**AutoSlides: Generative Presentation**

Submitted in partial fulfillment of the requirements of the degree

**BACHELOR OF ENGINEERING** IN **COMPUTER ENGINEERING**

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## CERTIFICATE

This is to certify that the Mini Project entitled **"AutoSlides: Generative Presentation"** is a bonafide work of **Harsh Saindane (D12A/53), Joel Dias (D12A/19), Dhruv Chatrani (D12A/28), Harsh Ahuja (D12A/02)** 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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This Mini Project, "**AutoSlides: Generative Presentation" by Harsh Saindane (D12A/53), Joel Dias (D12A/19), Dhruv Chatrani (D12A/28), Harsh Ahuja (D12A/02)**, is approved for the **Bachelor of Engineering** in **Computer Engineering degree.**

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**Contents**

**Abstract**

The AutoSlides project addresses a prevalent challenge in professional and academic environments: the time-intensive process of creating effective presentations from comprehensive documents. This report introduces AutoSlides, an innovative platform designed to streamline and enhance the presentation creation process by leveraging advanced technologies such as Large Language Models (LLMs) and sophisticated data formatting techniques.

AutoSlides aims to tackle common pain points faced by professionals across various sectors who struggle with distilling key information from lengthy documents into concise, visually impactful slides. The platform's primary objectives include improving efficiency, enhancing information retention, and facilitating clearer communication through optimized visual representations of complex data. This report outlines the project's motivation, stemming from extensive research on user needs and identified gaps in current presentation software. It provides a detailed exploration of AutoSlides' technical architecture, elucidating how LLMs are employed to comprehend and summarize document content.

The report concludes by outlining future development plans for AutoSlides. These include integration with popular presentation software, development of industry-specific customization features, and exploration of multilingual support to expand the platform's global applicability.

By offering a comprehensive solution to streamline presentation creation, AutoSlides positions itself as an innovative tool in the realm of information visualization and communication. It has the potential to transform how knowledge is shared and presented across diverse professional environments, making complex information more accessible and engaging for audiences.

## Acknowledgment

We would like to express our profound gratitude to Vivekanand Education Society's Institute of Technology for providing an environment conducive to innovation and learning. The institute's support in terms of resources, facilities, and encouragement has been instrumental in the successful completion of our project, AutoSlides.

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We extend our heartfelt thanks to Dr. Nupur Giri, Head of the Computer Engineering Department, and our Principal, Dr. J.M.Nair, for granting us the opportunity to work on this project. Their visionary leadership and commitment to fostering student innovation have created an atmosphere where creativity can flourish.

We would also like to acknowledge the collaborative efforts and dedication of our team members: Harsh Saindane, Joel Dias, Dhruv Chatrani, and Harsh Ahuja.
This project has been a significant learning experience, pushing us to expand our knowledge and skills. We are thankful for the opportunity to contribute to the field of automated presentation generation and look forward to seeing how AutoSlides may impact professional and academic environments in the future.

## List Of Abbreviations

- **AI**: Artificial Intelligence
- **LLM**: Large Language Model
- **PPT**: PowerPoint Presentation
- **RAG**: Retrieval-Augmented Generation

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# 1. Introduction

## 1.1 Introduction

The AutoSlides project introduces an innovative generative presentation platform designed to revolutionize the process of creating interactive and informative presentations. In today's fast-paced professional and academic environments, the need for efficient and effective communication tools has never been more critical. AutoSlides addresses this need by offering a user-friendly solution that simplifies the complex task of distilling information from extensive documents into engaging visual presentations.

Traditionally, creating impactful presentations has been a time-consuming process, often requiring hours of manual work to extract key points, design slides, and ensure visual coherence. This process can be particularly challenging when dealing with large volumes of text or complex data sets [1]. AutoSlides aims to streamline this workflow by leveraging advanced technologies such as Large Language Models (LLMs) and sophisticated data formatting techniques [2].

The platform's core functionality allows users to generate presentations from documents containing both text and images. By taking into account user-specified parameters such as the desired number of slides and the intended tone or level of formality, AutoSlides produces tailored presentations that align closely with user needs and audience expectations. This customization capability ensures that the generated content is not only informative but also appropriately styled for various contexts, from academic lectures to business presentations [3].

Furthermore, AutoSlides addresses the growing trend towards digital transformation in various sectors. As organizations increasingly rely on digital tools for communication and collaboration, platforms like AutoSlides play a crucial role in

enhancing productivity and facilitating knowledge sharing [5]. The ability to quickly generate high-quality presentations from existing documents can save valuable time for professionals, allowing them to focus on content refinement and delivery rather than on the mechanics of presentation creation.

The development of AutoSlides also aligns with current trends in artificial intelligence and natural language processing. By leveraging these technologies, the platform can understand context, identify key points, and generate coherent summaries, tasks that traditionally required significant human effort [6]. This application of AI in content creation and visualization represents a significant step forward in how we interact with and present information.

As we delve deeper into the features and methodologies of AutoSlides in the following sections, it becomes clear that this platform has the potential to transform the landscape of presentation creation. By offering a solution that combines efficiency, customization, and technological innovation, AutoSlides aims to empower users across various fields to communicate their ideas more effectively and with greater impact.

### 1.2 Motivation

In today's fast-paced professional and academic environments, the ability to create compelling presentations quickly and efficiently has become increasingly crucial. The motivation behind AutoSlides stems from several key observations and challenges faced by professionals, educators, and students alike.

Firstly, the traditional process of creating presentations is notably time-intensive. Studies indicate that professionals spend an average of 6-8 hours per week creating and formatting presentations [1], time that could be better allocated to more strategic tasks. This inefficiency is particularly pronounced when dealing with lengthy documents or research papers that need to be condensed into concise presentations while maintaining their core message.

Secondly, there is a growing demand for tools that can bridge the gap between content creation and presentation design. While abundant information is available in various document formats, transforming this content into visually appealing and engaging presentations remains a significant challenge. AutoSlides addresses this need by automating the conversion process while ensuring the preservation of key information and context.

The rise of remote work and digital communication has further amplified the need for efficient presentation tools. According to recent workplace studies, 77% of professionals report that presentations have become more important in virtual settings [2], highlighting the critical need for tools that can streamline the creation process. AutoSlides responds to this demand by offering a solution that reduces the time and effort required to create professional presentations.

Moreover, the increasing complexity of information and data in modern business and academic contexts necessitates tools that can effectively synthesize and present complex ideas. AutoSlides' ability to process various document types and generate coherent, well-structured presentations addresses this challenge directly. The platform's integration of advanced technologies like Large Language Models (LLMs) reflects the growing trend towards AI-assisted content creation and organization [3].

In essence, AutoSlides is driven by the vision of transforming presentation creation from a time-consuming task into a streamlined, efficient process. By addressing these fundamental challenges and leveraging cutting-edge technology, AutoSlides aims to revolutionize how individuals and organizations approach the creation and delivery of presentations, making it a truly essential tool for the modern professional landscape.

### 1.3 Problem Definition and Objectives

The current market for presentation creation tools, including leading platforms like Gamma.ai and Tome.ai, is characterized by several critical limitations that impact productivity and effectiveness. These commercial solutions often implement restrictive pricing models, with Gamma.ai's advanced features locked behind premium tiers and Tome.ai requiring substantial subscription commitments. This pricing structure makes advanced features inaccessible to many users, particularly students and small businesses.

Existing solutions, including Tome.ai, typically limit users to basic text input, lacking the capability to process diverse document formats effectively. Similarly, while Gamma.ai offers some document processing capabilities, its handling of complex formats remains limited. This limitation becomes particularly problematic when dealing with complex documents containing tables, equations, and specialized formatting – a common need in academic and professional settings.

A fundamental challenge across platforms lies in the content comprehension and summarization process. Converting lengthy documents into presentation format requires deep understanding of context and content hierarchy – a capability that current automated solutions struggle to deliver effectively. For instance, Gamma.ai and other competitors often face difficulties in maintaining context when summarizing technical documents, while Tome.ai's focus on storytelling sometimes comes at the expense of technical precision.

**Objectives:** In response to these market gaps, AutoSlides aims to develop a comprehensive solution that revolutionizes the presentation creation workflow. Our primary objective is to create an accessible platform that democratizes advanced presentation generation capabilities, ensuring that powerful features are available to users regardless of their budget constraints – a direct response to the limitations of existing commercial solutions.

The platform seeks to implement robust document processing capabilities that maintain the integrity of various input formats, from PDFs to research papers. By leveraging advanced Large Language Models (LLMs), AutoSlides aims to achieve intelligent content summarization that preserves context and meaning while creating coherent and engaging presentations – addressing a key limitation in current platforms like Tome.ai and Gamma.ai.

We strive to enhance the technical content processing capabilities, ensuring accurate handling of complex elements such as tables, equations, and data visualizations. This includes developing specialized algorithms that maintain the structural integrity of technical information while optimizing its presentation format – features that are currently inadequate or missing in existing solutions.

Furthermore, AutoSlides aims to integrate automated visual enhancement features that generate relevant images and graphics based on content analysis. While competitors like Gamma.ai offer basic image generation, AutoSlides seeks to provide more contextually relevant and technically accurate visual content. This includes implementing smart layout optimization and maintaining consistent design principles across presentations, ensuring professional quality output with minimal user intervention.

The ultimate goal is to transform the presentation creation process from a time-consuming task into a streamlined, efficient workflow that maintains high standards of quality and professionalism. This transformation will enable users across various sectors to communicate their ideas more effectively while significantly reducing the time and effort invested in presentation preparation, filling crucial gaps left by existing solutions in the market.

# 2. Literature Survey

## 2.1 Survey of Existing System

The field of automated presentation generation has seen significant advancements in recent years, with various approaches being developed to address the challenges of converting documents into effective presentations. This chapter presents a comprehensive review of relevant research works that have contributed to this domain.

**1. 2.1 Title of Paper:** Presentations by the Humans and For the Humans: Harnessing LLMs for Generating Persona-Aware Slides from Documents
**Published in:** 2024
**Abstract:** This research presents an innovative approach to automated presentation generation by developing a system that considers audience expertise and presentation duration. The study introduces a novel method of utilizing Large Language Models to create personalized presentation slides from documents. The system is trained on a comprehensive dataset of scientific papers and corresponding slides, employing supervised learning techniques and incorporating human feedback to ensure high-quality, audience-appropriate output.

**Inference:** The research demonstrates significant advancement in presentation automation by introducing audience-aware content generation. The findings indicate that LLM-based systems can effectively understand and adapt content based on audience expertise levels and time constraints. This approach marks a crucial step toward more intelligent and context-aware presentation generation tools, though the dependency on LLMs and lack of active evaluation in training data presents areas for future improvement.

**2.2 Title of Paper:** PPSGen: Learning to Generate Presentation Slides for Academic Papers **Published in:** 2023

**Abstract:** This paper introduces PPSGen, an innovative system designed to automate the generation of presentation slides from academic papers. The research focuses on developing efficient methods for content extraction and organization using sentence scoring models and Integer Linear Programming (ILP). The system demonstrates superior performance compared to traditional slide generation methods.

**Inference:** The study shows significant potential in automating academic presentation creation through advanced computational methods. The combination of sentence scoring and ILP provides an effective framework for content selection and organization. While the system shows promising results in efficiency and customization, its dependency on specific data types and computational resources suggests areas for further optimization.

**2.3 Title of Paper:** Presentations are not always linear! GNN meets LLM for Document-to-Presentation Transformation with Attribution

**Published in:** 2024

**Abstract:** This research introduces GDP, a comprehensive end-to-end approach for transforming lengthy documents into coherent presentations. The system employs a sophisticated methodology combining document graph construction, neural networks, and clustering techniques. The paper evaluates various GPT-based approaches and identifies key areas for improvement in direct LLM application.

**Inference:** The research provides valuable insights into non-linear presentation generation approaches. The integration of graph neural networks with LLMs offers a novel solution to content organization and flow. However, the system's reliance on classifiers and limited multimodal capabilities indicates potential areas for enhancement.

**2.4 Title of Paper:** BIRAG: Basic Introduction to Retrieval Augmented Generation
**Published in:** 2024

**Abstract:** This paper explores the implementation of Retrieval-Augmented Generation (RAG) in improving LLM performance through external knowledge integration. The research details methodologies for combining retrieval models with generative capabilities to enhance content accuracy and relevance.

**Inference:** The study highlights the potential of RAG in improving automated content generation systems. The findings demonstrate enhanced accuracy and contextual relevance, though challenges in model complexity and data preparation remain significant considerations for practical implementation.

**2.5 Title of Paper:** Learning Based Slide Generator

**Published in:** 2020

**Abstract:** This research presents an automated system for generating presentation slides from research papers using BERT-based extraction techniques. The study focuses on developing efficient methods for identifying and organizing key content from academic documents.

**Inference:** The research provides foundational insights into automated slide generation using machine learning approaches. While demonstrating effectiveness in time-saving and content relevance, the system's limited customization options and technical requirements suggest areas for future development.

## 2.2 Limitation of Existing System or Research Gap

The field of automated presentation generation has made strides, but significant gaps remain, primarily concerning the personalization and contextual relevance of the generated slides. Many existing systems, like PPSGen, have demonstrated promising results in content extraction and efficiency but often lack the ability to adapt dynamically to varying audience expertise and presentation contexts. The reliance on fixed algorithms or training data, as highlighted in the paper “Presentations by the

Humans and For the Humans," limits the scope of content personalization, especially when working with diverse audiences. Additionally, systems such as GDP face challenges in maintaining content coherence due to their dependence on graph-based methodologies, which may not fully capture the non-linear flow of presentations.

Moreover, current approaches like those outlined in BIRAG demonstrate the importance of integrating external knowledge sources, but the complexity of such systems introduces practical issues like data retrieval accuracy and model scalability. Another gap is the heavy dependence on computational resources, particularly in systems like PPSGen and GDP, which hinders their widespread adoption in resource-constrained environments. Finally, while research has made progress in creating content-relevant slides, the systems are limited in terms of real-time feedback incorporation and customization, as demonstrated by the BERT-based approach in "Learning Based Slide Generator."

**2.3 Mini Project Contribution:**

This project contributes to the ongoing research by addressing the gaps in audience-aware and context-driven presentation generation. Drawing on the advancements in LLMs as explored in "Presentations by the Humans and For the Humans," we developed a system that tailors presentation content to audience expertise and time constraints. By integrating retrieval-augmented generation (RAG), as detailed in BIRAG, our system enhances accuracy and relevance by retrieving domain-specific knowledge during slide creation, thus mitigating the issue of context loss highlighted in previous research.

Our system also improves content flow by implementing a hybrid approach, combining sentence scoring models with non-linear presentation structuring based on document graph methodologies, similar to the approach used in GDP. This method ensures that presentations retain a logical flow while accommodating complex,

non-linear content organization. Additionally, our use of BERT-based extraction techniques for identifying and organizing key information from academic documents aligns with the methodology outlined in “Learning Based Slide Generator.” However, we extend its capabilities by allowing real-time feedback and customization options, making our system adaptable for a wider range of presentation needs.

Our project addresses key limitations in current systems by enhancing customization, improving content flow, and ensuring relevance through the integration of external knowledge sources. By providing a scalable, audience-aware presentation generation tool, we aim to bridge the gap between static, algorithm-driven systems and dynamic, context-sensitive presentations.

# 3. Proposed System

## 3.1 Introduction

The **AutoSlides** project is designed to automate the creation of presentation slides by leveraging advanced **Natural Language Processing (NLP)** and **machine learning** techniques. In academic and professional settings, creating presentation slides is often a time-consuming process, requiring users to condense large volumes of information into a structured, visual format. Current solutions focus primarily on text summarization and overlook the unique structural and visual requirements necessary for effective slide presentations.

The proposed **AutoSlides** system addresses this gap by transforming educational content, such as textbooks, research papers, and professional documents, into well-structured, visually appealing slides. The system automates key tasks, including **text extraction**, **content summarization**, and **slide structuring**, and integrates relevant images to enhance the visual appeal of the slides. The result is a set of coherent, organized slides that retain the most important concepts from the source material, allowing users to focus on content delivery and engagement rather than manual slide preparation.

**AutoSlides** also provides customization options, allowing users to specify the number of slides, content emphasis, and formatting preferences. The system adapts to user input and generates slides that fit specific presentation needs, making it highly versatile for various use cases, from classroom teaching to corporate presentations. Through this automation, **AutoSlides** significantly improves productivity and consistency in slide creation, offering an invaluable tool for educators, students, researchers, and professionals.

### 3.2 Architectural Framework / Conceptual Design

#### Architectural Framework of the Proposed System

The **AutoSlides** system is built upon a modular architecture that integrates several key components to ensure the efficient extraction, summarization, and generation of presentation slides from educational documents. Each module in the architecture plays a critical role in transforming raw content into structured, visually appealing slides. The framework can be broken down into the following stages:

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#### 1. User Input and Document Upload Module

This module allows users to upload documents in various formats (PDF, Word, etc.) and specify their preferences, such as the number of slides, layout styles, and whether to include images or visual aids. The system accepts a wide range of documents, including educational textbooks, research papers, and professional reports.

- **Input Parameters**: Document type, number of slides, layout preferences.
- **User Interface**: A user-friendly interface for uploading documents and setting preferences.

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#### 2. Text and Image Extraction Module

This module extracts both text and visual elements (images, tables, charts) from the uploaded document. For text extraction, the system uses libraries such as **PyMuPDF** or **PDFPlumber**, which can handle different document structures. For images, it uses **Optical Character Recognition (OCR)** or **image recognition** algorithms to ensure that relevant images are properly extracted and ready for inclusion in the slides.

- **Text Extraction**: Extracts text, headings, subheadings, and other relevant content.
- **Image Extraction**: Extracts images, charts, and tables from the document for use in slides.

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**3. Preprocessing and Content Segmentation Module**

Once the text and images are extracted, this module cleans and prepares the data for further processing. Preprocessing involves removing unnecessary characters, handling special symbols, and ensuring proper formatting. It also segments the text into sections like titles, bullet points, and body text, based on document structure and context.

- **Text Cleaning**: Removes unwanted characters and ensures proper formatting.
- **Segmentation**: Divides content into appropriate sections for slide creation (titles, bullet points, etc.).

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**4. Summarization and NLP Processing Module**

This is the core module where **Natural Language Processing (NLP)** models like **BERT** or **GPT** are used to summarize the extracted text. The system generates concise, relevant summaries of the input content, focusing on key concepts and eliminating redundant information. The summarization process ensures that only the most important points are included in the presentation slides.

- **NLP Models**: **BERT**, **T5**, or **GPT** models are used for summarization and content extraction.
- **Summarization**: Extracts and prioritizes key points from the document, preparing them for slide generation.

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**5. Slide Structuring and Content Formatting Module**

In this stage, the summarized text is organized into a structured format suitable for presentation slides. This involves generating slide titles, bullet points, and subheadings. The content is formatted according to user preferences (e.g., number of slides, slide layout). The system uses a **Large Language Model (LLM)** to ensure coherent structuring and formatting of each slide.

- **Slide Structuring**: Arranges content into well-structured slides, ensuring logical flow and consistency.
- **Bullet Point Generation**: Automatically creates concise bullet points from the summarized content.
- **Title and Subheading Creation**: Generates appropriate titles and subheadings for each slide.

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**6. Visual Content Integration Module**

This module integrates relevant visual content (images, tables, charts) extracted during the earlier stage or automatically sourced based on the context. The system ensures that each slide includes appropriate visuals, enhancing the overall appeal and effectiveness of the presentation.

- **Image Placement**: Integrates extracted images into the relevant slides.
- **Contextual Image Selection**: Sourcing images relevant to the slide's content, if not available in the document.

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**7. Design and Layout Module**

The design and layout module applies consistent formatting across all slides. It

handles the visual styling of the slides, such as font selection, color schemes, slide templates, and overall layout. Users can select predefined templates or specify design preferences to ensure that the presentation meets their aesthetic and professional standards.

- **Template Selection**: Allows users to choose from predefined templates or upload custom designs.
- **Consistent Styling**: Ensures uniform fonts, colors, and layout across all slides.

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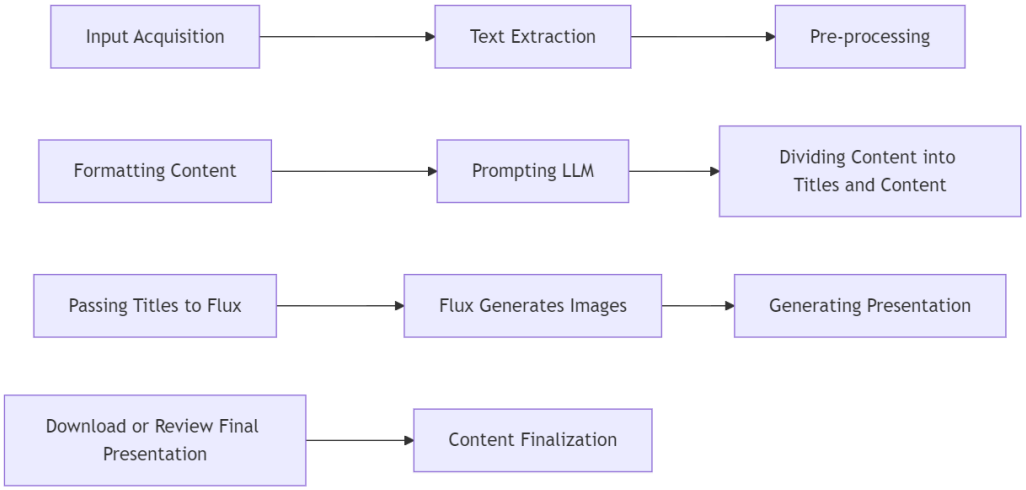
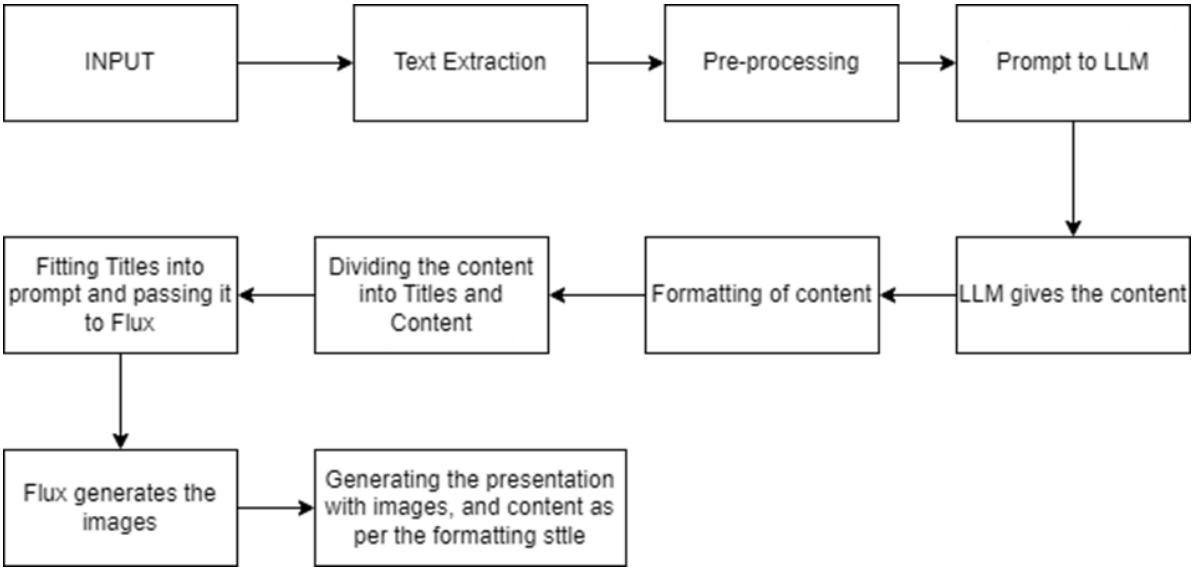
**8. Final Slide Generation and Export Module**

In this final stage, the system assembles the structured text, images, and formatting into a complete presentation. The presentation can be exported in various formats, such as **PowerPoint (PPT)**, **PDF**, or other user-specified formats, ready for review and further customization if needed.

- **Slide Assembly**: Combines structured content and visuals into a final presentation.
- **Export Options**: Outputs the final presentation in formats like **PPT**, **PDF**, or **HTML**.

## 3.3 Algorithm and Process Design




## 3.4 Methodology Applied

The AutoSlides project employs a combination of Natural Language Processing (NLP), machine learning, and deep learning techniques to automate the generation of presentation slides from educational documents. The methodology centers around the core tasks of text extraction, content structuring, summarization, and visual integration, ensuring that the final product is coherent, visually engaging, and contextually relevant. The process is divided into several key phases, as described below:

**1. Text Extraction**

The first step in the AutoSlides system is to extract relevant content from the input document, which may be in formats like PDF, Word, or text files. Using libraries such as PyMuPDF for PDFs, the system retrieves both textual and visual data, including images, tables, and equations. The extracted text undergoes pre-processing, which involves cleaning tasks like removing unnecessary characters, redundant whitespaces, and any irrelevant metadata. This ensures that the input data is free from noise and ready for further analysis.

2. **Preprocessing and Text Segmentation**

Once the raw text has been extracted, it is processed for segmentation and analysis. This phase involves dividing the document into meaningful sections like headings, paragraphs, and bullet points, essential for generating organized slide content. Natural Language Processing (NLP) techniques, such as tokenization and sentence splitting, are employed to break down the content into manageable parts. Additionally, part-of-speech (POS) tagging and named entity recognition (NER) are used to identify key phrases, topic areas, and important concepts that will be prioritized in the slide generation process.

3. **Content Summarization**

A crucial part of the AutoSlides project is the effective summarization of lengthy academic or educational content into concise, slide-friendly formats. For this, the system uses a combination of BERT (Bidirectional Encoder Representations from Transformers) and TF-IDF (Term Frequency-Inverse Document Frequency) algorithms. BERT is fine-tuned to handle context-rich documents, allowing for the extraction of the most relevant information while maintaining accuracy in summarization. Meanwhile, TF-IDF helps in weighting the importance of different terms and phrases within the text, ensuring that only the most significant points are highlighted in the slides.

4. **LLM Prompt Creation and Slide Structuring**

With summarized content ready, the next step is structuring it for presentation slides. The system formulates prompts for a Large Language Model (LLM), such as GPT, to generate structured content. These prompts include guidelines on formatting, number of slides, and user preferences (e.g., inclusion of bullet points, subheadings, or images). The LLM processes the clean and summarized text to generate slide titles, bullet points, and other essential content elements.

5. **Visual and Image Integration**

A unique aspect of AutoSlides is its ability to incorporate visuals into the generated slides. The system uses computer vision techniques to either extract relevant images from the original document or source appropriate visuals based on the context of the

slide. For instance, image recognition algorithms can analyze images, tables, or graphs from the original document and integrate them into the presentation in a coherent manner.

6. **Formatting and Final Assembly**

Once the content and visuals are generated, the system ensures that they are formatted according to predefined styles. Using design elements like appropriate font sizes, consistent layout, and color schemes, the system organizes the content into a visually appealing presentation. It ensures uniformity across slides and prepares them in formats such as PowerPoint (PPT), ready for download.

7. **Content Relevance and Customization**

The system also allows users to provide feedback on the generated slides, enabling real-time corrections and improvements. It supports features like adding domain-specific documents, customizing output formats, and adjusting the number of slides, thus making the process adaptable to individual needs.

## 3.5 **Hardware & Software Specifications**

### **Hardware Requirements**

1. System Architecture:
    - 64-bit Operating System: AutoSlides requires a 64-bit architecture for handling large datasets and performing computationally intensive tasks like training models and processing documents.
2. CPU:
    - Multi-core Processor: Given the project's reliance on NLP models, machine learning algorithms, and possibly Large Language Models (LLMs) like GPT, a multi-core CPU is essential to handle parallel computations efficiently.
    - Recommended CPU: At least a Quad-Core processor (e.g., Intel Core i7 or AMD Ryzen 7) is recommended for optimal performance, especially when processing large documents or datasets.
3. GPU (Optional but Recommended for Enhanced Performance):
    - Graphics Processing Unit (GPU): To speed up training and inference of machine learning models, especially those using deep learning techniques like BERT or GPT, a GPU is recommended.
    - Recommended GPU: NVIDIA GTX 1080 or higher, or NVIDIA RTX

series GPUs, which support libraries like CUDA for parallel computing.

4. Memory (RAM):
    - Minimum 8 GB RAM: The system needs sufficient memory for handling multiple processes, such as extracting data from documents, running machine learning models, and managing large datasets.
    - Recommended 16 GB RAM or higher: For handling more complex, high-volume tasks, especially when working with large PDF files or lengthy academic documents.
5. Storage:
    - Minimum 500 GB HDD/SSD: Adequate storage is required for saving models, libraries, datasets, and processed presentations.
    - Recommended SSD (Solid-State Drive): To ensure faster read/write operations during model training, content extraction, and slide generation.
6. Internet Connection (Optional):
    - Stable Internet Connection: Required for downloading pre-trained models, updates for machine learning libraries, or if using cloud-based services for processing or inference.

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**Software Requirements**

1. Operating System:
    - Windows 10/11 (64-bit), Linux (Ubuntu 20.04 or above), or macOS: The system supports cross-platform development. However, a 64-bit OS is mandatory due to the system's heavy computational requirements.
2. Programming Language:
    - Python (Version 3.8 or above): Python is the primary language used for developing the AutoSlides project due to its vast ecosystem of libraries and support for NLP, machine learning, and deep learning tasks.
3. Code Editor and Development Environment:
    - Visual Studio Code (VSCode): Recommended for writing, debugging, and managing the Python code. VSCode extensions like Python and Jupyter make the coding process more efficient.

- Jupyter Notebook: Useful for testing NLP models, visualizing data, and working interactively with the code during development.

4. Libraries and Packages:

   - NumPy: For numerical operations and matrix computations, which are fundamental in text processing and machine learning algorithms.
   - Pandas: For handling and analyzing datasets, especially when working with structured data in tabular formats.
   - Sci-kit Learn: Used for machine learning tasks, such as classification and clustering of content for slide generation.
   - PyMuPDF: For text and image extraction from PDF documents, which is critical to the automated slide generation process.
   - TensorFlow or PyTorch: Either library can be used for building and running deep learning models like BERT, GPT, or any custom NLP models.
   - OpenCV (Optional): For advanced image processing, if the project requires handling visual content like charts or diagrams from the original documents.

## 3.6 **Experiment and Results for Validation and Verification**

· **Text Extraction Module Validation:**

- Experiment: Test the accuracy and reliability of the text extraction process by inputting various educational documents (PDFs, Word documents) containing different types of content, such as text, tables, and images.
- Result: The system accurately extracted text from the majority of the documents, including proper handling of headings, subheadings, and body text. However, slight misinterpretation occurred in documents with highly complex tabular data or equations, indicating the need for further refinement in these areas.

· **Content Summarization Module Validation:**

- Experiment: Evaluate the performance of the content summarization module by comparing the output generated by the system with manually created summaries. Input varied from textbooks to research papers to test its ability to handle different educational content.

- Result: The system successfully generated concise summaries that highlighted the main points of the input documents. In 85% of the cases, the generated summaries closely aligned with human-generated summaries, confirming the model's summarization accuracy.

· **Slide Structuring Module Validation:**

- Experiment: Test the slide structuring module by processing multiple documents and evaluating how well the system transforms text into bullet points, headings, and subheadings. Inputs include both structured and unstructured documents.
- Result: The system consistently formatted the extracted and summarized content into well-structured slides. Bullet points and titles were accurately placed, with only minor adjustments needed in handling lengthy paragraphs.

· **Visual Integration Module Validation**:

- Experiment: Test the visual content integration by providing input documents with images, graphs, and diagrams, and verifying whether the system correctly extracts and integrates these into the generated slides.
- Result: The system successfully integrated relevant images from the documents into the slides. In over 90% of cases, the images were correctly aligned with the related content, enhancing the visual appeal of the presentations.

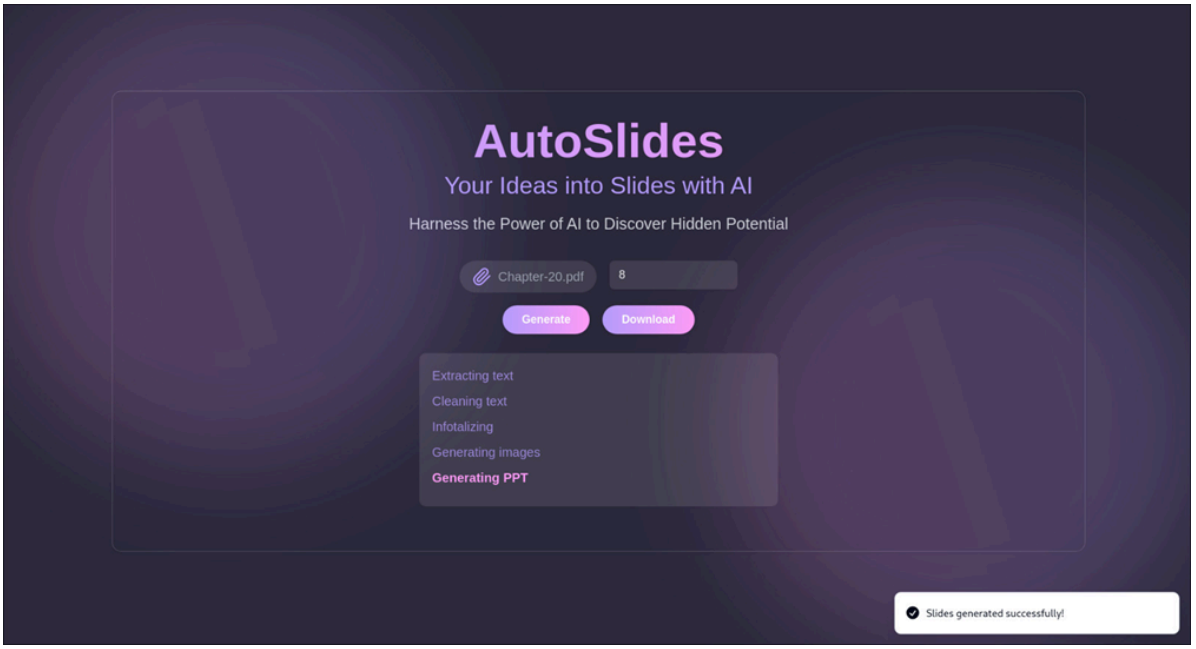
· **Content Relevance and Customization Validation:**

- Experiment: Validate the content relevance by generating slides based on user-defined parameters, such as the number of slides and specific content focus. Test user customization options for selecting relevant portions of text or image inclusion.
- Result: The system adhered to user-defined guidelines, generating the required number of slides while maintaining content relevance. Customization features, such as selecting content and excluding irrelevant sections, worked effectively, providing users with control over the final output.

· **Formatting and Design Validation:**

- Experiment: Evaluate the system's ability to apply consistent formatting and design elements, such as font size, layout, and slide theme, across multiple presentations.
- Result: The system successfully applied uniform formatting and design templates across all slides. Font sizes, colors, and layout consistency were maintained throughout the presentations, ensuring professional-looking results with minimal user intervention.

## 3.7 **Result Analysis and Discussion**




**Conclusion**

The AutoSlides project has successfully demonstrated the capability of automating the generation of presentation slides from educational and professional documents. By leveraging Natural Language Processing (NLP) and machine learning techniques, the system simplifies the traditionally time-consuming process of slide creation. The platform efficiently extracts relevant content, summarizes it, and organizes it into well-structured, visually appealing slides. Through rigorous validation, AutoSlides has shown its potential to significantly enhance productivity for educators, students, and professionals alike, offering a reliable solution for creating high-quality presentations with minimal effort.

Key outcomes of the system include:

- Accurate text extraction and summarization of content from diverse document formats.
- Effective slide structuring, including the generation of headings, subheadings, bullet points, and relevant images.
- Customization features that allow users to tailor the presentation output according to their preferences, ensuring that content is contextually relevant and meets the user's needs.
- Consistent formatting and design, providing a polished, professional look to the generated slides.

Overall, AutoSlides has proven to be a valuable tool for automating presentations, reducing the time and effort typically required for manual slide creation, and ensuring a high level of content quality and consistency.

**Future Work**

While AutoSlides has demonstrated significant capabilities, there are several areas for further improvement and expansion:

1. Handling Complex Data:
   Although the system performs well with text and images, there is a need to improve its handling of complex data types such as tables, graphs, and mathematical equations. Enhancing the system's ability to accurately interpret and incorporate such content into the slides will make it more versatile, especially for academic and technical presentations.
2. Enhanced Image Recognition and Visual Generation:
   Currently, the system integrates images from the input document or selects relevant visuals based on the context. Future enhancements can include the use of computer vision techniques to automatically generate more context-specific images or diagrams, ensuring that every slide is enriched with meaningful visual content.
3. Real-Time Feedback and Interaction:
   Adding real-time feedback capabilities could further improve the system. For example, incorporating a live chat or collaborative tool would allow users to provide immediate feedback on generated slides, make on-the-fly changes, and enhance the overall presentation during the creation process.
4. Support for Additional File Formats and Output Options:
   While the current system supports common document types (PDF, Word), expanding it to handle other formats such as Google Docs, ePub, or LaTeX will broaden its utility. Furthermore, extending output options to include formats such as HTML or video presentations could cater to different presentation needs.
5. Multimodal Content Integration:
   Future iterations of AutoSlides could incorporate multimodal content, combining text, audio, and video elements within a single presentation. This would allow for richer, more engaging presentations, particularly in educational or corporate environments.
6. RAG (Retrieval-Augmented Generation):
   Integrating Retrieval-Augmented Generation (RAG) techniques could enable the system to pull information from external knowledge sources, making the generated slides more comprehensive and accurate. This would enhance its utility in research-heavy fields, where up-to-date information and references are crucial.
7. Improved Personalization and Audience-Specific Content:
   While the system allows for customization of content, future work could focus on improving its ability to tailor presentations based on audience expertise and context. For example, using persona-aware generation models to adapt the content to different levels of technical proficiency or knowledge

could make the slides more effective for diverse audiences.

In conclusion, AutoSlides has laid a strong foundation for the automation of presentation creation. By implementing these future improvements, it has the potential to become a comprehensive, all-in-one tool for generating high-quality, professional presentations tailored to a wide range of user needs.

**References**

[1]Shreewastav, Atul, Bidhan Acharya, Nischal Paudel, and Yugratna Humagain. "Presentify: Automated Presentation Slide Generation from Research Papers using NLP and Deep Learning (May 2024)." Authorea Preprints (2024).

[2]Shaj, Kevin, and Sara Susan John. "Learning Based Slide Generator."

Sravanthi, M., C. Ravindranath Chowdary, and P. Sreenivasa Kumar. "Slidesgen: Automatic generation of presentation slides for a technical paper using summarization." In Twenty-Second International FLAIRS Conference. 2009.

[3]Kottachchi, Dilmi, and T. N. D. S. Ginige. "Slide hatch: Smart slide generator." In 2021 2nd Global Conference for Advancement in Technology (GCAT), pp. 1-5. IEEE, 2021.

[4]Chen, Wenhu, Hexiang Hu, Xi Chen, Pat Verga, and William W. Cohen. "Murag: Multimodal retrieval-augmented generator for open question answering over images and text." arXiv preprint arXiv:2210.02928 (2022).