FOODGUARD

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PROBLEM STATEMENT

Food allergies are a growing health concern worldwide, often leading to severe and life-threatening reactions. Identifying which food items may trigger allergies is difficult for users, especially when ingredients are hidden or dishes are unfamiliar. Traditional allergy tests are time-consuming and not accessible in daily life, leaving individuals vulnerable when making food choices.

SOLUTION

- FoodGuard provides an **intelligent, real-time system** to help users identify potential food allergens before consumption. When a user captures or selects an image of food, the system automatically:
- Detects and localizes food items using **ViT**, ensuring accurate recognition even in complex or cluttered images.
- Classifies the detected food with state-of-the-art models – **YoloV8,Vision Transformer (ViT), ResNet, and EfficientNet** – enabling robust prediction across a wide variety of cuisines and food types.
- **Maps recognized food** to known allergens (e.g., peanuts, shellfish, dairy, gluten, soy) using a curated allergy knowledge base.
- **Compares model performance (accuracy, speed, confidence)** across architectures, ensuring continuous improvement and transparency.
- Delivers user-friendly results through a mobile/**web interface**, highlighting the identified food item, possible allergens, and a risk confidence score.

CHALLENGES FACED

Globalization of Cuisine – With diverse and mixed food cultures, people encounter unfamiliar dishes containing hidden allergens.

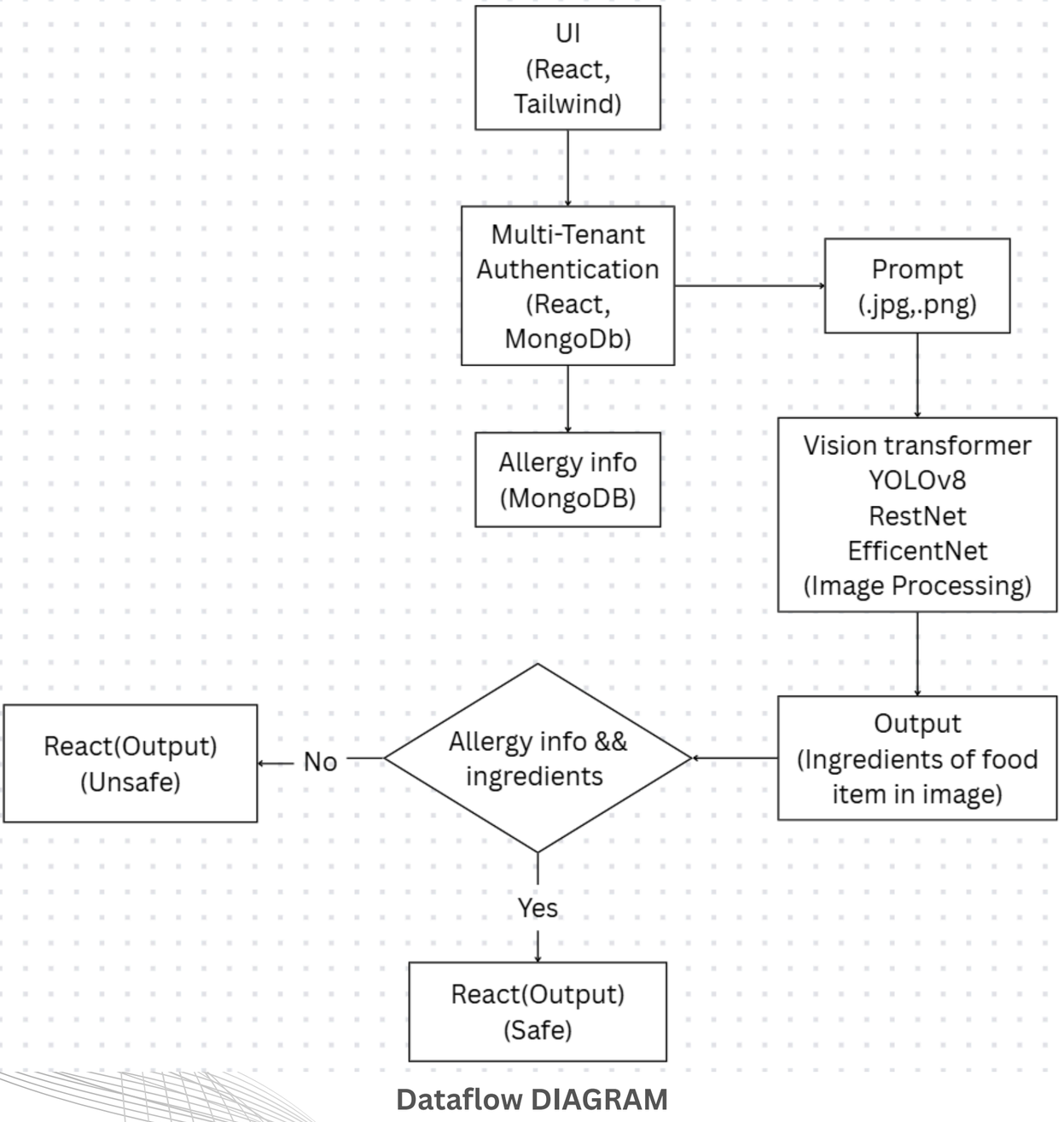
Food Safety & Allergies – Hidden ingredients and cross-contamination make it hard for allergic individuals to eat safely.

Rising Chronic Diseases – Increase in lifestyle-related conditions like diabetes, asthma, and allergies.

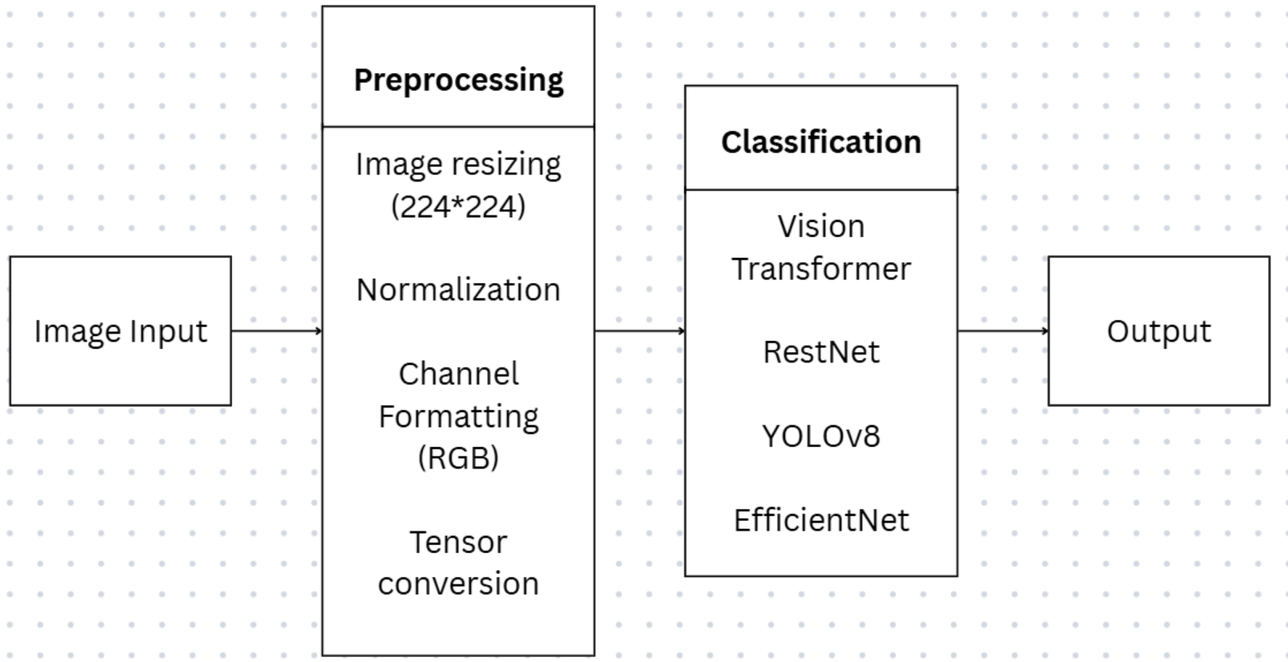
Misinformation – People often rely on unreliable sources (social media, unverified apps) for health advice.

Healthcare Accessibility – Allergy testing and specialist consultations are expensive and not available everywhere.

Delayed Diagnosis – Traditional allergy tests are time-consuming and sometimes inconclusive, leading to late treatment.



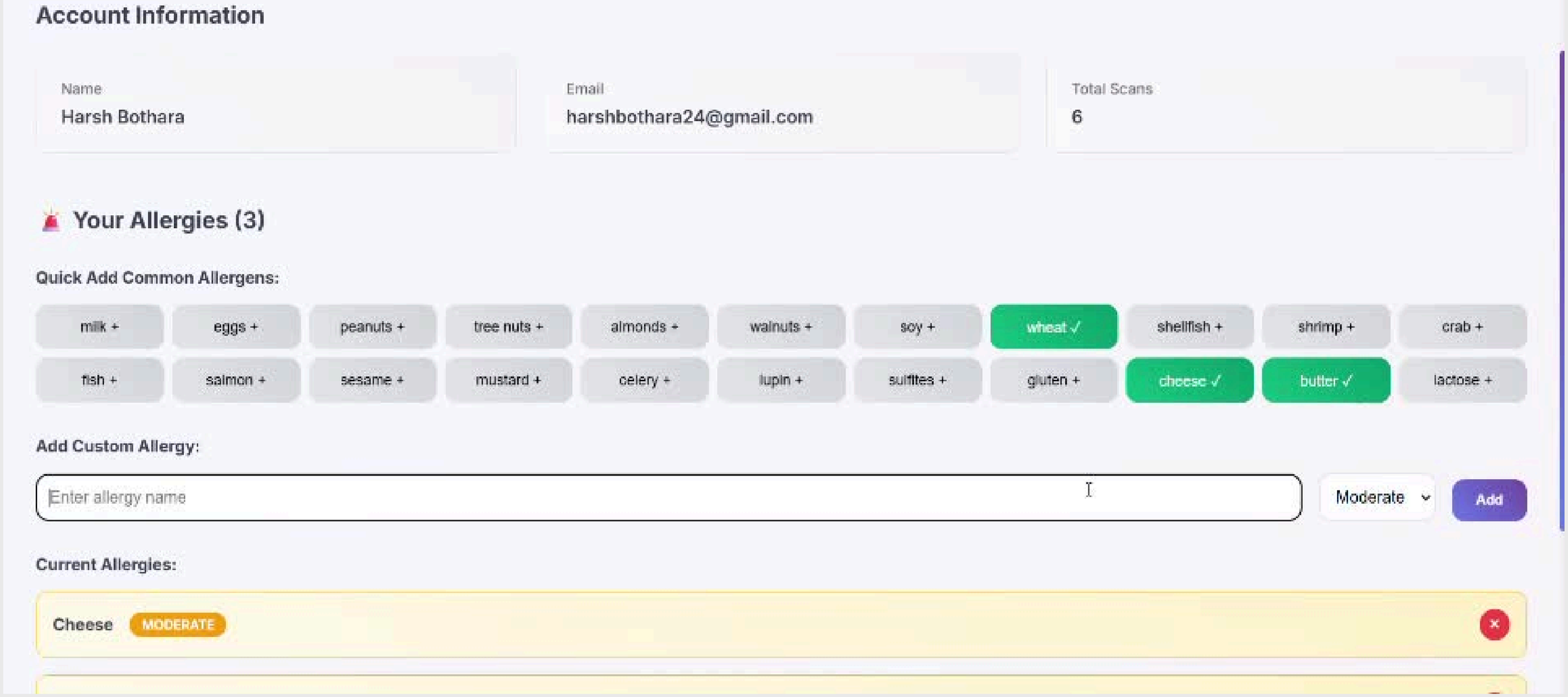
Dataflow DIAGRAM



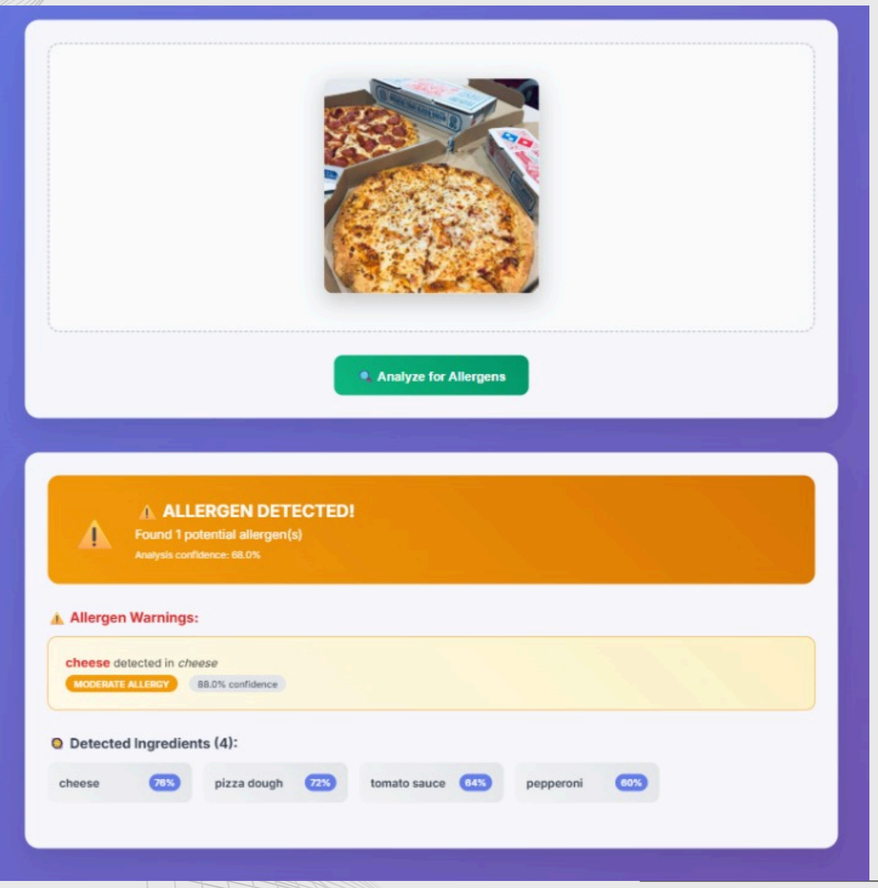
BLOCK DIAGRAM

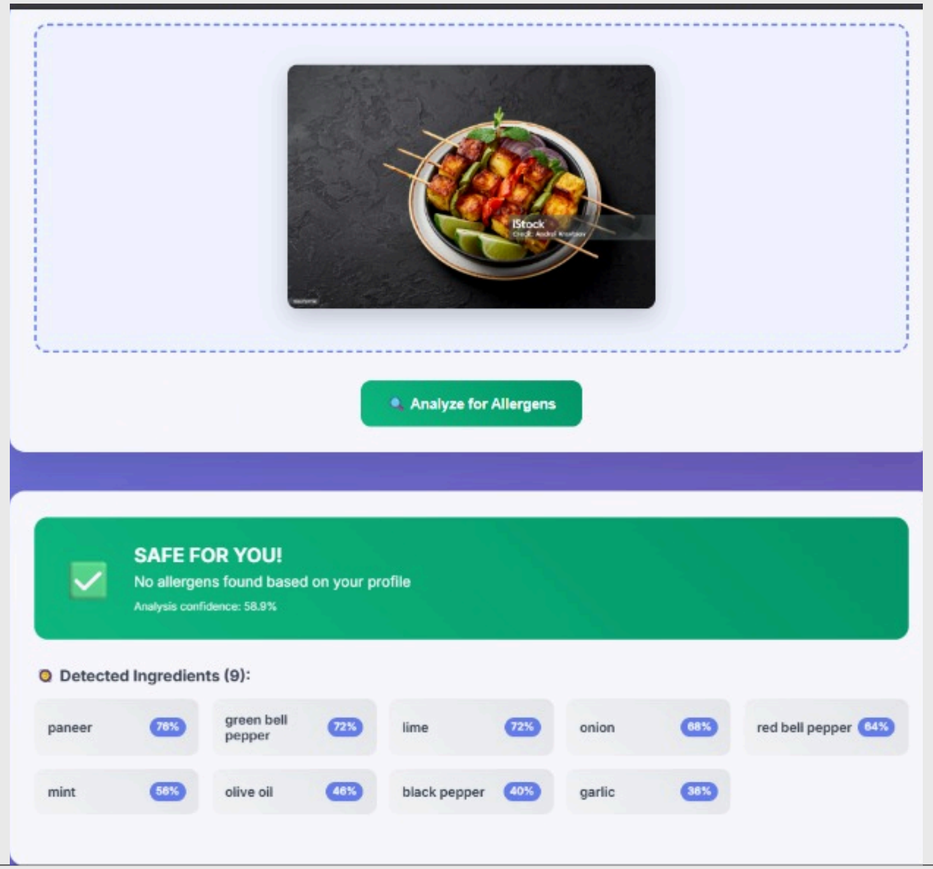
Model Architecture

OUTPUT


Account Information
Name
Harsh Bothara
Email
harshbothara24@gmail.com
Total Scans
6
Your Allergies (3)
Quick Add Common Allergens:
milk +
eggs +
peanuts +
tree nuts +
almonds +
walnuts +
soy +
wheat ✓
shellfish +
shrimp +
crab +
fish +
salmon +
sesame +
mustard +
celery +
lupin +
sulfites +
gluten +
cheese ✓
butter ✓
lactose +
Add Custom Allergy:
Enter allergy name
Moderate
Add
Current Allergies:
Cheese
MODERATE

OUTPUT


Analyze for Allergens
ALLERGEN DETECTED!
Found 1 potential allergen(s)
Analysis confidence: 68.0%
Allergen Warnings:
cheese detected in cheese
MODERATE ALLERGY
88.0% confidence
Detected Ingredients (4):
cheese 76%
pizza dough 72%
tomato sauce 84%
pepperoni 80%


Analyze for Allergens
SAFE FOR YOU!
No allergens found based on your profile
Analysis confidence: 58.9%
Detected Ingredients (9):
paneer 76%
green bell pepper 72%
lime 72%
onion 68%
red bell pepper 64%
mint 56%
olive oil 46%
black pepper 40%
garlic 36%


Nutritional Information
Hide Details
Total Estimated (per 100g)
CALORIES 380 kcal
PROTEIN 24.9g
CARBS 37.9g
FAT 19.1g
FIBER 10.6g
Key Vitamins:
Vitamin A: 230
Vitamin C: 228
Key Minerals:
Calcium: 358mg
Iron: 2.6mg
Sodium: 15mg
Per Ingredient:
green bell pepper
Cal: 20 P: 0.9g C: 4.6g F: 0.2g
lime
Cal: 30 P: 0.9g C: 7g F: 0.1g
mint
Cal: 20 P: 3g C: 7g F: 0.5g
paneer
Cal: 240 P: 18g C: 4g F: 18g
red bell pepper
Cal: 30 P: 1g C: 6g F: 0.2g
red onion
Cal: 40 P: 1.1g C: 9.3g F: 0.1g

SYSTEM COMPARISON

System	Accuracy	Real-time Processing	User Interface
ViT System	**91%**	**Yes**	**Streamlit UI**
YOLOv8	78%	Limited	Website
RestNet	73%	No	Website
Efficient Net-B0	10%	No	Research Prototype

Accuracy (Food Allergen Detection) → Vision Transformer (ViT) – 91%

Best at subtle/hidden allergens due to attention mechanism.

Real-time Processing (Speed) → YOLOv8

Fast inference, can detect multiple foods instantly.

Balanced Performance & Stability → ResNet-50

Reliable across categories, but not the best at fine-grained allergens.

Lightweight & Mobile Deployment → EfficientNet-B3

Smallest size, efficient, but less accurate on complex foods.

FUTURE SCOPE

Larger Datasets

Real-time Mobile App

Voice & Chatbot Assistance

Global Allergen Database

Explainable AI

Integration with Healthcare Systems

CONCLUSION

- Vision Transformer is the most effective for allergen detection.
- Each architecture has unique trade-offs (speed, size, accuracy, deployment).

DATASET USED

1 millions+ Recipes

5k receipes

FOOD- 101

Sr. No	Author(s), Year	Title	Link	Contribution (What they did)	Drawback / Limitation
1	Zhu & Dai, 2021	Food ingredient identification from dish images by deep learning	–	Proposed DL-based food ingredient detection system from dish images	Limited dataset, struggled with overlapping/complex dishes
2	Liu et al., 2025	Deep Learning in Food Image Recognition: A Comprehensive Review	Link	Comprehensive survey of food image recognition techniques using CNN, ViT, YOLO, etc.	Review only, no experimental implementation
3	Wang et al., 2022	Ingredient-guided region discovery & relationship modeling for food category-ingredient prediction	Link	Improved accuracy using ingredient-region correlation modeling	High computation, requires detailed annotations
4	Liu et al., 2024	Convolution-enhanced bi-branch adaptive transformer for food recognition	Link	Hybrid CNN + Transformer for ingredient & category recognition	Complex model → heavy training cost
5	Ismail & Yuan, 2023	Food ingredient recognition through multi-label learning	Link	Multi-label learning for recognizing multiple food ingredients	Limited to small datasets
6	Li et al., 2020	Picture-to-amount (PITA): Predicting relative ingredient amounts from food images	Link	Estimated ingredient *quantities* from food images	Accuracy drops with mixed/hidden foods
7	Fu & Dai, 2024	Recognizing multiple ingredients using a single-ingredient classification model	Link	Simplified single-label model adapted to multi-ingredient recognition	Not scalable for large ingredient sets
8	Ghosh & Sazonov, 2025	Improving Food Image Recognition with Noisy Vision Transformer	Link	Introduced noise-resilient ViT for real-world food images	Transformer-based, requires huge compute & data
9	Nfor et al., 2025	Explainable CNN + ViT for real-time food recognition	Link	Combined CNN + ViT with explainability for real-time detection	Real-time but limited to standard food datasets

Research Paper

https://docs.google.com/document/d/1qWfpckC06P5pJTorvrOxnEtPBIGX_Nqn90kLTlHnT6s/edit?tab=t.0