Generating Movie Reviews using Text Generation (GPT-2) and NER

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Abstract

This letter introduces a method that employs advanced Natural Language Processing (NLP) and Named Entity Recognition (NER) techniques to automatically generate movie reviews. Our system utilizes GPT-2, which has been trained on a vast corpus of movie reviews, to produce a detailed and comprehensive review based on a provided synopsis of a new movie.

The system integrates NER, which identifies and replaces pertinent details from the synopsis such as character names, locations, and important events. The pre-processing of the input synopsis involves extracting key entities, which are then utilized to generate a more nuanced and customized review that effectively captures the film's essence.

1 Introduction

Natural Language Processing (NLP) is a rapidly evolving and exciting field that aims to empower machines to understand, interpret, and even generate human language. In this letter, we present a program that text generation and Named Entity Recognition (NER) to automatically generate movie reviews.

Our system takes a synopsis of a new movie as input and employs GPT-2 to generate a comprehensive review. We then use NER to insert relevant details from the synopsis, thereby enhancing the coherence and personalization of the review.

The primary motivation behind this project is to create a versatile system that can generate reviews for various types of products. We chose movie reviews as our initial focus due to their wide availability and usefulness as a training data source for language models. However, we believe that our approach can be readily adapted to other domains, such as Amazon product reviews or restaurant reviews, making our system highly adaptable and flexible.

2 Previous Work

Our project is an extension of our prior work. In particular, we have leveraged the insights and techniques gained from our projects 1 and 3, which focused on generating coherent and accurate text using language models, as well as on utilizing named entity recognition (NER) to make the generated text more relevant to the underlying synopsis.

In our first project, we explored the use of different language models for generating text. We experimented with n-gram models, which allowed us to generate text on a character-by-character basis, but we quickly encountered limitations in terms of capturing the subtleties of natural language. In contrast, we found that GPT-2, was much better suited to generating high-quality text. We made GPT-2 the centerpiece of our movie review generation system in the current project. This generated reviews that were not only coherent and grammatically correct, but seem insightful and engaging.

In our third project, we focused on using NER to capture important entities in text, such as people, locations, and organizations. We found that this technique could greatly enhance the relevance and coherence of generated text, particularly when applied to movie synopses. As a result, we incorporated NER into our current project, using it to capture key details such as movie titles, character names, and locations. This allowed us to generate reviews that were not only well-written but also tailored to the specific movie being reviewed.

To ensure the success of our current project, we also drew on a variety of resources and tools developed in prior work. We used a Colab Notebook developed by Rey Farhan (Farhan, 2020) to fine-tune our GPT-2 model on a specific corpus of text. This allowed us to optimize the model for generating movie reviews.

3 Text Generation

We used Rey Farhan's Colab Notebook as a starting point, and then implemented the PyTorch Transformers package to work with our fine-tuned GPT-2 model.

We employ a corpus of 50,000 movie reviews from the Internet Movie Database (IMDB) obtained from Kaggle in 2019 (Kaggle, 2019). Due to the resource constraints of our computing environment, we select a representative subset of 5000 reviews for training the model.

The training process takes approximately 2 hours after which we save the model to a file that is used to generate new movie reviews with our approach.

4 Using NER

To ensure that the movie review produced by our system aligns with the input synopsis, we used Named Entity Recognition (NER) as a key component of our approach. This process involved labeling each entity with a specific tag, namely B-PER for characters, B-LOC for locations, and B-MISC for movie names. The tagged entities were then assigned an identifier to keep track of entities that were mentioned multiple times in the text.

The same process was repeated for the input synopsis. However, instead of creating blanks, we extracted information corresponding to characters, locations, and movie titles into separate lists.

We then filled in the blanks in the generated movie review by selecting an entity from the appropriate list that matched the type of blank. We ensured that the correct entity was selected by using the identifiers assigned during the entity recognition stage. This step was crucial to ensure that any blanks that referred to the same entity in the movie review and synopsis were replaced with the same entity, thereby enhancing the relevance of the generated review.

5 Results

Output from text generation: 'Alfred Hitchcock's last picture, adapted from the bestseller by Edgar Allan Poe, plays a thriller that is full of suspense and tension. William Holden never looked more menacing as an actor than in films as far back as 1895 when his films were mostly screenplays. Aside from his recurring use of black and white as the primary colors in his films, his last two films are the more black and white that are mentioned here. Hitchcock's films often deal with murder, but this one takes more advantage of black and white as the primary colors rather than as the covering of the original film. The opening and closing sequences of this movie are also effective, as are Hitchcock's other several films. Hitchcock took advantage of light and darkness in his films, creating the atmosphere of suspense in his later films, most notably Dreams and the Birds. All in all, one of his more famous films. '

Input review: 'Fast & Furious 6 (2013) is the best of the best Action film in the series franchise! It's Justin Lin's Masterpiece and I love it to death. Sorry but is not Fast Five and Furious 7 the best, but is Fast & Furious 6 the best one in the franchise! This my favorite best film of the franchise that I just love to death! The film has great cast and great action, great dialogue! It is the last time that Paul Walker starts in this film. In Furious 7 was his brother who was portraying Brian O'Conner with a fake CGI. In here Paul Walker is real, Justin Lin started a great franchise which ended in this film.'

Input Synopsis: 'Adrift in space with no food or water, Tony Stark sends a message to Pepper Potts as his oxygen supply starts to dwindle. Meanwhile, the remaining Avengers – Thor, Black Widow, Captain America and Bruce Banner – must figure out a way to bring back their vanquished allies for an epic showdown with Thanos – the evil demigod who decimated the planet and the universe.'

Output review (with blanks): '[NAME-0] (2013) is the best of the best [NAME-1] film in the series franchise! It's [PER-0]'s [NAME-2] and I love it to death. Sorry but is not [NAME-3] and [NAME-4] the best, but is [NAME-0] the best one in the franchise! This my favorite best film of the franchise that I just love to death! The film has great cast and great action, great dialogue! It is the last time that [PER-1] starts in this film. In [NAME-4] was his brother who was portraying [PER-2] with a fake [NAME-5]GI. In here [PER-1] is real, Justin Lin started a great franchise which ended in this film.'

Final Output review: 'Avengers (2013) is the best of the best Avengers film in the series franchise! It's Bruce Banner's Avengers and I love it to death. Sorry but is not Avengers and Avengers the best, but is Avengers the best one in the franchise! This my favorite best film of the franchise that I just love to death! The film has great cast and great action, great dialogue! It is the last time that

Pepper Potts starts in this film. In Avengers was his brother who was portraying Black Widow with a fake AvengersGI. In here Pepper Potts is real, Justin Lin started a great franchise which ended in this film. ’

6 Analysis

We shall now look closely and evaluate the text generation and NER output.

6.1 Text Generation

The Generated output looks coherent and correct at first but there are many factual inaccuracies such as:

1. Hitchcock did not direct any movie adaptations of Poe’s works.
2. The second sentence states that William Holden appeared in films as far back as 1895, which is impossible as the first movie was made in 1896.
3. The fourth sentence is unclear and possibly incomplete. It states that Hitchcock’s films often deal with murder, but it is not clear how this relates to the current movie being discussed.
4. The sixth sentence refers to "the covering of the original film," but it is unclear what this means or what film is being referred to.

Overall our algorithm does not get the facts right but still is able to generate coherent text which does work for the scope of this project.

6.2 NER

Here we see that the program successfully uses Named Entity Recognition (NER) to replace characters, movie names, and locations in a movie review, resulting in a review that talks about a different movie while maintaining the tone and language of the original review. However, the program is not perfect and may make mistakes, as seen with inaccurate information and nonsensical sentences. This highlights the limitation of using NER alone to create a convincing movie review for a different movie. To address this, additional language processing techniques such as taking into account the context and connotation in the synopsis related to each entity in it as currently all we do is replace a word in the movie review with a word in the synopsis that has the same tag.

The most obvious mistake here would be that Bruce Banner is mistakenly identified as the creator of the Avengers. Additionally, the phrase "Black Widow with a fake AvengersGI" is nonsensical and is believed to be a consequence of mistakes made by the NER tagging model. This is again factually incorrect as Justin Lin never started the Avengers franchise nor does Black Widow have a brother. In conclusion, although the program was able to accomplish its purpose, it is not flawless and will need some manual editing and verification to correct any errors because a semi-contextual find and replace will not get the job done but is certainly a step in the right direction.

7 Conclusion

Our approach to producing movie reviews yields results that are relatively coherent, albeit with some room for improvement. Notably, we have observed instances of self-contradiction and details that are difficult to replace through Named Entity Recognition (NER) alone. These observations underscore the need for a more comprehensive set of language processing techniques to generate a convincing movie review, as certain details may be unique to a particular movie and not easily replaced with generalized methods.

To create a truly compelling movie review, it is necessary to combine a larger array of language processing techniques with human judgment. While our current methodology shows potential, further research and refinement will be necessary to develop output reviews that are both coherent and persuasive. Ultimately, this work represents a promising step towards more sophisticated automated movie review generation, but there remains much to be done in order to achieve this goal.

References

Rey Farhan. 2020. Easy gpt2 fine-tuning with hugging face and pytorch.

Kaggle. 2019. IMDB Dataset of 50K Movie Reviews. Accessed March 12, 2023.

A Honor Code

I affirm that I have carried out my academic endeavors with full academic honesty.

Manav Bilakhia (MB)