CS510 NLP - Synth Metal 🤘

Lawrence Gunnell
Portland State University
905 sw Cedar Hills blvd
lgunnell@pdx.edu

Santiago Tobon
Portland State University
9930 sw 151st ave
stobon@pdx.edu

Shayan Jalalipour
Portland State University
16766 sw Marcile ln
shayan2@pdx.edu

1 Research Paper Survey

1.1 Bibliographical Info

References

Eric Malmi, Pyry Takala, Hannu Toivonen, Tapani Raiko, and Aristides Gionis. 2015. http://arxiv.org/abs/1505.04771 Dopelearning: A computational approach to rap lyrics generation. *CoRR*, abs/1505.04771.

1.2 Background

The research paper entitled ”Dopelearning” utilizes deep learning methods to generate substantive and meaningful lyrics for rap-based songs. The rankSVM and deep neural networks were used to create verses possessing both semantic meaning and above-average rhyming density.

1.3 Summary of Contributions

Algorithmic extraction of three types of lyrical features: rhymes, structural sentence patterns, and semantic features. This research builds upon prior works in deep learning-based methods for rhyme extraction and meaningful lyric construction. Performance measures were not only able to correctly identify the following line in a rap verse 17% of the time out of 299 candidates, but also was able to generate lyrical rhyme schemes containing above-average rhyme densities. Additionally, the lyric generator was deployed as an online tool for assisting in the creation of rap music.

1.4 Limitations and Discussion

Although their model was able to correctly identify the following lyrical passage 17% of the time, it still has problems in generating semantically correlated verses. Additionally, their use of the ”bag of words” method doesn’t preserve word positioning. This lack of these fine-grained relationships may impact its ability to generate properly formed sentences. It also does not address syllable counts, which is essential for generating high quality lyrics that can be overlayed over many different beats, due to maintaining a common ratio of beats per measure.

1.5 Why This Paper?

The clarity of the paper in both detailing the algorithmic implementation, as well as in identifying and extracting features, is very accessible and relevant to our project. While not all of the songs we will be training on will maintain strict rhyming schemes, their methods for training the network to detect certain sentence structures or properties of words serves as a guide for engineering our own feature extraction methods.

1.6 Wider Research Context

This paper furthers computer-based methods of understanding and constructing rhyme-centric sentence structures. This work may find future use in furthering the analysis of writing and poetry. Its ability to mimic the writing styles of various authors, lyricists, and poets may also useful for furthering style transfer type models in NLP tasks.

2 Proposed Project

2.1 Main Goal

The main goal of this project is to create a model that can generate heavy metal song lyrics resembling as closely as possible lyrics written by people.

2.2 NLP Task

This project addresses two (albeit similar) tasks: Machine mimicry and ”Creativity”. These go hand in hand, first the objective is to mimic human made lyrics with enough accuracy and realism as to create genuine lyrics following common lyric and word patterns. Next is creativity. We can apply the model to create novel lyrics, where novelty is its deviation from the initial training

set of lyrics, while maintaining as much ”Human” mimicry as possible.

2.3 Data

We will use Kaggle’s ”Large Metal Lyrics Archive” of approximately 228k songs. It is important to note however that not all of these have lyrics, it is simply a compilation of many bands and their respective albums and songs.

2.4 Methods

Our current plan is to modify and apply GPT-2 for the purpose of better identifying relationships between words and to further supplement training of neural networks to predict varying n-grams of lyrics ahead of an initial word or phrase.

2.5 Baseline

Because our goal is to generate text, we can use a simple Naive Bayes N-gram model to generate lyrics based on probability and word frequency as observed throughout the corpus.

2.6 Evaluation

Different ways to measure ”Realism” include the model’s ability to form rhymes, verses and chorus, as well as maintain context, theme, phrasing, and subjects throughout a given song.

3 Midterm Report / Research Plan

3.1 Research Problem

The proposed task is to be able to take a statement of $n >= 1$ starting word(s) and generate “Heavy Metal” genre song lyrics.

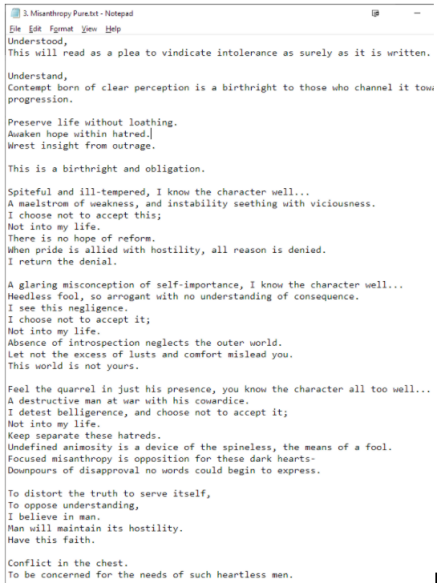
3.2 Data Set

The dataset we are using is the “Large Metal Lyrics Archive” containing approximately 228k song lyrics in multiple languages from a wide variety of artists and bands. It was scraped from the “darklyrics.com” website, and all songs are copyrighted to their original authors. The data is made up of text files organised by artist and album, and stored in plain text format. We have decided to filter out all songs containing non-english lyrics leaving approximately 156k data entries. This was done for the sake of both consistency and verifiability (as our group cannot read or write in any of the non-english data). Because the dataset is unlabeled, this leaves room to add more song lyrics if we need and can find more, as we have seen other similar datasets (though not as large as this one).

3.3 Methodology

1. We will generate our corpus by reading in all data files in the dataset directories in their their raw format and then preprocess all files into a single list of song strings 2. Next we will then use signal letters and words (or “signal tokens”) such as other equivalents of “the” and “and” in other languages as well as different letter types like the “Umlaut”/ Ö which are common in foreign languages and uncommon in english to identify as many non-english songs as possible. Any song containing one of the signal tokens was removed from the set in its entirety. 3. The data that remains will then be tokenized into a GPT2 specific encoding using a pre-built tokenizer. 4. Apply transfer learning by tuning GPT2 weights to our corpus/tokens 5. Generate data using the GPT2 model 6. Evaluate data using various metrics such as “Latent Semantic Analysis” (or LSA) to compare the semantic similarity between various songs in our corpus and the generated output. An additional metric is to feed a portion of a song and then query the network as to which line is most likely to come next. This also allows us to test semantic understanding provided the songs have distinctive content and logical progression.

Example 1: Shai Hulud - Misanthropy Pure - Song lyrics are in English. Lines are of varying length. Rhyming schemes are present. Text comes in groups of lines, and typically blocks at a time. Here, the chorus is not explicitly repeated throughout the lyrics. This may be a common trait amongst many of these transcriptions.


3. Misanthropy Pure.txt - Notepad

File Edit Format View Help

```
Understood,
This will read as a plea to vindicate intolerance as surely as it is written.

Understand,
Contempt born of clear perception is a birthright to those who channel it tow
progression.

Preserve life without loathing.
Awaken hope within hatred.
Wrest insight from outrage.

This is a birthright and obligation.

Spiteful and ill-tempered, I know the character well...
A maelstrom of weakness, and instability seething with viciousness.
I choose not to accept this;
Not into my life.
There is no hope of reform.
When pride is allied with hostility, all reason is denied.
I return the denial.

A glaring misconception of self-importance, I know the character well...
Heedless fool, so arrogant with no understanding of consequence.
I see this negligence.
I choose not to accept it;
Not into my life.
Absence of introspection neglects the outer world.
Let not the excess of lusts and comfort mislead you.
This world is not yours.

Feel the quarrel in just his presence, you know the character all too well...
A destructive man at war with his cowardice.
I detest belligerence, and choose not to accept it;
Not into my life.
Keep separate these hatreds.
Undefined animosity is a device of the spineless, the means of a fool.
Focused misanthropy is opposition for these dark hearts-
Downpours of disapproval no words could begin to express.

To distort the truth to serve itself,
To oppose understanding,
I believe in man.
Man will maintain its hostility.
Have this faith.

Conflict in the chest.
To be concerned for the needs of such heartless men.
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Example 2: Stick To Your Guns: Compassion Without Compromise - Song lyrics are in English.

Strange formatting exists at the end of each line. Some lines may commonly begin with words like “And”, etc. Rhyming is also present here. Here each line is separated by blank lines. These can be pre-processed out and ignored. Some lines have been omitted from the actual lyrics, such as when it says “But for now it’s time to swallow your pride.. Because we won’t all comply..” should be followed by “You may not see things the way I do, but I won’t turn my back on you”. These types of omissions can be fairly common in most lyrics databases and can sometimes break the semantic flow of sentences however these effects are typically quite isolated and shouldn’t significantly impact a network’s ability to learn. Also many songs may not include apostrophes and may include common spelling errors and grammatical errors like “loosing” vs “losing” etc. If they are common enough they may realistically work their way into the output, however, these are usually quite apparent and simple to manually correct.