Smart Medical Assistant Using Large Language Models

Abstract

Medical prescriptions are often challenging for patients to understand due to handwritten notes, complex drug names, medical abbreviations, and dosage instructions that require prior clinical knowledge. This lack of clarity can lead to confusion, improper medication usage, and reduced adherence to treatment plans. To address this issue, this project proposes a smart medical assistant based on Large Language Models (LLMs) that assists patients in interpreting medical prescriptions and obtaining clear, understandable guidance.

The proposed system enables users to upload prescription images and interact with the system through a conversational interface. Initially, Optical Character Recognition (OCR) techniques are employed to extract textual information from prescription images, including patient details, prescribed medicines, dosage instructions, and related medical notes. The extracted text is then processed using Natural Language Processing (NLP) techniques, such as Named Entity Recognition (NER) and rule-based analysis, to structure and categorize relevant medical information.

A multi-agent LLM architecture is utilized to perform specialized tasks within the system. Dedicated agents handle prescription interpretation, medicine explanation, safety and disclaimer generation, and patient-friendly summarization. By decomposing the workflow into multiple intelligent agents coordinated by an orchestrator, the system ensures modularity, interpretability, and robustness. The LLM-based agents generate simplified explanations of prescribed medicines, their intended usage, potential side effects, and general health guidance in language accessible to non-medical users. To maintain ethical and safe usage, the system explicitly provides disclaimers indicating that it serves as an assistive tool and does not replace professional medical consultation.

Additionally, the system integrates a location-based recommendation module that suggests nearby doctors or medical specialists based on the identified condition or treatment category. This feature enhances healthcare accessibility by providing users with relevant information such as doctor specialty, clinic location, and contact details. By integrating computer vision, NLP, multi-agent LLM reasoning, and geolocation services, the proposed solution functions as an end-to-end intelligent healthcare assistant.

The expected outcome of this project is a patient-centric system that transforms complex medical prescriptions into meaningful, actionable insights, improves patient awareness, supports better treatment adherence, and assists users in seeking timely medical care. This work demonstrates the potential of LLM-driven multi-agent systems to enhance transparency, accessibility, and trust in digital healthcare applications multi-agent systems in digital healthcare applications.