FOOD CALORIE MEASUREMENT USING VIDEO PROCESSING AND DEEP LEARNING

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ABSTRACT: Consumption of unhealthy foods has been linked to an increase in diet-related disorders in recent decades. Customary consumption of healthy food is necessary for the maintenance of a diet to avoid getting avoirdupois. This experiment will be able to reliably identify food nutrition and quickly produce a dietary evaluation study. It proposes a one-of-a-kind method for measuring food attributes mechanically. It proposes a one-of-a-kind method for estimating food attributes mechanically by classifying the input video record of food to the backup images. Exploitation deep learning, in addition to image analysis, attributes square dimensions, which can be determined by extracting the related words from the vast text collected from the info collection. Convolutional neural networks, a subset of deep learning, are a game-changing force in laptop vision applications. We conducted experiments with a dataset containing a hundred categories, averaging one thousand pictures for each category. To achieve a prime one classification rate. A Food-101 dataset was also developed to include sub-continental foods. A Food-101 dataset is also being developed to include foods from other continents.

KEYWORDS: **Deep learning, Supervised learning, KNN algorithm, Digital video processing**

I. INTRODUCTION

Fat in adults and children is considered a global epidemic. Excessive food intake combined with a lack of physical activity may be the most common cause of obesity. As a result, keeping a precise live diet becomes important. Preliminary research among adolescent counselors using technology can develop adolescent dietary data. People are involuntarily frenzied from being awake to their food energy consumption as they become accustomed to an inactive lifestyle. There's a lot of evidence that metabolic problems caused by a fat raise the risk of developing harmful health effects like polygenic disease, high blood pressure, and hypertension. Diet and health are usually related in people's minds. In fact, there's a plethora of nutritional information and pointers available to users at their fingertips. However, such knowledge is inadequate. Many people find it difficult to navigate through all of the knowledge about nutrition and food choices. Furthermore, due to a lack of dietary knowledge, erratic eating habits, or a lack of self-control, people are unaware of the volume or superiority of their daily calorie intake. Empowering patients with a long-term resolution necessitates the development of novel mechanisms that enable them to make permanent improvements to their dietary quality and calorie intake.

II. RELATED WORK

[1] "Longitudinal changes in the accuracy of reported energy intake in girls 10-15 y of age". The goal of this section is to outline the benefits and disadvantages of this approach. The 24-Hour Dietary Recall is a clinical study in this field (24HR).

[2] "H. C. n Chen, W. Jia, Z. Li, Y. Sun, M. Sun, 3D/2D model to-image registration for quantitative dietary assessment". It's famous for estimating the volume of food from a two-dimensional picture. The food in this method is segmented from the background image using morphological operations, and its size is measured using a 3D shape model.

[3] "A food portion size measurement system for image-based dietary assessment - J. Wenyan, Z. Ruizhen, Y. Ning, J. D. Fernstrom, M. H. Fernstrom, R. J. Sclabassi Description". The food portion size is determined in this device using a camera and a light-emitting diode (LED). The LED is fixed at a distance from the sensor so that the light optical axis is parallel to the camera's optical axis. The deformation of the predicted spotlight pattern is used to measure the object's distance and oblique angle.

[4] "A novel method for measuring nutrition intake based on food image - R. Almaghrabi, G. Villalobos, P. Pouladzadeh, and S. Shirmohammadi Description". In addition to nutritional fact tables, this method is focused on food image processing and shape recognition. Numerous studies have recently indicated that using technology, such as a smartphone, may improve the treatment of obese and overweight patients. The machine takes a snapshot of the food before and after eating in order to measure the calorie intake and nutritional components of the chosen food.

[5] "Fengqing Zhu, Marc Bosch, Nitin Khanna, Carol J. Boushey Multiple Hypotheses Image Segmentation and Classification with Application to Dietary Assessment". In their algorithm, they merged two principles. To solve the problem, they used different segmentation methods to divide a collection of segmented objects into related object classes based on their features. Second, a multichannel feature classification system was used to identify automatically segmented regions. They used SVM to classify their data. The final decision is made by integrating individual feature class decisions.

III. EXISTING SYSTEM

This current method protocol uses a special format to list the daily food consumption for a duration of twenty-four hours. The patient is expected to remember all foods and drinks eaten the day before the interview within twenty-four hours. Using uniform cups and spoons, this technique produces an estimate of food portion size.

IV. PROPOSED SYSTEM

In this section, we go through the specifics of the K-Nearest Neighbor approach that was used. The first step in our process is to use a KNN network to build a pre-trained model file. This is achieved by first taking a set of images of a single class (for example, 50 images) and then marking them with a food name-set. These images will be used to train the device and will be considered a collection of relevant (positive) images. We re-train the machine with the background images in the second phase of the training so that it does not identify them as part of the food. We load the model file into the application and compare it against the images captured and submitted by the user once the model file has been created from the training.

After that, the machine performs image recognition and produces a list of probabilities based on the label name. In the dialogue box, the user is asked to confirm the food name and calorie with the label with the highest likelihood. After the food name has been checked, the machine measures the calories by dividing the food item by the number of calories it contains. Finally, the output with the necessary calorie is printed to the consumer. Besides, we are introducing voice alerts to show if those food types are safe or unsafe.

V. BLOCK DIAGRAM

A. Hardware Specification

Processor	: INTEL I4
RAM	: 4 GB RAM
Hard disk	: 1TB
Monitor	: 20' color monitor

B. Software Specification

Front end	: GUI
Back end	: Python
Software tool used	: THONNY
Platform	: Windows 8

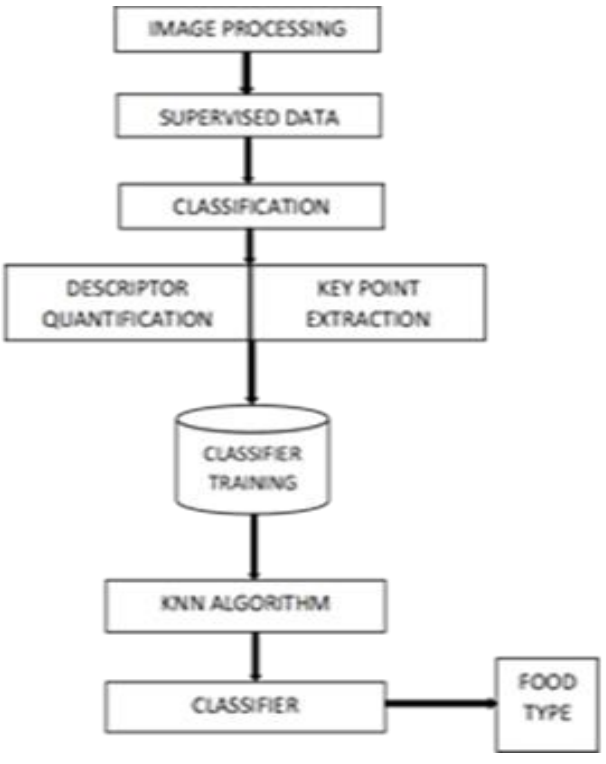

Fig. 5.1 Block diagram of food calorie measurement using video processing and deep learning

C. Algorithm

The K-NN algorithm compares the new data to the trained set of data and positions it in the most similar of the trained groups. The K-NN algorithm saves all of the required data and identifies new data points based on their proximity. As a consequence, when new data comes in, this algorithm will classify it into a category that is appropriate for it.

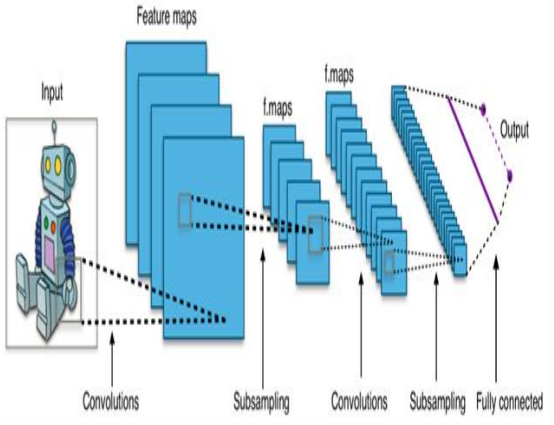

Fig. 5.2 Convolutional Neural Network

Fig. 5.3 Trained images

VI. EXPERIMENTAL RESULTS

By the K-Nearest Neighbor machine learning algorithm and deep learning algorithm on the image classification, it is concluded that Convolutional Neural Networks (CNN) is the most workable process for classification of the image from our dataset along with both the speed and accuracy. In addition, CNN performs foremost even in large datasets.

Future Enhancement

For low-light videos, a brightness-maintaining algorithm to be used. When a large amount of data is loaded, a large amount of memory is consumed. To overcome this, external memory source to be used. Multiprocessing code stability. Even when parallelism is used, processing is fast.

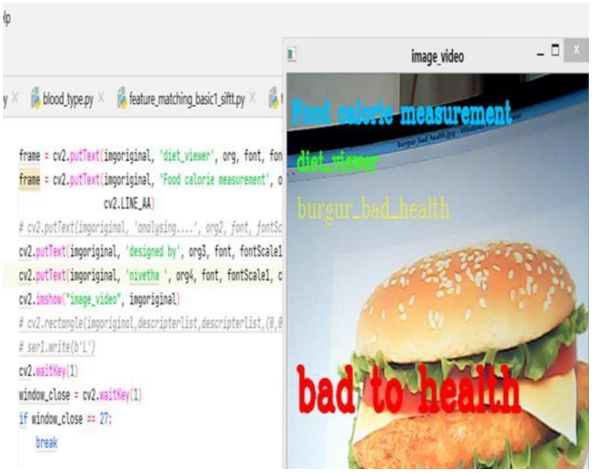

Fig. 6.1 Bad for health

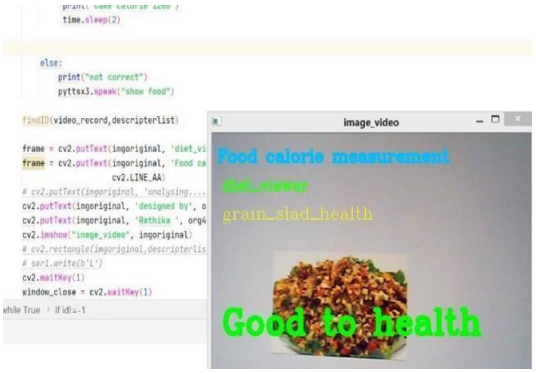

Fig. 6.2 Good for health

VII. CONCLUSION

In this project, we have the opportunity to propose a deep learning-based framework for food image classification as a first step toward the creation of a mobile application that provides diabetic patients with dietary recommendations. Our mission is to empower the user by offering a quick, intelligent, and reliable system that assists them in making informed decisions about their calorie intake. We also have a proclivity for correctly classifying and identifying food objects using a very unusual combination of segmentation and deep learning neural networks. Then it reveals how combining these two approaches produces a powerful tool for achieving 100 percent accuracy in food identification in our system. We prefer to offer the implementation of the virtualization approach of the application that allows us to benefit from dataset-based resources.

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