iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 Issue: V Month of publication: May 2026

DOI: https://doi.org/10.22214/ijraset.2026.81653

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue V May 2026- Available at www.ijraset.com

NutriLens: A Computer Vision Approach to Food Energy Estimation

Kovvuri Gayatri Devi, Vasagiri Sruthi Vandana, Veer Kukreja, Divya Bindu Dasari, Dr. Ch. Sita Kameswari,
Keshav Memorial Institute of Technology Hyderabad, India

Abstract: The importance of health monitoring using modern digital platforms cannot be understated in recent times; however, recording daily food intake accurately remains challenging. Most of the available applications do not give personal and instant feedback about user-specific analysis and insights. In order to address such issues, the current proposal presents an innovative application called the AI Food Analyzer, which uses deep learning techniques as well as analytics of the collected data. Specifically, food objects are identified using an EfficientNet model con- structed in TensorFlow framework. Meanwhile, nutrition details are acquired from structured databases whereas user data is stored in a secure manner through SQLite database and SHA- 256 algorithm. An interactive interface designed by Streamlit makes it user-friendly and easily operable. Also, an embedded AI assistant gives personalized advice related to healthy eating habits along with weekly health summaries.

Index Terms—Artificial Intelligence, Food Recognition, Nutri- tion Analysis, TensorFlow, Streamlit, SHA-256

I. INTRODUCTION

Logging daily intake and exercises have been an essential part of life today. Nonetheless, pinpointing specific food objects and evaluating their nutrition is still challenging. Most current methods are highly reliant on manual inputting that makes them not very accurate and time-consuming[3]. However, AI can help solve this issue. Specifically, the AI Food Analyzer will utilize TensorFlow to recognize food items based on images and classify them via deep learning[2]. This output will be merged with nutrition data obtained from organized databases. User details will be stored in the SQLite database protected by the SHA-256 algorithm.

II. RELATED WORK

Many implementations have used Artificial Intelligence for the purposes of food recognition. According to Mingxing Tan and Quoc V. Le, the use of the EfficientNet structure allows for achieving better results in image classification[1]. Moreover, a variety of studies implemented models based on TensorFlow to recognize foods and calculate their caloric values[2],[3]. However, many applications related to food tracking still rely either on manual input of information or its incomplete automation[3]. In the majority of such systems, the absence of accuracy is the main drawback, as well as the lack of personalized data for each user. The suggested application provides an answer to these problems by integrating automatic food identification and assessment

III. SYSTEM ARCHITECTURE

The AI Food Analyzer setup has a few main parts that all connect to make things work right. Like, the user interface comes from Streamlit, which makes it pretty easy to use and interactive. Then theres the Python code handling the main logic, and for spotting the food, it uses this deep learning model with TensorFlow and something called Effi- cientNet[1],[2]. Oh, and theres an AI assistant from a large language model that gives smart tips, plus SQLite to keep track of user info in a database.

When someone uploads a picture of their food, thats where it starts. The image gets resized and normalized first, just to fit what the model needs. After that, the model looks at it and figures out what kind of food it is. It matches that to some nutritional info from a database, and saves it all in SQLite along with what the user has done before. I think the AI assistant then looks over everything to suggest personalized stuff, like diet ideas or whatever.

For getting the model ready, they used this FoodSight AI dataset with about 55,000 images of 100 different Indian foods[4]. It covers a bunch of cuisines, which seems useful. They split it into 70 percent for training, 20 for validation, and 10 for testing, to check how well it does. Preprocessing meant getting rid of duplicates or bad images, and trying to balance the classes so the model doesnt favor one type too much.

Figure 1 shows the connections, like how the model, database, and other parts link up for recognizing food and tracking nutrition. That interaction is key, I guess, but it gets a bit complicated explaining it all. Some parts might overlap more than I thought.

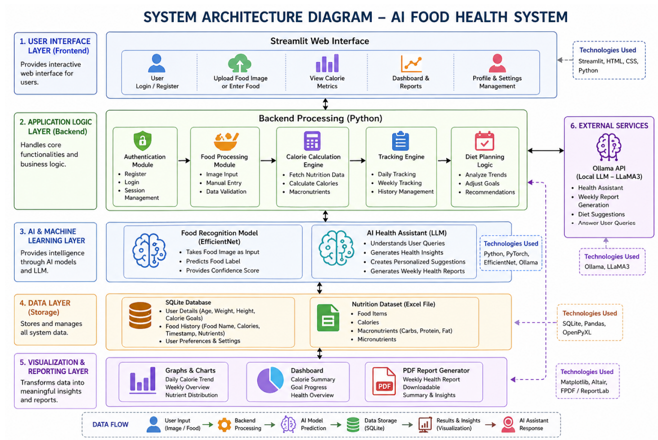


Fig. 1. System Architecture of NutriLens

Fig. 1 illustrates the interaction between the AI model, database, and analysis modules, ensuring accurate food recog- nition and reliable nutrition tracking.

IV. METHODOLOGY

A. *Food Detection & Logging*

Firstly, an image containing the food item needs to be up- loaded. This is followed by pre-processing the image through resizing and normalization and feeding it into an EfficientNet neural network model using TensorFlow framework[1],[2]. The food is recognized by the neural network and it provides a confidence value for that specific detection. Afterwards, based on the identified food item, the system searches and finds the relevant nutrition information from a database[5]. Finally, the gathered information is stored in a database (SQLite) along with the timestamp and the ID of the respective user.

B. *Nutritional Analysis & Insights*

The system allows the user to review all previously logged meals. It will provide the user with an analysis of how many calories he/she has consumed during a certain period of time. In addition to that, it analyzes the eating patterns of the user and provides him/her with valuable insights related to the food items that the user consumes most often. These insights are used to provide personalized suggestions to the user with the help of an AI-based assistant.

V. DIAGRAMS

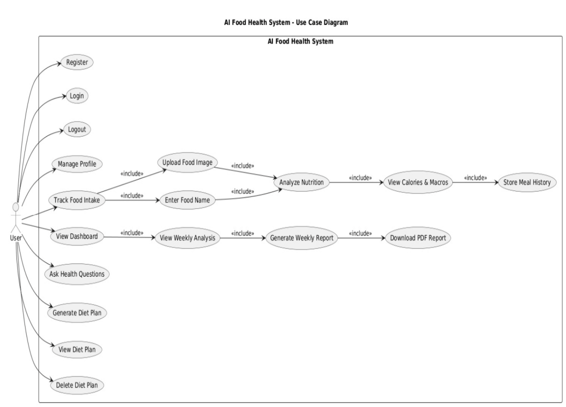


Fig. 2. UseCase Diagram

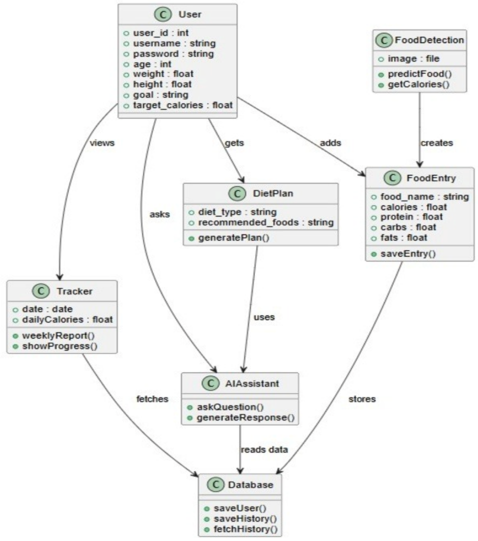


Fig. 3. Class Diagram

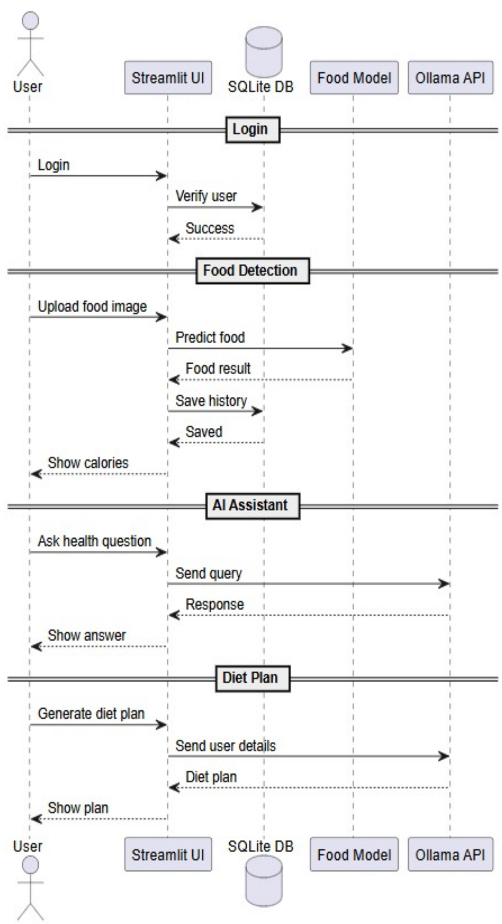


Fig. 4.Sequence Diagram

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue V May 2026- Available at www.ijraset.com

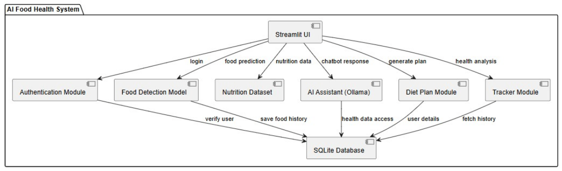


Fig. 5. Component Diagram

VI. SECURITY ANALYSIS

A number of security elements have been incorporated into the system design to ensure secure transmission of user data. User authentication credentials are kept safe from any form of security breach by using the SHA-256 hashing algorithm, which ensures that data is not exposed in its raw format. Data exchanged between the front-end and back-end application is encrypted using HTTPS to prevent any form of data leakage during exchange.

The SQLite database is set up in such a way as to control access to all types of stored data, including user data and logs. Further, secure handling of API keys is ensured in order to reduce any form of exposure that may occur in the process of data exchange.

VII. PERFORMANCE EVALUATION

The performance of the system is evaluated using accuracy, computation speed, and latency measures. The model of food categorization has a test accuracy of 86.77

The model's behavior can be further evaluated by applying the confusion matrix approach to classify different classes of foods. The use of the EfficientNet framework, alongside optimized preprocessing steps, allows for quick and almost instant inference capabilities.

In terms of the system, the use of SQLite technology is an efficient and straightforward approach for managing the database. Streamlit facilitates a high-performing front-end application that has a short response time. The whole system operates at low latency, which facilitates instantaneous predic- tions and reporting processes. Furthermore, the embedded AI assistant generates customized recommendations and reports within seconds.

VIII. ADVANTAGES

- The system provides accurate food categorization, reach- ing up to 86.77
- It allows for immediate calculation and prediction of calories, facilitating continuous food monitoring.
- Streamlit provides the user with a friendly and interactive interface.
- SQLite provides fast data storage and rapid access to user data.
- The entire system structure is economical and scalable for future expansion.
- Customized diet recommendations are developed via AI processing

IX. CONCLUSION

The introduction of AI-based Food Health System has provided an efficient and reliable way to track and analyze the diet. With the integration of deep learning and real-time processing, the system is capable of identifying the foods with an accuracy rate of 86.77With the integration of machine learning algorithms, recommendation mechanisms, database systems, and visualization tools, the system enables users to have a seamless and personalized experience.

X. FUTURE WORK

Future improvements include:

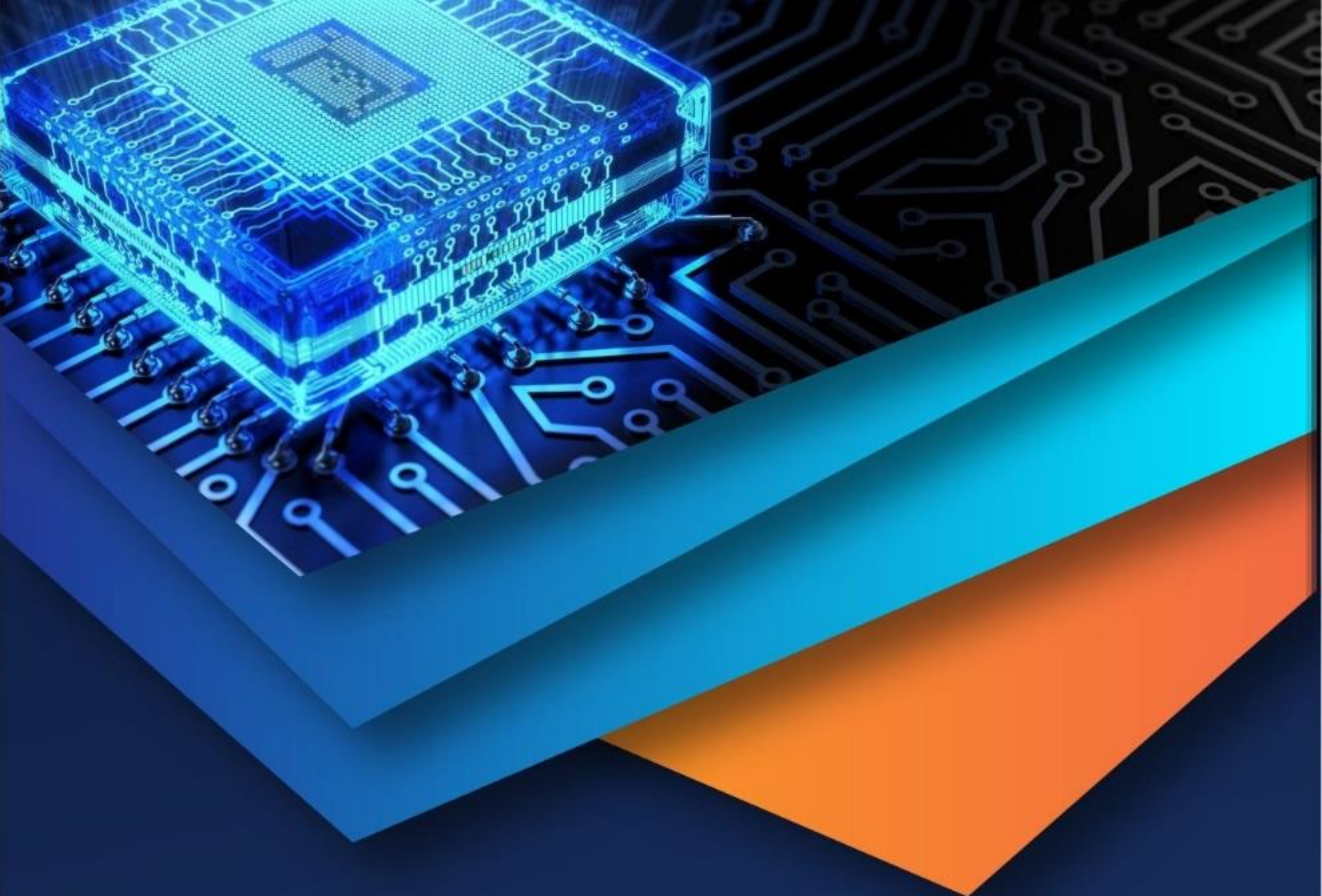
- Using deeper neural networks to improve the accuracy of classification.
- Using multiple modalities by analyzing both image and label data along with the health conditions of the users.
- Using mobile applications for convenient food recogni- tion.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue V May 2026- Available at www.ijraset.com

- Analyzing both diet and physical activity using wearable devices.
- Leveraging cloud and edge computing methods for better efficiency.

REFERENCES

[1] M. Tan and Q. Le, "EfficientNet: Rethinking Model Scaling for Convo lutional Neural Networks," ICML, 2019.
[2] IEEE, "Navigating Landscapes through AI: A Comparative Study of EfficientNet and MobileNetV2 in Image Classification,"IEEE Xplore, 2025.
[3] P. Pouladzadeh et al., "Deep Learning-Based Food Calorie Estimation:A Survey," IEEE Access, 2018.
[4] FoodSight AI Dataset, "100-Class Indian Food Dataset," 2026.
[5] Jessie R. Balbin et al., "Determination of Calorie Content in Different Type of Foods Using Image Processing," IEEE, 2020.



10.22214/IJRASET

INDEX COPERNICUS

45.98

IMPACT FACTOR:
7.129

TOGETHER WE REACH THE GOAL

IMPACT FACTOR:
7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY