

Food Calories Detection Using Deep Learning Techniques

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Abstract:

Corpulence become the significant wellbeing infection among the grown-up for as far back as couple of many years. Information of EASO show that almost 2.8 million grown-ups pass on every year because of being overweight or hefty. The greater part of this issue can be killed by controlling the admission food calories. In this paper we proposed a strategy which will break down the calories and in food by utilizing the profound learning technique and give the exact information of the food incorporating the fixing present in the food. In this strategy first the picture of the food is given as contribution, by the acquired nourishment information it will give the complete calories of the food with singular calories of every fixing present in it. Here we use CNN (Convolutional Neural Network) it is a viable acknowledgment calculation; the picture of food is go through pre-handling it will remove required pixel from the picture so the size of the picture will lessen without losing the information. We are utilizing very much upgraded calculation; it will be speeding up so we can get exact yield with less measure of time.

Keywords: Food calories, CNN, DWT, GLCM, OpenCV, Deep learning.

I. Introduction:

Food acknowledgment strategies and techniques has getting well known lately a more noteworthy number of individuals are snap the picture of their food prior to eating and offer in the online media and some of them utilize the photograph to discover the fixings and calories of food. Standard admission of high calories food causes numerous wellbeing sicknesses like heart issue, hypertension, and so forth Its calories can be diminished by the normal activities, however today quick world numerous individuals don't have the opportunity to do exercise. Along these lines, it leaves us to another choice like control the admission calories by recognize the calories in the food[1], in the event that we ready to distinguish the fixing and its calories it will be help to control of admission of the food. In the advanced world we have current innovation and technique to amend the issue by straightforward snapping the picture of the food and transfer to the framework it will give the all the information of the food with in the minutes.

II. Existing method:

To acknowledgment the food there are numerous strategies are accessible in the profound learning and neural organization a portion of the current techniques are SVM Classifier, Random tree classifier, K-implies bunching these techniques are produce wrong yield, the preparing speed pretty lethargic and it required more information preparing set while contrast with the CNN strategy[2]-[6].

III. Proposed Method:

The block diagram explains the algorithms of a proposed method, in which two main parts has have the system, i.e., One is feature extraction and another one is classifier (here we use CNN)

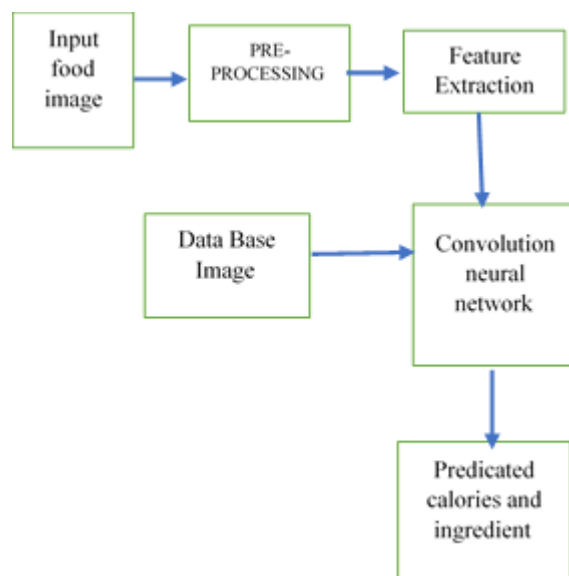


Figure 1 Block Diagram

A. Feature extraction:

Many picture handling highlights were extricated for every food picture including DWT channel, GLCM surface component and RGB channel. This component extraction assists with recognizing the necessary pixel and concentrate it impeccably it prompts get the precise calories of the food.

B. DWT

Discrete Wavelet Transform is prescribed preparing calculation to change picture information to wavelet coefficient information. The DWT acquires low-pass wavelet coefficients with a 9-tap channel and high-pass wavelet coefficients with a 7-tap channel. There are two different explicit 9/7 Discrete Wavelet Transforms proposed.

Fig 2 show the construction of DWT. It is a nearby change from time and recurrence space. It disintegrates the picture into various sub band pictures. LL, LH, HL, and HH. Multi Resolution Analysis is intended to give helpless time goal and recurrence goal at high frequencies. Great recurrence goal and time goal at low frequencies. Useful signal having high recurrence parts for brief terms

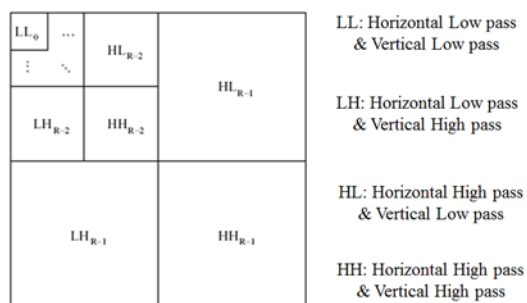


Figure 2 DWT Structure

A. GLCM

Gray Level Co-event Matrix is expansion of GLCM which is utilized to compute the Contrast, Correlation, Entropy, Energy of the picture.

Contrast: In the Gray level co-event network, it measures the neighbourhood varieties and surface of shadow profundity.

$$\text{Contrast } I = \sum \sum (a-b)^2 p(a,b)$$

Energy: It is a behaviour that determines the picture's homogeneity and can be calculated using a standardised COM [7]. It is an effective metric for detecting turbulence in a surface picture.

$$J = \sum \sum (p(a,b))^2$$

Correlation Coefficient: The joint probability event of the predefined pixel sets is calculated.

$$\text{Correlation } \sum \sum (a - \mu_a)(b - \mu_b) p(a,b) / \sigma_a \sigma_b$$

B. Convolution Neural Network:

A neural network is a movement of computations that usage see fundamental associations in a lot of data through a connection that copies the way where the human cerebrum works. Here we using the CNNestimation its affirmation incorporate is works exact to perceive the food. CNN isn't required more data for setting up the yield of the food [8]

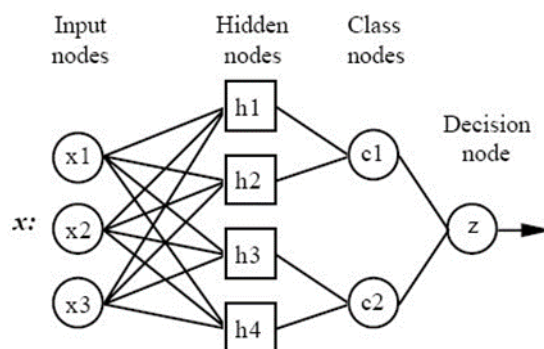


Figure 3 General Structure of Neural Network source Wikipedia

Convolution neural network consist of 5 layers as convolution, ReLu (Rectifier Liner Unit), Pooling, Flattening, Full connection. The aim of the convolution layer is to reduce the image size and make processing quicker and easier.

$$\begin{aligned}(f * g)(t) &\stackrel{\text{def}}{=} \int_{-\infty}^{\infty} f(\tau)g(t - \tau) d\tau \\ &= \int_{-\infty}^{\infty} f(t - \tau)g(\tau) d\tau.\end{aligned}$$

Figure 4 equation of Convolution Source Wikipedia

ReLU use to increase non-linearity in the CNN. Pictures are made of different things that are not directly to each other. Without applying this limit, the image portrayal will be treated as an immediate issue while it is actually a non-straight one. Pooling diminishes over fitting [9],[10] which would occur if the CNN is given a ton information, especially if that information isn't appropriate in gathering the image this cycle not required generally for some obfuscated picture it will used evening out resembles the pooling, it changes over pooling lattice into single area then it dealt with to neural association getting ready. After the smoothing the and dealt with into neural association it goes through full affiliation. The totally related layer resembles the mysterious layer in ANNs yet for the present circumstance it's totally related. The yield layer is where we get the expected classes. The information is gone through the association and the bungle of conjecture is resolved. The misstep is then back propagated through the structure to improve the conjecture.

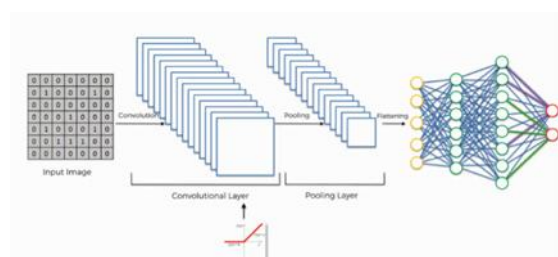


Figure 5 Structure of CNN source: super data science

C. Algorithm for CNN based classifier

1. Apply convolution direct in first layer
2. The affectability of channel is diminished by smoothing the convolution channel (i.e.) subsampling
3. The sign trades beginning with one layer then onto the following layer is compelled by authorization layer
4. Secure the arrangement period by using reviewed direct unit (RELU)
5. The neurons in proceeding with layer are related with every neuron in resulting layer

6. During planning Loss layer is added close to the completion to give a contribution to neural association.

IV. Result and Discussion:

The experimental setup, food image database, CNNN preparation, and testing will all be covered in greater depth in this portion.

A. Experimental Setup

A For processing, a multicore processor with 3rd Gen Ryzen 5 4500U (6 cores with 6 threads), 8 GB RAM, and a 1 TB SSD hard disc was used, which was equipped with the new Windows 10 operating system. The programme is written in Python and executes on the Anaconda platform, which includes all of the necessary libraries like pandas, NumPy, TensorFlow and cv2.

B. Food Image Data Base:

We utilized the food picture data set created by comprising of 800 food pictures. It has 14.5% organic products picture, 24.8% vegetables, 23.5% meat (multi variative), 4.0% fish, 1.6% nuts and dry fruits, 1.6% drinks, and 30% different food sources (such as idili, dosa, roti, and other Indian cuisines) Every food's calorie content is precisely calculated by trained nutritionists and cross-confirmed by a web source. The picture data was divided into two categories: 85 percent preparation and 15 percent research. This excess calories will damage human teeth also [11].

C. Prediction and analysis:

Give the food picture as input to the code. Our CNN calculation will dissect the picture and give the yield[12]. Here we utilizing biriyani (Indian food) picture as info.

The info picture acknowledgment as like the prepared picture then it will recover the calories subtleties from the information base and furnish the calories of food with singular fixing calories



Figure 6 input image (biriyani Indian food)

The input is given to the python code it, first it will analyse the image and using feature extraction it will extract the required pixel data. From the trained and test image it will identify the food and the ingredient used in the food.

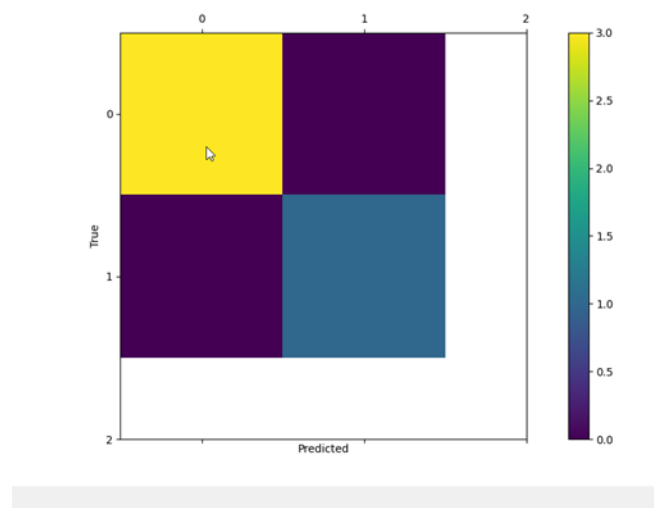


Figure 7 True vs prediction graph

This graph shows that prediction of food with comparison of test and trained data.

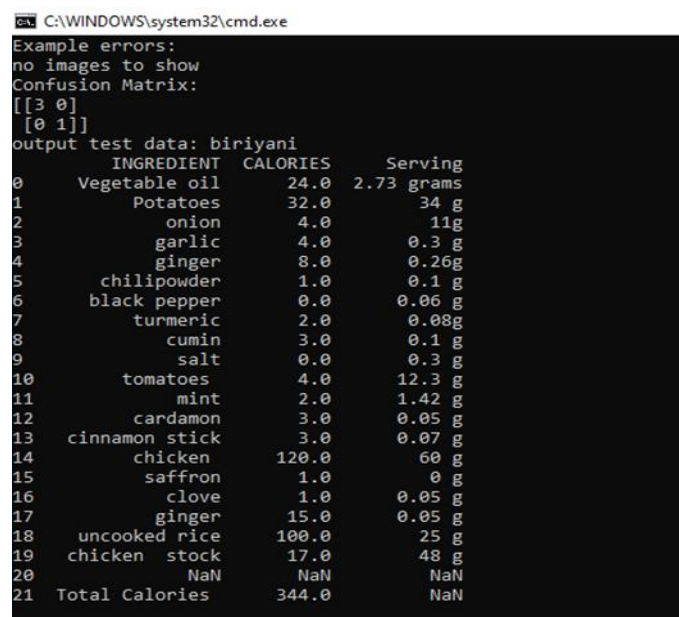


Figure 6 output with food calories data

The final output is show above with the ingredient details and calories in it. Calories are calculated based on the weight of the ingredient in grams.

V. Conclusion and Future works:

This technique gives the quick and precise calories of food. In future the undertaking will create in to portable application so a snap of food is will give all information about food likewise we wanted to interface the application with wellness application so it works in viable way.

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