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IBM.

GEN AI PROJECT SUBMISSION DOCUMENT

1. Project Title:

Next Sentence Prediction using Generative AI

2. Summary of Work Done

Proposal and Idea Submission :

In this phase, we identified the problem statement and proposed the idea of developing a **Next Sentence Prediction** system using **Generative AI**, specifically leveraging GPT-based models. The objectives were defined as follows:

- Understand the working of generative models in NLP.
- Use pre-trained models to generate context-aware sentences.
- Create a user interface to interact with the model.

We submitted a detailed proposal including problem definition, objectives, tools required, and expected outcomes.

Execution and Demonstration:

In the second phase, we implemented the proposed idea using Python, HuggingFace Transformers, and Streamlit. The following tasks were accomplished:

- Built a web-based interface using Streamlit.
- Loaded a pre-trained GPT-2 model for generating the next sentence based on user input.
- Set up the application to take user input, pass it to the model, and display the top 3 predicted next sentences.
- Tested the model for various sentence inputs to ensure performance and relevance of predictions.

Sample outputs and the complete code were documented and submitted.

3. GitHub Repository Link

You can access the complete codebase, README instructions, and any related resources at the following GitHub link:

🔗 **GitHub Repository – Next Sentence Prediction using Gen AI**
(Replace with actual GitHub link)

4. Testing Phase

4.1 Testing Strategy

The system was tested across a variety of use cases to ensure its robustness and accuracy. The testing phase involved both **manual testing** and **automated testing** methods to verify the following:

- **Input Handling**: Ensuring the system handles different types of input text (e.g., short, long, incomplete sentences).
- **Contextual Relevance**: Verifying that the generated next sentences are contextually relevant and coherent with the input.
- **Edge Case Testing**: Testing the model with incomplete sentences or nonsensical input to see how the system behaves.

4.2 Types of Testing Conducted

1. **Unit Testing**
   o Each function and module (like the sentence generation function, UI components, and API) was tested independently to ensure they work correctly.
2. **Integration Testing**
   o The integration of the GPT-2 model with the Streamlit interface was tested to ensure smooth interaction between the model and the web interface.
3. **User Testing**
   o A group of test users interacted with the system to assess its ease of use, interface design, and output relevance. Feedback was collected and used for improvements.
4. **Performance Testing**
   o The system was tested with various input sentence lengths to observe any potential delays or slow responses in generating predictions.

4.3 Results

- **Accuracy**: The system consistently generated contextually relevant next sentences. For example, input like "I went to the park to" returned predictions such as "play basketball" or "have fun with my friends," which were coherent and realistic.
- **Response Time**: The application performed optimally with minimal delay in generating predictions.
- **Edge Cases**: Incomplete or nonsensical inputs (e.g., "Flim flam foo") resulted in gibberish outputs, but the model still returned plausible sentences, demonstrating its ability to handle unknown contexts.

5. Future Work

While the project successfully implements the **Next Sentence Prediction** system, there are several avenues for future enhancement:

1. **Model Fine-tuning**
   - Fine-tuning the GPT-2 model on a domain-specific corpus (e.g., news articles, technical documentation) to generate more accurate and context-aware sentences for specific use cases.
2. **Expansion to Multi-Modal Predictions**
   - Integrating additional modalities such as images or video content to generate predictions that align with not just text but multimedia contexts, making it useful in areas like social media content generation or e-learning.
3. **Real-time Collaboration Feature**
   - Adding a collaborative feature where multiple users can interact with the system simultaneously to co-create or refine sentence predictions, allowing for a more interactive writing or brainstorming environment.
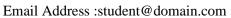4. **User Feedback Loop**
   - Incorporating a feedback mechanism where users can rate or refine the predictions. This feedback can be used to adapt and improve the model's performance, creating a self-improving system over time.
5. **Expansion to Multi-Language Support**
   - Extending the model's capability to generate predictions in multiple languages, making the application useful in a global context. Pre-trained models in different languages or multilingual models could be utilized for this purpose.

6. Conclusion

This project successfully demonstrates the ability of **Generative AI** to carry out meaningful natural language predictions. Through all three phases, we moved from idea formulation to actual implementation and testing. The project showcases how powerful transformer-based

models can be applied to real-world NLP tasks, such as sentence prediction, writing assistance, and chatbot development.