

Problem Statement:

Medical lab reports—such as blood tests, lipid profiles, and diagnostic summaries—are often filled with **technical jargon**, **abbreviations**, and **reference values** that the average person cannot interpret without a doctor. Furthermore, reports come in **various formats** (PDFs, scans, images), making it even harder to access understandable information quickly.

The Challenge:

Design and develop an AI-powered assistant that can:

- Extract data (text, numbers, tables) from **scanned medical reports or PDFs**
 - Use **NLP** to analyze and structure the content
 - Apply **Generative AI** to explain test results in **simple, human-understandable language**
 - Optionally, **suggest follow-up actions** or flag values that are out of range
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Project Objectives:

1. Input Handling

- Allow users to **upload medical report files** in image format (JPEG/PNG) or scanned PDFs.
- Preprocess the input (denoising, binarization) using **OpenCV** to improve accuracy.

2. Text Extraction (OCR)

- Use **Tesseract** or **EasyOCR** to extract content from reports.
- Extract structured data like:
 - Test Name

- Measured Value
- Normal Range
- Unit (mg/dL, etc.)

3. NLP-based Structuring

- Use rule-based or ML-based logic to:
 - Map extracted rows into structured format (dictionary or table).
 - Identify values **outside** the normal reference range.
 - Categorize values (e.g., Critical, Borderline, Normal).

4. Generative AI Explanation

- Use **GPT-3.5** or **Gemini Pro** via API to explain each test result using a prompt like:

“Explain in simple language what it means if the patient’s Hemoglobin is 9.5 g/dL, given the normal range is 13–17 g/dL.”

- Return explanations for **each abnormal result** or all if time allows.

5. Optional Risk Summary / Follow-up Suggestion

- Based on extracted values and explanations, optionally generate:
 - A **summary paragraph**
 - A list of **suggested actions** like “Consult a cardiologist” or “Increase iron intake.”

6. User Interface (Streamlit / Flask)

- File upload box
- OCR result viewer

- Explanations in expandable/collapsible sections
- Downloadable **PDF summary** of results