audio attributes generated by Echonest is used to predict the genre of the missing tracks using Deep Neutral Networks.
- Chose the 8 audio attributes and genre attributes and used the data to do k-means clustering using TensorFlow.
- Used performance index to come up with the best clusters
- Profiled clusters based on the audio attributes and played the song

Assumptions

- Data has equal representation of genres and is not biased
- Dataset being a subset of the much larger dataset(70GB) some tracks might be incorrectly tagged
- Identification of themes intuitively based on Echonest ratings

TENSORFLOW – FUTURE!!

Convolutional Neural Network for recommendation system

- Convolutional Neural Network could be used to better train and recognize music and build recommendation systems based on music features and user behaviors.
- TensorFlow can be used to utilize wide and deep learning to implement recommendation system. Further analysis work could be done
- TensorFlow's highly customized tools to train data and evaluate large datasets using GPU computing.
- By transforming music data into graphs, we could find music patterns beyond genres. In addition to patterns, visualization of different type of music could also be easier through TensorFlow by utilizing TensorBoard.

Recurrent Neural Network on social media music comments for backward training

- Rich music data features and users' behavior could be accessed via multiple APIs like Spotify and SoundCloud feature and client APIs
- Utilizing powerful Recurrent Neural Networks we could utilize natural language processing to mine online comments and users feedback of the music.
- Combining these with our previous features analysis, we could better calibrate our music genres and music features.
- Furthermore, personalized recommendation could be achieved through a combination of the RNN and logistic analysis.

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