VIVEKANAND EDUCATION SOCIETY'S INSTITUTE OF TECHNOLOGY

(An Autonomous Institute Affiliated to University of Mumbai)

Department of Computer Engineering

Project Report on

ReadWiz: AI Assistant for Mastering any Content

Submitted in partial fulfillment of the requirements of the degree

BACHELOR OF ENGINEERING IN COMPUTER ENGINEERING

By

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University of Mumbai
(AY 2023 - 24)

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Certificate

This is to certify that the Mini Project entitled **"ReadWiz: AI Assistant for Mastering any Content"** is a bonafide work of **Nikhil Dhanwani (D12B - 12), Chirag Santwani (D12B - 50) & Manraj SinghVirdi (D12B - 66)** submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of **"Bachelor of Engineering"** in **"Computer Engineering".**

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Principal

Mini Project Approval

This Mini Project entitled **"ReadWiz: AI Assistant for Mastering any Content"** by **Manraj SinghVirdi (D12B - 66), Nikhil Dhanwani (D12B - 12) & Chirag Santwani (D12B - 50)** is approved for the degree of **Bachelor of Engineering** in **Computer Engineering.**

Examiners

1. ……
(Internal Examiner name & sign)

2. ……
(External Examiner name & sign)

Date: 01st April 2024

Place: Chembur, Mumbai

Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Date: 01st April 2024

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Abstract

This project introduces an innovative approach to text summarization and multimedia content understanding, employing advanced natural language processing techniques and deep learning models. We leverage the Lamini-Flan-T5 model, now named RefinedWiz after fine-tuning on the SAMSUM dataset, to generate concise summaries from input text. Additionally, we integrate a paraphrasing task, enabling users to rephrase text while preserving its original meaning. Our system incorporates chat functionality with PDF documents through the Gemini model, facilitating interactive querying and information retrieval. Furthermore, image and video summary capabilities are included for compact representations of multimedia content. Evaluation using ROUGE metrics for text summarization and relevant metrics for multimedia content understanding showcases the effectiveness of our approach in producing clear and informative outputs. These advancements hold promising possibilities for information retrieval, content analysis, and user interaction across various applications.

List of abbreviations

Sr no.	Short form	Abbreviated form
1	LLM	Large Language Model
2	AI	Artificial Intelligence
3	NLP	Natural Language Processing
4	PDF	Portable Document Format
5	LSTM	Long Short-Term Memory
6	VAE	Variational Autoencoder
7.	RNN	Recurrent Neural Network
8	TXT	Plain Text
9	DOC	Document
10	PPT	Presentation
11	APIs	Application Programming Interface
12	ROUGE	Recall-Oriented Understudy for Gisting Evaluation
13	TTS	Text-to-Speech
14	GUI	Graphical User Interface
15	ROUGE-N	Recall-Oriented Understudy for Gisting Evaluation - N-gram.

List of figures

Chapter I: Introduction

1.1 Introduction

In today's information-overloaded digital environment, ReadWiz: AI Assistant for Mastering Any Content is your go-to resource. Whether you're a professional, student, or researcher, ReadWiz is designed to make learning easier for everyone. It provides strong tools for understanding complicated materials with ease. With its simple UI and innovative technology, ReadWiz makes it simple to extract important insights from lengthy papers and articles. It is a partner in the hunt for knowledge rather than just a tool. By leveraging advanced techniques in natural language processing (NLP) and large language models (LLM), ReadWiz adeptly handles multimedia content, rephrases intricate topics, and delivers concise summaries. ReadWiz is your reliable companion for subject mastery, always adapting to your demands.

1.2 Motivation

The motivation for developing ReadWiz: AI Assistant for Mastering Any Content comes from the need to address today's difficulties of too much information and making learning easy for everyone. We are bombarded with text in the modern world, and it can be challenging to stay along. Whether you are a professional, researcher, or student, we aim to make life easier for everyone. Our aim is to provide people with a tool that simplifies complicated knowledge. We think that everyone is able to acquire knowledge more easily when the material is clear and easy to grasp.

1.3 Problem Statement

The problem we aimed to solve with this project is the lack of accessible and comprehensive tools for managing the overwhelming volume and variety of digital content available today. We recognized that users face challenges in efficiently processing, understanding, and interacting with diverse types of information, including text, PDFs, videos, images, and other document formats. Existing systems often lack user-friendly interfaces and fail to offer a holistic set of features, such as text summarization, paraphrasing, and interactive capabilities with PDF files. Our goal was to develop a solution that addresses these shortcomings by providing intuitive interfaces and a comprehensive suite of functionalities to empower users to navigate and comprehend digital content more effectively.

1.4 Existing Systems

Several existing systems offer features akin to those provided by ReadWiz. SummarizeBot condenses lengthy texts into concise summaries, while Paraphrase Online aids in rewriting text to simplify language or avoid plagiarism. PDF Expert facilitates comprehensive PDF document management, and MindMeister enables visual organization of ideas through mind mapping. NaturalReader converts written text into spoken words for auditory consumption. However, ReadWiz stands out by integrating multiple functionalities such as text summarization, paraphrasing, PDF interaction with chat capabilities, mind mapping, text-to-speech, and image and video summary, along with summary analytics, into a single, user-friendly platform.

1.5 Lacuna of existing systems

Existing text processing systems frequently struggle to satisfy the wide range of user demands due to a number of issues. A major disadvantage is the absence of full integration across various functionalities. Although several systems do particularly well at certain tasks, such as paraphrase or text summarization, they frequently fall short of offering a full solution. Furthermore, a lot of current systems are not very user-friendly; in order to do certain activities, users frequently must switch between different platforms or tools. The restricted support for multimedia material processing, including picture and video summarization, is another flaw in these systems that limits their usefulness and accessibility. These drawbacks attract attention to the need for a more adaptable and user-friendly solution, such as ReadWiz, which solves these issues by combining a variety of features into a single platform.

1.6 Relevance of the project

In today's knowledge-centric world, when people and organizations struggle with information overload and advanced textual material, the project is extremely relevant. ReadWiz provides an extensive tool for understanding multimedia material, summarizing text, and paraphrasing, addressing the crucial need for effective information processing. It increases productivity and knowledge transfer by simplifying the process of obtaining important ideas from long materials. Additionally, ReadWiz encourages users from a variety of areas and backgrounds to have easy access to knowledge, enabling them to further their objectives and make well-informed judgments.

Chapter II: Literature survey

A: Textlytic: Automatic Project Report Summarization Using NLP Techniques. [1]

Authors: Menon, Riya & Tolani, Namrata & Tolamatti, Gauravi & Ahuja, Akansha & R L, Priya

The paper proposes a methodology for automatic project report summarization using NLP techniques. The approach involves preprocessing the document, splitting it into sections, and summarizing each section. The methodology uses PyPDF2 and Camelot libraries for document processing, word2vec for extractive summarization, and K-means clustering for grouping word vectors. The resulting summary is generated by combining the summaries and figures/diagrams of each section. The system also provides a user-friendly web application interface for convenience.

B: Hybrid Algorithm to Generate Summary of Documents by Extracting Keyword. [2]

Authors: Surbhi Patel, Devanshi Parikh, & Hiren Joshi

The paper presents a hybrid algorithm for generating summaries of documents by extracting keywords. The algorithm follows a step-by-step process that includes identifying the number of pages, performing N-gram analysis, removing stop words, applying stemming, and measuring word similarity using WordNet. The results are then displayed. The automatic keyword extraction enables the identification of key words, phrases, or segments that describe the meaning of the document. The proposed algorithm combines multiple methods and algorithms, such as Text Rank, RAKE, and TAKE, to achieve higher recall and f-measure compared to individual extractors.

C: A Deep Generative Framework for Paraphrase Generation. [3]

Authors: Ankush Gupta, Arvind Agrawal, Prawaan Singh, & Piyush Rai

The paper proposes a deep generative framework for paraphrase generation. It combines deep generative models (VAE) with sequence-to-sequence models (LSTM) to generate paraphrases given an input sentence. The models are trained using stochastic gradient descent with a fixed learning rate and dropout rate. The proposed method conditions both the encoder and decoder sides of the VAE on the original sentence to generate paraphrases. The proposed method outperforms state-of-the-art methods in terms of performance improvement, as demonstrated by quantitative evaluation on a benchmark paraphrase dataset. The generated paraphrases are well-formed, grammatically correct, and relevant to the input sentence, as indicated by qualitative human evaluation.

Chapter III: Requirement Gathering for the Proposed System

3.1 Introduction to requirement gathering

Requirement gathering is a crucial initial phase in the software development process, where the focus is on identifying and documenting the needs and expectations of stakeholders for a given project. This process involves gathering information about the desired features, functionalities, and constraints of the software system to be developed. The main objective of requirement gathering is to establish a clear understanding of what the software should accomplish and to define the scope of the project. This is achieved through various techniques such as interviews, surveys, workshops, and documentation analysis, where stakeholders, including clients, end-users, and domain experts, are actively engaged to elicit and prioritize their requirements.

3.2 Functional requirements

Functional requirements specify the specific functionalities and features that the system must provide to meet the needs of stakeholders and users. Functional requirements for our system are:

- Text Summarization: Accept input text of varying lengths and generate concise summaries of input text based on specified parameters (e.g., summary length).
- Paraphrasing: Accept input text or files for paraphrasing. Provide paraphrased versions of input text that preserve the original meaning. It gives 3 paraphrased outputs.
- Chat with PDF: Enable users to upload PDF documents for interactive chat. Extract text content from uploaded PDF files for chat interactions.
- Multimedia Content Summarization: Support the summarization of multimedia content, including videos and images.
- Text-to-Speech Functionality: It allows users to convert output texts into spoken audio.

3.3 Non functional requirements

Non-functional requirements define the quality attributes and constraints that the system must adhere to. In our project, non-functional requirements includes:

- Performance: The system should respond to user interactions within acceptable response times, even under peak loads. Text summarization, paraphrasing, and multimedia content processing should occur efficiently to minimize processing delays.

- Reliability: The system should be reliable and available for use at all times, with minimal downtime for maintenance or updates.
- Scalability: The system should be scalable to accommodate increasing numbers of users and growing volumes of data.
- Usability: Text summarization, paraphrasing, and multimedia content processing features should be accessible and straightforward to use, even for users with limited technical expertise.

3.4 Hardware, Software, Technology and tools utilized

- Hardware
  - Standard computing hardware including processors, memory, storage device
- Software
  - Python as primary programming language
- Technology
  - Tensorflow to implement neural networks
  - Google Gemini

3.5 Constraints

- Technological Constraints: The system must be compatible with specific natural language processing (NLP) frameworks or libraries for text analysis and processing. Integration with third-party APIs or services for text-to-speech functionality may impose constraints on the selection of compatible services and technologies.
- Resource Constraints: Limited computational resources, such as processing power and memory, may impact the system's ability to handle large volumes of data efficiently.
- Operational Constraints: Integration with existing systems or platforms, such as network bandwidth limitations or server capacity, may impact system performance and scalability, particularly during peak usage periods.
- User Constraints: User preferences and expectations regarding the user interface design, functionality, and accessibility may impose constraints on the system's usability and user experience. Multilingual or multicultural user bases may require support for diverse languages, dialects, or cultural norms, imposing constraints on content processing and interaction.
- Environmental Constraints: Environmental factors, such as internet connectivity issues or device compatibility limitations, may impact the accessibility and usability of the system for users in different geographical locations or environments.

Chapter IV: Proposed Design

4.1 Block diagram of system

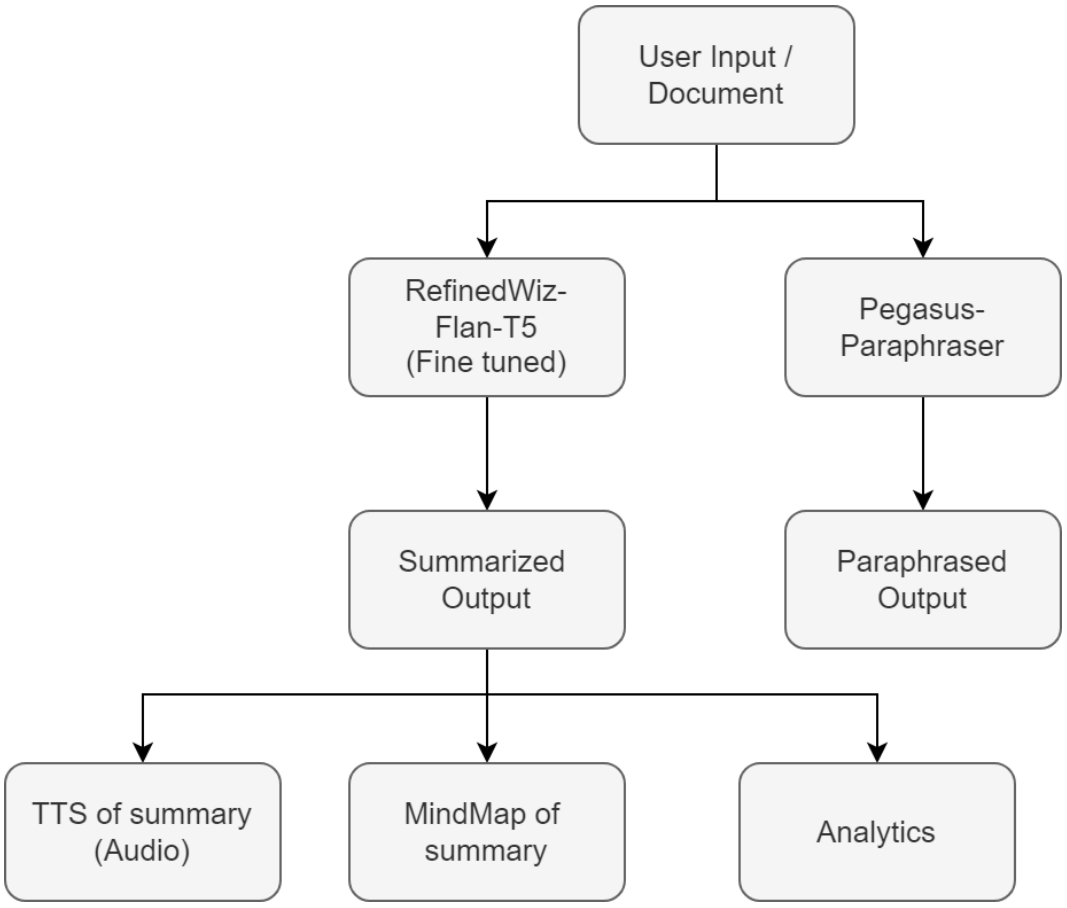

Figure 4.1 Block Diagram of system

1. User Input/Document: This section enables users to input text directly or upload documents in various formats such as Word, PDF, PPT, or TXT, providing flexibility in content input methods.

2. RefinedWiz (Fine-tuned Model): RefinedWiz represents the fine-tuned model responsible for processing the input text and generating a summary. It refines the input data and prepares it for further analysis and summarization.

3. Pegasus-Paraphraser: Powered by Pegasus, an advanced language model, the Paraphraser module rephrases the input text while maintaining its original meaning. This functionality is crucial for tasks like content rewriting, language learning, and avoiding plagiarism.

4. Summarized Output: After processing by RefinedWiz, this block produces a concise summary of the input text, highlighting key points and essential information extracted from the original content.

5. Paraphrased Output: Utilizing the capabilities of Pegasus, this block produces paraphrased versions of the input text. These paraphrases offer alternative expressions while preserving the core ideas, enhancing the accessibility and understanding of the content.

6. TTS (Text-to-Speech) of Summary (Audio): ReadWiz offers a Text-to-Speech feature that converts the summarized text into audio format. Users can listen to the summary instead of reading it, catering to different learning preferences and accessibility needs.

7. MindMap of Summary: To aid in visualizing the structure and key points of the summarized text, ReadWiz generates a mind map. This visual representation helps users grasp the relationships between different concepts and navigate the content more effectively.

8. Analytics: The Analytics block provides insights into the differences between the original text and the summary in terms of word count, character count, line count, and other relevant metrics, aiding users in evaluating the summarization effectiveness.

4.2 Project Scheduling & Tracking using Timeline / Gantt Chart

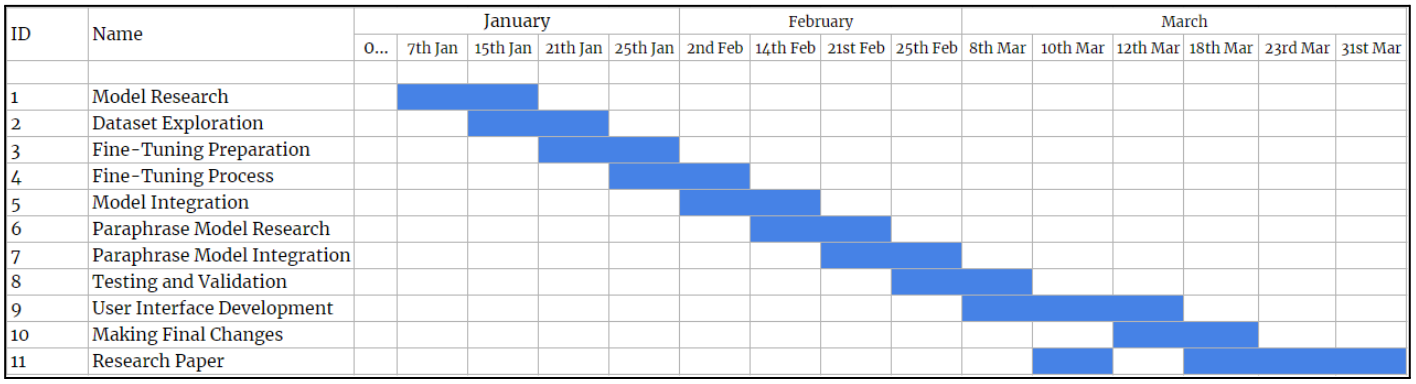

Figure 4.2 Gantt Chart

Chapter V: Implementation of Proposed System

5.1 Methodology employed for development

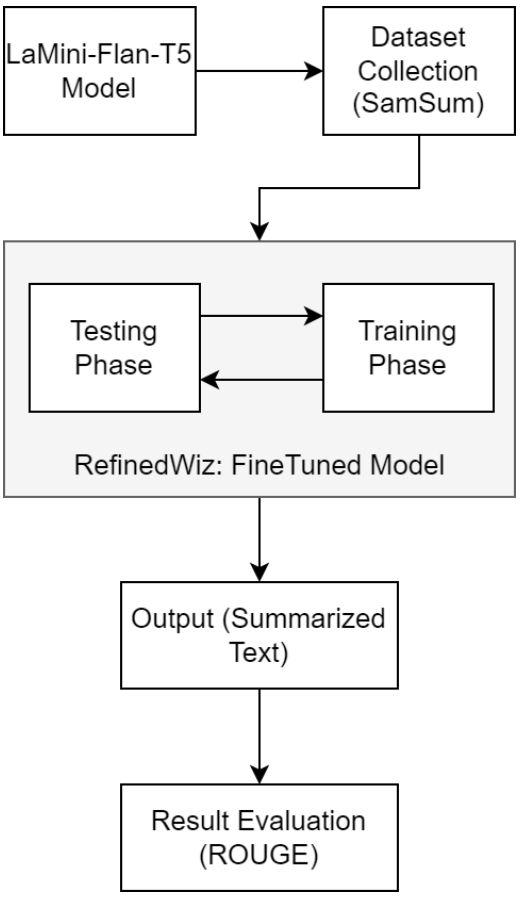

Figure 5.1 Methodology followed for Summarizer

- Model Selection and Preparation: We carefully choose the LaMini-Flan-T5 Model for its excellent text summarization capabilities. Before using it, we make sure the model is ready by preparing it and optimizing its settings to improve its performance.
- Dataset Collection: To train our summarization model effectively, we acquire the SAMSum dataset, containing over 16,000 chat-like conversations with accompanying summaries. This diverse dataset encompasses various linguistic styles and conversation types, providing valuable training data for our model.
- Fine-Tuning Model: The LaMini-Flan-T5 Model undergoes a fine-tuning process using the SAMSum dataset. Through this process, the model learns to better understand and summarize text, refining its abilities to generate accurate and concise summaries tailored to specific input text. Additionally, the fine-tuned model is referred to as "RefinedWiz," representing its enhanced capabilities in text summarization.
- Output Text Generation: Once the model is fine-tuned, it becomes capable of generating summaries based on input text. We focus on ensuring that these summaries are not only accurate but also coherent and relevant to the original text, making them easier for users to understand and extract key information from.

- Result Evaluation: To assess the effectiveness of our summarization model, we employ the ROUGE metric, which measures the similarity between the generated summaries and reference summaries. By analyzing ROUGE scores, we can evaluate the quality of our model's output and make any necessary adjustments to improve its performance.

5.2 Algorithms and flowcharts for the respective modules developed

Algorithm for Summarize Module:

- Input: Users can provide a document (PDF, TXT, DOC, PPT, Image) or text input or a video link, which is then preprocessed to remove any irrelevant information or noise.
- Process: The text is tokenized into sentences, allowing for a more granular analysis of the content. This step ensures that the summarization process captures the key points of each sentence.
- Action: The preprocessed text is fed into the RefinedWiz model, which has been fine-tuned to generate accurate and concise summaries. The model leverages advanced natural language processing techniques to identify the most important information and condense it into a summary.
- Output: The module produces a summarized version of the input text, providing users with a concise overview of the original content. Additionally, analytics are generated to compare the input data with the summary, including metrics such as word count, character count, and line count.

Algorithm for Paraphrase Module:

- Input: Similar to the summarization module, users input a document or text that they want to paraphrase for better understanding or to avoid plagiarism.
- Process: The input text undergoes preprocessing, which involves cleaning and formatting to ensure consistency and accuracy.
- Action: The module utilizes the Pegasus paraphrase model to generate multiple paraphrased versions of the input text. Pegasus is capable of understanding the context and semantics of the input text, allowing it to produce paraphrases that retain the original meaning while using different wording.
- Output: Three variations of the input text are generated, providing users with alternative formulations of the same content. This enables users to choose the paraphrase that best suits their needs or preferences.

Algorithm for Chat With PDF Module:

- Input: Users upload a PDF document containing the information they want to inquire about or discuss.

- Process: The module extracts the text content from the PDF document and preprocesses it to prepare it for analysis.
- Action: Users can ask questions related to the content of the PDF document, which are then processed by the system. The module employs the Gemini model, a chatbot specifically trained on the extracted text, to provide relevant and accurate answers to user queries.
- Output: Concise answers to user questions are displayed, allowing users to interact with the content of the PDF document in a conversational manner. This enhances user engagement and facilitates knowledge retrieval from the document.

5.3 Datasets source and utilization

Datasets Source:

- The SAMSum dataset, sourced from Hugging Face, comprises around 16,000 messenger-like conversations alongside summaries.
- Curated by linguists proficient in English, SAMSum conversations mimic real-life messenger exchanges, capturing various styles, registers, and content nuances.
- Annotated with summaries reflecting essential conversation points, SAMSum aims to provide concise third-person perspectives on the discussions.

Utilization in the Project:

- SAMSum plays a pivotal role in fine-tuning the text summarization model, particularly the RefinedWiz component.
- Fine-tuning entails training the model on a subset of SAMSum data to enhance its summarization capabilities.
- Leveraging the dataset's diverse conversational content, the fine-tuned model generates accurate and coherent summaries from input text.
- SAMSum also serves as a valuable resource for evaluating the model's performance and assessing its efficacy in capturing crucial information from conversations.

Chapter VI: Testing of Proposed System

6.1 Introduction to testing

Testing plays a crucial role in ensuring the system's reliability and functionality before it goes live. It involves systematically examining the system's performance under different scenarios to detect any issues, validate its functionality, and confirm that it meets the expected requirements. Through rigorous testing, we aim to identify and address any potential defects or problems, ensuring a smooth user experience and minimizing the likelihood of errors or malfunctions.

6.2 Types of tests Considered

- Unit Testing: Individual components are tested in isolation to verify their correctness and functionality.
- Integration Testing: Ensures that different components/modules work seamlessly together when integrated into the system.
- Functional Testing: Validates that the system's functionalities align with specified requirements and user expectations.
- Regression Testing: Verifies that recent changes in the codebase do not introduce unintended side effects or break existing functionalities.
- Performance Testing: Measures the system's responsiveness, stability, and scalability under various load conditions to ensure optimal performance.
- Security Testing: Identifies and addresses vulnerabilities to ensure the system's protection against potential security threats and breaches.
- Usability Testing: Assesses the system's ease of use and intuitiveness from an end-user perspective to enhance user experience.
- Compatibility Testing: Validates that the system functions correctly across different platforms, devices, and environments to ensure widespread accessibility and usability.

6.3 Various test case scenarios considered

- Summarization Accuracy: Ensure that the generated summaries accurately capture the key information from the original text across various document types and lengths.
- Paraphrasing Quality: Validate the quality of paraphrased texts by comparing them with the original input to ensure they preserve the original meaning while offering alternative expressions.
- PDF Chat Interaction: Test the chat functionality with PDF documents to ensure accurate extraction of information and relevant responses to user queries.

- Mind Map Visualization: Verify the effectiveness of the mind map feature in representing the summarized content's structure and key points for enhanced comprehension.
- Text-to-Speech (TTS) Conversion: Assess the clarity and coherence of the audio summaries generated through the TTS functionality to ensure easy comprehension for users.
- Image and Video Summary Accuracy: Evaluate the accuracy of descriptive summaries generated for multimedia content, ensuring they effectively convey the content's essence.
- Summary Analytics: Validate the accuracy of summary analytics, including metrics like word count, character count, and similarity scores between original and summarized texts.
- User Interface Interaction: Test the user interface for intuitiveness, responsiveness, and accessibility across different devices and screen sizes to ensure a seamless user experience.

6.4 Inference drawn from the test cases

The test cases conducted on ReadWiz revealed insights into its performance and functionality. Summarization accuracy varied based on text complexity, with shorter documents yielding more accurate summaries. Paraphrasing quality was satisfactory, preserving original meaning while offering diverse expressions. PDF chat interaction accurately extracted information and provided relevant responses. The mind map visualization aided in understanding content structure and key points. Text-to-speech conversion produced clear audio summaries, enhancing accessibility. Image and video summaries were generally accurate, with occasional discrepancies. Summary analytics provided valuable insights, aiding in content assessment. The user interface was intuitive, contributing to a seamless experience.

Chapter VII: Results and Discussion

7.1 Screenshots of User Interface (UI) for the respective module

Summarizer:

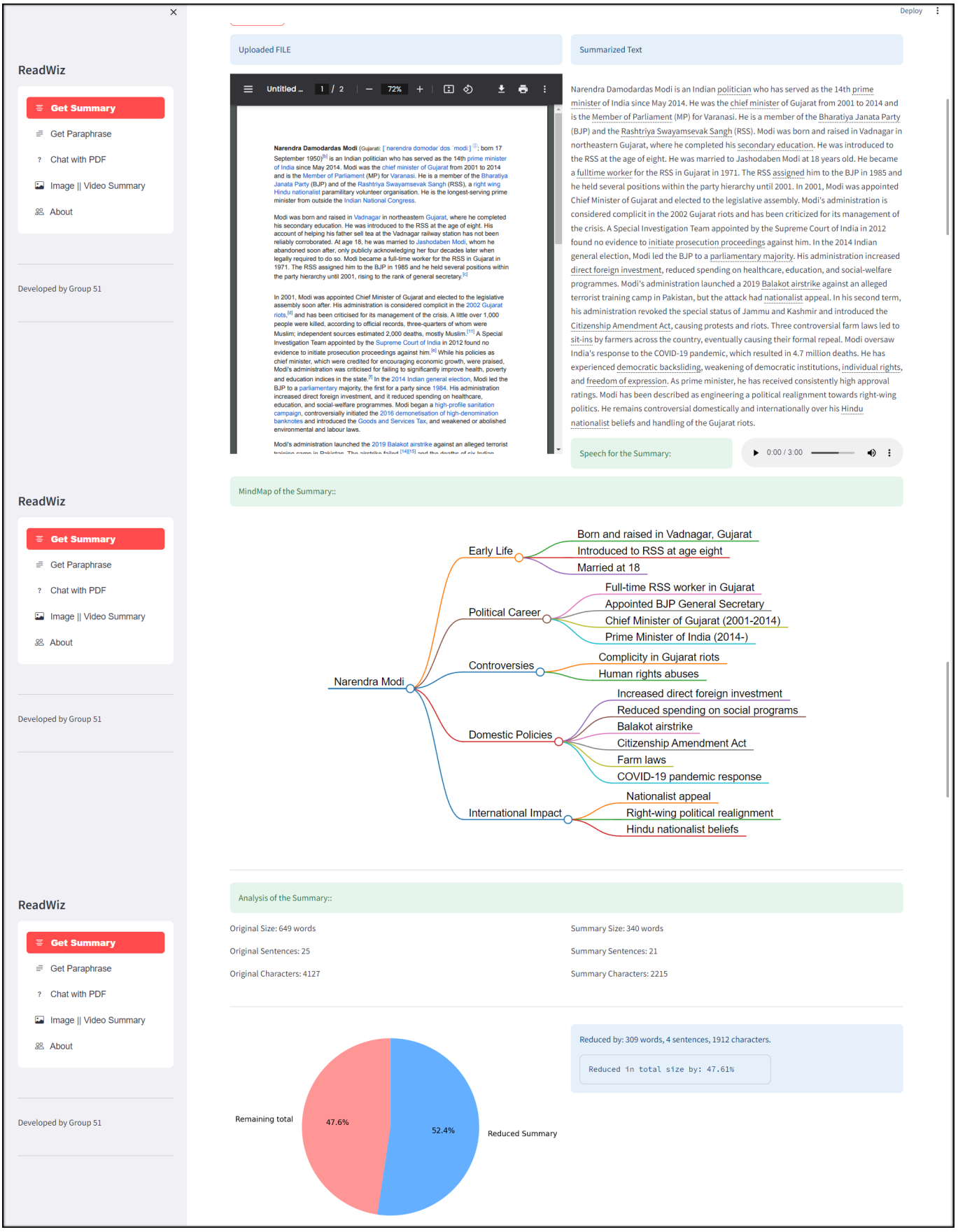

Figure 7.1.a Text Summarizer Module

Paraphraser:

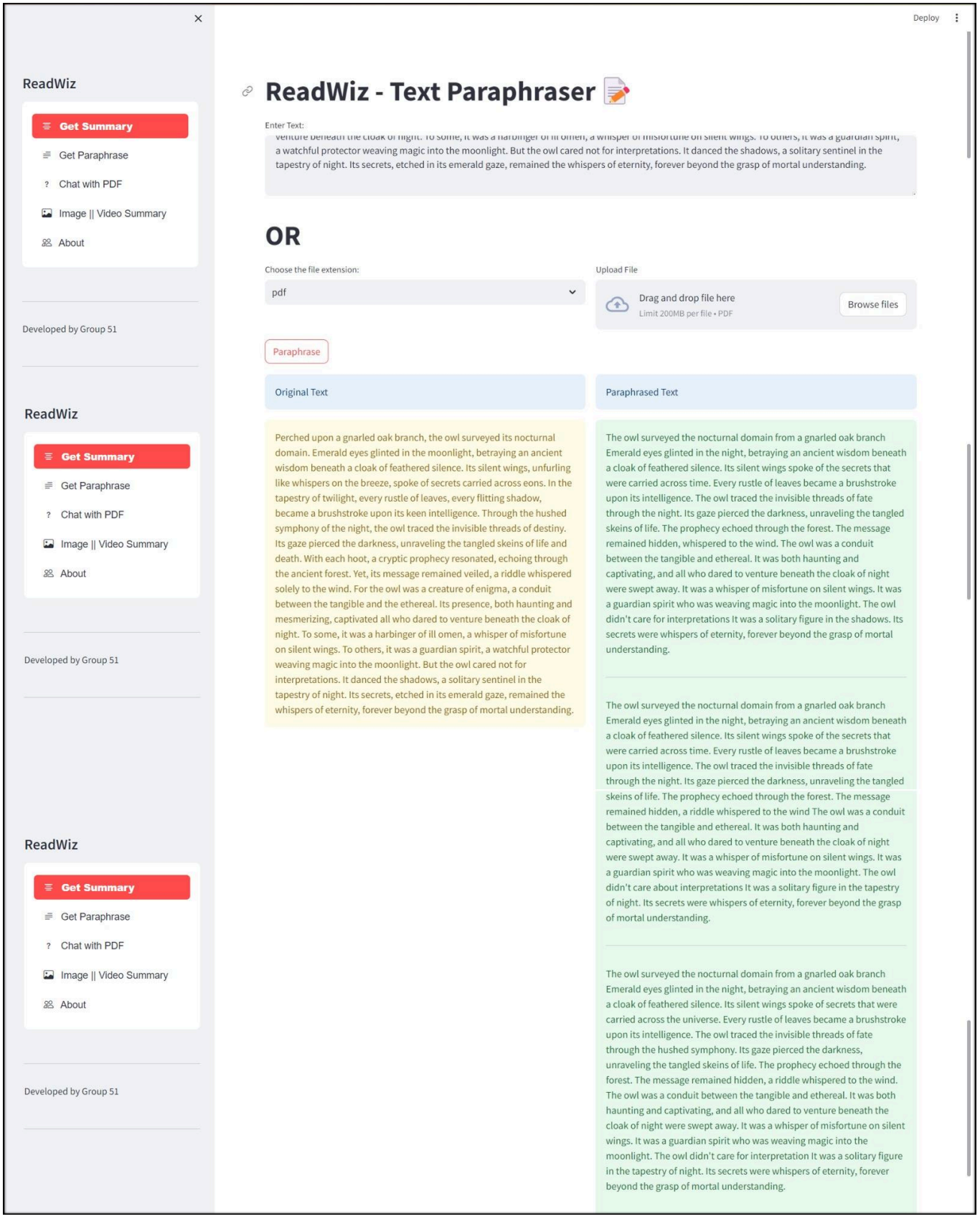

Figure 7.1.b Text Paraphraser Module

Chat with PDF:

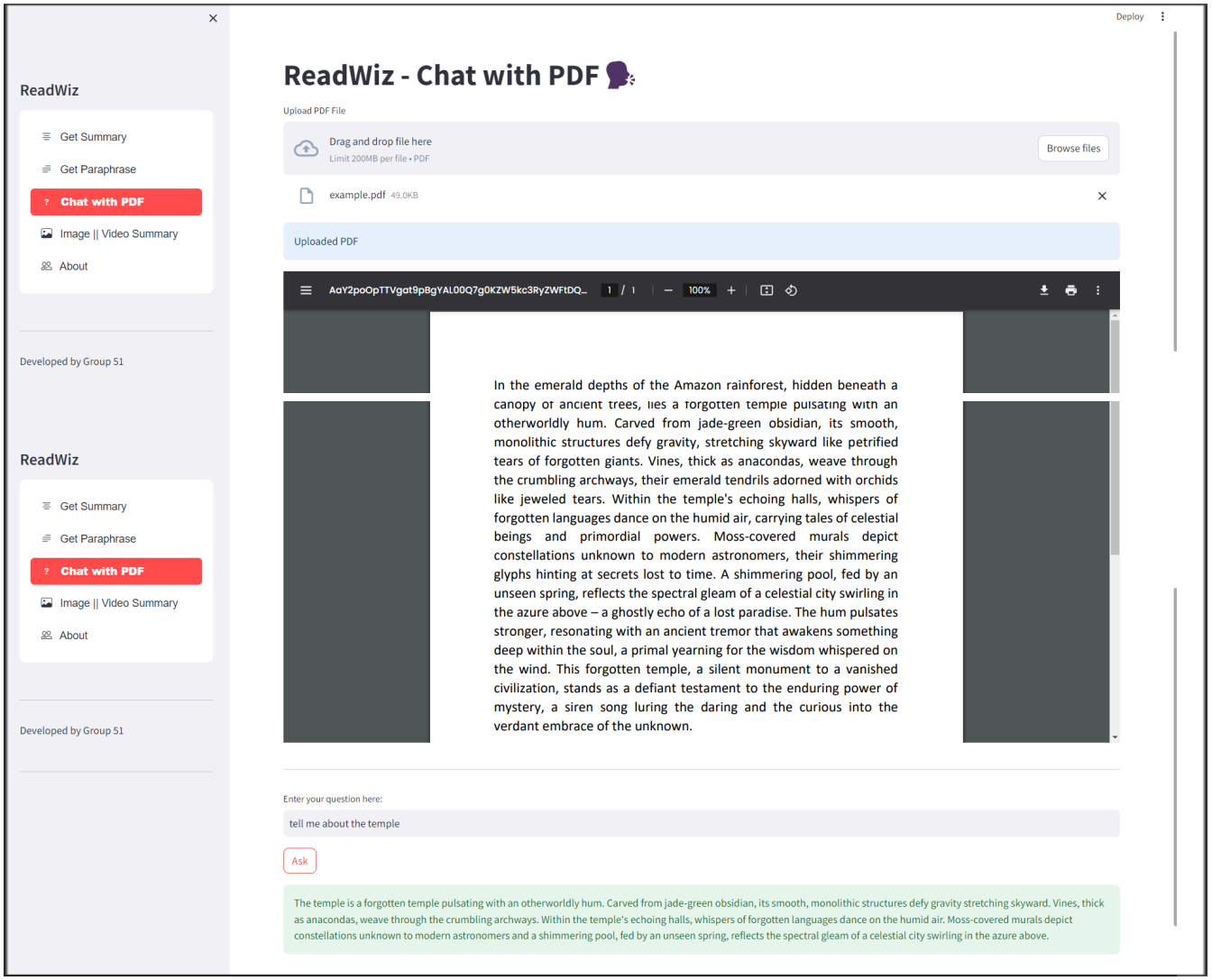

Figure 7.1.c Chat with PDF Module

Image and Video Summarizer:

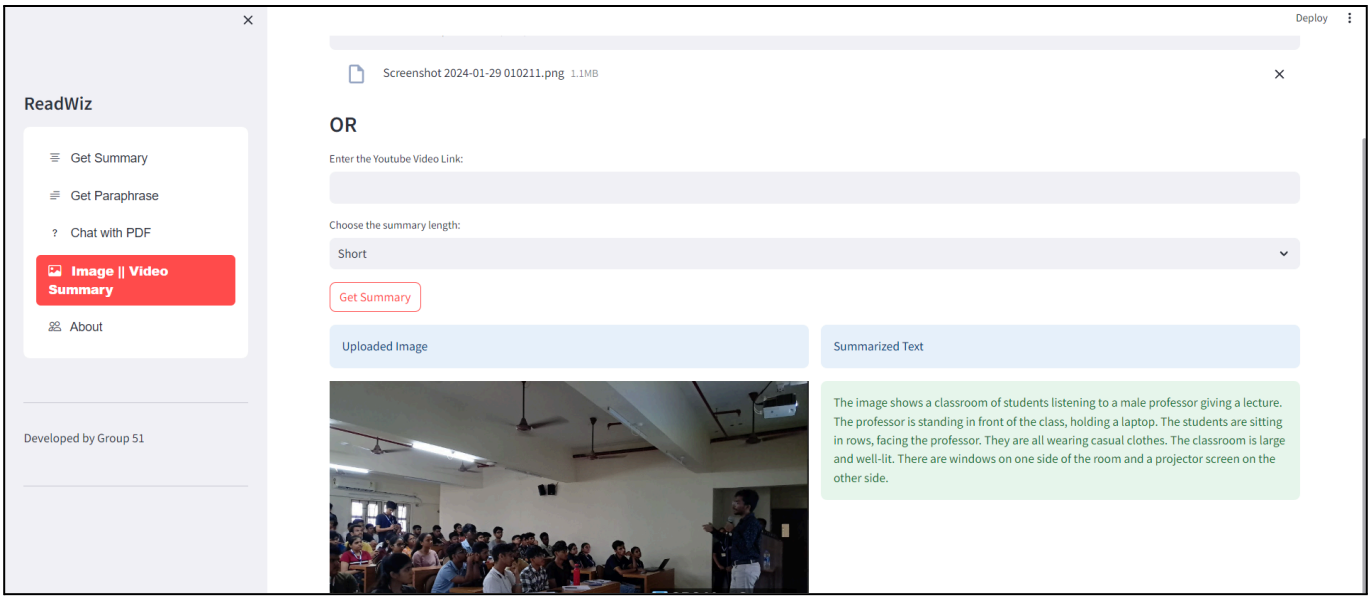

Figure 7.1.d Image and Video Summarizer Module (*Image Summary*)

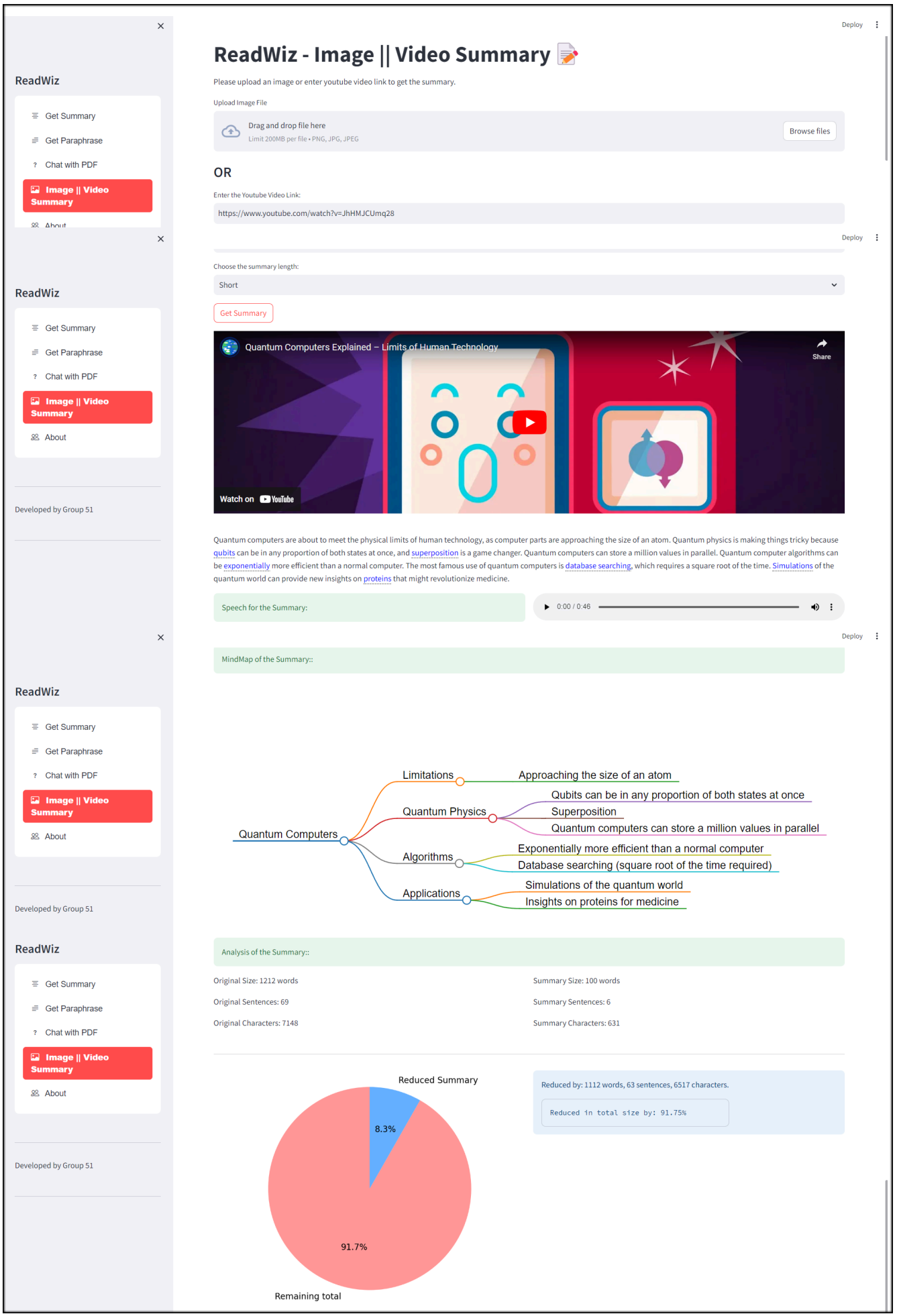

Figure 7.1.e Video Summarizer (*Youtube Video Summary*)

7.2 Performance Evaluation measures

For evaluating the performance of ReadWiz Summarizer Module, the ROUGE metric was employed as the primary evaluation measure. ROUGE assesses the quality of generated summaries by comparing them with reference summaries, measuring factors like overlap in n-grams, word sequences, and sentence similarity. This metric provides valuable insights into the coherence, relevance, and informativeness of the generated summaries. Additionally, other performance evaluation measures, such as precision, recall, and F1-score, may also be utilized to assess the system's summarization accuracy and effectiveness.

- Precision: Precision measures the accuracy of the system's generated summaries by calculating the ratio of relevant information presented in the generated summary to the total information included in the summary.
- Recall: Recall evaluates the comprehensiveness of the system's generated summaries by determining the ratio of relevant information covered in the generated summary to the total relevant information available in the source document.
- F1 Score: The F1 score provides a balance between precision and recall, calculated as the harmonic mean of precision and recall. It offers a single metric to assess the overall effectiveness of the system's summarization performance.

Example:

LLM Model	ROUGE-1			ROUGE-2			ROUGE-L		
	R	P	F	R	P	F	R	P	F
RefinedWiz-Flan-T5-248M (Fine tuned)	49.18	38.02	41.29	17.19	12.14	13.25	45.91	34.72	38.11

Table 7.2 Performance of RefinedWiz model on sample data

7.3 Input Parameters / Features considered

For evaluation based on ROUGE metrics, we considered the following input parameters:

- ROUGE-N Precision: Measures the proportion of overlapping n-grams (contiguous sequences of n words) between the generated summary and the reference summary.
- ROUGE-N Recall: Calculates the proportion of overlapping n-grams between the generated summary and the reference summary relative to the reference summary.
- ROUGE-N F1 Score: Represents the harmonic mean of precision and recall, providing a balanced measure of summarization quality.
- ROUGE-L Precision: Evaluates the precision of the longest common subsequence (LCS) between the generated summary and the reference summary.

- ROUGE-L Recall: Assesses the recall of the LCS between the generated summary and the reference summary relative to the reference summary.
- ROUGE-L F1 Score: Computes the F1 score of the LCS, indicating the overall effectiveness of the summarization process.

7.4 Graphical and statistical output

Outputs for Summarizer:

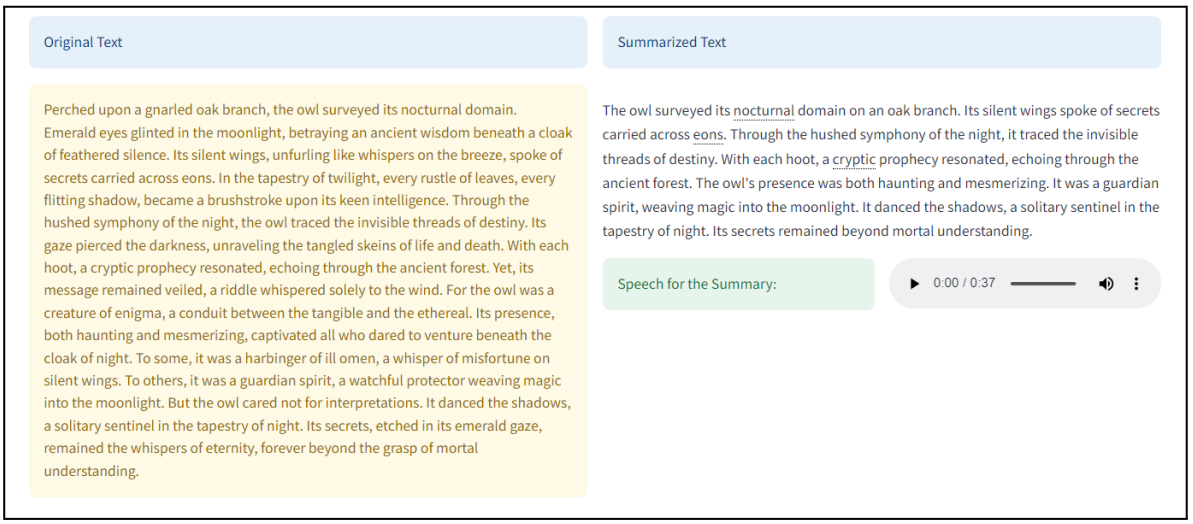

Figure 7.4.a Generating summary of the sample paragraph

Following the creation of the summary according to the input text, we moved our attention to evaluating the performance of the summarizing process. We evaluated the quality of the produced summaries using recognized assessment measures by utilizing a thorough testing technique. Using Rouge testing, a popular approach to assess text summarizing algorithms' performance, the input text was carefully analyzed. The findings were then carefully examined and graphically shown to give an in-depth understanding of the effectiveness of the summarizing procedure. This included creating a line graph using the Rouge scores that were obtained during the testing phase to provide an understandable and straightforward representation of the summarizing model's performance. Through this careful review and visualization method, we wanted to give consumers significant insights into the summary process and its outcomes, facilitating informed decision-making and enhancing overall user experience.

Rouge results for this generated Summary:

{'rouge-1':
{'r': 0.5254237288135594, 'p': 0.4769230769230769, 'f': 0.4999999950117067}},
{'rouge-2':
{'r': 0.2898550724637681, 'p': 0.25, 'f': 0.2684563708661773}},
{'rouge-l':
{'r': 0.4745762711864407, 'p': 0.4307692307692308, 'f': 0.45161289823751305}}

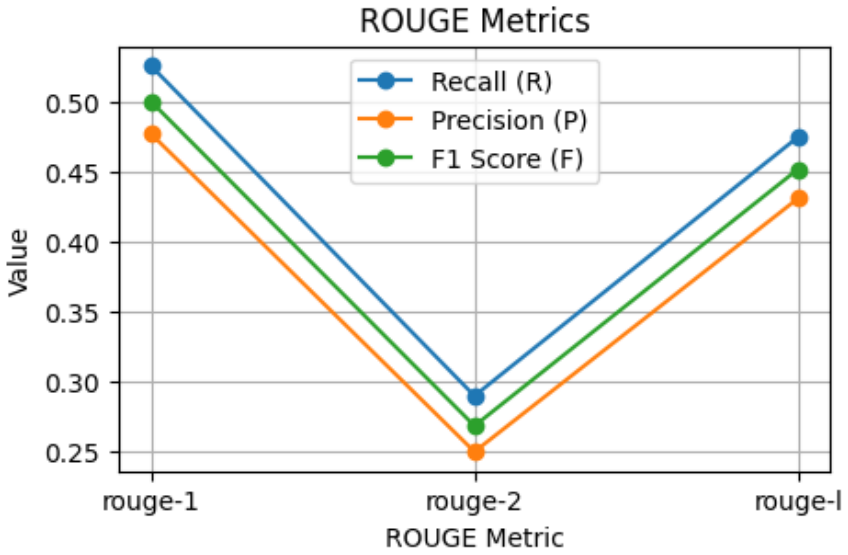

Figure 7.4.b Performance of RefinedWiz model on sample data

7.5 Comparison of results with existing systems

In our comparative analysis for the Summarizer task between the RefinedWiz model and an online tool, we aimed to evaluate their performance in text summarization based on various ROUGE metrics. The comparison was conducted on a subset of rows extracted from the SAMSum dataset, with the average scores considered for each metric.

The RefinedWiz model achieved higher scores across almost all ROUGE metrics compared to the online tool, indicating its superior performance in text summarization.

LLM Model	ROUGE-1			ROUGE-2			ROUGE-L		
	R	P	F	R	P	F	R	P	F
RefinedWiz Model	53.21	33.71	40.48	16.95	08.80	11.00	50.54	31.85	38.32
Online Tool	51.63	31.46	38.51	15.54	09.36	11.57	47.15	29.05	35.42

Table 7.5 Comparison with Online Tool

For ROUGE-1, which measures the overlap of unigram units between the generated summary and the reference summaries, the RefinedWiz model achieved a Recall of 53.21%, Precision of 33.71%, and F1-score of 40.48%. In comparison, the online tool scored slightly lower with a Recall of 51.63%, Precision of 31.46%, and F1-score of 38.51%.

Similarly, for ROUGE-2, which considers the overlap of bigram units, the RefinedWiz model outperformed the online tool with a Recall of 16.95%, Precision of 8.80%, and F1-score of 11.00%, compared to the online tool's Recall of 15.54%, Precision of 9.36%, and F1-score of 11.57%.

Finally, for ROUGE-L, which computes the longest common subsequence of words, the RefinedWiz model demonstrated superior performance with a Recall of 50.54%, Precision of 31.85%, and F1-score of 38.32%, while the online tool achieved a Recall of 47.15%, Precision of 29.05%, and F1-score of 35.42%.

Sample Example:

Input: *Olivia: Who are you voting for in this election? Oliver: Liberals as always. Olivia: Me too!! Oliver: Great.*

Actual Summary: *Olivia and Olivier are voting for liberals in this election.*

Online tool: *Olivia inquires about her voting preferences in the upcoming election, and Oliver confirms that she is a Liberal, which Olivia agrees with.*

RefinedWiz Summary: *Olivia and Oliver are voting for the Liberals in the election. Oliver is also a Liberal. They both agree that it's a great election.*

7.6 Inference drawn

From the comparison with ROUGE measures, it is clear that the RefinedWiz model performs better than the current online tool in several evaluation categories. RefinedWiz's better recall, precision, and F1 ratings indicate how well it summarizes textual material. This improved performance demonstrates how strong RefinedWiz is at producing concise and appropriate summaries from input texts or documents.

Through improved summarization accuracy, RefinedWiz helps users quickly extract important details and insights from long texts. As a result, RefinedWiz is unique as a useful tool for a range of uses, such as data processing jobs, organizing content, and educational research. Furthermore, these results underscore the need of utilizing cutting-edge natural language processing methods, like those utilized in RefinedWiz, to meet the increasing need for efficient text summarization solutions.

Chapter VIII: Conclusion

8.1 Limitations

While ReadWiz offers remarkable capabilities in text summarization, it is not without its limitations. Firstly, due to the complexity of processing large volumes of text, the summarization process may take some time to complete, especially for lengthy documents. Additionally, it's important to recognize that the generated summary is computer-generated and may not always capture the nuanced details of the original text with absolute perfection. Furthermore, when summarizing videos from platforms like YouTube, access to a transcript is essential, as ReadWiz relies on textual content for analysis and summarization. Moreover, utilizing the app efficiently may require a good computer specification to handle the processing demands effectively. Additionally, while the chat feature with PDF documents enhances interaction and accessibility, it may not always provide additional insights beyond the content already available in the document. Despite these limitations, ReadWiz remains a valuable tool for simplifying and enhancing the comprehension of textual material, offering users an efficient means to navigate through vast amounts of information.

8.2 Conclusion

In conclusion, our project aims to provide a simple and effective solution for summarizing text, paraphrasing content, and managing multimedia resources. We're committed to ensuring that our tool is user-friendly and accessible to everyone. By incorporating user feedback and continuously enhancing our system, we're confident that we can deliver a valuable resource for individuals seeking to streamline their digital content experience. We're excited about the possibilities our project holds for improving information accessibility and usability for users across various domains.

8.3 Future Scope

- Better GUI: Enhance the user interface with intuitive design elements, clear navigation, and customizable layouts to improve user experience and engagement.
- Multi-languages: Support multiple languages to cater to a diverse user base, allowing users to interact with the system in their preferred language for improved accessibility and inclusivity.
- Faster Processing: Optimize algorithms and system architecture to ensure faster processing times, enabling quick generation of summaries, paraphrases, and multimedia representations for enhanced efficiency and productivity.

- Comic/Video Representation: Transform text summaries into engaging comic strips or animated videos, adding visual and audio elements to make the content more engaging and memorable for users.
- Offline Access: Provide offline access to summarized content and functionalities, enabling users to access and interact with the system even without an internet connection for increased flexibility and convenience.
- Voice Control: Implement voice control features, allowing users to navigate, interact, and generate content using voice commands for hands-free operation and accessibility.

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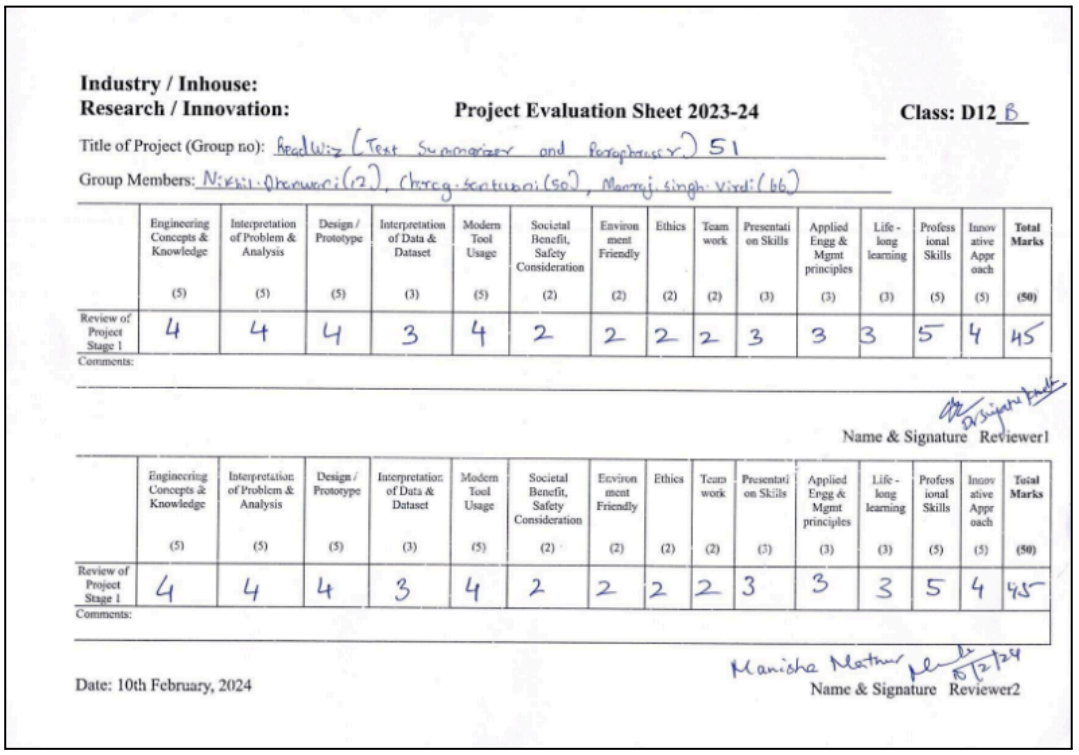
Appendix

Research paper details

Attached separately

Review I sheet:



Industry / Inhouse:
Research / Innovation: **Project Evaluation Sheet 2023-24** **Class: D12 B**

Title of Project (Group no): ReadWiz (Text Summarizer and Paraphraser.) 51

Group Members: Nikki Dhanwani (12), Chirag Santwani (50), Manraj Singh Virdi (66)

	Engineering Concepts & Knowledge (5)	Interpretation of Problem & Analysis (5)	Design / Prototype (5)	Interpretation of Data & Dataset (3)	Modern Tool Usage (5)	Societal Benefit, Safety Consideration (2)	Environment Friendly (2)	Ethics (2)	Team work (2)	Presentation Skills (3)	Applied Engg & Mgmt principles (3)	Life-long learning (3)	Professional Skills (5)	Innovative Approach (5)	Total Marks (50)
Review of Project Stage 1	4	4	4	3	4	2	2	2	2	3	3	3	5	4	45

Comments:

Name & Signature Reviewer1

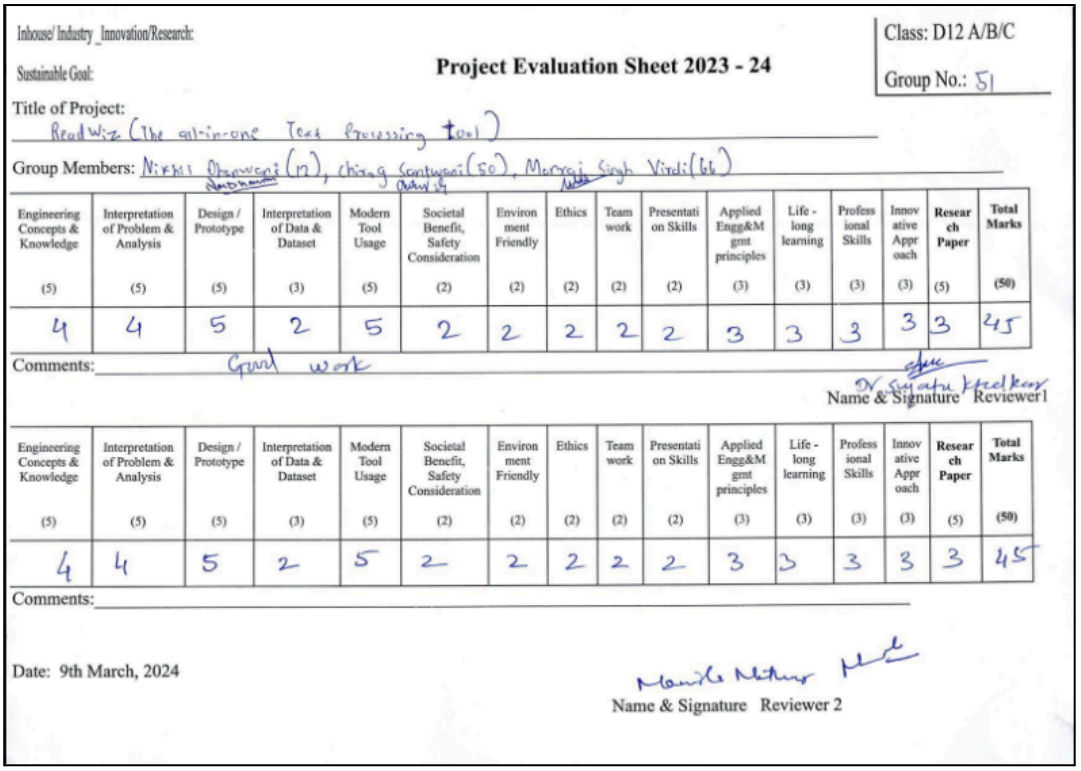
	Engineering Concepts & Knowledge (5)	Interpretation of Problem & Analysis (5)	Design / Prototype (5)	Interpretation of Data & Dataset (3)	Modern Tool Usage (5)	Societal Benefit, Safety Consideration (2)	Environment Friendly (2)	Ethics (2)	Team work (2)	Presentation Skills (3)	Applied Engg & Mgmt principles (3)	Life-long learning (3)	Professional Skills (5)	Innovative Approach (5)	Total Marks (50)
Review of Project Stage 1	4	4	4	3	4	2	2	2	2	3	3	3	5	4	45

Comments:

Date: 10th February, 2024

Manisha Mathur 10/2/24
Name & Signature Reviewer2

Review II sheet:



Inhouse/ Industry _Innovation/Research:

Sustainable Goal:

Project Evaluation Sheet 2023 - 24

Class: D12 A/B/C

Group No.: 51

Title of Project:
ReadWiz (The all-in-one Text Processing tool)

Group Members: Nikki Dhanwani (12), Chirag Santwani (50), Manraj Singh Virdi (66)

Engineering Concepts & Knowledge (5)	Interpretation of Problem & Analysis (5)	Design / Prototype (5)	Interpretation of Data & Dataset (3)	Modern Tool Usage (5)	Societal Benefit, Safety Consideration (2)	Environment Friendly (2)	Ethics (2)	Team work (2)	Presentation Skills (2)	Applied Engg&Mgmt principles (3)	Life-long learning (3)	Professional Skills (3)	Innovative Approach (3)	Research Paper (5)	Total Marks (50)
4	4	5	2	5	2	2	2	2	2	3	3	3	3	3	45

Comments: Good work

Name & Signature Reviewer1

Engineering Concepts & Knowledge (5)	Interpretation of Problem & Analysis (5)	Design / Prototype (5)	Interpretation of Data & Dataset (3)	Modern Tool Usage (5)	Societal Benefit, Safety Consideration (2)	Environment Friendly (2)	Ethics (2)	Team work (2)	Presentation Skills (2)	Applied Engg&Mgmt principles (3)	Life-long learning (3)	Professional Skills (3)	Innovative Approach (3)	Research Paper (5)	Total Marks (50)
4	4	5	2	5	2	2	2	2	2	3	3	3	3	3	45

Comments:

Date: 9th March, 2024

Manisha Mathur
Name & Signature Reviewer 2