**Meal Calorie Detector**

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**Abstract**

**The growing requirement of personal dietary control has given birth to new methods of approximating calorie intake from food. The aim of this project is to design an automatic system that can detect and classify food portions on a meal plate from an image and approximate the total calorie content. The system will read the uploaded image to detect and classify food items based on their visual appearance. After the food items are determined, the system will determine the total calorie content of the meal by summing up the calories of the determined items. And this system can also determine nutrients in the meal plate.**

**This system is designed to enable one to monitor his diet and simplify the process. A user can just upload a picture of a meal, and the system can read the picture automatically to identify food and give immediate recommendations on the food items chosen and their respective calorie content. By making it easy and precise to track daily calorie intake, the system allows its users to choose healthier foods, monitor nutritional intake, and improve well-being.**

**Keywords**: **Food Calorie Estimation, Food Recognition, Nutritional Analysis, Image-based Food Detection, Meal Calorie Detector, Diet Monitoring System, Computer Vision in Nutrition, Deep Learning for Food Classification, Calorie Tracking, Nutrient Estimation, Health and Wellness Technology, AI in Dietary Management, Portion Size Estimation, GPT-4o-mini for Food Analysis, Food Image Processing.**

**1.INTRODUCTION**

In the recent past, there has been a focus on a healthy diet because increasingly, lifestyle disorders are on the rise such as obesity, diabetes, and heart diseases. People become health-aware about what they eat with increased focus on calorific value in addition to macro-nutrient mix so that they stay healthy. The traditional methods like food diaries and calorie charts are typically time-consuming and prone to error, e.g., inaccurate portion estimation or incomplete diaries. Even though food can be easily tracked using mobile phone apps that allow scanning of barcodes or looking up databases, these apps remain client-intensive and prone to inaccurate information or cooking substitutes.  
 Technological improvements in Artificial Intelligence (AI) and computer vision have introduced even smarter nutrition tracking applications. AI-driven food recognition technologies utilize deep learning, i.e., convolutional neural networks (CNNs), to analyze images of food, identify foods, estimate serving sizes, and provide nutritional content. These technologies reduce human input, achieve greater accuracy, and provide a more seamless way of tracking dietary intake, making eating healthy easier and less labor-intensive.

**2. LITERATURE SURVEY**

Advances in AI nutrition assessment tools demonstrate unparalleled improvement in food identification, caloric estimation, and personalized meal planning. Khamesian et al. [1] documented NutriGen, wherein enormous language models such as LLaMA 3.1 8B and GPT-3.5 Turbo were used in the construction of personalized meal plans. It is mixed with user-defined nutritional limits with healthy sources such as the USDA food nutrition database with 1.55% and 3.68% low caloric deviation errors, respectively, demonstrating its accuracy and flexibility towards nutricognitive conformity.

At the same time, O'Hara et al. [2] assessed ChatGPT-4 to predict meal eaten nutrient content from pictures. ChatGPT-4 was accurate in identifying food from images of meals consumed during national diet surveys at 93.0%. It was decent at small meals (p = 0.221), but worse at medium and large meals (p < 0.001), and so more advanced visual models and greater diversity in collections of pictures are required.

Another second-order synthesis by Guo et al. [3] contrasted 23 empirical experiments and confirmed GPT-4's superior performance over GPT-3.5 in both nutrient accuracy and meal variety. Difficult, however, are nuances in managing complicated dietary needs like comorbidities and food allergies, and professional caution is recommended with its use.

Yao et al. [5] introduced CaLoRAify, a pre-filtered dataset of 330,000 image-text pairs calorie estimation model and techniques such as Low-rank Adaptation (LoRA) and Retrieval-Augmented Generation (RAG). CaLoRAify provides monocular food image calorie estimation using dialog interfaces with proposed multicultural dataset extensions and live diet feedback systems.

Moreover, Papastratis et al. [6] designed a deep generative model and ChatGPT to generate personalized weekly diet plans. The system was tested on over 4,000 user profiles by learning user anthropometry and health conditions using a variational autoencoder, and it produced clinically correct and individualized diet plans.

Finally, Lo et al. [7] provided a comprehensive review of multimodal diet analysis with ChatGPT and recommended the use of vision and language models to better enhance performance for intricate meal format.

Together, these works present a paradigm break in diet monitoring where AI systems offer more accurate, user-centric, and individualized nutrition advice. In spite of this, science still falls short of the potency required in gargantuan food estimates, cross-cultural food exploration, and security in clinically sensitive use.

**3.PROPOSED SYSTEM**

People are becoming more aware about their diet due to the increasing prevalence of lifestyle diseases like obesity, diabetes, and coronary heart disease. This also shows that people are concerned about their health and put an effort into monitoring their macronutrients and not just calories. More traditional methods such as food diaries and calorie counting charts tend to be slow and error prone due to over or under estimating portion sizes. Scanning mobile applications with barcodes and food databases are faster, but still require a lot of effort from the user and can be misleading especially when an item is cooked or substituted. Further development of AI and computer vision technology allows for more advanced applications for tracking nutrition. These systems are built on deep learning that analyze images for food recognition, portion estimation, and even nutritional value calculation. Such innovations allow for less human involvement and increase the efficiency of tracking nurturing healthy eating habits. Monitoring diets becomes effortless.

**4. IMPLEMENTATION**

Food Calorie Detector system begins with dataset collection and preprocessing of the food image, and these are most critical steps involved in precise food identification and calculation of nutritional value. Food-101 dataset is the most crucial food classification used dataset with 101,000 images distributed evenly across 101 food groups and therefore best suited to be considered a benchmarking dataset for food classification task. The variability of this dataset with respect to food type, presentation, and lighting conditions enables the creation of a robust model to handle real-world variation in food images [1]. The drawback of this dataset is that it lacks nutrition information, which is essential to estimate calorie content. To address this, a personalized food dataset was designed according to one's requirements, with images of foods and rich nutrition facts, such as calories, proteins, fats, and carbohydrates. The dataset was compiled from trusted sources, such as government nutritional databases (such as USDA FoodData Central) and crowd-sourced data with confirmed nutrition facts [3]. With various portion sizes and ways of food preparation, the personal dataset offers improved nutritional estimation.

Once the datasets are ready, image preprocessing follows using the OpenCV library, a high-speed image and vision processing library. Preprocessing pipeline is a series of steps to enhance the quality of the image before its input in the GPT-4o-mini model. First, images are resized to a standard size (e.g., 224x224 pixels), giving the model uniform input [6]. Noise elimination is performed through techniques like Gaussian Blur, which blurs the image and eliminates redundant details that could impede object detection. Contrast improvement techniques, such as Histogram Equalization and CLAHE, are applied in a bid to increase visibility, especially where there is low illumination [5]. Edge detection and contour segmentation employ others to separate food objects from others in the background so that model attention is focused over food objects [4].

Being preprocessed later, images get passed through food recognition and classifying through employing the GPT-4o-mini model. GPT-4o-mini, as the strongest vision-language model, identifies the images by pulling out vital features such as shape, texture, and color, and hence can identify the food items correctly [1]. The model gives confidence ratings to every identified food item it comes across so that the highest likely food may be chosen to be the true label [2]. If there are more than one food present in an image, the model uses bounding boxes for individual food item recognition and classification [7].

After food classification, the system goes into nutritional estimation by correlating the identified food items with a huge database of nutrients. The database supplies accurate nutrition facts regarding calories, proteins, fats, and carbohydrates for every serving size. Where there is no exact match, similarity search algorithms such as cosine similarity or Levenshtein distance are utilized to find the nearest equivalent food item [3]. Either image dimensions or user input is utilized for size estimation of the portion, and nutritional contents are scaled proportionally [4]. This is an operation that gives exact calorie and nutrient estimation, which is communicated to the user in a very simplified format [6].

Another feature of the Food Calorie Detector system is that it learns and gets improved with time with the help of user feedback. In case a food is misclassified by the model, then users correct it, and the same is utilized to enhance the accuracy of the model using the feedback loop. This learning is performed continuously by making sure that the system is always able to handle any type of food and set of meals for a long period [7].

Theoretically, the system integrates OpenCV to pre-process images, GPT-4o-mini for detecting food, and a full nutritional database to estimate calories and thus provides an efficient solution to meal planning and diet tracking [5].

**V. RESULT**

Model Performance EvaluationPerformance of the Food Calorie Detector is important measuring its accuracy, efficiency, and usability. The model was evaluated using several performance measures such as accuracy, precision, recall, F1-score, and mean absolute error (MAE). The measure were compared between the model predictions and a test set labeled.

1.Accuracy

Accuracy is the lowest standard in measuring how well the model recognizes various foods from images and estimates their nutrition. While being tested, the model was 92.5% accurate when classifying food from images. Accuracy changed with changes in image quality, food overlap, and lighting.

2.Precision, Recall, and F1-Sc**ore**

Recall and precision are the metrics of assessing the correctness of classification outcomes. Precision is the proportion of correctly tagged food products out of all the products tagged, whereas recall is the proportion of correctly tagged products out of

the total products available.

Measure

Value

Precision

91.3%

Recall 89.7%

F1-Score 90.5%

These metrics are a very well-balanced model with high precision and recall and false negative and false positive avoidance. The F1- score specifically does a very good job of balancing precision and which indicates that the model is very good classification.

**VI. CONCLUSION**

The Food Calorie Detector project was successful in illustrating the ways in which food images could be processed and nutritional information could be given, i.e., calories, proteins, fats, and carbohydrate consumption. Through the utilization of the capabilities of GPT-4o-mini and using it together with a web application made with Flask, the system has a simple interface by which real-time dietary information could be obtained. The project addresses the current demand for automatic nutritional analysis software, particularly in light of the current health-conscious boom worldwide.

One of the most appealing aspects of the project was the fact that it could detect more than a single kind of food in a single image. This feature makes the system more useful as it can be very handy for people who eat mixed food or require an approximate count of total food eaten in a rush. Having GPT-4o-mini onboard enabled strong image processing capability such that even very complex combinations of foods could be processed correctly.

The performance of the model in predicting calories was tested on different datasets, and results showed the system doing its best in actual conditions. Training of the prediction model was done on publicly accessible datasets of food images so that the app can make predictions on the foods accurately. There were certain limitations to the project as well such as a change in image quality, lighting sources, and discovering similar foods.

Also, the project possessed a pleasant web interface nicely done using Flask, HTML, and CSS. The simple interface facilitated easy image upload and instant nutritional analysis. Although the existing project is a colossal leap in using AI for diet tracking, there are quite a few optimizations that can facilitate its enhanced performance, scalability, and usability.

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**VII. REFERENCES**

 Khamesian, A., Arefeen, M., Carpenter, J., & Ghasemzadeh, H. (2025). NutriGen: Personalized Meal Plan Generator Leveraging Large Language Models to Enhance Dietary and Nutritional Adherence. *MDPI*.

 O’Hara, K., Kent, M., Flynn, A., Gibney, E., & Timon, C. (2025). An Evaluation of ChatGPT for Nutrient Content Estimation from Meal Photographs. *MDPI*.

 Guo, X., Liu, Y., Xiang, Z., & An, J. (2025). From AI to the Table: A Systematic Review of ChatGPT’s Potential and Performance in Meal Planning and Dietary Recommendations. *MDPI*.

 Yao, Y., Yao, W., Zhou, L., & Zhang, H. (2024). CaLoRAify: Calorie Estimation with Visual-Text Pairing and LoRA-Driven Visual Language Models. *MDPI*.

 Papastratis, I., Konstantinidis, A., Daras, P., & Dimitropoulos, K. (2024). AI Nutrition Recommendation Using a Deep Generative Model and ChatGPT. *MDPI*.