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NutriScan: An Intelligent Mobile Application for Food Ingredient Analysis and Health Based Recommendation

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ABSTRACT - Consumers often face difficulty understanding food labels filled with hidden ingredients, chemical additives, and allergens that may negatively affect health. Limited nutritional awareness can lead to the unintentional intake of harmful substances, increasing the risk of chronic diseases such as diabetes, obesity, and hypertension. This paper presents NutriScan, an Android-based intelligent application designed to simplify food evaluation for consumers. The system scans packaged food items using barcode or QR code recognition and extracts ingredient details. These ingredients are analyzed based on WHO guidelines and data from FoodData Central to generate a color-coded alert system that categorizes components as safe, moderate, or harmful. NutriScan also identifies potential allergens, calculates a nutritional score (A–E) using macro- and micro-nutrient analysis, and offers personalized dietary recommendations based on the user's health conditions. The proposed solution enhances consumer awareness, promotes healthier food choices, and supports informed decision-making in daily life.

Key Words: Food safety, barcode scanning, nutritional analytics, allergen detection, recommendation system, WHO guidelines.

1.INTRODUCTION

The consumption of packaged foods has increased significantly due to changing lifestyle and food accessibility. However, understanding nutritional labels remains a challenge for common consumers who are not familiar with technical chemical terms and hidden food additives. Many food products contain preservatives, artificial sweeteners, stabilizers, and high sugar or sodium content that may pose serious health risks when consumed regularly. To address this health concern, an automated system that instantly analyzes food safety and provides intelligent dietary suggestions is essential. The proposed mobile application NutriScan bridges this gap by converting complex nutritional data into simplified insights through risk alerts and personalized recommendations..

2.LITERATURE SURVEY

A. Overview of mobile food-scanner applications: Mobile food-scanner applications have become an important tool for consumers to make healthier purchasing decisions. Experimental studies indicate that scanner apps can influence consumers' intentions and behavior by increasing awareness of nutrient content and prompting healthier choices at the point of purchase. Werle et al. report measurable behavior shifts when shoppers use a food-scanner app that presents clear health evaluations and alternative suggestions. B. Data sources and standardized guidelines: High-quality nutrient and ingredient data are crucial for reliable app outputs. Public databases such as USDA's FoodData Central provide comprehensive nutrient datasets and REST APIs intended for developer integration; FoodData Central is widely used as a primary data source in nutrition applications and research. Nutrition and ingredient risk thresholds should be anchored to authoritative public-health guidance. The World Health Organization (WHO) publishes global recommendations (for example on free sugars and sodium intake) that are commonly used to define thresholds for 3 "high" or "unsafe" levels in nutritional scoring algorithms.C. OCR and automated allergen/ingredient extraction: Optical Character Recognition (OCR) combined with natural language processing is frequently employed to extract ingredient lists from product packaging. Recent implementations demonstrate that OCR pipelines, when paired with domain-specific name-matching and rule engines, can accurately identify allergens and flagged additives directly from photographed labels. Several

prototypical systems and theses show successful allergen detection using OCR + NLP with regionally curated allergen lists and rule sets. These approaches enable near real-time allergen alerts for users with declared sensitivities. D. Comparative evaluations of existing apps and scoring systems: Commercial and research apps (e.g., Yuka, Fooducate, Label-AI prototypes) adopt different scoring principles: some apply a Nutri-Score/Nutritional-value style algorithm, others combine rule-based detection of additives and allergens with visual alerts. Evaluations of apps like Yuka show that a consumer-friendly interface, transparent scoring rationale, and meaningful alternative suggestions are key to user trust and behavioral impact. However, these systems often rely on western product databases and may not generalize well to other markets without localized datasets and rules.

3. OBJECTIVES

The main objectives of the NutriScan system are as follows: To simplify product ingredient understanding: Develop a mobile application that can clearly explain the nutritional composition and hidden harmful ingredients in packaged food products, making them easily understandable for general consumers. To enable fast food scanning using barcode/QR technology: Provide a seamless scanning experience where users scan the product barcode/QR code to instantly retrieve ingredient details and nutritional information from reliable food data sources. To detect allergens and dietary risks in real time: Automatically identify ingredients that may cause allergies or health issues such as gluten, lactose, nuts, or excessive sugar, based on user-defined medical and dietary conditions. To provide a health-based warning system: Display color-coded alerts (Green – Safe, Yellow – Moderate, Red – Harmful) to help consumers quickly judge the health impact of products before consumption. To calculate and present a nutritional score: Assign an A–E grade according to nutrient values such as sugar, saturated fats, sodium, calories, and fiber, following international health guidelines like WHO and FoodData Central. To offer personalized food recommendations: Suggest healthier product alternatives that fit user preferences such as vegan, diabetic friendly, low-sodium, or protein-rich diets.

4.SCOPE

The scope of NutriScan focuses on developing an Android-based tool that analyzes packaged food ingredients to improve consumer nutritional awareness. It is limited to barcode/QR-labeled industrial food products and relies on trusted databases like FoodData Central, along with WHO and FSSAI guidelines. The system supports basic personalized profiles (vegan, diabetic-friendly, allergen sensitivity) but does not provide medical diagnosis. It offers a color-coded risk alert system and A–E health grading, along with alternative product suggestions based on available data. Initially designed for Indian users, it can expand globally with regional database integration. The interface prioritizes simple, easy-to-understand ingredient explanations for all age groups.

5.MATERIAL AND METHODS

5.1. Materials Used: The development of the system required both software and information resources, listed as follows: Hardware: o Android smartphone for testing (Minimum Android 8.0 or above) o Laptop/Desktop with minimum 8 GB RAM for development environment . Software and Tools: o Android Studio – For UI design, coding, and debugging o Java & Kotlin SDKs – Programming languages for app development o Firebase/SQLite – To store user profiles and local nutrition data o ZXing Library – For fast barcode and QR scanning. Data Sources: o FoodData Central (U.S. Department of Agriculture) – Nutritional composition and product database o WHO & FSSAI Guidelines – Thresholds for harmful and safe ingredient values o Research papers and verified food labeling standards for risk factor detection. Dataset Characteristics: o Packaged food product samples across categories such as snacks, beverages, dairy, and cereals containing barcode/QR labels.

5.2.Tools and Instruments for Data Analysis: To ensure the nutritional evaluation is scientifically accurate and reliable, the following methods and tools were incorporated: Ingredient Extraction Algorithm: Parses and identifies critical nutrients (Sugar, Sodium, Saturated fat, Trans fat, Calories). Health Scoring Model (A–E Grade): Calculated using nutrient thresholds aligned with WHO and FDA regulatory guidelines. Color-Coded Alert System: o Green – Safe for consumption o Orange – Consume in moderation o Red – High-risk or harmful ingredients detected .User Profile Filtering: o Applies dietary preferences (vegan, low-sodium, diabetic-friendly, allergen-free) o Customized nutritional warnings and

product suitability scores .Statistical Reliability Checks: o Cross-verification of ingredient results with multiple product labels.

6.METHODOLOGY

The development process followed a structured and systematic approach: Step 1: Requirement: Identification Conducted a survey among consumers to understand difficulty in reading and interpreting nutrition labels. Finalized features like scanner-based identification, alerts, recommendations, allergen detection. Step 2: System Design: Prepared UML diagrams: Use Case, Data Flow, Activity and Sequence diagrams. Defined application modules: o Login & Registration Module o Scanner Module o Nutrition Analysis Module o User Profile & Preferences Module o Recommendation System o Alert and Report Module Step 3: Development Phase : Implemented an interactive UI compatible with all screen sizes. Integrated ZXing library for camera-based scanning. Established real-time connection to FoodData Central API. Step 4: Ingredient Extraction and Classification: Extracted ingredient strings from product data. Tokenized and matched ingredients with known harmful substance lists: o Artificial colors (E102, E110, etc.) o Excessive sugar/sodium identifiers o Preservatives like BHA, BHT o Allergen triggers Step 5: Health Score Calculation: Designed a Nutritional Grade System (A–E): o A = Highly healthy o E = Highly unhealthy . Used WHO guidelines to classify nutrients into thresholds.Step 6: Color-Coded Alert System: Green: Safe. Orange: Moderate. Red: Harmful Alerts displayed instantly after analysis. Step 7: Personalized Suggestion System: Compared scanned item with healthier alternatives. Considered user parameters like: o Diabetes risk o Weight management goals o Vegetarian/vegan preferences Step 8: Testing & Validation: Tested across multiple smartphone models. Performed accuracy verification by comparing extracted values with physical product labels. Conducted pilot testing with real users to validate simplicity and usefulness.

7.RESULT AND DISCUSSION

The performance of the NutriScan system was evaluated based on its scanning efficiency, accuracy of nutritional analysis, alert generation correctness, and user acceptance. A total of 50 packaged food products across snacks, beverages, cereals, and dairy categories were tested using the application.

7.1.Data Visualization of Results

A. Scanning Accuracy:

Parameter	Expected Output	Actual Output	Accuracy
Barcode Detection	50/50	49/50	98%
Ingredient Extraction	50/50	46/50	92%
Allergen Detection	32/32	30/32	94%

These results confirm that barcode scanning works reliably in most lighting and background conditions

B. Food Health Grade Distribution:

Grade	Meaning	Number of product	Percentage
A	Highly Healthy	6	12%
B	Healthy	10	20%
C	Moderate	18	36%
D	Unhealthy	12	24%
E	Highly Unhealthy	4	8%

Observation: Majority of products fall under Moderate (C) or Unhealthy (D) categories.

C. Color-Coded Alert Results:

Alert Type	Count	Percentage
Green	14	28%
Orange	20	40%
Red	16	32%

Almost 1 in 3 products scanned were Red, indicating high health risk.

CONCLUSION

NutriScan provides an effective and user-friendly solution to help consumers understand the nutritional quality and safety of packaged food products. By integrating barcode and QR scanning with trusted nutritional databases and health guidelines, the system simplifies complex ingredient information into clear risk alerts and personalized recommendations. It supports healthier decision-making by identifying harmful additives,

allergens, and high-risk nutrient levels that are often overlooked by consumers. While the current version focuses on Android devices and packaged food items, NutriScan can be expanded with broader database coverage, advanced health profiling, and multi-platform support. Overall, the system contributes significantly to promoting informed food choices and improving public health awareness.

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REFERENCES

1. S. Roy and A. Banerjee, "Nutritional Recommendation Models," *Journal of Intelligent Systems Research*, 2023.
2. P. Patel and R. Deshmukh, "Barcode/QR Scanning in Health Apps," *International Journal of Computer Science Trends*, 2022.
3. U.S. Department of Agriculture, "FoodData Central Database," USDA, 2022.
4. R. Bharati, S. Kumar, and V. Rao, "Smartphone-Based Allergen Detection," *IEEE Transactions on Consumer Electronics*, 2021.
5. Food Safety and Standards Authority of India (FSSAI), "Packaging and Labelling Regulations," 2020.
6. World Health Organization (WHO), "Guidelines on Fat, Sugar, and Sodium Intake," 2019.
7. L. Zhang and Y. Chen, "Color-Coded Hazard Alerts for Consumer Health," *Human-Centered Computing Review*, 2019.
8. C. A. Monteiro, G. Cannon, M. Lawrence, and L. Costa, "Ultra-Processed Foods and Health," *Public Health Nutrition*, 2018.
9. J. P. Goldberg and J. Gunther, "Understanding Food Labels," *Journal of Consumer Health*, 2017.