MUSIC MOOD CLASSIFICATION

NHÓM 24

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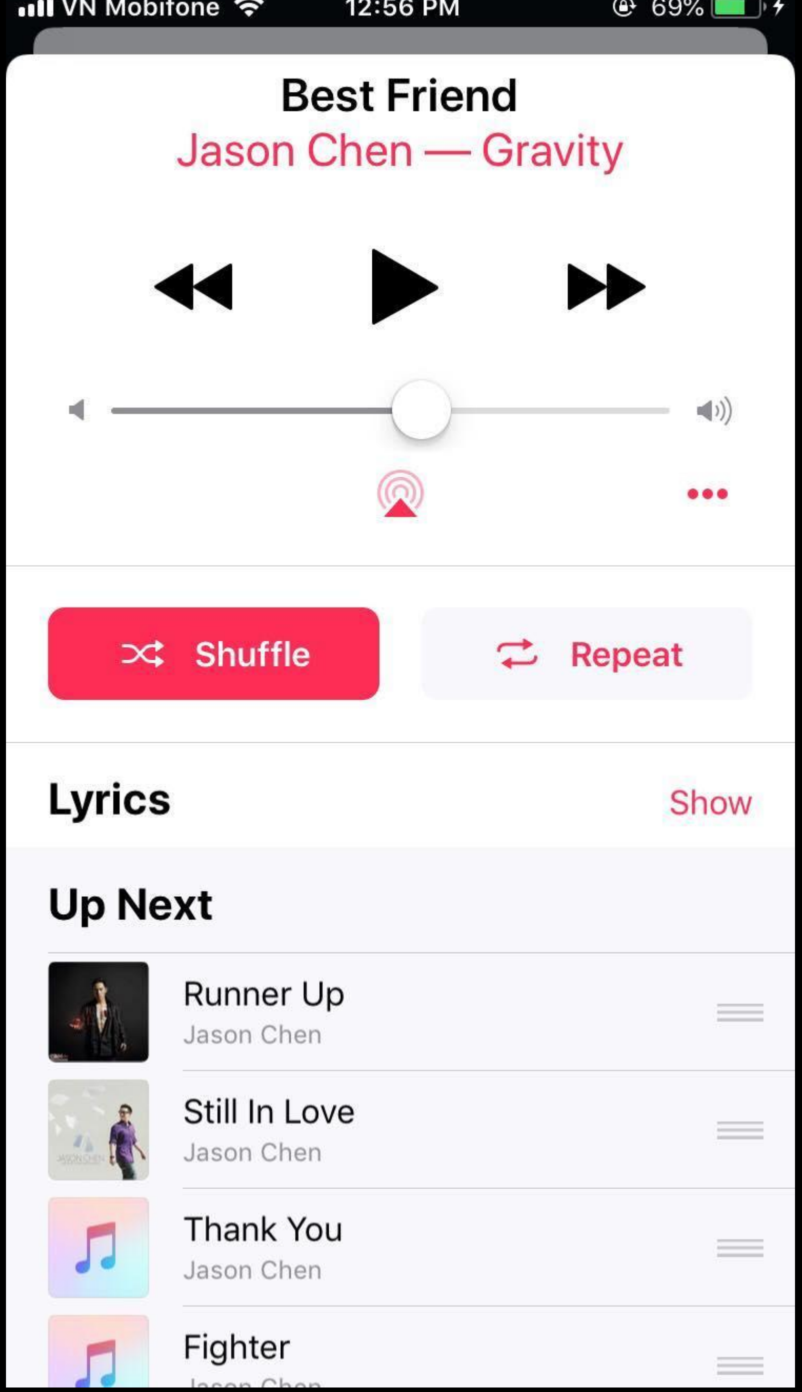
Motivation

- Since the shuffle function doesn’t suggest her the similar song for our mood.
- A good chance for all of us to study about machine learning.
- Similar projects is available.

Objective

- Making an AI function that can suggest a similar song base on the mood of the first song user selected.
- Apply this to shuffle function, which can be used offline.
- Break the objective into small objectives



Break the objective into small objectives

Define mood of each song → Classify song base on its mood → Recommendation function base on mood.

Heuristic

- **Step 1:** Find the similar project that have a dataset.
- **Step 2:** Reimplement the project to get the result as the first result
- **Step 3:** Classify music by our own method and get the second result
- **Step 4:** Compare the first result to the second result

Dataset

- Feature analysis and metadata from **Million Song Dataset** (The Echo Nest)
- 1200 songs, 2 Mood, removed all non-English songs labeled as **happy and sad** (by Sebastian Raschka University of Wisconsin-Madison)

Train: 1000 song

Valid: 200 song

Methodology

Author's method

- Built upon on a Naive Bayes classifier.

Our method

- Use both audio features and lyrics to measure.
- Try manual
- Use Deep learning

Lyrics

Downloaded from
http://lyrics.wikia.com
Base on metadata

Author Method

-Couter Vector
-TF-IDF
-Ngram (BoW)

→

-Naïve Bayes
-Linear Classifier
-SVM
-Bagging
-Boosting Model

PRE 88.89%
ACC 72.5%

Reimplement base on paper

```
NB, Count Vectors:  0.725
NB, WordLevel TF-IDF:  0.54
NB, N-Gram Vectors:  0.54
NB, CharLevel Vectors: 0.54
->
LR, Count Vectors:  0.645
LR, WordLevel TF-IDF:  0.655
LR, N-Gram Vectors:  0.615
LR, CharLevel Vectors:  0.67
->
SVM, N-Gram Vectors:  0.475
SVM, CharLevel Vectors:  0.475
->
RF, Count Vectors:  0.545
RF, WordLevel TF-IDF:  0.535
->
Xgb, Count Vectors:  0.645
Xgb, WordLevel TF-IDF:  0.61
Xgb, CharLevel Vectors:  0.695
```

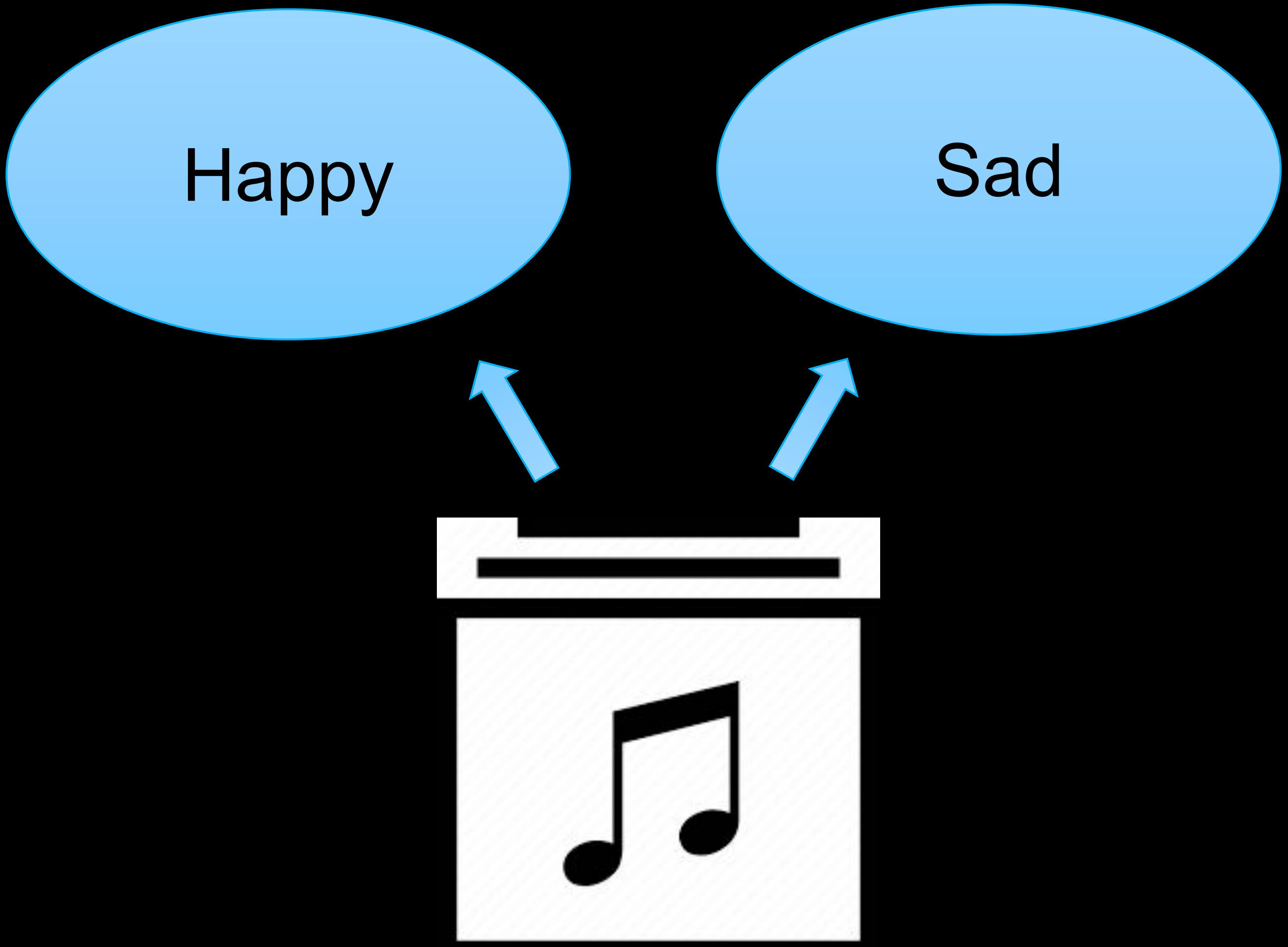
Manual method: lexicon-based

-Build Trie
-Add Song to Trie
-Check Test Song

=> 48 %

-Stopword
-Balance Dataset

=>55%



Deep Learning:

Preprocessing:

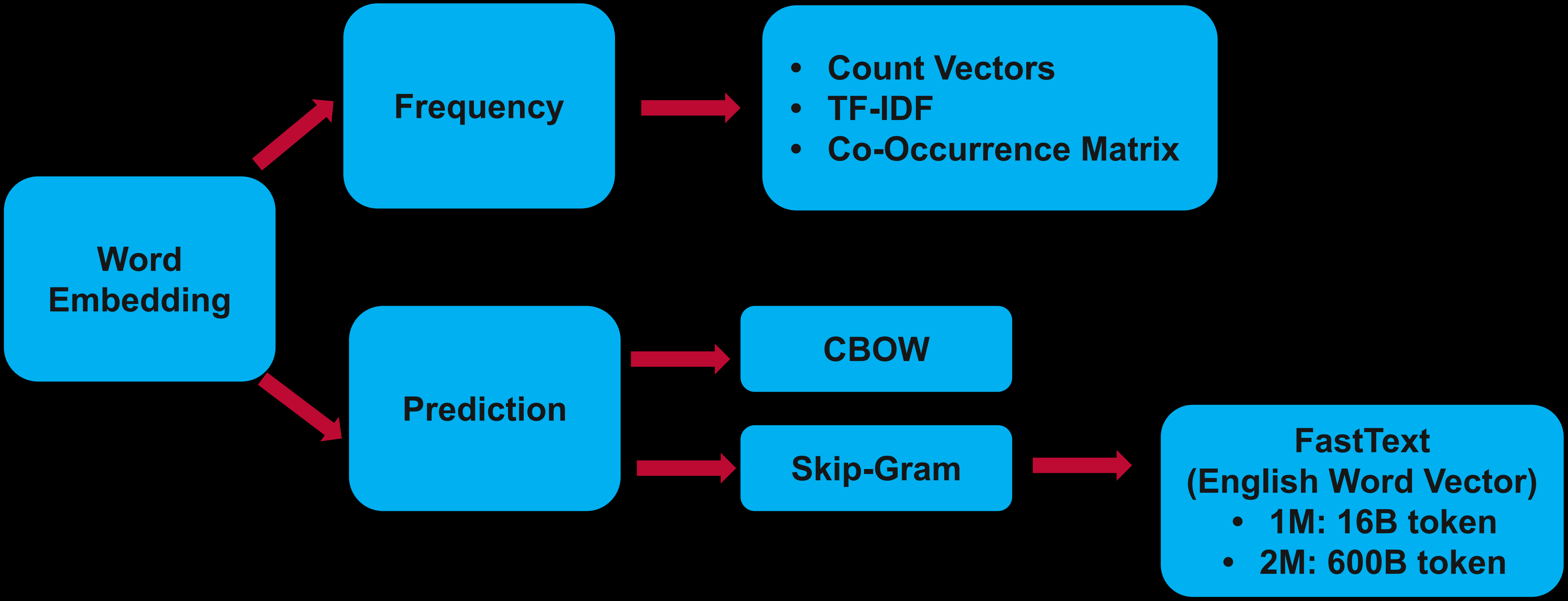
Remove
Stopword
punctuations

Lemmatization

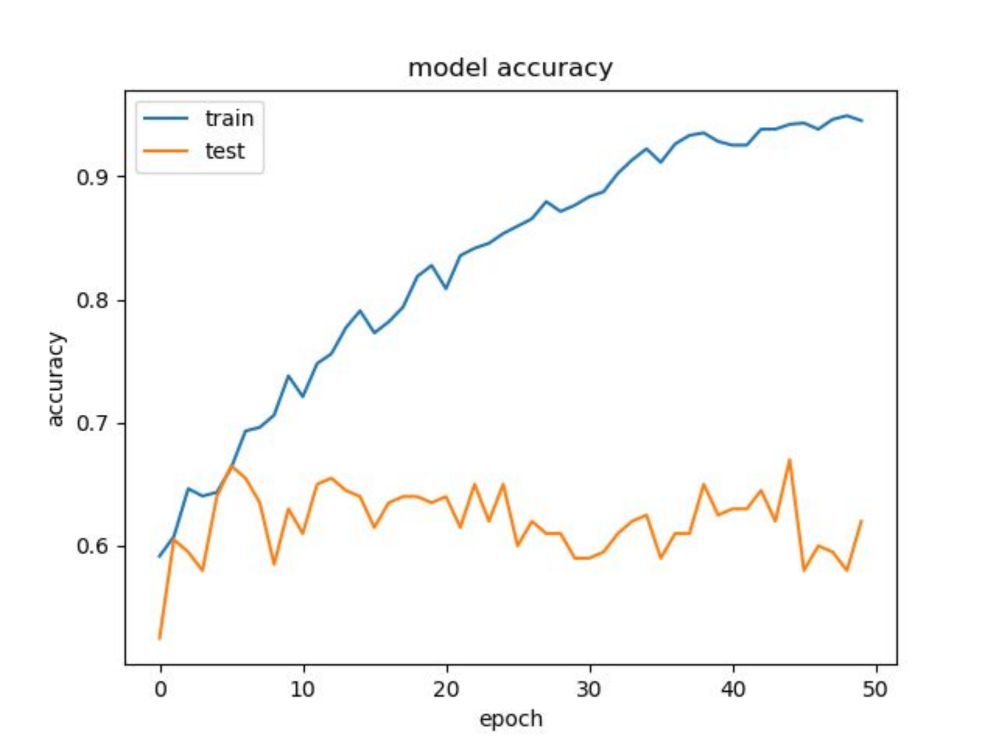
Stemming !!!

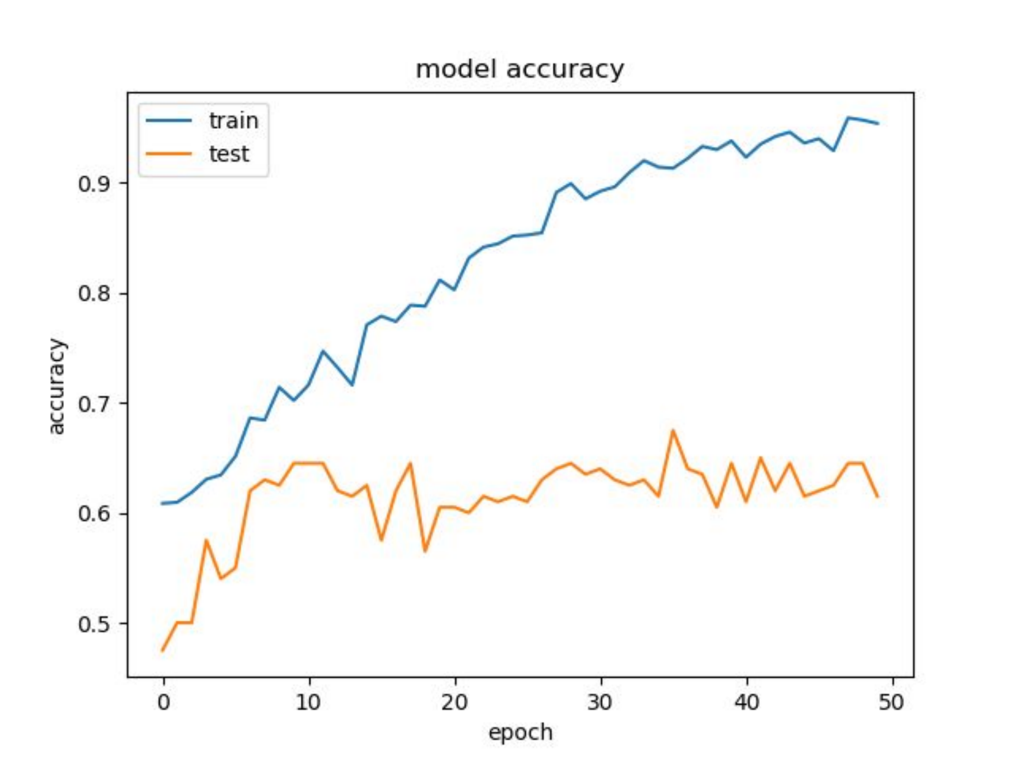
Exaggerated
word shortening

Feature


Word Embedding
Frequency
Count Vectors
TF-IDF
Co-Occurrence Matrix
Prediction
CBOW
Skip-Gram
FastText
(English Word Vector)
1M: 16B token
2M: 600B token

Model: RNN





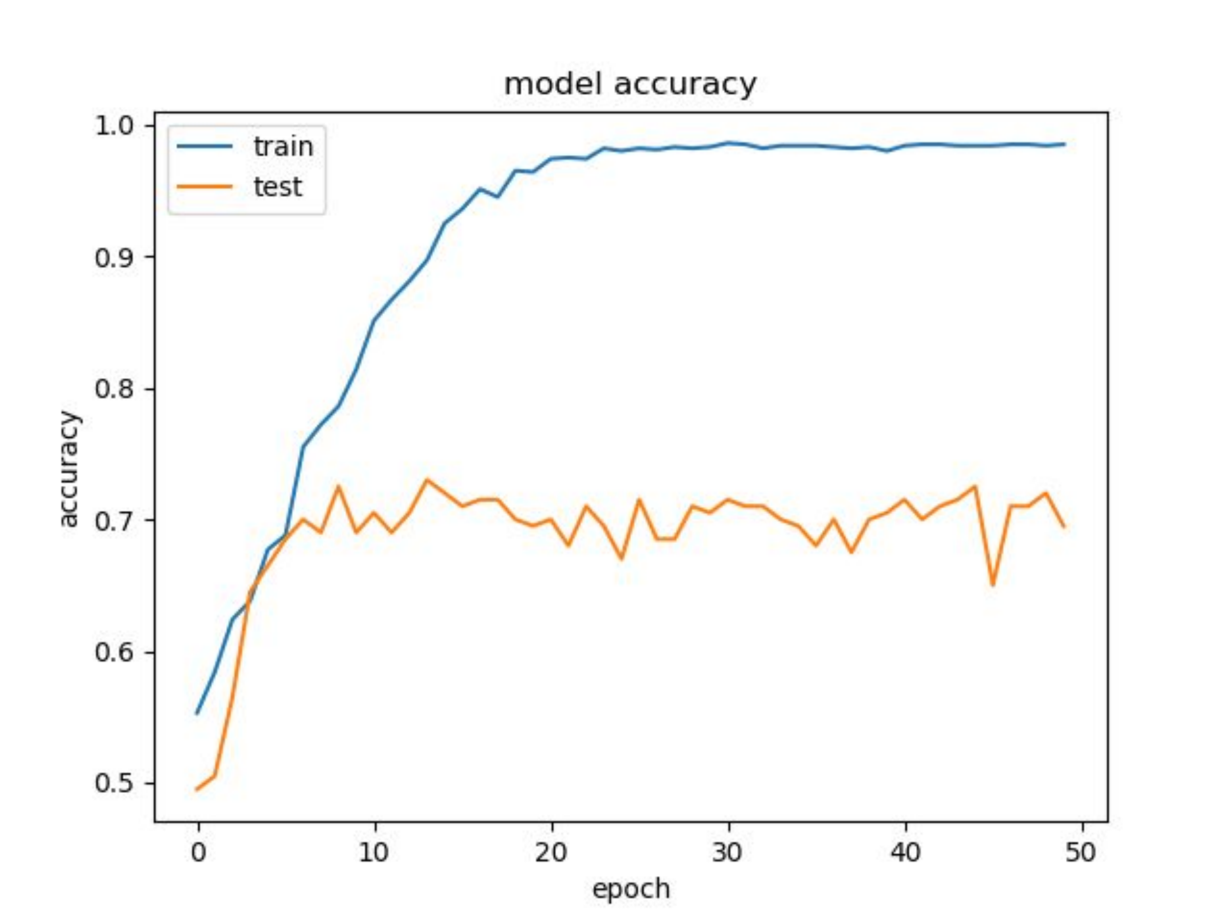
LSTM

64%

GRU

68%

Model: CNN



71.5% Stopword Lema → **74.5%** **(best case)**

Audio

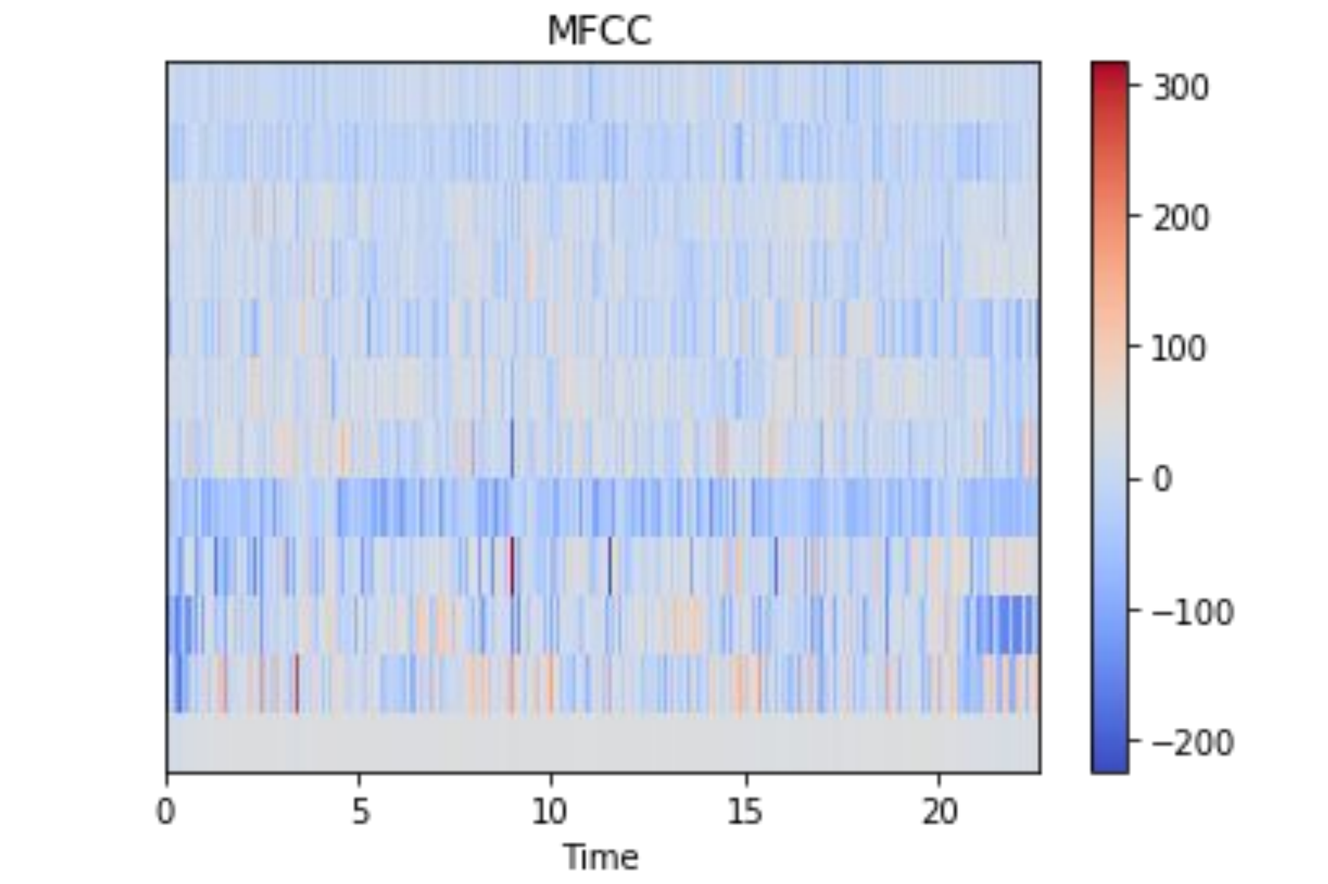
MFCC features

- The shape of the vocal tract including tongue, teeth etc determines what sound comes out
- The shape of the vocal tract manifests itself in the envelope of the short time power spectrum, and the job of MFCCs is to accurately represent this envelope

MFCC features retrive from dataset

segments_timbre: shape = (935, 12)

MFCC-like features for each segment



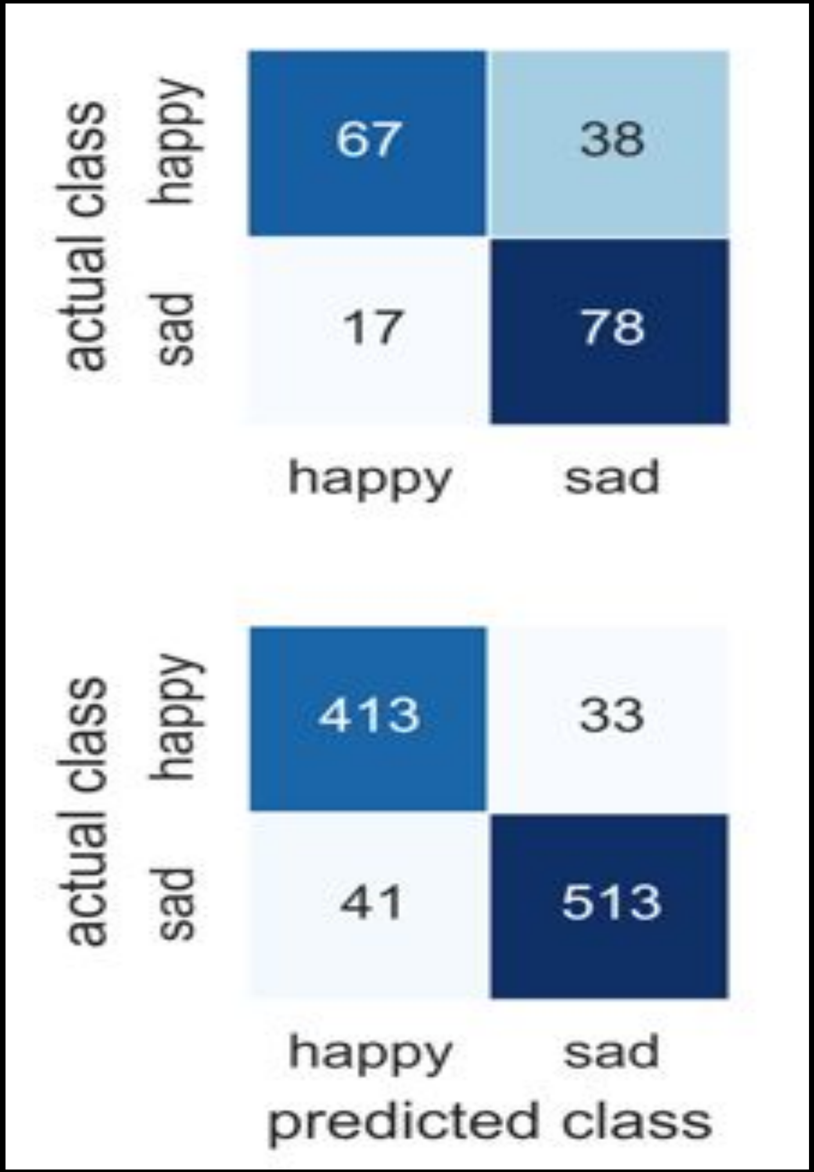
Training model

Input_1	Input	(None, 814, 12)
	Output	(None, 814, 12)
Time_distributed_1: Dense_1	Input	(None, 814, 12)
	Output	(None, 814, 64)
Time_distributed_2: Dense_2	Input	(None, 814, 64)
	Output	(None, 814, 64)
LSTM	Input	(None, 814, 64)
	Output	(None, 256)
Dense_3	Input	(None, 256)
	Output	(None, 1)

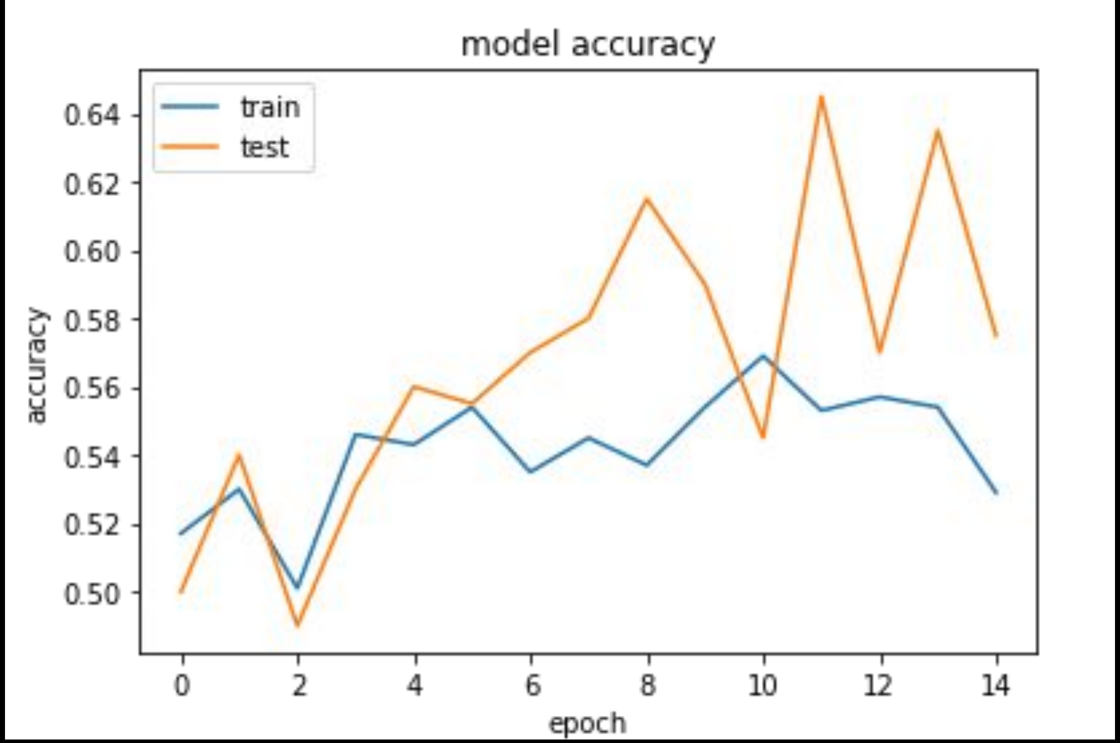
Compare the results

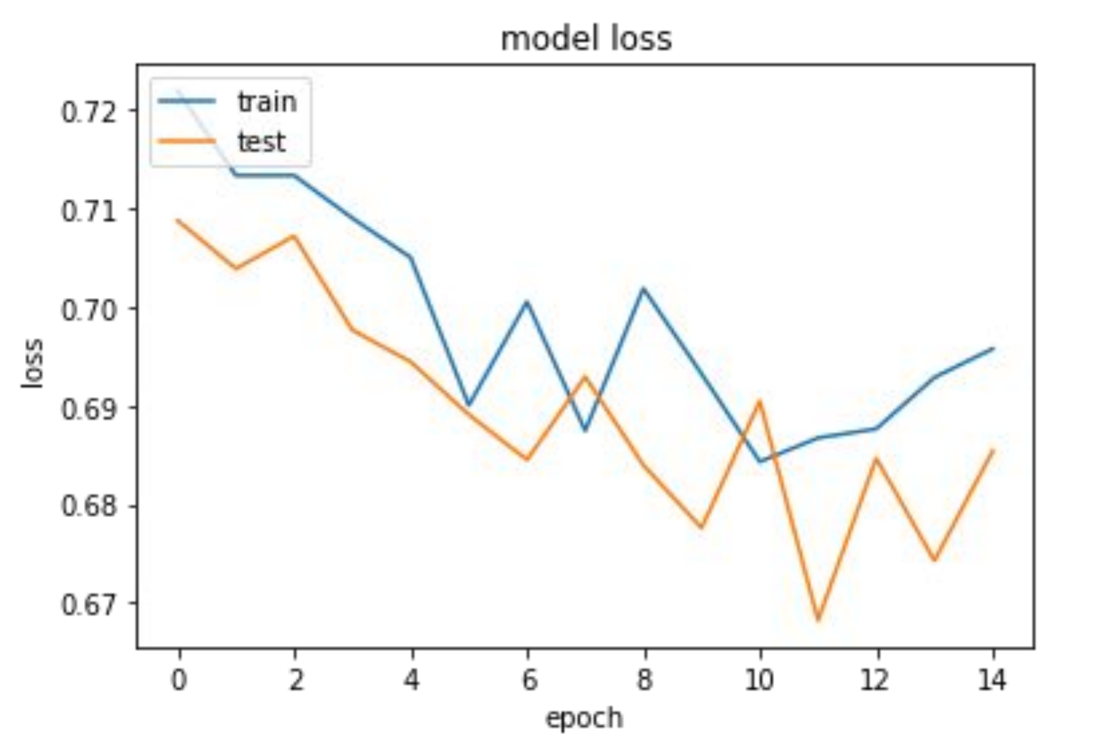
The existed method

- **Hand label: 67+38 happy songs**
- **Model label: 67 songs, 38 songs were labeled wrongly**



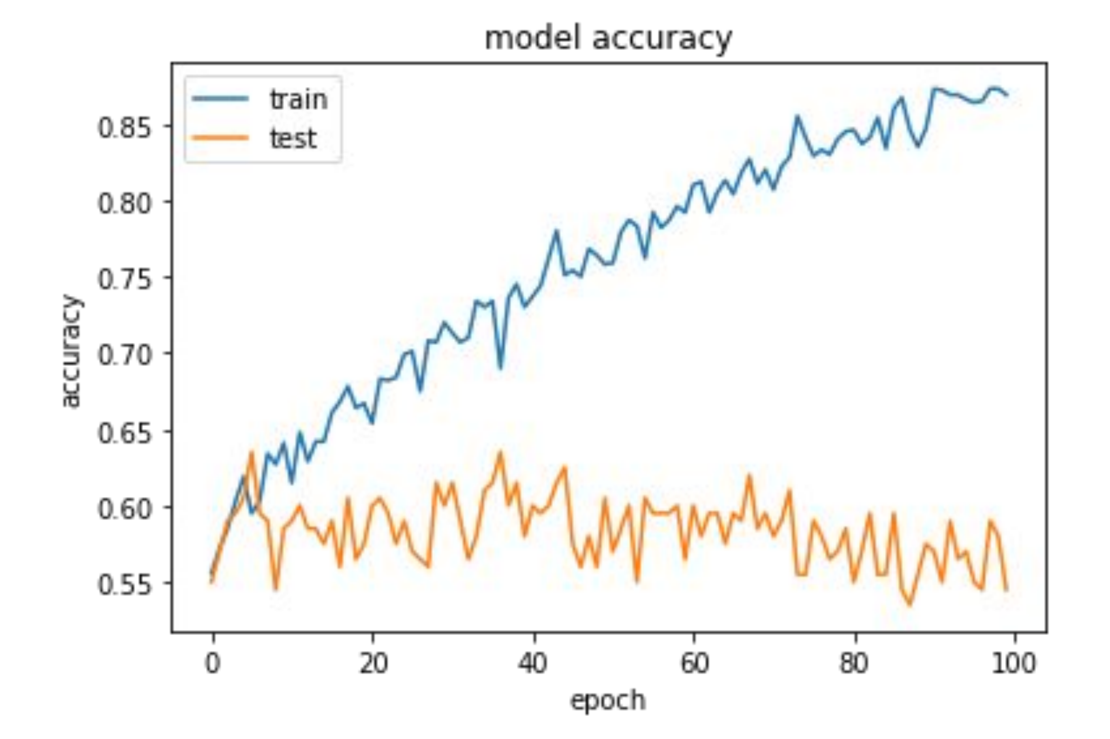
Our method
Initial result





LSTM networks

Our method
Initial result



LSTM networks

Let's try it in real life

2 song to let the model predict

Oasis – Morning Glory 49% sad

Xi Guan Liang Ge Ren 80% sad

Future work

- Combine both audio features and lyrics
- Trying Lexicon based model in NLP
- Apply Treebank to RNTN (Recursive Neural Tensor Network) in Deep learning)
- Apply adjective annotation dataset
- Try Glove, Word2vec, self-train in embedding step
- Use different song's mood grid (spotify and gracenote)
- Testing on large and more precise, mood dataset

References

- Dataset: https://github.com/rasbt/musicmood
- Paper: https://arxiv.org/abs/1611.00138
- Method deeplearning: https://www.analyticsvidhya.com

Thank You

NHÓM 4
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