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Food Detection and Calorie Estimation using Deep Learning

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Abstract: ***For the fight against obesity, precise food and energy intake measurement techniques are essential. One of the most important lessons for long-term prevention and effective treatment programmes is the provision of users and patients with practical and intelligent solutions that assist them in measuring their food intake and gathering dietary information. In this article, we suggest a calorie measurement technique to assist patients and medical professionals in their battle against diet-related illnesses. In this document, we suggest a food identification system that, when given the appropriate quantity of data, can assist a user in keeping track of daily caloric consumption. Calorie estimation for the current method must be done by hand. The proposed model will use a deep learning algorithm to offer a special method of calculating calories. In the world of medicine, calorie calculations for food are crucial. because the calories in this food are beneficial to your health. This measurement is derived from photographs of various foods, including fruits and vegetables. Our suggested solution relies on cell phones, which enable the user to take a picture of the food and instantly calculate the number of calories consumed. We classify food photos for system training using deep convolutional neural networks to reliably identify the food in the system. In this study, we use a convolutional neural network (CNN) to detect and identify images of food. Given the huge range of food types, picture recognition of food products is frequently very difficult. Whatever the case, deep learning has recently been shown to be an incredibly innovative image identification approach, and CNN is the greatest way to use deep learning.***
Keywords: deep learning algorithm, Calorie estimation, convolutional neural network (CNN), food identification.

I. INTRODUCTION

The secret to a healthy human body is food. Weight is a disease that indicates a high ratio of muscle to fat. If your BMI is greater than 30, you are likely obese. Different factors might contribute to weight gain. Burning off lots of calories is one of these causes. The idea of consuming too many calories suggests that you are taking in more calories than you are using. The body stores the excess calories as a ratio of muscle to fat. People need to keep an eye on their caloric intake in order to become in shape or maintain a healthy weight. Nevertheless, this engagement can be frustrating and draining. People frequently don't watch their food intake because they generally avoid difficult and exhausting pursuits, which can lead to stoutness. Among these investigations, the volume, object position computation, and calorie evaluation approach are the two primary variables of the precision modification. People need to keep an eye on their caloric intake in order to become in shape or maintain a healthy weight. This inquiry was conducted in order to simplify the following. People will truly want to know how many calories are in the food they are consuming, not just the meal's appearance in photographs. In this inquiry, we identify the food, describe it, and estimate its volume. Finally, based on the volume that the models have predicted, we determine the food's calorie content. However, we discovered that calculating the calories directly produced considerably more accurate results. However, most of the time people have trouble estimating and measuring the amount of food they eat. Thanks to developments in deep learning and convolutional networks over the past three years, it is now much easier to classify and detect objects. In this study, we analyse each network design and utilise a deep learning-based picture recognition method to increase the accuracy of nutritional assessment.

II. LITERATURE SURVEY

On smartphones, it is possible to automatically estimate the calories in food photographs, but there is a drawback to this is less precise for a variety of foods. An image-based calorie estimation system that can identify multiple foods is offered as a solution to this problem. It has the advantage of being able to recognise multiple images, but it is always dependent on a device that supports stereo mode. Then a novel model is presented that creates a map of the food's energy distribution to estimate the size of each food portion for the entire input image. Additionally, it processes images more quickly. nonetheless, just one food portion estimation is carried out simultaneously. A novel framework for automatic food analysis using images is capable of handling several jobs.

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This increased food calorie estimation accuracy, but the process was still challenging. So, in order to obtain high accuracy in this model, machine learning techniques are being used. The classification will determine how the results are displayed. Keiji Yanai and Koichi Okamoto [1] Department of Informatics, University of Electro-Communications, Tokyo, Japan, "An Automatic Calorie Estimation System of Food Images on a Smartphone" a smartphone application that estimates calories from images without the use of outside servers for recognition. [2] An integrated system for food image analysis He Jiangpeng Runyu Mao, Zeman Shao, Janine L. Wright, Deborah A. Kerr, Carol J. Boushey, and Fengqing Zhu all contributed to this article. Frameworks for end-to-end or multi-task processing (such recognition and portion estimate) are available for automated image-based food analysis. [3] Real Food Size Estimation from Images for Accurate Calorie Calculation (2019) a tool for estimating calories from images that can identify various foods.

III. AIM, OBJECTIVES AND PROPOSED SYSTEM

A. Aim

To display or alert the user to their daily calorie intake

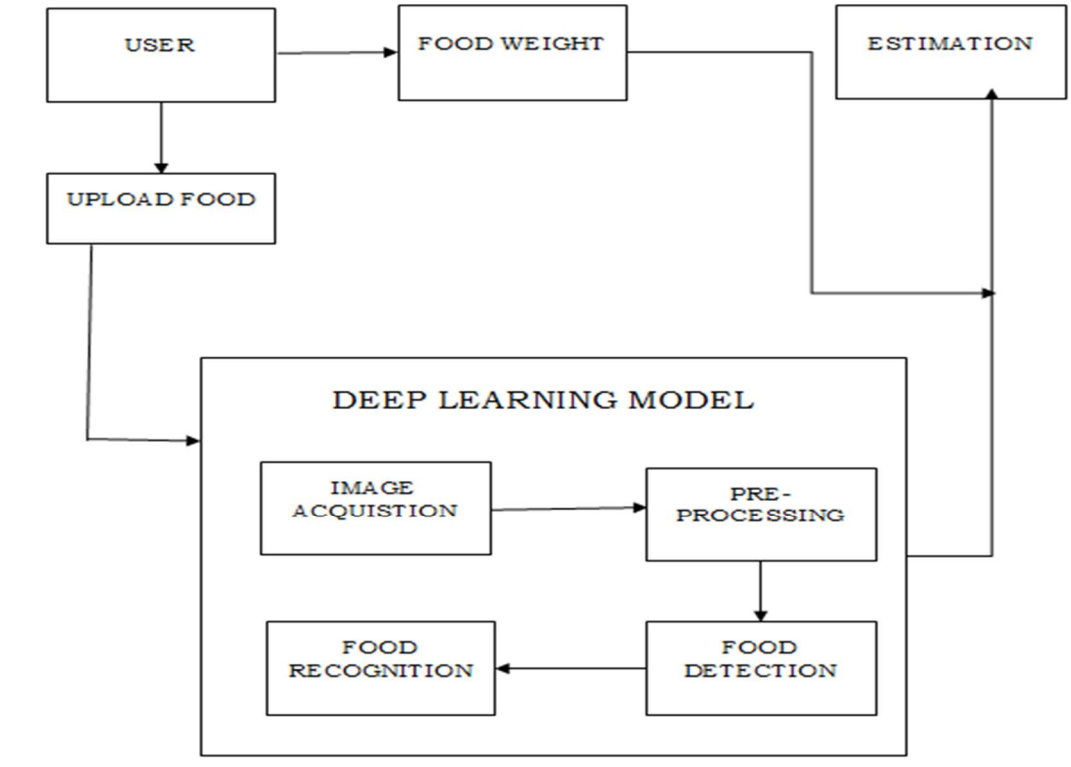
B. Objectives

1) To detect the type of food.
2) To estimate the calories of food.
3) To notify the user on whether the food consumed is as prescribed or not.

C. Proposed System

Food recognition is an existing idea that can detect and recognise food items based on the input image. Our model is trained on 101 categories of food items. Further, the idea is to estimate the calorie content of the food item that is being recognised. The convolutional neural network (CNN) is used to recognise the food item. To further estimate the calories, we have given the standard calorie value for one gramme 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.

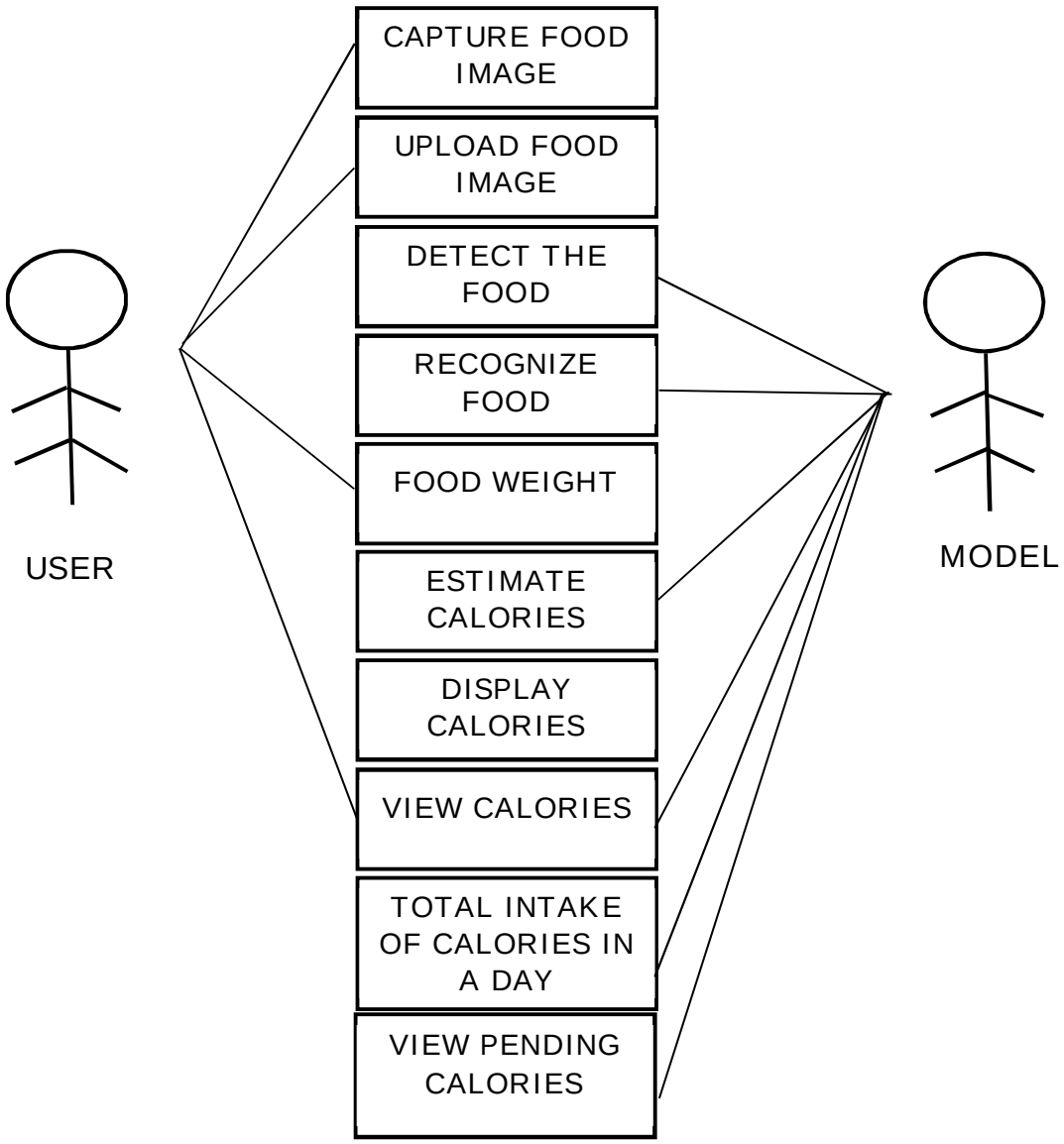
IV. ARCHITECTURE DIAGRAM



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V. USE-CASE DIAGRAM



VI. SOFTWARE DESCRIPTION

A. MIT App Inventor

MIT App Inventor is an intuitive, visual programming environment that allows everyone even children to build fully functional apps for smart phones and tablets. The MIT App Inventor project seeks to democratize software development by empowering all people, especially young people, to move from technology consumption to technology creation.

B. Python

Python is a popular programming language, and it is one of the most used programming languages today. Python works on all the main platforms and operating systems used today, such Windows, macOS, and Linux. Python is a multi-purpose programming language, which can be used for simulation, creating web pages, communicate with database systems, etc.

C. TensorFlow library

TensorFlow is a free and open-source software library for machine learning and artificial intelligence. It can be used across a range of tasks but has a particular focus on training and inference of deep neural networks.

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D. OpenCV library

OpenCV is the huge open-source library for the computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even handwriting of a human. When it integrated with various libraries, such as NumPy, python is capable of processing the OpenCV array structure for analysis. To Identify image pattern and its various features we use vector space and perform mathematical operations on these features.

VII. RESULTS

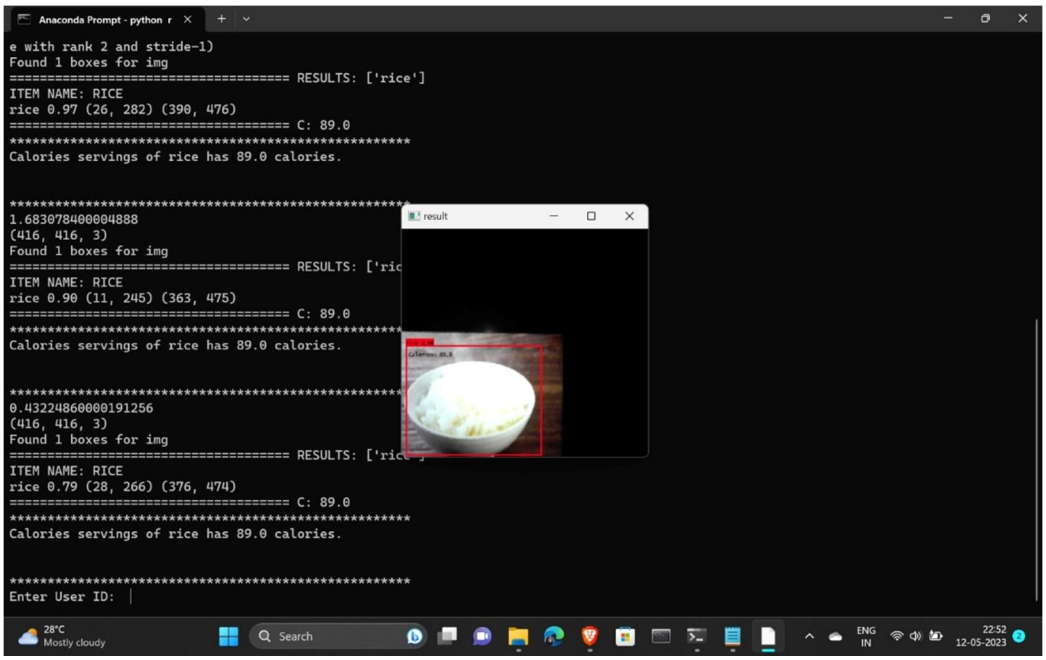


Fig. 1 output when rice item is detected

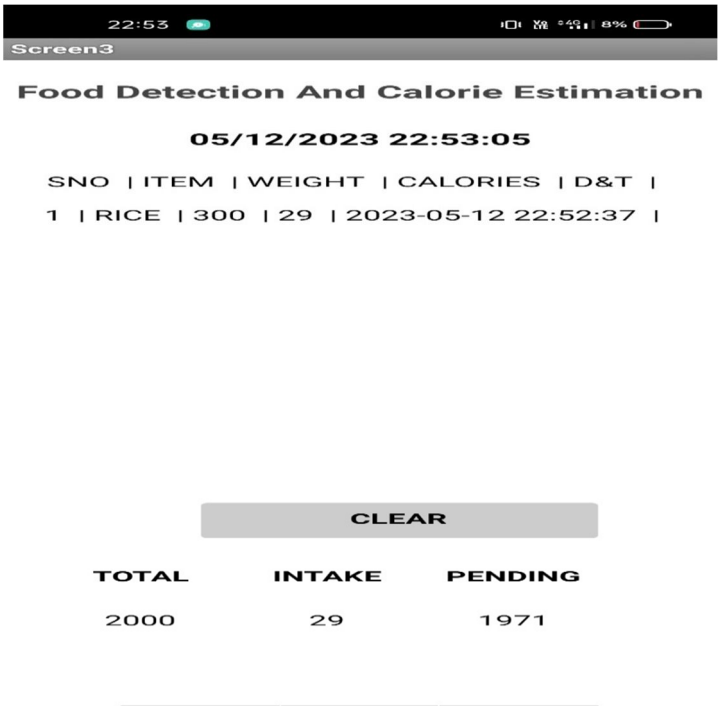


Fig. 2 output when rice item is updated in app

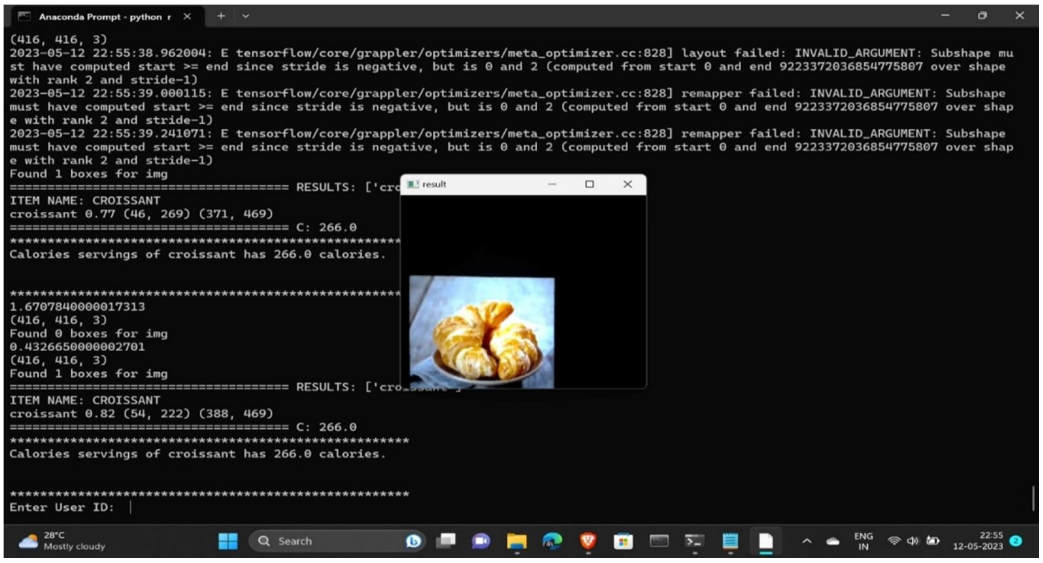


Fig. 3 output when croissant item is detected

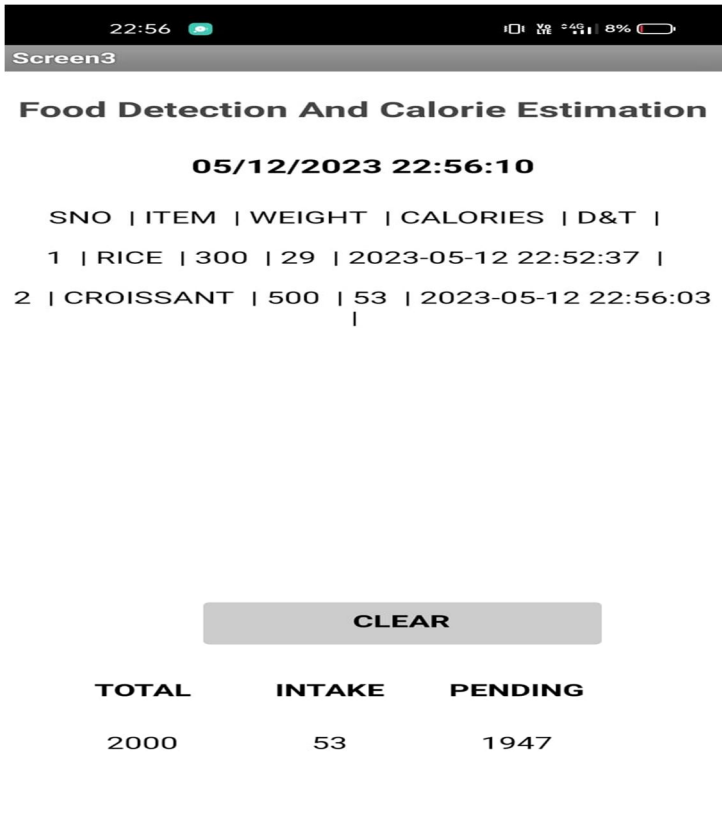


Fig. 4 output when croissant item is updated in app

VIII. CONCLUSION

In this study, we have looked at how well CNNs can recognise and recognise food images. First, using pictures supplied by numerous authentic individuals, we created a dataset of food photographs. Second, we used CNN to identify 10 different foods and assessed its performance. We discovered that CNN outperformed conventional techniques that used handmade characteristics significantly. Third, we established that color features are necessary for food image recognition by observing trained convolution kernels. Fourth, we used CNN to detect food and discovered that it performed noticeably better than a baseline approach.

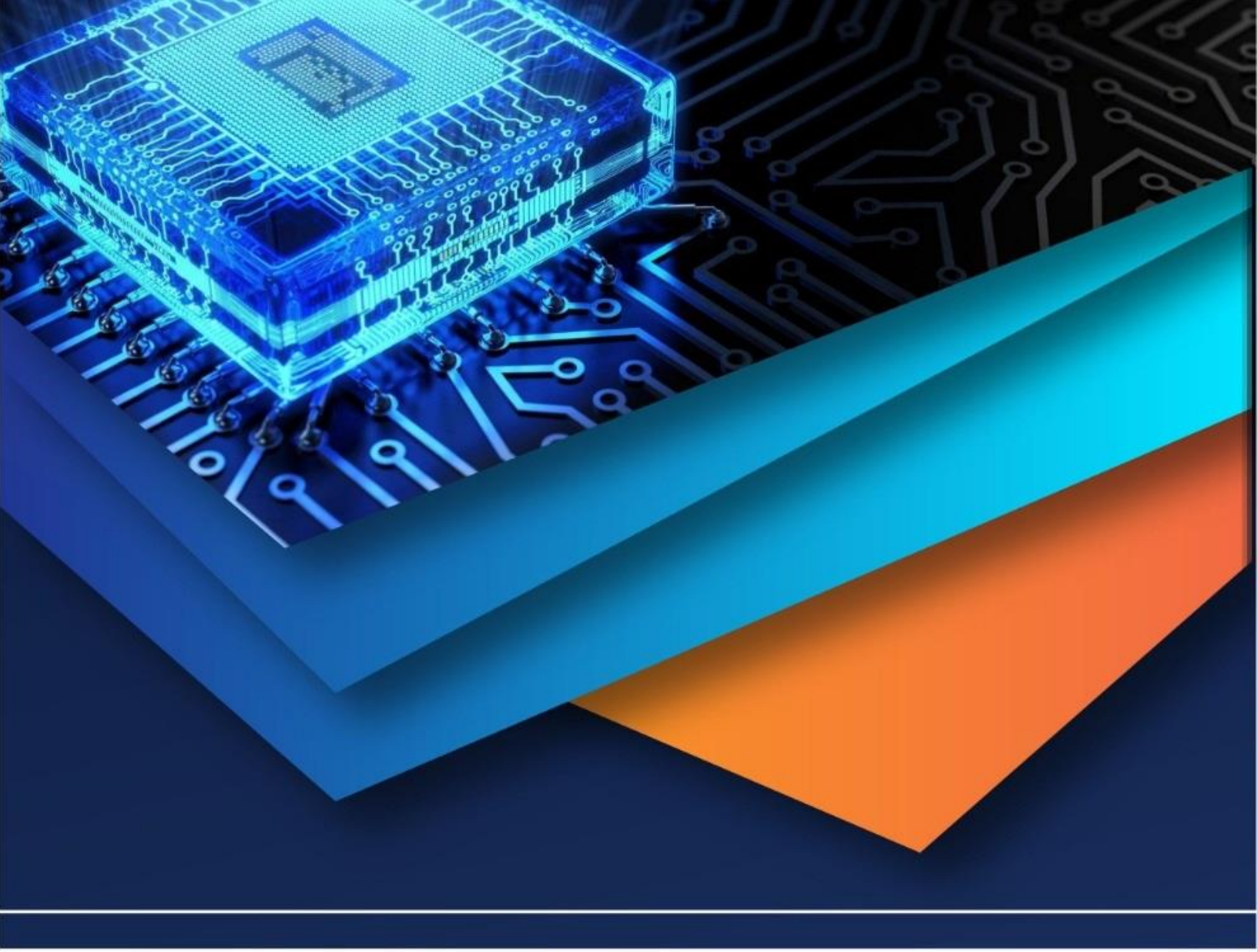
IX. FUTURE SCOPE

The project can be worked on in one specific area. It involves estimating calories. I was only able to complete a food item detection model in the allotted time. Given all of its facets, a calorie estimation model would require more time. In addition, this application is not a non-volatile user food tracking system, thus one may work on making it one.

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