Neural Machine Translation:
Explaining the Meaning Behind Lyrics

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Background

As a rhetoric student, I wanted to further explore how neural networks could pick up on the more subtle semantic patterns in natural language.

One of the main challenges in NLP is a lack of labeled data, especially in regard to pragmatics (the study of meaning with respect to goals and intentions).

Data

Genius.com is an online community where users browse, rate, and create annotations for lyrics to help explain their meaning and context.

Example from Childish Gambino's *3005*:

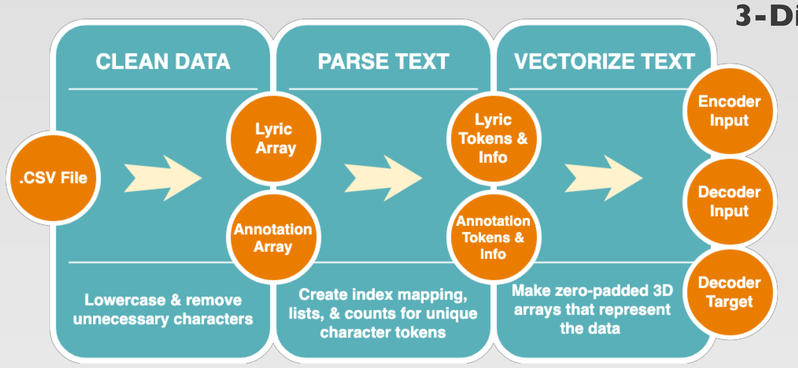
- *9,828 lyric-annotation pairs & metadata from API*
- *Most popular songs from top 20 artists on Genius*

Objectives

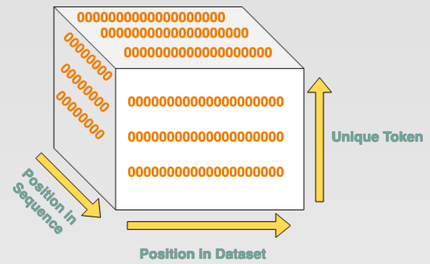
The semantic and contextual similarity between these lyrics and their annotations allows us to view this as a translation problem.

Can a Seq2Seq LSTM model use the linguistic patterns in the data to learn how to explain lyrics?

Data Preparation

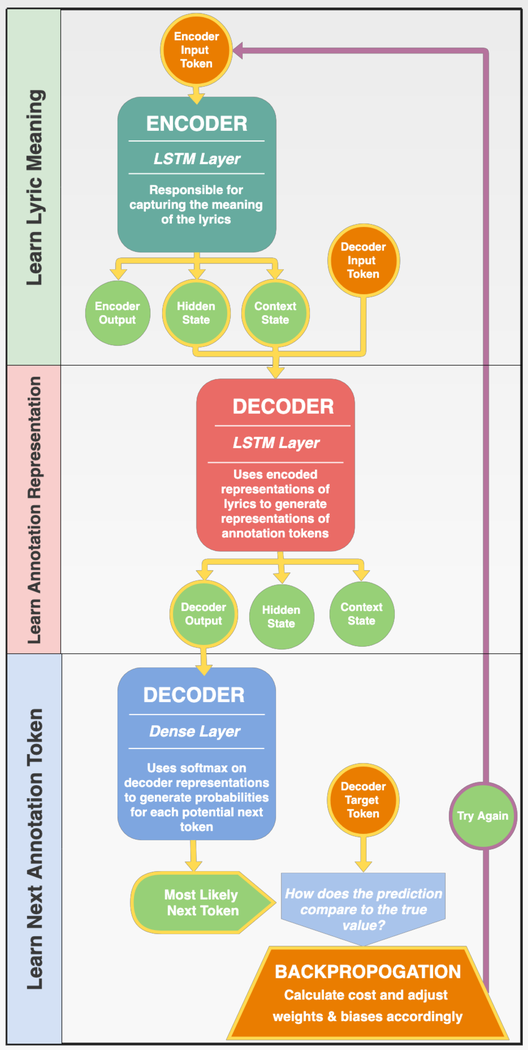


3-Dimensional Vectorized Texts

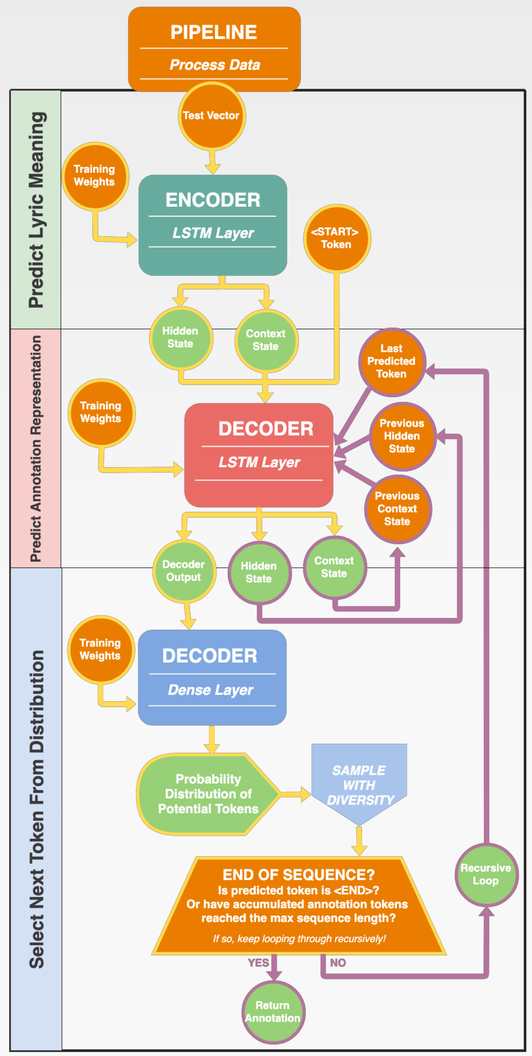


- *Max. Lyric Length of 320 characters*
- *Max. Annotation Length of 1,600 characters*

Training Process



Inference & Generation



Chosen Model Specs

Model Architecture

- *Character-Based Vanilla Seq2Seq LSTM model*
- *512 Latent Dimensions*
- *Adam optimizer*
- *Categorical cross-entropy (loss)*

Training

- *100 Epochs*
- *Batch size of 64*
- *Trained on 7,889 pairs*
- *Validated on 876 pairs*

Results

Sampling without Diversity (Temperature = 1)

Input Lyric
now the only thing we share is the refigerator

Frank Ocean in *Pilot Jones*

Generated Annotation
in the song is a similar to the song is a statement of the song is a statement of the song in the song is a statement of the song is a statement of the song is a start of a street of a statement of the song in the song. the second verse is a similar line of the song is a statement of the song is a statement of the song is a play on words to the problems of the song in the song.

Sampling with Diversity (Temperature = 0.71)

Input Lyric
now the only thing we share is the refigerator

Frank Ocean in *Pilot Jones*

Lyric Background (My Interpretation of Song)
This song is about his deteriorating relationship, as he realizes he should break up with his drug-addicted girlfriend.

Generated Annotation
this girl gives a mac miller and has a which he talks about in the hood.

however, drake doesnt try to classe for new freeming, such as designer gang risk and recognize though in his final life, they had a shoulder between them. the inspirations are going through this, theyre not so much dear group, that was himself and he was able to handle his world

Future Work

Relative Self-Attention & Transformer Models

- *Better able to model self-similarity*
- *Explicit connections to entire history, which are weighted based on positional and contextual importance to current token*