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Food Calorie Estimation Using Machine Learning

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ABSTRACT

Machine Learning (ML) is a very powerful and important technology in the world today. With the help of ML modules, various appropriate algorithmssuch as Faster R- CNN algorithm, canny edge detection algorithm are applied to the proposed system. This system focuses mainly on the calculation of calories and other nutrients present in food. The whole thing will be automated as opposed to existing systems where the user needs to manually deliver the values. However, userswill only needto click on the food image and provide it asan input to the system. Further processes can be automated quickly, such as the use of nearer R-CNN to perceive for each food and standardization item. Then the volume of individually food is determined by formulas for volume valuation. Lastly, it estimates the calories of each food and experimental studies have shown that by providing production with information of calories and nutrients present in the food, the proposed estimation method is effective.

Keywords—Machine Learning, Calorie estimation

I. INTRODUCTION

Practically 20% of deaths worldwide are caused by unnatural diets according to the World Health Organization (WHO). 39% of grown person aged 18 and over were over heavy in 2016 and 13% were obese. Maximum of the world'sresidents survive in nations where over heavy and fatness killmore people than underweight. The core cause for fatnessis the inequity amongst the quantity of caloric consumption and theenergy yield. The BMI will increase risk for diseases such ascardiovascular disorders and many more. Persons with over30 kg/m2 of BMI are typically seen for obesity. Calorie is the nutritional energy unit. Because of the hectic life, health is the greatest requirement in the world. The existing calories measurement scheme is flawed in the manual entry of data such as food platter weight, food plattervolume etc. To do this, a fully automated calorie measurement system isproposed.

Various ML modules are used in this system to assess thesizeof foodstuffs. Next, the user Selects on a photo of the food from the dataset Therefore, the user must click on two photos. Those images are then taken by the machine as inputand the portion size and volume can be measured usingvarious algorithms. The numerous ML techniques can be used to do this. However, after the image is given as an input, it is possible to define and segment simultaneously. The whole thing will likewise be automated and a final result willbe derived from the whole summary of dietary items containing calories and other nutrients.

II. LITERATURE REVIEW

Some of the most commonly developed methods for calculating intake of food in recent years are discussed inthis section. Many people take photographs of their foodearlier they eat, and they place it in the community. It is of crucial interest to evaluate the calorie contented of the picture by defining the food and valuing the volume by means of machine learning.

Deng utilized the ImageNet system being a huge degree power of pictures dependent on the establishment of the WordNet structure. ImageNet hopes to populate the majority of the 80,000 synsets of WordNet withan ordinary of 500-1000 immaculate and full objective pictures. This will achieve gigantic number of explained pictures composed by the semantic movement of WordNet. This paper offers a bare essential examination of ImageNet in its current status: 12 sub-trees with 5,247 synsets and 3.2 million pictures altogether. It is indicated that ImageNet is a lot bigger in scale and variety and significantly more exact than the current picture datasets. Developing a particularly huge scope data set is a difficult assignment. The convenience of ImageNet through three straightforward applications in article acknowledgment, picture grouping and programmed object bunching is demonstrated. It is proved that the scale, exactness, variety and various leveledconstruction of ImageNet can offer unmatched freedoms to analysts in the PC vision local area and past. ImageNetframework allows pre-training models to extract image functionalities (such as colors, texture detail, and high-level abstract images.

Krizhevsky have arranged a gigantic, significant convolutional neural association to organize the
1.2 million significant standard pictures in the ImageNet LSVRC-2010 test into the 1,000 remarkable classes. In the testing cycle, top-1 and top-5 error spaces of 37.5% and 17.0%, independently, which is essentially in a way that is superior to the past top tier were refined. The neural association, which has 60 million limits and 6,50,000 neurons, includes five convolutional layers, some of which are trailed by max-pooling layers, and three completely associated layers with a last 1000-way softmax. To make preparing quicker, non-immersing neurons and an effective GPU usage of the convolution activity is utilized. To lessen
overfitting in the completely associated layers, an as of late created regularization strategy called "dropout" that end up being extremely viable is utilized. A variant of proposed system has achieved best error rate of 15.3% when competedwith the other competitors in ILSVRC-2012 competition.

Simonyan and Zisserman, (2014) haveresearched the impact of the convolutional network profundity on its precision in the huge scope picture acknowledgment setting. It has done a care full assessment of organizations of expanding profundity utilizing an engineering with little (3x3) convolution channels, which shows that a critical enhancement for the earlier craftsmanship setups can be accomplished by pushing the profundity to 16-19 weight layers. These discoveries were the premise of our ImageNet Challenge 2014 accommodation. It is additionally shown that this system's portrayal sum up well to other datasets, where they accomplish best in class results. Two best- performing ConvNet models openly accessible to encourage further exploration on the utilization of profound visual portrayals inPC vision are developed.

Szegedy have been using the parallel data channel GoogLeNet. The Residual Neural Network (Res Net) developed by residual blocks is used by Zhang et al., [7].

III. PROPOSED MODELING

We will review our system in more depth in this section. Our dataset is composed by users who use the ECUSTFD food data [14] and contain 19 kinds of foods by manually clicking images of a food item. The design of the entire device is as shown in Figure 1.

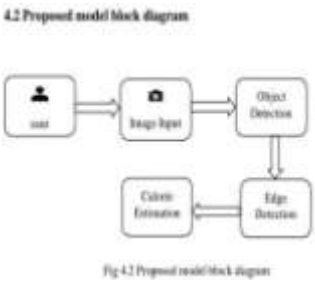

Fig : Proposed Architecture

A. Object Detection

The user selects one image from the dataset. It is sent as an input for object detection and classification after recording these images. Quick region-based Convolutionary Neural networks (Faster R-CNN) for object detection and classification are used for object detection. An object is

detected in the image during object detection. After the object is marked, the classifier classifies the detected object and trains it according to the standard. We must ensure that both pictures have the same mark, otherwise the amount of the food shown in Figure 2 would not be sufficient.

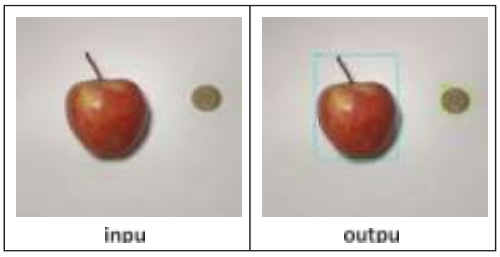

Fig : Object Detection

B. Edge Detection

The next step is to detect the edges of the food in the image shown in Figure 3 after object detection and classification are made. A very popular algorithm is used for the detection of the edges of the food. Algorithm for Canny edge detection.

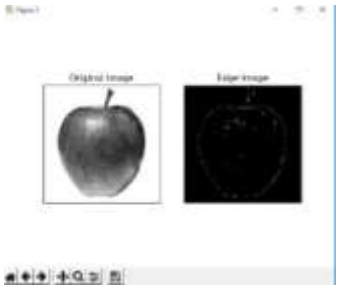

Fig : Edge DetectionImage Segmentation

The output image of the edge detection algorithm is used after the edge detection process. Segmentation of thr image is done. We label the object using a box. The box is used to differentiate between the object and its context.

The background is the external part of the rectangle, and the inner part of the algorithm combines certain background with subject. The background pixels of this algorithm is set to black, with the exception of food detected in the image. The actual food is ignored on the edge detected in the step 2 and the remaining pixels of thebackground are determined using this method.

After the image segmentation process, the size of theoriginal image is reduced. Now the ratio of the original and reduced image is calculated and the volume is calculated.

C. Calorie Estimation:

After the volume is calculated then the calories of the foodare estimated.

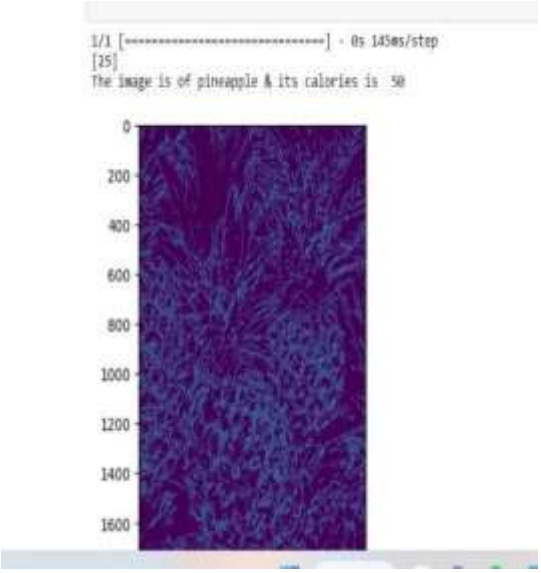

Fig : Output

IV. EXPERIMENTAL RESULTS AND DISCUSSION

The proposed methodology is employed to measure calorie from the fruit's image and compared with actual one in termsof error parameter that is obtained as given below.

Error = [(Ca-Co)/Ca]*100

Where, Ca=actual calorie measured in Kcal/gram.Co=obtained calorie measured in Kcal/gram.

The experimental results of our method are presented in Table I. The results achieved by calorie estimation as done in above equation are discussed. If the measurement error is less than 10%, our system is efficient. The results of the sameare given in Table I below.

S.No	FoodItem	Actual Calories	Obtained Calories	Error in %
1	Banana	89	89	0.0
2	Grapes	67	69	2.9
3	Kiwi	61	61	0.0
4	Carrot	41	41	0.0
5	Egg Plant	25	25	0.0
6	Cabbage	25	25	0.0
7	Cucumber	13	15	9.7
8	Pine Apple	48	50	4.16
9	Pomegranate	83	83	0.0
10	Mango	65	60	7.6
11	Beetroot	44	43	2.27
12	Cauliflower	25	25	0.0
13	Capsicum	26	27	3.8
14	Pear	58	57	1.7
15	Sweetcorn	84	86	2.3

Fig :Table I Calorie Estimation Result

V. CONCLUSION

This Paper offers a Calorie calculation using algorithms for

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