Music Moods Classification

Final Year, Major Project

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Introduction

From the drumbeats of our ancient ancestors to today's unlimited streaming services, **music is an integral part of the human experience**. It inspires and motivates us. It helps elevating our mood.

We listen to music using our phones, walkman and computers. Individually we store around 300 to 1500 songs on our phones. A modern computer system can store more than million songs on its hard disk and using streaming services companies are offering possibly every song available in the world to us. **With million of songs at our fingertips the challenge is how to manage these songs and how to find the right music to listen to as per our mood.**

So what we intend to do?

With the use of machine learning techniques a classifier can be trained using features (are to be discussed) to classify a song as Happy / Sad.

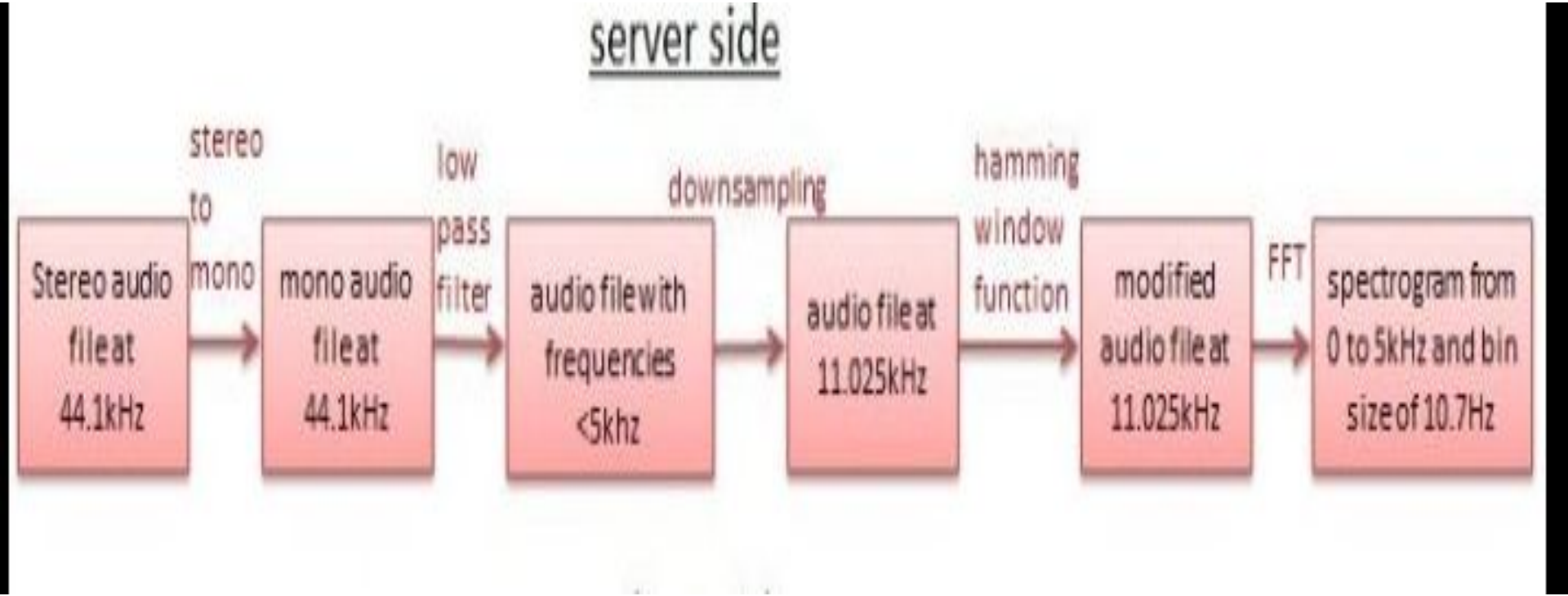
Dataset

Like any other machine learning problem, data is the key to success.

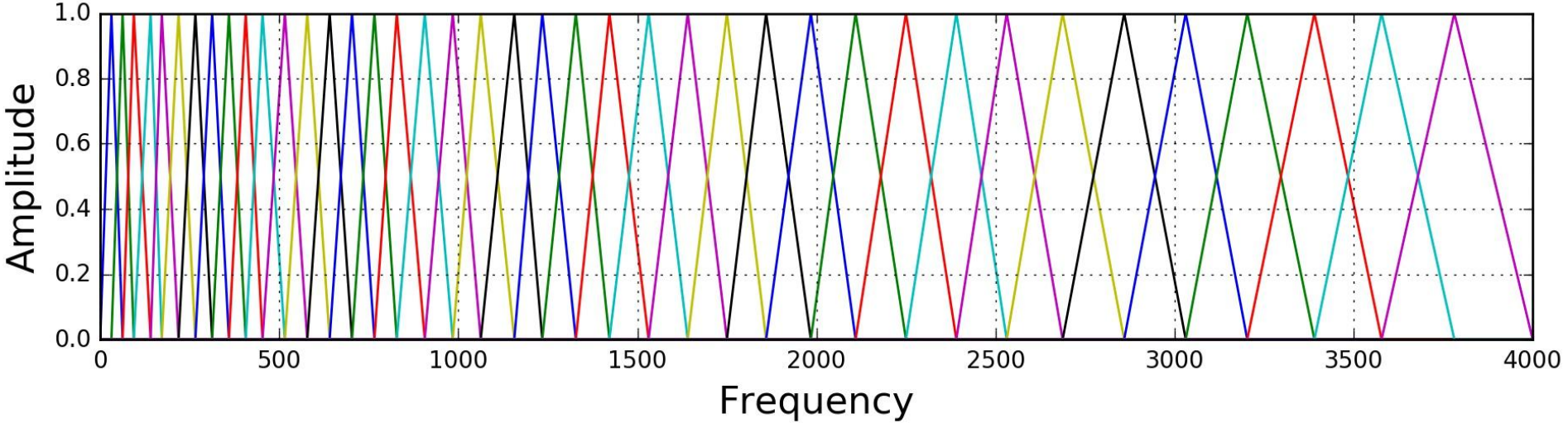
The Million Song Database (MSD) we have planned to use is a freely-available collection of audio features and metadata for a million contemporary popular music tracks. The entire database of a million songs is 300GB in size.

Labels for the supervised learning will be collected from last.fm

Representation of Data



Adding the human perception : Mel-scale



Features that determine mood

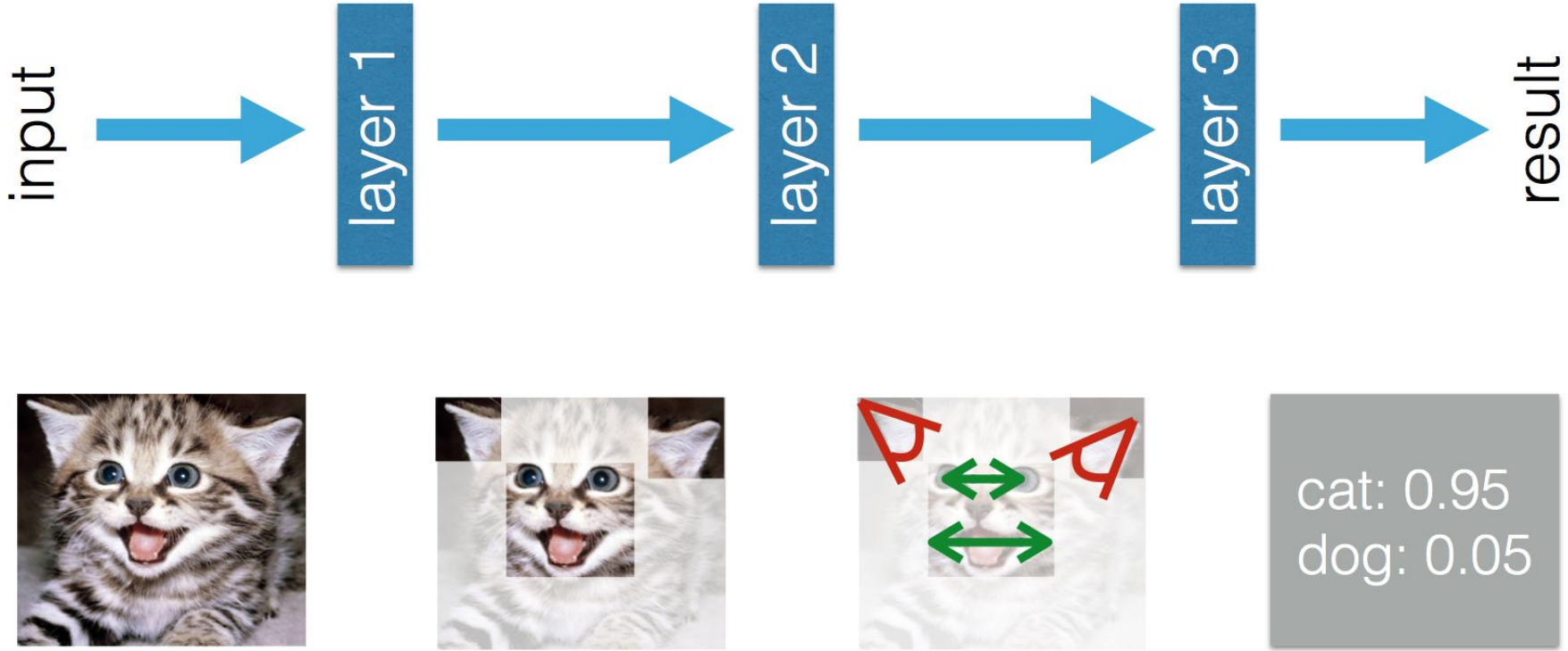
1. Tempo: the speed or pace of the piece, measured in beats-per-minute(BPM). This is a time domain feature which captures the rhythm of the song.
2. Energy: obtained by integrating over the Power Spectral Density (PSD).
3. Mode: indicates if a piece is played in major or minor key.
4. Key: identifies which of the 12 keys the song has been played.
5. Harmony: relative weighting between notes, characterized as chords or modes.

But..... The problem is

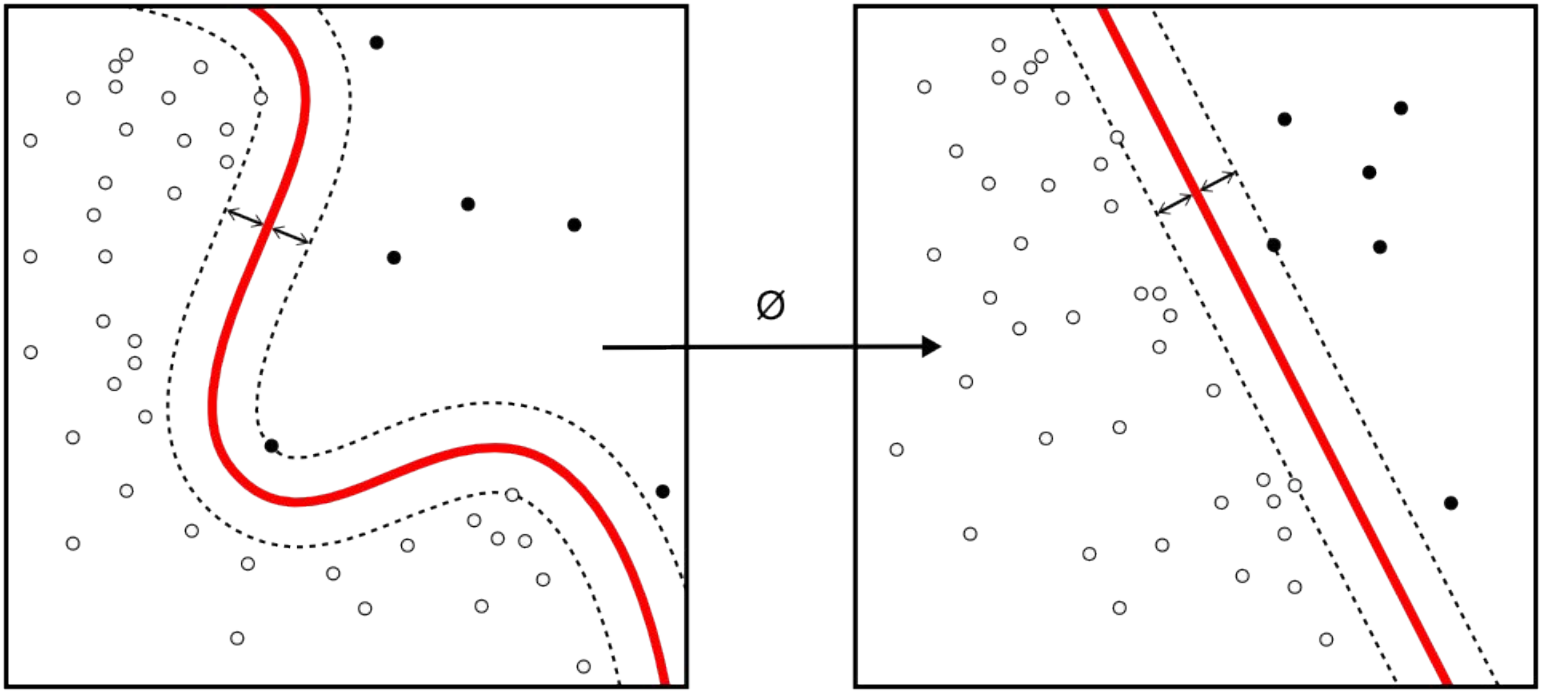
Its hard to have the domain knowledge of the music and at the same time. what if some other feature that we don't know is more important he ones listed previously.

SO the solution is **Feature Learning**

Feature Learning Example: Using RNN



Classify



SVM

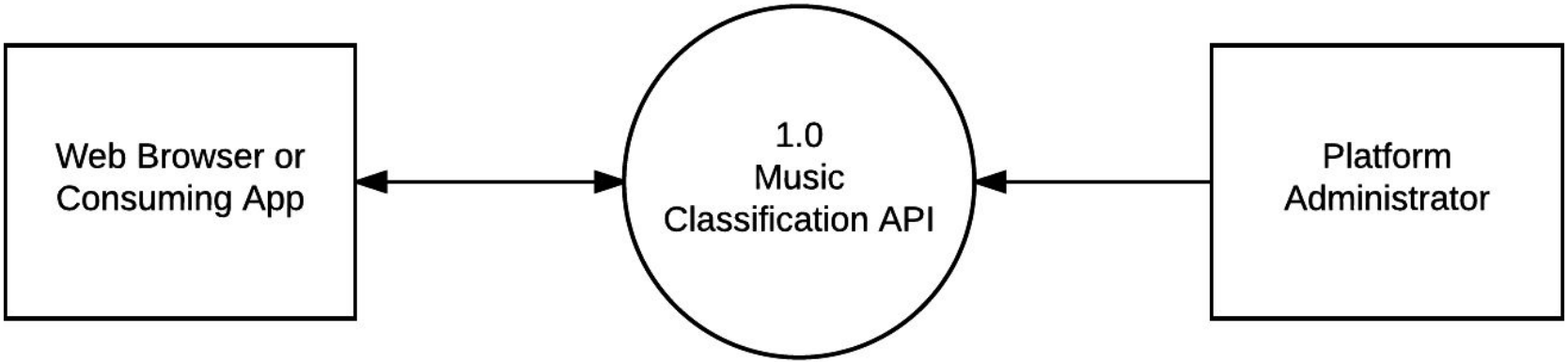
Support Vector Machine is a **supervised** machine learning algorithm used for classification. In this algorithm, we plot each data item as a point in n-dimensional space (where n is number of features) with the value of each feature being the value of a particular coordinate. Then, we perform classification by finding the hyperplane that differentiate the two classes very well.

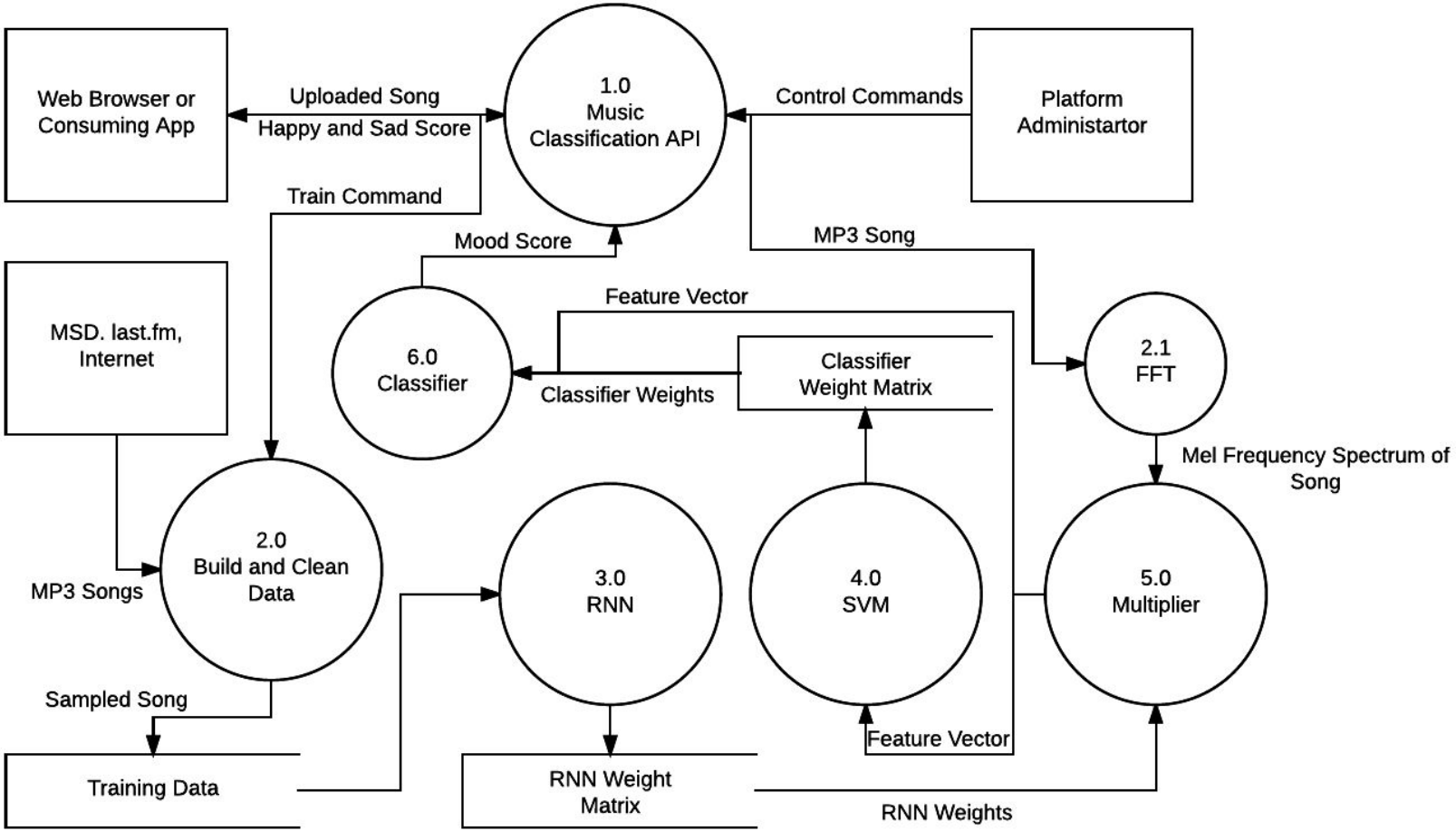
How will we do it?

We will need to go through the following steps:

1. Get the Dataset (Million Song Dataset).
2. Get the labels for each song in the data set.
3. Do FFT
4. Train to earn features using RNN, save the weight matrix
5. Train classifier using SVM, save the weight matrix
6. Serve the user through the web api and browser.
    a. Get the song through web request.
    b. Apply FFT
    c. Get features by applying the learned weight matrix, then feed to classifier
    d. Classify using learned weights.
    e. Send response to user

Our System


Web Browser or
Consuming App
1.0
Music
Classification API
Platform
Administrator


Web Browser or Consuming App
Uploaded Song
Happy and Sad Score
1.0 Music Classification API
Control Commands
Platform Administartor
Train Command
Mood Score
MP3 Song
MSD. last.fm, Internet
6.0 Classifier
Feature Vector
Classifier Weights
Classifier Weight Matrix
2.1 FFT
Mel Frequency Spectrum of Song
2.0 Build and Clean Data
MP3 Songs
3.0 RNN
4.0 SVM
5.0 Multiplier
Sampled Song
Feature Vector
Training Data
RNN Weight Matrix
RNN Weights

Tools

1. We plan to build our classifier in **Python**, by using its powerful libraries like pandas, scikit-learn,NumPy, etc.
2. Librosa - audio processing library for Python
3. For data preparation and inspection audio tools like **Audacity** may be used.
4. For web service **MEAN stack** or **Flask** may be used.

Challenges

- Dealing with a large data set consisting of approximately 10,000 songs would be a difficult task.
- To generate accurate Happy/Sad labels for the songs contained in the training set.
- Having the domain knowledge of music related to the problem is required.

Thank You