SmartSlideGen: An AI-Powered System for Automated Presentation Creation from Word Documents

1. Summary

In this project, students will develop an AI-driven pipeline to convert a Microsoft Word document into a well-structured PowerPoint presentation. The system should:

1. Parse and extract text content from the document to create initial text-based slides.
2. Identify and extract relevant figures (images, charts) from the document.
3. Determine which slides should contain the extracted figures or if they merit a slide of their own.
4. Use generative AI techniques to create new figures (infographics, flowcharts, etc.) for text content that could be better explained visually.
5. Apply a coherent design or color theme across all generated slides to ensure consistency.

Learning Objectives

1. NLP & Document Parsing: Gain hands-on experience extracting and structuring textual data from complex documents.
2. Computer Vision / Image Processing: Learn how to identify, extract, and place images in presentations.
3. Generative AI: Utilize text-to-image or AI-based diagram generation (e.g., using Cladue API that generates flowcharts/infographics based on text).
4. Slide Layout & Design: Understand layout heuristics, design themes, and color consistency for professional presentations.
5. Systems Integration: Combine multiple AI and software components (e.g., Python libraries, PPT generation libraries, and possibly cloud-based AI services).

Project Components & Tasks

1. Text Extraction and Slide Generation (you will get the code for this)
2. Figure Extraction

Identify & Extract Figures

* Parse the Word document for embedded images, charts, or tables.
* Decide how to store and reference these figures (e.g., saving them to a temporary folder).

Slide-Figure Mapping

* Use rules or an AI-based classifier (e.g., using the text around the figure) to determine which slide(s) the figure should be placed on.
* If the figure is large or highly detailed, consider creating a separate slide.

1. Generating New Figures

Identify Content Needing Visual Aid

* Apply NLP to detect keywords such as “process,” “steps,” “workflow,” or complex data references.
* When such keywords are detected without any accompanying figure, suggest generating a new visual (infographic, flowchart, timeline, etc.).

Figure Generation

* For flowcharts/sequence diagrams:
  + Use a diagram generation tool (like Mermaid or [PlantUML](https://plantuml.com/)) or an LLM-based approach that generates diagram syntax from text.
* For infographics or illustrative images:
  + Use a text-to-image model (e.g., Stable Diffusion, Midjourney, or DALL·E) to create simple explanatory graphics.
* Automate the insertion of these newly generated figures onto slides.

1. Slide Design & Theme Consistency

Color Theme Enforcement

* Provide or let the student design a style template (or use a standard PowerPoint theme).
* Ensure all slides adopt the same primary color palette, consistent fonts, and layout guidelines.

Layout Selection

* Use heuristics or simple ML-based rules (e.g., if a slide has more text, choose a two-column layout or bullet-list layout. If it has a figure, place the figure on the right and bullet points on the left).

Styling & Formatting

* Incorporate the course branding or institutional design guidelines if available.
* Maintain consistency in font sizes for headers, subheaders, bullet points, and footers.