Food Recognition And Calorie Estimation Using Image Processing

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ABSTRACT

Obesity and overweight have traditionally being linked to intake of high calorie food and lifestyle. Obesity may be a medical condition during which excess body fat has accumulated to the extent that it's going to have an adverse effect on health. Obesity in childhood and adolescents is associated a number of complications like, psychological stress, cardiovascular disease, orthopedic problems, etc. Obesity is usually preventable through a mixture of social changes and private choices. Changes to diet and exercising are the most treatments. Diet quality are often improved by reducing the consumption of energy-dense foods, like those high in fat or sugars, and by increasing the intake of dietary fiber. Medications are often used, along with an appropriate diet, to scale back appetite or decrease fat absorption. If diet, exercise, and drugs aren't effective, a gastric balloon or surgery could also be performed to scale back stomach volume or length of the intestines, resulting in feeling full earlier or a reduced ability to soak up nutrients from food. There are also other reasons that lead to monitoring of food calorie intake. In order to keep track of the amount of calorie intake of a person, we made food recognition and calorie estimation system that estimates the calorie of the food image which is given as input .We trained more than 1000 images in each category for our model. We have used CNN (convolutional Neural Network) as a classifier for food recognition and based on the food weight in grams, the calorie of the food item is determined.

Keyword: -*Obesity, Diet, Food Recognition, convolutional Neural Network and Calorie Estimation*

1. INTRODUCTION

Food is the key of human's body. So, a diet plan always needs to take into consideration the total number of calories to be consumed to maintain a fit and healthy life. But, in most cases, unfortunately people face difficulties in estimating and measuring the amount of food intake due to the mainly lack of nutritional information, which includes manual process of writing down this information, and other reasons. As such, it will be useful if there is a system to keep track and maintain the calorie intake. Hence accurate prediction of food calorie is equally important in such cases. In the last three years, object classification and detection capabilities have dramatically improved due to advances in deep learning and convolutional neural networks. Harnessing this technology to accurately classify and detect food objects is significantly essential for a healthy and fit life. But to always refer to the nutritional content in each food item is an extremely tedious task. Food image recognition provides an easy means to estimate the dietary caloric intake and evaluate people's eating habits, by using cameras to stay track of their food consumption. An accurate estimation of daily nutritional intake provides a useful solution for keeping healthy and to prevent diseases.

2. PROPOSED SYSTEM

Food recognition is an existing idea which can detect and recognize food item based on the input image. Our model is trained on 101 categories of food items. Further the idea is to estimate the calorie of the food item which is being recognized. The convolutional Neural Network (CNN) is used to recognize the food item. Further to estimate the calories we have given the standard calorie value for one gram of each food item. The weight of the food item is given as an input and based on the standard calorie value the accurate calorie value of the food item is calculated.

2.1. Architecture Diagram

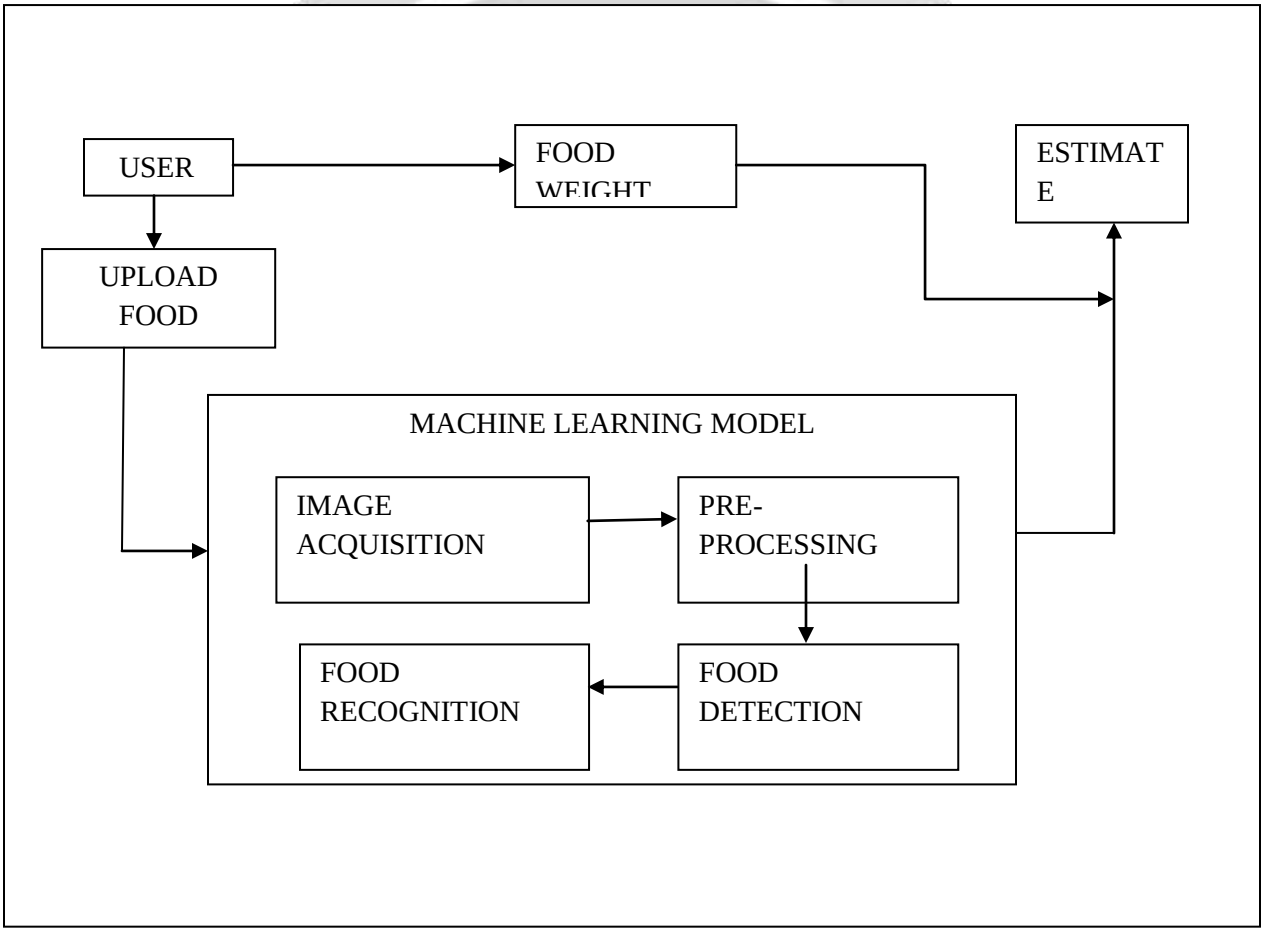

Fig-1: Architecture Diagram

2.2. Use-Case Diagram

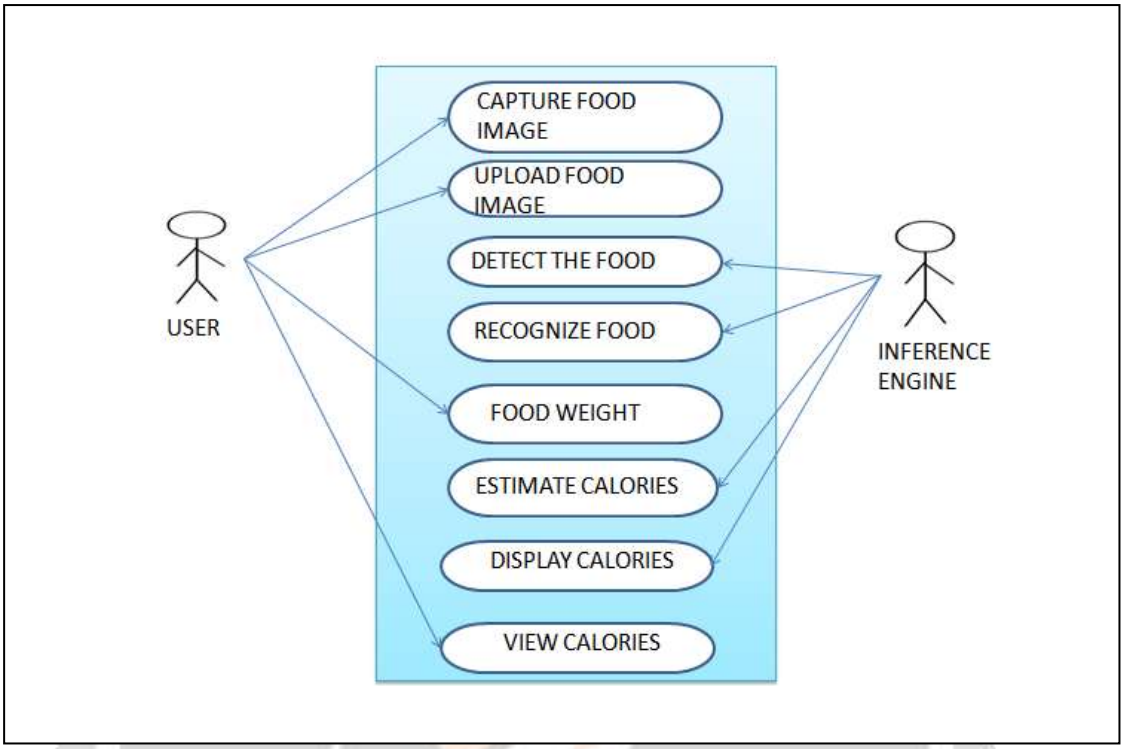

Fig-2: Use-case Diagram

3. METHODOLOGY

The project consists of two steps, identifying food from an image and converting the food identified into a calorie estimation. We performed food image classification using CNN (convolutional Neural Network).

Steps followed:

1. **Pre-processing:** Some basic pre-processing has been performed to clean the dataset where the irrelevant and noisy images of 15 categories have been removed.

   Also, data augmentation has been performed –
   - Pixel values re-scaled in the range of [0,1].
   - Random rotations max 40 degree.
   - Random zoom applied.
   - Shear angle in counter-clockwise direction in degrees

2. **Trained the model:** We trained the model with images of 15 categories using the classifier CNN (convolutional Neural Network) which is a class of deep, feed forward artificial neural networks that has successfully been applied to analyzing visual imagery.

3.1 convolutional Neural Network

The convolutional Neural Network (CNN) offers a technique for many general image classification problems. It has been applied in food classification and resulted in a good accuracy.CNN is widely used in food recognition and provides high performance than the traditional methods. Over the last few years, due to the

enhancements in the deep learning, especially in the convolutional neural networks, the accuracy in detecting and recognizing food images has been increased. This is not only because larger datasets but also new algorithms and improved deep architectures. convolutional Neural Network (CNN) is also known as LeNet due to its inventor.CNN mainly comprises convolutional layers, pooling layers and sub-sampling layers followed by fully-connected layers. The CNN takes an input image and applies convolutional and then sub-sampling. After two such computations, the data is fed into the fully connected neural network, where it performs the classification task. The main advantage of CNN is the ability to learn the high-level efficient features and in addition to that, it is robust against small rotations and shifts.

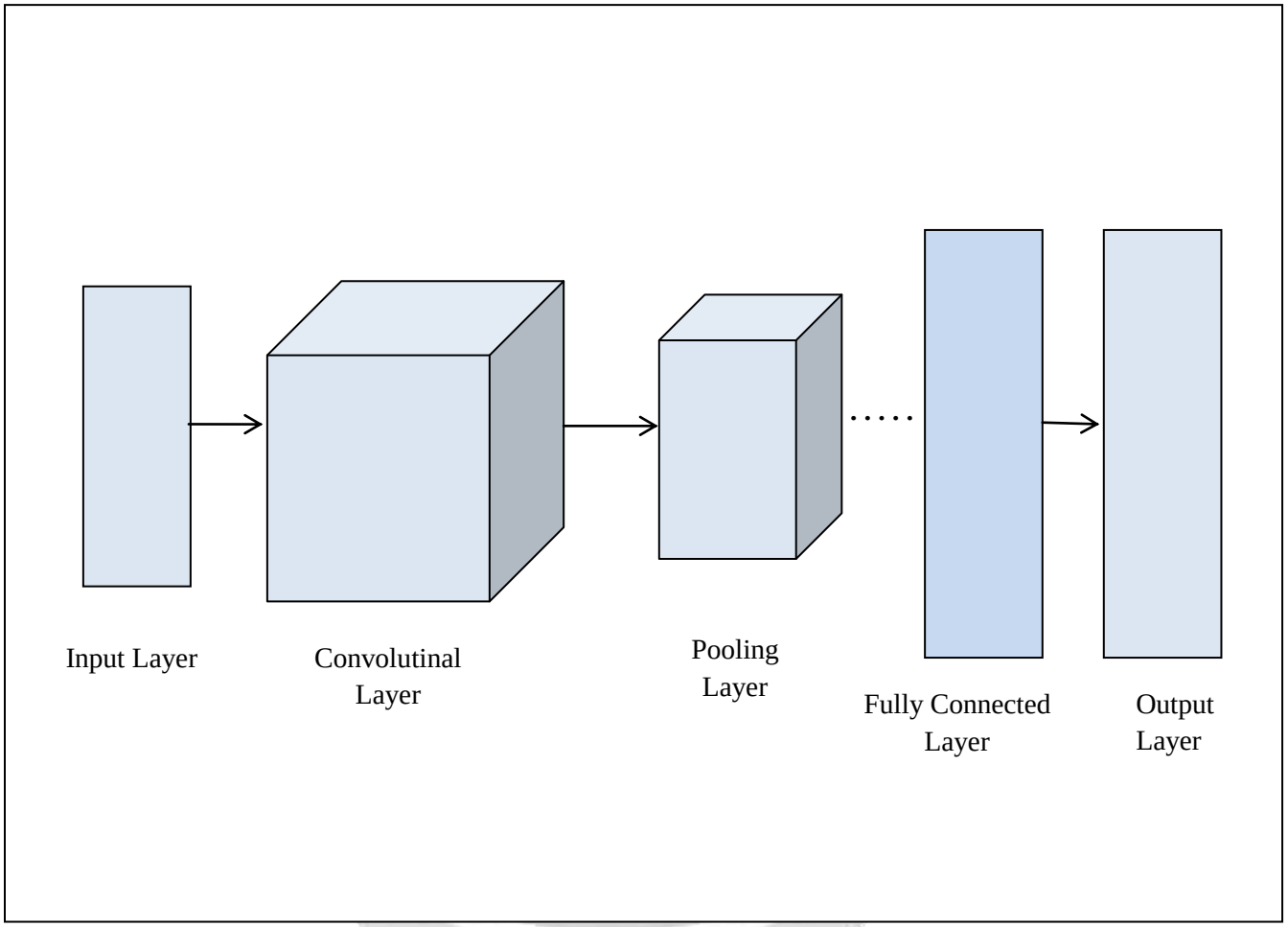

Fig-3: Layers of a Convolutional Neural Network

4. CHALLENGES

- Recognizing the food item with the help of single picture
- Similar type of images for example roti and dosa, both are in same shape which we find difficult to recognize
- Dataset becomes much larger when it comes on food images, so currently we take a finite dataset for training

5. BENEFITS

- Precise and accurate recognition of food
- Rapid estimation of calorie helps users to monitor their nutritional intake

- Can keep track of dietary information

6. FUTURE SCOPE

- The web application can be converted into mobile app for more user convenience
- More categories of food can be trained in future
- Multiple layers in single food item can be recognized
- Calorie can be estimated with the help of volume

7.CONCLUSIONS

In practice, the traditional models in machine learning are not attaining much accuracy when it comes to image classification. In this project, the CNN model is applied in image recognition.Much of data augmentation and segmentation has to be performed as well and clean pixel values are not necessary in CNN as it on it's own learn the generalized pattern required to identify and recognize new images.So using CNN model, the accuracy is comparatively a lot higher than all other traditional models.

8. REFERENCES

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