

# Medicine Safety Tool using Gemma 3n

## Description

This tool is a local processing solution that analyzes medicine images using Gemma 3n and EasyOCR, providing accurate safety warnings for pregnant women, especially in remote areas. It aims to empower users with instant insights into medication safety with minimal dependency on external resources, demonstrated through real-world examples like “Ciproxin”.

## Architecture

- **Core Technology:** The system leverages Gemma 3n, a lightweight multi-modal model, to process extracted text and generate detailed safety analyses. EasyOCR handles text extraction from images with enhanced pre-processing (MedianFilter, thresholding, sharpening).
- **Workflow:** Images are uploaded via a user-friendly HTML/CSS interface. The tool applies noise reduction and resizing, then uses EasyOCR to extract text. Gemma 3n analyzes this text to deliver medicine name, safety info, dosage, risks, and alternatives in concise summaries.
- **Efficiency:** Designed for local processing, the tool ensures accessibility in areas with limited connectivity, with a responsive design for quick results.

## Challenges & Solutions

- **Challenge 1: Weak OCR Accuracy** *Solution:* Implemented advanced preprocessing (MedianFilter, adjusted threshold to 180, resized to 700x700) and switched to EasyOCR for better text recognition over Tesseract.
- **Challenge 2: Medicine Name Extraction** *Solution:* Developed a custom algorithm to extract the medicine name from Gemma’s output, prioritizing “Medicine Name:” sections and falling back to capitalized words.
- **Challenge 3: Response Consistency** *Solution:* Optimized the prompt to focus on key sections (safety, dosage, risks, alternatives) with concise summaries (2-3 sentences each) to fit within `max_new_tokens=350`.

## Examples & Scenario

- **Example 1: Ciproxin (Ciprofloxacin)** A user uploaded an image of “Ciproxin 500” packaging. The tool identified the medicine, provided a summary: “Ciprofloxacin is generally discouraged during pregnancy due to potential fetal risks; consult a doctor. Dosage is 500 mg twice daily for infections, but adjusted by a physician. Risks include nausea and tendon rupture, with alternatives like Azithromycin.”
- **Scenario:** A pregnant woman in a remote area finds “Ciproxin” and uploads its image. The tool instantly displays: the name “Ciproxin”, a

warning about fetal risks, a dosage of 500 mg twice daily, risks like tendon rupture, and alternatives like Azithromycin, enabling her to consult a doctor safely.

## Medical Sources & Prompt Type

- **Medical Sources:** The model’s responses are based on general medical knowledge embedded in its training data, reflecting guidelines similar to those from the FDA (U.S. Food and Drug Administration) and WHO (World Health Organization) on antibiotic safety during pregnancy. Specific details (e.g., tendon rupture risks for Ciproxin) align with known fluoroquinolone side effects documented in medical literature.
- **Prompt Type:** The system uses a structured text prompt: “Based on the text: ‘[extracted\_text]’, identify the medicine name and provide a concise summary (2-3 sentences each) for safety for pregnant women, dosage, risks, and alternatives. Output only the analysis without repeating the prompt or instructions.” This ensures focused, concise outputs tailored to user needs.

## Why These Choices?

- **Gemma 3n:** Chosen for its local processing capability and multimodal nature, making it ideal for remote healthcare applications.
- **EasyOCR:** Selected for its superior performance in extracting text from noisy images compared to alternatives.
- **HTML/CSS Interface:** Ensures an intuitive and visually appealing user experience, enhancing accessibility.

## Conclusion

This tool demonstrates the power of Gemma 3n in real-world impact, offering a reliable, local processing solution for pregnant women to assess medicine safety, with potential for further integration into healthcare systems. Examples like “Ciproxin” highlight its practical utility in diverse scenarios.