Research Paper Helper using Large Language Models

A.   Problem Statement

Reading and understanding research papers is challenging for beginner researchers and students due to complex writing styles, dense technical terminology, and the distribution of key information across multiple sections such as abstract, methodology, and conclusions. New readers often struggle to quickly identify the problem being addressed, the main contributions, limitations, and future research directions. So, there is a need for an automated system that can assist beginners by extracting and simplifying important sections of a research paper in a structured and easy to understand manner without replacing human judgment and also allowed to effectively frame the literature review/related works section.

B.   Objective of the Project

The primary objective of this project is to develop a Research Paper Helper that simplifies the reading and comprehension of research papers for novice readers. The specific objectives are provided as below,

- To extract machine-readable text from research papers which also includes scanned documents
- To analyse the extracted text and identify key sections such as, abstract, problem statement, contributions, proposed Work, limitations, future work
- To present the extracted information in a simplified and structured format using a Large Language Model (LLM)

D.   System Overview

The proposed Research Paper Helper system is designed to assist beginner readers in understanding academic research papers by automatically extracting and simplifying key sections of the document. The system accepts a research paper in PDF or scanned format as input. If the document is image-based (i.e. where the text cannot be selected or searched), GLM-OCR is used as a pre-processing step to extract machine-readable text. The extracted text is then segmented and processed by a Large Language Model (LLM) deployed locally using Ollama. By employing the carefully designed prompts, the LLM analyses the content and identifies important sections such as the abstract, problem statement, contributions, proposed work, limitations, and future research directions. The final output is presented in a structured and simplified format, enabling new researchers to quickly grasp the core ideas of the paper while still encouraging detailed manual reading.

Methodology: The input research paper is loaded into the system. The GLM-OCR is applied only if the document is scanned. The Extracted text is cleaned and segmented. Once done, we provide a prompt-engineered instructions for guiding the LLM to extract specific sections. Finally, the results are presented in a readable and structured format.

Role of GLM-OCR: GLM-OCR is used only as a pre-processing tool to extract machine-readable text from scanned research papers or image-based PDFs. It does not perform content understanding, summarization, or reasoning.

Role of LLM: The Large Language Model deployed using Ollama is responsible for, Analyzing extracted research paper text. Identifying key sections such as abstract,

contributions, and limitations. Simplifying technical content into beginner-friendly explanations. Generating structured outputs using prompt engineering.

E.   Technology Stack

Hardware Requirements	
Component	**Specification**
Device	HP Pavillion
Processor	AMD Ryzen 5 5600H with Radeon Graphics 3.30 GHz
RAM	8GB
Graphics	4GB CPU `
Storage	500GB
Software Requirements	
Category	**Tools/Technologies**
OS	Windows 11 Home (64-bit)
Programming Language	Python
OCR Model	GLM-OCR (Text Extraction only)- https://ollama.com/library/glm-ocr
LLM Framework	Ollama
LLM Model Used	Phi-2 (2.7B parameters)- https://ollama.com/library/phi
Libraries	pdfplumber, subprocess, os
Version Control	Git, GitHub

F.   Advantages of Proposed System

- Reduces time required to understand research papers.
- Helps beginner researchers quickly grasp core ideas.
- Works locally without dependency on cloud APIs.
- Modular design allows easy extension.

G.   Limitations

- The system may generate generic summaries for highly complex papers.
- OCR accuracy depends on input document quality.
- The system does not verify factual correctness.
- LLM outputs may contain simplifications that require human validation.

H.   Conclusion

In conclusion, this mini project demonstrates the practical application of Large Language Models in academic assistance. By combining OCR-based text extraction with prompt-engineered LLM analysis, the Research Paper Helper provides an effective tool for simplifying research paper reading for beginner audiences.