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CS 499 - 001

Project Progress Update

April 18, 2022

From my initial project proposal, this update brings with it major changes from my project proposal, so I have written it as a separate document.

I had originally planned for the use of a LSTM RNN model for the rap-lyric generation. However, since my initial project proposal, I have read far too many research papers and found many more state-of-the-art implementations for both general text-generation and rap-lyric generation. Such state-of-the-art implementations use auto-regressive transformers and brilliant novel data preprocessing techniques for analyzing rhyme and rhythm patterns, such that you can sync a beat with model-generated lyrics.

However, in the interest of time, instead of designing a similar model to those seen in the research papers I discussed with you, Dr. Yao, I will likely finalize my model using Hugging Face’s plug-and-play GPT-2 model. We had discussed the usage of GPT-3 and I have played with it quite a bit since then in the playground on the official OpenAI site. It’s a brilliant model but the paywall that blocks an expansive usage of it outside of fleeting trials of lyric generation has proven to be a bit of a blocker for me. Instead, as my code currently stands, I have a pre-trained GPT-2 model instantiated, where the majority of the code focuses on data preprocessing. If for some reason I find a way to make the GPT-3 model usage more feasible, I can easily pivot to using it instead of GPT-2.

In regard to data collection and preprocessing, I originally planned to scrape the Genius Lyrics website myself but I instead found a convenient Python package that some other wizard built that does exactly for me. This is far more efficient as I can simply grab *all* lyrics for a given artist at once, which has made lyric collection far more convenient and efficient. The documentation for this package can be found [here](https://lyricsgenius.readthedocs.io/en/master/). Additionally, for data preprocessing, we discussed labeling entire songs with particular genres, its artist and start of song and end of song tokens. This was to formulate the data in a way that our GPT(-2 or -3) model could generate rap lyrics in the style of an artist *and* in a particular genre of music, which would further distinguish this model’s novelty from other research in the particular niche of text generation. This would also come in handy during evaluation time, as we could label known lyrics with known genres and see if the model can correctly match genres - with a subjective evaluation of lyrical content and its similarity to training examples. Additional metrics for evaluation are discussed in influential research papers such as [Potash et. al 2015](https://aclanthology.org/D15-1221.pdf), [Nikolov et. al 2020](https://aclanthology.org/2020.inlg-1.42.pdf), and most importantly [Xue et al. 2021](https://arxiv.org/pdf/2107.01875.pdf). Such metrics include BLEU score, PPL, distinct N-gram sequence counting, and rhyme density. Rhyme density is by far the most mentioned measurement for evaluation next to PPL. However, it has been difficult to find actual code to look over to see how these evaluation methods are implemented at the time of writing this paper. I will be perusing these research papers for Githubs in the coming weeks as well so I can evaluate the model on a known objective standard rather than my own opinion of generated lyrics. This will also help me abide by the principle that how we train the model is exactly how we use it. Alternatively, I may just feed in song lyrics with its artist name alone and instead generate lyrics with subjective evaluation instead of the more objective means I mentioned above. I have yet to decide if the generation of a solo or coupled verse or an entire song would be more appropriate given the training data. I will likely side with the generation of one or two verses to share instead of an entire song to avoid issues with repeated or very contextual similar lyrics which is an issue thus far.

I look forward to updating you and the rest of the class on my project during my final report and final presentation!