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Autonomous Fruit Recognition System based on Deep Convolutional Neural Network

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ABSTRACT

Recently it is found that people are becoming more cautious to their diet throughout the universe. Unhealthy diet can cause many problems like sugar, obesity, gain in weight and many other chronic health related issues. Essential part of our diet is contributed by fruits as they are rich source of vitamins,fiber,energy and nutrients. Today's era has been adapted to a system of intake of foods which has several adverse effects on human health. The proposed system is Autonomous Fruit Recognition system based on Deep Convolutional Neural Network (DCNN) method. Using this technology recognition and estimation of fruit calories is necessary to spread awareness about food habits among people suffering from obesity due to bad food culture and consumption of food .This proposed web/app based system simplifies the calorie measuring process of fruit. The machine learning based API used in our system recognize the fruit and provide calorie content of that fruit. System uses convolutional Neural Network called MobileNet. This web/app based application is user friendly.

Keywords : Fruit Recognition/ DCNN/ Machine vision/Calorie measurement/MobileNet.

I. INTRODUCTION

One of the serious condition our Country is facing today is obesity. Rates of overweight and obesity have grown to epidermic outbreak which threaten India's economic conditions and security over past few years. The common method for estimation of human weight is done by (BMI)Body Mass Index[1] .Based on persons height in meters and weight of a person in kilograms BMI is calculated. When a BMI of a person is greater than or equivalent to 30 kg/m2 person said to be obese [2]. Over the period of few years the number of obese person is increasing in rapid rate[3].

The main Reason for fatness and excess weight in beginning level is nutrition imbalance and excess calorie intake. Consumption of healthy nutritious food improves health and minimizes nutrition related epidermic diseases and overweight. In Obese people generally we find Chronic diseases such as diabetes, hypertension, breathing disorder, myocardial infarction,stroke [4].The most common reason for excess weight of a person is more consumption of food as compared to energy consumed. So daily food intake must be regularly measured to reduce weight in a systematic way and to control healthy weight[5]. Novel smart phone shall be used for estimation of calories incase of normal human beings to monitor weight and to boost good health of patients suffering from diabetes. Due to current trends and

advancement of technology mobile devices such as health monitoring smart applications such as mobile devices are accessible to patients all the time. The mobile application which measures food intake automatically can be used to estimate the consumption of calories of patients[6]. Electronic devices plays an crucial role for recognition of food such as mobile phones. The present approaches of current control of diets is based on fixed and flexible background information in getting food images.The web/mobile based system is useful to common people for proper intake of food.

The rest of the paper consists of following sections, Section I introduces the topic, Section II relates to survey of Literature, Section III focuses on Proposed system, section IV is Conclusion and the final section involves the References.

II. LITERATURE SURVEY

There are two approaches in nutritional therapy i.e Ancient and Computerized approaches.Usage of the Ancient methods is popular for many years in hospitals and research studies. Computerized methods are recently used throughout the globe. In this paper,we are focusing on different methods of common dietary control measures and demerits of those methods are proposed. This can be used for medical purpose and to introduce novel treatment methods of people suffering from fatness and excess weight. For measuring food system following are the different methods.

M. Livingstone et al. [7] uses this approaches In Clinical Approaches method that is 24 hr dietary recall which, basically means an interview and F.E. Thompson et al.[8] food frequency questionnaire (FFQ). In this 24 hr dietary recall people shall be asked to keep record of food and drink intake during past 24 hrs.Trained interviewer is required for this.The interview can occur online through mobile device or meeting the patient face to face.The interviewer should have knowledge regarding cooking methods and nutritional knowledge to control and complete data collection format This method is not so useful because it needs only a little memory and trained interviewer. This method is inconvenient for specially obese people.In 24 hrs dietary recall reporting may be inaccurate due to number of factors like age,education ,gender etc.

The limitations of clinical approaches can be overcomed by Assistant-based approaches such as electronic devices.They are used nowadays for calorie measurement like mobile devices. People use electronic devices like mobile phones as a User Interface and forward their information to expert. Then expert will measure quantum of food. In this Assistive technique, initially captured image is sent to the server and analysis is done manually. Based on the food and Nutrient Database for Dietary Studies(FNDDS) extraction of nutritional information of the food is the next step. Finally result is sent back to the user for further confirmation and/or adjusting this information.Main Demerit of this Assistive method is that results are delayed[19].

Fruits are one of the healthy diet option.They contain less sodium,fat and calories.But they are abundant in fiber potassium and vitamin C. A diet rich in fruits can help us to fight against cancer, diabetes, heart diseases etc. A system is needed which will help us to know how much calories particular diet or fruit intake contains that can be very useful to maintain healthy diet without expert advice . Along with health benefits, eating fruits can make weight management easier. Fruit recognition based on object intensity, colour, texture is recognized by computer vision. S.Arivazhagan et al. [9] discusses fruit recognition based on efficient fusion of various features of the fruit,and with the help of minimum distance classifier, which is further based upon the co-occurrence and statistical features derived from the Wavelet transformed sub- bands.

Horea Muresan et al. [10] discusses on how to increase the accuracy of the neural network,360

dataset is introduced and tensorflow is used as a framework .In this paper new high quality dataset of fruits is introduced.Complex and new database of images with fruits is introduced .Future scope of this paper is mobile application which takes picture of fruits. Another objective of this paper in future is to expand the dataset which include more fruits.It also discusses on an effective system of fruit classification using deep convolutional neural network model is proposed. Israr Hussain, et al.[11] discusses about Deep Convolutional Neural Network with the help of data expansion techniques and further application of deep convolutional Neural Network. Fruit images of 15 class varieties are taken. Without the intervention of any feature extraction Image can be used as a input in Deep Convolutional neural network （DCNN) Model with only five-layers, is proposed,to improve recognition performance.

Hasan Basri et al. [22] Faster R-CNN to detect Classification of multi fruits is proposed in this paper Distinguishing of convolutional neural network is done deeply using MobileNet's. Mango and Pitaya fruits are taken as a input . The realtime dataset is taken in the study. MobileNet model is used on TensorFlow platform. The accuracy score of about 99% is obtained.To build efficient model,training is done quickly and classification of fruits is done based on the width multiplier along with checking the rightness level, shrink size and latency. For this Faster RCNN is used.

III. PROPOSED SYSTEM

The proposed web/app based system simplifies the calorie measuring process of fruit. The user has to take the picture of the fruit by clicking on capture image button or browse for the fruit image. After taking the picture of fruit, the preview of the picture appears in our web/mobile application, Then we need to click on detect button or on reset button to reset. Then the machine learning based API used in our system recognize the fruit and provide the calorie content of that fruit. Our system uses a CNN (convolutional neural network) called MobileNet.

IV. CONCLUSION

People throughout the globe are cautious about their health. People are experimenting various methods to keep themselves physically fit. This proposed web/app based system recognize the fruit and provide calorie content of that fruit which uses deep convolutional neural network. This proposed web/app based system encourages the users to use this system frequently .It is Quick,user friendly, reliable fruit recognition and it is an effective calorie measuring system.

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