ISSN XXXX XXXX © 2019 IJESC

Research Article Volume 9 Issue No.3

Precisional Detection of Calorie Information in Indian food types using Image Recognition to address Annorexia Nervosa

Sangamesh Gama[1], Bhavana. N[2] , Himashree. D. B[3], Nagashree M. Hegde[4]
Assistant Professor[1], BE Student[2, 3, 4]
Department of Information Science and Engineering
Atria Institute of technology, Bangalore, India

Abstract:
The goal of machine learning is to give computers the ability to do something without being explicitly told how to do it. We just provide some kind of general structure and give the computer the opportunity to learn from experience, similar to how we humans learn from experience too. Fascinated by this technology of deep convolution neural networks, we the Students of AIT feel that this technology can be applied to understanding the recognition and detection of various types of food items and getting in return the amount of calories it consists of.

Keywords: Tensor-Flow, Image Recognition, Machine Learning.

I.INTRODUCTION

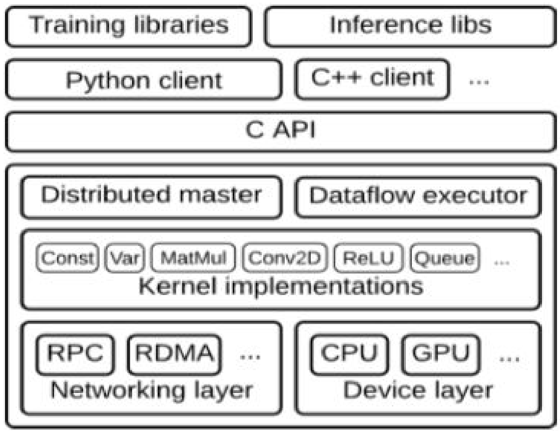
Our brains make vision seem easy. It doesn't take any effort for humans to tell apart a lion and a jaguar, read a sign, or recognizes a human's face. But these are actually hard problems to solve with a computer. They only seem easy because our brains are incredibly good at understanding images. In the last few years the field of machine learning has made tremendous progress on addressing these difficult problems. In particular, we've found that a kind of model called a deep convolutional neural network can achieve reasonable performance on hard visual recognition tasks matching or exceeding human performance in some domains. How can we get computers to do visual tasks when we don't even know how we doing it ourselves? Instead of trying to come up with detailed step by step instruction of how to interpret images and translating that into a computer program, we're letting the computers figure it out itself.

Tensor flow

Tensor Flow is a machine learning framework introduced by Google to help the construction of neural networks for image recognition and analytics. The possibilities and functions of Tensor flow help to optimally use machine learning neural networks for all sorts of applications. It can be built on Python, C++, Haskell, Java, Go, REST, R, Scala and Ocaml. It also its own JavaScript Framework. It has its own model that can be run on Android and Raspberry Pi. Tensor flow for poets is the model that helps to image recognition software that can be run on Android and Raspberry Pi. It helps to dynamically build neural networks purely just by supplement of datasets. The Labels of the datasets will be the labels of the images supplied and will be displayed on the output monitors of the Android and Raspberry pi models. Prediction is one of the main reasons for the framework to seem intelligent. Once the model has been trained, the computer can learn outside the training set.

Tensor flow architecture

Software Architecture involves the high level structure of software system abstraction, by using decomposition and composition, with architectural style and quality attributes. A software architecture design must confirm to the major functionality and performance requirements of the system, as well as satisfy the non functional requirements such as reliability, scalability, usability, and performance.



The Tensor Flow runtime is a cross-platform library. The above figure illustrates its general architecture. A C API separates user level code in different languages from the core runtime.

This diagram focuses on the following layers:

Client:

- Defines the computation as a dataflow graph.
- Initiates graph execution using a session

Distributed Master:

- Prunes a specific subgraph from the graph, as defined by the arguments to Session. run().
- Partitions the subgraph into multiple pieces that run in different processes and devices.
- Distributes the graph pieces to worker services.
- Initiates graph piece execution by worker services.

Worker Services (one for each task):

- Schedule the execution of graph operations using kernel implementations appropriate to the available hardware (CPUs, GPUs, etc).

• Send and receive operation results to and from other worker services.

Kernel Implementations:
• Perform the computation for individual graph operations.

A.Why machine learning for food recognition

When people's Body Mass Index (BMI) is over 30 (kg/m2), they are generally considered to be obese. High BMI can increase the risk of illnesses like heart disease [1]. The main reason of obesity is due to the imbalance between the amount of caloric intake (consumption) and energy output (expenditure). Because of unwillingness to record and track, lack of related nutritional information or other reasons, patients often experience trouble in controlling the amount of calories they consume. There are lots of proposed methods to estimate calories based on computer vision [2, 3, 4, 5], but after the authors' analysis, the accuracy of detection and volume estimation still need to be improved.

II.MATERIALS AND METHODS

A.Calorie Estimation Method Based On Deep Learning

This method is shown in Figure 1. As mentioned before, the process of estimating calories requires two images from top and side, and each image should include the calibration object. Here, the authors choose Faster Region-based Convolution Neural Networks (Faster R-CNN) [5] to detect objects, and GrabCut algorithm [6] as the segmentation algorithm.

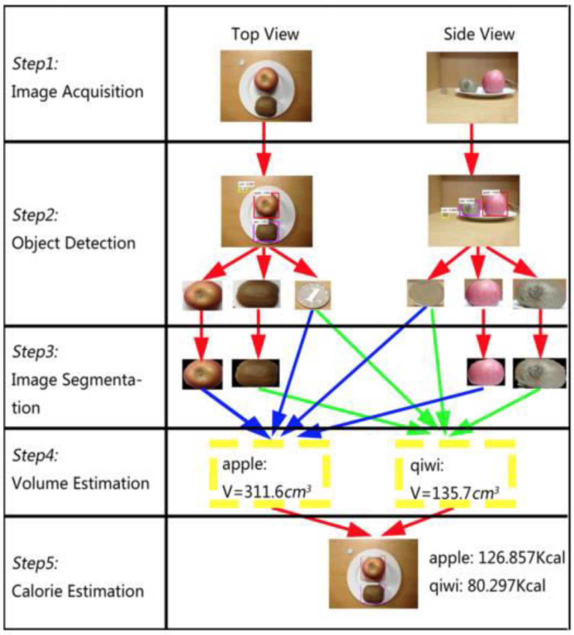


Figure 1: Calorie Estimation Flowchart

B. Deep Learning Based Objection Detectiond

The authors chose Faster R-CNN instead of using semantic segmentation method such as Fully Convolutional Networks (FCN). Here, after the images are inputted as RGB channels, the authors can get a series of bounding boxes, which means the class if judged.

C. Image Segmentation

This process uses an image processing approach to segment each bounding box. As mentioned above, the bounding boxes around the object that GrabCut needs can be provided by Faster R-CNN. After segmentation, we can get a series of food images stored in matrix, but with the the values of the background pixels being replaced by zeros. This will leave only the foreground pixels.

D. Volume Estimation

To estimate the volume, the authors calculate the scale factors based on calibration objects. The authors use a 1 CNY coin to show the specific process of calculating the volume. The diameter of the coin is 2.5 cm, and the side view's scale factor was calculated with Equation 1.

$$\alpha_S = \frac{2.5}{(W_S + H_S)/2} \tag{1}$$

In this equation, Ws is the width of the bounding box, Hs is the height of the bounding box. Similarly, the top view's scale can be calculated with Equation 2.

$$\alpha_T = \frac{2.5}{(W_T + H_T)/2} \tag{2}$$

After, the authors divide the foods into three categories based on shape: ellipsoid, column, irregular. Different volume estimation formula will be selected for different types of food, according to Equation 3. HS is the height of side view PS and LkS is the number of foreground pixels in row k (k ∈ 1,2,…,HS). LMAX = max(Lk ,…,Lk), it records the maximum number of foreground pixels in PS. ß is a compensation factor (default value = 1.0). After that, for each food type there will be a unique value.

$$v = \begin{cases} \beta \times \frac{\pi}{4} \times \sum_{k=1}^{H_S} (L_S^k)^2 \times \alpha_S^3 & \text{if the shape is ellipsoid} \\ \beta \times (s_T \times \alpha_T^2) \times (H_S \times \alpha_S) & \text{if the shape is column} \\ \beta \times (s_T \times \alpha_T^2) \times \sum_{k=1}^{H_S} \left(\frac{L_S^k}{L_S^{MAX}}\right)^2 \times \alpha_S & \text{if the shape irregular} \end{cases} \tag{3}$$

E. Calorie Estimation

After estimating the volume, the next step is to estimate each food's mass. It can be calculated in Equation 4, Where v (cm^3) represents the volume of current food, and ρ (g/cm^3) represents its density values.

Then the calorie of the food can be obtained with Equation 5.
C=c*m (5)
Where m(g) represents the mass of current food and c(Kcal/g) represents its calories per gram.

B.Calories of food used in this project:

As per the WHO we are following the below table:

Item	Quantity	Calorific Value (apx.)
Breakfast		
Egg boiled	1	80
Egg Poached	1	80
Egg Fried	1	110
Egg Omelet	1	120
Bread slice	1	45
Bread slice with butter	1	90
Chapati	1	60
Puri	1	75
Paratha	1	150
Subji	1 cup	150
Idli	1	100
Dosa Plain	1	120
Dosa Masala	1	250
Sambhar	1 cup	150

Lunch/Dinner		
Cooked Rice/Plain	1 cup	120
Cooked Rice/Fried	1 cup	150
Chapati	1	60
Puri	1	75
Paratha	1	150
Nan	1	150
Dal	1 cup	150
Sambhar	1 cup	150
Curd	1 cup	100
Curry/Vegetable	1 cup	150
Curry/Meat	1 cup	175
Salad	1 cup	100
Papad	1	45
Cutlet	1	75
Pickle	1 tsp	30
Soup/Clear	1 cup	75
Soup/Heavy	1 cup	75
Fruit	1 helping	150

Beverages		
Tea/Black/without sugar	1 cup	10
Coffee/Black/without sugar	1 cup	10
Tea with milk & sugar	1 cup	45
Coffee with milk & sugar	1 cup	45
Milk without sugar	1 cup	60
Milk with sugar	1 cup	75
Milk with sugar, Horlicks	1 cup	120
Fruit Juice, concentrated	1 cup	120
Soft Drinks	1 bottle	90
Beer	1 bottle	200
Soda	1 bottle	10
Alcohol neat	1 peg, small	75

Miscellaneous & North Indian		
Porridge	1 cup	150
Jam	1 tsp	30
Butter	1 tsp	50
Ghee	1 tsp	50
Sugar	1 tsp	30
Biscuit	1	30
Fried Nuts	1 cup	300
Puddings	1 cup	200
Ice-cream	1 cup	200
Milk-Shake	1 glass	200
Wafers	1 pkt	120
Samosa	1	100
Bhel Puri/Pani Puri	1 helping	150
Kebab	1 plate	150
Indian sweets/mithai	1 pc	150

International food		
Bread Slices with Butter & Jam/Cheese, etc.	1	120
Breakfast cereal with milk sweetened	1 cup	130
Porridge & Milk	1 cup	120
Porridge & Milk sweetened	1 cup	150
Sausage, bacon,ham etc. fried	1 helping	120
Potato mash	1 cup	100
Potato fried	1 cup	200
Sandwich large	1	250
Hamburger	1 pc	250
Steak & Salad	1 plate	300
Spaghetti & meat, sauce etc.	1 plate	450
Baked dish	1 helping	400
Fried Chicken	1 helping	200
Chinese noodles	1 plate	450
Chinese Fried Rice	1 plate	450
Pizza	1 plate	400

ACCURACY AND RESULTS:

when you put this image ,it will show the result as we showned in the figure.

IV. CONCLUSION:

Anorexia nervosa, often referred to simply as anorexia, is an eating disorder characterized by low weight, fear of gaining weight, and astrong desire to be thin, resulting in food restriction. Many people with anorexia see themselves as overweight even though they are in fact underweight. If asked they usually deny they have a problem with low weight. Often they weigh themselves frequently, eat only small amounts, and only eat certain foods. Some will exercise excessively, force themselves to vomit, or use laxatives to produce weight loss. Complications may include osteoporosis, infertility and heart damage, among others. A lot of these people are very conscious about what they eat and it's nutrient content. A simple application like this one can solve this problem and help them gain mental comfort regarding their dietary and weight gain restrictions. This application is thus an attempt at being able to demonstrate the use of Machine learning and Image recognition not restricting ourselves to the tremendous applications of the deep learning network in every field including nutrition.

V. REFERENCES

[1]. Nutri Net: A Deep Learning Food and Drink Image Recognition System for Dietary Assessment

[2]. Real-time Mobile Food Recognition System

[3]. Deep Learning Based Food Recognition

[4]. Food Recognition using Ingredient-Level Features

[5]. R. Albatal, C. Gurrin, J. Zhou, Y. Yang, D. Carthy and N. Li (2013), "Sense seer mobile Cloud based Lifelogging framework".

[6]. Autores Pedro Casas, Raimund Schatz (2014)," Quality of experience in cloud services: Survey and measurements".

[7]. S. V. B. Peddi, A. Yassine and S. Shirmohammadi (2015), "Cloud based virtualization for a calorie measurement e-health mobile".

[8]. Z. Ning, F. Xia, X. Kong and Z. Chen (2016), "Social Oriented Resource Management in Based Mobile Networks".

[9]. M. Artuso and H. Christiansen (2016), "Optimising TCP for Cloud Based Mobile Networks".

[10]. Ardhendu Bandhu, Sanjiban Sekhar Roy (2017)," Classifying multi-category images using Deep Learning: A Convolutional Neural Network Model".