Theme Extraction from Lyrics

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Introduction

Songs sometimes make us feel differently from what they intend to. Musicians and poets like to play with contrasting or implied emotions for an artistic effect. The real meaning of the songs written by the artists is contained in the lyrics. The tone and the mood of the audio does not always complement the lyrical content. A number of songs may sound happy and upbeat but what they actually convey through the lyrics may be completely on the opposite spectrum of darkness and grief. Using the power of Computer Science and Big Data Analytics we have become capable of automating numerous intelligent systems to carry out tasks that were previously imagined only possible by human brains. In this project we try to automate the extraction of themes based on lyrical content of songs and poems.

Background and Related Research

Currently, songs are classified primarily based on genre, audio mood, keywords, related artists and related songs by name. There has been substantial research on mood based classification of lyrics.

Yang et. al successfully developed a model for emotion identification in lyrics with 23 emotions based on the psychological model [5]. He et. al used combination of language features in form of uni-gram, bi-gram, tri-gram with supervised learning to get emotion from lyrics. They used Naive Bayes’s, Maximum Entropy and SVM for classification [3]; Wei et. al developed a keyword generation model for lyrics using Lesk measurement for word similarity in WordNet utilizing sentence dependencies formed in sentence clusters [4].

Data and Understanding Lyrics


Lyrics can differ from other text documents like news articles, speeches, essays etc. in the nature of their structure. Lyrics are often written in artistic language which more often than not use rhymes, figure of speeches like similes, metaphors, half formed sentences, exclamations etc. Many songs use abstract unrelated thoughts to express an emotion. They are written with accents and sometimes unfinished grammatically incorrect phrases.

Road Blocks and Challenges

Lack of Annotated Data made it very slow and difficult to build training dataset. The APIs online which make lyrics available do not have license for distribution as the content is copyrighted.

Non-standard syntax and semantics of lyrics owing to the artistic expression and online content riddled with accents and spelling errors do not allow conventional topic modelling.

Theme

<table>
<thead>
<tr>
<th>Emotion and Sentiment</th>
<th>Subject and Topics</th>
<th>Auxiliary Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Emotions: Joy, Sadness, Anger, Surprise, Fear</td>
<td>• Named Entities</td>
<td>• Questioning Score</td>
</tr>
<tr>
<td>• Sentiment: Positive, Negative, Neutral.</td>
<td>• Key Words</td>
<td>• Excitement Sore</td>
</tr>
</tbody>
</table>

Implementation

Input: Lyrics content as text.

Pre-Processing:
Part of speech Tagging (POS): words are tagged into nouns, verbs, adjectives, adverb, conjunction, determiner, number, preposition, pronoun.

Figure 1: POS Tagging.

Lemmatization: Base word of a word is evaluated. Eg: once -> one.

Tokenization: text document broken into individual words.

Stop words Removal: removing of semantically inconsequential words.

Named Entity Recognition: Evaluating and extracting words which are names of places, people, organizations. Indico uses TFID (term Frequency inverse document frequency) for keywords and Convolution Neural Networks for named entities. [1]

Sentiment Analysis: Trained on a Bag of Words for positive and negative words. (Naive Bayes Classifier). [1]

Questioning Score: NLP syntax structure for questions. With the help of POS tagging, Fig 2: Question NLP.

\[ Q(x) = \sum Q_m + Q_p \]

Excitement Score: Exclamations, excited word similarity and Interjections contribute to a degree of excitement.

\[ E(x) = \sum E_m + E_l \]

Auxiliary Emotion: Synset using Wordnet is used to get other emotions and related words by checking word similarity.

Summary: Extraction-Based Summarization: Aylien uses with key phrase extraction. The summary is then refined to remove repeated sentences using frequency of phrases. [2]

Results

As the theme is a subjective entity, 5 human users were asked to grade the results of the application for a set of 25 song lyrics of their choice.

Basic emotion was found to have 88% satisfaction. Emotion Sentiment 96% satisfaction. Subject Identification had 66% satisfaction rate. Auxiliary Features 92% satisfaction rate.

Conclusion and Future Scope

The application gives a fairly accurate theme of the song lyrics. In future the application could include the following:

- Include analysis of metaphors and smilesys (possible with larger data).
- Integrate with audio component of songs for more extensive and accurate classification and check for contrast with audio mood.
- Increase number of emotion categories.
- Expand to multi-language support.
- Increase number of emotion categories.
- Include similarity score to related lyrics.

References