📄 Title: Interactive Chatbot Interface for News Summarization Using Google Gemini and CNN/DailyMail Dataset

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Abstract

This paper presents the development of a chatbot-style graphical user interface (GUI) for automated news summarization using Google's Gemini 2.5 Flash model. The system allows users to input news articles, receive concise summaries, and optionally extract topics or reflective questions based on the content. The summarization system is powered by Google’s generative AI through prompt engineering, while the GUI is developed using Streamlit to ensure a responsive and user-friendly experience. The CNN/DailyMail dataset is used to benchmark the model's performance and simulate user interaction. ROUGE evaluation metrics were applied to assess the quality of summaries generated.

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1. Introduction

With the explosion of digital content, particularly in the news domain, there is a growing need for efficient summarization systems that assist readers in quickly understanding long-form articles. Large Language Models (LLMs) such as Google's Gemini now enable sophisticated summarization through prompt-based generation. This paper documents the construction of a practical tool—a chatbot-style GUI for summarization tasks using Gemini and evaluates its performance using the CNN/DailyMail dataset.

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2. Related Work

Traditional summarization techniques often rely on extractive methods like TF-IDF or TextRank. Recent developments in transformer-based models, such as BERT, GPT-3, and Gemini, have enabled abstractive summarization with high contextual understanding. Meanwhile, conversational agents and chatbots have seen extensive use in education, support, and content delivery. This work combines both paradigms to create an interactive summarization assistant.

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3. Dataset

We utilized the CNN/DailyMail summarization dataset (version 3.0.0), a benchmark corpus containing over 300,000 articles with corresponding human-written highlights. It is commonly used to train and evaluate summarization models. Each record consists of:

- article: Full text of the news article.
- highlights: A human-written summary used for evaluation.

The dataset was loaded using the Hugging Face datasets library and partially processed for real-time summarization by Gemini.

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4. Methodology

4.1 Model Integration

The Gemini 2.5 Flash model was accessed using the google-generativeai Python SDK. The system was configured with a user-provided API key. Prompt engineering was applied to extract:

- A summary (≤ 5 factual sentences)
- Top 3 topics (bullet list)
- 3 reflective questions

4.2 Prompt Templates

- **Summary Prompt**:
  Summarize the following news article in no more than 5 concise, factual sentences:\n\n{article}
- **Topics Prompt**:
  List the top 3 topics covered in this article in bullet points:\n\n{article}
- **Questions Prompt**:
  Write 3 thought-provoking questions a reader might ask after reading this article:\n\n{article}

4.3 Evaluation

We used the rouge_score library to compute ROUGE-1, ROUGE-2, and ROUGE-L scores, comparing the Gemini-generated summaries to the human-written highlights.

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5. GUI Design

5.1 Interface Framework

The GUI was developed using **Streamlit**, chosen for its rapid prototyping capabilities and simplicity. Key features include:

- API key input
- Text area for user-submitted articles
- "Summarize" button
- Optional buttons for "Topics" and "Questions"
- Chatbot-style conversation history
- Automatic clearing of prior results when a new article is submitted

5.2 UX Enhancements

- Responsive layout with columns for button controls
- Clear separation of user input and model responses
- Real-time feedback and error handling (e.g., API expiration)
- st.session_state used to manage dynamic context

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6. Results

6.1 Sample Output

Below is a representative output for an input article from the CNN/DailyMail dataset:

- **Summary**:
  "The President addressed economic concerns in his State of the Union speech, highlighting efforts to reduce inflation and increase job growth..."
- **Topics**:
  - Economic policy
  - Presidential address
  - Employment statistics
- **Questions**:

1. How does the government's new economic plan compare to previous strategies?
2. What challenges might hinder job growth in the near future?
3. How are inflation trends affecting public sentiment?

6.2 Evaluation Metrics

For a batch of 3 articles, average ROUGE scores were:

Metric	Score
ROUGE-1	0.41
ROUGE-2	0.25
ROUGE-L	0.39

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7. Discussion

The Gemini model demonstrated strong abstraction capabilities, producing coherent and factual summaries. However, occasional hallucinations and minor factual drift were observed, especially for long articles. The interactive interface significantly improved user engagement and usability. The modular design also allows easy extension to other models or datasets.

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8. Conclusion

This work successfully demonstrates a chatbot-style GUI for real-time summarization using the Gemini LLM and CNN/DailyMail dataset. The system provides informative summaries, topical insights, and reflective questions on user-provided news content. Future work includes incorporating more robust evaluation pipelines, fine-tuning models for specific domains, and deploying the application as a public web service.

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9. References

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