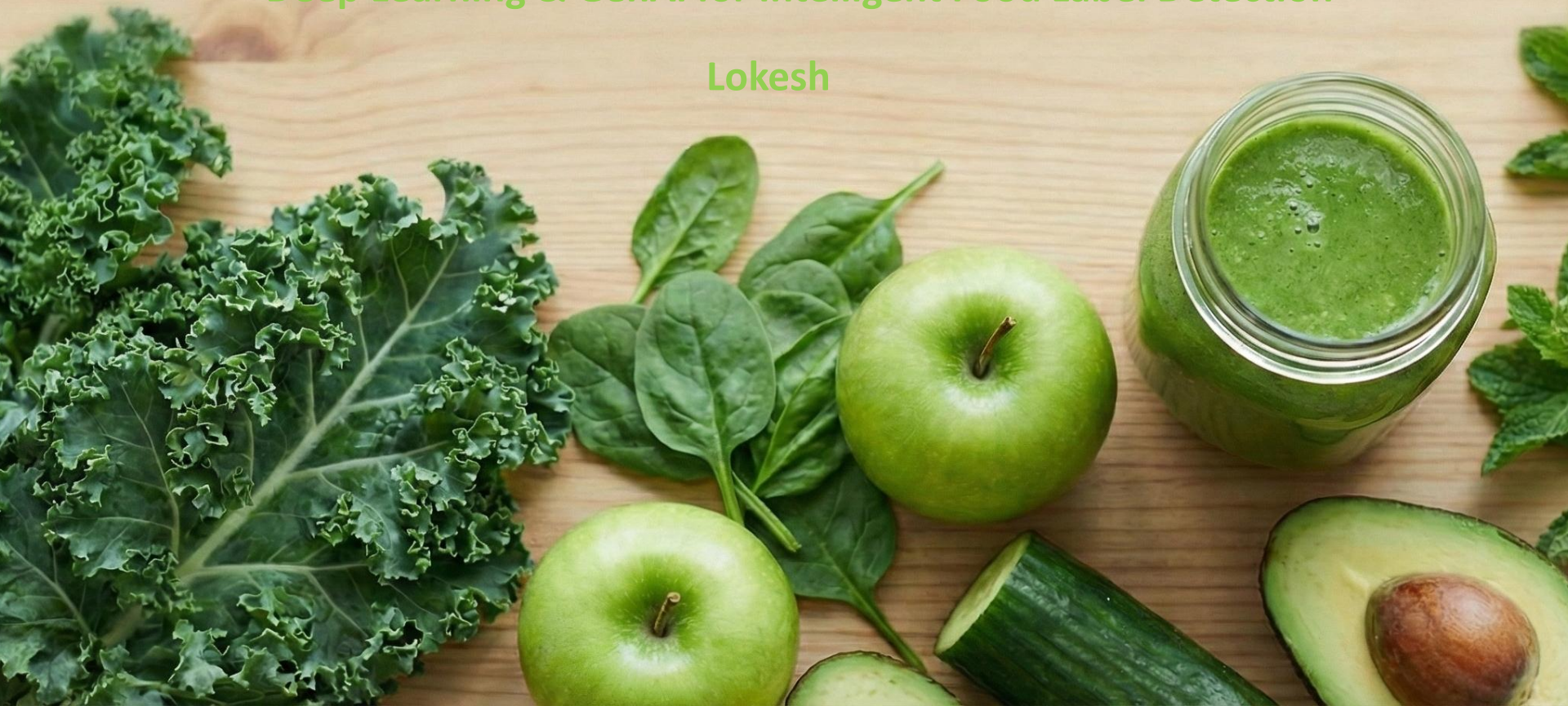


Nutri Green

AI-Powered Food Product Analyzer

Deep Learning & GenAi for Intelligent Food Label Detection

Lokesh



Project Overview

Nutri Green is an AI-powered food analysis system that uses computer vision to detect nutritional labels on product packaging and extract detailed product information. The system combines a custom YOLOv5 model with vision-language models to analyse European grocery products.

Users can upload product images and instantly receive nutrition facts, allergen warnings, and smart recommendations through an intuitive interface.

Dataset

Total: **10,472** labeled food product images available

Used: **7,271** images with YOLO format annotations

Products from major European retailers: Tesco, Sainsbury's, ALDI
label categories:

- **Nutri Score (A-E):** European nutritional quality indicators
- **BIO:** EU Organic certification markers
- **V-Label:** Vegan/Vegetarian certification

NUTRI-SCORE



Dataset

7,271

Total Images

5,089
(70%)

Training Set

1,090
(15%)

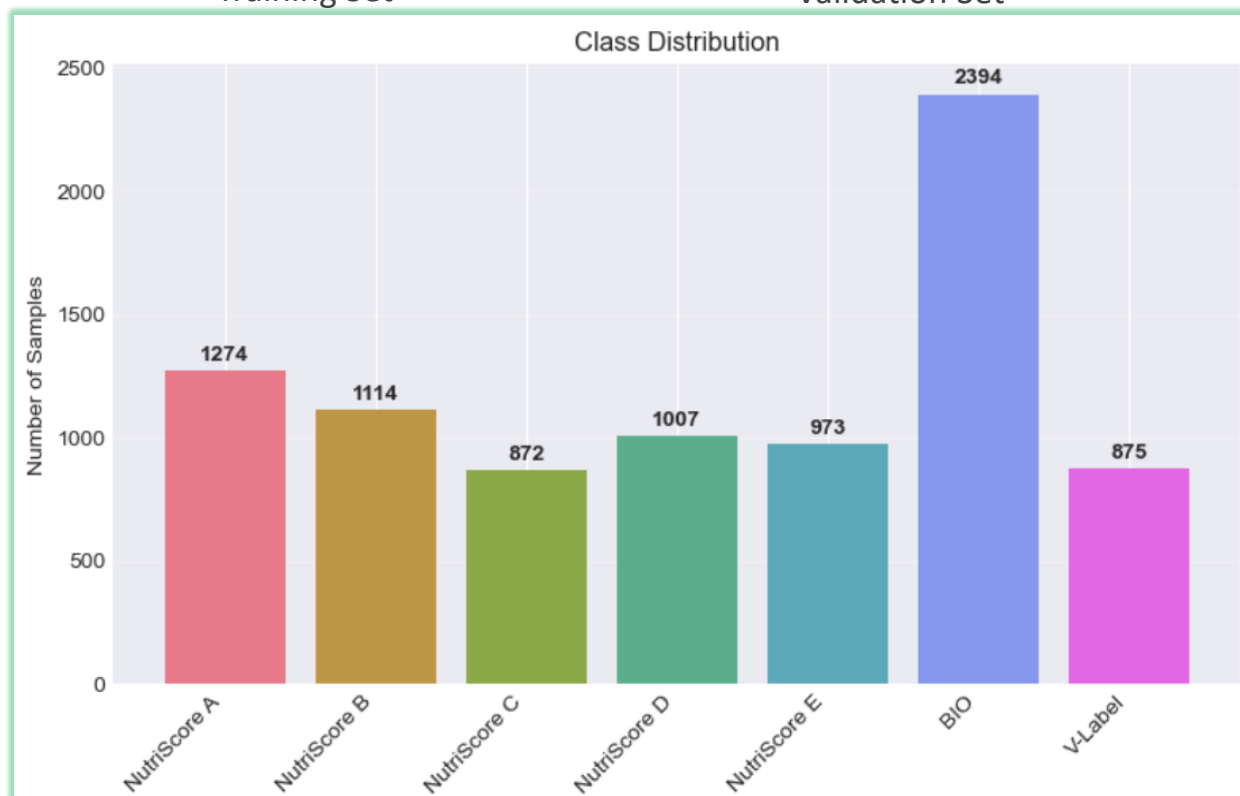
Validation Set

1,092
(15%)

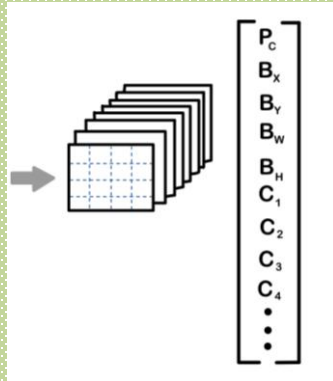
Test Set

Data

CSV data with bounding
box coordinates in the
images and Labels



Phase 1: Computer Vision (yolov5s Model)



Training

YOLO Model

Epochs : 25
Batch size : 8
Image : 640
Model : yolov5s
Model size:7.2M

Output

Bio 97.8



Testing

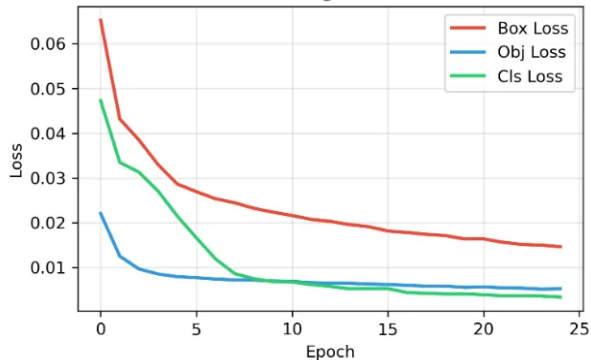
Validate and
Deployed Model



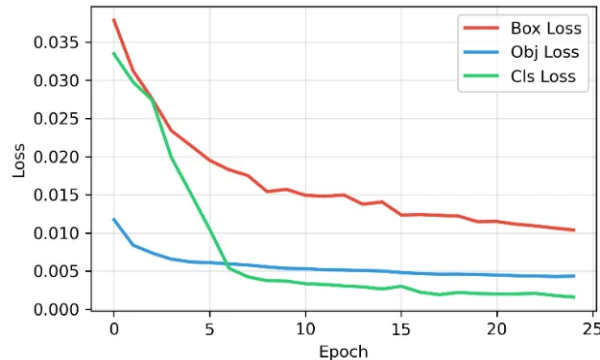
Training & Validation Metrics

Complete Training and Validation Metrics

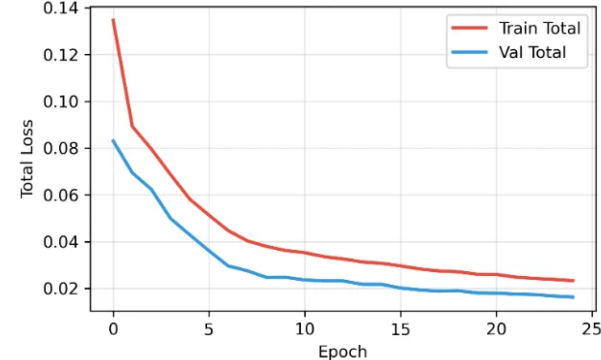
Training Losses



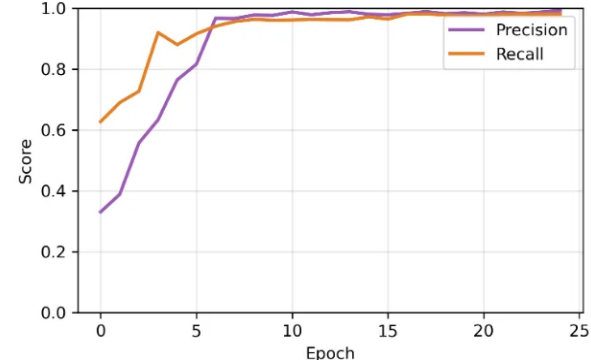
Validation Losses



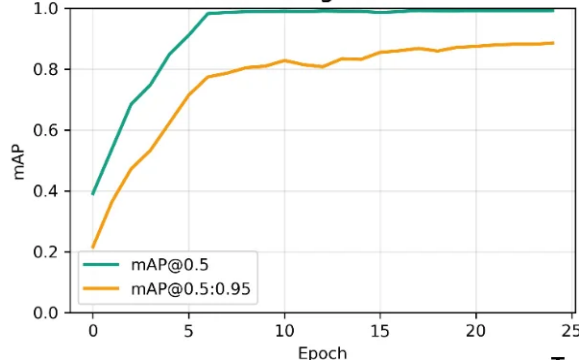
Total Loss (Train vs Val)



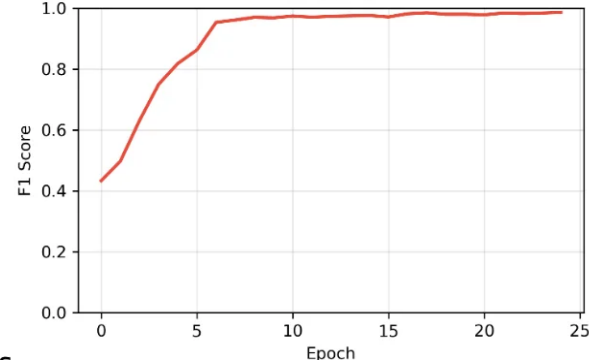
Precision & Recall



Mean Average Precision



F1 Score



98.10%

Recall

98.66%

F1 Score

99.23%

Precision

Sample Predictions

103vegan



136vegan



145vegan



152vegan



183vegan



188vegan



199vegan



20289249



20297084



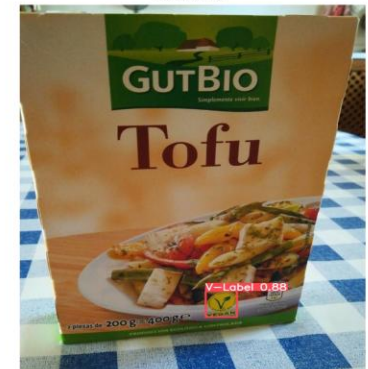
21142581



231vegan



24002738



Error Analysis & Edge Cases

Top Misclassifications

GT: NutriScore C
Pred: NutriScore D
Conf: 0.90



GT: NutriScore A
Pred: NutriScore B
Conf: 0.87



GT: NutriScore B
Pred: NutriScore D
Conf: 0.86



GT: NutriScore A
Pred: NutriScore B
Conf: 0.83



GT: NutriScore D
Pred: NutriScore E
Conf: 0.82



GT: NutriScore A
Pred: NutriScore B
Conf: 0.81



GT: NutriScore A
Pred: NutriScore B
Conf: 0.78



GT: NutriScore A
Pred: NutriScore B
Conf: 0.78



GT: NutriScore E
Pred: NutriScore D
Conf: 0.87



GT: NutriScore A
Pred: NutriScore B
Conf: 0.82



GT: NutriScore A
Pred: NutriScore B
Conf: 0.51



GT: NutriScore A
Pred: NutriScore B
Conf: 0.46



Phase 2: Product Database & Processing

1 The Dual-Engine OCR Core (Pixels → Raw Text)

Easy OCR :

Stage A: Text Detection (CRAFT) - finds where text exists, draws bounding boxes

Stage B: Text Recognition (CRNN) - decodes pixels into strings with confidence scores

Paddle OCR (Booster/Fallback):

Used for low confidence, complex layouts, multilingual

Merging: Combine outputs, prioritize high-confidence reads for cleanest text blocks

2 Parsing & Structuring (Rules & Regex)

Nutrition Extraction: Regex matches patterns (e.g., 'Energy 234 kJ / 56 kcal')

Allergen Scanning: Scan ingredients against 14 EU allergen keywords (milk, gluten, soy, eggs)

3 Data Synthesis

Combine key database fields into single rich text description and put in **SQL database**

4 Creating Embeddings (The 'Semantic Bridge')

Sentence-Embedding Model converts text → fixed-size dense vector

Vision Models

Moondream2

Quick Mode

Specs

Speed: 2-3 seconds
VRAM: ~2 GB
Model Size: ~3 GB
Local inference
Cost: FREE

Why Choose

Fastest processing
Low VRAM usage
Good for quick scans
No API costs
Works offline

Best For

- Rapid batch processing
- Mobile/edge devices
- Quick label detection
- Budget systems
- High-volume analysis

LLaVA-1.5

Standard Mode

Specs

Speed: 5-8 seconds
VRAM: ~4 GB
Model Size: ~7 GB
Local inference (4-bit)
Cost: FREE

Why Choose

Balanced performance
Better accuracy
Detailed understanding
Still runs locally
Production ready

Best For

- Standard workflows
- Detailed analysis
- Complex layouts
- Multi-language text
- Default choice

GPT-4o Vision

Premium Mode

Specs

Speed: 3-5 seconds
VRAM: 0 GB (Cloud)
Model Size: N/A (API)
Cloud-based
Cost: ~\$0.01/image

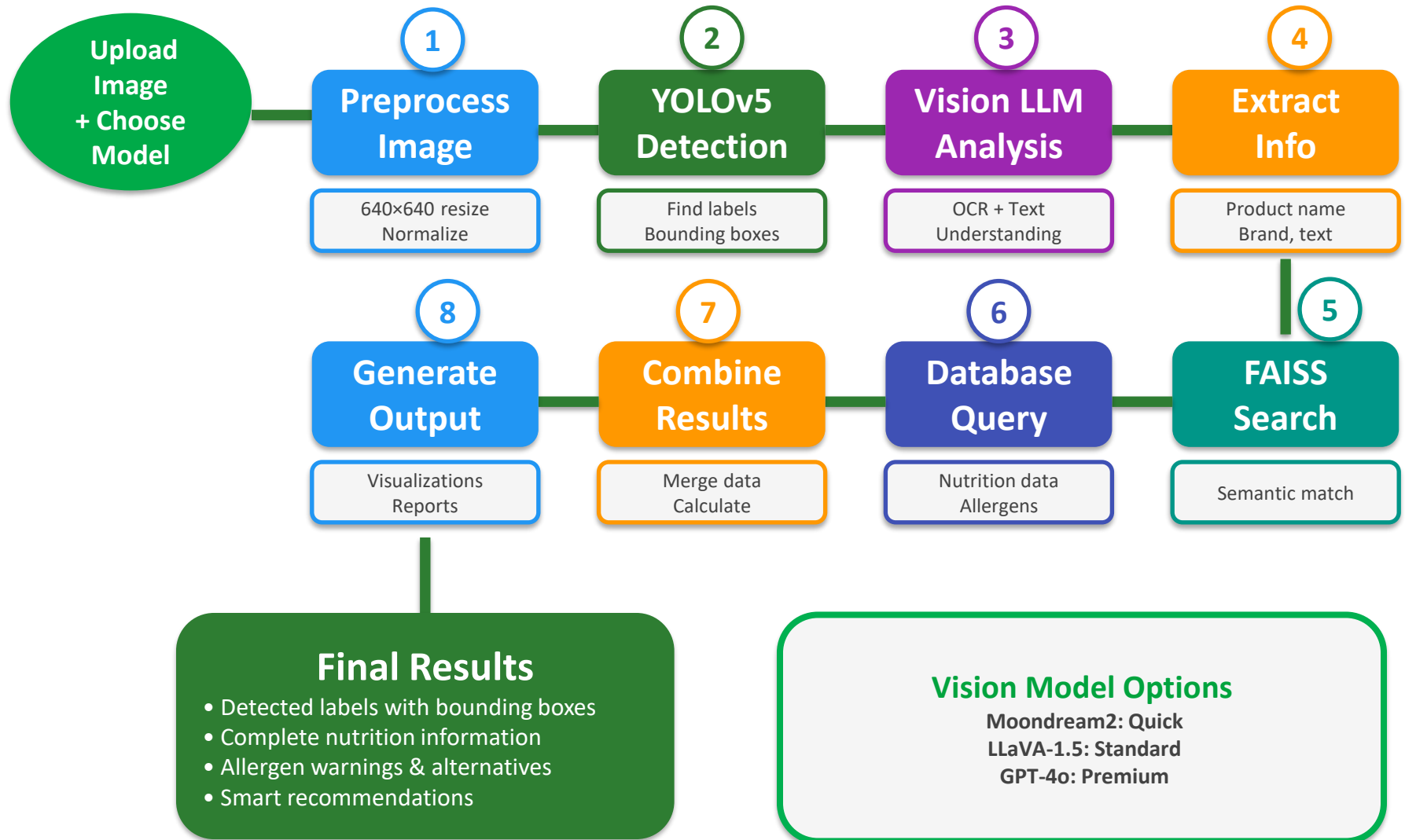
Why Choose

Highest accuracy
Best reasoning
No local GPU needed
Latest capabilities
Most robust

Best For

- Critical analysis
- Complex products
- Max quality needed
- No GPU available
- Research/validation

NutriGreen: Real Processing Workflow



Phase 2: Product Database & Processing

Database: 7,271 products with complete information

Allergen Detection: 3,076 products (42.3%) with allergen data

Nutrition Facts: 100% coverage (calories, macros, serving sizes)

Cost: - Completely FREE, offline processing

Processing Time: 13.6 hours for complete dataset

Streamlit Web Application

Analyze Image: Upload & instant analysis

Compare Products: 2-5 image comparison

Nutrition Calculator: OCR-based extraction

Allergen Alerts: Multi-language detection

Recommendations: AI-powered suggestions

Database Explorer: Browse 7k+ products

API Key Input: User-provided OpenAI key

Interactive Charts: Plotly visualizations

Thank You!

Questions?



Contact: lokeshh1219@example.com



Github

<https://github.com/lokesh12190/NutriGreen---AI-Powered-Food-Product-Analyzer>