💡 Solution

FridgeMate: AI-Based Recipe Generator from Fridge Photos

Overview

To address the challenge of deciding "what to cook with what you have," we propose an **AI-powered web application** that automatically identifies food ingredients from an uploaded photo and generates suitable recipe suggestions using generative AI.

The solution combines **computer vision (CV)** for ingredient recognition and **large language models (LLMs)** for recipe creation, offering a seamless, smart, and interactive cooking assistant for everyday use.

How It Works

1. **Image Upload** – The user takes or uploads a photo of their fridge, pantry, or ingredients.

2. **Ingredient Detection** – A **YOLO-based object detection model** identifies and labels the visible ingredients in the image.

3. **Data Processing** – The detected ingredients are converted into a list (e.g., `["tomato", "cheese", "bread"]`).

4. **Recipe Generation** – A **Language Model (LLM)** like GPT or Llama uses these ingredients as a prompt to generate a creative recipe including:

   ○ Dish name

   ○ Ingredients list

   ○ Step-by-step preparation

   ○ Optional nutritional or customization tips

5. **User Display** – The recipe is displayed neatly on a React-based frontend with options to save, share, or regenerate new variations.

Example Scenario

Input:
A user uploads a photo showing *eggs, tomatoes, onions, and bread.*

AI Process:

- CV model detects: `["eggs", "tomatoes", "onions", "bread"]`

- LLM prompt: "Generate a breakfast recipe using eggs, tomatoes, onions, and bread."

Output (Generated Recipe):
Recipe: Spicy Tomato Egg Sandwich

1. Beat eggs with chopped onions and tomatoes.

2. Cook on a pan until fluffy.

3. Toast the bread and layer the egg mixture between slices.

4. Serve hot with optional cheese or sauce.

✅ In under 10 seconds, the user gets a ready-to-cook idea without typing a word.

System Architecture

Frontend (React):

- User uploads photo.

- Displays ingredients and generated recipe.

Backend (FastAPI):

- Handles image upload and prediction.

- Runs YOLO/Detectron2 for ingredient detection.

- Calls LLM API (e.g., OpenAI GPT or open-source Llama) for recipe text generation.

AI Models:

- **YOLOv8 (Object Detection):** Pre-trained or fine-tuned on food datasets (Food-101, IndianFood14).

- **LLM (Text Generation):** Generates creative, structured recipes from detected ingredients.

Tech Stack

Component	Technology
Frontend	React, Tailwind CSS
Backend	FastAPI (Python)
Model Frameworks	PyTorch, YOLOv8
Language Model	GPT / Llama
Data Sources	Food-101, Open Images (food subset)
Deployment	Render / Vercel / Docker (optional)

Key Features

- 📸 **Automatic Ingredient Detection** — Upload photo, AI detects items instantly.

- 🧠 **AI Recipe Generation** — Get unique recipes using detected ingredients.

- ⚙️ **Real-Time Processing** — FastAPI backend enables near-instant suggestions.

- 🌍 **Customizable Recipes** — Option to specify dietary preferences (vegetarian, high-protein, low-calorie, etc.)

- 💾 **Save & Share Recipes** — Users can bookmark or share their generated dishes.

Advantages

- Eliminates the need for manual input of ingredients.

- Reduces food waste by suggesting recipes for unused items.

- Encourages healthy, creative home cooking.

- Demonstrates real-world synergy of CV + LLM in a simple, user-friendly tool.

Expected Impact

This solution empowers users to cook smarter, waste less, and rely more on AI for daily decision-making. It represents a **practical, impactful use case of generative AI** — one that blends convenience, sustainability, and creativity into a single experience.