Fruit Recognition System for Calorie Management

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***Abstract*—Fruits contain important vitamins, minerals and fiber. A diet comprising mainly of fruits and vegetables can help prevent cancer, diabetes and heart diseases. In this paper we execute in an effective type of recognize, fruit recognition is carried out using CNN algorithm. A set of fruit image is trained in a CNN model for recognition a standard nutrition table is referred to measure calorie since using an image to measure calorie is an arduous task. the image is captured by the raspberry pi through the webcam.**

Keywords—Convolution Neural Network, Python, Machine Learning, TensorFlow and Keras, image recognition

I. INTRODUCTION

In the recent years, due to a rise in health consciousness, many mobile applications for recording everyday meals have been released. Some of them employ fruit image recognition , which estimates not only fruit names but also fruit calories. However, these applications often require the user to enter information such as fruit categories and size or volume, which render it cumbersome owing to subjective evaluation. To overcome these inconveniences, automatic recognition of the fruit photo is employed on mobile devices. However, in most of the cases, the estimated calories are just associated with the estimated fruit categories or the relative size compared to the standard size of each fruit category which is usually indicated manually by the user. Currently, no applications exist that can estimate fruit calories automatically. Although CNN based image recognition methods have considerably solved most of the image recognition tasks including fruit recognition. fully-automatic fruit calorie estimation from a photo still remains an enigma. This paper proposes a new portfolio of pictures include popular fruits. A portfolio named as “fruits”. As a second object . a deep intimated neural signal is trained to facilitate identification of fruit image this part can find more larger array of picture It is here that the ‘fruits’ dataset is described as to how it is created and what its contents are, the aim of the project is developing a application for estimating a fruit calorie and improve people’s consumption conducts for health care.

II. LITERATURE SURVEY

Title : fruit recognition and its calorie measurement : an image processing approach

Using image processing technique the agriculture field and food science field is increasing day by day. The image features are shape, color and texture which is used to classification and calorie estimation of fruits. This paper proposes an algorithm for fruit recognition and its calorie estimation based on the shape, color and texture along with the histogram of gradients and GLCM with the local binary pattern algorithms for texture segmentation scheme recognizing the fruits and area , major axis, minor axis, minor axis is calculated by using the shape feature to get more accurate calorie value. With the help of nutritional look up table these features are fed to multi SVM classifier for accurate classification [15][16]. real time database and pretend plastic fruit databases of MATLAB used for evaluation. Results obtained are very close to real calories of the fruit.

Drawback: the drawback of this paper is it cannot determine raw, ripen and rotten fruit category.

Title: A novel svm based food recognition method for calorie measurement applications

Emerging food classification methods play an important role in food recognition applications. For this purpose, a new recognition algorithm for food is presented, considering its shape, color, size, and texture characteristics. Using various combinations of these features, a better classification will be achieved more importantly. At the classification step the support vector machine method is engaged which leads to better results. Support vector learning is based on simple ideas which originated in statistical learning theory. Supported by our simulation results, the proposed algorithm recognizes food categories with an average approval recognition rate of 92.6%

Drawback:

III. EXPERIMENTAL TOOLS

A. *Hardware requirements*

Raspberry Pi

Fig: 2.1 Raspberry Pi-3B

The raspberry pi could be a bargain basement priced, credit-card sized computer which might be easily plugged into a computer monitor or TV. It's capable of doing everything we might expect a desktop IP system to perform, surfing from the online and playing high-definition videos, to creating database data processing, and live games. Raspberry pi has the aptitude to intercommunicate with the outside world, and has been utilized in a spacious array in digital projects, from music equipment and sensors to weather stations and chirping birdhouse with infrared cameras.

Frontech webcam

Fig 2.2 Frontech Webcam

This 20 megapixels webcam comes with an adjustable focus, the frame rate of MOS sensor up to 30fps. To great quality and image. The connectivity of usb 2.o connection allows to simply connect with electronic devices of user, it's an mounted microphone. It provides great sound quality.

B. *Software requirements*

Python in machine learning: Python has the library that permits developers to use optimized algorithms. It implements popular machine learning techniques like recommendations, classification, and clustering.

Libraries and packages:
To understand machine learning, you would like to possess basic knowledge of python programming. In addition, there are a number of libraries and packages generally used in performing various machine learning tasks as listed below:
numpy: Is used for its N-dimensional array objects.
pandas: Is a data analysis library that includes dataframes.
matplotlib: Is 2D plotting library for creating graphs and plots.
scikit-learn: The algorithms used for data analysis and data mining tasks.
seaborn: A data visualization library based on matplotlib.

Dataset pre-processing
First to download train and test data sets of fruits.
Step 1: setup and install
Step 2: organize your train folder
Step 3: Train your model using our processed dataset
Step 4: test your model

IV. METHODOLOGY

A. *CNN architecture*

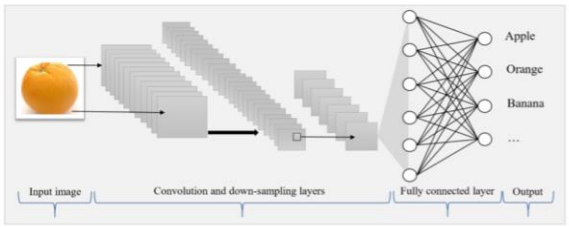

Fig: 3.1 CNN architecture

It is encouraged by biological procedures of neurons that resemble the connectivity outline amongst the neurons of the animal visual cortex. The specific cortical neurons reply to incentives only the rare area of the pictorial field . The pictorial arena of dissimilar neurons moderately overlays such that they cover the pictoria.CNN is a scheme much like a multilayer perception that has been intended for abridged processing requirements. As associated to the other image classification algorithms, it has less pre-processing.

Layers of Convolutional Neural Network

1. **Input:** This layer holds the raw pixel values of image.
2. **Convolutional Layer**: This layer gets the results of the neuron layer that is connected to the input regions. We define the number of filters to be used in this layer. Each filter may be a 5x5 window that slider over the input data and gets the pixel with the maximum intensity as the output.
3. **Rectified Linear Unit [ReLU] Layer**: This layer applies an element wise activation function on the image data.
4. **Pooling Layer**: This layer perform a down-sampling operation along the spatial dimensions (width, height), resulting in volume.
5. **Fully Connected Layer**: This layer is used to compute the score classes i.e. which class has the maximum score corresponding to the input image

B. *System block diagram*

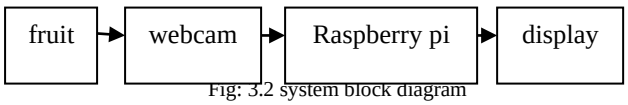

Fig: 3.2 system block diagram

raspberry pi may be raspberry pi defined as single board system it's have capability of finding and searching capability it contains video core multimedia GPU, 64bit RISC machine and CPU core The package of the Raspberry Pi Is Raspbian. OpenCV The program is dumped into the Raspberry PI board. Raspbian OS is that the OS involved. The proposed system starts the method by capturing the fruit image. Captured image using raspberry pi through the webcam. Then, the image is transmitted to the processing level in open CV where the fruit features like color shape of fruit samples are extracted. During this project open cv method is employed to detect shape, color of fruit and with the mixture of features the results obtained are very promising. Results shown within the system display. Then come to open CV is an bundle of computer algorithms its contain several sources.

C. Design Flow Diagram

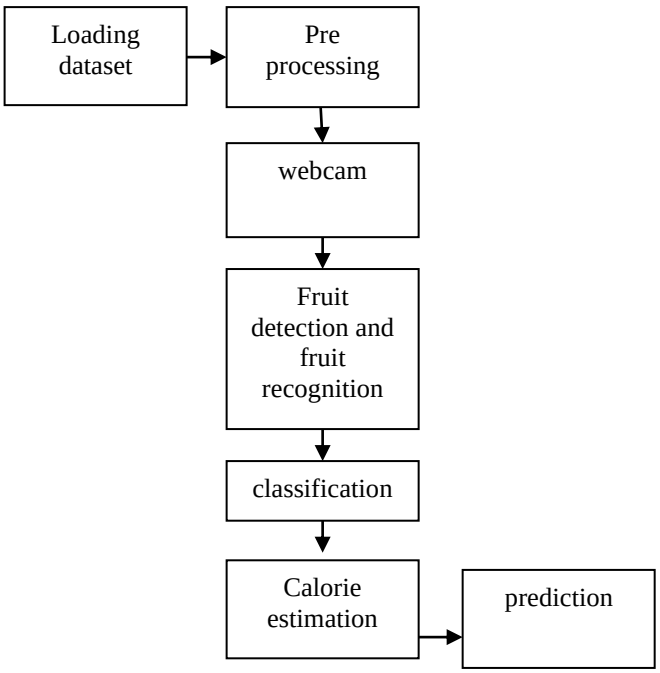

Fig: 3.3 design flow diagram

Dataset collection: for collecting fruit pictures in data set we elaborate single fruits into different collection. For an different fruit angles and dimension. So, we used to spread subsequent components like camera lighting capture angle, white plate, thumb fruit. Data set have captured image into different angles into different cameras. Large style fruit or large sized dimension fruit fives more comfortable data set and it helps to increase an accuracy of calories which we have done in fruit reorganization of calories measurement. And details of fruit name, number are already stored in dataset. In the process of data set picture divided into many several parts for capturing all angles in all dimensional to get exact perfect calories measurement.

Pre-processing: image cropping note that the pictures from pfid are taken within the laboratory with an enormous white background. it is generally considered good to appear the feature in questions for better ccn results. Thus, we use the function crop from python image library to process these images. Data augmentation we rotate each time by 45 degree to 315 degree. We gain 18323 images totally. We split the info set into training set, validate set and test set. Hog feature (histogram of gradient) may be a local feature descriptor applied in image processing. The image is split into small regions called cell and intensify gradients are calculated over the within the cells.

Fruit recognition: first, so as to set the accurate answer in our segmentation. An easy exchanges performed on the images captured by us. We can change the image size into desired format to get on accurate efficiency each image compared with size of the picture. If the image is not suitable for a process and its not united with a category. We used a another some technique to compatible with scale of images such are cropping and padding technique. If we apply these technique to these captured image we get i.e 720x1080 for simplicity. the heavy large image are cropped to the scale before we proceeding to process. Every picture elaborated to various segments of the fruit which been recognized. In this part mainly focused on segmentation to exact images are proposed frequently. And perhaps we used color segmentation , k-mean clustering, texturing tools. And more than our fruit recognition we selected the parts of the process that are cloud svm and deep neural network methodologies. And these are help to get a perfect accuracy of system and last finally we get the calories of the fruit.

Calories Estimation: finally, we want to execute our experimental answers of our part or task of project. Calorie identification of fruits item, as of in the before learning task we explained about our data set into sets. And the answer of 23 task after executing the lesser reduction we are put to type classifier. This is identified output fruit type for a picture or image. Then the expected fruit comes with an extra image. Hence, reduced or lesser were proceed to our learnt size indicator which answer is output approximately size of fruit item.

D. Data Flow Diagram

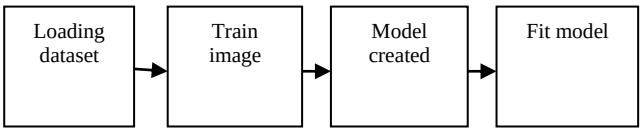

Fig: 3.4 Level 1

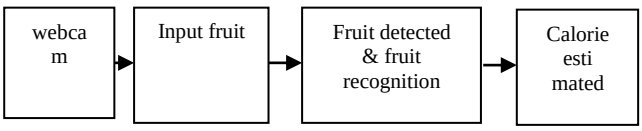

Fig: 3.5 Level 2

Often they're a preliminary step accustomed create an summary of the system which may later be elaborated. Data flow diagrams may be used for the visualization of knowledge processing (structured design). the info flow sheet is additionally called as bubble chart. it's simple graphical formalism that may be accustomed represent a system a system in terms of the input file to the system,

various processing meted out on these data, and therefore the output data is generated by the system.

V. EXPERIMENTAL CONDITIONS

Fig: 4.1 CNN result for fruit detection for Apple

Fig 4.1 following fruit are detected with their name and nutrition value of that object is shown after calculation which is done by Convolutional Neural Network (CNN)

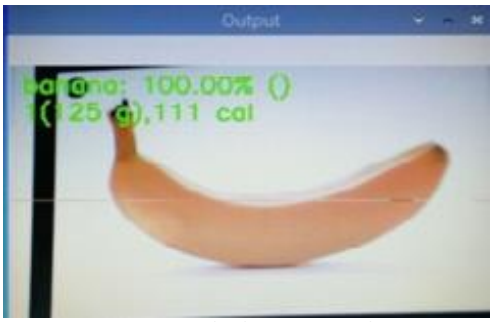

Fig: 4.2 CNN result for fruit detection for Banana

Fig 4.2 following fruit are detected with their name and nutrition value of that object is shown after calculation which is done by Convolutional Neural Network (CNN).

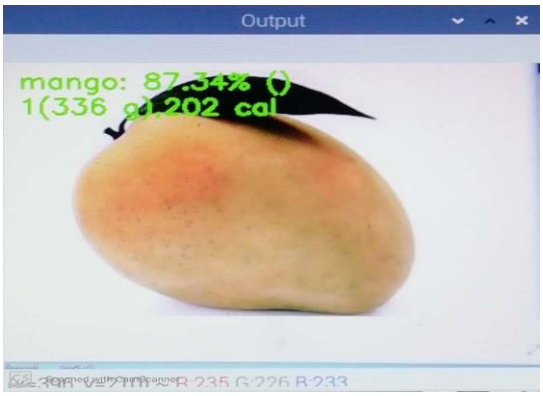

Fig: 4.3 CNN result for fruit detection for Mango

Fig 4.3 following fruit are detected with their name and nutrition value of that object is shown after calculation which is done by Convolutional Neural Network (CNN).

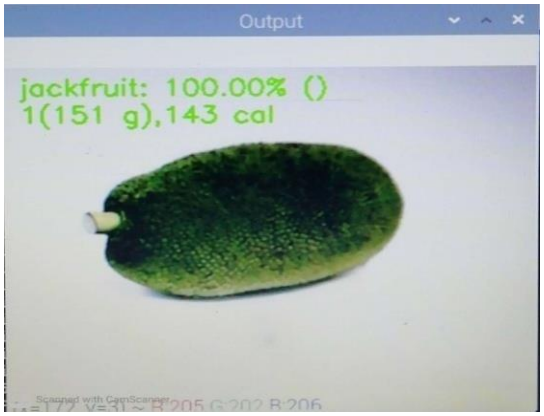

Fig: 4.4 CNN result for fruit detection for Jackfruit

Fig: 4.4 following fruit are detected with their name and nutrition value of that object is shown after calculation which is done by Convolution Neural Network (CNN).

Fig: 4.5 CNN result for unknown object

No	Fruit name	Measure	Weight	Calorie
1	apple	1	182g	95cal
2	banana	1	125g	111cal
3	mango	1	336g	202cal
4	jackfruit	1(cup)	151g	143cal

Fig: 4.6 Standard Nutrition Table

VI. CONCLUSION AND FUTURE WORK

The presentation of program is high and that taken into point of user view from the number of user usage. However the CNNs need an excellent computing system to experiment the large scale of data sets. The CNN is able to keep highly nonlinear data. It takes more executable time to coach the signal. And in this performance and speedy matters a lot. Once the program or project well trained, process can be reducing less leads to lower time. The photocopies are properly prepared and every image forms are absolutely checked with CNN. And mostly CNNs are more classified and well suitable for photocopies. When the quality and quantity matter. From our side or mindset

one of the main objects is used for future work for improve an accuracy and perfection in our project. In in future we could add a load cell to calculate the weight of the fruit and also implement freshness detection on the fruit. Another classified objective thing is to elaborate or extend dataset that contain more fruits this will take time to code the process. And we did not taken or included from other paper related to this project.

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