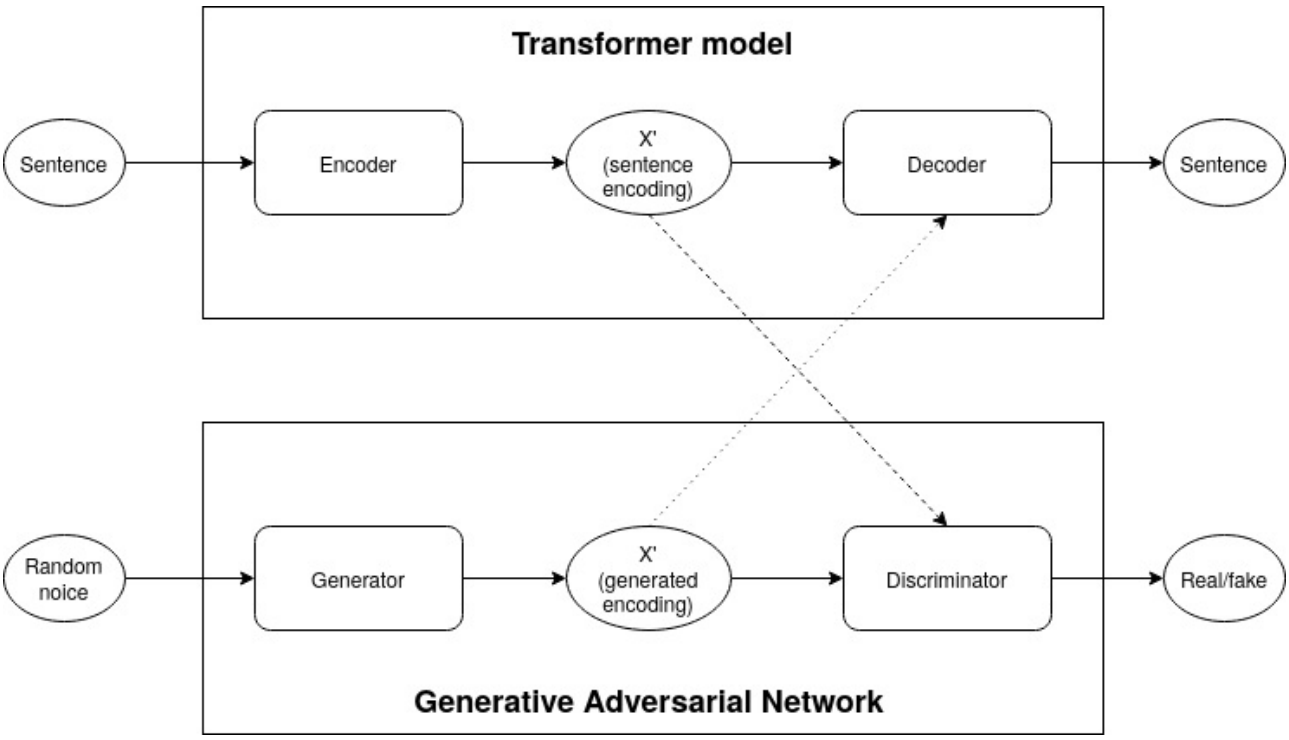
Text generation with Transformer model and Generative Adversarial Network

Project description

In recent years, Generative Adversarial Networks (GANs) have gained a lot of traction in the Deep Learning community because of their impressive results in image generation. The general idea is that a generator and a discriminator are jointly trained to produce an image output that is seemingly indistinguishable from non-generated images.

We want to attempt to apply this strategy for text generation. The main difficulty for this task is that whereas image outputs can be considered a continuous value, a sentence is inherently discrete as it is a sequence of words each of which is chosen by the model using the non-differentiable $argmax$ function. To remedy this, we propose a model where the discriminator is trained to distinguish between the continuous outputs of a pre-trained encoder from a Transformer model given a 'true' sentence from the generated, 'fake' output stemming from our generator.



In our model, we will use a pre-trained Transformer (ie. by using BERT) that can encode and decode a sentence from English to English. The encoded sentences are then used as labelled training data for the discriminator, representing 'true' values. The job of the generator is to produce similar encodings but doing this from random noise (a sample of words) in a way that makes the discriminator unable to distinguish between the encodings stemming from the encoder of the Transformer model and the encodings stemming from the generator.

Ideally, this would train the generator to produce sentence encodings that can be fed to the decoder of the Transformer model which would then produce meaningful sentences from this artificially generated input.

In our project, we want to explore and explain the theory of this model as well as building a working prototype within the time and resource constraints that we have. We do not assume any results and we are well prepared to discover, that the model does not work as we intend. Furthermore, we want to analyze and discuss the shortcomings of the model and present ideas for future fine-tuning and other architectural improvements either to the model itself or to the training process and data.