LLM Fine-Tuning for Fictional Stories Generation

Daria Seredina
National Research University Higher School of Economics, Saint-Petersburg, 194100
dariasrdn@gmail.com

Task overview

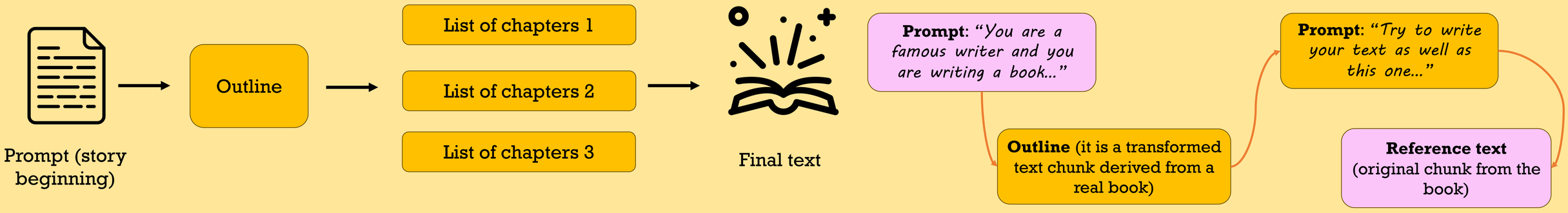
Today it became possible to generate various types of content using Large Language Models. However there is still a problem of generating coherent, engaging and human-like narratives. In this connection we decided to explore a hybrid approach, integrating fine-tuning and prompt-engineering techniques to enhance long story generation results.

Pipeline

- We use the provided prompt and Mistral-7B-Instruct-v0.2-GPTQ to generate a high-level outline (setup, climax, resolution, and conclusion).
- We generate a more detailed content outline (chapters)
- We utilize our fine-tuned model Mistral7B-Instruct-v0.2-GPTQ to generate the final story.

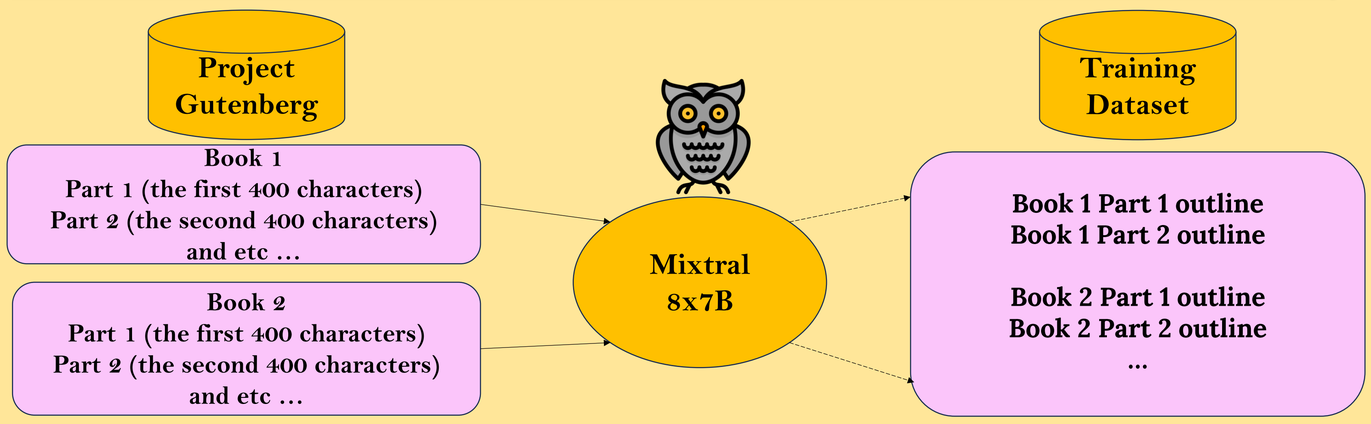
Fine-tuning Approach

For fine-tuning the model, we employed a hybrid approach that combines elements of Supervised Learning (SL) and Self-Supervised Learning (SSL). Our dataset consisted of pairs of input data - brief summaries of books chunks, and their associated labels (original book chunks), which is peculiar to the supervised learning. However we didn't provide the model with explicit labels for every possible output. Instead, the model must learn to generate text by leveraging the interconnection between the input data and the desired output, which is a characteristic of self-supervised learning.



Dataset Creation

The dataset was constructed using a part of the vast digital collection of public domain books provided by Project Gutenberg (Project Gutenberg, 2016). This collection comprises a broad spectrum of classic literature. To create the dataset, we selected over 500 books from the Project Gutenberg collection. These books were converted into text format and processed, enabling us to extract plotlines for generating brief summaries or "outlines" with Mixtral 8x7B model (Jiang et al., 2023).



We constructed a dataset that conforms to the following structure:

- "Outline": a concise summary of the narrative that the model should utilize to generate a fictional text.
- "Reference text": an exemplary text that serves as a benchmark for a well-crafted fictional text.
- "Instruction": a specific prompt that guides the model on how to integrate the " outline" and "reference text" to produce a coherent output.

To prepare the data for model training, we transformed it into the required format by adding special tokens, the specific prompt, and the reference text, as follows:

*"[INST] You are a famous writer and you are writing a book· Now you are going to write one chapter of your book according to this plot: Harry Potter is walking in the forest<...>· Add as many descriptions, dialogues, feelings of the main characters and other things as possible· [/INST] Try to write your text as well as this one: *Reference text*·"*

Epoch testing

After the first epoch of training, we revealed a model capable of generating more lively text based on the provided "plot-prompt" from a single sentence. The model could put new ideas and details into the fictional world while creating the content. Moreover, it perfectly managed to follow the main plot line provided in the prompt.

For example, we gave the following plot-prompt: "Harry Potter meets a magical spider". And we got a short, but still interesting response, with some fabulous vibe (the model says: "It was a spider, and it was very, very magical." The word "very" is doubled and it is not a simple tautology, but a lexical repetition, which is used in fictional texts to add expressiveness).

After the third epoch generated texts revealed to be written in a language rich in metaphors and complex vocabulary.

As the model continued to train, it became difficult for it to generate text based on a small sentence. In earlier epochs, the model excelled at "expanding the idea," while in later epochs, it focused on generating text strictly within the given "plot" scope, resulting in a more detailed storyline (look Epoch 7).

Epoch 1 — Plot: "Harry Potter meets a magical spider."

"Harry Potter was walking through the forest when he stumbled upon a small, furry creature with eight legs· It was a spider, and it was very, very magical· <···> "Hello, Harry," said the spider· "I am a magical spider, and I can see into the future· <···>"

Epoch 3

"Harry Potter was walking through the forest when he suddenly felt a tickling sensation on his neck· He looked up and saw a small spider crawling up his hair· It was a magical spider, and it had the power to grant wishes· "

Epoch 4

"Harry Potter was walking through the forest one day when he came across a spider· It was a big, fat spider, with a glossy black body and a large, golden head· Harry was fascinated by the spider's appearance, and he was about to move on when he noticed that the spider was wearing a large, golden ring on its head· Harry was very curious about the ring, and he decided to investigate· <···> "

Epoch 7

"<···>Harry had never heard a spider speak before· He was afraid to say anything· "I am not a spider," he said· "I am a boy·" "I know that," the spider said· "But I am a spider· I want to be your friend·" Harry was still very surprised· He did not know what to say· "I am not a boy," he said again· "I am a man·" "I know that," the spider said· "But I am a spider· I want to be your friend·"

Evaluation

	Power law MAPE	Exp law MAPE	GAPEL-MAPER
Don Quixote	0.20	0.44	0.45
The Adventures of Tom Sawyer	0.21	0.55	0.38
S4 generated text	0.21	0.5	0.38
Mistral-7B-Instruct-v0.2-GPTQ Fine-tuned	0.17	0.402	0.44

Table 1

The final text generated by the fine-tuned Mistral7B-Instruct-v0.2-GPTQ was evaluated with GAPELMAPER Metric (Mikhaylovskiy, 2023; Mikhaylovskiy and Churilov, 2023). The automatic evaluation results of the generated text are presented in Table 1, alongside the results calculated for well-known books. The metrics obtained by our text are similar to those achieved by "Don Quixote" and show that it exhibits a structured composition.

Metric	Score
Correlation between the fanfic title and its content	3.25
Compatibility of chapter and sub-chapter titles with the overall style of the text	3.2
The strength of the stylistic connection between all the elements of the text	2.6
The pace of the plot	1.8
Word repetitions	2.6
Text composition	2.8
General idea of the text	3.2

Table 2

The human evaluation results of the generated text are presented in in Table 2. Based on these scores, it can be concluded that the generated text demonstrates a satisfactory level of coherence. The chapters showed a high degree of narrative repetition. However, if this repetition is set aside, one evaluator believed that the writing style was typical of a young adult author who is a fan of the Harry Potter books.

As a result of our research, we were able to finetune the model and to generate a long and cohesive artistic text. One of the key findings from our investigation was that our fine-tuned model currently lacks the ability to make smooth transitions from one chapter to another. This limitation resulted in the appearance of unexpected plot twists as well as the repetition of similar scenarios in adjoining chapters.
By refining our model to better handle these transitions, we can potentially improve the overall quality and coherence of the generated texts.