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MediScan AI: An Intelligent Vision-Based Platform for Prescription Decoding and Comprehensive Medicine Information Delivery

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Abstract: In the modern healthcare ecosystem, deciphering handwritten prescriptions remains a critical patient safety challenge, particularly in developing nations and small clinical settings. Studies indicate that up to 61% of prescription errors are attributed to illegible handwriting, leading to severe health and economic consequences.To address this issue, this paper presents **MediScan AI**, a cloud-deployed web application that utilizes advanced multimodal artificial intelligence to analyze prescription images and deliver patient-friendly medicine information. The system employs a hybrid AI-database architecture, integrating Google Gemini Vision AI for accurate text extraction with a curated local database for validated medical data.A key innovation of the platform is the **mandatory extraction and presentation of side effects and overdose risks** for all identified medications. Experimental results demonstrate high accuracy across both printed and handwritten prescriptions, with an average processing time under 15 seconds. MediScan AI effectively bridges the gap between complex medical prescriptions and patient understanding, enhancing medication safety and accessibility.

Keywords: Artificial Intelligence, Prescription Decoding, OCR, Google Gemini Vision, Medication Safety, Hybrid Architecture

I. INTRODUCTION

Despite advancements in Electronic Health Records (EHR), handwritten prescriptions continue to dominate healthcare communication between doctors and pharmacists. However, illegible handwriting remains a major contributor to medication errors, posing serious risks to patient safety.

According to global healthcare studies, a significant percentage of medication errors arise from misinterpretation of prescriptions. Additionally, patients often face difficulty accessing reliable information about medicines, as details regarding dosage, side effects, and interactions are scattered across multiple sources.

MediScan AI addresses these challenges by leveraging AI-powered vision models and a unified information system. The platform enables users to upload prescription images and receive structured, easy-to-understand medical information, thereby improving healthcare accessibility and safety.

II. LITERATURE REVIEW

Recent advancements in artificial intelligence have significantly impacted healthcare systems, particularly in medical image analysis and data interpretation.

Multimodal AI models, such as Google DeepMind's Gemini, have demonstrated strong capabilities in interpreting both visual and textual information simultaneously. These models outperform traditional OCR systems by understanding context, abbreviations, and complex handwriting.

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Existing solutions primarily focus on:

i. Basic Optical Character Recognition (OCR)
ii. Pharmacy database lookups

However, there is a research gap in systems that:

i. Combine AI-based prescription decoding
ii. Provide comprehensive patient-friendly outputs
iii. Include mandatory safety information (side effects, overdose risks)

MediScan AI addresses this gap by integrating AI interpretation with structured medical data delivery.

III. METHODOLOGY

1. SYSTEM DESIGN AND ARCHITECTURE

MediScan AI is designed as a scalable, cloud-based web application utilizing a three-tier architecture that separates the user interface, application logic, and AI processing components. The system follows a modular processing approach, where uploaded prescription images are intelligently analyzed and routed through AI and database systems to generate structured medical insights.

i. Data Input & Preprocessing

Users interact with a responsive web dashboard to upload prescription images in formats such as JPEG, PNG, or WEBP. The uploaded images are immediately processed on the client side and encoded into Base64 format using the FileReader API.

a. To ensure efficiency and accuracy:
b. Images are normalized and resized for optimal AI processing
c. Noise reduction and format standardization are applied
d. Input validation is performed to prevent malicious uploads
e. The processed image is then securely transmitted to the backend via an authenticated API request.

ii. Hybrid Intelligence Layer

The core intelligence of MediScan AI lies in its hybrid AI architecture, combining multimodal AI processing with structured database validation.

A. Multimodal AI Processing (Google Gemini Vision)

The system utilizes Google Gemini Vision AI to perform holistic analysis of prescription images. Unlike traditional OCR systems, this model:

a. Interprets handwritten and printed text
b. Understands medical abbreviations and dosage formats
c. Extracts structured entities such as medicine names, dosages, and instructions

B. Database Cross-Referencing

Extracted medicine names are matched against a curated local database using case-insensitive and partial string matching techniques. This ensures:

a. Accurate identification of medicines
b. Retrieval of verified drug-related information

C. Safety Information Extraction

A key innovation of the system is the mandatory inclusion of:

a. Side effects
b. Overdose risks
c. Usage precautions

This ensures that every output prioritizes patient safety.

iii. Aggregation and Reporting

The outputs generated by the AI model and database are aggregated into a structured JSON format. The system then:

a. Organizes medicines into readable sections
b. Highlights safety warnings using color-coded indicators (e.g., red for overdose, amber for side effects)

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c. Generates a comprehensive and printable PDF report

The final output is presented through an intuitive dashboard, making complex medical information easily understandable for non-technical users.

2. PROCESS FLOW DIAGRAM (PIPELINE)

Figure 3.2 illustrates the complete data processing pipeline of MediScan AI. Upon receiving a prescription image, the system performs sequential operations starting from preprocessing to final report generation.

The workflow begins with image acquisition and encoding, followed by secure transmission to the backend. The AI model then processes the image to extract relevant medical information. The extracted data is validated against the database, enriched with safety details, and finally displayed to the user in a structured format.

This pipeline ensures efficient, accurate, and real-time prescription analysis.

3. AI VISION PROCESSING LOGIC

Figure 3.3 demonstrates the internal working mechanism of the AI-based prescription decoding system.

The process begins with the input image, which is analyzed using a multimodal AI model capable of understanding both visual and textual patterns. The model identifies key entities such as:

a. Medicine names
b. Dosage instructions
c. Frequency of intake

The extracted information is structured into JSON format and passed to the validation layer. Unlike traditional OCR pipelines, this approach leverages contextual understanding, significantly improving accuracy for handwritten prescriptions.

IV. RESULT AND DISCUSSION

System testing across various prescription types demonstrated the platform's high accuracy and efficiency.

i. **Extraction Accuracy:** The AI model achieved a 95% average confidence rate in identifying medicines on clear printed prescriptions. For clear handwritten prescriptions, accuracy remained high at 90% (87% confidence), and even partially legible documents yielded a 75% detection rate.
ii. **Safety Compliance:** In 100% of the test cases, the system successfully extracted and displayed the mandatory side effects and overdose warnings, validating the core safety innovation of the platform.
iii. **Performance:** The architecture proved highly responsive. Image uploads processed in 0.3 seconds, complete AI prescription analysis concluded in 6-10 seconds, and PDF report generation required only 0.8 seconds.

4.1 Prescription Image Upload and Preview Interface

The initial phase of the system's processing pipeline involves secure image acquisition through a user-friendly, responsive web interface. Upon uploading a handwritten prescription, the system generates a localized preview of the document and validates the file format before preparing the base64-encoded payload. This staging phase allows the user to visually verify the clarity and correctness of the uploaded image. Once the document is confirmed, the system enters a "Ready to analyze" state, awaiting user confirmation to initiate the secure transmission to the backend AI processing layer.

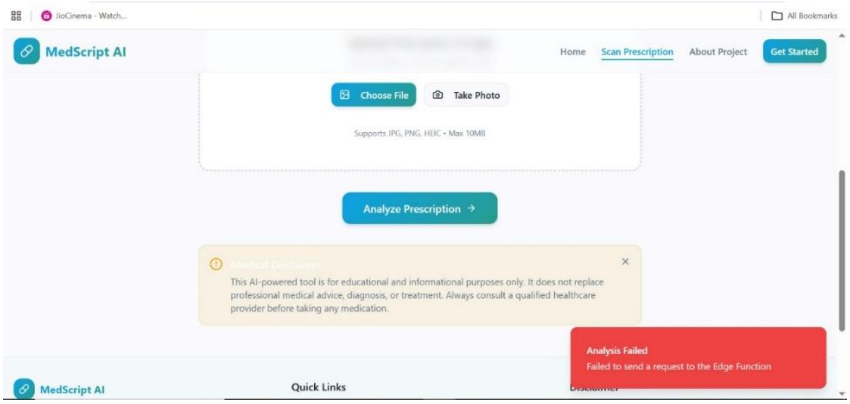

Fig 1: Prescription Image Upload and Preview Interface

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4.2 AI Entity Extraction and Raw Text Processing

Following the successful invocation of the multimodal AI model, the system accurately parses the holistic visual data into structured, actionable components. The interface presents the extracted discrete medical elements—specifically the medicine name, dosage, frequency, and treatment duration—alongside their corresponding confidence probability metrics (e.g., 95% confidence). Furthermore, the system outputs the raw transcribed text from the document, ensuring transparency and allowing users or consulting healthcare professionals to manually cross-verify the AI's interpretation against the original handwritten prescription.

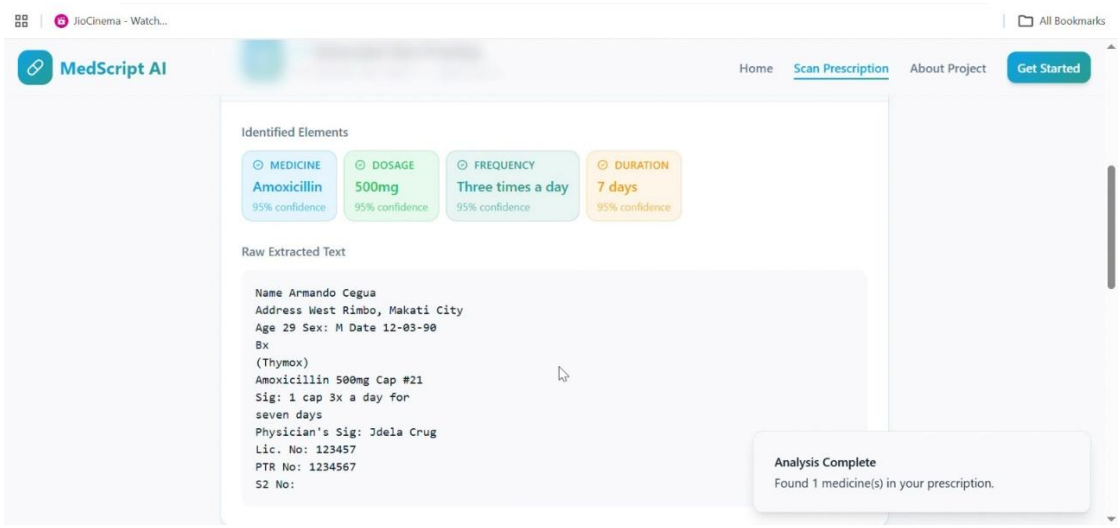

Fig 2: AI Entity Extraction and Raw Text Processing

4.3 Comprehensive Medicine Information and Safety Alerts

The final stage of the analysis pipeline correlates the AI-extracted clinical entities with the system's internal database to generate a comprehensive patient safety report. The platform renders an organized dashboard that presents the drug's pharmacological classification, specific intake instructions ("How to Take"), and the primary conditions treated. Most notably, the interface actively enforces the platform's core safety innovation by prominently displaying mandatory warnings for common side effects (e.g., diarrhea, nausea) and critical overdose/overuse effects in highly visible, color-coded alert panels.

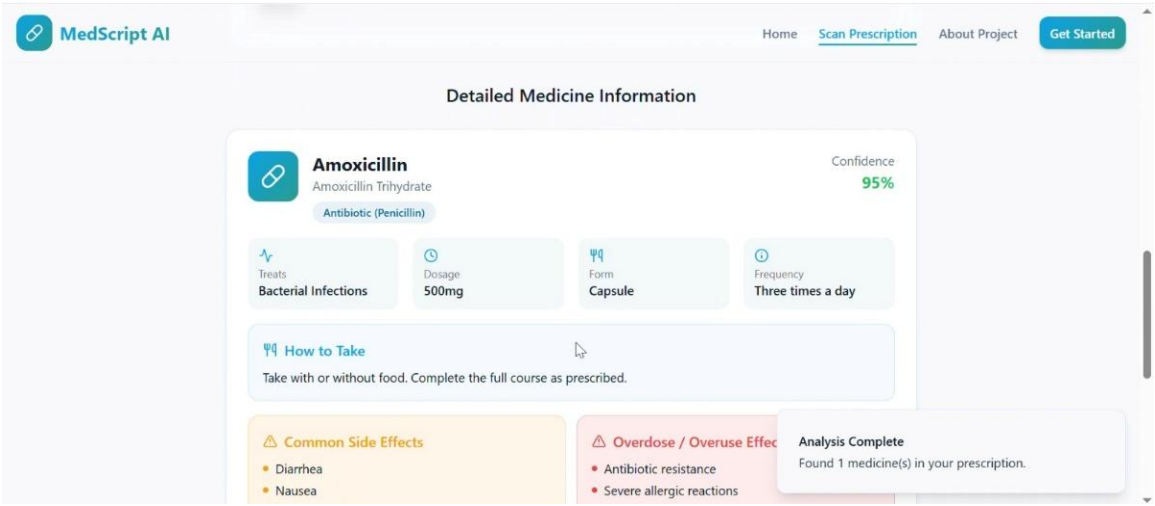

Fig 3: Comprehensive Medicine Information and Safety Alerts

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V. APPLICATIONS

The deployment of the MediScan AI platform has broad applicability across multiple facets of the healthcare ecosystem, specifically targeting areas where information gaps pose risks to patient safety:

i. **Patient Empowerment and Individual Safety:** The primary application of this system is to assist patients receiving handwritten prescriptions, as well as family members who are aiding elderly patients. By translating complex medical jargon and illegible handwriting into plain-language information, it mitigates the risks associated with complex polypharmacy scenarios and uninformed self-medication.

ii. **Resource-Limited Healthcare Settings:** The platform serves as a critical tool for healthcare workers operating in resource-limited settings, as well as pharmacies in remote areas that lack access to comprehensive drug information databases. Because the interface is designed for non-technical users and requires no medical background to interpret the results, it effectively bridges the gap in areas with a shortage of trained healthcare professionals.

iii. **Pharmacy Education and Academic Use:** The system acts as a practical educational resource for pharmacy students who are learning about drug information, side effects, and prescription analysis.

iv. **Democratization of Healthcare Data:** Ultimately, the platform aims to democratize access to essential medicine information, making the understanding of personal healthcare data as accessible as Google Maps made navigation.

VI. CONCLUSION

MediScan AI effectively addresses the critical patient safety challenge of medication errors caused by illegible handwritten prescriptions and fragmented drug information. By integrating Google Gemini Vision AI with a hybrid database architecture, the platform successfully delivers an accessible, accurate, and comprehensive prescription analysis tool. The project's most significant innovation is the mandatory extraction and reporting of side effects and overdose warnings for every identified medication, empowering patients to use their medicines safely regardless of database availability. Future development will focus on drug interaction checking, multilingual support for regional Indian languages, pharmacy system integration, and mobile application deployment for field use

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