Interactive Story Generation

Janesh Kapoor
21466
janesh21466@iiitd.ac.in

Mahima Chopra
21398
mahima21398@iiitd.ac.in

Mahisha Ramesh
MT23121
mahisha23121@iiitd.ac.in

Shaina Mehta
MT23139
shaina23139@iiitd.ac.in

Shivam Dwivedi
21352
shivam21352@iiitd.ac.in

1. Problem Formulation

Storytelling [1] has been one of the most essential parts of human culture for many years. People tell stories to others to share their experiences, beliefs, and values via paintings, carvings, movies, podcasts etc. Nowadays, due to technological advancements and the increase in the use of Artificial Intelligence, our ability to tell stories has been expanded. AI-based storytelling has become popular nowadays, but it is the most difficult task and it is challenging to produce consistent, coherent and engaging narratives. This encompasses issues such as maintaining logical plot progression, developing well-rounded characters, and ensuring that the story's pacing remains appropriate. The AI may struggle with generating stories that flow naturally and captivate the audience, leading to disjointed or unsatisfying narrative experiences. This problem is crucial since engaging storytelling is fundamental to capturing and retaining users' attention, fostering immersion, and eliciting emotional responses. Without compelling narratives, users are less likely to interact with the AI generator, leading to diminished satisfaction and decreased utility of the tool. Moreover, it is crucial to solve this issue since it is necessary to expand the potential of Generative AI in several fields such as therapy, education, and entertainment. It also has the potential to increase the explainability of the AI models, especially Large Language Models so that it will help researchers to enhance the AI models for various applications in future [2].

This project aims to build a platform for interactive story generation platform by finetuning Large Language Models such as GPT-2 models based on different themes. It also focuses on developing longer stories taking care of consistency, coherency, and engaging narratives.

2. Literature Survey

Various research work has been done by several researchers in the field of AI-based Story Generation. Earlier works were based on logic, formal grammar and statistical machine learning models. Now a days, Deep Learning is playing a crucial role in generating engaging narrative that has high level of consistency and coherence. Fan et. al. [3] has developed the dataset for story generation that is Writing Prompts that has approximately 300K stores along

with its prompts and trained fusion of Conv Seq2seq + self-attention-based model and achieved the perplexity of 36.08 and 36.56 on validation and testing set respectively and performed well on human evaluation test. Khan et al. [4] have developed a keyword-based story generation model by finetuning the GPT 2 model on the private dataset created by themselves and achieved the BLEU score of about 0.704 averaging over 10 genres. Yao et. al. [5] proposed the framework for generating the stories which is named Play-and-Write which plans the storyline first and then generates the stories. It works in two schemas, static and dynamic schema in which both have performed better than the baselines in both objective and subjective evaluation. Pradyumna et. al. [6] used Reward Shaping technique which comes under Reinforcement Learning to generate stories. They trained the models on CMU movies dataset and achieved the lower perplexity values (7.61 and 5.73 for DRL Clustered and DRL Unrestricted with goal 'admire') than the baseline model and performed better in human evaluation. Ammanabrolu et. al. [7] developed an ensemble-based framework for generating stories based on combination of Retrieve and Edit model, Sentence Templating, Monte-Carlo Beam Search and Finite State Constraint Beam Search algorithms and achieved the lowest perplexity and highest BLEU score of 70.179 and 0.0481 respectively than all the four models applied individually. Kong et. al. [8] developed the story generator model which plans the stylized keywords first and then generates the stories based on these keywords. This model achieved the LSC and SSC scores of 0.474 and 0.371 respectively for emotion-driven style and 0.309 and 0.293 respectively for event driven style higher than the baseline models. Mathews R.F. et. al. [9] have developed the procedural story generation model using a handcrafted event network and a dynamic artificial social network created for each new story. SeokKyoo Kim et. al. [10] have developed a story generation algorithm using Constraint Based Narrative structure implemented in Storytelling Markup Language.

3. Methodology

3.1 Dataset Description

In total 3 kinds of themes are chosen for generating stories that are Scary, Science Friction and Humor using GPT 2. The dataset is taken from [11] which consists of short stories of 3 kinds of themes mentioned above. The first theme, which is Scary, has about 28 stories whereas Science Friction has about 22 stories and the last theme, Humor has about 16 stories.

3.2 Training of OpenAI GPT-2 Model

The following steps have been followed like [11] while performing finetuning of GPT-2 model on the given dataset:

1. The GPT-2 models are trained separately on three themes that is Scary, Science Friction and Humor. Note that given GPT-2 models have 124 million parameters.
2. Each model is trained on 1000 epochs on each theme. Note that for Science Friction theme, this model has trained on each story about 12 times since each story Science Friction story is written in separate files.

4. Results

This section discusses the results of the models. All the models are trained using Python 3.10 Programming language using Kaggle Notebook and tested using Google Colab. The plots for training loss for models trained on Scary, Humor and Scifi stories are shown in figure 1, 2 and 3. In figures 1 and 2, the loss becomes less than 0.5 and becomes almost constant after epoch 100 and 50 respectively. In figure 3, the loss becomes less than 0.5 after epoch 600.

Figure 1: Sample Story Generated by GPT-2 Model Trained on Stories of Scary Theme

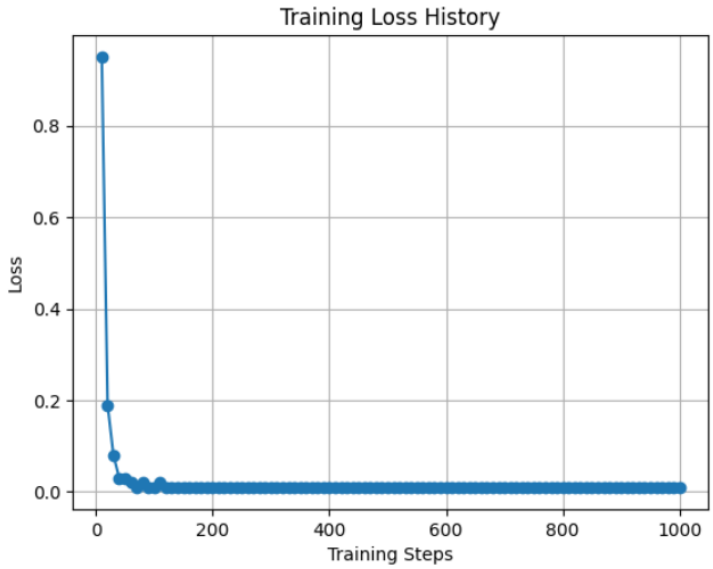

Figure 2: Sample Story Generated by GPT-2 Model Trained on Stories of Humor Theme

Figure 3: Sample Story Generated by GPT-2 Model Trained on Stories of Scifi Theme

On human evaluation, it has been observed that GPT-2 model trained on Scifi stories generated different variety of stories having some coherence and cohesion as compared tom models trained on scary and humor theme. On the other hand, the GPT-2 model trained on Humor dataset generated the same story with less coherence and cohesion since the dataset has stories.

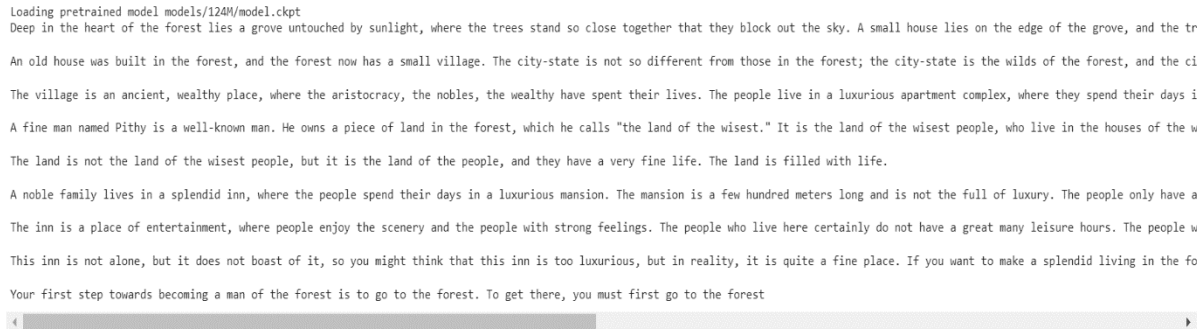

Figure 4: Sample Story Generated by GPT-2 Model Trained on Stories of Scary Theme

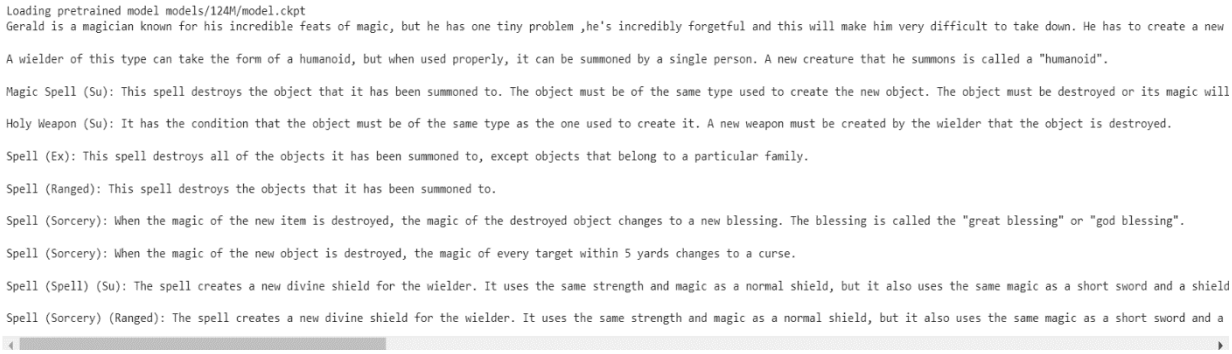

Figure 5: Sample Story Generated by GPT-2 Model Trained on Stories of Humor Theme

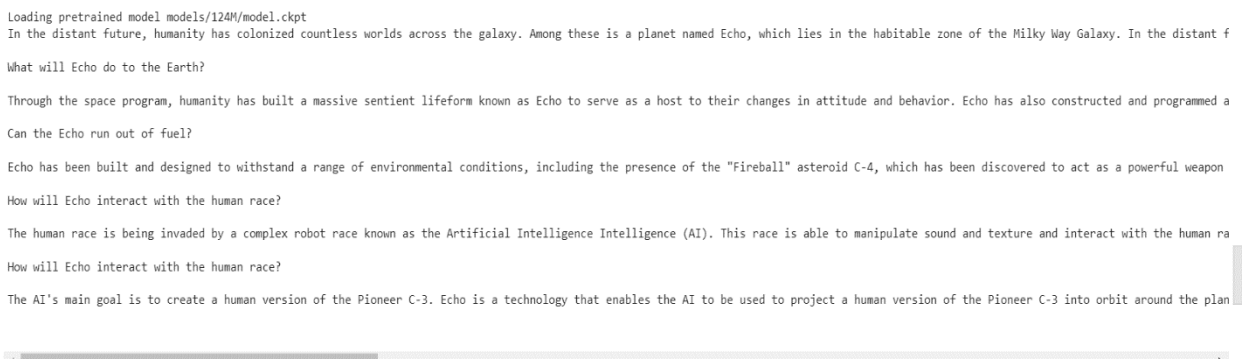

Figure 6: Sample Story Generated by GPT-2 Model Trained on Stories of Scifi Theme

Figures 4, 5, and 6 show the sample text generated by GPT-2 model when trained on Scary, Humor and Scifi stories.

5. Conclusion and Future Work

Till now we have fine-tuned the GPT-2 model on stories based on 3 themes and it is not giving much up to mark performance. Now, we are planning to add more themes and decided to finetune different Large Language Models such as Llama, Mistral, T5 etc. on all those different themes. We will also try to generate longer stories.

References

[1] AIContentfy. (2023, November 6). The art of AI-generated storytelling. AIContentfy. Retrieved January 31, 2024, from https://aicontentfy.com/en/blog/art-of-ai-generated-storytelling#:~:text=One%20potential%20future%20for%20AI,may%20not%20have%20considered%20before.

[2] Riedl, M. (2021, January 4). An Introduction to AI Story Generation. Medium. Retrieved February 1, 2024, from https://mark-riedl.medium.com/an-introduction-to-ai-story-generation-7f99a450f615.

[3] Fan, A., Lewis, M., & Dauphin, Y. (2018). Hierarchical neural story generation. arXiv preprint arXiv:1805.04833.

[4] Khan, L. P., Gupta, V., Bedi, S., & Singhal, A. (2023, April). StoryGenAI: An Automatic Genre-Keyword Based Story Generation. In 2023 International Conference on Computational Intelligence and Sustainable Engineering Solutions (CISES) (pp. 955-960). IEEE.

[5] Yao, L., Peng, N., Weischedel, R., Knight, K., Zhao, D., & Yan, R. (2019, July). Plan-and-write: Towards better automatic storytelling. In Proceedings of the AAAI Conference on Artificial Intelligence (Vol. 33, No. 01, pp. 7378-7385).

[6] Pradyumna, T., Murtaza, D., Lara, J. M., Mehta, A., & Harrison, B. (2019). Controllable neural story plot generation via reward shaping. In Proc. Int. Joint Conf. Artificial Intelligence (pp. 5982-5988).

[7] Ammanabrolu, P., Tien, E., Cheung, W., Luo, Z., Ma, W., Martin, L., & Riedl, M. (2019, August). Guided neural language generation for automated storytelling. In Proceedings of the Second Workshop on Storytelling (pp. 46-55).

[8] Kong, X., Huang, J., Tung, Z., Guan, J., & Huang, M. (2021). Stylized story generation with style-guided planning. arXiv preprint arXiv:2105.08625. [3] Jain, P., Agrawal, P., Mishra, A., Sukhwani, M., Laha, A., & Sankaranarayanan, K. (2017). Story generation from sequence of independent short descriptions. arXiv preprint arXiv:1707.05501.

[9] Mendonça, M. R., & Ziviani, A. (2018). Network-based procedural story generation. Computers in Entertainment (CIE), 16(3), 1-18.

[10] Kim, S., Moon, S., Han, S., & Chan, J. (2011). Programming the story: Interactive storytelling system. Informatica, 35(2).

[11] Shukla, E. (2021, October 18). GRANNY: A Web Application to Generate Multiple Genre Stories Based on GPT2 Model. Github. Retrieved March 5, 2024, from https://github.com/ekagrashukla/GRANNY-GPT2-Based-Multiple_Genre-Story-Generator-Web-Application