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Deep Learning-Based Implementation of Food Nutritional Intake Tracking System Using Convolution Neural Network Algorithm

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Abstract:

Nutrition is an important basis for developing the human body. Malnutrition can weaken the immune system, cause an increased risk of various diseases, and develop poor physical and mental health. Based on an in-depth study, this project will automatically detect nutritious foods and create an accurate system in which we find that nutritional levels in the diet increase nutritional or poor nutrition. Monitor nutrition in their diet and maintain daily health records. The quality of the nutrition is maintained on the website. The level of the elements should be compared to the site using the convolution neural network (CNN) algorithm. Collected databases should be reviewed after 7 days when food levels are healthy or nutritious. If healthy eating is not good, the methods try to eat more protein and fat and light sugars and walk or engage in less activity to stimulate your appetite. It is about building a healthy and balanced diet essential for a healthy lifestyle. The technology is useful in developing a daily diet plan aimed at recommending the most popular foods for the user, which can be eaten as soon as possible, and to satisfy one's daily nutritional needs.

Keywords: Food nutrition detection, CNN algorithm, healthy lifestyle, Deep Convolutional Neural Network.

Introduction

The main cause of obesity is a combination of overeating and lack of exercise. Therefore, the need for accurate food balance is important [1-4]. Preliminary research among young people suggests that new technologies may improve the accuracy of teen nutrition information [5]. And as people become accustomed to a sedentary lifestyle, they become obsessed with their diet [6-9]. There is overwhelming evidence that metabolic disorders caused by obesity increase the risk of developing serious health problems such as diabetes, high blood pressure, dyslipidemia and high blood pressure [10-13]. People generally understand the link between food and health. There is a wide range of healthy eating information and guidelines available to users on their hands [14-17].However, such information alone did not prevent foodborne illness or help patients eat healthy food.

In many cases, people find it difficult to check all the information about food and food choices. In addition, people do not pay attention to balancing or controlling their daily calorie intake due to a lack of knowledge of healthy eating, abnormal eating patterns, or self-control [18-21]. Empowering patients with an effective long-term solution requires new methods that help them make lasting changes in their diet and calorie intake [22-25]. Statistics show that 95% of people no longer follow any diet plan, which prevents people from eating their daily diet [26-29]. Therefore, the main cause of obesity is an imbalance in the individual's amount of food and energy, and a healthy diet is necessary [30].

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Hence, keeping a solid eating regimen is a significant objective for the vast majority [31-35]. The method involved with following how many calories are devoured can be exceptionally dreary as it requires the client to keep a food diary and perform filthy computations to assess the number of calories eaten in all food varieties [36-41]. With this concentration, we attempt to order pictures of Indian food as indicated by their classes. The proposed programming model purposes AI as a reason for perceiving a food picture transferred as client input, handling the picture, seeing it, and estimating calories from the anticipated picture [42-49]. Individuals record, transfer, and share food photographs willfully never like before on sites like Instagram, Facebook, etc. In this manner, it is exceptionally simple to track down extra information (photographs and recordings) connected with food [50]. This way, to help clients in food the executives and lessen the requirement for a manual paper technique [51-56].

Existing System

The existing framework uses the Deep Convolutional Neural Network (DCNN) based on the development of ResNet 50 [57-62]. Due to each model's limited calculation training tools, the ResNet model is simulated, and pre-trained weights are imported. This section introduces a proposed food monitoring system based on ResNet50, one of the winning networks in the ImageNet machine learning competition [63-71]. The reason why the ResNet50 Architecture is chosen over other buildings is because of the small parameter size. This makes model loading and weights and model training much faster. The solution includes preprocessing, training and classification [72-76]. The training includes the extraction and weight learning features performed by CNN's SoftMax layer. Separation is also done on CNN [77]. The present system only finds foods that you cannot measure the level of nutritious food (figure 1) [78-81].

Proposed System

This project proposes a nutritional quality tracking system to help a person successfully cope with food-related health conditions. Our proposed program is a comprehensive learning-based program that automatically allows the user to take video feed and measure the amount of nutritious food [82-89]. In order to accurately determine the nutritional status of a system, we use a convolutional neural networks algorithm to compare the nutritional status of food data stored on a website [90]. The need for a system that measures the amount of daily food intake and the number of nutritional measures that keep daily health records [91-96]. Therefore, we have proposed a method of measuring the number of nutrients in different food images. Collected data should be reviewed after 7 days when food levels are healthy or unhealthy. If the level of nutrition is low, the methods suggest you try to eat more protein and fat, and if the level of nutrition means higher exercise [97-101].

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Architectural Framework of the System

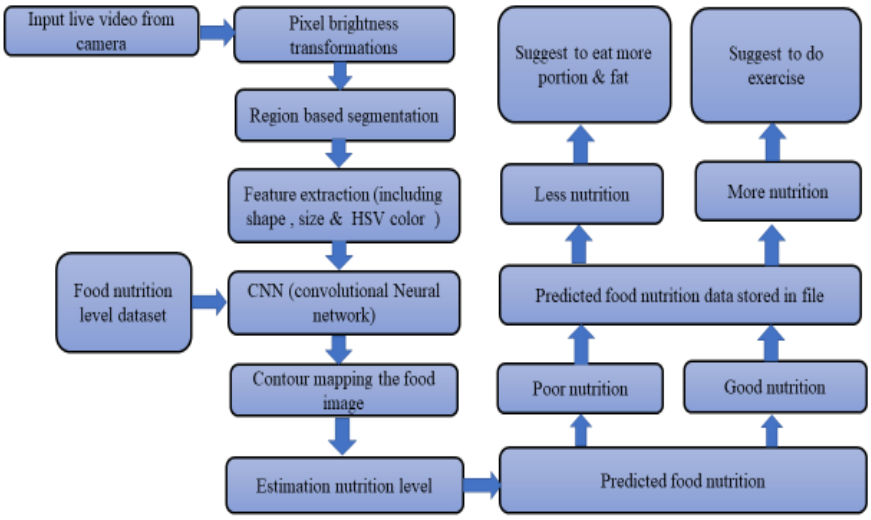

Figure 1: Architecture of the proposed system

Modules

- There are six modules used in this program
- Input acquisition module
- Image preprocessing and segmentation module
- Domain module features
- Knowledge set training module
- Food quality measurement module
- Suggestion module

Module Description

Input acquisition module

In this module, the input camera will capture video, and multiple frames can be converted into a single frame image and sent to the next block for further processing (figure 2) [102-115]**.**

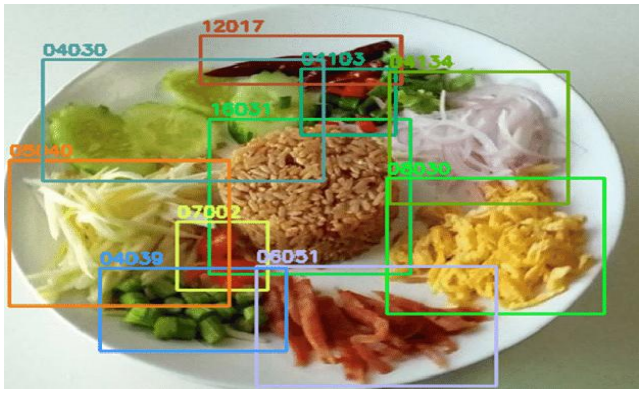

Figure 2: Food Input acquisition Image

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Pre-image processing and classification module:

The sorting process will take place, and the input image will be separated for the acquisition needed to identify the region you are interested in in the image [116-119]**.** This module will convert processed and classified images by performing a region-based classification [120-125]**.** It uses key elements in an image, such as the fullness of the hue, and the dot points, to analyze the full content of the image (figure 3)**.**

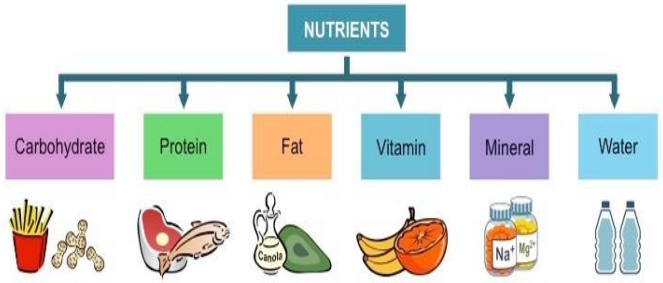

Figure3: Food Pre-image processing and classification Image

Feature output module:

This output feature module can remove features such as color, size, and shape from the feed input image (figure 4)**.**

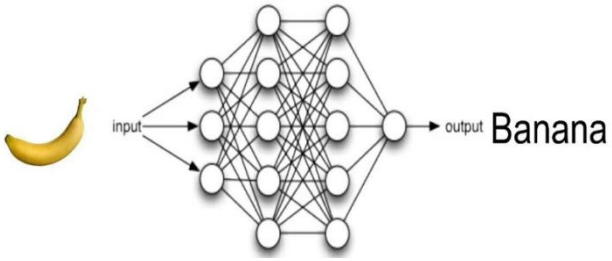

Figure 4: Feature output Image

Knowledge set training module

The nutritional status of the food database can be maintained in advance on the website [126-131]**.** In this module, the system will use the CNN algorithm to download old features from previously stored data on a website and check those features' availability in the input image (figure 5) [132-139]**.**

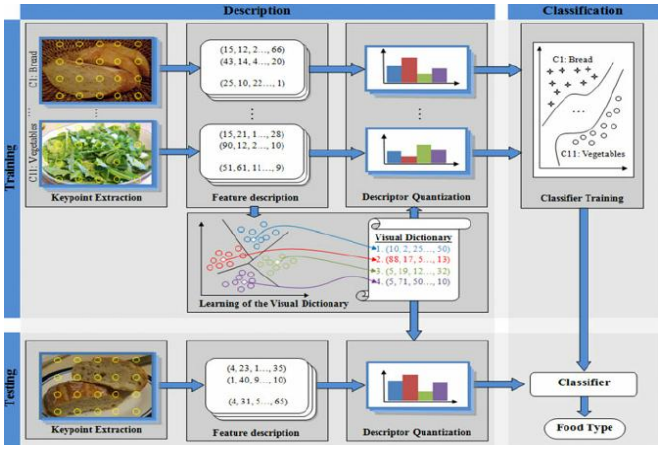

Figure 5: Knowledge set training Image

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Food quality measurement module

The convolutional neural network algorithm will measure the nutritional level by comparing the database of the nutritional level in the database [140-147]**.** After that, measure whether the food's quality is good or lacks nutritious food**.** Daily food data can be stored in a text file (figure 6) [148-151]**.**

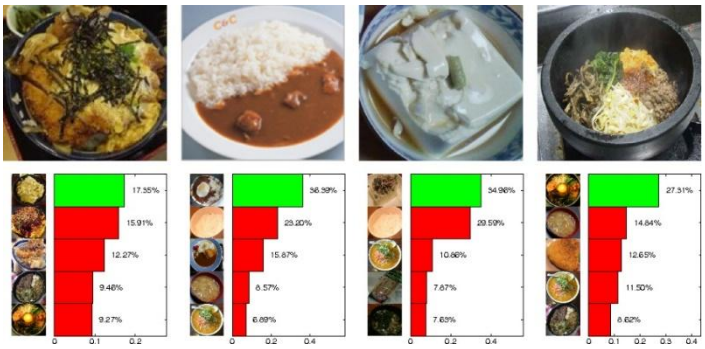

Figure 6: Food Quality Measurement Image

Module proposal

The Collected databases should be reviewed after 7 days when food levels are healthy or nutritious [152-159]**.** If the level of nutrition is low, the methods suggest you try to eat more protein and fat, and if the level of nutrition means higher exercise (figure 7)**.**

Figure 7: Module proposal Images

Result

Thus, our project food nutritional intake tracking system based on deep learning was successfully implemented. In this system, the person's intake food nutritional status can be determined using a convolutional neural network algorithm and a measured number of nutritional data stored in a file as a daily health record (figures 8 to 10).

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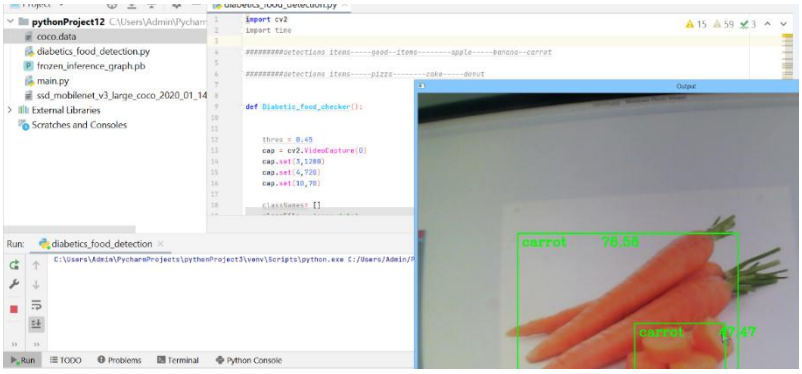
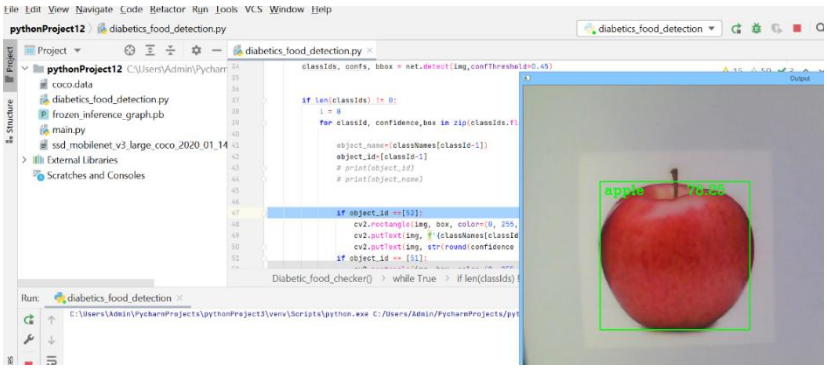
Figure 8: Poor food detects Image



(a)



(b)

Figure 9: (a) & (b) Healthy Food detects Image

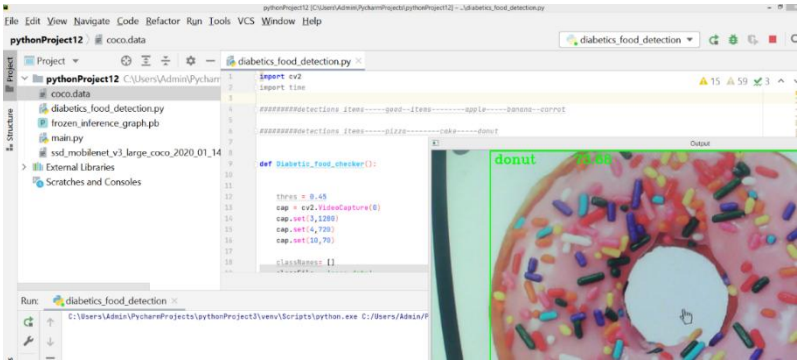


Figure 10: Donut poor food detects image

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Conclusion

The convolution-based model is prepared over many food pictures, which improves your model's ability to recognize the necessary elements rapidly. In investigating the outcomes, the precision of the preparation information base of the got pictures is around close to 100%. We can make an enormous data set that consolidates different food pictures to obtain the best outcome. The need to have an everyday eating routine for smart dieting is significant because deficient information on wholesome requirements and nourishing status information can be put away in a text record. In this way, we have proposed a technique for assessing the number of calories from various food pictures by estimating variables like the shade of the food from the picture.

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