

# ROTY studio

A tool kit for aspiring rappers to take their rap another level

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## Goal

ROTY studio is designed to help music creators to write better rap lyrics. Rap artists can be frustrated sometimes when they face the writer's block and eager to find inspiration to keep their creative juice going. Listening to other rappers is always helpful, however, it could be also helpful to have a mentor that is always accessible.

## Problems

We wanted to help our users in specific scenarios in the following.

1. Word selection and style consistency: Good rap lyrics are defined by its brilliance in choosing the "right" word that rhymes while consistently conveying the strong messages. Rappers often face challenges in finding the word or phrases that follow the "rule" and still unique.
2. Next line exploration: Although you already have an idea about how to write the next line, exploring another option wouldn't hurt. The ability to explore different options for the next line can enable users to tap into the ideas that they never thought of
3. Definition of rap lyrics "technicality": Music creators are curious about the technicality of the outcome. The questions include; What defines "good" rap music? How can I improve my rap skills in what way? Is there any way to measure the technicality of my rap?
4. Comparison to successful rappers: Everybody has their favorite rappers. Imitation is a great starting point for creating something new. When you create your own, you might wonder how close/different your outcome is from that of your idol.

## Solution

We created a simple toolset that helps rappers to easily analyze their lyrics and overcome the writer's block. The toolkit consists of two parts, 1) analytics, which gives the user descriptive statistics of their rap and visualization of its rhyming structure, 2) lyrics generation, which suggests a possible line of lyrics given three lines of lyrics of your own. The two parts are integrated on a web site, using JavaScript React library. ([link](#))

## How it works

1. Analytics: It takes lines of lyrics in a text form from users. The algorithm breaks it into syllables and calculates the similarity between the two, then narrows the scope to the pairs that are in close proximity. Based on the information of the distance and pairs, it quantifies its technicality, displayed as End Rhymes, Internal Rhymes, Alliteration, Assonance, Consonance, Overall rhyme scores. Also, it visualizes the rhyming structure of the rap automatically.

2. **Lyrics Generation:** Powered by machine learning, it suggests an appropriate subsequent line given any set of lines. The unidirectional LSTM language model takes lyrics and breaks them into phonemes, a building block of the model, and takes semantic information of the lyrics from pre-trained word embeddings, combined with each phoneme's positional information. The model is trained with 31,000 songs of 300 rappers and suggests a line of lyrics decoded from phonemes returned by the model using the beam search algorithm. Details are explained in the paper attached at the end of this document.

### **Future work**

We introduced creative ways to look at rap analytics and lyrics generation, however, there are limitations.

1. **Transcribing lyrics:** Phoneme is a building block of our algorithm and plays a significant role in detecting and creating rhymes. However, transcribing it from a text form of lyrics cannot capture how it actually is pronounced by the rapper. Considering the fact that wordplay is an integral part of what makes rap such a unique genre of music, it is imperative to capture the information correctly. In our project, we utilized the g2p library that returns the most common way to pronounce a word. In the future, obtaining a transcript directly from audio data will be able to improve the accuracy of the prediction.
2. **Improving semantics from text generation:** Our lyrics generation focuses on how to capture a rhyme structure/style from given lyrics. This method falls short in producing lyrics that semantically make sense. Incorporating a decoding phase that takes pre-trained embeddings while honoring the structure information the model already generated, we expect our model to be able to generate lyrics that make the story flow naturally.
3. **Tools for recording and visualization of lyrics in musical notation:** What makes rap interesting is the ways in which it sounds and interacts with the beat. Our work is solely based on the text form of lyrics, missing out on an integral part of forming a unique style of the artist. In order to help artists in more immersive ways, enabling recording and showing its interactions with the music will be a necessary step.