🧰 Tech Stack / Tools Used

Frontend

- **React** – For building the interactive user interface
- **Tailwind CSS** – For styling and responsive design
- **React Router** – Navigation between pages/components
- **Axios / Fetch API** – To communicate with backend APIs
- **Framer Motion (optional)** – For smooth UI animations

Backend

- **FastAPI** – Lightweight Python framework for APIs
- **Uvicorn** – ASGI server to run FastAPI
- **Flask (optional)** – Alternative backend framework if preferred
- **Python Libraries:**
    - `Pillow` – Image processing
    - `OpenCV` – Image preprocessing, optional for YOLO input
    - `NumPy`, `Pandas` – Data manipulation
    - `Requests` – API calls

Machine Learning / AI

- **Computer Vision (Ingredient Detection):**
    - YOLOv8 / Detectron2 – Object detection model to identify ingredients from photos
    - PyTorch – Model framework
- **Language Model (Recipe Generation):**
    - GPT (OpenAI API) or LLaMA – Generate structured recipe text from detected ingredients
- **Additional ML Libraries:**
    - `Transformers` (HuggingFace) – For using/finetuning LLMs
    - `Torchvision` – Image transforms & datasets

Database

- **MongoDB** – NoSQL database for storing users, recipes, and preferences
- **PostgreSQL** – Optional relational database alternative for structured storage

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Deployment / DevOps

- **Vercel / Render** – For hosting frontend & backend
- **Docker** – Containerization for easy deployment & reproducibility
- **Git / GitHub** – Version control
- **NGINX (optional)** – Reverse proxy & load balancing

Data Sources

- **Food-101** – Large dataset of food images
- **IndianFood14** – Dataset of Indian cuisine images
- **Open Images (food subset)** – Additional ingredient images for model training/fine-tuning

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Optional / Supporting Tools

- **DALL·E / Stable Diffusion** – Optional image generation for dish previews
- **Tesseract OCR** – Optional for text recognition if reading labels
- **VS Code / PyCharm** – IDEs for development
- **Postman** – Testing backend APIs
- **Jupyter Notebook** – ML experiments & prototyping