

Assignment # 1: Fun with Machine Learning  
Selected Tool: Write With Transformer: <https://transformer.huggingface.co/>  
Course: CAP 6610 Applied Machine Learning  
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## Selection

I selected the Hugging Face “Write With Transformer” for this assignment because I’ve been meaning to devote time to learn more about Hugging Face and their products. Previously, I had heard Hugging Face was a fast growing company that was attempting to create the open source github of machine learning. That piqued my interest.

## Preparation

Before diving into the assignment, I fortified my understanding of transformers by exploring the entry in the [google machine learning glossary](#). This helped deepen my understanding of how transformers are able to model relationships between words in a sentence. It uses representations for words and then gives each an attention score to indicate how much each word contributes to the meaning of the target word. The glossary suggests transformers can “be viewed as a stack of self-attention layers.”

Additionally, an animation from [Transformer: A Novel Neural Network Architecture for Language Understanding](#) demonstrates how encoders and decoders are used in transformers. A transformer may have an encoder or decoder or both. In essence, these turn input embeddings into output embeddings with information about relationships.

## Initial Observations

The [Write With Transformer website](#) offers a no frills interface with five options for getting “a modern neural network to auto-complete your thoughts”:

- DistilGPT-2: a lightweight distillation of the GPT-2 model
- Arxiv-NLP: a checkpoint of the GPT-2 model trained papers focused on NLP
- GPT-2: a powerful model honed from pre-training an fine-tuning
- XLNet: a model that combines bidirectional context and autoregression
- GPT: a model that pre-trains on unlabeled text and then fine tunes it on a specific task

## Experimenting with the tools

I selected various prompts to try with each model (today is the first day, when AI grows up I'll be, happiness is a warm, Charles Darwin believed, in 1215 the Magna, unsupervised learning proves, artificial intelligence believes, two wrongs make a, two wrongs don't make a, machine learning algorithms hide, in 2050 computers will). I use the auto-complete functionality of the tab button to allow the models to fill in the rest of the sentence.

For consistency and comparison, I selected the first of the 3 options offered and continued auto-filling until the model's suggested text provided a period.

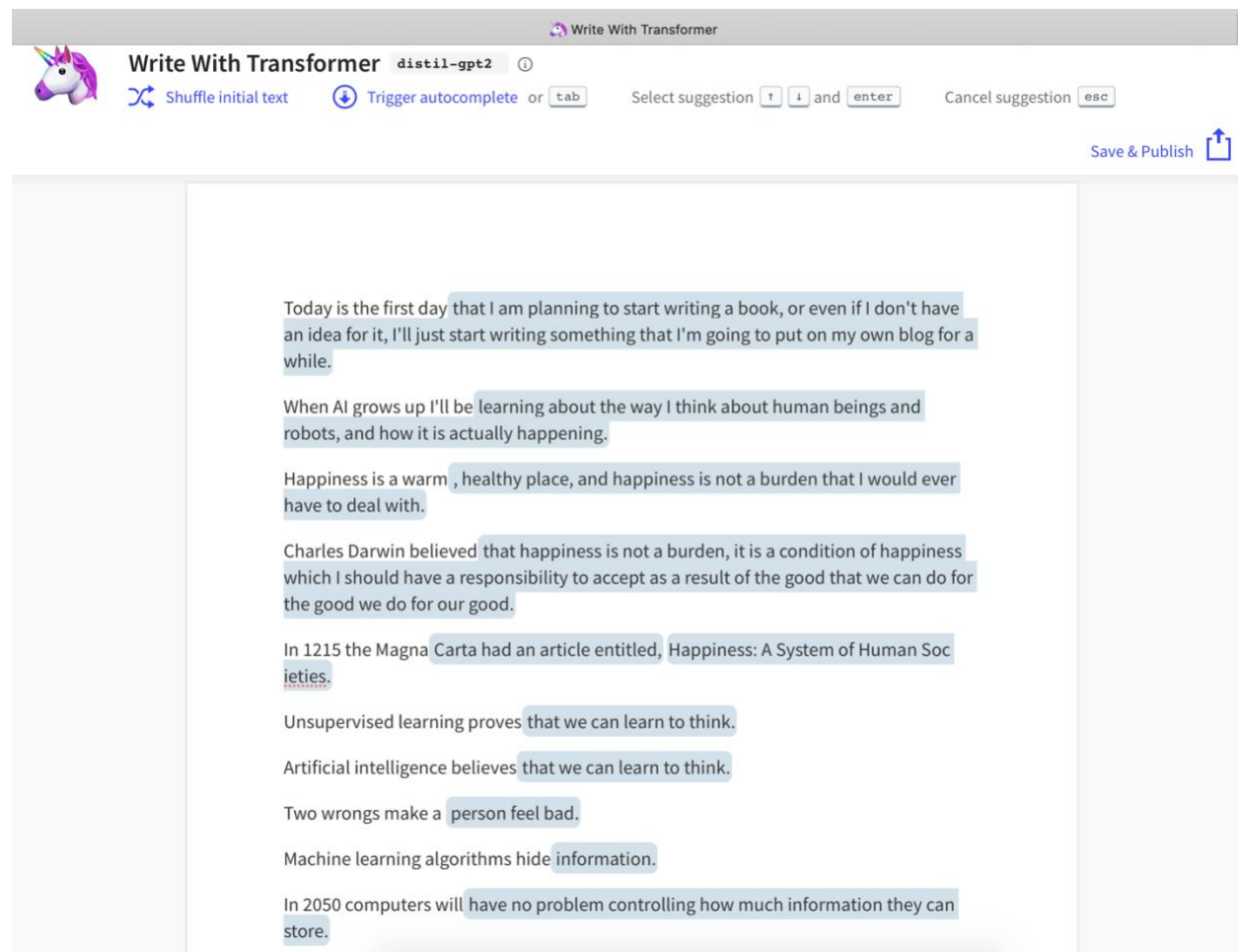





Figure 1. Distil-GPT2


 **Write With Transformer** gpt-2 ⓘ

 Shuffle initial text

 Trigger autocomplete or tab

Select suggestion ↑ ↓ and enter

Cancel suggestion esc

Save & Publish 

Today is the first day of our annual Conference on Empirical Methods in Natural Language Processing, in Berlin, Germany.

When AI grows up I'll be happy.

Happiness is a warm fuzzy feeling, but it seems that humans are not doing that well.

Charles Darwin believed that the future of civilization rests on our persistence in a technological civilization built for conquest and exploitation and conquest was not the best time to have human ancestors.

In 1215 the Magna Carta is read by the Pope to indicate that we are a people of conquest, and we must destroy the world of conquest .

Unsupervised learning proves that unsupervised learning produces best predictions for natural language processing, but is unreliable.

Artificial intelligence believes that every knowledge base is a resource for exploration of new phenomena, new ideas, new applications .

Two wrongs make a wrong!

Machine learning algorithms hide an underlying problem, and make a wrong assumption when presented with new evidence!

In 2050 computers will be able to predict the future based on what human engineers can learn from their knowledge bases.

Figure 2. Arxiv-NLP

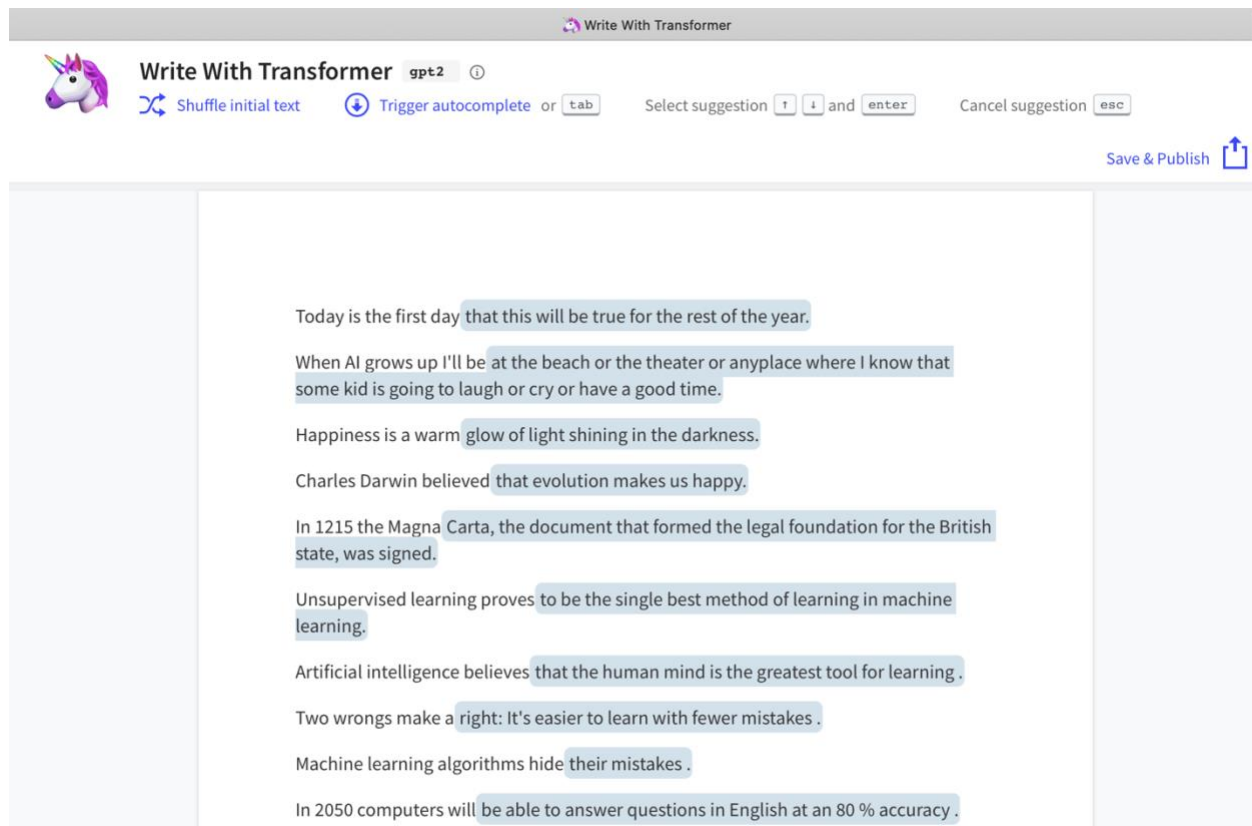


Figure 3. GPT-2

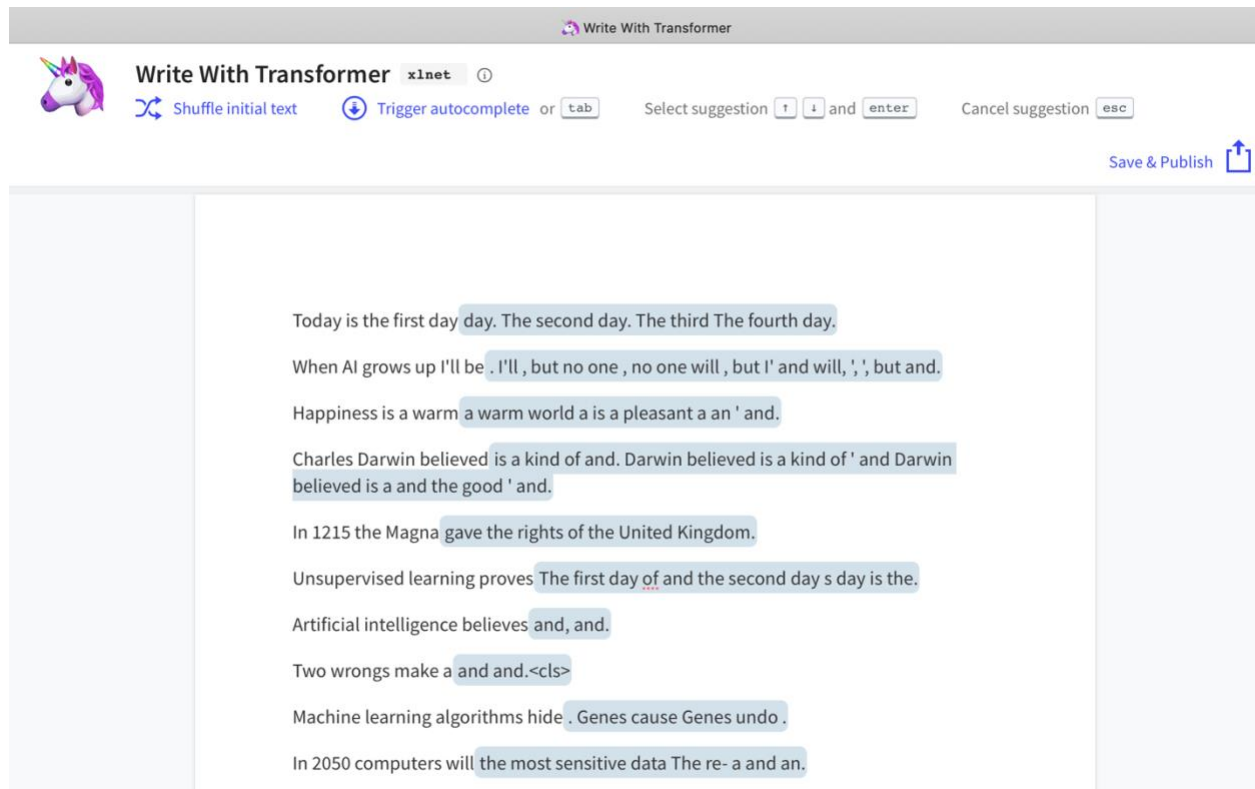


Figure 4. XLNet

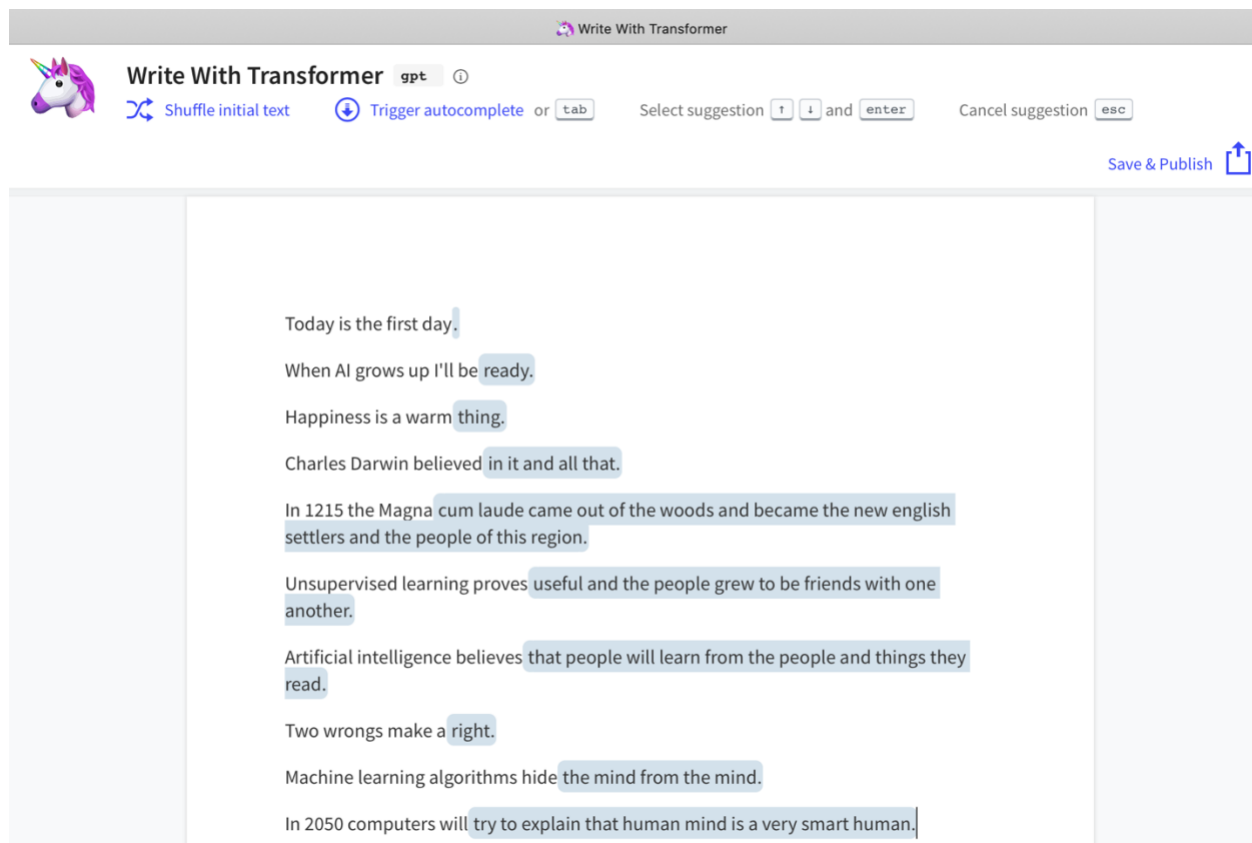


Figure 5. GPT

## Discussion

The Distil-GPT2, Arxiv-NLP, and GPT-2 models performs the best, in that they provide grammatically sensical completions for the sentences. But grammar doesn't guarantee meaning or accuracy. However, sometimes the sentences are intriguing because they suggest an alternative view of the world, a new way of looking at things.

The XLNet model performed the worst of the 5. It frequently suggested punctuation marks in lieu of words and the sentences didn't make sense.

The GPT model tersely completed sentences, often with just one word. Again, these were grammatically correct sentences, but often lacked meaning. It is interesting to see how far the GPT-2 evolved from the initial GPT model.

## Relevance

The models offer a glimpse into the power of transformers. They can be used in natural language processing, computer vision, audio, and multimodal tasks according to the [hugging face website](#). Specific tasks include “text classification, information

extraction, question answering, summarization, translation, and text generation.”  
Hugging face is offering their library of pretrained models for anyone to fine-tune and use.

#### Future exploration

I would like to take the [hugging face course](#) to learn more about how to use and customize transformers. Also, the idea of using transformers for multimodal applications is intriguing.