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Calorie Detector

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Abstract--*The process of identifying food items from an image is quite interesting. Food monitoring plays a leading role in health-related problems, and so it is becoming more essential nowadays. Our proposed system allows the user to take a picture of the food and display the calorie intake, through their smartphones which is more convenient for users. In this paper, convolutional neural networks has been used to classify images of food. Unlike the traditional artificial neural networks, convolutional neural networks have the capability of estimating the score function directly from image pixels. Bitmapping is done to get the image in a fixed dimensions. Tensor Flow is used to mine the data set.*

Keywords: Convolutional Neural Networks, Image Processing, Feature Map, Tensor Flow, Segmentation.

I.INTRODUCTION

Healthy diet is important to human health. Natural products have been widely used as food, and they can also be processed to meet the demand of consumer. People are becoming more conscious about their food and diet in order to avoid diseases. People are dependent on smart technologies like smartphones, provision of an application to automatically monitor the individual's diet, helps in many ways. It increases the awareness of people in their food habits and diet. Over the last two decades, research has been focused on automatically recognizing the food and their nutritional information from images captured using computer vision and machine learning techniques. To properly assess dietary intake, accurate estimation of calorie value of food is important. A majority of the people are overeating and not being active enough. Given how busy and stressed people are today, it's effortless to forget to keep track of the food that they eat. This only increases the importance of proper classification of food. Recently, smart applications for mobile devices such as Android phones and iPhone, have increased tremendously. These applications are capable of balancing the food habits of users and also notify them about unhealthy food intake. Advances in various technologies used in smartphones, has led to the increase in their computational power. It is also capable of processing real-time multi-media information using computational power, while traditional phones are not capable. Because of this images are send to high processing servers which leads to the increase in cost of communication and delay. Nowadays, smartphones can handle the high-quality images, so research on food classification is focused on developing real-time applications which capture images and train the machine learning models instantly. By knowing the calorie intake, it helps users to take prevention measures to avoid diseases such as diabetes, blood pressure and so on.

We propose a model, which integrates our calorie detector application to the deep neural network. We use Convolutional Neural Network (CNN) with TENSORFLOW.

The combination of different segmentation method such as color, texture, graph-cut segmentation and deep learning neural network combination is done.

II.OBJECTIVE

1. To identify the food accurately based on the images of food.
2. To measure the calorie of the food automatically.

III. EXISTING SYSTEM

There are some methods existing for dietary assessments which involve self-reporting and manually recorded instruments. But it has some issues with the evaluation of calorie consumption. calorie consumption by a participant is prone to be biased, i.e. underestimating and under reporting of food intake to increase the accuracy and to reduce the bias current methods are enhanced by mobile cloud computing system, which makes use of devices such as smartphones to capture dietary and calorie information. Next to this step, dietary and calorie information are analyzed by employing the computing capacity of the cloud for an assessment. However, users still have to enter the information manually. Though plenty of research and development efforts have been made in the field of visual-based dietary and calorie information analysis, the efficient extraction of information from food images remains a challenging issue.

Discreet cosine transform is used to portion the food and it is searched by segmentation process. To classify K-NN (k nearest neighbor) is used which takes much time to train the images and classify. If data is not assumed properly, data loss may occur.

IV. PROPOSED SYSTEM

In this paper, an effort has been made to classify the images of food for further diet monitoring applications using convolutional neural networks (CNNs). Since the CNNs are capable of handling a large amount of data and can estimate the features automatically, they have been utilized for the task of food classification. Convolutional Neural Networks along with a Global Average Pooling layer, generates Food Activation Maps (heat maps of food probability). Fine tuning is done for FAM generation, which includes adding a convolutional layer with stride, and setting a soft max layer. Additionally, via threholding, bounding boxes are generated. The present work aims to combine some of the above methodologies together, that creates a food classification system that predicts the class of food the image is in, and also gives the calorie count based on the portion size visible. This concept has a high scope in the health sector, as people want to keep track of what and how much they eat and simplifying the process into the form of this implementation increases usage and awareness of health-related factors.

V. SYSTEM DESIGN AND ARCHITECTURE

The steps in image processing are

1. Pre-processing and

2. Neural Network Training.

From this, the trained model can be obtained which will classify any supplied image based on the trained database.

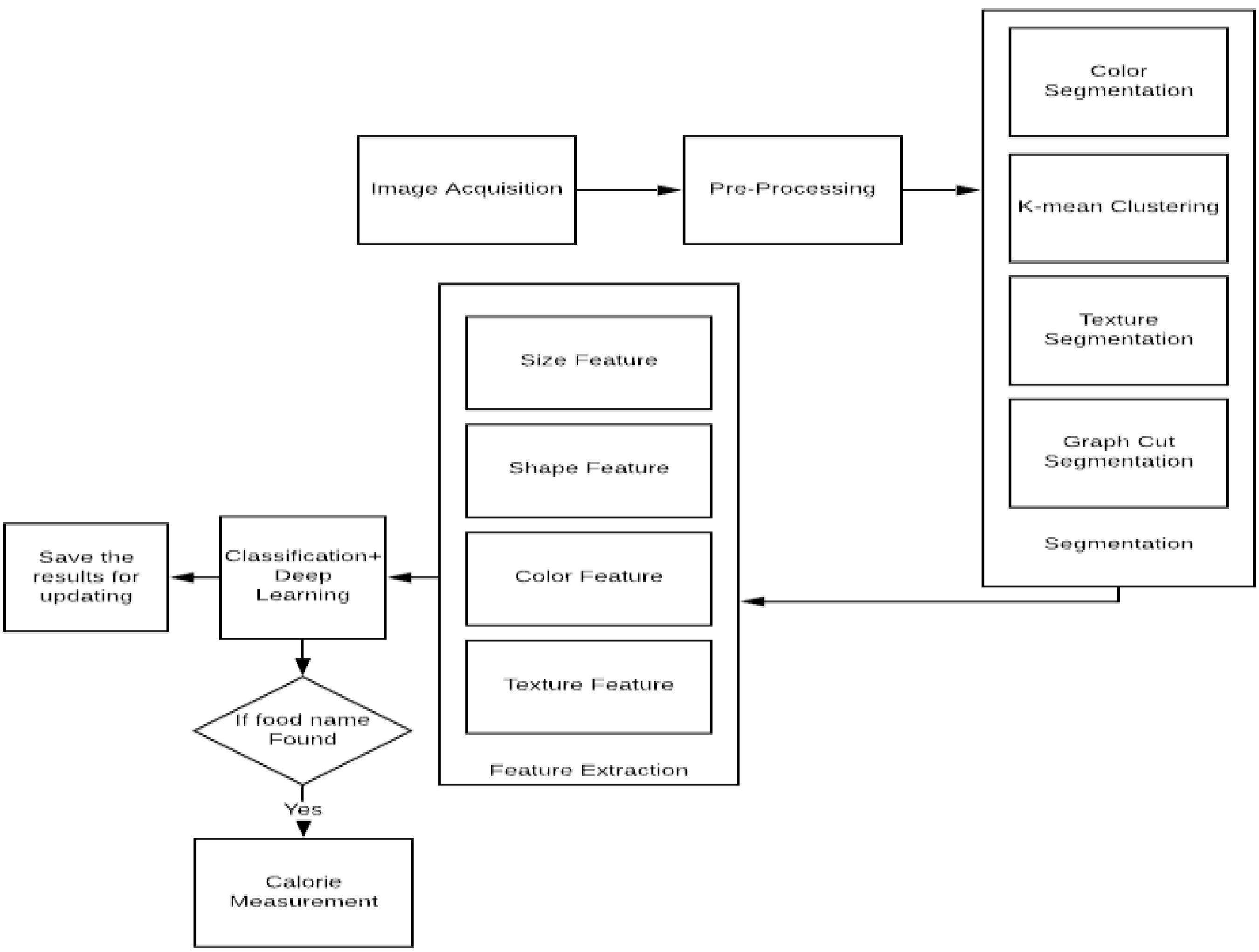

Fig-1: Functional implementation

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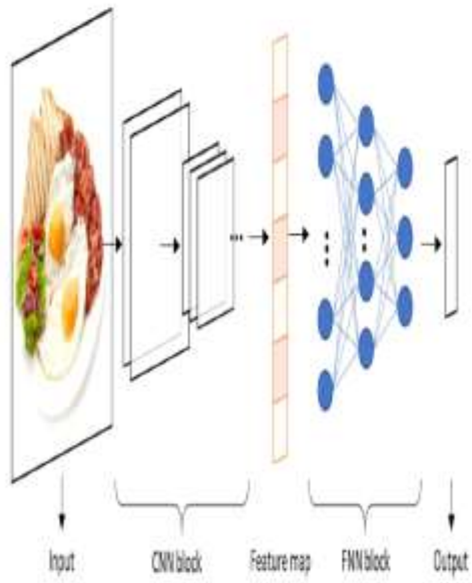

Fig-2: Block Diagram

VI. BRIEF INTRODUCTION OF DEEP LEARNING

Machine learning has been active in various fields, which acts as an effective tool for data processing. For the lack of ability to analyze raw natural data, traditional machine learning techniques usually needs to be supplemented by a manual feature extraction method. With the development of hardware computing ability and storage capacity, the abilities of machine learning can be promoted by adding more complex structures to achieve deep representation of the data (Schmidhuber, 2015). Representation learning enables a machine to extract the features from raw data for detection, classification, or regression. Deep learning can be understood as a kind of representation-learning method that refines multilevel representation by utilizing the deep ANN composed by multiple layers of neurons (nonlinear modules). Due to the strong feature learning ability of deep learning method, many complex problems can be solved in a rapid and effective way. Deep learning models demonstrate powerful capabilities in classification/regression tasks, provided that adequate data support was available which represents the specific problem. With the strong ability of automatic feature learning, deep learning method starts to be applied in the field of food science, mainly referring to food category recognition, fruit and vegetable quality detection, food calorie estimation, and so on. We will introduce in detail in section "Deep learning applications in food." CNN including a set of components (convolutional layers, pooling layers, fully connected layers, and so on) is currently considered as one of the most popular machine intelligence models for big data analysis in various research areas. A typical architecture of CNN model for classification problems is displayed in Figure. Convolution operations are implemented by traversing input matrices with convolution kernels that can be understood as filters for feature extraction. Different from filters used in conventional image processing method whose parameters need to be set manually, the parameters inside the kernel can be learned automatically by deep learning method. Convolutional layers are built by a set of convolution kernels, whose parameters (channels, kernel size, strides, padding, activation, and so on) should be set and optimized according to the practical problem. The computed output from convolutional layer is then subsampled by pooling layers. A group of chained convolutional layers and pooling layers can learn high level features representing the original input. The fully connected network (FNN) block, composed by fully connected neural units, is usually placed at the end as the classifier or used to generate numerical output for regression problems exploiting the learned feature map.

VII. TENSOR FLOW OBJECT DETECTION API

The Tensor Flow Object Detection API is an open source framework built on top of Tensor Flow that makes it easy to construct, train and deploy object detection models. The Tensor Flow Object Detection API makes it extremely easy to train your own object detection model for a large variety of applications. With an object detection model, not only can you classify multiple objects in one image, but you can specify exactly where that object is in an image with a bounding box framing the object.

Step 1: Work with dataset:

The initial step is to generate a pre-trained model file with the help of CNN network. It is performed by initially capturing a set of images of one particular class (For e.g. 25 images of carrot class).

Step 2: Label the dataset:

Next step is labeling them with object name-set (object being carrot). These images are considered the set of relevant images. After the image-set are captured, the system is trained with these images. In our case, we trained the system with background images, so it does not recognize them or categorize them as part of the image class.

Step 3: Convert labels to binary format (TFRecord):

Using a binary file format for storage of our data can have a great impact on the performance of our import pipeline and as a consequence on the training time of our model. Binary data takes up less space on disk, takes less time to copy and can be read much more efficiently from disk. Hence, TFRecord which is a Tensor Flows binary storage format is used.

Step 4: Final Result:

Once the model file is generated from the training, we load it into the Android Application and test it against the images captured and saved by the user. The resultant model can be run directly on mobile device or converted to Tensor Flow Lite format to leverage Android's Neural Network APIs.

Advantage:

1. Calorie detector Application is easy to use and understand. It is user friendly.

2. There is no need of personal dietitian since user can check the calorie easily using this application.

3. There is no need to create an account, user can simply capture the food image and find the calorie using this application.

4. This application also has a calendar with which the user can view the previously captured food and their corresponding calories anytime.

5. As Tensor Flow is used in this application, the response time is high.

6. The captured images by the user are automatically saved in the user device.

7. This application also shows the accuracy of how much it has matched with the trained data set.

8. It not only predicts the calorie but also carbs, fat and protein of the captured food.

9. This application does not require internet connection.

Disadvantage:

1. It only gives about 90% accuracy in predicting the captured food.

2. Since there is no user id and password protection any one can view the details inside that application.

3. The System provides only the amount of calorie, fat, carbs, protein in the food captured. Hence the user may not know the limitation range for the intake of the above.

VIII. FUTURE ENHANCEMENT

In this system, we provide the details of calorie, carbs, fats and proteins in each food captured by the user. In future we plan to enhance our system by notifying the user about how much the user should intake calorie, carbs, fats and proteins to maintain a healthy diet.

IX. CONCLUSION

Our aim in this paper is to empower the user by a convenient, intelligent and accurate system that helps them become sensible about their calorie intake. We employed a rather unique combination of Convolutional neural networks and fully connected neural network. We showed that the combination of those two methods provides a powerful instrument to attain a accuracy of food recognition in our system. Our plan for future work is to increase our database of images and send notification to user smartphones regarding the calorie.

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