A System Approach To Global Obesity Epidemic

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ABSTRACT

Money comes and goes, but good health is a treasure to keep. In today's world, the important thing that matters is health. People have become more health-conscious and are careful about their diet. Due to the fast moving world, obesity and other related issues become a major health problem among human beings. Many people have the difficulty choosing food items that have good nutrients and low calorific values. Our proposed system not only detects varieties of fruits & vegetables but also provides per serving calories of each food detected in a single image. To achieve this, we will take the input of the food image from the user. This food item is detected with the help of the CNN algorithm. The model fetches calorie information(per 100gm) of the predicted image directly from google. If a system can help the people and give them suggestions about the food and its calorific values, we can find a solution for this obesity problem.

Keywords: *convolutional neural network, calorie*

INTRODUCTION

Good health is the only resource that allows people to live a long, productive, and fruitful life. Taking care of your body is a must as it is the only place to live in. According to the NIH (National Institutes of Health), obesity is the second leading cause of preventable death. A million people die yearly due to obesity. Nowadays it is very difficult for a person to track the calories consumed by them. The intake of calories plays a very vital role in one's healthy lifestyle. According to medical experts, a person is defined as obese when their BMI is greater than 30 kg/m2. Obesity leads to many diseases like high cholesterol, liver failure, breathing issues, heart problems, diabetes and sometimes cancer. Earlier the users used to track their calorie intake with the help of charts. These methods are very hectic to follow and lead to an unquantified meal diet. Having a meal which is quantified helps you reduce that extra fat. We came up with an idea to help the people track the number of calories that it takes in with the help of simple images of the food that is captured by the user instantly.

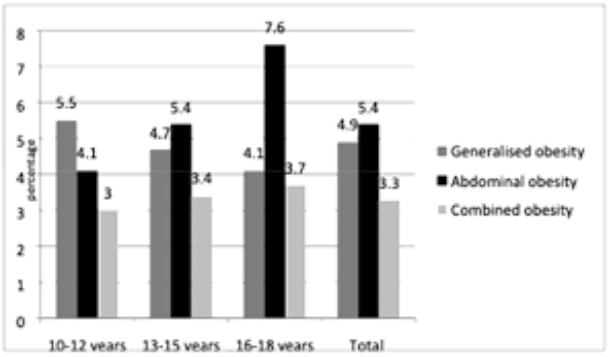
METHODS:

TYPES OF OBESITIES

Obesity is a complex disease involving an excessive amount of body fat. Obesity isn't just a cosmetic concern. It's a medical problem that increases the risk of other diseases and health problems, such as heart disease, diabetes, high blood pressure and certain cancers.

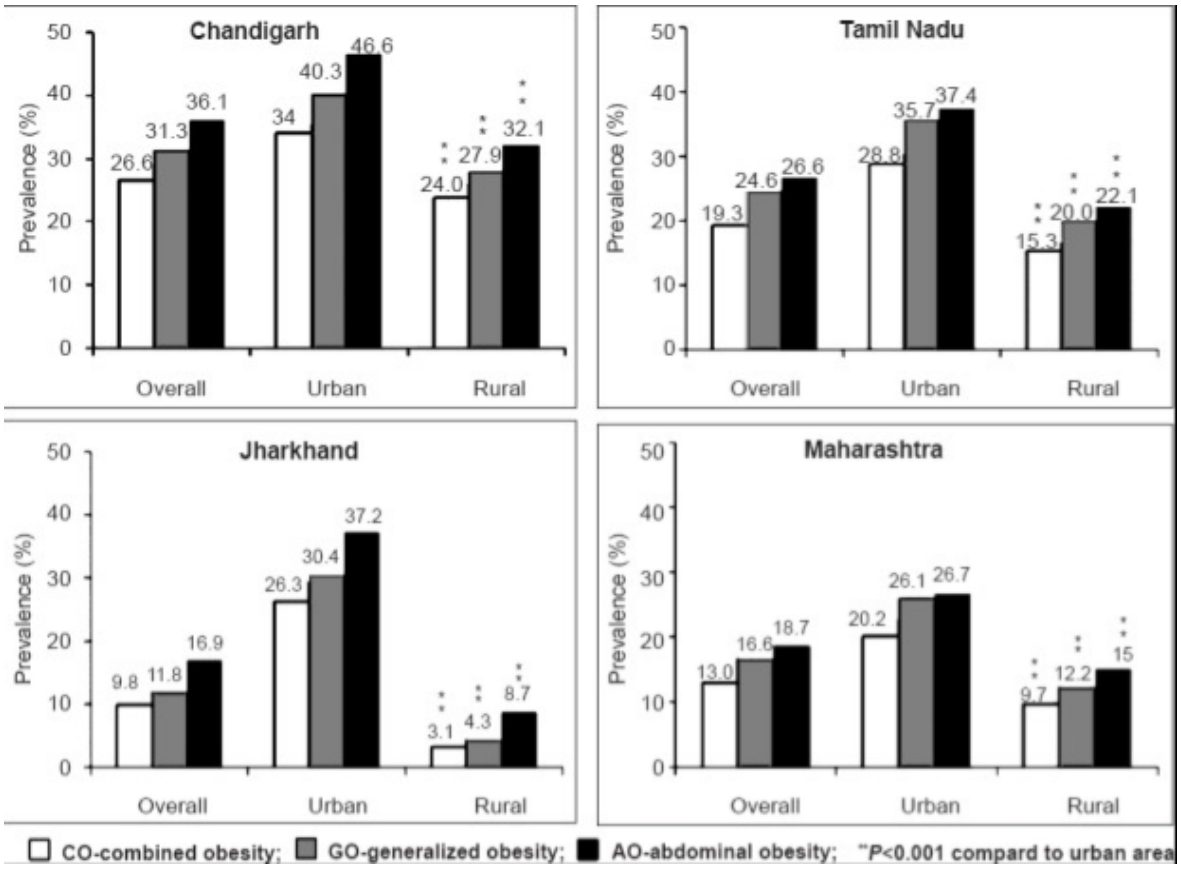
BMI	**Weight status**
Below 18.5	Underweight
18.5 - 24.9	Normal
25.0 - 29.9	Overweight
30.0 and higher	Obesity

Generalized obesity: Generalized obesity was defined using the WHO Expert Consultation guidelines (WHO Expert Consultation, 2004) as BMI≥23 kg m−2
Abdominal obesity: Excess weight that develops over time around the center of the body, also called visceral fat. Also, defined as a waist circumference of more than 88 cm (35 inches) in women and more than 102 cm (40 inches) in men.
Combined obesity: Individuals with both generalized obesity and abdominal obesity.



PREVALENCE OF OBESITY IN INDIA

ICMR-INDIAB study was conducted in a representative population of three States [Tamil Nadu (TN), Maharashtra (MH) and Jharkhand (JH)] and one Union Territory (UT)[Chandigarh (CH)] of India. A stratified multi-stage sampling design was adopted and individuals ≥ 20 yr of age were included. Of the 14,277 participants, 13,800 subjects (response rate, 96.7%) were included for the analysis (urban: n = 4,063; rural: n = 9737).



The prevalence of GO, AO and CO were significantly higher among urban residents compared to rural residents in all the four regions studied.

PHYSICAL ACTIVITY LEVELS IN INDIA

ICMR-INDIAB study was conducted in four regions of India (Tamilnadu, Maharashtra, Jharkhand and Chandigarh representing the south, west, east and north of India respectively) with a combined population of 213 million people. Physical activity was assessed using the

Global Physical Activity Questionnaire (GPAQ) in 14227 individuals aged ≥ 20 years [urban-4,173; rural- 10,054].

However, there has been no nationwide survey in India on physical activity levels involving both the urban and rural areas in whole states of India. The aim of the present study was to assess physical activity patterns across India - as part of the Indian Council of Medical Research-India Diabetes (ICMR-INDIAB) study.

Subjects were more inactive in urban areas, compared to rural areas. Males were significantly more active than females. The study shows that a large percentage of people in India are inactive with fewer than 10% engaging in recreational physical activity.

ANALYSIS

“QUALITY MATTERS NOT QUANTITY” - The food we eat does not matter how much quantity it is, quality of the food matters the most. With the fast moving world, having easy availability of food, people least care about the calorie intakes and health disorders for which one possible reason is obesity. Obesity is now becoming a global epidemic.

Balanced diet ->Controlled calorie intake->Regular physical activity->no obesity->no overweight ->less health disorder ->more healthy nation.

Ketosis:- It is famously also known as Keto diet, which includes carbohydrate deficient or no carbohydrate food. Ketosis is a process that happens when your body doesn't have enough carbohydrates to burn for energy. Doing a ketosis effective diet helps burn the excessive fat in the body.

Intermediate fasting:- Intermittent fasting is an eating plan that switches between fasting and eating on a regular schedule. Research shows that intermittent fasting is a way to manage your weight and prevent — or even reverse — some forms of disease.

Fruit Diet:- The fruitarian, or fruit, diet is a highly restrictive vegan diet. It excludes all animal products, including dairy. People following this program eat a diet consisting primarily of raw fruits.

Diary Diet:- Dairy foods are a standalone food group in many FBDGs due solely to their calcium contributions to the diet. Dairy foods are also recognized in FBDGs as a source of multiple essential vitamins and minerals and/or high-quality protein. Although mentioned less

frequently in FBDGs messaging, fermented dairy products, such as yogurt and kefir, can provide health benefits beyond their essential nutrient content. They have been shown to be among the most effective dietary carriers of probiotics and have been credited with protecting various aspects of oral health, gut health, and overall immune function.

Active Lifestyle:- An active lifestyle means you do physical activity throughout the day. Any activity that gets you up and moving is part of an active lifestyle. Physical activity includes exercise such as walking or lifting weights. It also includes playing sports. These things will keep your body up and running and burn excessive fat.

Meditation and Yoga:- Meditation and yoga helps keep mind and body balanced from obesity and its side effects.

Limiting Unhealthy Food:- Limiting processed food like refined grains and sweets, potatoes, red meat, processed meat and beverages (sugary drinks).

Limiting Sit Time:- Limiting television time, screen time,etc will greatly reduce the sit time, so a person can be physically active.

Improving sleep:- 6-8 hours of sleep is very important whether for burning fat or staying healthy.

Reducing stress:- Eat a well-balanced diet, get enough sleep, and exercise on a regular basis. Engage in self-relaxation.

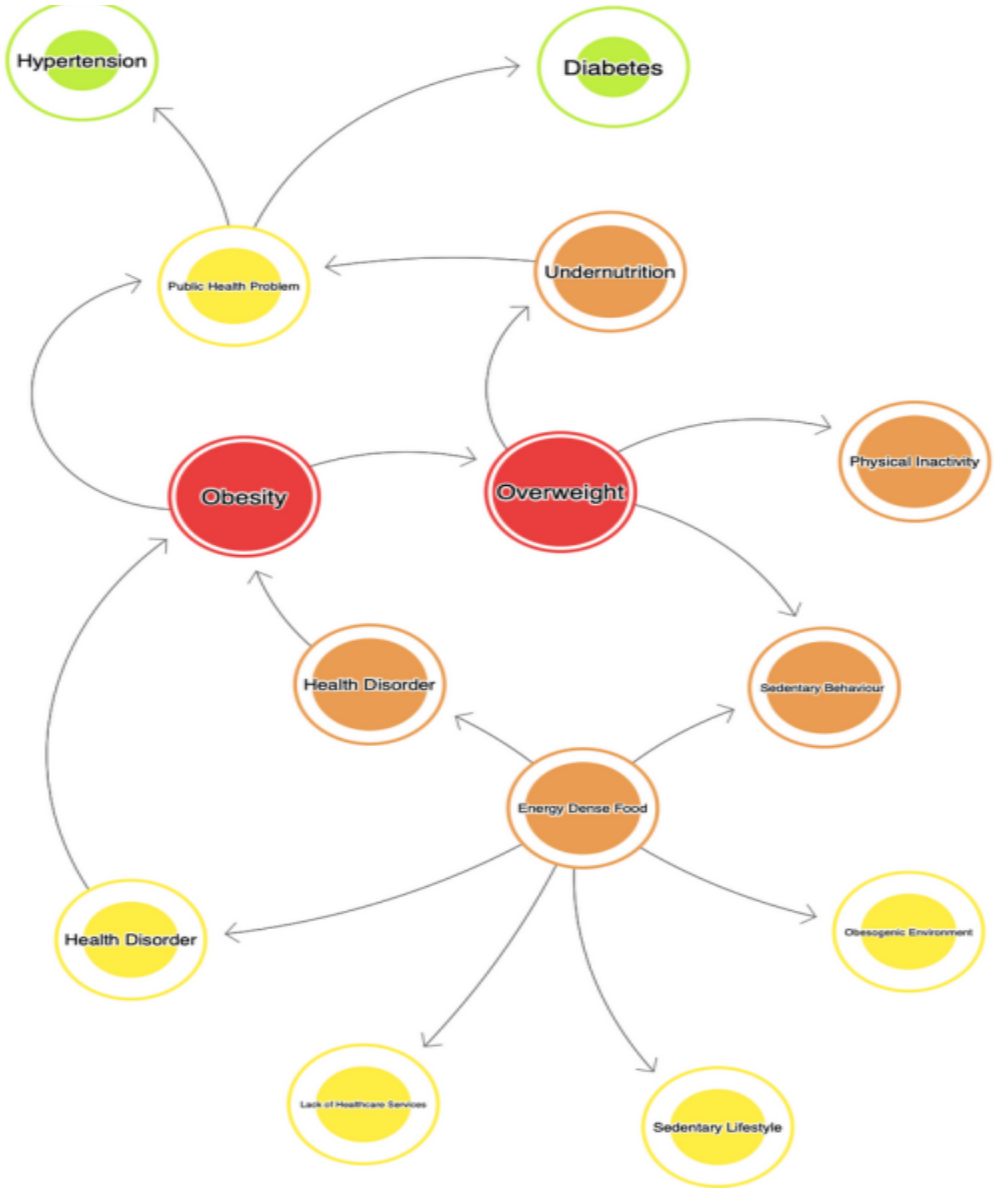
Recommendations for Global Obesity Epidemic :

- Stay Hydrated
- Eat whole foods
- Limit intake of added sugar
- Eat rich in protein foods
- Try low-carb diet
- Eat more slowly
- Eat more fiber

The 3 keys to preventing Obesity :

- Healthy eating behaviors
- Regular physical activity
- Reduced sedentary activity

Causal Loop:-



Obesogenic environment :the influences that the surroundings, opportunities or conditions of life have on promoting obesity in individuals and populations

A Calorie Estimator App

How good it would be if we can see how many calories we are taking with each fruit or vegetable we eat. The proposed solution is a simple web application that every user can use. Users need to upload the image of any image of fruit and vegetable and our system will automatically classify the image and will predict the name of the fruit and vegetable and will also show the number of calories present in 100grams of the predicted image. This is a web application, so users can directly use it in any browser.

Tools and Libraries:-

No.	Tools & Library Name	Use
1	Keras	For deep learning tasks like creating models, predicting the object etc.
2	Pillow	For preprocessing the images of our dataset.
3	Streamit	It is a backend framework for developing web applications.
4	Beautifulsoup, Requests	For scraping the calories from the internet for the predicted object.
5	Numpy	For the Image matrix handling.

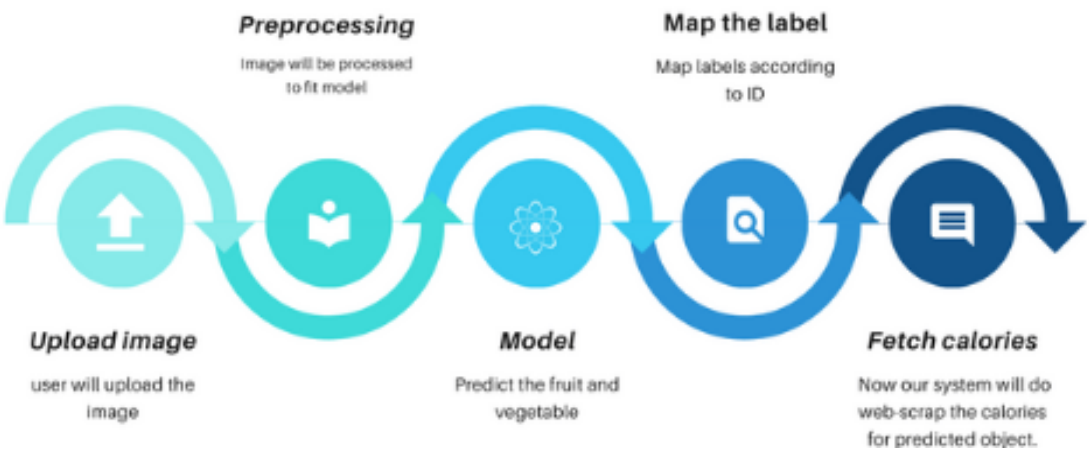
Architecture:-

We are using the MobilenetV2 architecture. MobileNetV2 is a convolutional neural network architecture that seeks to perform well on mobile devices. It is based on an inverted residual structure where the residual connections are between the bottleneck layers. Mobilenet supports any input size greater than 32 x 32 In MobileNetV2, there are two types of blocks. One is a residual block with a stride of another one is a block with stride of 2 for downsizing. There are 3 layers for both types of blocks. This time, the first layer is 1×1 convolution with ReLU6. The second layer is the depth wise convolution. The third layer is another 1×1 convolution but without any non-linearity. It is claimed that if RELU is used again, the deep networks only have the power of a linear classifier on the non-zero volume part of the output domain.

Dataset:-

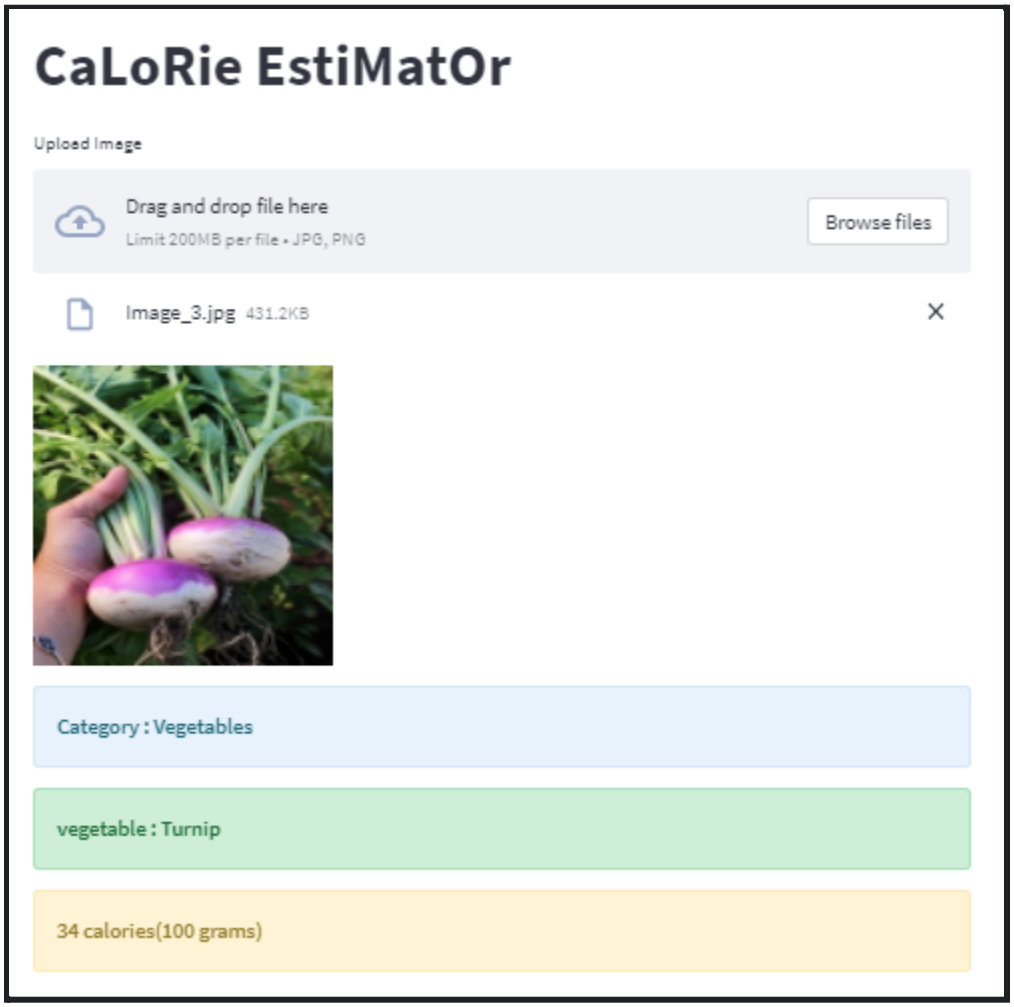
In this project we are using the “Fruit and Vegetable Image Recognition” dataset from kaggle. This dataset has 36 classes, and almost 100 images for each class so we can say we have 3600+ training images. We have 10 images for each category in Train/Validation .

Workflow:-



We have divided our modules so our task is going to be easy. Our frontend-backend will be handled by Streamlit. As a normal user, the user will visit our application by URL. There will be an upload button so users can upload the image. After uploading the Image our system will do the task automatically. User, will upload the Image. That image will be stored into the local system. Now the pillow will resize the image according to our model shape, it will convert into a vector. Now this vector will be passed to our model, our model will classify the class of category. We will get the ID of the category, now we need to map the labels according to the ID. Now our system will web-scrape the calories for predicted objects. Our application will display the Result and Calories into our application.

Demo screenshot:-



Conclusion

The overall prevalence of overweight and obesity is expected to increase considerably in India by 2040, with substantial increases particularly among rural residents and older Indians. Detailed predictions of excess weight are crucial in estimating future non-communicable disease burdens and their economic impact. The study shows that a large percentage of people in India are inactive with fewer than 10% engaging in recreational physical activity. Obesity, overweight and central obesity and sedentary behavior coexist with undernutrition, and have become a public health problem in all the five cities of India.

Project conclusion: With the advent of fitness devices & application & advancements in wearable devices, food recognition research is graining pace. The proposed system is an image

processing based food recognition system with high accuracy & repetitive performance. The model not only detects the image of food, also fetches the calorie (per 100gm) of that food. This will keep a track of one's calorie consumption.

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