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AI-Powered Fruit Nutrition Analyzer

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ABSTRACT: Fruit is one of the most crucial for a healthy life. Currently new dietary evaluation and nutrition examination tools allow more chance to help people to realize their routine diet. It is also used to make people to explore nutrition ideas and manage a healthy dietary. The process of defining the nutritional content of a fruit is known as the Nutritional analysis. It is a essential part of analytical chemistry that gives knowledge about the chemical constitution, processing, quality management and contamination of food. This project is used to identify the nutrients present and their corresponding ratio or quantity in the fruit is detected using Artificial Intelligence (AI). The main objective of this project is to develop a model which detects or classify the fruit based on the different characteristics present in the fruit like color, texture, shape, size etc. The end user can capture and upload the image of the fruit which will transported to the trained model. The model analyzes the image and discover the nutrition and their quantity based on the fruit like calories, fiber content, sugar, protein etc. This is used to study the human diet plan, lifestyle and helps to maintain a healthy diet. The identification of fruits and its nutrition contents plays a very important role in health-related fields and problems, so it has become more vital in our day-to-day life. The recognition of a fruit is undertaken by examining the characteristics like shape, size, color etc. In this paper, our approach has been presented to identify the image of the fruit and the nutrition contents in it using Convolutional Neural Network (CNN) based on the fruit image recognition algorithms. The vital goal of our research is to increase and enhance the accuracy of dietary evaluation by analyzing the images of the fruit uploaded by the end user. It requires a good hardware with stable internet connection to upload the image in the website or the application and analyze the nutrition contents in the fruit.

KEYWORDS: Artificial Intelligence, Convolutional Neural Networks (CNN), Deep learning, Nutrition assessment, Fruit image recognition, Fruit classification, Fruit detection, Fruit nutrition level.

I. INTRODUCTION

The main cause of obesity is a combination of overeating and lack of exercise. Therefore, the need for accurate nutrition balance is necessary. Preliminary research among young people suggests that new technologies may improve the accuracy of teen nutrition information. And as people become accustomed to a sedentary lifestyle, they become obsessed with their diet. People generally understand the link between food and health. In fact, there is a wide range of healthy eating information and guidelines available to users on their hands. However, such information alone did not prevent foodborne illness or help patients to eat healthy fruits.

When eaten in moderation, fruit can be a very healthy part of a nutritious diet. Fruits contain fiber, which can help lower your cholesterol and encourage regular bowel movements. Apples, pears, blackberries, and raspberries are examples of fruits high in dietary fiber. Oranges, red peppers, and strawberries are examples of fruits that contain lots of vitamin C. Bananas, guavas, cantaloupe, and mangos are examples of fruits higher in potassium. Potassium can help maintain a healthy blood pressure and regulate fluid balance in the body. Oranges and tropical fruits such as mangos are high in folate. This can help the body produce red blood cells. Folate also supports healthy fetal development. Black plums, prunes, and all berries are examples of fruits rich in antioxidants. Antioxidants limit the production of free radicals. They can protect your skin and fight off illness.

One of the healthy diets includes a fruitarian diet where fruits are the main part of consumption. Fruits are packed with fiber and powerful antioxidants that can help lower inflammation in the body and reduce the risk of cancer, digestive diseases and heart disease. The fiber in fruits can provide nourishment for good bacteria in the gut and potentially help boost the immune system, as much of our immune system is located in our gut. The process of tracking the fruit nutrition level that is being consumed can be very tedious as it requires the user to keep a fruit intake pattern and perform calculations to estimate the nutrition level consumed in all fruits. With this study we try to classify images of

fruit according to their categories. The proposed software model uses deep learning as a basis for recognizing a fruit image uploaded as a user input, processing the image, viewing it, and measuring nutrition level from the predicted image. People are recording, uploading, and sharing food photos voluntarily more than ever on websites like Instagram, Facebook etc. Therefore, it is very easy to find additional data (photos) related to fruit. Therefore, to support users in fruit consumption management and to reduce the need for a manual paper method.

II. OBJECTIVE

The aim of this project is to consistently detect the fruit and their nutrition content using an Artificial Intelligence and deep learning based on algorithm which can detect fruits items and all nutrition quantity from image or picture uploaded in the forum by the end user.

- The main objective of this project is to empower the user by a convenient, intelligent and accurate system that helps them become sensible about their nutrition intake.
- We employed a rather unique combination of region-based segmentation and deep learning neural networks as a means of accurately classifying and recognizing fruits and estimate the nutrition level.
- We employed a rather unique combination of region-based segmentation and deep learning neural networks as a means of accurately classifying and recognizing fruits and estimate the nutrition level.
- The combination of those two methods provides a powerful instrument to attain a better accuracy of food nutrition level intake tracking in our system.

III. RELATED WORK

The existing framework uses the Deep Convolutional Neural Network (DCNN) based on the development of ResNet 50. Due to the limited calculation training tools for each model, the ResNet model is simulated and pre- trained weights are imported. This section introduces a proposed food monitoring system based on ResNet50 which is one of the winning networks in the ImageNet machine learning competition. The reason why the ResNet50 Architecture is chosen over other buildings is because of the small parameter size. This makes model loading and weights and model training much faster. Solution includes pre-processing, training and classification. The training includes the extraction and weight learning features performed by CNN's SoftMax layer. Separation is also done on CNN. In the present system only find foods that you cannot measure the level of nutritious food.

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IV. OVERVIEW OF PROPOSED SYSTEM

In this project, we build a model which is used to classify the fruit depending on the different characteristics. Here the user can capture the images of different fruits and then the image will be sent to the trained model. It is a deep learning-based system to satisfy the need to measure daily nutrition intake value. The value of nutrition intake is recorded. Hence, we proposed a measurement method to estimate the amount of nutrition from different fruit images.

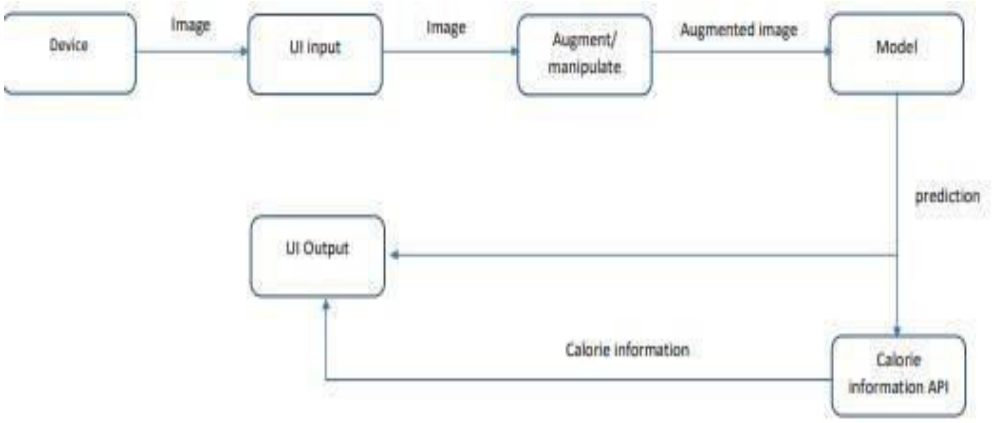

Fig 1

A. Input Acquisition Module

The camera will capture the photo and the multiple frames can be converted into a single frame image and sent to the next block for further processing.

B. Image Preprocessing And Segmentation

The Segmentation process will take place and the input image will be segmented for the purpose of detection which is necessary to identify the region of interest in the image. This module will convert the processed and segmented images by performing a region-based segmentation process. It uses key factors in the image like hue saturation value, descriptor points in order to analyze the complete content of the image.

Fig. 2. Fruit image segmentation: (top) original fruit images, (bottom) segmented using GrabCut.

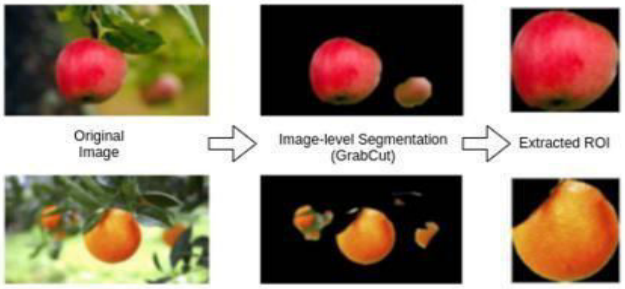

Fig. 3. Extracting region of interest from GrabCut output.

Fig 2

C. Feature Extraction

In this feature extraction module, the features like color, size and shape can be extracted from the input food image.

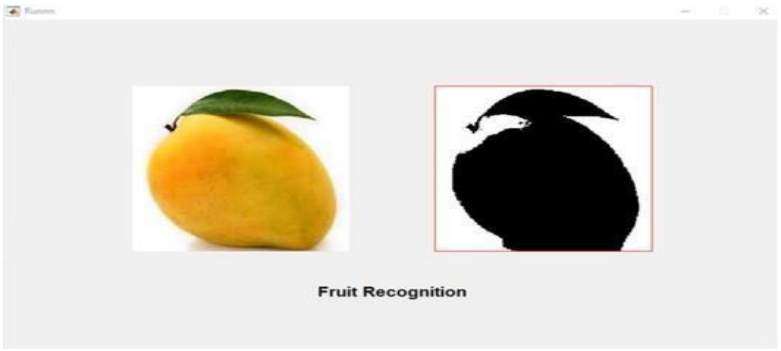

Fig 3

D. Dataset Training

The CNN model will be trained with a fruit dataset. In the fruit dataset we will have five classes of fruit like apple, orange, banana, watermelon, pineapple.

E. Nutrition Level Estimation

In rapid API we use one of the API called Calorie Ninjas to predict the nutrition level in fruit.

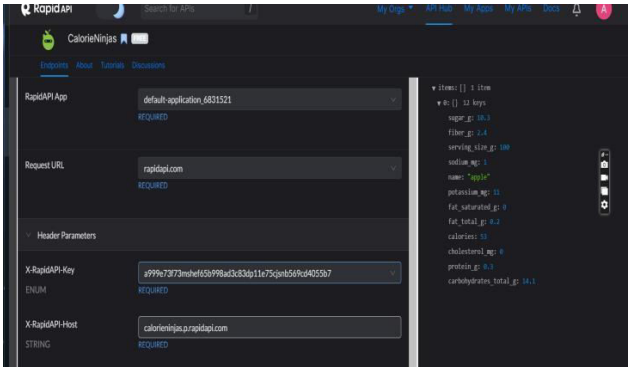

Fig 4

V. CONVOLUTION NEURAL NETWORK

A convolutional neural network (CNN) is a subset of machine learning. It is one of the various types of artificial neural networks which are used for different applications and data types. It is a kind of network architecture for deep learning algorithms and is specifically used for image recognition, object detection, segmentation and tasks that involve the processing of pixel data. These algorithms are currently the best algorithms we have for the automated processing of images.Images contain data of RGB combination. Matplotlib can be used to import an image into memory from a file. The computer doesn't see an image, all it sees is an array of numbers. Color images are stored in 3-dimensional arrays. The first two dimensions correspond to the height and width of the image (the number of pixels). The last dimension corresponds to the red, green, and blue colors present in each pixel. There are three types of layers in Convolutional Neural Networks:

1. Convolutional Layer: In a typical neural network, each input neuron is connected to the next hidden layer. In CNN, only a small region of the input layer neurons connects to the neuron hidden layer.
2. Pooling Layer: The pooling layer is used to reduce the dimensionality of the feature map. There will be multiple activation & pooling layers inside the hidden layer of the CNN.
3. Fully-Connected layer: This layer forms the last few layers in the network. The input to the fully connected layer is the output from the final Pooling or Convolutional Layer, which is flattened and then fed into the fully connected layer.

A. Pooling

The CNN model will be trained with some fruit images like apple, banana, pineapple, watermelon, orange. The dataset will be preprocessed and it will be splitted according to various fruit categories and the model will be trained. For validation there will be separate testing dataset images. When the testing image is sent by the user it goes to the convolutional layer where images will be converted to binary image by extracting features with a help filter that is present in the kernel and are saved in a single neuron. In max pooling it selects the maximum element from the region of the feature map covered by the filter. Thus, the output after max-pooling layer would be a feature map containing the most prominent features of the previous feature map.

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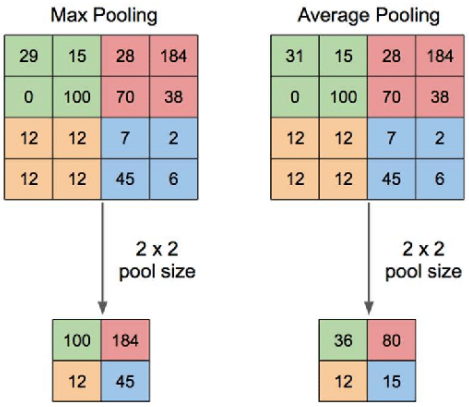

Fig.5 a Fig. 5 b

B. Dropout

The Dropout layer is a mask that nullifies the contribution of some neurons towards the next layer and leaves unmodified all other neuron. We can apply a dropout layer to the input vector, in which case it nullifies some of its features; but we can also apply it to a hidden layer, in which case it nullifies some hidden neurons.

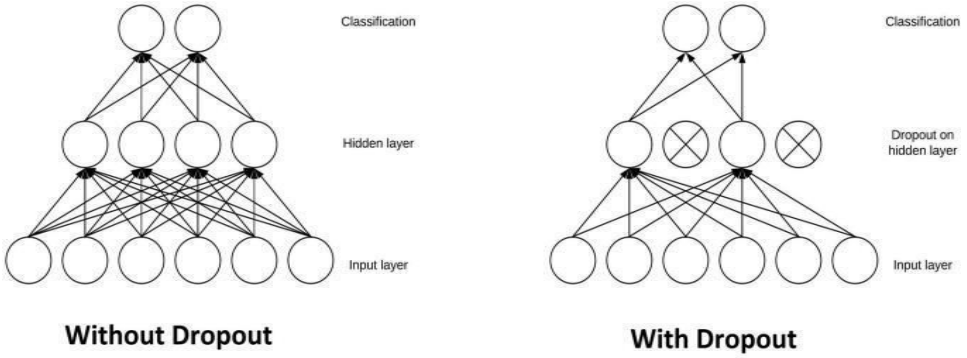

Fig. 6

Dropout layers are important in training CNNs because they prevent overfitting on the training data. If they aren't present, the first batch of training samples influences the learning in a disproportionately high manner. This, in turn, would prevent the learning of features that appear only in later samples or batches.

C. Flattening

Flattening is used to convert all the resultant 2- Dimensional arrays from pooled feature maps into a single long continuous linear vector. The flattened matrix is fed as input to the fully connected layer to classify the image. Connected Layers form the last few layers in the network. The input to the connected layer is the output from the final Pooling or Convolutional Layer, which is flattened and then fed into the fully connected layer.

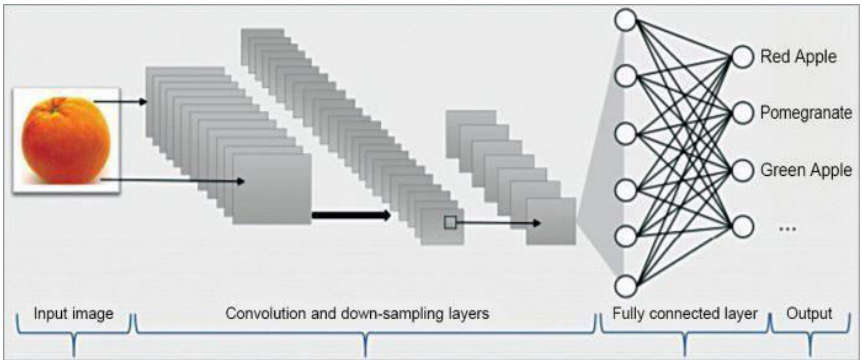

Fig. 7

Further the image will be classified to their fruit category based upon which nutrition level for fruit will be estimated.

VI. TECHNOLOGY USED

In this project we are used the following technology:

1. TensorFlow: It is an end-to-end open-source platform for machine learning. It has a comprehensive, flexible ecosystem of tools, libraries, and community resources that lets researchers push the state-of-the-art in ML, and gives developers the ability to easily build and deploy ML-powered applications.
2. Anaconda Navigator: Anaconda Navigator is a desktop graphical user interface included in Anaconda that allows you to launch applications and easily manage conda packages, environments and channels without the need to use command line commands.
3. Python IDE: An IDE (or Integrated Development Environment) is a program dedicated to software development. As the name implies, IDEs integrate several tools specifically designed for software development. These tools usually include: An editor designed to handle code (with, for example, syntax highlighting and autocompletion) and Build, execution, and debugging tools.
4. Spyder: Spyder is a free and open-source scientific environment written in Python, for Python, and designed by and for scientists, engineers and data analysts. It features a unique combination of the advanced editing, analysis, debugging, and profiling functionality of a comprehensive development tool with the data exploration, interactive execution, deep inspection, and beautiful visualization capabilities of a scientific package.

VII. RESULTING APPLICATION

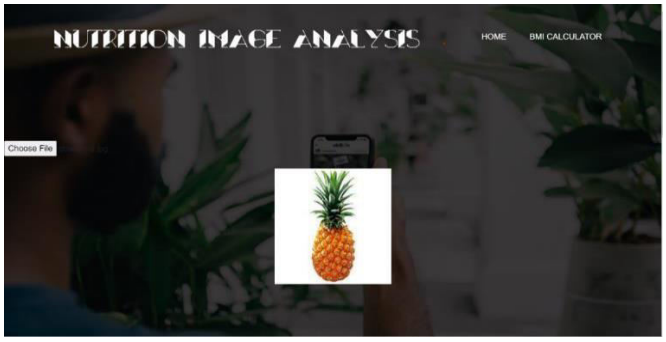

Fig 8.1

In this paper, Fig 8.1 if the page where the end user has uploaded a fruit image in the corresponding location to detect the nutrients present in it. Here the user has uploaded the image a pineapple to detect the contents and the quantity of each nutrient present in it. The image is scanned and check with the model to produce accurate result.

Fig 8.2

Fig 8.2 gives all the nutrition present in the pineapple and their quantity in the form of visualization so that it can be easily understand by the end user.

VIII. CONCLUSION

The convolution-based model is trained over a large number of fruit images, which enhances your model's ability to detect the required features quickly. In the analysis of the results, the accuracy of the training database of the obtained images is about 87%. We can create a large database that combines different fruit images to get the best result. The need to have a daily diet plan for the people who follow the fruitarian diet is important because of insufficient knowledge in taking the proper amount of fruit according to nutritional needs to maintain a healthy diet. Therefore, we have proposed a method of estimating the number of calories, proteins, fiber etc., from different fruit images by measuring factors such as the color, size, shape.

REFERENCES

1. Rajayogi, J.R., Manjunath, G. and Shobha, G., 2019, December. Indian Food Image Classification with Transfer Learning. In 2019 4th International Conference on Computational Systems and Information Technology for Sustainable Solution (CSITSS) (Vol. 4, pp. 1-4). IEEE.
2. Reddy, V.H., Kumari, S., Muralidharan, V., Gigoo, K. and Thakare, B.S., 2019, May. Food Recognition and Calorie Measurement using Image Processing and Convolutional Neural Network. In
3. 2019 4th International Conference on Recent Trends on Electronics, Information, Communication & Technology (RTEICT) (pp. 109- 115). IEEE.
4. Subhi, M.A. and Ali, S.M., 2018, December. A deep convolutional neural network for food detection and recognition. In 2018 IEEE-EMBS conference on biomedical engineering and sciences (IECBES) (pp. 284-287). IEEE.
5. Burugapalli, V.C. and Patil, P.C., TRANSFER LEARNING: INCEPTION-V3 BASED CUSTOM CLASSIFICATION APPROACH FOR FOOD IMAGES.
6. Fruit Recognition and its Calorie Measurement: An Image Processing Approach Manpreet kaur Basant singh Sardar1, Dr. Sayyad D. Ajij2 (2016)

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