Lyrical Expectations - A sentiment analysis for song lyrics

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Abstract

This report shows a way of determining the emotional sentiment of song texts of various genres using a *bag of words (BOW) model* and the *VADER Sentiment Analysis* toolkit included in the *NLTK* package.

1 Introduction

In the current society, music has become integral to an individual - regardless of what genre, people want to express themselves through music. It can be related to on an emotional level, i.e. they find sentiments in music they think defines the personal environment of a person.

Countless of songs have been made in modern times - with each their own set of lyrics, which have their own meaning and sentiment involved. While a human being can draw a certain emotion from said song texts, it would be of great interest to have it automated. As such, this report will delve deeper into this issue.

1.1 The Problem Description

[2] mentions the rapidly increasing interest in the development of content-based music information retrieval systems (MIR). Although it mostly concerns audio-based automation, there have been studies that involve song lyrics as a means of sentiment classification (e.g. [3, 5, 8]).

The problem in this case is finding a means to relate song lyrics to an emotion based on its contents. Furthermore, the results will be compared to other genres.

2 The Data Set

The data set used is a large CSV file, extracted from Kaggle (see [1]). It contains over 380,000 song lyrics of various genres, labeled by index number, song title, year of release, artist name, genre and lyrics.

2.1 Pre-processing of the Data Set

Some basic EDA on the data set shows that twelve genre titles have been used in the set: *Rock, Pop, Hip-Hop, Metal, Country, Jazz, Electronic, R&B, Folk, Indie, Other and Not Available* (See Figure 1). Due to time constraints and the size of the data set, the data set has been restricted to using entries of the genres

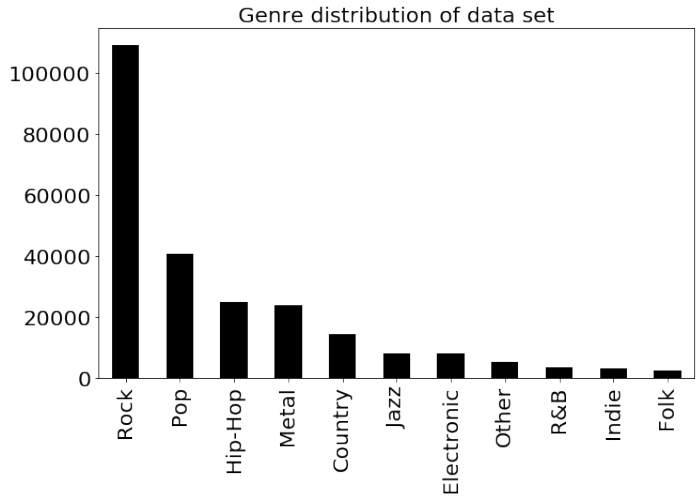

Figure 1: Genre distribution within data set

Pop and Metal only. Furthermore, to cut computation costs, the ten artists with the highest amount of song texts per genre have been selected in the final data set, cutting down the amount of song lyrics from 380,000 to approximately 6,000 (See Figure 6 and 7 in the appendix).

3 Analysing the Data

The Natural Language Toolkit (NLTK) provides useful tools for text mining, as well as text tokenization. As the first relevant thing is finding out which words are the most frequently used in both genres, it was found through using the built-in tokenizer through a bag-of-words model.

The Natural Language Toolkit (NLTK) has a built-in framework for sentiment analysis, of which the documentation can be found online (see [4, 7]). The approach is an adapted version of the code used in [6], which 'flattens' (i.e. makes a series of strings in which each entry is a new sentence) the song lyric and processes it through the NLTK sentiment analyser.

4 Results

Figures 2 and 3 show the frequency of the most prevalent words in the song texts. What is notable is pop music uses a lot of words that show desire or passion (e.g. want, get, baby, love) whereas metal music seems more aggressive (e.g. take, blood). The word 'love' is particularly frequently used in pop music, almost doubling the frequency of the second most frequently used

word. For metal music, the distribution seems more even, mainly due to the smaller sample size of song texts used (4500 versus 1500).

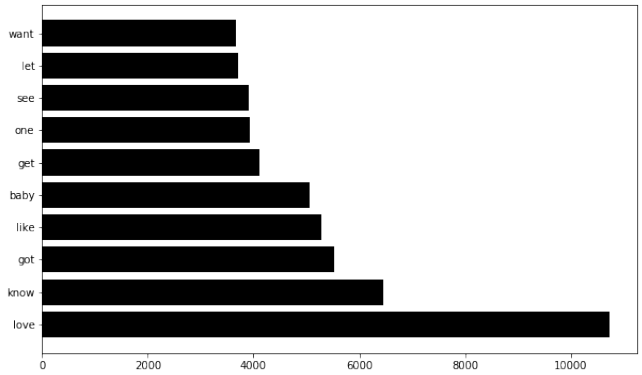

Figure 2: Most frequent word use in Pop music

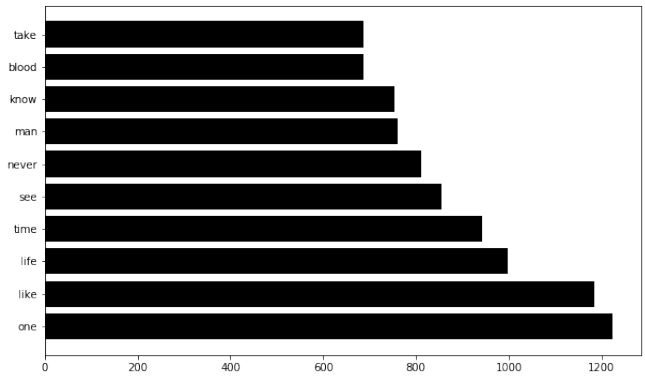

Figure 3: Most frequent word use in Metal music

In Figures 4 and 5, the results of performing a NLTK sentiment analysis on the song texts are shown. The most notable difference between the two genres is the distribution of positive and negative sentiment within the lyrics (see Tables 1 and 2 in the appendix). The distribution between positive and negative seems opposite to each other, each genre ranging in between a 1%-6% range in positivity for metal and negativity for pop.

Notable is the percentage of negativity for the bands Agoraphobic Nosebleed and Cannibal Corpse, which are two bands focusing on more brutal, extreme lyrics. It is obvious why the negativity percentage would be so high for those bands inparticular.

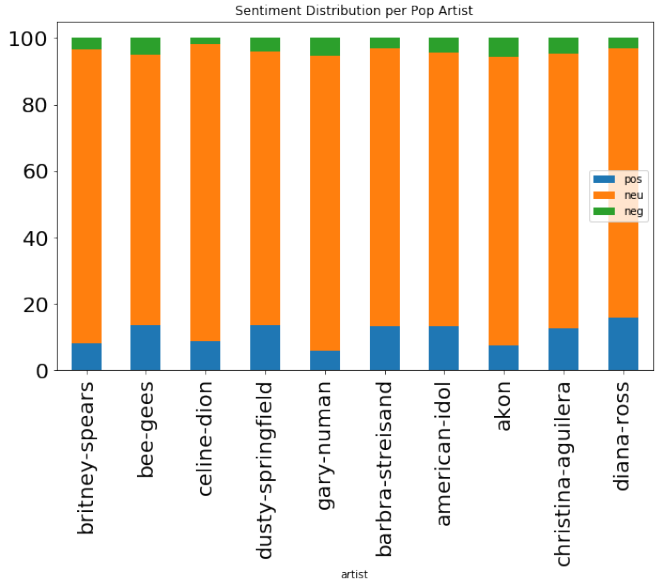

Figure 4: General sentiment in song texts per Pop artist

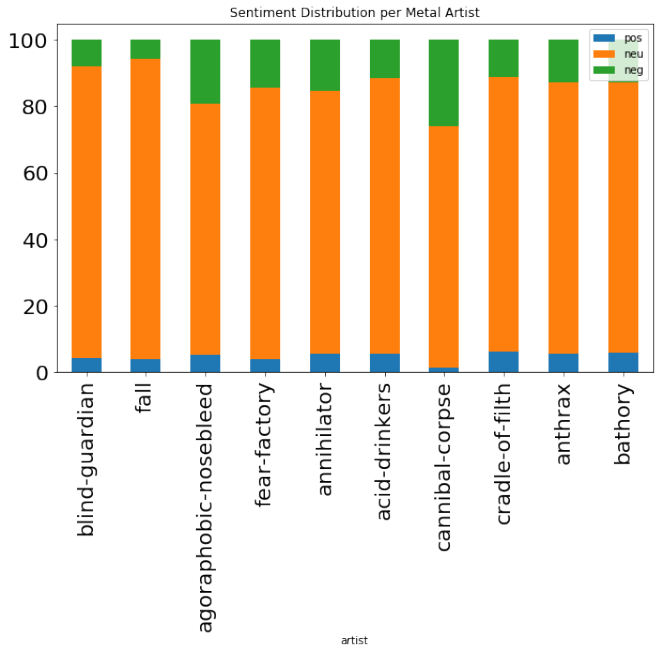

Figure 5: General sentiment in song texts per Metal artist

5 Conclusion

What can be concluded is that the sample size was too small for metal song texts in order to make good observations - however, due to the generally more aggressive emotion related to the music, it is more apparent when performing sentiment analysis on the song texts.

Similarly, Pop music shows the contrary of what has been mentioned about Metal music. Where metal is more aggressive, Pop music seems generally more about passion and positivity, which sounds more log-

ical as it is aimed at a general/ mainstream audience.

6 Future Improvements

Due to time constraints, an insufficient amount of tasks could be completed. Therefore the following things can be suggested:

For future improvement, there could be looked into different emotional lexicons, such as the NRC Lexicon and the TextBlob Lexicon. Having all three run a sentiment analysis through the same data set and comparing the results could show what lexicon works better for what cases.

Furthermore, establishing a word tree might give a better impression of a general sentiment for an artist their lyrics. It could make it easier to interpret the results of a sensitivity analysis.

Furthermore, using a larger sample size for the song texts, as well as the amount artists included can bring more light on the emotional value of song texts. It could be interesting to look how the song texts evolved within a genre over the years. The large sample size of Rock music could be used for that in particular.

Appendix

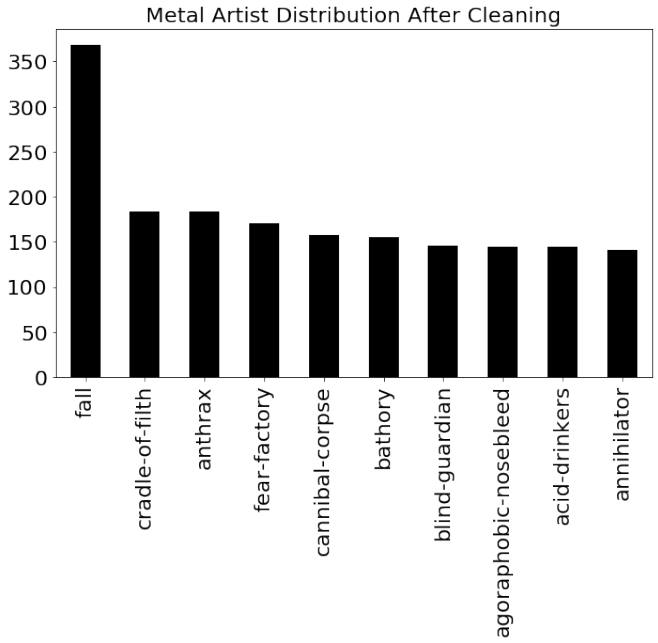

Figure 6: Most frequent metal artists

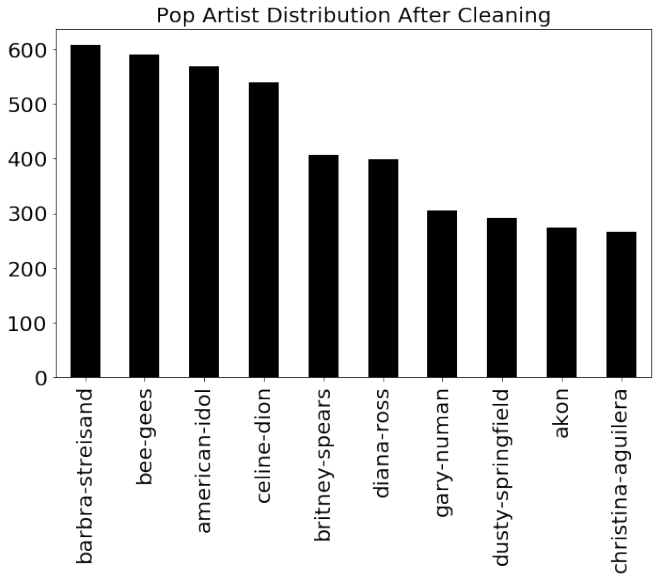

Figure 7: Most frequent pop artists

Artist	Pos	Neu	Neg
Britney Spears	8.0%	88.7%	3.3%
Bee Gees	13.4%	81.7%	4.9%
Celine Dion	8.6%	89.6%	1.8%
Dusty Springfield	13.4%	82.7%	3.9%
Gary Numan	5.9%	88.8%	5.3%
Barbra Streisand	13.2%	83.7%	3.1%
American Idol	13.3%	82.4%	4.3%
Akon	7.5%	86.7%	5.8%
Christina Aguilera	12.7%	82.5%	4.8%
Diana Ross	15.7%	81.4%	2.9%

Table 1: Percentual emotional distribution of Pop songtexts

Artist	Pos	Neu	Neg
Blind Guardian	4.2%	87.9%	7.9%
The Fall	3.9%	90.6%	5.5%
Agoraphobic Nosebleed	5.2%	75.6%	19.2%
Fear Factory	3.8%	81.8%	14.4%
Annihilator	5.3%	79.4%	15.3%
Acid Drinkers	5.4%	83.1%	11.5%
Cannibal Corpse	1.4%	72.6%	26.0%
Cradle of Filth	6.2%	82.5%	11.3%
Anthrax	5.5%	81.7%	12.8%
Balthory	5.9%	81.4%	12.7%

Table 2: Percentual emotional distribution of Metal songtexts

References

[1] 380,000+ lyrics from metrolyrics. `https://www.kaggle.com/gyani95/380000-lyrics-from-metrolyrics`.

[2] Downie, J. Stephen and Cunningham, Sally Jo (2002). Toward a theory of music information retieval queries: System design implications.

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[3] Hu, X. and Downie, J. S. (2010). Improving mood classification in music digital libraries by combining lyrics and audio. *Proceedings of Joint Conference on Digital Libraries*.

[4] Hutto, C. J. and Gilbert, E. E. (2014). Vader: A parsimonious rule-based model for sentiment analysis of social media text. *Eighth International Conference on Weblogs and Social Media (ICWSM-14)*.

[5] Laurier, C., Grivolla, J., and Herrera, P. (2008). Multimodal music mood classification using audio and lyrics. *Proceedings of the International Conference on Machine Learning and Applications*.

[6] Lyrics sentiment analysis using vader. `https://kvsingh.github.io/lyrics-sentiment-analysis.html`.

[7] Vader documentation. `https://github.com/cjhutto/vaderSentiment`.

[8] Yang, Y.-H., Lin, Y.-C., Cheng, H.-T., Liao, I.-B., Ho, Y.-C., and Chen, H. H. (2008). Toward multi-modal music emotion classification. *Proceedings of Pacific Rim Conference on Multimedia*.