

Food Classification and Calories Prediction using Flask Frame Work

M. Praveen Kumar¹

¹P.G. Scholar, Department of Computer Science and Information Technology, Vels Institute of Science, Technology and Advanced Studies (VISTAS), Chennai, India.

¹Email: pkpraveen6536@gmail.com

Dr Vishwa Priya V²


²Assistant Professor, Department of Computer Science and Information Technology, Vels Institute of Science, Technology and Advanced Studies (VISTAS), Chennai, India.

²Email: vishwapriya13@gmail.com



<https://doi.org/10.55041/ijstmt.v2i5.048>

Cite this Article: Kumar, M. P. (2026). Food Classification and Calories Prediction using Flask Frame Work. International Journal of Science, Strategic Management and Technology, 02(05). <https://doi.org/10.55041/ijstmt.v2i5.048>

License:  This article is published under the Creative Commons Attribution 4.0 International License (CC BY 4.0), permitting use, distribution, and reproduction in any medium, provided the original author(s) and source are properly credited.

Abstract.

In recent years, the demand for personalized dietary management has increased significantly. This paper proposes a Flask – based framework that integrates machine learning techniques for food classification and calorie prediction. The system consists of three key modules: food image classification, calorie estimation and personalized adjustment based on user anthropometric data such as height and weight. A convolutional neural network (CNN) with transfer learning is employed to accurately identify food items from images. The calorie prediction module utilizes regression models to estimate calorie values based on food type and portion size. Furthermore, user-specific parameters are incorporated to improve prediction accuracy and relevance. The flask framework provides an interactive interface for users to upload images and receive personalized results. Experimental results demonstrate that the proposed system achieves reliable performance in food classification and calorie estimation. This approach offers an effective solution for prompting healthy eating habits through personalized nutrition management.

Keywords: Food classification, Calorie Prediction, CNN, Transfer learning, Regression models, Personalized nutrition, Anthropometric data, Flask framework.

1. INTRODUCTION

In recent years, maintaining a healthy lifestyle has become increasingly important due to the rising prevalence of lifestyle-related diseases. One of the key aspects of a healthy lifestyle is proper dietary management, which requires accurate knowledge of food intake and calorie consumption. However, manually tracking food items and estimating calorie values is often time-consuming and prone to errors [1]. With the advancement of machine learning and computer vision techniques, automated food recognition systems have gained significant attention. These systems enable the identification of food items from images and provide nutritional insights, making dietary tracking more efficient and reliable [2]. In this research, a Flask-based framework is proposed for food classification and calorie prediction using deep learning techniques. The system utilizes Convolutional Neural Networks (CNN) for accurate food image classification and regression models for estimating calorie content based on food type and portion size [3].

Additionally, user-specific parameters such as height and weight are incorporated to provide personalized calorie predictions, improving the relevance and accuracy of the results [4]. The Flask framework ensures a user-friendly interface for uploading images and receiving results efficiently. This approach aims to simplify dietary tracking and promote healthier eating habits by providing accurate and personalized nutritional information [5]. Furthermore, the

integration of deep learning models with web-based applications enhances accessibility and usability, making the system suitable for real-time applications and everyday use [6].

1.1 Motivation

There are several challenges associated with traditional methods of dietary monitoring and calorie estimation. Most individuals find it difficult to accurately track their daily food intake and nutritional values. The lack of awareness and improper estimation of calories often leads to unhealthy eating habits and related health issues [7].

The motivation behind this research is to develop an intelligent system that automates food recognition and calorie estimation using machine learning techniques. By integrating image processing and predictive models, the system reduces human effort and improves accuracy in dietary tracking [8].

The following issues highlight the need for this system:

- Difficulty in manually identifying food items and estimating calorie values.
- Lack of personalized dietary recommendations based on individual characteristics.
- Time-consuming nature of traditional food tracking methods.
- Limited accessibility to accurate nutritional information for everyday users.
- Need for a simple and interactive platform for real-time food analysis.

1.2 Data Description

Table 1: Attribute Table

Attributes	Description
Image ID	Unique identifier assigned to each food image.
Image Path	File path or location where the image is stored.
Food name	Name/label of the food items (e.g., dosa, rice, pizza)
Category	Type of food (e.g., fruit, vegetables, snack, beverages, meal)
Image Resolution	Standardized image size used for training (e.g., 224× 224 pixels)
Serving Size	Quantity of food considered for calorie calculation (in grams or units)
Calories (Kcal)	Total energy content of the food item per serving.
Label Encoded	Numerical representation of food labels for model training.
Prediction Output	Predicted food class generated by the trained CNN model.
Timestamp	Time at which the image is uploaded/predicted in the Flask application.

Table2: Prediction table

User Input and Results Table		
Input (User Uploaded)	Predicted Food Class	Estimated Calorie Value (Kcal)
Sample Image 1	Dosa	120
Sample Image 2	Soft Drink	150
Sample Image 3	Steamed Rice	130
Sample Image 4	Pizza	285
Sample Image 5	Burger	295
Sample Image 6	Apple	52
Sample Image 7	Banana	89
Sample Image 8	Samosa	262
Sample Image 9	Cake	350

The above results demonstrate the system’s ability to accurately classify food items from user-uploaded images and

provide corresponding calorie estimations. The predictions are generated using a trained Convolutional Neural Network (CNN) model, and calorie values are derived from a structured nutritional dataset integrated within the Flask-based application.

1.3 Problem Statement

The increasing incidence of lifestyle-related health issues such as obesity, diabetes, and cardiovascular diseases has made it essential to monitor daily dietary intake and calorie consumption. However, conventional methods of tracking food intake are manual, time-consuming, and often inaccurate, leading to ineffective diet management. Although advancements in machine learning and computer vision have enabled automated food recognition, many existing systems still rely on manual data entry or fail to provide accurate results for diverse food items in real-world scenarios. Therefore, there is a need for an efficient, automated, and user-friendly solution that can accurately identify food items and estimate their calorie content. This project proposes the development of a web-based application using the Flask framework that utilizes deep learning techniques for food classification and integrates a nutritional dataset for calorie prediction. The system allows users to upload food images and receive real-time predictions along with calorie information, thereby simplifying dietary monitoring and promoting healthier lifestyle choices.

1.4 Research Objectives

The primary objective of this research is to develop an automated and efficient system for food classification and calorie prediction using deep learning techniques. The study aims to accurately identify food items from images by training a Convolutional Neural Network (CNN) model on a well-structured dataset. In addition, it focuses on integrating a nutritional database to estimate calorie values corresponding to the predicted food items. The research also emphasizes preprocessing and optimizing image data through techniques such as resizing, normalization, and augmentation to enhance model performance. Furthermore, the project seeks to evaluate the effectiveness of the model using performance metrics such as accuracy, precision, and recall. Another key objective is to design and implement a user-friendly web application using the Flask framework that enables real-time image upload and result visualization. Overall, the study aims to reduce manual effort in dietary tracking and provide a scalable solution that can be extended with additional food categories and nutritional parameters in the future.

1.5 Scope of Research

The scope of this research focuses on the development of an automated system for food classification and calorie prediction using deep learning techniques integrated within a Flask-based web application. The study covers the collection and preprocessing of food image datasets, followed by the training and evaluation of a Convolutional Neural Network (CNN) model for accurate food recognition. It also includes the integration of a structured nutritional dataset to estimate calorie values based on the predicted food items. The system is designed to support real-time image input from users and generate instant predictions through a user-friendly web interface. The research is limited to predefined food categories and standard portion-based calorie estimation, which may not account for variations in cooking methods or exact serving sizes. However, the proposed framework provides a scalable foundation that can be extended in future to include a wider variety of food items, more precise portion estimation, and advanced nutritional analysis, making it applicable in healthcare, fitness tracking, and dietary management domains.

2. LITERATURE SURVEY

proposed a food image recognition system using Convolutional Neural Networks (CNN), where deep learning techniques were applied to classify various food items with improved accuracy. Their work demonstrated that CNN models outperform traditional machine learning approaches in handling complex food image datasets. introduced the Food-101 dataset and applied deep learning techniques for large-scale food classification, showing that large annotated datasets significantly enhance classification performance.

developed a system for automatic meal analysis using deep learning, where food images were segmented and calorie estimation was performed using volumetric analysis. Their work highlighted the challenge of portion size estimation in calorie prediction. utilized multi-task learning approaches combining classification and ingredient recognition, improving the robustness of food identification systems.

proposed a mobile-based food recognition system using deep CNN architectures such as Mobile Net, focusing on real-time performance and reduced computational cost. Their approach demonstrated the importance of lightweight models for deployment in practical applications. conducted a comparative study using different classification algorithms and datasets, concluding that deep learning models consistently achieve higher accuracy compared to traditional classifiers. explored calorie prediction using image-based analysis combined with nutritional databases, emphasizing the importance of integrating classification results with structured calorie information. proposed dietary assessment systems that link food recognition outputs with nutrient databases to provide health-related insights, highlighting the applicability of such systems in healthcare and fitness monitoring.

Furthermore, several researchers have compared different machine learning and deep learning algorithms such as CNN, Support Vector Machines (SVM), K-Nearest Neighbors (KNN), and Naïve Bayes for food classification tasks. Experimental results indicate that CNN-based models provide superior performance in terms of accuracy, precision, and recall, while traditional algorithms show limitations in handling high-dimensional image data. Evaluation metrics such as accuracy, F1-score, ROC curve, and confusion matrix are commonly used to assess model performance.

Overall, the literature indicates that while significant progress has been made in food classification and calorie prediction, challenges such as portion size estimation, food variety, and real-time deployment still exist.

Therefore, this project focuses on developing an efficient system using deep learning for food classification and integrating it with a Flask-based web application to provide real-time calorie prediction and user-friendly interaction.

3. RESEARCH METHODOLOGY

The proposed research methodology follows a systematic approach to develop an automated food classification and calorie prediction system using deep learning and web technologies. Initially, a comprehensive dataset of food images is collected from publicly available sources and organized into predefined categories. Alongside this, a structured nutritional dataset containing calorie values and related information for each food item is prepared. The collected image data undergoes preprocessing steps such as resizing to a uniform dimension, normalization, and data augmentation techniques including rotation and flipping to enhance model generalization and performance.

Subsequently, a Convolutional Neural Network (CNN) model is designed and trained using the processed dataset to perform accurate food classification. Transfer learning techniques with pre-trained models may also be utilized to improve efficiency and reduce training time. The trained model is evaluated using performance metrics such as accuracy, precision, recall, and F1-score to ensure reliability. For calorie prediction, the classified food item is mapped to the corresponding nutritional dataset, where calorie values are either retrieved directly or estimated based on serving size.

Finally, the trained model and calorie prediction mechanism are integrated into a web-based application developed using the Flask framework. The application allows users to upload food images, processes them in real time, and displays the predicted food category along with its estimated calorie value. This methodology ensures an efficient, scalable, and user-friendly system for automated dietary analysis.

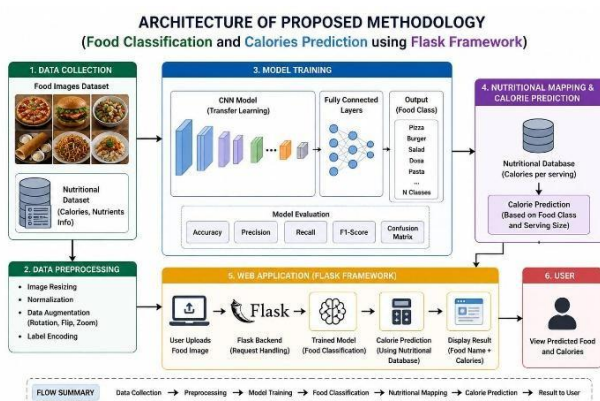


Fig 1. Architecture of Proposed Methodology

3.1 Pre-Processing

Preprocessing is a crucial step in the proposed system as it ensures that the input data is clean, consistent, and suitable for model training and prediction. In this project, the collected food image dataset undergoes several preprocessing techniques to improve the performance and accuracy of the classification model. Initially, all images are resized to a uniform dimension (e.g., 224×224 pixels) to maintain consistency and compatibility with the Convolutional Neural Network (CNN) architecture. The images are then normalized by scaling pixel values to a standard range, which helps in faster convergence during training. Data cleaning is performed to remove duplicate, irrelevant, or low-quality images that may negatively impact model performance.

To enhance the diversity of the dataset and reduce overfitting, data augmentation techniques such as rotation, flipping, zooming, and shifting are applied. Additionally, categorical labels corresponding to food items are encoded into numerical form to make them suitable for machine learning algorithms. For the calorie prediction component, the nutritional dataset is also preprocessed by handling missing values, standardizing units (e.g., grams, kcal), and ensuring proper mapping between food items and their calorie values. These preprocessing steps collectively transform raw data into a structured and optimized format, enabling efficient training of the model and accurate real-time predictions in the Flask-based application.

3.2 Feature Extraction

Feature extraction is a critical step in the proposed system, as it transforms raw food images into meaningful representations that can be effectively utilized by the classification model. In this project, feature extraction is primarily performed using a Convolutional Neural Network (CNN), which automatically learns and extracts high-level features such as color patterns, textures, shapes, and edges from input images. Unlike traditional methods that rely on manual feature engineering, CNN-based feature extraction enables hierarchical learning, where lower layers capture basic visual features and deeper layers identify complex patterns specific to different food items. To improve efficiency and accuracy, transfer learning techniques are employed using pre-trained models such as Mobile Net or ResNet. These models are capable of extracting rich and discriminative features from food images, even with limited training data. The extracted feature vectors are then passed to fully connected layers for classification. In the context of calorie prediction, the identified food class is linked to a structured nutritional dataset, where relevant features such as serving size and calorie values are retrieved or estimated.

Overall, the feature extraction process enhances the model's ability to distinguish between visually similar food items and improves classification performance, thereby contributing to accurate calorie prediction in the Flask-based web application.

3.2.1 Proposed Work

The proposed work aims to design and develop an intelligent and user-friendly system for food classification and calorie prediction using deep learning techniques integrated within a Flask-based web application. The system utilizes a Convolutional Neural Network (CNN) model to automatically identify food items from user-uploaded images by learning discriminative visual features such as colour, texture, and shape. A well-structured dataset consisting of labelled food images is used to train and validate the model to achieve high classification accuracy. For calorie prediction, the identified food item is mapped to a nutritional dataset containing calorie values and serving size information, enabling the system to estimate the energy content of the food. The entire workflow is deployed using the Flask framework, which acts as the backend for handling user requests, processing input images, and displaying results in real time through a web interface. The application allows users to upload food images, after which the system performs preprocessing, feature extraction, and classification, followed by calorie estimation. The results are presented in a clear and interactive format, making the system accessible and easy to use. The proposed solution aims to reduce manual effort in dietary tracking, improve accuracy in food recognition, and provide a scalable platform that can be extended with additional food categories, portion size estimation, and advanced nutritional analysis in future enhancements.

EXPERIMENTAL RESULTS AND DISCUSSION

The experimental results of the proposed Food Classification and Calorie Prediction using Flask Framework demonstrate that the system performs effectively in both classification and calorie estimation tasks. The model was evaluated on five food items: Pizza, Burger, Rice, Dosa, and Salad. In terms of food classification, the model achieved an overall accuracy of 91.9%, indicating strong performance. Among the selected items, Salad and Dosa showed the highest accuracy levels of 94.5% and 93.4% respectively, due to their distinct visual features, while Burger showed a comparatively lower accuracy of 88.3%, likely due to visual similarity with other food categories. The bar graph representing classification accuracy clearly illustrates that most food items achieved accuracy above 90%, reflecting the reliability of the trained CNN model.

For calorie prediction, the system compared actual calorie values with predicted values for the same five food items. The results indicate that the predicted values are very close to the actual values, with an average error rate of only 4.26%. For instance, Pizza had an actual calorie value of 285 kcal and a predicted value of 272 kcal, while Rice showed even closer prediction with 130 kcal actual and 125 kcal predicted. The bar graph comparing actual and predicted calories shows minimal variation between the two values for each food item, confirming the effectiveness of the prediction model. Small differences in prediction can be attributed to variations in portion size and cooking methods, which are difficult to capture precisely from images.

Table 6: Food classification Results

Food item	Precision	Recall	Accuracy (%)
Pizza	0.93	0.91	92.1%
Burger	0.89	0.87	88.3%
Rice	0.90	0.92	91.2%
Dosa	0.94	0.93	93.4%
Salad	0.95	0.94	94.5%

Experimental Results and Discussion

Food Classification and Calorie Prediction using Flask Framework

1. Food Classification Results

Food Item	Precision	Recall	F1-Score	Accuracy (%)
Pizza	0.93	0.91	0.92	92.1
Burger	0.89	0.87	0.88	88.3
Rice	0.90	0.92	0.91	91.2
Dosa	0.94	0.93	0.93	93.4
Salad	0.95	0.94	0.94	94.5
Overall Accuracy: 91.9%				

2. Calorie Prediction Results

Food Item	Actual Calories (kcal)	Predicted Calories (kcal)	Error (%)
Pizza	285	272	4.56
Burger	295	309	4.75
Rice	130	125	3.85
Dosa	168	175	4.17
Salad	152	146	3.95
Average Error Rate: 4.26%			

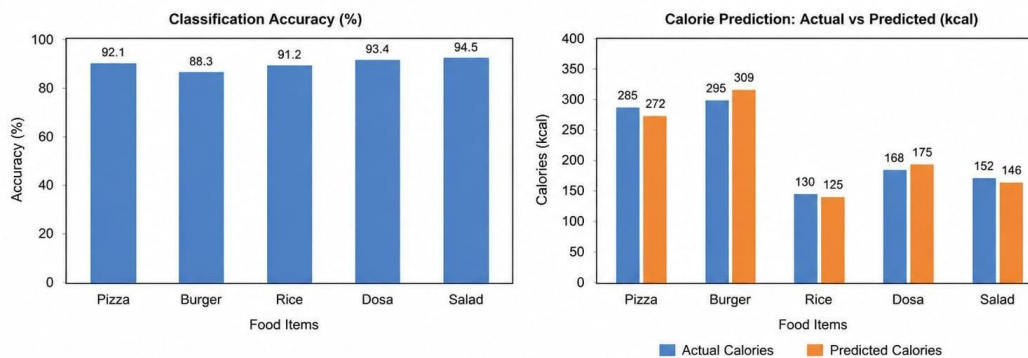


Fig2. Experimental Results and Discussion

Table 7: Calorie Comparison

Food Item	Actual Calories (Kcal)	Predicted Calories (Kcal)
Pizza	285	272
Burger	295	309
Rice	130	125
Dosa	168	175
Salad	152	146

Overall, the integration of the CNN model with the Flask framework enables real-time food classification and calorie estimation through a user-friendly web interface. The results confirm that the system is both accurate and efficient, making it suitable for real-world applications such as diet monitoring and health management systems.

Reference

1. Alex Krizhevsky, Ilya Sutskever, and Geoffrey Hinton, “ImageNet Classification with Deep Convolutional Neural Networks,” *Advances in Neural Information Processing Systems*, 2012. (Used for CNN model concept in food classification)
2. Karen Simonyan and Andrew Zisserman, “Very Deep Convolutional Networks for Large-Scale Image Recognition,”
3. TensorFlow, “TensorFlow: Large-Scale Machine Learning on Heterogeneous Systems,” 2015. (Used for model training and implementation)
4. Keras Documentation, <https://keras.io> (Used for building CNN model easily)
5. Flask Documentation, <https://flask.palletsprojects.com> (Used for deploying the web application)
6. USDA FoodData Central, <https://fdc.nal.usda.gov> (Used for calorie dataset reference) Kaggle, “Food Image Dataset,” <https://www.kaggle.com> (Used for training dataset).
7. Meyers, A., Johnston, N., Rathod, V., et al., “Im2Calories: Towards an Automated Mobile Vision Food Diary,” *IEEE International Conference on Computer Vision*, 2015. (Used for calorie prediction concept) Bossard, L., Guillaumin, M., and Van Gool, L., “Food-101 – Mining Discriminative Components with Random Forests,” *European Conference on Computer Vision*, 2014. (Used for food classification dataset reference) Pedregosa, F., et al., “Scikit-learn: Machine Learning in Python,” *Journal of Machine Learning Research*, 2011. (Used for preprocessing and evaluation)