

SOFTWARE REQUIREMENTS SPECIFICATIONS

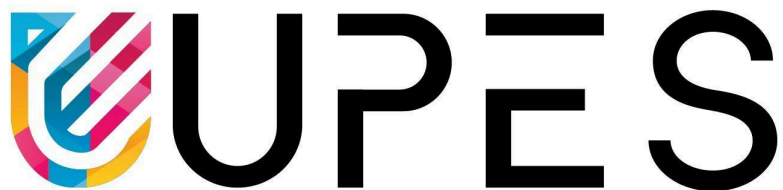
FOR

SummaEase: A tool for text and speech summarization using LLM

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CANDIDATE'S DECLARATION

We hereby certify that the project work entitled “**SummaEase: A tool for text and speech summarization using LLM**” in partial fulfillment of the requirements for the award of the Degree of BACHELOR OF TECHNOLOGY in COMPUTER SCIENCE AND ENGINEERING with specialization in AIML & CCVT and submitted to the Department of Systemics, School of Computer Science, University of Petroleum & Energy Studies, Dehradun, is an authentic record of our work carried out during a period from **January, 2024 to May, 2024** under the supervision of **Dr. Rahul Kumar Singh, Assistant Professor (SS)**.

The matter presented in this project has not been submitted by us for the award of any other degree of this or any other University.

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Project Guide

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ABSTRACT

SummaEase is an innovative tool designed to revolutionize the process of text and speech summarization using cutting-edge Large Language Models (LLMs). With a primary focus on enhancing the efficiency and accuracy of summarization tasks, SummaEase employs advanced natural language processing (NLP) techniques to generate concise and informative summaries of various types of content.

SummaEase is an AI system being developed to automatically summarize both written and spoken information. It can handle various text formats like articles, documents, and reports, and even summarize spoken content like lectures and interviews by first converting speech to text. This multimodal capability makes SummaEase versatile. The user-friendly interface makes it easy to use for anyone, and it leverages pre-trained large language models to ensure summaries are accurate and relevant to the input content. Overall, SummaEase aims to empower users to quickly grasp key information from various sources, improving accessibility and efficiency.

SummaEase not only summarizes text and speech, but also lets users compare its accuracy to human-made summaries and other tools. This ensures high quality and caters to diverse needs. By combining advanced NLP and LLMs, SummaEase is a user-friendly tool for summarizing large amounts of information across various fields.

SummaEase-Text-And-Speech-Summarizer-using-LLM (Public template)

51 Commits · 3 Stars · 0 Forks · 5 Branches · 0 Tags

Commit History:

Commit	Message	Time
solo-coder13	Update README.md	3 weeks ago
solo-coder13	Final module ready	3 weeks ago
solo-coder13	Create dataset	3 weeks ago
solo-coder13	Update README.md	2 weeks ago
solo-coder13	Add files via upload	3 weeks ago
solo-coder13	Final module ready	3 weeks ago
solo-coder13	data added	3 weeks ago
solo-coder13	Initial commit	2 months ago
solo-coder13	Initial commit	2 months ago
solo-coder13	Update README.md	3 weeks ago
solo-coder13	SummaEase Synopsis ppt presentation	2 months ago
solo-coder13	Synopsis Report	2 months ago
solo-coder13	Organized the code structure, deleted redundant file PR #2	3 weeks ago

README:

Empower users with succinct, accessible summaries of text and speech content through the power of language models.

SummaEase: Text and Speech Summarizer using Large Language Models

The input here is speech or text, which will be utilized further by processing it to generate the output.

Workflow:

```
graph LR; Input["The input here is speech or text, which will be utilized further by processing it to generate the output."] --> SPEECHTEXT["SPEECH/TEXT"]; SPEECHTEXT --> DataCollection["Data Collection"]; DataCollection --> Preprocessing["Preprocessing"]; Preprocessing --> FeatureEngineering["Feature Engineering"]; FeatureEngineering --> Document["Document"]; Document --> Summary["Summary"];
```

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Languages:

- Jupyter Notebook: 99.9%
- Other: 0.1%

Github:

<https://github.com/solo-coder13/SummaEase-Text-And-Speech-Summarizer-using-LLM>

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1. INTRODUCTION

The abundance of information in today's data-driven world is a major challenge that calls for effective techniques to extract important insights. “SummaEase” Abstractive text and speech summarization are important solutions that provide the capacity to summarize large amounts of information into brief but informative summaries. The need for automated summarization techniques is growing, whether it is for accessibility, knowledge extraction, or quick decision-making. Accurate, cogent, and contextually relevant summaries are still difficult to produce, though. The present introduction delineates the urgent necessity for progress in abstractive summarization, emphasizing its significance in various fields for expedient information processing and understanding.

1.1 Purpose of the Project

The purpose of the project "SummaEase: A tool for text and speech summarization using LLM" is to develop a comprehensive tool that leverages Large Language Models (LLMs) for summarizing both written text and spoken content. The tool aims to provide users with an efficient and accurate way to summarize large volumes of text and speech data, extracting key information and insights. By utilizing advanced natural language processing techniques, the tool seeks to improve the summarization process, making it faster, more accurate, and more accessible to a wider range of users. Ultimately, the goal is to enhance the efficiency of information processing and decision-making in various fields such as research, education, and business.

1.2 Target Beneficiary

The target beneficiaries of the project "SummaEase: A tool for text and speech summarization using LLM" include:

1. **Researchers:** Researchers can use SummaEase to quickly summarize large volumes of research papers, articles, and documents, enabling them to identify key findings and trends more efficiently.
2. **Students:** Students can use SummaEase to summarize complex textbooks, lectures, and academic papers, helping them to grasp important concepts and information more effectively.
3. **Professionals:** Professionals in various industries can use SummaEase to summarize reports, emails, and other business documents, saving time and improving productivity.
4. **Journalists:** Journalists can use SummaEase to summarize interviews, press releases, and news articles, enabling them to quickly extract key information for their stories.
5. **General Public:** The general public can use SummaEase to summarize articles, blog posts, and other online content, making it easier to digest information and stay informed.

1.3 Project Scope

The project "SummaEase: A tool for text and speech summarization using LLM" aims to develop a comprehensive tool for summarizing both written text and spoken content using Large Language Models (LLMs). The scope of the project includes the development of algorithms and models for text summarization, focusing on articles, documents, and reports. Additionally, the project will implement algorithms for speech summarization, allowing for the summarization of lectures, presentations, and interviews by transcribing speech to text and then summarizing the text using LLMs. The tool will also integrate both text and speech summarization capabilities into a single, user-friendly interface, enabling users to easily input content and receive summarized output. Furthermore, the project will involve the integration of pre-trained LLMs, fine-tuned on specific datasets, to improve summarization performance. The tool will be evaluated for its performance against human-generated summaries and existing summarization tools. Overall, the project aims to develop a scalable, efficient, and accessible tool for text and speech summarization, with a focus on usability and accuracy.

2. PROJECT DESCRIPTION

2.1 Data/ Data structure

In "SummaEase: A tool for text and speech summarization using LLM," various data structures are used to manage and process text and speech data. String structures handle text content, while tokenized representations (lists of words or tokens) aid in analysis. Speech input is converted to text for processing. Tokenized words are stored for further processing, including removing stopwords. Filtered words, excluding stopwords and special characters, are stored. Word frequency is tracked using dictionaries or tuples. Summarized output is stored in strings or files. These structures streamline text and speech data management throughout the summarization process.

2.2 SWOT Analysis

<p style="text-align: center;">Strengths</p> <ul style="list-style-type: none"> • Utilizes state-of-the-art large language models for high-quality summaries. • Integrates text and speech summarization for a comprehensive solution. • Offers personalized summaries through fine-tuning on diverse datasets and a user-friendly interface. 	<p style="text-align: center;">Weaknesses</p> <ul style="list-style-type: none"> • Reliance on large language models may lead to high computational requirements. • Challenges in handling domain-specific jargon and context. • Ensuring the accuracy of speech-to-text transcription for speech input.
<p style="text-align: center;">Opportunities</p> <ul style="list-style-type: none"> • Potential integration with other AI technologies like question-answering systems. • Room for research and development to enhance summarization algorithms. • Expansion into new languages and domains for broader impact. 	<p style="text-align: center;">Threats</p> <ul style="list-style-type: none"> • Competition from existing summarization tools and services. • Ethical concerns regarding data privacy and bias in summarization. • Regulatory challenges related to the use of AI in summarization.

2.3 Project Features

The project "SummaEase: A tool for text and speech summarization using LLM" offers advanced features for enhancing summarization tasks. It utilizes natural language processing and Large Language Models (LLMs) to summarize written text, including articles and documents, as well as spoken content like lectures and interviews. SummaEase stands out for its multimodal summarization, allowing users to summarize both text and speech seamlessly. It features a user-friendly interface for easy input and output. The tool integrates pre-trained LLMs, fine-tuned on specific datasets, to enhance summary quality. Additionally, SummaEase includes a performance evaluation component for assessing its accuracy compared to human summaries and other tools. Overall, SummaEase aims to be a scalable, efficient, and user-friendly tool for various summarization needs.

2.4 Design and Implementation Constraints

The project "SummaEase: A tool for text and speech summarization using LLM" faces several design and implementation constraints that need to be considered:

1. **Computational Resources:** Utilizing LLMs for text and speech summarization requires significant computational resources, including powerful hardware (e.g., GPUs) and memory. Ensuring the tool's scalability and efficiency while managing these resources is a key constraint.
2. **Data Availability and Quality:** The quality and availability of datasets for training and fine-tuning LLMs can impact the performance of the summarization tool. Access to diverse and high-quality datasets is crucial for achieving accurate summaries.
3. **Model Complexity and Training Time:** LLMs are complex models that require extensive training time and computational resources. Balancing the model's complexity with its training time is a critical constraint for the project.

4. **Integration with Existing Systems:** Integrating the summarization tool with existing systems or workflows, such as content management systems or speech-to-text conversion tools, may pose challenges in terms of compatibility and data exchange.
5. **User Interface Design:** Designing a user-friendly interface that accommodates both text and speech inputs, as well as providing summarized outputs in an intuitive manner, requires careful consideration of user experience and interface design principles.

2.5 Design diagram

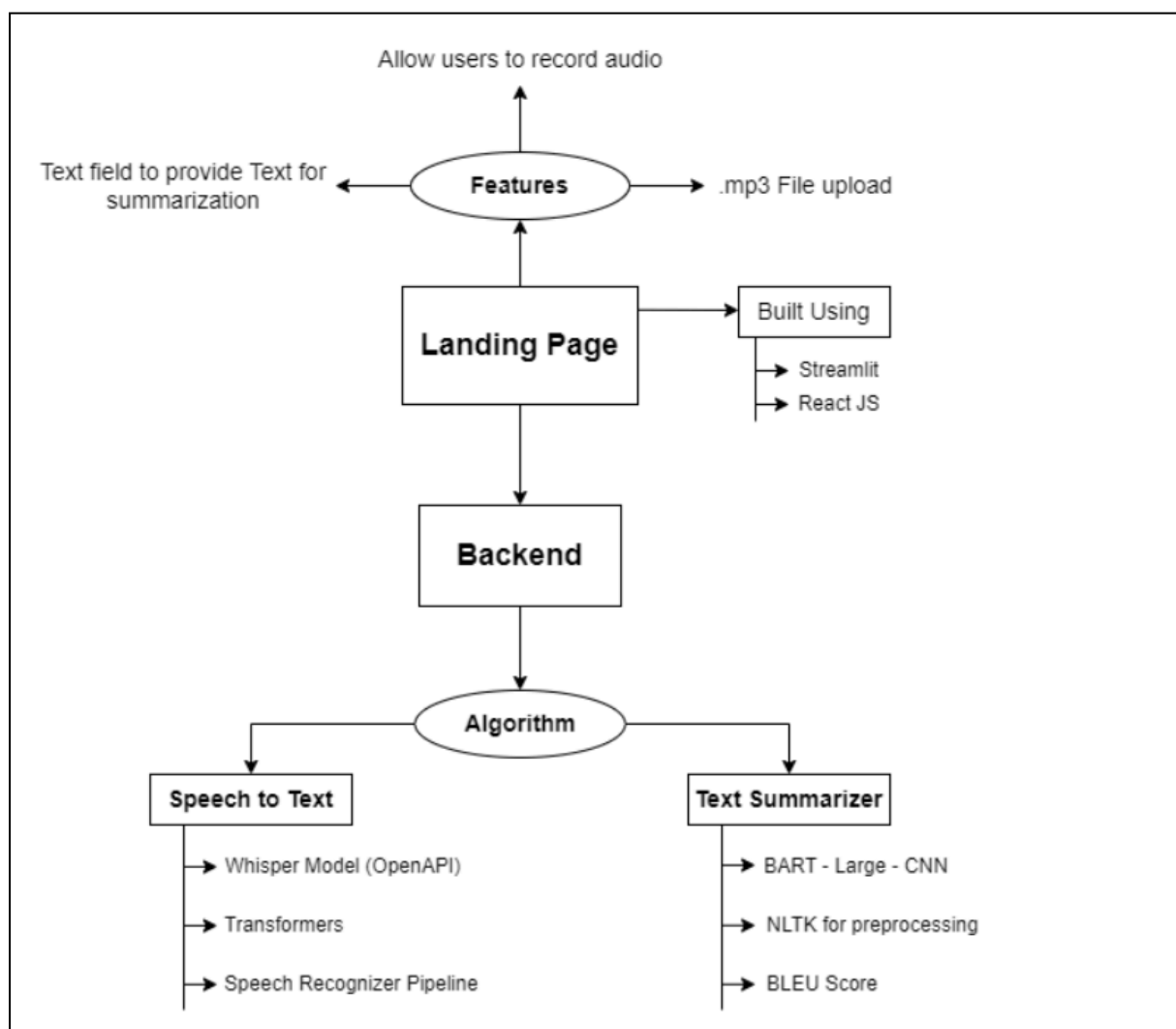


Fig: Design Diagram

3. SYSTEM REQUIREMENTS

3.1 User Interface

Hardware Requirements:

1. **Processor:** A modern multi-core processor (e.g., Intel Core i5 or AMD Ryzen 5) is recommended for efficient processing of text and speech data.
2. **Memory (RAM):** At least 8 GB of RAM is recommended to handle large datasets and ensure smooth performance.
3. **Storage:** Sufficient storage space (e.g., SSD) to store the tool's software, datasets, and any generated summaries. A minimum of 256 GB is recommended.

Software Requirements:

1. **Programming Languages:**
 - a. **Python:** Used for the development of the tool and implementation of natural language processing algorithms.
 - b. **JavaScript/CSS:** For developing the user interface (if applicable).
2. **Libraries and Frameworks:**
 - a. **Transformers:** For utilizing pre-trained language models (LLMs) such as BERT, GPT, etc., and fine-tuning them for summarization tasks.
 - b. **NLTK (Natural Language Toolkit):** For text processing tasks such as tokenization, lemmatization, and stop-word removal.
 - c. **Streamlit:** for developing GUI
3. **Text-to-Speech (TTS) and Speech Recognition Libraries:**
 - a. For speech summarization, libraries such as Google Text-to-Speech (gTTS) or IBM Watson Text to Speech for converting text to speech, and libraries like SpeechRecognition for converting speech to text.

4. NON-FUNCTIONAL REQUIREMENTS

4.1 Performance requirements

Performance requirements are crucial for ensuring that your system meets certain performance criteria. Here are some examples:

1. **Speed and Efficiency:** The tool should be able to summarize text and speech quickly and efficiently, providing results in a timely manner to users.
2. **Accuracy:** The summaries generated by the tool should be accurate and relevant, reflecting the key points of the input text or speech.

3. **Scalability:** The tool should be scalable to handle large volumes of text and speech data, accommodating varying user demands.
4. **Usability:** The user interface should be intuitive and user-friendly, allowing users to easily input text or speech and view the summarized output.
5. **Robustness:** The tool should be robust and able to handle different types of text and speech inputs, including variations in language, accents, and content.

4.2 Software Quality Attributes

Software quality attributes encompass various characteristics that contribute to the overall quality of the system. Here are some examples:

1. **Reliability:** The tool should be reliable, providing consistent and dependable results across different inputs and users.
2. **Security:** The tool should ensure the security and privacy of user data, following best practices for data protection and encryption.
3. **Maintainability:** The codebase should be well-structured and maintainable, allowing for easy updates and improvements over time.
4. **Compatibility:** The tool should be compatible with different operating systems and platforms, ensuring broad accessibility to users.
5. **Performance Monitoring:** The tool should include performance monitoring capabilities to track and analyze its performance over time, allowing for optimization and improvements.

1.4 References

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