

# Rap and Text generation

## How a rap text can be generated considering the rhyming, metrical, and lexical questions

E. Partouche      H. Hamila      N. Perdriau

Octobre 2019

### **Contents**

<b>1</b>	<b>Abstract</b>	<b>2</b>
<b>2</b>	<b>Data and Methods</b>	<b>3</b>

# 1 Abstract

In this paper, we will aim to show how we can use a Long Short-Term Memory Language (LSTM) to generate a rap text or to create a “rap machine”, including the generation of diverse recurrent requirements for this kind of texts such as rhymes, rhythm and a various vocabulary.

In fact, a large part of the previous studies on the generation of text [1] have as basis a Neural network, especially Recurrent Neural Networks (RNN): when a Neural Network is a circuit of artificial neurons made to solve artificial intelligence (AI) problems, a RNN, still composed of Neural Networks, can remember them because they are recurrent but encounters some limits.

This is why the LSTM model appears to be more effective within the scope of text generation : it has the possibility to correct the vanishing gradient problem of the RNN and thus learning what to remember and what to forget. An interesting work was made on the use of ghostwriting through LSTM [2] : the goal is to give the impression that a rapper has produced a new song, by reproducing his style of writing.

It is necessary to base our generation on a pre-existing set of lyrics from one or several artists on which we train our model. We also considered the different ways of predicting the next character, the next word or the next line. As they are several ways of doing so, we have shown some interest in the way Ruslan Nikolaev [3] showed the effectiveness of the character-level model in 2018. Also, Hirjee and Brown have created a rhyme detection tool based on probabilistic model.[4]

Still, methods to estimate the quality of generated lyrics are noted by Potash, Romanov and Rumshisky in 2015 and Malmi and his colleagues in 2016 [5], considering the style of the rapper and the rhyme density. Still, the text has to answer to some considerations such as the occurrence of linguistic phenomena as lexis and phonetics, even if most of the time, the program elaborated appears to give a “word salad” [6].

This is why using the CMU Pronouncing Dictionary appears to be essential [4], as it make it possible for us to capture the global meaning of a group of words. One of the goal of this research is to have a nicely generated pronunciation at the same time. Finally, Malmi in 2016 also considers the length of verses in a rap text generated and all the kind of rhymes that we

can find in it.

This work, then, will be a mixture of all of these previous works, trying to produce a more precise model for rap lyrics generation, including metric and length, phonemes, question of predictions and judgment of the uniqueness of the production.

## 2 Data and Methods

We first started to gather knowledge about the vast and rapidly changing field that is machine learning and text generation. A lot of examples came from collaborative source code sharing websites, which we tried and from which we were inspired. This gave us an insight on the general concepts, as well as teaching us what existed, what needed improvement, and where we were too far out of our field. Thus, we have established a comprehensive and accessible goal.

One of the main exercises we had to perform was writing a model in Python, using the TensorFlow library, that would take into account our needs. This program is available for free, under the GPLv3 licence, and is available with this article. The initial set of lyrics came from Rap Genius, where we downloaded the lyrics thanks to a scraper [7]. Then, thanks to the help of a teacher from Paris-Diderot, we trained the model on a cluster of computers for about XXXX TODO XXX iterations. You can see an example of the evolution through the iterations in the poster accompanying our research, as well as an example of generated lyrics.

## References

- [1] I. Sutskever, J. Martens, and G. Hinton, “Generating Text with Recurrent Neural Networks,” p. 8.
- [2] P. Potash, A. Romanov, and A. Rumshisky, “GhostWriter: Using an LSTM for Automatic Rap Lyric Generation,” in *Proceedings of the 2015 Conference on Empirical Methods in Natural Language Processing*, (Lisbon, Portugal), pp. 1919–1924, Association for Computational Linguistics, 2015.

- [3] R. Nikolaev, “Generating Drake Rap Lyrics using Language Models and LSTMs,” Apr. 2018.
- [4] H. Hirjee and D. Brown, “Using Automated Rhyme Detection to Characterize Rhyming Style in Rap Music,” *Empirical Musicology Review*, vol. 5, no. 4, pp. 121–145, 2010.
- [5] E. Malmi, P. Takala, H. Toivonen, T. Raiko, and A. Gionis, “Dope-Learning: A Computational Approach to Rap Lyrics Generation,” *Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining - KDD '16*, pp. 195–204, 2016. arXiv: 1505.04771.
- [6] H. G. Oliveira, “Automatic generation of poetry: an overview,” p. 7.
- [7] F. Paupier, “RapLyrics-Scraper,” Sept. 2018.