AI-Powered Nutrition Analyzer For Fitness Enthusiasts

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1. INTRODUCTION

1.1 Overview:

Artificial intelligence (AI) is a rapidly evolving area that offers unparalleled opportunities of progress and applications in many healthcare fields. In this review, we provide an overview of the main and latest applications of AI in nutrition research and identify gaps to address to potentialize this emerging field. AI algorithms may help better understand and predict the complex and non-linear interactions between nutrition-related data and health outcomes, particularly when large amounts of data

need to be structured and integrated, such as in metabolomics. AI-based approaches, including image recognition, may also improve dietary assessment by maximizing efficiency and addressing systematic and random errors associated with self-reported measurements of dietary intakes.

1.2 Purpose: The main purpose of the project is to build a model which is used for classifying the fruit depends on the different characteristics like colour, shape, texture etc. Here the user can capture the images of different fruits and then the image will be sent the trained model. The model analyses the image and detect the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.).It classify an object with higher degree of accuracy by fine tuning the parameters of the network. The main motto is to reduce the training time and compute complexity of the network by adding a sub layer after each convolution layer.

2. LITERATURE SURVEY

2.1 Existing problem /approaches: A number of studies have been conducted on image categorization. Veggie-Vision was an initial attempt to develop a produce recognition system for use in supermarkets. The system could analyze color, texture and density, and thus was able to obtain more information. Density was calculated by dividing weight with the area of the fruit. The reported accuracy was approximately 95% when color and texture features were combined. Faria et al. presented a framework for classifier fusion for the automatic recognition of produce in supermarkets. They combined low-cost classifiers trained for specific classes of interest to enhance the recognition rate. Chowdhury et al. recognized 10 different vegetables using color histogram and statistical texture features. They obtained a classification accuracy of up to 96.55% using neural network as a

classifier. Dubey proposed a framework for recognizing and classifying images of 15 different types produce. The approach involves segmenting an image to extract the region of interest, and then calculating the features from that segmented region, which is further used in training and classification by a multi-class support vector machine. Moreover, they proposed an improved sum and difference histogram (ISADH) texture feature for this kind of problem. Fruit detection greatly affects the robot's harvesting efficiency because it is an unstructured environment with changing lighting conditions. Bulanon et al. enhanced the portion occupied by fruit in images using a red chromaticity coefficient and adopted a circle detection method for classifying individual fruits. Jimenez et al. developed a method that can identify spherical fruits in the natural environment in which difficult situations are present: occlusions, shadows, bright areas, and overlapping fruits. Range and attenuation data are sensed by a laser range-finder sensor, and the 3-D position of the fruit with radius and reflectance are obtained after the recognition steps.

2.2 References

1.Mureșan, Horea & Oltean, Mihai. (2018). Fruit recognition from images using deep learning. Acta Universitatis Sapientiae, Informatica. 10. 26-42.

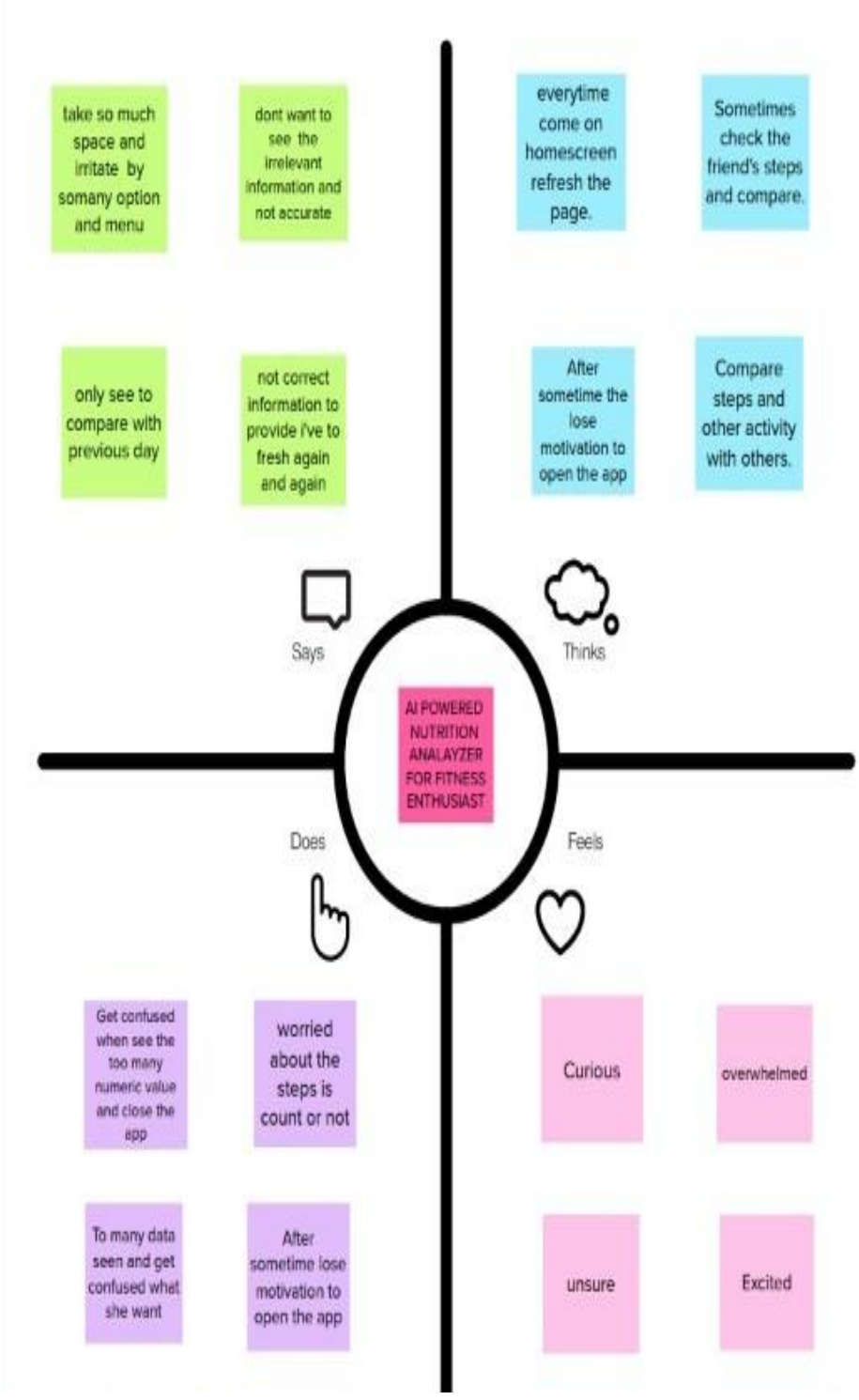
10.2478/ausi-2018-0002. 2.https://github.com/garodisk/Fruits-classification-120-different-fruits
3.https://www.1electronicsforu.com/electronics-projects/electronics-design-guides/fruitclassification-quality-detection-using-deep-convolutional-neural-network 4.https://medium.com/ai-techsystems/fruits-classification-using-deep-learning-f8261b0ee0ca 5.Khatun, Mehenag & Nine, Julker & Ali, Md. Forhad & Sarker, Pritom & Turzo, Nakib. (2020). Fruits Classification using Convolutional Neural Network. 5. 1-6.

2.3 Problem Statement Definition

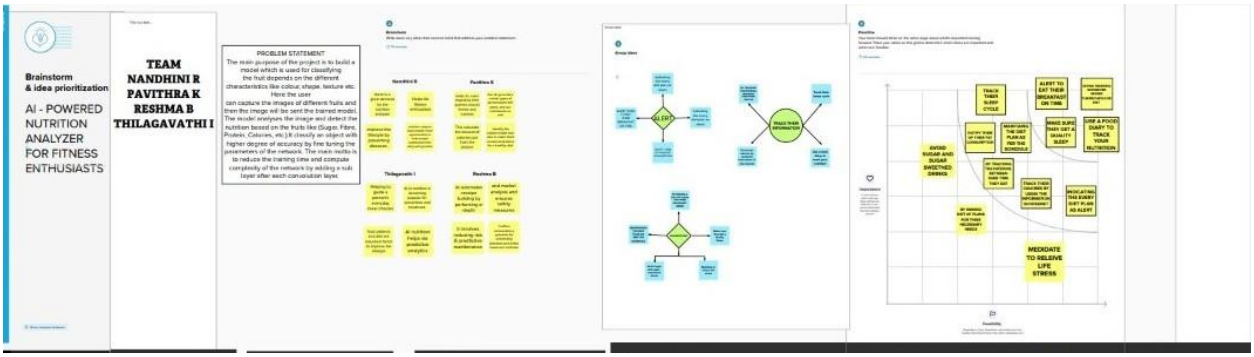
The main purpose of the project is to build a model which is used for classifying the fruit depends on the different characteristics like colour, shape, texture etc. Here the user can capture the images of different fruits and then the image will be sent the trained model. The model analyses the image and detect the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.).It classify an object with higher degree of accuracy by fine tuning the parameters of the network. The main motto is to reduce the training time and compute complexity of the network by adding a sub layer after each convolution layer.

3.IDEATION AND PROPOSED SOLUTION

3.1 Empathy Map Canvas


take so much space and irritate by somany option and menu
dont want to see the irrelevant information and not accurate
everytime come on homescreen refresh the page.
Sometimes check the friend's steps and compare.
only see to compare with previous day
not correct information to provide i've to fresh again and again
After sometime the lose motivation to open the app
Compare steps and other activity with others.
Says
Thinks
AI POWERED NUTRITION ANALAYZER FOR FITNESS ENTHUSIAST
Does
Feels
Get confused when see the too many numeric value and close the app
worried about the steps is count or not
Curious
overwhelmed
To many data seen and get confused whet she want
After sometime lose motivation to open the app
unsure
Excited

3.2 Ideation & Brainstorming



3.3 Proposed Solution

In this project, CNN algorithm helps to extract the important features from the images and train according to them. These neural networks have proven to be successful in many different real-life case studies and applications like

1. Image classification, object detection, segmentation, face recognition.
2. Self driving cars that leverage CNN based vision systems.
3. Classification of crystal structure using a convolutional neural network.

This model involves 4 steps: 1. Convolution 2. Max pooling 3. Flattening

4. Full connection And finally import the image using these packages to find the predictions: from keras.models import load_model from keras.preprocessing import image The extension for saving the model is .h5 file.

1. Data Collection

I. Download the dataset

II. Load the dataset

III. In this project, we have used 5 datasets namely:

1. Apple

2. Banana

3. Pineapple

4. Orange

5. Watermelon

In training dataset ,we notice that 2626 images are belonging to 5 classes for training and 1055 images belong to 5 classes for testing purpose.

1. Data Modelling Convolution Neural Network (CNN) algorithm is applied to this model .This helps us to extract the important features from the images and train them.

It has four steps namely:

1. Convolution
2. Max pooling
3. Flattening
4. Full connection

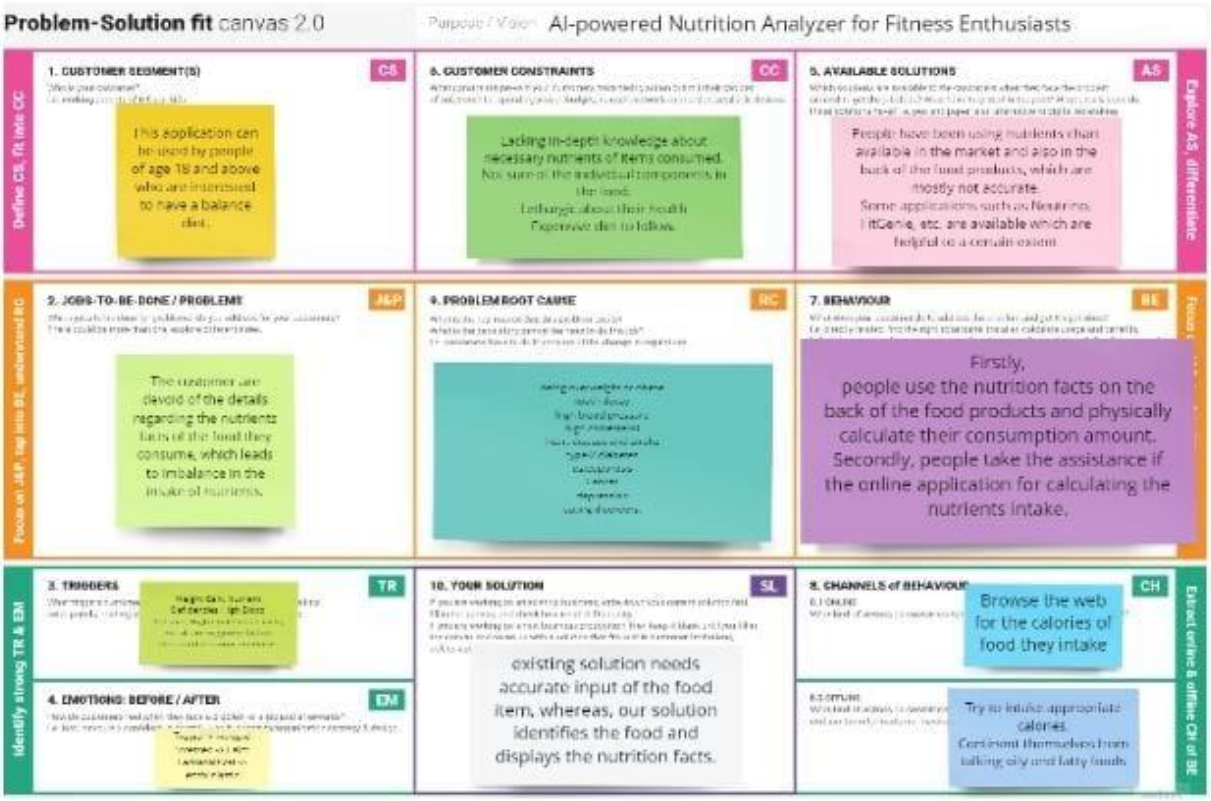
1.In convolution operation, the input image is convoid with feature detector or filter to get a feature map. By applying convolution operation, the size of image is reduced we may lose some information but feature detector or filter will helps us to extract main features from image and remove unwanted features.

2.Max pooling is a technique which helps us to avoid over-fitting of data and helps us to avoid special ingredients and distortions in data.

3.Flattening layer converts multi dimension pooled feature map to single dimension pooled feature map. Flattening layer is the input layer. Start initializing the parameters and finally train the model with Keras fit() function. The model trains for 20 epochs. Testing is similar to training, except that we don't need to compute gradients and training targets. Instead, we take the predictions from network output, and combine them to get the real detection output. Fit generator is used to find the training and validation accuracy. Image data generator is a class

in keras.preprocessing package to apply some image processing to the images. In this project the accuracy error is also good, so that the model is perfect.

3.4 Problem Solution fit



4. REQUIREMENT ANALYSIS

<table>
<tr><td>FR NO.</td><td>FUNCTIONAL REQUIREMENTS(EPIC)</td><td>SUB REQUIREMENT(STORY/SUBTASK)</td></tr>
<tr><td>FR-1</td><td>USER REGISTRATION</td><td>Registration through Gmail -Registration through Mobile Number -Registration through Face-book</td></tr>
<tr><td>FR-2</td><td>USER CONFIRMATION</td><td>Confirmation via Email Confirmation via OTP</td></tr>
<tr><td>FR-3</td><td>USER DETAILS</td><td>PERSONAL DETAILS FOOD DETAILS
<table><tr><td>Age</td><td>Food</td></tr><tr><td>height</td><td>Receipe</td></tr><tr><td>weight</td><td>added ingredients</td></tr><tr><td>Diseases if any</td><td>age</td></tr><tr><td>condition if any</td><td></td></tr></table></td></tr>
</table>

		allergies if any
FR-4	USER REQUIREMENTS	-The user simply inputs your recipe ingredients and amounts. The software will instantly produce an accurate readout of your dish in terms of nutritional analysis in a readable format that consumers are familiar with. -With already given details the system can alert the consumer if any content of their allergies ,it can alert the consumer

4.2 Non-Functional requirements

FR.NO	NON-FUNCTIONAL REQUIREMENTS	DESCRIPTION

NFR-1	USABILITY	• No training is required to access the Nutrition Analyzer • The results should be loaded within 30 seconds. • It should be user friendly and comfortable. • It should be simple and easy to use. • The results should be self explanatory so that it can be understood by common people.
NFR-2	SECURITY	• AI powered

		nutrition analyzer for fitness should contain more security in which our data which entered or maintained should be more security. • With the help of the username and password it provides more security in which it can access more securable and the data are private. • It should be social-economic which

		should access to sufficient and safe to use.
NFR-3	RELIABILITY	• It is Important that the AI powered nutrition analyzer for fitness provides should Must reliable. • How a person can find it is reliable? It is easy to find that is he/she can compare the nutrition based food with other nutrition related application so, it

		can easily rectify whether it is reliable or not. • But it take too much time, to avoid this a reliable application should made in which it itself produces whether we can get correct solution or not. So, it is necessary that the AI powered nutrition analyzer for fitness should have proper data and information in

		which we can get a correct information about it and also get a proper guidance about it. • With the proper guideness and proper information in which we can get a nutrition properly and we can have get a proper fitness plan. • It should also provides the information on nutrition and health which it

		should prevent from health information on diseases, health risks and prevention guidelines. It should also provides an extension a research based online learning network with several resource areas, so it provides more reliability in that area. For more reliable it can also contains the

		calorie information, balanced diet plans, what type food can consumed at what time etc..... So, by this way it can reliable.
NFR-4	PERFORMANCE	• It should provide more number of users to consume at any time and at any place. • It should provide Reliability, Scalability, Security and Usability. • It should contain minimum data

		while over-paging the websites or application and it is necessary that it should not exceed more than 20mb. • While consuming the page it should provide the response as much as possible without any delay or time traffic. • The connection should e properly maintained so that it can use while travelling or in

		remote places. • The nutritious food to meet their dietary needs and the food preferences for an active and healthy life. • It should be consistently access, availability and affordability of foods and beverages that promote well-being and prevent from diseases. • It should suitable in all situations that

		exists to all people, at all times.
NFR-5	AVAILABILITY	• Easy to access Data. • Avoids Data redundancy and inconsistency.
NFR-6	SCALABILITY	• The architecture for AI powered Nutrition Analyzer for fitness provides the clear procedure daily consumption of food and helps the user to maintain a healthy diet. • According to their

		tracking system implemented in architecture provide the proper mechanism to the every individual of their nutrients intake which can be increased or decreased. The premium amount for analyzer is very much optimum.

5. PROJECT DESIGN

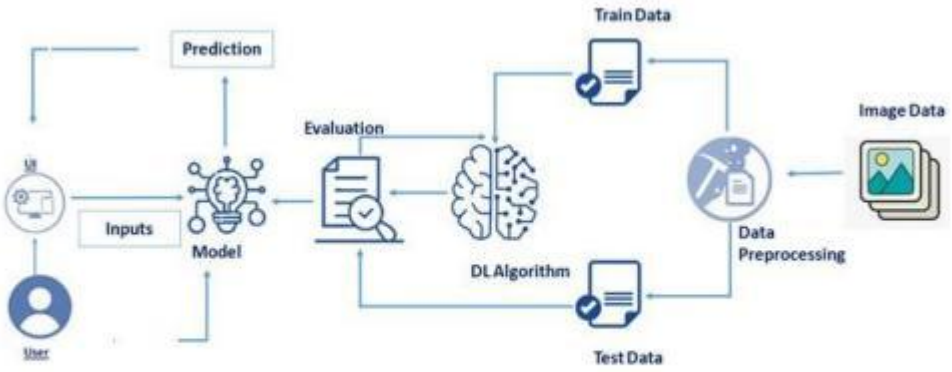
5.1 Data Flow Diagrams

Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Example: DFD Level O (Industry Standard)

5.2 Solution & Technical Architecture



5.3 User Stories

5.3 User Stories	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Priority
Nutrition Domain	User Registration	USN-1	Registration to the	I can get the	High	Sprint-1

			respective nutrition through the nutritional website by entering your name, Phone Number, Age and Address.	information of the list of nutrition and fitness available based on their speciality		
Nutrition Domain	Registration Options Available	USN-2	As a user, I can register for the application through the Nutrition Official Website	I can register & access the nutritional panel which prompts reminders about your nutrition,	High	Sprint-2

				fitness through apps scheduled.		
Nutrition Domain	Login	USN-3	As a Nutritional user, I can login to the application by entering the right credentials like phone number and password	I can register & access the nutritional panel which prompts reminders about your nutrition, fitness through apps scheduled	Medium	Sprint-1
Nutrition	Dashboard	USN-4	Enables	I can	High	Sprint-1

Domain			nutritional professionals to access important user statistics in real time	register & access the nutritional panel which prompts reminders about your nutrition, fitness through apps scheduled		

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection & Image Processing					
Sprint-1		USN-1	Collect images of different food items organized into subdirectories based on	3	Medium	Pavithra

			their respective names.			
Sprint-1			Import and configure the Image data generator library from Keras	3	Medium	Reshma
Sprint-1		USN-3	Apply Image data generator functionality	5	High	Nandhini

			to training set and testing set			
Sprint-1		USN-4	Improving the image data that suppresses unwilling distortions or enhances some image features important for further processing	3	Medium	Thilagavathi

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2	Model Building & Testing					
Sprint-2		USN-5	Importing the model building libraries and Initializing the model .	5	High	Pavithra
Sprint-2		USN-6	Adding CNN layers, Dense layers & other necessary layers and	5	High	Reshma

			Compile the model			
Sprint-2		USN-7	Train & Test the model based on the image dataset	5	Medium	Nandhini
Sprint-3	Application building					
Sprint-3		USN-8	Create HTML pages to design the front-end part of the web page	5	High	Pavithra
Sprint-3		USN-9	Create the	5	High	Reshma

			flask application and loading the model file.			
Sprint-3		USN-10	Routing to the HTML page and Running the application	5	High	Thilagavathi
Sprint-4	Cloud integration					
Sprint-4		USN-11	Train the model on Cloud	5	High	Thilagavathi, Nandhini

6.2 Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 days	07 Nov 2022	12Nov 2022	20	12Nov 2022

Sprint-4	20	6 days	14 Nov 2022	19Nov 2022	20	19Nov 2022

7. CODING & SOLUTIONING (Explain the features added in the project along with code)

7.1 Feature 1

main.css

```
body {
    background-image: url("https://www.livingproofnyc.com/wp-content/themes/livingproof/assets/img/hero-background.jpg");
    background-size: cover;
}

.bar {
    margin: 0px;
    padding: 20px;
    background-color: white;
```

```
    opacity: 0.6;
    color: black;
    font-family: 'Roboto', sans-serif;
    font-style: italic;
    border-radius: 20px;
    font-size: 25px;
}

h3 {
    margin: 0px;
    padding: 20px;
    background-color: #9ACD32;
    width: 800px;
    opacity: 0.6;
    color: #000000;
    font-family: 'Roboto', sans-serif;
    font-style: italic;
    border-radius: 20px;
```

```
    font-size: 25px;
}

a {
    color: grey;
    float: right;
    text-decoration: none;
    font-style: normal;
    padding-right: 20px;
}

a:hover {
    background-color: black;
    color: white;
    border-radius: 15px;
    0 font-size: 30px;
    padding-left: 10px;
}
```

```
.div1 {
    background-color: lightgrey;
    width: 500px;
    border: 10px solid peach;
    padding: 20px;
    margin: 20px;
    height: 500px;
}
```

```
.header {
    position: relative;
    top: 0;
    margin: 0px;
```

```
    z-index: 1;
    left: 0px;
    right: 0px;
    position: fixed;
    background-color: #8B008B;
    color: white;
    box-shadow: 0px 8px 4px grey;
    overflow: hidden;
    padding-left: 20px;
    font-family: 'Josefin Sans';
    font-size: 2vw;
    width: 100%;
    height: 8%;
    text-align: center;
}

.topnav {
    overflow: hidden;
```

```
    background-color: #FCAD98;
}

.topnav-right a {
    float: left;
    color: black;
    text-align: center;
    padding: 14px 16px;
    text-decoration: none;
    font-size: 22px;
}

.topnav-right a:hover {
    background-color: #FF69B4;
    color: black;
}

.topnav-right a.active {
```

```
    background-color: #DA70D6;
    color: black;
}

.topnav-right {
    float: right;
    padding-right: 100px;
}


.img-preview {
    width: 256px;
    height: 256px;
    position: relative;
    border: 5px solid #F8F8F8;
    box-shadow: 0px 2px 4px 0px rgba(0, 0, 0, 0.1);
    margin-top: 1em;
    margin-bottom: 1em;
```

```
}

.img-preview>div {
    width: 100%;
    height: 100%;
    background-size: 256px 256px;
    background-repeat: no-repeat;
    background-position: center;
}

input[type="file"] {
    display: none;
}

.upload-label {
    display: inline-block;
    padding: 12px 30px;
    background: #39D2B4;
```

```
    color: #fff;
    font-size: 1em;
    transition: all .4s;
    cursor: pointer;
}

.upload-label:hover {
    background: #34495E;
    color: #39D2B4;
}

.loader {
    border: 8px solid #f3f3f3;
    /* Light grey */
    border-top: 8px solid #3498db;
    /* Blue */
    border-radius: 50%;
    width: 50px;
```

```
    height: 50px;
    animation: spin 1s linear infinite;
}

@keyframes spin {
    0% {
        transform: rotate(0deg);
    }

    100% {
        transform: rotate(360deg);
    }
}
```

style.css

```
body{
       background-image:url(bg.jpg);
    background-size: 400% auto;
```

```
        background-repeat: no-repeat;
        background-position:center;
        color:#555;
        font-family:Arial, Helvetica, sans-serif;
        font-size:16px;
        line-height:1.6em;
        margin:0;
}

.container{
        width:80%;
        margin:auto;
        overflow:hidden;
}

.justify{
    text-align:justify;
    text-justify: auto;
```

```
}

.parallax {
  /* The image used */
     background-image: url("doc.jpg");

  /* Set a specific height */
  min-height: 750px;

  /* Create the parallax scrolling effect */
  background-attachment: fixed;
  background-position: center;
  background-repeat: no-repeat;
  background-size: cover;
}

html {
  scroll-behavior: smooth;
```

```
}
#section2 {
  height: 500px;
  background: ;
}
div.background {
  background: url("static/bgg2.jpg");
  min-height: 5px;
 background-attachment: fixed;
  background-position: center;
  background-repeat: no-repeat;
  background-size: cover;
}


#navbar{
        background-color:#fff;
        color:#333;
```

```
}

#navbar ul{
	padding:0;
	list-style: none;
}

#navbar li{
	display:inline;
}

#navbar a{
	color:#fff;
	text-decoration: none;
	font-size:18px;
	padding-right:15px;
}
```

```
#showcase{
      min-height:300px;
      margin-bottom:30px;
}


#showcase h1{
    width: 100%;
      color:#333;
      font-size:40px;
      text-align: center;
      line-height: 1em;
      padding-top:10px;
}
#showcase h2{
    width: 100%;
      color:#333;
      font-size:30px;
```

```
        text-align: center;
        line-height: 1.6em;
        padding-top:10px;
}

#main{
        float:left;
        color:#fff;
        width:65%;
        padding:0 30px;
        box-sizing: border-box;
}

#sidebar{
        float:right;
        width:35%;
        background-color: #ffcccc;
        color:#000;
```

```
        padding-left:10px;
        padding-right:10px;
        padding-top:1px;
        box-sizing: border-box;
}


.img-preview {
    width: 10px;
    height: 10px;
    position: relative;
    border: 5px solid #F8F8F8;
    box-shadow: 0px 2px 4px 0px rgba(0, 0, 0, 0.1);
    margin-top: 1em;
    margin-bottom: 1em;
}

.img-preview>div {
```

```
    width: 10%;
    height: 10%;
    background-size: 100px 10px;
    background-repeat: no-repeat;
    background-position: center;
}

input[type="file"] {
    display: none;
}

.upload-label{
    display: inline-block;
    padding: 12px 30px;
    background: #39D2B4;
    color: #fff;
    font-size: 1em;
    transition: all .4s;
```

```
    cursor: pointer;
}

.upload-label:hover{
    background: #34495E;
    color: #39D2B4;
}

.myButton {
  border: none;
  text-align: center;
  cursor: pointer;
  text-transform: uppercase;
  outline: none;
  overflow: hidden;
  position: relative;
  color: #fff;
  font-weight: 700;
```

```
  font-size: 12px;
  background-color: #ff0000;
  padding: 10px 15px;
  margin: 0 auto;
  box-shadow: 0 5px 15px rgba(0,0,0,0.20);
}

.myButton span {
  position: relative;
  z-index: 1;
}

.myButton:after {
  content: "";
  position: absolute;
  left: 0;
  top: 0;
  height: 310%;
```

```
  width: 150%;
  background: #f2f2f2;
  -webkit-transition: all .5s ease-in-out;
  transition: all .5s ease-in-out;
  -webkit-transform: translateX(-98%) translateY(-25%) rotate(45deg);
  transform: translateX(-98%) translateY(-25%) rotate(45deg);
}

.myButton:hover:after {
  -webkit-transform: translateX(-9%) translateY(-25%) rotate(45deg);
  transform: translateX(-9%) translateY(-25%) rotate(45deg);
}

.loader {
    border: 8px solid #f3f3f3; /* Light grey */
    border-top: 8px solid #ff0000; /* Red */
    border-radius: 50%;
    width: 50px;
```

```
    height: 50px;
    animation: spin 1s linear infinite;
}

@keyframes spin {
    0% { transform: rotate(0deg); }
    100% { transform: rotate(360deg); }
}

#main-footer{
        background: #333;
        color:#fff;
        text-align: center;
        padding:1px;
        margin-top:0px;
}

@media(max-width:600px){
```

```
      #main{
        width:100%;
        float:none;
      }

      #sidebar{
        width:100%;
        float:none;
      }
}
```

7.2 Feature 2

home.html

```
<!DOCTYPE html>
<html>

<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
```

```
  <meta http-equiv="X-UA-Compatible" content="ie=edge">
  <title>Home</title>
  <link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css"
rel="stylesheet">
  <script
src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></script>
  <script src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
  <script
src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
  <link href="{{ url_for('static', filename='css/main.css') }}" rel="stylesheet">
</head>

<body>
  <div class="header">
    <div style="width:50%;float:left;font-size:2vw;text-align:left;color:black;
padding-top:1%;padding-left:5%;">
      Nutrtion Image Analysis</div>
    <div class="topnav-right" style="padding-top:0.5%;">
```

```
    <a class="active" href="{{ url_for('home')}}">Home</a>
    <a href="{{ url_for('image1')}}">Classify</a>
  </div>
</div>
</div>
<br><br><br><br>
<br><br><br><br>
<h1>
  <center>
    <h3>
      Food is essential for human life and has been the concern of
      many healthcare conventions. Nowadays new dietary assessment
      and nutrition analysis tools enable more opportunities to help
      people understand their daily eating habits, exploring nutrition
      patterns and maintain a healthy diet.Nutritional analysis is the
      process of determining the nutritional content of food. It is a
      vital part of analytical chemistry that provides information about
      the chemical composition, processing, quality control and contamination
```

```
      of food. It ensures compliance with trade and food laws.
    </h3>
  </center>
 </h1>
</body>

</html>
```

image.html

```
{% extends "imageprediction.html" %} {% block content %}
<div style="float:left">
  <br>
  <br>
  <h5>
    <font color="black" size="3" font-family="sans-serif"><b>Upload image to
classify</b></font>
  </h5>
  <div>
```

```
        <form id="upload-file" method="post" enctype="multipart/form-data">
            <label for="imageUpload" class="upload-label">
                Choose...
            </label>
            <input type="file" name="file" id="imageUpload" accept=".png, .jpg, .jpeg">
        </form>

        <center>
            <div class="image-section" style="display:none;">
                <div class="img-preview">
                    <div id="imagePreview">
                    </div>
        </center>
    </div>
    <center>
        <div>
            <button type="button" class="btn btn-primary btn-lg " id="btn-
predict">Classify</button>
```

```
        </div>
    </center>
</div>
<div class="loader" style="display:none;margin-left: 450px;"></div>
<h3 id="result">
    <span>
        <p style="padding-top: 25px;">
        <h4>Food Classified is : <h4><b><u>
                        {{showcase}}{{showcase1}}
                        </p>
    </span>
</h3>
</div>
</div>
{% endblock %}
```

imageprediction.html

```
<!DOCTYPE html>
<html>
<head>
  <meta charset="UTF-8">
   <meta name="viewport" content="width=device-width, initial-scale=1.0">
   <meta http-equiv="X-UA-Compatible" content="ie=edge">
   <title>Predict</title>
   <link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.css"
rel="stylesheet">
   <script
src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js"></script>
   <script src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js"></script>
   <script
src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js"></script>
   <link href="{{ url_for('static', filename='css/main.css') }}" rel="stylesheet">
<style>
body
{
```

```
    background-image:
url("https://i.pinimg.com/originals/be/21/1a/be211ad5043a8d05757a3538bdd
8f450.jpg");
    background-size: cover;
}
.bar
{
margin: 0px;
padding:20px;
background-color:white;
opacity:0.6;
color:black;
font-family:'Roboto',sans-serif;
font-style: italic;
border-radius:20px;
font-size:25px;
}
a
```

```
{
color:grey;
float:right;
text-decoration:none;
font-style:normal;
padding-right:20px;
}
a:hover{
background-color:black;
color:white;
border-radius:15px;0
font-size:30px;
padding-left:10px;
}
.div1{
  background-color: lightgrey;
  width: 500px;
  border: 10px solid peach;
```

```
  padding: 20px;
  margin: 20px;
  height: 500px;
}




.header {     position: relative;
              top:0;
              margin:0px;
              z-index: 1;
              left: 0px;
              right: 0px;
              position: fixed;
              background-color: #8B008B ;
              color: white;
```

```
            box-shadow: 0px 8px 4px grey;
            overflow: hidden;
            padding-left:20px;
            font-family: 'Josefin Sans';
            font-size: 2vw;
            width: 100%;
            height:8%;
            text-align: center;
        }
        .topnav {
  overflow: hidden;
  background-color: #FCAD98;
}

.topnav-right a {
  float: left;
  color: black;
  text-align: center;
```

```
  padding: 14px 16px;
  text-decoration: none;
  font-size: 18px;
}

.topnav-right a:hover {
  background-color: #FF69B4;
  color: black;
}

.topnav-right a.active {
  background-color: #DA70D6;
  color: black;
}

.topnav-right {
  float: right;
  padding-right:100px;
```

```
}
</style>
</head>
<body>
<div class="header">
<div style="width:50%;float:left;font-size:2vw;text-align:left;color:black; padding-top:1%;padding-left:5%;">Nutrtion Image Analysis</div>
  <div class="topnav-right"style="padding-top:0.5%;">

    <a href="{{ url_for('home')}}">Home</a>
    <a  class="active" href="{{ url_for('image1')}}">Classify</a>
  </div>
</div>
<br>


</div>
<div class="container">
```

```
      <center>
<div id="content" style="margin-top:2em">{% block content %}{%
endblock %}</div></center>
   </div>
</body>

<footer>
   <script src="{{ url_for('static', filename='js/main.js') }}"
type="text/javascript"></script>
</footer>

</html>
```

7.3 Database Schema

app.py

```
from flask import Flask, render_template, request
import os
```

```
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
import requests

app = Flask(__name__, template_folder="templates")
model = load_model('nutrition.h5')
print("Loaded model from disk")


@ app.route('/')
def home():
    return render_template('home.html')


@ app.route('/image1', methods=['GET', 'POST'])
def image1():
    return render_template("image.html")
```

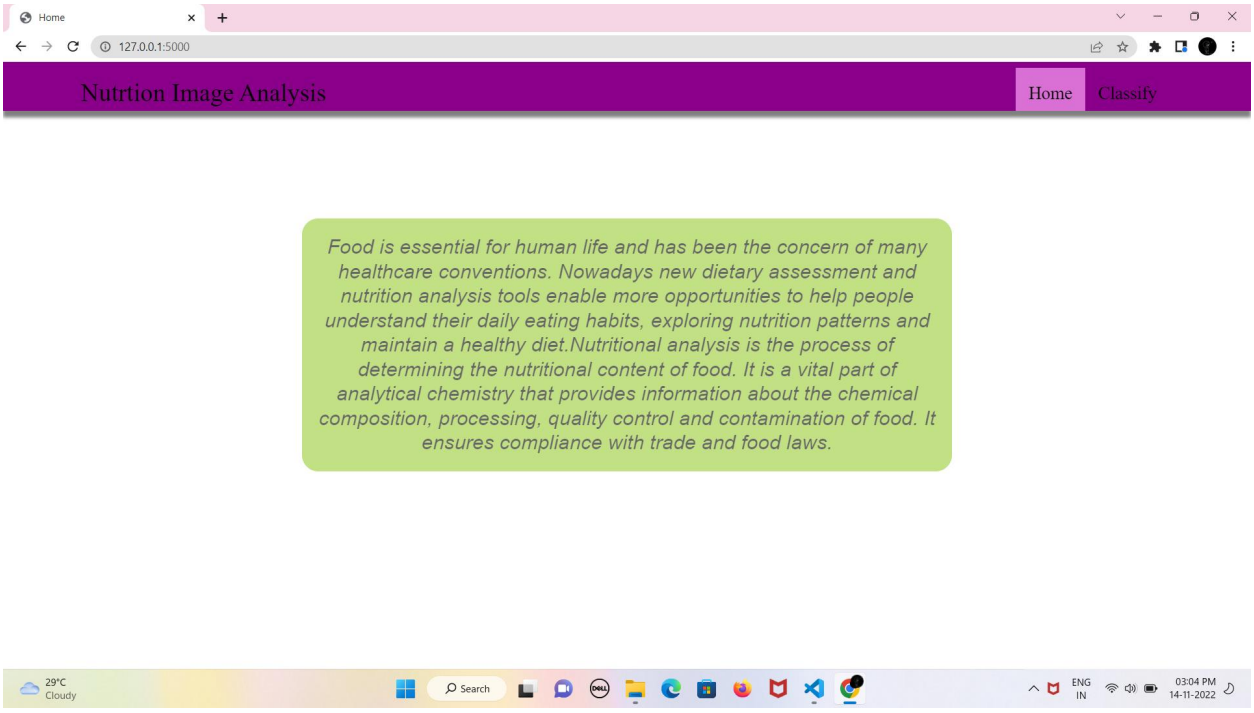
```
@ app.route('/predict', methods=['GET', 'POST'])
def lanuch():
    if request.method == 'POST':
        f = request.files['file']
        basepath = os.path.dirname('__file__')
        filepath = os.path.join(basepath, "uploads", f.filename)
        f.save(filepath)

        img = image.load_img(filepath, target_size=(64, 64))
        x = image.img_to_array(img)
        x = np.expand_dims(x, axis=0)

        pred = np.argmax(model.predict(x), axis=1)
        print("prediction", pred)
        index = ['APPLE', 'BANANA', 'ORANGE', 'PINEAPPLE', 'WATERMELON']
```

```
        result = str(index[pred[0]])
        print(result)
        x = result
        result = nutrition(result)
        print(result)

        return render_template("0.html", showcase=(result), showcase1=(x))


def nutrition(index):
    import requests
    url = "https://calorieninjas.p.rapidapi.com/v1/nutrition"
    querystring = {"query": index}
    headers = {
        'X-RapidAPI-Key':
'605c2daec2msh39166eaff43e473p1b13eejsn04bb67d5b6a6',
        'X-RapidAPI-Host': 'calorieninjas.p.rapidapi.com'
    }
```

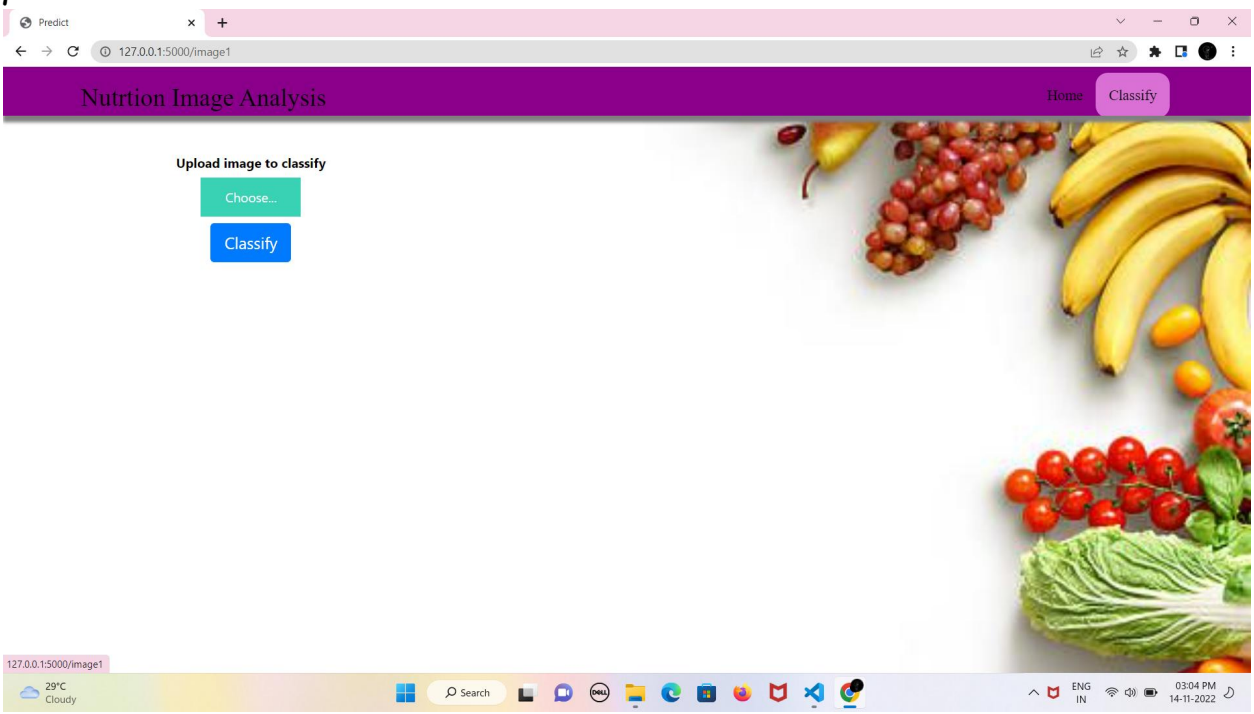
```
    response = requests.request(
        "GET", url, headers=headers, params=querystring)

    print(response.text)
    return response.json()["items"]


if __name__ == "__main__":

    app.run(debug=True)
```

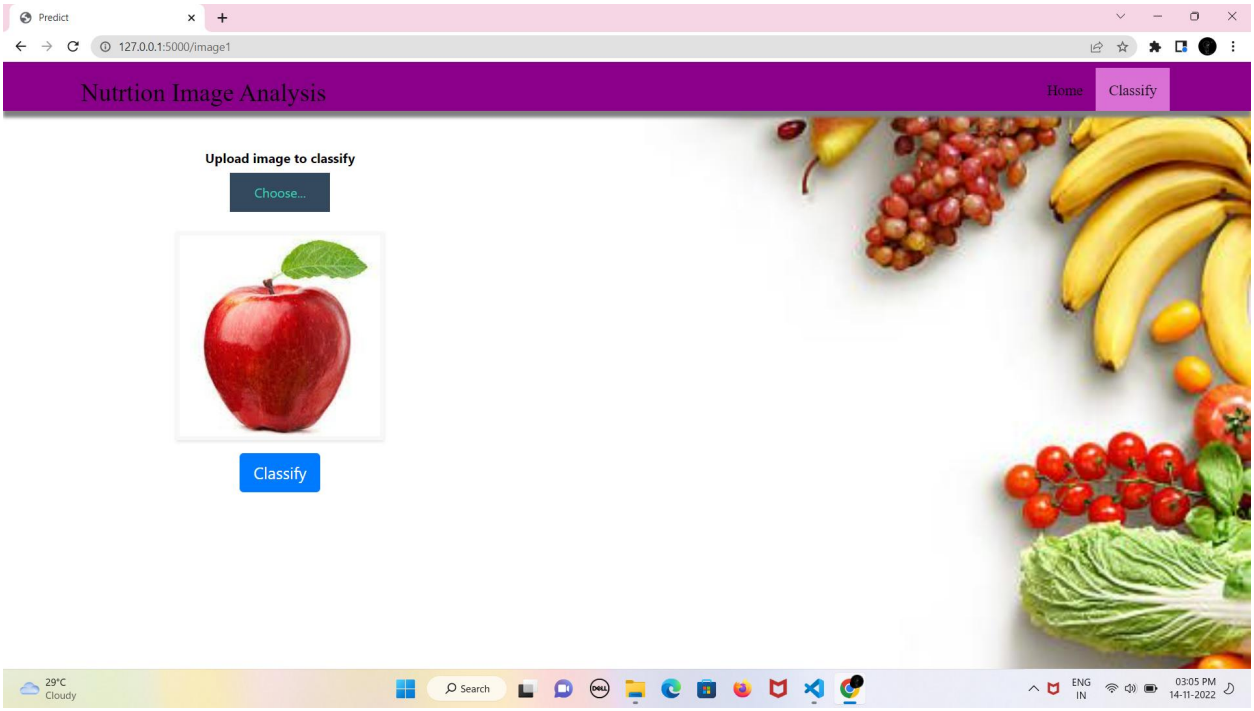
8. RESULTS

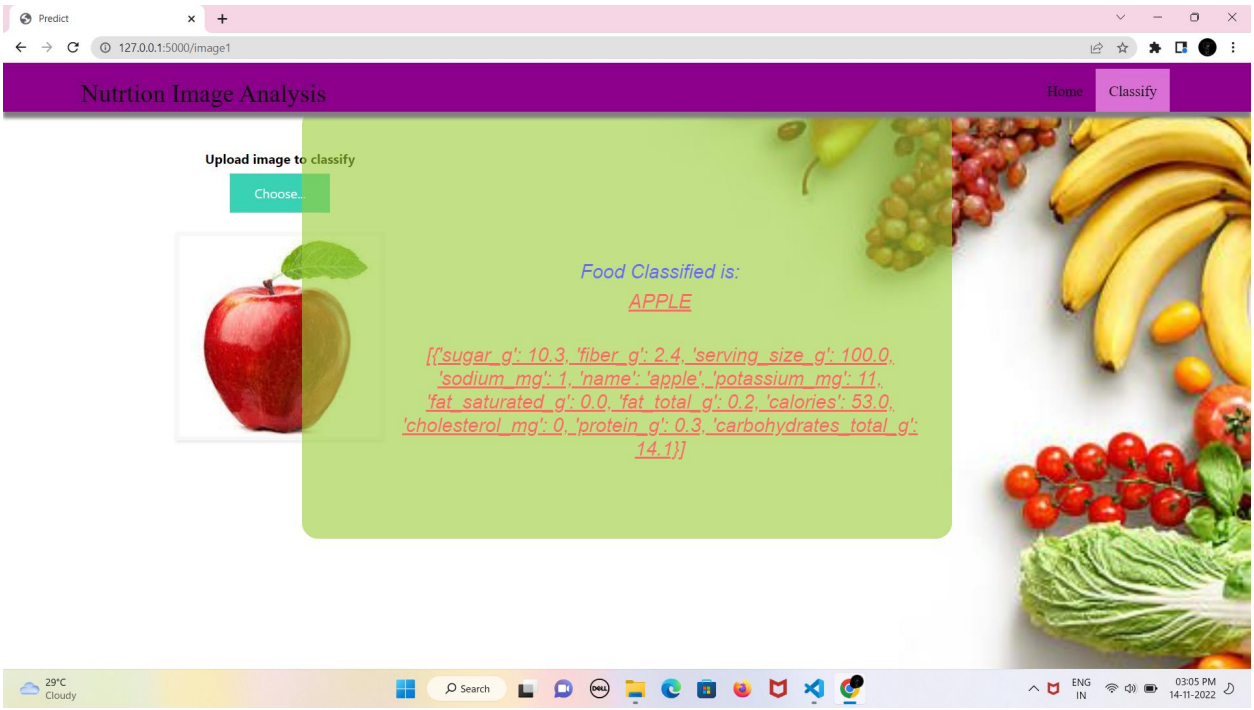
Home page


Home
127.0.0.1:5000
Nutrtion Image Analysis
Home
Classify
Food is essential for human life and has been the concern of many healthcare conventions. Nowadays new dietary assessment and nutrition analysis tools enable more opportunities to help people understand their daily eating habits, exploring nutrition patterns and maintain a healthy diet.Nutritional analysis is the process of determining the nutritional content of food. It is a vital part of analytical chemistry that provides information about the chemical composition, processing, quality control and contamination of food. It ensures compliance with trade and food laws.
29°C
Cloudy
Search
ENG
IN
03:04 PM
14-11-2022

prediction


Predict
127.0.0.1:5000/image1
Nutrtion Image Analysis
Home
Classify
Upload image to classify
Choose...
Classify
127.0.0.1:5000/image1
29°C
Cloudy
Search
ENG
IN
03:04 PM
14-11-2022


Predict
127.0.0.1:5000/image1
Nutrtion Image Analysis
Home
Classify
Upload image to classify
Choose...
Classify
29°C
Cloudy
Search
ENG
IN
03:05 PM
14-11-2022



9. ADVANTAGES & DISADVANTAGES

Advantages: 1. Classification of fruits is a needful exercise to differentiate the particular variety of fruits of the same family. Most of the case, the variety of fruits of the same family differ in the sense of colour and size only. 2. The use of image processing for the grading of fruits involves categorization of fruits, with consideration of the severity of the disease, defects, and contamination on fruits. Grad-ing is an important step in the post-harvest process. Grading of fruits manually is a time taking and unreliable process. Therefore, it is needful to adapt the automated faster system in this regard. 3. Some of the other associated benefits include speed operation, production consistent, greater product stability and safety.

Disadvantages: 1. Most of the research conducted by taking the one-side view of fruits. In addition, by considering the one-side image of fruit, it is challenging to evaluate the quality fruits. 2. It does not provide stable recognition in adverse imaging condition.

10. CONCLUSION

During this project, we had the option to investigate some portion of the profound learning algorithms and find qualities and shortcomings. We picked up information on deep learning, and we got a product that can perceive fruits from pictures. A new method for classifying fruits using convolutional neural network algorithm is proposed. The above listed results were obtained using 7 test samples taken out from the actual number of 2626 and 1050 images used for training and testing. The above algorithm was coded and tested using anaconda software. Different fruits varieties that had different backgrounds were taken for training and testing. The proposed algorithm gave 98% accuracy rate. This project explores a fruits classification based on CNN algorithm. The accuracy and loss curves were generated by using various combinations of hidden layers for five cases using fruits. CNN gave better performance to attain better fruit classification. We trust that the outcomes and strategies introduced in this project can be additionally extended to a greater task. From our perspective, one of the principal goals is to improve the precision of the neural system. This includes further exploring different avenues regarding the structure of the system.

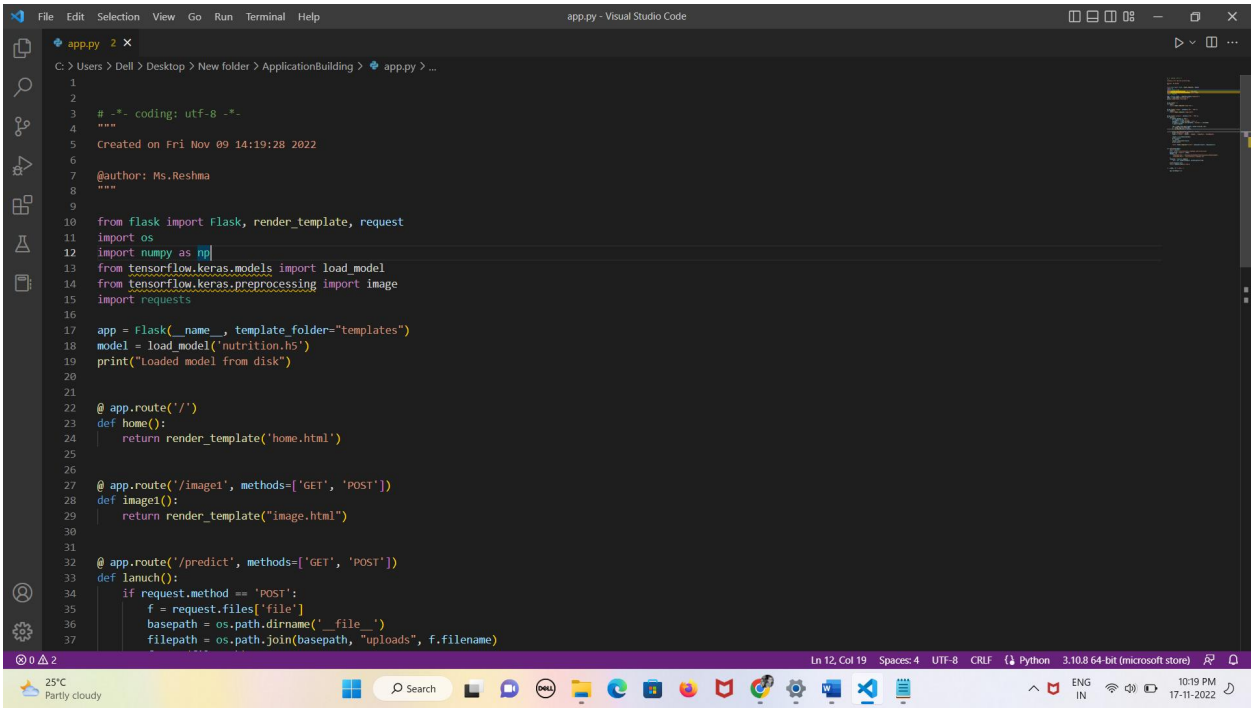
11. FUTURE SCOPE

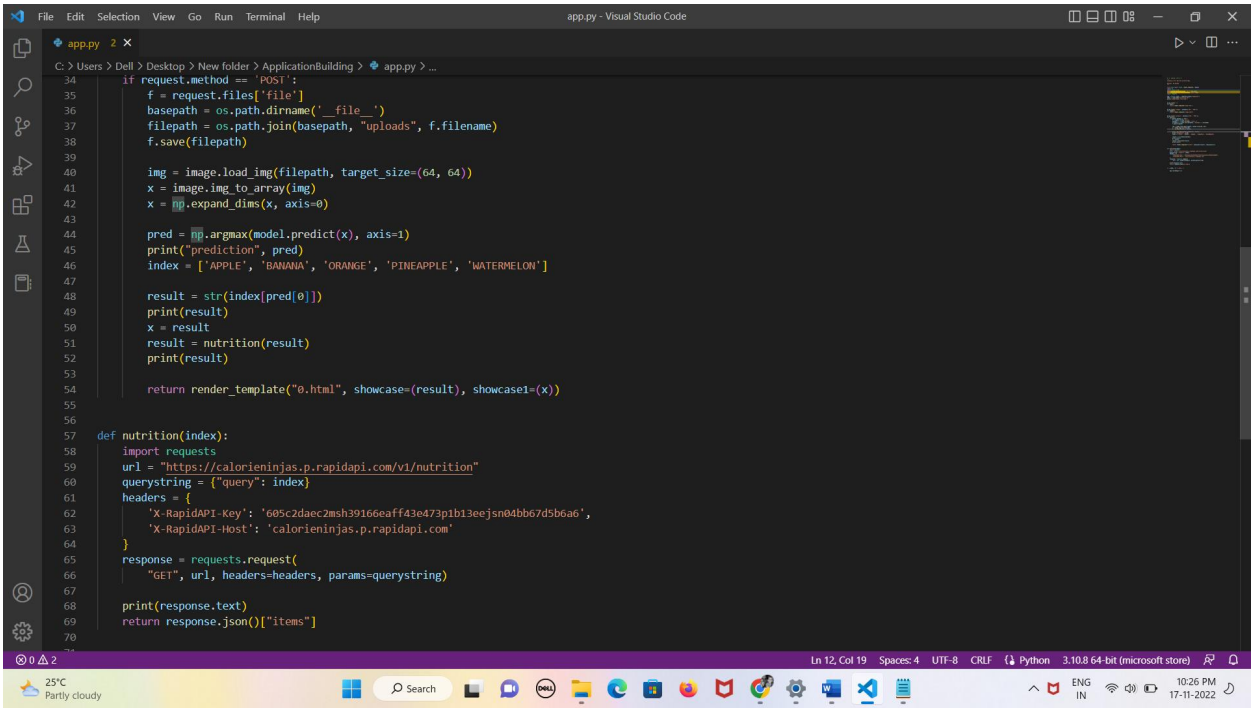
Hopefully, in the future, this project can be extended with a larger dataset having more categories of fruits & vegetables. We will also have the plan to implement some other CNN based models to compare the accuracy on the same dataset, can also work on some more features for grading and classification, which can identify types of disease and/or texture structure of fruits. All these are future direction.

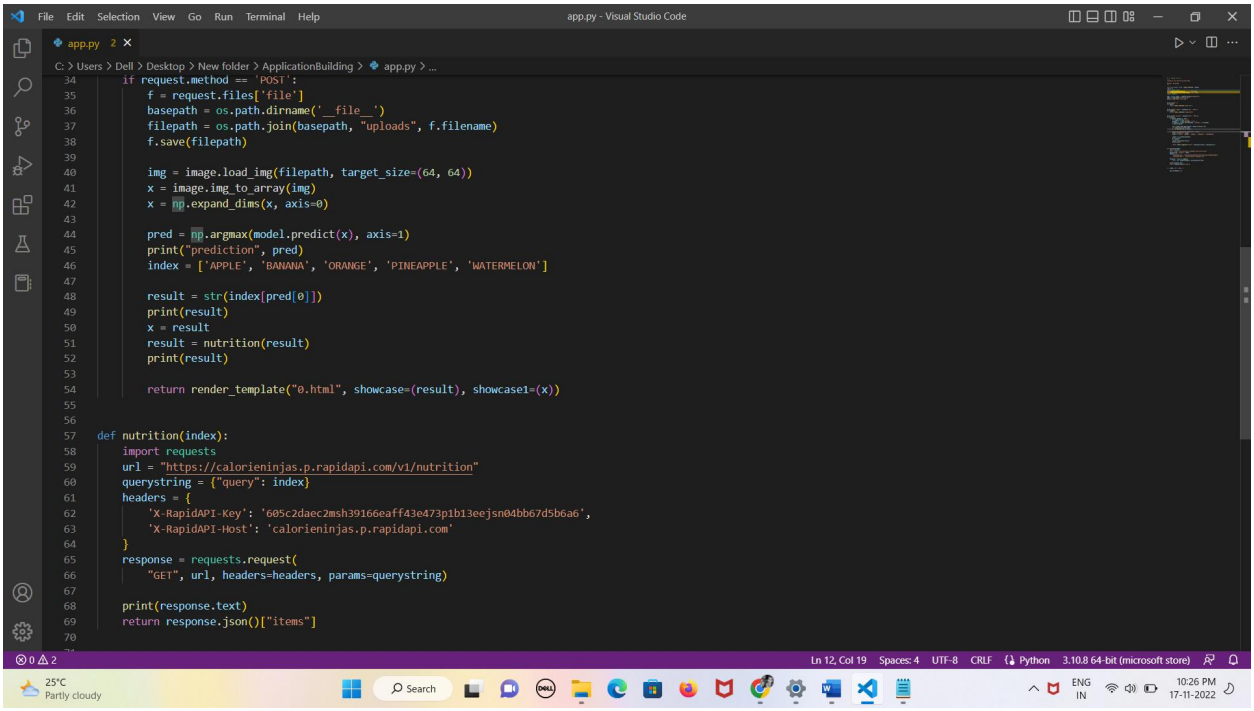
12. APPENDIX

Source Code

app.py


File Edit Selection View Go Run Terminal Help
app.py - Visual Studio Code
app.py 2
C: > Users > Dell > Desktop > New folder > ApplicationBuilding > app.py > ...
-*- coding: utf-8 -*-
"""
Created on Fri Nov 09 14:19:28 2022
@author: Ms.Reshma
"""
from flask import Flask, render_template, request
import os
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
import requests
app = Flask(__name__, template_folder="templates")
model = load_model('nutrition.h5')
print("Loaded model from disk")
@ app.route('/')
def home():
return render_template('home.html')
@ app.route('/image1', methods=['GET', 'POST'])
def image1():
return render_template("image.html")
@ app.route('/predict', methods=['GET', 'POST'])
def lanuch():
if request.method == 'POST':
f = request.files['file']
basepath = os.path.dirname('__file__')
filepath = os.path.join(basepath, "uploads", f.filename)
Ln 12, Col 19 Spaces: 4 UTF-8 CRLF Python 3.10.8 64-bit (microsoft store)
25°C
Partly cloudy
Search
ENG
IN
10:19 PM
17-11-2022


File Edit Selection View Go Run Terminal Help
app.py - Visual Studio Code
app.py 2
C: > Users > Dell > Desktop > New folder > ApplicationBuilding > app.py > ...
if request.method == 'POST':
f = request.files['file']
basepath = os.path.dirname('__file__')
filepath = os.path.join(basepath, "uploads", f.filename)
f.save(filepath)
img = image.load_img(filepath, target_size=(64, 64))
x = image.img_to_array(img)
x = np.expand_dims(x, axis=0)
pred = np.argmax(model.predict(x), axis=1)
print("prediction", pred)
index = ['APPLE', 'BANANA', 'ORANGE', 'PINEAPPLE', 'WATERMELON']
result = str(index[pred[0]])
print(result)
x = result
result = nutrition(result)
print(result)
return render_template("0.html", showcase=(result), showcase1=(x))
def nutrition(index):
import requests
url = "https://calorieninjas.p.rapidapi.com/v1/nutrition"
querystring = {"query": index}
headers = {
'X-RapidAPI-Key': '605c2daec2msh39166eaff43e473p1b13eejsn04bb67d5b6a6',
'X-RapidAPI-Host': 'calorieninjas.p.rapidapi.com'
}
response = requests.request(
"GET", url, headers=headers, params=querystring)
print(response.text)
return response.json()["items"]
Ln 12, Col 19 Spaces: 4 UTF-8 CRLF Python 3.10.8 64-bit (microsoft store)
25°C
Partly cloudy
Search
ENG
IN
10:26 PM
17-11-2022



GitHub & Project Demo Link

https://github.com/IBM-EPBL/IBM-Project-20494-1659721401