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# Estimation of Calorie Content in a Diet

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**Abstract -** Excessive calorie consumption has been evinced as noxious worldwide, as it is betraying to many harmful afflictions. However, nutritionists have assayed that a calibrated intake of calories is vital to maintain the equitable balance of nutrition and calorie content in human body. The intent of this research is to institute a machine learning model which is trained to perceive food images and compute the volume and approximate the calorie content. In this proposed model convolutional neural network (CNN) is used to detect the food item and when the food item is recognized, the volume is computed by approximating the geometric shape like sphere, cylinder, etc. The model is trained using the Support Vector Machine model in which 94% accuracy is obtained in the classification of the food items. Once the volume is computed, the mass of the food item is computed using standard density tables.

***Key Words***: **Machine Learning, Convolutional Neural Network, Support Vector Machine, Nutrition, Calorie Content, etc**

## 1. INTRODUCTION

Computing calorie content from the food item images is a pivotal task, presuming the data to notify the nutrition experts and advising the individuals attain a balanced intake. Yet this function seems to be arduous for both specialists and non-specialists. We are utilizing this research as a window to supplement our interpretation of calorie content estimation in real-life day to day scenario. In this research when the food item is detected from the image, the feature vector of the image is extracted for training and testing purposes. Using the hsv histogram for colour features and Gabor filters for texture features and the hu moments for the shape and the area of size the feature vector is calculated. The Support Vector Machine model is used for training the images using dimensional feature vector. An accuracy of 94% is obtained while classifying the food items. The geometric shape of the food item is contoured to compute the mass and density of the food items which in turn helps in computation of the calorie content. After the completion of the training, the same model is used for testing it on different food item images.

## 2. LITERATURE REVIEW

Numerous applications of this perception are present stretching from enhancing the methodologies to evaluating the diet, a prevalent and uncharted question in the field of nutrition as well as regulating the design of interferences which are engrossed on nutrition functioning change.

## 3. MATERIALS AND METHODOLOGIES

A congregation of 10 classes of food items were used. Various image processing and classification techniques are used to identify the food items and compute the volume and the nutritional content in the food item which is detected. A congregation of methods consisting of canny edge detection, watershed segmentation, morphological operators and Otsu's method are used to segment the food item to obtain the outline of the fruit and the outline of the thumb. The thumb finger is used for calibration purpose. While clicking the photo the thumb is placed next to the food item to estimate the real-life dimension of the food item which in turn helps to estimate the volume accurately.

### 3.1 DATASET:

The dataset comprises of the following parameters:

Food Item- name of the food item

Density- the density of the food item

Calorie- the caloric value of the food item

Label- the label number of the food item

Shape- the geometric shape of the food item

| Food Item | Density | Calorie | Label | Shape |
|---|---|---|---|---|
| Apple | 0.609 | 52 | 1 | Sphere |
| Banana | 0.94 | 89 | 2 | Cylinder |
| Carrot | 0.641 | 41 | 3 | Cylinder |
| Cucumber | 0.641 | 16 | 4 | Cylinder |
| Onion | 0.513 | 40 | 5 | Sphere |
| Orange | 0.482 | 47 | 6 | Sphere |
| Tomato | 0.481 | 18 | 7 | Sphere |

**Fig -1**: Some of the images from the dataset used to train the model

## 4. PROPOSED MODEL

We used a classification model to detect the food item to compute the mass, density and calorie content. Using this model, we calculated the calorie content value in the detected food item and compared it with the estimated calorie content values and determined the accuracy of the proposed model. For computing certain values, we used Support Vector Machine model and the Convolutional Neural Networks.

## 5. EXPERIMENTAL RESULTS

The Support Vector Machine model is used for training the images using the 95-dimensional feature vector. We acquired an accuracy of 94% in the classification of food items.

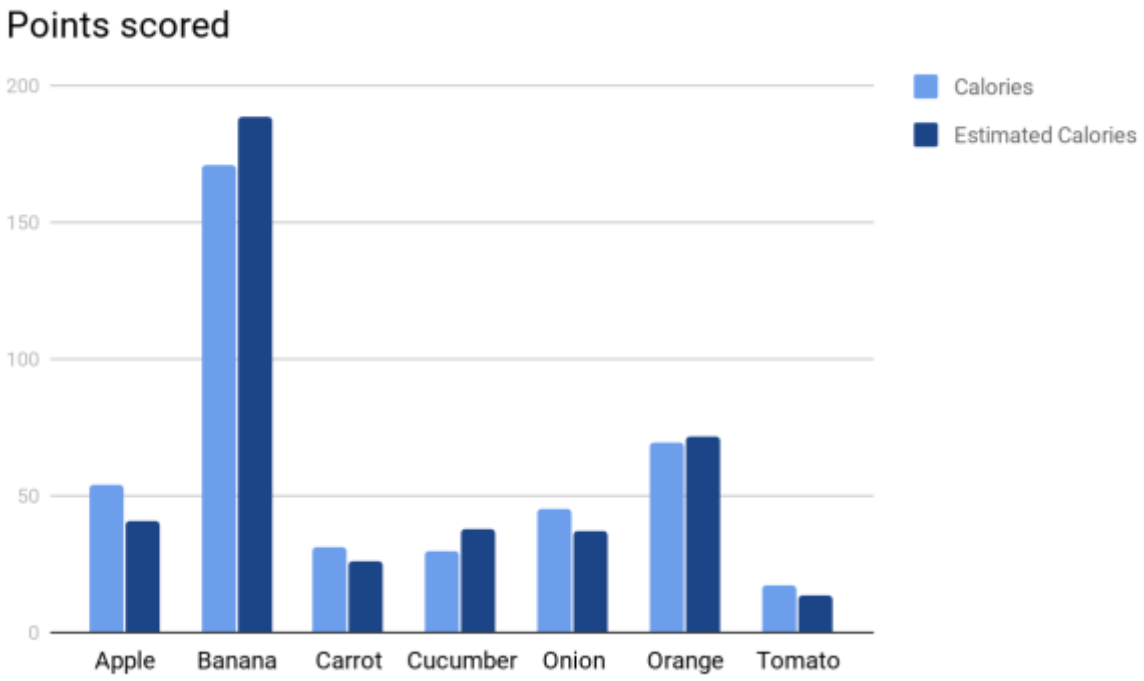


**Fig -2**: Comparison of calories with estimated calories

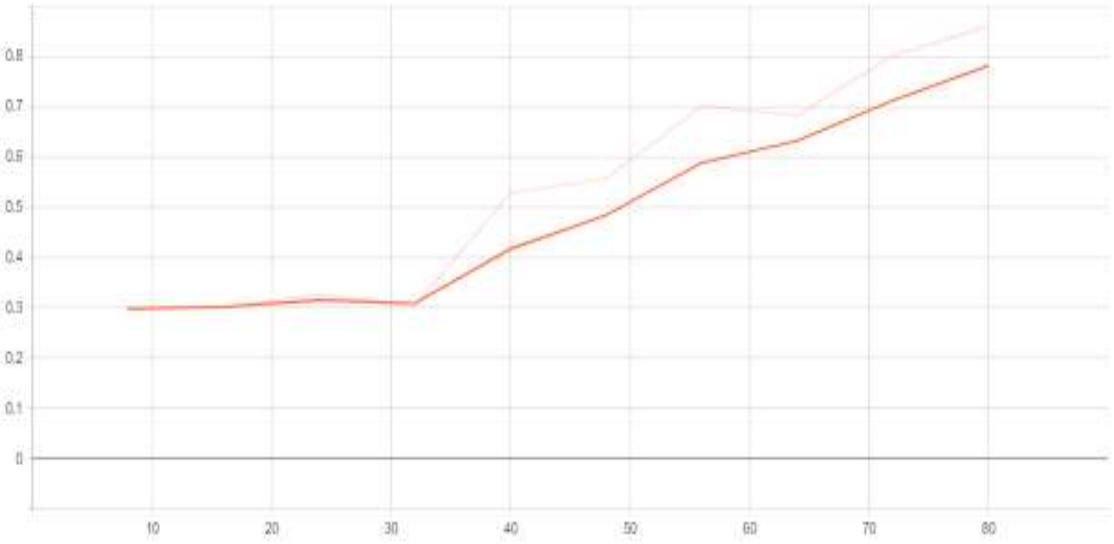


**Fig -3**: Depiction of accuracy function

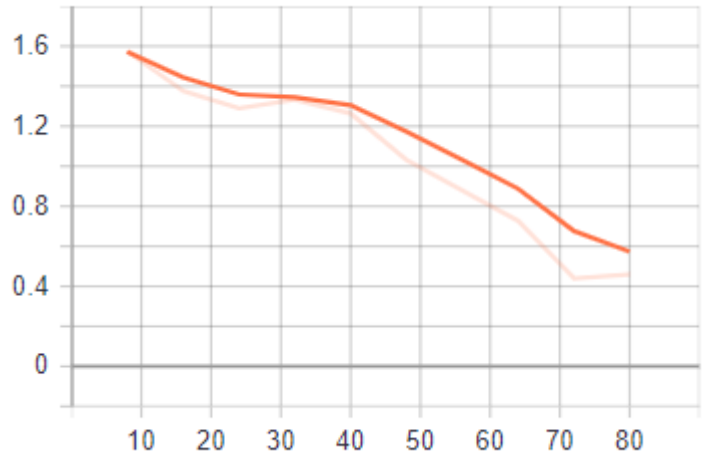


**Fig -4**: Depiction of loss function

## 6. CONCLUSION

This paper depicts a model for estimating the calorie content which a person intake and shows how accurate the proposed model is with the help of accuracy.

## 7. FUTURE ENHANCEMENT

In future this methodology can be modified to estimate the calorie content from all categories of food items and this proposed machine learning model can be transformed to reduce the error that turn out while computing the calorie content in the food items.

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