JNTUH UNIVERSITY COLLEGE OF ENGINEERING JAGITIAL

Department of Electronics and Communication

Title of the Project:

NutriVision: Automated Nutritional Analysis from Food Images Using Image Processing Techniques

ABSTRACT

In the current era where health awareness is on the rise, there is a growing demand for intelligent systems that assist in dietary monitoring. This project, NutriVision, introduces a smart image-based approach for evaluating the nutritional content of food items using a single captured image. It aims to provide users with estimates of calories, protein, and fat, thus empowering them to make informed dietary decisions.

The development of NutriVision is grounded in modern computational technologies. The application is built using Python, incorporating OpenCV and PIL for image processing. TensorFlow and Keras frameworks are employed to construct and train a Convolutional Neural Network (CNN) model. The model development and evaluations were conducted using Jupyter Notebook and Google Colab platforms. Nutritional values are referenced from the USDA FoodData Central database, complemented with local food information.

The process begins with image acquisition followed by several preprocessing steps such as resizing and filtering. Segmentation and feature extraction techniques are then applied to isolate food objects in the image. These extracted features are passed through the CNN model trained on a diverse dataset of Indian and international food items for classification. Once a food item is classified, its nutritional content is retrieved from the database and displayed to the user.

When tested on a dataset of 500 food images, NutriVision achieved a classification accuracy of 87.4%. The calorie predictions showed a mean absolute error of ±23.6 kcal, while protein and fat estimates were accurate to within ±2.1g and ±1.9g respectively. The model performed particularly well on clearly defined food items such as fruits and rice-based dishes, although mixed and occluded foods posed more complexity.

This work highlights the practicality and effectiveness of using image processing and machine learning for real-time nutritional analysis. NutriVision holds promise for applications in personal fitness tracking, digital health platforms, and clinical nutrition. Continued improvements could involve incorporating portion estimation and mobile application integration for broader accessibility.

Project Guide:

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