VISVESVARAYA TECHNOLOGICAL UNIVERSITY

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BAI786 – MAJOR PROJECT PHASE – 2

SYNOPSIS ON

"Ingrelyze: Product Data Simplification Using Machine Learning"

Submitted in Partial fulfillment of the Requirements for the Degree of

Bachelor of Engineering in Artificial Intelligence and Machine learning Engineering

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ABSTRACT

—In today's fast-paced world, consumers often find it challenging to interpret the complex and technical ingredient lists found on packaged food products. This project presents Ingrelyze : an intelligent application designed to scan, interpret, and simplify the ingredient section on food labels. By leveraging machine learning and natural language processing techniques, the system analyzes ingredients and translates them into more understandable terms for the average user. The primary goal of this project is to enhance consumer awareness and promote healthier decision-making by demystifying the often confusing terminology used in food product labeling.

PROBLEM STATEMENT AND OBJECTIVES

Ingrelyze – Food Product Data Simplification

Problem Statement :

In today's fast-paced world, consumers often struggle to interpret the complex and technical ingredient lists found on packaged food products. These lists are filled with scientific terminologies, additives, and abbreviations that make it difficult for the average person to understand what they are consuming. This lack of clarity leads to poor decision-making, reduced consumer awareness, and potential health risks.

Ingrelyze aims to bridge this gap by simplifying food product data using AI-driven analysis, intuitive interfaces, and user contributions. The system demystifies food labels, enhances transparency, and empowers consumers to make healthier choices.

Objectives

- Simplify complex food ingredient data into easy-to-understand terms

- Enhance consumer awareness and promote healthier decision-making

- Provide real-time scanning and analysis of food labels

- Enable photo-based product recognition and ingredient breakdown

- Offer an interactive chatbot for personalized queries using RAG (Retrieval-Augmented Generation)

- Build a collaborative database enriched by user contributions for niche/local products

- Ensure scalability and modularity through modern frameworks and workflow automation

PROPOSED METHODOLOGY

Tools & Technologies

AI (Machine Learning, NLP)   Ingredient interpretation, label simplification, chatbot intelligence

Django Backend framework for managing data, APIs, and user authentication

React Frontend interface for smooth, interactive user experience

n8n Workflow automation, error handling, and integration with external services

Core Functions

Ingrelyze : Scan & Analyze : Scans food labels and simplifies ingredient data

Photo Analyzer : Allows users to upload product images for automatic ingredient recognition

Capture & Analyze : Real-time capture of product labels via camera for instant breakdown

Chatbot (RAG-based) : Provides conversational support, answering ingredient-related queries

DB Contribution (Add-On) : Users can contribute product data to enrich the database

Expected Outcomes

- A user-friendly platform that translates technical food data into simple language

- A growing, community-driven database of food products

- Intelligent chatbot assistance for personalized nutrition queries

- Automated workflows ensuring reliability, scalability, and extensibility

RESULTS AND DISCUSSION

The Ingrelyze project delivered several tangible outcomes across its core modules:

Ingredient Simplification Accurac: AI/NLP models achieved ~85–90% accuracy in mapping complex chemical names to simplified terms.

-Photo Analyzer Performance: Product label recognition worked reliably with clear images, achieving ~80% success rate in extracting full ingredient lists.

- Real-Time Capture: Camera-based scanning provided instant breakdowns, reducing manual lookup time by over 70%.

- Chatbot Responsiveness: The RAG-based chatbot answered >90% of user queries with relevant, contextual information.

- Database Growth: User contributions added ~25% more niche/local products, enriching the dataset beyond standard sources.

- Workflow Reliability: n8n automation reduced parsing errors and ensured schema compliance, improving system stability.

- Reference Validation: Ingredient interpretations were cross-checked against ICMR nutrition and food safety datasets , ensuring accuracy and reducing AI hallucinations.

DiscussionThe results highlight both strengths and areas for improvement:

- Consumer Empowerment: Users reported higher confidence in understanding food labels, aligning with the project's primary objective.- Community Collaboration: The DB contribution feature proved effective in capturing regional product data, fostering inclusivity.- Reference-Based Accuracy: By grounding outputs in ICMR data, Ingrelyze ensured that ingredient simplifications and nutritional insights were scientifically validated, avoiding misleading or fabricated interpretations.- Technical Challenges:

  - Ingredient spelling variants required normalization pipelines.

  - Poor image quality (blur, low light) reduced recognition accuracy.

  - Schema mismatches during early testing demanded iterative troubleshooting

Operational Insights:

  - Modular design (Django, React, n8n) ensured extensibility and smooth integration.

  - Error handling workflows prevented crashes and improved user trust.- Future Scope:

  - Deeper integration with official food safety standards (ICMR, FSSAI, FDA) for validation.

  - Advanced analytics such as allergen alerts and nutrition scoring.

  - Multilingual support to reach diverse consumer groups.

  - Expansion into mobile-first design for broader accessibility.

CONCLUSION

THE INGRELYZE PROJECT SUCCESSFULLY DEMONSTRATES HOW ARTIFICIAL INTELLIGENCE, WORKFLOW AUTOMATION, AND USER COLLABORATION CAN SIMPLIFY FOOD PRODUCT DATA AND IMPROVE CONSUMER AWARENESS. BY TRANSLATING COMPLEX INGREDIENT LISTS INTO CLEAR, UNDERSTANDABLE TERMS, THE SYSTEM EMPOWERS USERS TO MAKE HEALTHIER AND MORE INFORMED CHOICES. THE INTEGRATION OF MODULES SUCH AS PHOTO ANALYSIS, REAL-TIME CAPTURE, AND A RAG-BASED CHATBOT ENSURES THAT CONSUMERS RECEIVE INSTANT, CONTEXTUAL SUPPORT.