Submission 2 Template

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SECTION : D

AI-Based Instagram Caption Generator using Hugging Face Transformers

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Problem Statement

Social media users often find it difficult to write engaging and creative captions for their photos. This project aims to develop an AI-based Instagram Caption Generator that takes a short photo description as input and automatically generates multiple creative captions using Natural Language Processing techniques and text generation models from Hugging Face.

Abstract

This project presents an AI-powered Instagram Caption Generator developed using Hugging Face Transformers. The system uses a pre-trained GPT-2 text generation model to produce creative and engaging Instagram captions based on a user-provided photo description. By applying prompt-based text generation, the model generates multiple caption suggestions in different styles. This project demonstrates how generative AI can assist users in social media content creation and highlights the practical application of transformer-based language models.

Documentation

What I Understood

Text generation is a Natural Language Processing (NLP) task in which a model predicts the next words in a sequence to produce meaningful and coherent sentences. Transformer-based models such as GPT-2 are trained on large text datasets and can generate creative text when given an appropriate prompt. By carefully designing prompts, the output can be guided toward specific tasks such as generating Instagram captions.

What I Built

I developed an AI-based Instagram Caption Generator that takes a short description of a photo as input and produces three creative caption suggestions. The system uses the Hugging Face text-generation pipeline with the GPT-2 pre-trained model. The model is guided using a prompt format such as *"Caption for this photo:"* to ensure relevant and meaningful outputs. This project shows how AI can be used to support users in creating engaging social media content.

Technologies Used

- Python
- Hugging Face Transformers
- GPT-2 Pre-trained Model
- Jupyter Notebook

Sample output/ screen shots

```
[23]: generate_captions("girl standing alone at night in fog on an empty road")

Both `max_new_tokens` (=20) and `max_length`(=50) seem to have been set. `max_new_tokens` will take precedence. Please refer to the documentation for m
ore information. (https://huggingface.co/docs/transformers/main/en/main_classes/text_generation)

[23]: ['Lost in dreamy thoughts under quiet skies 🌙',
       'Some nights just feel calm and still 🥡',
       'Wrapped in shadows, silence, and aesthetic moments 🌌']

[24]: generate_captions("girl with curly hair smiling in a cafe eating a choclate ")

Both `max_new_tokens` (=20) and `max_length`(=50) seem to have been set. `max_new_tokens` will take precedence. Please refer to the documentation for m
ore information. (https://huggingface.co/docs/transformers/main/en/main_classes/text_generation)

[24]: ['Caught in a with kind of moment 😊',
       'Smiling through these curly little things ✨',
       'Just me, some hair vibes, and good energy 🌈']
```

```
description = "a girl sitting in the hall and eating a pizza "

mood = detect_mood(description)
captions = generate_captions(description)

print("Detected Mood:", mood.upper())
print("\nGenerated Instagram Captions:\n")

for i, caption in enumerate(captions, 1):
    print(f"Caption {i}: {caption}")
    print("-"*50)
```

```
Both `max_new_tokens` (=20) and `max_length`(=50) seem to have been set. `max_new_tokens` will take precedence. Please refer to the documentation for m
ore information. (https://huggingface.co/docs/transformers/main/en/main_classes/text_generation)
Detected Mood: HAPPY

Generated Instagram Captions:

Caption 1: Caught in a sitting kind of moment ✨
--------------------------------------------------
Caption 2: Smiling through these hall little things 🥰
--------------------------------------------------
Caption 3: Just me, some eating vibes, and good energy 🌸
--------------------------------------------------
```

```
caption_style_summary(captions)
```

```
Caption Style Summary:
'Caught in a sitting kind of moment ✨' → Happy/Aesthetic Style
'Smiling through these hall little things 🥰' → Happy/Aesthetic Style
'Just me, some eating vibes, and good energy 🌸' → Happy/Aesthetic Style
```