Phase 2 Report

Insightify

Group F(original assigned group)

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1. Introduction

- Project Overview: Insightify is a tool designed to extract and organize valuable information from PDF documents efficiently.
- Current Phase: This phase focuses on implementing core functionalities, resolving bugs, and planning for future enhancements.

2. Features Implemented

2.1 PDF Read and Parsing:

- Open and read PDF files using Fitz (PyMuPDF).
- Parse and extract meaningful content such as text and images from PDF pages.

2.2 Text Extraction:

- Extract text from PDF pages using Fitz (PyMuPDF).

2.3 Image Extraction:

- Extract images from PDF pages using Fitz (PyMuPDF).

2.4 Table Extraction:

- Extract tables from PDF documents using Camelot and save them as CSV files.

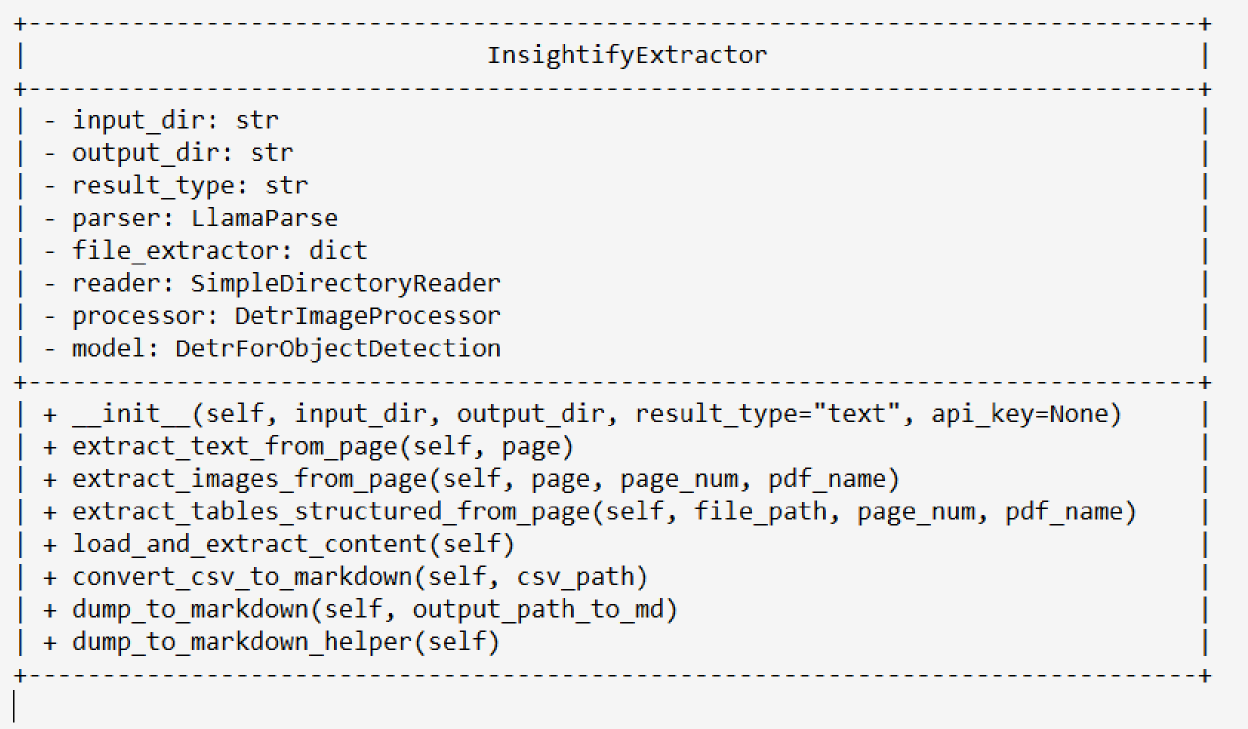
2.5 Object Detection:

- Utilize the DEtection TRansformers (DETR) model from the Transformers library for object detection within images.

2.6 Markdown File Generation:

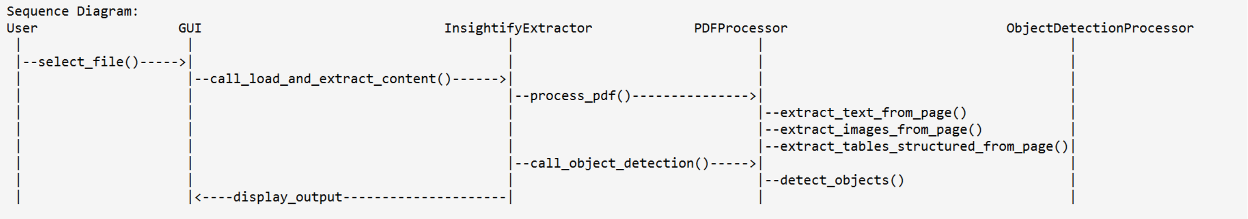
- Convert extracted content into a well-structured markdown file for easy access and readability.

3. Class Diagram



```
+-------------------------------------------------------------------------------+
|                               InsightifyExtractor                             |
+-------------------------------------------------------------------------------+
| - input_dir: str                                                              |
| - output_dir: str                                                             |
| - result_type: str                                                            |
| - parser: LlamaParse                                                          |
| - file_extractor: dict                                                        |
| - reader: SimpleDirectoryReader                                               |
| - processor: DetrImageProcessor                                               |
| - model: DetrForObjectDetection                                               |
+-------------------------------------------------------------------------------+
| + __init__(self, input_dir, output_dir, result_type="text", api_key=None)     |
| + extract_text_from_page(self, page)                                          |
| + extract_images_from_page(self, page, page_num, pdf_name)                    |
| + extract_tables_structured_from_page(self, file_path, page_num, pdf_name)    |
| + load_and_extract_content(self)                                              |
| + convert_csv_to_markdown(self, csv_path)                                     |
| + dump_to_markdown(self, output_path_to_md)                                   |
| + dump_to_markdown_helper(self)                                               |
+-------------------------------------------------------------------------------+
|
```

4. Sequence Diagram



```
Sequence Diagram:
User                  GUI                                InsightifyExtractor          PDFProcessor                             ObjectDetectionProcessor
 |                     |                                        |                               |                                       |
 |--select_file()----->|                                        |                               |                                       |
 |                     |--call_load_and_extract_content()------>|                               |                                       |
 |                     |                                        |--process_pdf()---------------->|                                       |
 |                     |                                        |                               |--extract_text_from_page()             |
 |                     |                                        |                               |--extract_images_from_page()           |
 |                     |                                        |                               |--extract_tables_structured_from_page()|
 |                     |                                        |--call_object_detection()----->|                                       |
 |                     |                                        |                               |--detect_objects()                     |
 |                     |<----display_output---------------------|                               |                                       |
```

5. Individual Contribution

Bingchen Yang

- Project Initiation:
  - Set up the initial project structure and GitHub repository.
  - Configured the PyCharm environment for seamless development and version control integration.
- Core Development:
  - Implemented the InsightifyExtractor class to handle text extraction, image extraction, table extraction, and object detection.
  - Integrated various libraries including Fitz, Camelot, Transformers, and LlamaParse to facilitate robust PDF parsing and content extraction.
- Bug Fixes:
  - Identified and resolved issues related to temporary memory handling, ensuring that PDF pages are properly closed to avoid PermissionError.
  - Debugged and optimized the interaction between Fitz and Transformers to prevent access conflicts.
- Feature Development:
  - Developed a user-friendly GUI for file selection using tkinter.
  - Created functionality to convert extracted content into markdown files for easy readability and accessibility.
- Future Planning:
  - Outlined plans for OCR integration using Tesseract for handling scanned PDFs.
  - Proposed enhancements to use AI models for interpreting structured data and images.
  - Planned the transition from markdown output to PDF format, leveraging libraries like ReportLab.
- Documentation:
  - Documented the entire development process, including code comments, usage instructions, and detailed reports on progress and future goals.

6. Team Leader Role

Task Assignment and Coordination:

- Assigned tasks to team members both during class and after class to ensure continuous progress.
- Set up the GitHub repository and invited team members to collaborate.
- Taught team members how to use PyCharm and Git for version control.
- Created a Google Drive folder for non-code-related tasks such as documentation and presentations, and invited team members to collaborate.

Support and Mentorship:

- Offered assistance to team members facing challenges with setting up their workflows and working environments.
- Provided guidance on coding-related issues to ensure effective contributions from all team members.

Weekly Check-Ins:

- Organized and led weekly check-in meetings with the team to discuss progress, challenges, and next steps.
- Used these meetings to provide updates, gather feedback, and ensure that all team members were aligned with the project's objectives.

7. Bugs, Issues, and Future Implementation

7.1 Object Detection Integration:

- Description: Integration of Hugging Face's DEtection TRansformers (DETR) model for object detection tasks within images.
- Solution: Implemented object detection using DETR model and ensured compatibility with other extraction methods.
- Status: Fixed

7.2 Structured Data Extraction:

- Attempts: We attempted to resolve issues related to extracting structured data, specifically tables, from PDF documents.
    - Attempt 1: Tried using LlamaParse for structured data extraction but found it unsuitable as it does not handle structured data well.
    - Attempt 2: Moved to using Camelot to extract tables directly from the PDF.
- Status: Fixed

7.3 Rendering Extracted Structured Data to Markdown:

- Description: Rendered extracted structured data in CSV format to a markdown file.
- Solution: Implemented a function to convert CSV data into markdown table format.
- Status: Resolved

7.4 Temporary Memory Issue:

- Description: PDF pages were not being closed properly by the time the program terminated, resulting in permission errors.
- Solution: Ensured that PDF documents are explicitly closed using the .close() method.
- Status: Unresolved

7.5 Conflict with Hugging Face Transformer:

- Description: A conflict arose when both Fitz and the Transformer model tried to access the same resources in temporary memory, causing a PermissionError.
- Solution: Proper file handling and separation of tasks were suggested to avoid conflicts. However, further debugging and implementation are required.
- Status: Unresolved

7.6 Scanned Content Handling:

- Description: Planned implementation of features for scanned content using the Hugging Face transformer. Integration is planned for OCR using Tesseract to handle scanned PDFs.
- Solution: Use Tesseract for OCR to handle scanned PDFs separately from Fitz and Transformers.

- Status: Planned for Future Implementation

7.7 Generating PDF Output:

- Description: Transitioning from markdown file generation to PDF format while maintaining readability and accessibility.
- Solution: Utilize libraries like ReportLab to generate formatted PDF reports.
- Status: Planned for Future Implementation

8. Presentation Video and Slides

Presentation Slides: Deliverable 1 Presentation
Presentation Video: Presentation_Feb_12th.mp4
Github Repository: Insightify