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Diet Food Recipe Recommendation by Ingredients using Image Processing and Object Detection

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Diet Food Recipe Recommendation by Ingredients using Image Processing and Object Detection

Sindhuja

Abstract

The fact that food supplies us with all the nutrients we need to maintain a healthy lifestyle makes it an indispensable component of our day-to-day existence. Obesity has only lately been recognized as a major problem in terms of public health. Because of this, it is imperative that everyone monitor their dietary intake of nutrients in order to keep up a healthy diet. You can find a web application that helps users of this web app find recipes by photographing their ingredients and uploading them to the app in this paper. This application helps users use emerging technologies in a better way for living a fit and healthy lifestyle, and this paper describes how you can find it. And the diet recipe will be derived from the processed versions of these photographs. People in paid employment will benefit from the paradigm that was offered. The user will be presented with the diet formula of a food item based on the image taken of that food item, as the globe continues to develop current technology such as mobile phones. Deep learning, food recognition, and diet recipes are some of the keywords that might be used here.

1 Introduction

Tracking one's diet must be one of the fundamental practices one engages in if one is serious about leading a healthy lifestyle today. As the capabilities of machines continue to increase, Artificial intelligence may help us with a variety of things, including managing our health and diet in a lot more straightforward manner. These are just two of these areas. Because of this, artificial intelligence (AI) and food are significant aspects of our everyday life. Maintaining a healthy diet while going about daily life.The consumption of unhealthy foods is the key contributor to this alarmingly high obesity rate. Because of their packed schedules and overwhelming amounts of work, people are not paying enough attention to their health and fitness. The most widespread and important health problem facing today's age is a lack of physical activity. [The Influence of One's Body Image] What we consume on a regular basis. Every day, you will consume proteins, lipids, carbohydrates, and vitamins; nonetheless, it is essential to consume a diet that is properly balanced. As a direct consequence of maintaining this as the major emphasis, I have developed a device that can carry out correct identification. Food that is precisely segmented into different nutrient values gives the consumer the ability to draw from a variety of different sources

of sustenance. [personalized] When developing our recipe recommendation system, I concentrated primarily on the relationships between ingredients, recipes, and users. This is because we consider these to be the most important aspects of a recipe to consider when making suggestions regarding which recipes are both nutritious and appetizing. Additionally, I have settled on maintaining a separate modeling career. Modeling the deliciousness of a recipe allows one to derive its nutritional value. In comparison to rating data, nutritional statistics are typically less open to interpretation and more straightforward to rationalize. In conclusion, I have concluded that it is more important for our models to be easily understood as well as flexible, rather than exhaustive because we feel that in the long run, anyone will be able to utilize them in the future. This proposal will serve the purpose of justifying the research question that will be asked, which is as follows: How well do deep learning algorithms recognize food, and how well can diet food recipes be recommended by analyzing ingredients using image processing and object recognition to meet the needs of people suffering from obesity and other health issues? The purpose of this research project is to make use of a collection of deep learning techniques to correctly identify the components and provide the user with the recipe. In this research I have used two datasets, the one which is Fruit and Vegetable Images for Object Recognition and another one is Recipes from Epicurious by rating, nutritional content, and categories, both datasets are available in Kaggle. A dataset consisting of 13,500 photographs will be used to train the models. I needed some photographs for a project that I was working on, so I scraped them from Bing Image Search. This dataset contains those images. These images will first be segmented, then their characteristics will be retrieved, and finally, the images will be categorized into several categories. This research makes comparisons between MobileNetV2, VGG19, DenseNet201, ResNet152V2, and InceptionResNetV2 in order to determine which model of deep learning is the most effective. A model was chosen for the deep learning framework after considering factors including accuracy, loss, latency, and size. Using conventional methods of classification, one can successfully complete the tasks of feature segmentation, classification, and extraction. The technique of segmentation is necessary for figuring out the different image regions and localizing the items that are contained inside those regions. The following is the order in which the information from the research is presented: The following section II will focus on earlier research projects that are relevant to this proposal, the following section III will consist of the methodologies and architectures required for this research, the following section IV will consist of Design specifications for the data and the plan for managing the project, and the following section V will have the Implementation of the research, VI will consist Evaluation of the project and VII conclusion and future work

2 Related Work

This section is a compilation of the older efforts that have lately been recommended and put into effect that are considered to be the most important and impactful. The experimental efforts of the researcher have been subjected to a thorough evaluation, and their methods, findings, and conclusions have all been discussed. It ought to be ensured that this report puts up an original and imaginative strategy that will be beneficial to the neighborhood. This research's

drawbacks, pitfalls, and strengths have all been subjected to in-depth analysis and consideration. The new method will be analysed, and its application will be carried out in a way that keeps the most important aspects of the prior investigations and also analyses the limitations of the existing body of study.

2.1 Machine learning algorithms and modules

Recipes for foods, such as those with a Vietnamese flavour profile, were recommended in this research and were proposed in (Banerjee Mondal, 2021). In order to do picture identification, they have relied on some of the more conventional machine learning techniques, such as HOG (Histogram of Gradient) and SIFT. (Scale Invariant Feature Transform). In addition to that, they have implemented deep learning models as part of the process of feature extraction (Tran et al. 2021). Deep learning models such as VGG16, lMobile Net, ANN, Resnet18, Resnet50, Densenet121. They employed logistic regression and softmax in order to accomplish the classification of the extracted feature.

The DASH diet recommender system was proposed by researchers and it is intended to provide hypertension patients with dietary advice that is focused on providing them with healthy nutrition. The machine learning techniques that were utilized in the development of this system include the data filtering tool known as the Estimation module, as well as the Food Classifier model and the Content-based filtering Module (Sookrah et al. 2019). Patients with hypertension aren't the only ones who can benefit from the advised diet regimens. This is also helpful for users with more ordinary needs. In the not-too-distant future, this diet plan system will be utilized to locate and analyze the user's diet tracking, and it will be able to be watched. In this research, the authors implemented both machine learning and deep learning algorithms such as logistic regression, naive Bayes, Recurrent Neural Network (RNN), Multilayer Perceptron (MLP), Gated Recurrent Units (GRU), and Long Short-Term Memory.

The solution proposed for patients who are suffering from diseases based on the required nutrients includes calories, fiber, protein, fat, and sodium (LSTM). The medical dataset has 1000 items, 30 patient records, and 13 different attributes. It was compiled using information obtained from hospitals and the internet. We were able to get an accuracy rate of 97.74 percent by employing a deep learning model based on LSTM (Iwendi et al. 2020). In a similar vein, precision levels of 98 percent, recall levels of 99 percent, and F1-measure levels of 99 percent are attained for permitted classes, but precision levels of 89 percent, memory levels of 73 percent, and F1-measure levels of 80 percent are attained for prohibited types. The primary emphasis of this study by its four authors was on the application of machine learning methods to the analysis of recommendation systems including Random Forest XG Boost (Khan et al. 2019). SVM was utilized in order to make projections regarding comparable food goods and vouch for them in the eyes of the customer (Khan, Deshpande and Tripathy, 2019). The proposed approach for determining the nutritional content of foods is a straightforward one. Within the framework of the diet advice system, the five academics that contributed to this publication recommended two categories. The first is to help both vegetarians and non-vegetarians locate the foods they are looking for. They have developed the performance for the very accurate

classifiers by using food classification and machine learning techniques (Shah et al. 2022).

2.2 Transfer learning, RCNN, and graph cluster are the three types of algorithms.

the researchers built a model for classifying food components and developed an algorithm to suggest recipes based on the components. They employed a special dataset with 9856 images sorted into 32 different categories of food items for the outcome. Convolution neural network (CNN) modelling was used to identify food items, and machine learning was used to provide recipe suggestions. Our accuracy rate was 94 percent, which is respectable. Since certain ingredients weren't available on any websites, they developed their own data. The new necessary dataset, which has a total image of 9856 of 32 different elements, was also created by combining three datasets (food101, fruit 360, and UECFOOD256). With 94 percent accuracy, they were able to do the test. Therefore, it is obvious that using images to identify food ingredients is advanced. Additionally, the system used ResNet50, VGG16, and MobileNetV2 as a basic model to train the CNN model. ResNet50 had demonstrated a greater performance than all of these (Rokon et al. 2022). They developed a special algorithm for recommending meals based on the detection of ingredients, and they chose 19 cooking recipes out of 32 food ingredients. In their investigation, they discovered two issues. One is a problem with the contrast between the images, while the other is a problem with the imbalance of classes. The CNN model can identify one food constituent at a time, they say. It is unable to discriminate between several dietary components from a given sight.

To outperform the prior model, the researchers developed a novel hybrid model for meal suggestions. The model used in this study involves two phases, including a suggestion phase based on dietary content as well as user-based advice (Rostami et al. 2022). In the first phase, they used graph clusters, and in the second phase, they combined user recommendations and food items using a deep-learning model.

the researchers have analysed the diet plan system and food identification using photographs of daily meals captured by smartphones. Using the deep method convolutional neural network (CNN) for object classification, food images were found (Jiang et al. 2020). The researchers employed the R-CNN model's Region Proposal Network to map the location using two well-known data sets: UEC-FOOD100 and UEC-FOOD256. The outcome of this system so demonstrates that it would be simple for them to locate food products to develop a new diet plan for the customer.

2.3 The algorithms known as CNN, LSTM, and deep learning

This research presents food recognition using a Convolutional Neural Network, and the authors tested their algorithm with the following three networks: Siamese, a straightforward categorization network Triplet Network, in addition to the Network. To learn picture similarity models is the purpose of this network.

In these tests, they utilized the dataset known as UEC-FOOD256, which has 256 different food categories and 100 photos for each category (Shimoda Yanai 2017). Because of this, the triplet network performed exceptionally well in comparison to other types of networks in the tests that were conducted. During the time of the COVID pandemic, when people desperately needed nutritious food to help them fight off the virus, this research was carried out. Using the deep learning model, it is not simple to identify healthy food options in large supermarkets; nevertheless, it is simple to categorize and forecast healthy food options (Banerjee Mondal 2021). The creation of healthy versions of common foods is the primary focus of this piece of writing. researchers have utilized a framework that tends to learn from the ingredient dictionary to give ingredient semantic graphs for ingredient relationship modeling here. This was done in order to better understand how ingredients interact with one another. The researchers used three different datasets and used a convolutional graph network to combine the data in order to improve the results and demonstrate their superiority (Wang et al. 2022). On three widely used benchmark datasets—ETH Food-101, Vireo Food-172, and ISIA Food-200—our method's applicability was put through a series of stringent tests to ensure its effectiveness.

In this research, the authors implemented both machine learning and deep learning algorithms such as logistic regression, naive Bayes, Recurrent Neural Network (RNN), Multilayer Perceptron (MLP), Gated Recurrent Units (GRU), and Long Short-Term Memory. Additionally, the authors proposed a solution for patients who are suffering from diseases based on the required nutrients such as calories, fiber, protein, fat, and sodium (LSTM). The medical dataset has 1000 items, 30 patient records, and 13 different attributes. It was compiled using information obtained from hospitals and the internet. We were able to get an accuracy rate of 97.74 percent by employing a deep learning model based on LSTM (Sundarramurthi et al. 2020). In a similar vein, precision levels of 98 percent, recall levels of 99 percent, and F1-measure levels of 99 percent are attained for permitted classes, but precision levels of 89 percent, memory levels of 73 percent, and F1-measure levels of 80 percent are attained for prohibited types.

This idea describes an automated approach for recording diet information. This makes use of deep learning techniques to boost the degree to which diet recording is automated. They have made use of certain data sets, including UEC FOOD 100, UEC FOOD 256, Food-101, and Chinese.Food Net datasets (Hu et al. 2018). In addition, this study adds two new points. First, various deep learning models are trained and evaluated by combining many well-known convolution neural network models with datasets of well-known food photos. It achieved a precision of 84.0. Employing deep learning models, the authors of this research 14 conducted an experiment using data pertaining to Indian food to process the cooking steps of an image recipe. In addition to CNN and LSTM, Bi-LSTM with directional input. The data came from many websites around the internet. The model that was proposed has the potential to be very useful for information retrieval systems and has the potential to be used successfully in automatic recipe recommendations (Kumari Singh 2019). The most challenging aspects of this project are the variable length of the instructions, the increasing amount of instructions found in each recipe, and the presence of multiple foods in a single image. They have also included contextual information in this paper

in order to boost the classification precision of the model over identical ingredients and the concept of the food platter. This was done in order to do this. It is still need to conduct research on the efficiency of decoding as well as wider international recipe data sets.

An application for food photography has been developed by the researchers in this study. This application will assist users in determining the nutritional content of any food images that are submitted through the application and will also provide users with recommendations regarding their meals. (Tiankaew et al. 2018) The researchers have utilized native for the process of building the app's front end, and they have used python flask for the process of building the app's back end. In addition to this, they learned the dataset with the assistance of a deep convolutional neural network. The exact number of calories can now be determined thanks to the researchers' newly developed model, which was applied to the problem. A novel technique called deep CNN (Convolutional Neural Network) to improve their ability to recognize food photos. The researchers made use of the dataset, which is available in the open internet resources and contains information on Malaysian street cuisine (Subhi Ali 2018). In addition, the convolutional mask assists in identifying the color of the food being analyzed. In addition, over the course of this research, they made use of a robust neural network to carry out an analysis of the size and quantity of the food. With the assistance of deep learning techniques such as convolutional neural networks,

food quality offered to patients at the Canberra hospital could be recognized as a meal. This study focused on the nutrition field (CNN). They used the deep learning models VGG and Resnet to get a high recognition accuracy, and the fast-training procedure was carried out with the assistance of the SGD and Adam algorithms (Mao et al. 2020). According to the findings of the system, the proposal has an accurate and efficient recognition method for the offered meals and foods that come from the datasets that were employed. The researchers employed two different kinds of datasets to make predictions about diabetic patients' food preferences and diabetic patients' food preferences. This study was conducted by making use of ANN for the purpose of diabetic prediction and food recognition along with its respective nutritional values utilizing CNN and VGG16. It is also helpful to provide the overall number of calories contained in the items in the recipe (Brintha et al. 2022). To facilitate tracking of the purpose, this outcome will be published on the website. The study experiment can calculate body mass index (BMI), glucose level, diabetes risk, and age prediction based on the user's input value. It can also forecast the thickness of the skin based on the user's input value.

2.4 Extraction of features and Image categorization

The illustrations each depict a different food item along with the nutrients that it contains. Several procedures, including image conversion to grayscale, were used to evaluate the foods divide the image into sections, create an image's histogram, as well as performing feature extraction and picture categorization. An automated system, as well as an Android application, have been built in order to recognize different foods, present their respective calorie counts, and offer users suggestions for nutritious meals. Therefore, the purpose of this research is to ensure that users of this software can keep their privacy intact while tracking

their daily calorie totals utilizing the software. Consuming the foods recommended by this method will provide you with guidelines and recommendations, and it will make it easier to keep your body in good shape (Rewane Chouragade 2019). Identification of food items utilizing the most effective approaches and algorithms, which offer enhanced and better efficiency, includes multiple isolating the food component from the other members by using an image, identifying its attributes, and classifying it. the authors have utilized techniques such as Relief F and ARCIKELM (adaptive reduced class incremental kernel extreme learning machine) to extract features from the dataset to classify the data. To this study, a dataset pertaining to Pakistani food was utilized (Tahir Loo 2020). The researchers also stated that in the future, they plan to implement a new hybrid model to minimize the occurrence of catastrophic forgetting.

3 Research Methodology

As can be seen in Figure 1, the study approach is broken down into five distinct stages, which are data collection, data pre-processing, data transformation, data modeling and conversion, and evaluation and results.

In the first step of the process, titled ”Data Gathering,” two different datasets are combined [21], [20]

The next stage is called Data pre-processing. To provide a clean image collection, pre-processing entails re-classifying images, cropping images, removing text, and filtering backgrounds. We deleted from the images any extraneous material, such as persons or text labels, that they may have contained. The datasets need to be pre-processed for the deep learning algorithms to process the photos. The photographs will be subjected to four distinct categories of pre-processing techniques based on the pixel brightness modifications, gradient or sharpening filters, and vignetting effects that are applied to them.

Detectors of the images’ edge lines in the images. As part of the validation strategy, the dataset is segmented into train data and test data, with 70 percent of the data being grouped into the training data category and 30 percent of the data being classified into the test data category. It is essential to get rid of the photographs that can be assigned to no class, and it will be necessary to standardize the processes of shearing, scaling, flipping, segmenting, and zooming photographs. To carry out these procedures, Python is used for coding. After being pre-processed, the fruits and vegetable dataset comprised 13,500 ingredient photos. These photographs were then re-numbered, saved in the JPG format, and compressed into a file with the.zip extension.

The third phase is called ”Data Transformation,” and it entails adding more data to the dataset and resizing the images in the dataset. The dataset was previously divided into a training dataset and a test dataset. To get the dataset ready for model training, you must first go through the process of data augmentation, which entails reshaping and reconstructing the dataset. The fruits and vegetable dataset comprised three different types of folders, including). It has all types of fruits and vegetables. The Image Data Generator service on TensorFlow was utilized to perform data augmentation on the fruits and vegetable

dataset. These included activating shuffle = True and horizontal flip = True, setting rescale = 1./255, zoom range = 0.2, color mode = ”rgb” (3 - channels), batch size = 32, and having a random seed of 20. Depending on the model, the target size should be either (224, 224) or (299, 299) pixels. For training and validation purposes, the expanded fruits and vegetable dataset was divided into three parts. The train (100 images each) test (10 images each), and validation (10 images each).

The fourth step is called Data Modelling and Conversion, and it consists of model training, model conversion, and the deployment of both models and gamification. The models were trained using a partitioned version of the training dataset, and then they were validated using a separate dataset. To train the model, we imported five models that were already trained from TensorFlow's library. An image shape of was used throughout the training process for ResNet152V2, MobileNetV2, DenseNet201, and VGG19. (32, 224, 224, 3). Inception ResNetV2 [26] was taught to recognize images with the shape of (32, 299, 299, 3). To get the most out of the feature extraction and selection, transfer learning was used. In order to standardize the results produced by the neural network, the training models were given ten iterations, a categorical cross-entropy loss function, a ReLU activation function, and a SoftMax activation function respectively. The Adam optimizer was utilized to perfect the models. After the models were trained, they were exported from TensorFlow Lite into a format that is compatible with mobile devices. In order to generate a model with a smaller footprint while not sacrificing any of its functionality, the post-training quantization approach was utilized. Multiple inference tests were performed on a mobile device using the trained models.

Evaluation and Results is the fifth phase, in which the performance of each of the deep learning image classification models is evaluated using accuracy, loss, size, and latency respectively. Using power Bi, comparisons were made between the five models, and the results were shown. Following the completion of the experimentation, the most effective deep-learning classification model was chosen, and the food components were then included.

4 Design Specification

As can be seen in Figure 1, the design of the on-device deep learning framework integrates gamification components with a deep learning picture categorization model. As was covered in section 4.1, the components that make up the Database layer In the following section (4.2), the components of the Application layer and (4.3) the components of the presentation layer.
The suggested system's research architecture is broken down into three stages, which are referred to as the database layer, the application layer, and the presentation layer. In the system that is being presented, the presentation layer is the one that is responsible for providing the user with the optimal diet.

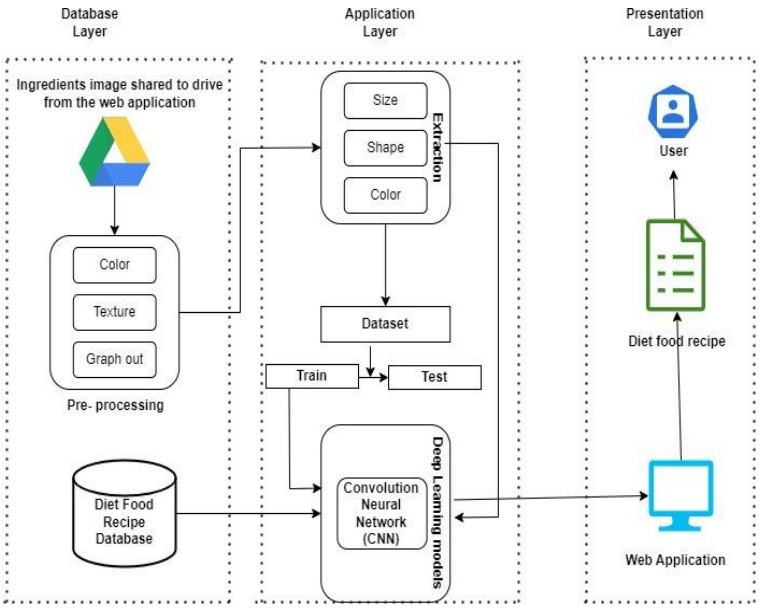

Figure 1: Design Specification

4.1 Database Layer

A recipe for food. Images obtained from the device are categorized in the database layer according to color, graph, and texture. In addition, the database layer features a recipe database that may be accessed at any time. So, in this database layer, the user can take a picture of the ingredients. And the picture will be get stored in drive and it goes for the pre processing phase where in the pre processing phase it will identify the color texture and the graph out . and it also contains the database with the diet food recipe.

4.2 Application layer

Application layer consist of the extraction process such as size, shape and color. The data received from the database layer enter into the extraction phase and from there it gets into the dataset where it splits there in two such as train and test . the image from the database layers gets through the dataset and under-goes with the deep learning model such as Convolution neural network (CNN).

4.3 Presentation Layer

The data from the deep learning model is sent to the presentation layer. In the presentation layer, it goes into the website application where it searches for the diet food recipe and gives it to the user. It is based on the recipe that the user uploading the ingredients and also in the presentation layer it will give directions to use the recipe.

5 Implementation

The web application development can be carried out using the Flutter framework, which is compatible with multiple platforms. On Visual Studio Code, Flutter was installed and configured. The graphical layouts of the screens were imported into Visual Studio Code. When a user touches the capture button, The camera will take a picture of ingredients in front of the camera to gather input from the mobile camera and the user must save the pictures to the desktop of the computer. The deep learning model that had been trained was then translated into the HTML, CSS, Bootstrap, and Flask has been used to create the web application.

Figure 2: Implementation of the model

Fig 2 says that the input screen of the recipe maker the user can choose files from the desktop and upload the images, and the recipe will come from the dataset of the recipe There are over 20,000 different recipes posted, each with a rating, associated category, and nutritional breakdown. So, from the datasets, we can get the recipe that matches the ingredients of the user. So those input ingredients pictures are shown in the below figure.

A dataset including images of fruits and vegetables has been posted to Google Drive. As can be seen in Figure 4, this dataset was uploaded from Google Drive into Google Co-laboratory (Colab) so that it could undergo pre-processing and model training. TensorFlow models were trained with the dataset.

The above fig 4 shows the output screen of the recipe model. So we can see there are five images uploaded for the test model. Bell pepper , cabbage, banana and apple. So it has been given a more recipes with directions to use

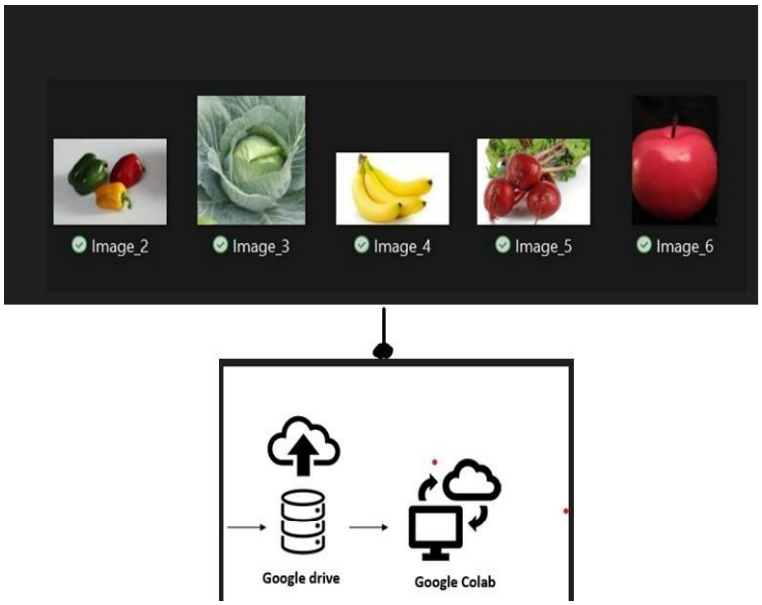

Figure 3: Fruits and vegetable dataset implementation

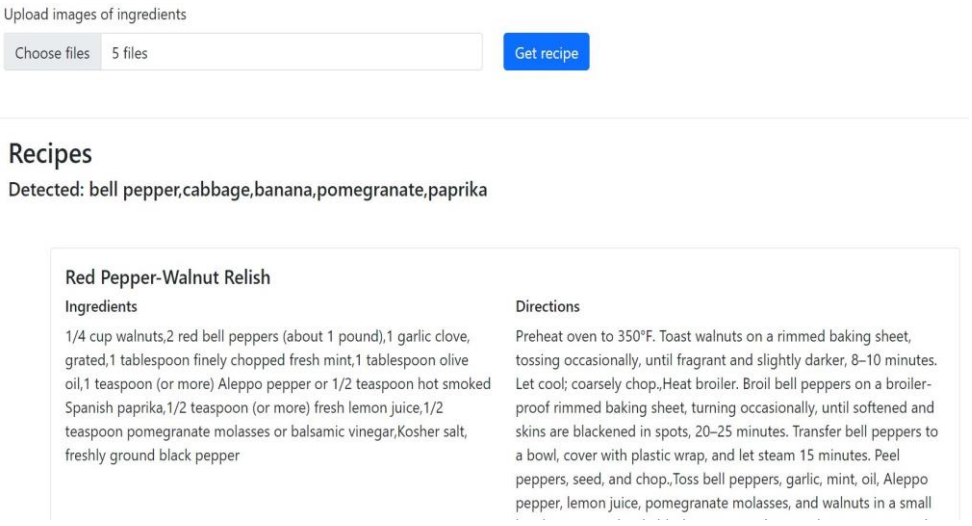

Figure 4: Result of the web application

the recipe.

6 Evaluation

```
]  # Defines & compiles the model
   model = tf.keras.models.Sequential([
       tf.keras.layers.Conv2D(16, (3,3), activation='relu', input_shape=(150, 15
   tf.keras.layers.MaxPooling2D(2, 2),
   keras.layers.Dropout(rate=0.15), #adding dropout regularization throughout th
   # The second convolution
   tf.keras.layers.Conv2D(32, (3,3), activation='relu'),
   tf.keras.layers.MaxPooling2D(2,2),
   keras.layers.Dropout(rate=0.1),
   # The third convolution
   tf.keras.layers.Conv2D(64, (3,3), activation='relu'),
   tf.keras.layers.MaxPooling2D(2,2),
   keras.layers.Dropout(rate=0.10),
   # Flatten the results to feed into a DNN
   tf.keras.layers.Flatten(),
   # 512 neuron hidden layer
   tf.keras.layers.Dense(512, activation='relu'),

   # 3 output neuron for the 3 classes of Animal Images
   tf.keras.layers.Dense(NUM_CLASSES, activation='softmax')
   ])
```

Figure 5: Define and compile the model

Fig 5 explains the defining and compiling of the mode the second testing model tested with the max pooling layers and then used the third convolution and then flatten the results to feed into DNN. And then used output neurons for the 3 classes of images

```
test_generator.reset()

# Evaluate on Validation data
scores = model.evaluate(test_generator)
print("%s%s: %.2f%%" % ("evaluate ",model.metrics_names[1], scores[1]*100))
```

```
 8/23 [=========>....................] - ETA: 14s - loss: 0.8028 - acc: 0.8750/usr/l
  warnings.warn(str(msg))
23/23 [==============================] - 19s 834ms/step - loss: 0.4699 - acc: 0.9109
evaluate acc: 91.09%
```

Figure 6: Output and accuracy of the Model

Fig 6 explains the evaluation of validation of data and This research proves an accuracy of 91.09 percent with a higher accuracy percentage. CNN model

has been used to check the accuracy. There were more models have been tested but the CNN model is best for image recognition and this image recognition is helping the model combine images into a recipe for the final output. In this model when the training has increased the accuracy will increase. The size of a mobile application will expand because of the incorporation of a deep learning model into the application. The actual model ought to be as small as is practicable while still retaining a high level of accuracy. MobileNetV2, with a size of only 2.6 megabytes, was the smallest model, but it was also the model with the second-worst accuracy. DenseNet201 possessed the second-best size and the second-best accuracy among all the networks. The DenseNet201 algorithm has shown some encouraging results in terms of its accuracy and size. This can be related to the way the movable architecture of the model was designed.
The data necessary for the model's inference are kept persistently in the cache memory of the CPU. The amount of power required to power the mobile device will increase if the application generates an excessive amount of data, which will overload the cache memory. This could also influence the functioning of mobile devices owned by homeowners, particularly devices lacking sufficient mobile resources such as random-access memory (RAM) and processing speed.

7 Conclusion and Future Work

The purpose of this study is to develop a framework for on-device deep learning that incorporates components of gamification in addition to a deep learning picture categorization model. The findings indicate that InceptionResNetV2 demonstrates promise if the motivation is for accuracy and accuracy and loss; MobileNetV2 and DenseNet201 display promise for accuracy and latency; and MobileNetV2 and DenseNet201 demonstrate promise for accuracy and size. This research offers a potential solution to the problem that has been hindering people's efforts to consume food in a manner that is more beneficial to their health. This research enables individuals to take a picture of their ingredients and immediately receive a recipe for a diet-friendly dish within an application by providing them with the ability to do so. The study was conducted using a large number of research papers being analysed and examined, and deep learning models being incorporated into this research for improved performance.

The project is to provide the user with a recipe that includes the calorie count for each individual meal. This will enable the user to calculate the number of calories they need to consume in accordance with the diet plan that they have chosen that models are available online. With the help of an object detection model, the on-device deep learning framework will be able to draw conclusions about a number of different things all at once. So, the conclusion of the project is the user can make a healthy recipe with the web application I have created with the ingredients they have in their home instantly. This is proved with 91 percentage of accuracy.

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