AI POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

TECHNOLOGY:ArTIFICIAL INTELLIGENCE

DOMAIN:HEALTH CARE

TEAM ID: PNT2022TMID30357

PROJECT REPORT

submitted by

Kokila.A	**611419104034**	**Computer Science And Engineering**	**Mahendra Engineering Collge For Women**
Kanipriya.M	**611419104030**	**Computer Science And Engineering**	**Mahendra Emgineering College For Women**
Kaliyammal .T	**611419104028**	**Computer Science And Engineering**	**Mahendra Engineering Collge For Women**
Pooncholai.C	**611419104052**	**Computer Science And Engineering**	**Mahendra Engineering College For Women**

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1.INRODUCTION

a. Project Overview

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.

The main aim 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.

b. Purpose

Nutrition Analyzer helps in the detailed and perfect determination of the component nutrients present in any food item. Food components have vast bio metabolic roles and could affect human health severely.

2.LITERATURE SURVEY

a. Existing Problem

Controlled intake of nutrition is recommended as a condition forbeing a healthy individual. Knowing and monitoring how much food is consumed during the day following the calorie and nutrition of these foods helps tocontrol healthy nutrition. However, there is no proper assistance to achieve it. Nutritional intake is fundamental to human growth and health, and the intake of different types of nutrients and micro-

nutrients can affect health. The content of the diet affects the occurrence of disease, with the incidence of many diseases increasing each year while the age group at which they occur is gradually decreasing. The consumption of a wide variety of food items is necessary in order for the human body to obtain the right amounts of nutrients. Failing to follow such a well-balanced diet, in combination with a generally unhealthyway of living, has been shown to increase the risk for cardiovascular disease, type II diabetes and some forms of cancer.

b. References

1. "Approximate Estimation of the Nutrition's of Consumed Food by Deep Learning" by İbrahim Berkan Aydilek Published in 2017 International Conference on Computer Science and Engineering (UBMK), IEEE, 2017.

2. "Validation of a deep learning system for the full automation of bite and meal duration analysis of experimental meal videos"D Konstantinidis, K Dimitropoulos, B Langlet, PDaras… - Nutrients, 2020

3. "Precision Nutrient Management Using Artificial Intelligence Based on Digital Data Collection Framework" by Hsiu-An Lee, Tzu-Ting Huang, Lo-Hsien Yen, Pin-Hua Wu, Kuan-Wen Chen, Hsin-Hua Kung, Chen-Yi Liu and Chien-Yeh Hsu Appl.Sci.2022,12,4167

4. "AI Nutrition Recommender System" by Thamos Theodoridis, Vassilios Solachidis, Kosmos Dimitropoulos, Lazaros Gymnopoulos and Petros Daras in the 12th Pervasive Technologies Related to Assistive Environments Conference

a. Purpose of the AI powered Nutrition Analyzer is to help individuals who needs a proper nutrition assistant to achieve fitness, to cure diseases through foods or to lead a healthy lifestyle. With the help of Artificial Intelligence, it was possible to achieve a proper nutrition analyser which is capable of showing the nutrition content of the food when we give the picture.

C.Problem Statement Definition

Ideal situation:

Ideally, a Nutrition Analyzer is available which will help people in assisting the nutrition analysis and help them in maintaining good health.

Reality:

Currently there is no ideal nutrition analyzer is available. Those which are available, fails to satisfy the needs of the people. Some are not personalized while some are very complicated to be accessed by everyone. Hence, there is no Nutrition analyzer to guide and assist people.

Consequences:

People tend to consume food without the knowledge of nutrition content of the food. This results in nutrition imbalance leading to nutrition deficiencies and diseases.

Proposal:

Our project of Nutrition Analyzer for Fitness Enthusiasts Focus on Developing a simple Nutrition Analyzer which is capable of analyze the nutrition in the food by giving the picture of the food. This is achieved by Artificial Intelligence with Python, Deep learning ,CNN etc..

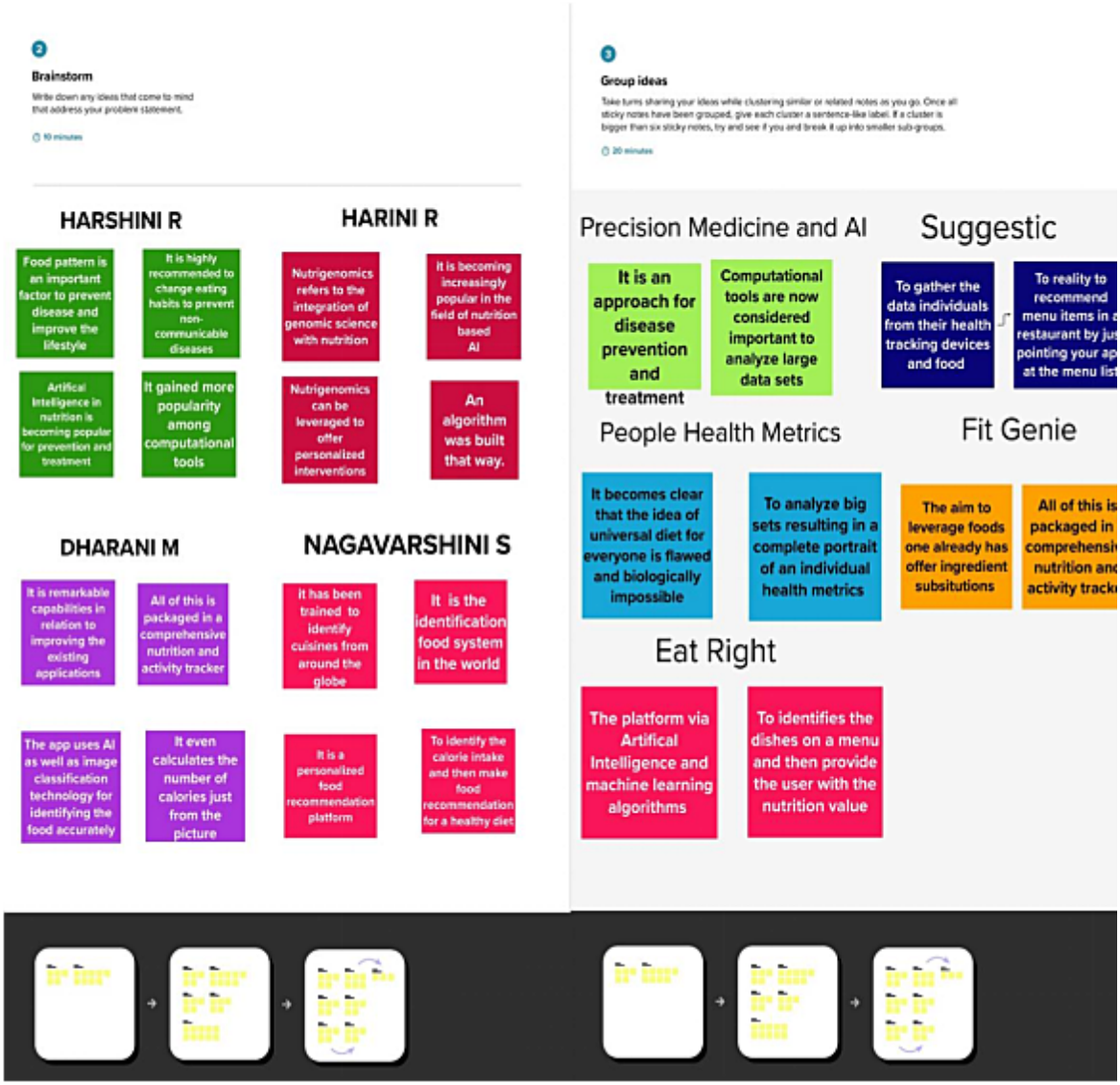
3.IDEATION AND PROPOSED SOLUTIONS

a. Empathy Map Canvas

Empathy mapping is a simple yet effective workshop that can be conducted with a variety of different users in mind, anywhere from stakeholders, individual use cases, or entire teams of people. It can be conducted by many different teams such as design teams, sales, product development or customer service. Essentially, it is an exercise that seeks to get inside the head of the customer as they interact with your product/service.

Nutrition Analyzer does the process of determining the nutritional contet of the food that provides information about chenical composition , processing, quality conntrol and containation of food

The following empathy map helped us to understand the customer needs and their expections and to develop our Nutrition Analyser.



a.Proposed Solution

1. Problem Statement

Food is essential for human life and has been the concern of many healthcare conventions. Nowadays it has become even more difficult for people to understand their daily eating habits, exploring nutrition patterns and maintain a healthy diet.

2. Solution Description

In order to guide people to follow healthier eating habits nutrition analyzer has to be introduced. Nutritional analyzer does 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.

3. Novelty/Uniqueness

Consult Online Doctor/ Nutritionist, Research on some websites based on the nutrition and Chat- bots in which we can able to answer all our queries based on importantly in Calories, Nutritional Food content, Diet plans, Balanced food based charts etc.. This also gives the correct solution and answer for the Nutrition to get fit in our life.

4. Social Impact/ Customer Satisfaction

Being Healthy is very important and our project will help those who are trying to maintain their health. There are different food available and there are many undesirable contents in the food. Many people consume them unconsciously. Our project paves way for conscious eating and to control what we eat. This will help many people who are trying to eat according to their body needs like people with health conditions or some people who likes to consume healthy content. This can create a great awareness among the people and help them in many ways

5. Business Model

The person using nutrition analyzer may avoid spending time and money for nutrition analyst instead by paying the less premium amount can communicate with nutritional specialists and get benefited.

6. Scalability of Solution

AI powered Nutrition Analyzer for fitness provides the clear procedure daily consumption of food maintain a healthy diet. According to their tracking system for the person nutrients intake can increased or decreased.

b.Problem-Solution Fit

1.Customer Segments:

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recommendatio
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nutrition pattern
exploration
Classification of
food based on
its nutrients

1. Triggers

   To maintain good heath and to regulate their eating. Good intake of foods

2. Emotion Before/After

   Before: Depressed, Exhausted, Confused, Tense on body shape

   After : Confidence, Delightful, Encouraged, Motivated,

   Customer became mentally and physically fit

3. Available Solutions

   - ➤ They can hire a personal nutritionist.
   - ➤ They can consult dietitians
   - ➤ They can use apps such as My Fitness Pal, Chronometer, Life Sum, etc...

4. Customer

   Lack of kowledge on understanding everything and go beyond onn calorie counting, scared on getting help from the resources on anlayzer, whether the premiun amount for the premium is acceptable for the customers.

5. Behaviour

   Consulting doctors or utritionist, enquiuries about the food to be consumed, refer articles such as magazine, newsapaper, watching excercises and yoga , searching it in websites ,etc.....

6. Channels of Behavior

   Refering Articles, Checking websites related on nutrition, Consulting nutritionist on online, etc....

7. Problem Rootcause
   a. Fast paced lifestyle
   b. Availability of low quality food
   c. Nutrition less food
   d. Improper diet plan
   e. Lack of health related awareness
   f. Emotional Eating
   g. Improper food timings

8. Solution

   Food has the power to influence metabolismm and health directly. If food is the reason nutrition is the result, Hence we should give high importance to proper nutritiion. Our project "AI Powered Nutrition Analyzer" helpspeople to get to know the nutrition content in their food and improve body health.

9.Problem Rootcause
   a. Fast paced lifestyle
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   e. Lack of health related awareness
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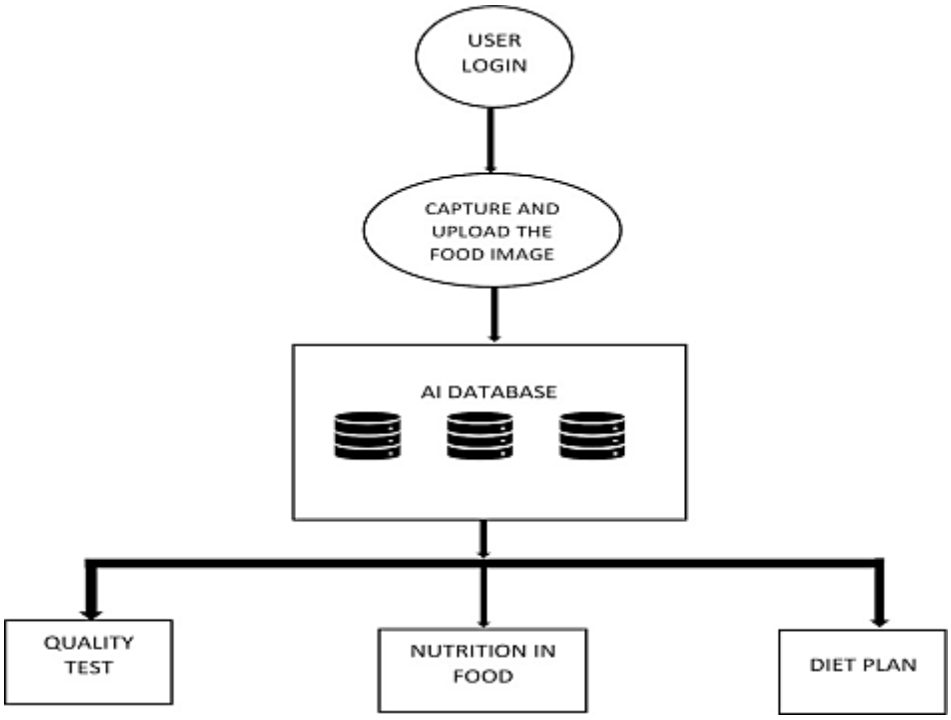
5.PROJECT DESIGN

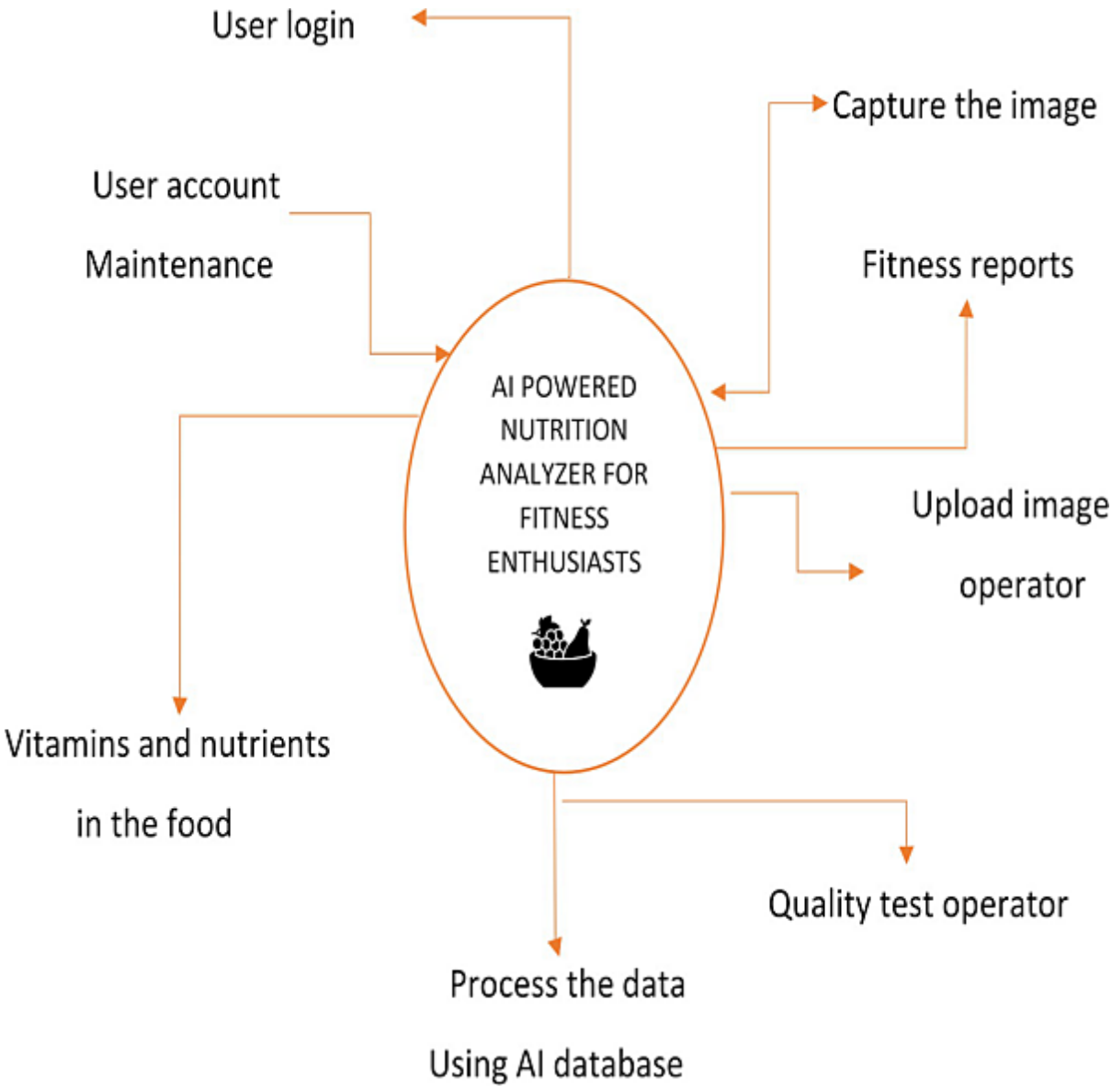
a. Data flow diagrams

Simplified Data flow:



the"Analyze Food" and wait for sometime. The AI database process the image.

i. The tool fuguring out image and page automatically give the information about food such that the quality off the food, Nutrition , then issue the diet and fitness plan for the user.


User login
Capture the image
User account
Maintenance
Fitness reports
AI POWERED
NUTRITION
ANALYZER FOR
FITNESS
ENTHUSIASTS
Upload image
operator
Vitamins and nutrients
in the food
Quality test operator
Process the data
Using AI database

a. Technical and Solution Architecture

Technical Architecture:

ABSTRACT :

- The main aim of the project is to building a model which is used for classifying the fruit, vegetables, spinach, fish, meat, Green leafy vegetables etc….. depends on the different characteristics like colour, shape, texture etc.

- Here the user can capture the images of different fruits, vegetables, spinach, Green leafy vegetables, fish, meat , etc.. 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.).

- 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.

- This solution helps fitness enthusiasts to do Nutritional analysis of food which provides information about the chemical composition, processing, and quality control of food.

- The chance of occurrence of error is minimal since the model provides more precise reports of the analysis.

OBJECTIVES:

- Being healthy should be an integral component of your life. A Healthy intake of food can assist in the prevention of chronic diseases and long-term ailments.

- What you eat is closely related to your health. Eating a healthy diet can help boost your immune systems, help you maintain a healthy weight and can improve your overall health.

- The importance of diet can't be overstated for a healthy lifestyle. People get the vitamins, minerals and nutrients they need to function and thrive from the foods they eat, so choosing foods that offer the most of those components helps improve quality of life.

- It's just as important to limit foods that are high in fat, sugar, sodium and cholesterol as it is to choose healthy foods.

- Nutrition helps in functioning, maintaining, or improving important bio metabolisms like building muscles, producing energy, thriving body cells, improving body health, replenish malnourishment, and strengthening immunity. If food is the reason, Nutrition is the result.

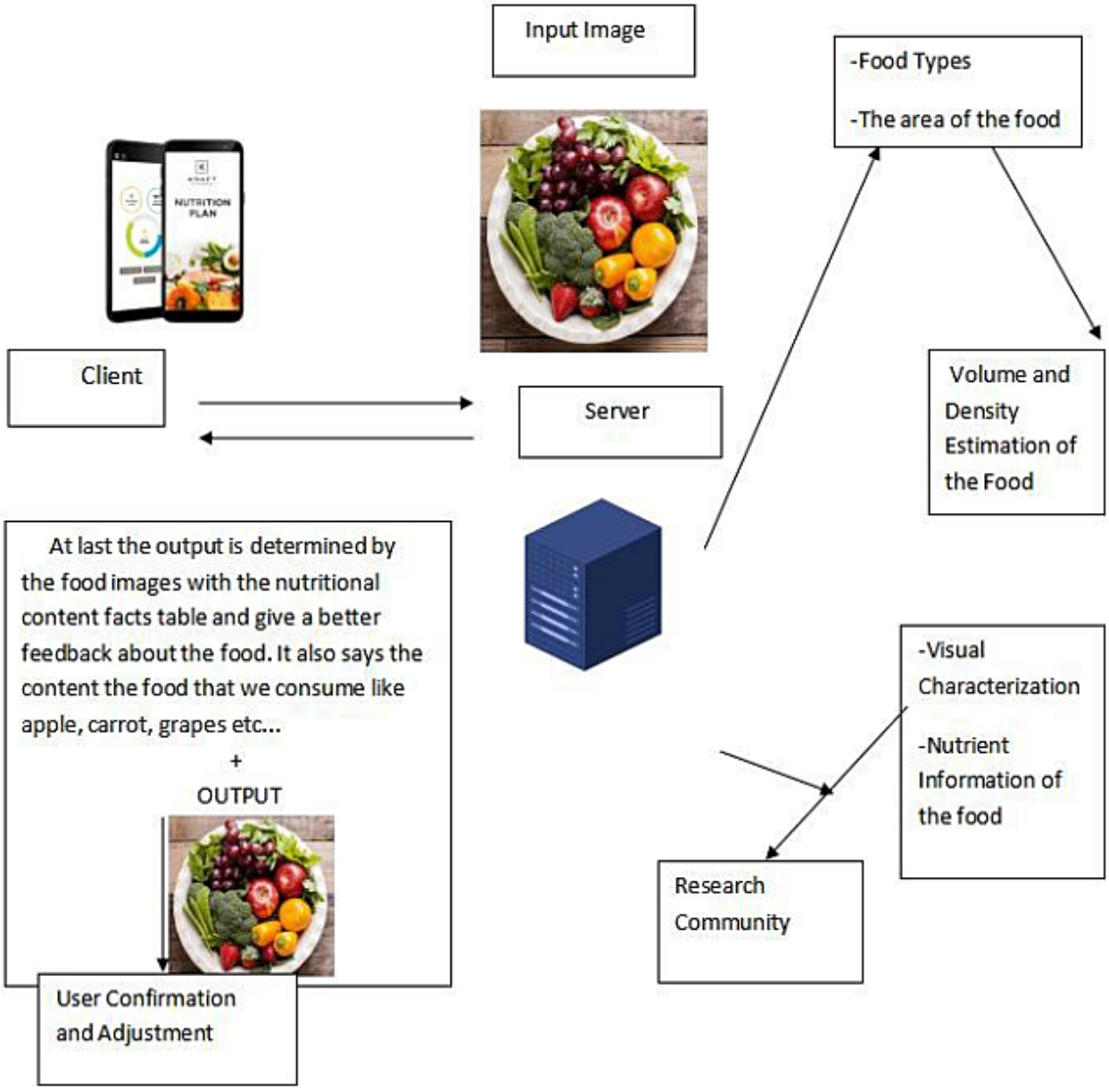
- Consumers have become more concerned over the quality and compositions of their food purchases, the contained ingredients, and the presence of additives and contaminants. Therefore, knowledge of the chemical and biochemical composition of foods is important to the health, well-being, and safety of the consumers.

- We consume food so that we can obtain proper nutrition. Hence it is very important for us to know the composition of nutrients in our food.

- Through a nutrition analyzer we can measure the nutrients and with that information we can make a healthy diet by adding

nutrients required for our body and excluding which is not good for health.

TECHNOLOGY ARCHITECTURE



Solution Architecture:

Being healthy should be an integral component of your life. A Healthy intake of food can assist in the prevention of chronic diseases and long-term ailments. What you eat is closely related to your health. Eating a healthy diet can help boost your immune systems, help you maintain a healthy weight and can improve your overall health. The importance of diet can't be overstated for a healthy lifestyle. People get the vitamins, minerals and nutrients they need to function and thrive from the foods they eat, so choosing foods that offer the most of those components helps improve quality of life. It's just as important to limit foods that are high in fat, sugar, sodium and cholesterol as it is to choose healthy foods.Nutrition helps in functioning, maintaining, or improving important bio metabolisms like building muscles, producing energy, thriving body cells, improving body health, replenish malnourishment, and strengthening immunity. If food is the reason, Nutrition is the result. Consumers have become more concerned over the quality and compositions of their food purchases, the contained ingredients, and the presence of additives and contaminants. Therefore, knowledge of the chemical and Biochemical composition of foods is important to the health, well-being, and safety of the consumers. We consume food so that we can obtain proper nutrition. Hence it is very important for us to know the composition of nutrients in our food. Through a nutrition analyzer we can measure the nutrients and with that information we can make a healthy diet by adding nutrients required for our body and excluding which is not good for health.

- This solution helps fitness enthusiasts to do Nutritional analysis of food which provides information about the chemical composition, processing, and quality control of food.

- The chance of occurrence of error is minimal since the model provides more precise reports of the analysis.

- First, the user captures the images of the food and uploads it.

- Next, the image will be sent to the trained model.

➤ The model will classify the food based on the different characteristics like colou

a. User Stories

Functional Requirement (Epic)	User Story Number	User Story / Task
Data Collection & Image Processing		
	USN-1	Collect images of different food items organized into subdirectories based on their respective names
	USN-2	Import and configure the Image data generator library from Keras
	USN-3	Apply Image data generator functionality to training set and testing set
	USN-4	Improving the image data that suppresses unwilling distortions or enhances some image features important for further processing
Model Building & Testing		
	USN-5	Importing the model building libraries and Initializing the model
	USN-6	Adding CNN layers, Dense layers & other necessary layers and Compile the model
	USN-7	Train & Test the model based on the image dataset

Application building		
	USN-8	Create HTML pages to design the front-end part of the web page
	USN-9	Create the flask application and loading the model file
	USN-10	Routing to the HTML page and Running the application
Cloud integration		
	USN-11	Train the model on Cloud

7.CODING & SOLUTIONING

a. Feature 1

i. AI-powered Nutrition Analyzer for Fitness Enthusiasts

ii. The main aim of the project is to building 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.).

iii. Languages:Python

iv. Tools/IDE:Google Collaboratory, JupyterNotebook

v. Libraries:Recommendation

```
from flask import Flask,render_template,request
# Flask-It is our framework which we are going to use
to run/serve our application. #request-for accessing file
which was uploaded by the user on our application.
import os
import numpy as np #used for numerical analysis
from tensorflow.keras.models import
load_model#to load our trained model from
```

```
tensorflow.keras.preprocessing import image
import requests


app = Flask(__name__
,template_folder="templates") # initializing a
flask app # Loading the model
model=load_model
('nutrition.h5')
print("Loaded
model from disk")


@app.route('/')# route
to display the home
page def home():
    return render_template('home.html')#rendering the home page

@app.route('/image1',methods=['GET','POST
'])# routes to the index html def image1():
    return render_template("image.html")



@app.route('/predict',methods=['GET', 'POST'])# route to show
the predictions in a web UI def launch():
    if
        request.metho
        d=='POST':
        f=request.files
        ['file']
        #requesting
        the file
        basepath=os.path.dirname('__file__')#storing the file directory

filepath=os.path.join(basepath,"uploads",f.filename)#storing the file in uploads fold
        f.save(filepath)#saving the file
```

```
img=image.load_img(filepath,target_size=(64,64)) #load and
reshaping the image x=image.img_to_array(img)#converting
image to an array x=np.expand_dims(x,axis=0)#changing the
dimensions of the image

pred=np.argmax(m
odel.predict(x),
axis=1)
print("prediction",p
red)#printing the
prediction
index=['APPLES','BANANA','ORANGE','PINEAPPLE','WATERMELON']
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    return
render_template("0.html",showcase=(result),
showcase1=(x)) def nutrition(index):


  url =

  "https://calorieninjas.p.rapidapi.

  com/v1/nutrition" querystring =

  {"query":index}

  headers = {
    'x-rapidapi-key':
    "5d797ab107mshe668f26bd044e64p1ffd34jsnf47b
    fa9a8ee4", 'x-rapidapi-host':
    "calorieninjas.p.rapidapi.com"
    }
  response = requests.request("GET", url, headers=headers,
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    params=querystring) print(response.text)

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1. RESULTS:

Performance Metrics

Output link : https://github.com/IBM-EPBL/IBM-Project-3466-1668781480/blob/main/OUTPUTS.pdf

10.ADVANTAGES AND DISADVANTAGES

Advantages:

- Food and food habits are ever-changing and evolving. People and professionals need to quickly adapt to new food products, diets, and changing preferences. The best way to instantly adapt to these changes is to have software that changes and adapts with you.
- Using automated nutrition analysis software will allow you to free up more time to innovate or grow your business. If you find a nutrition analysis software that has all the features you

need, you can create much more time to focus on improving your business.

➤Features such as a quick preview of nutrients while adding foods to diets, menus, and recipes give you the ability to save time when new recipes and food products are introduced.

➤ Having quick and easy software to help them plan their meals will save you tons of time.

Disadvantages:

➤This methodology is still limited by its dependency on time-consuming and error-prone manual video annotations,with many studies resorting to the use of multiple human annotators.

➤Often suffers from reliability issues.

➤ It is extremelyexpensive due to semantics analysismodel andnutritional analysis model.

➤ In order to make recommendations, the system needs tocollect nutritional needs from users. Most of the information is only provided through continuous interactions with users. However, in reality, recording nutritional intake from users cannot avoid faults because users usually forget or give wrong informationabout the foodsthey have consumed.

➤ Moreover deep learningrequires expensive GUIs andhundreds of machines. This increases the cost to the users.

11.CONCLUSION

Food is essential for human life and has been the concern of many health care conventions. In this project we have built a nutrition analysis model that classifies the nutritional content of the food through the image uploaded by the user. Such Nutritional analysis helps people understand their daily eating habits, exploring nutrition

patterns and maintaining a healthy diet. It is a vital part of analytical chemistry that provides information about the chemical composition, processing, quality control and contamination of food.

The nutritional analysis model is implemented using Convolutional neural network and the web application is built and implemented using Flask framework. As for the future work, the model can be trained and tested on more datasets to provide accurate results and better performance.

12.FUTURE SCOPE

The future scope of this project is very brod. Few of them are:

1. The model could be trained using vast database in order to increase the accuracy of results.
2. The Backend framework of the web application can be improved so that the uploaded images can be handled appropriately.
3. In addition to the nutrition analysis, the application can also be designed to provide recipes that can be prepared using the nutrient-rich foods
4. A database can also be implemented for the system so that users can save their data and relook into it later.
5. The Web application can be further developed and launched as an Android App so that anyone anywhere with or without internet connection can access it and get benefited from its use cases.

13.APPENDIX

Source Code:

App.py

```
from flask import Flask,render_template,request
# Flask-It is our framework which we are going to use
to run/serve our application. #request-for accessing file
which was uploaded by the user on our application.
```

```
import os
import numpy as np #used for numerical analysis
from tensorflow.keras.models import
load_model#to load our trained model from
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to display the home
page def home():
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@app.route('/predict',methods=['GET', 'POST'])# route to show
the predictions in a web UI def launch():
    if request.metho
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        f=request.files
        ['file']
        #requesting
        the file
        basepath=os.path.dirname('_file_')#storing the file directory
```

```
filepath=os.path.join(basepath,"uploads",f.filename)#storing the file in uploads
folder f.save(filepath)#saving the file

img=image.load_img(filepath,target_size=(64,64)) #load and
reshaping the image x=image.img_to_array(img)#converting
image to an array x=np.expand_dims(x,axis=0)#changing the
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axis=1)
print("prediction",p
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prediction

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        return
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showcase1=(x)) def nutrition(index):


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    "https://calorieninjas.p.rapidapi.

    com/v1/nutrition" querystring =

    {"query":index}

    headers = {
        'x-rapidapi-key':
        "5d797ab107mshe668f26bd044e64p1ffd34jsnf47b
        fa9a8ee4", '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__":
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MODEL BUILDING AND DEPLOYEMENT

Preprocessing

In [52]:

```
from keras.preprocessing.image import ImageDataGenerator

train_datagen=ImageDataGenerator(rescale=1./255,shear_range=0.2,zoom_range=0.2,horizontal_flip=True)
test_datagen=ImageDataGenerator(rescale=1./255)
```

Importing data into ibm Platform

In [53]:

```
import os, types
import pandas as pd
from botocore.client import Config

import ibm_boto3

def __iter(self): return 0
```

```
# @hidden_cell
# The following code accesses a file in your IBM Cloud Object
Storage. It includes your credentials.
# You might want to remove those credentials before you share the notebook.
cos_client = ibm_boto3.client(service_name='s3',
    ibm_api_key_id='WImD1lYFgLr7ETzVUrUheKzW-
    cdRHnZBTZU5S49O9gq3',
    ibm_auth_endpoint="https://iam.cloud.ibm.com/oidc/t
    oken", config=Config(signature_version='oauth'),
    endpoint_url='https://s3.private.us.cloud-object-
    storage.appdomain.cloud')

bucket = 'imageclassification-
donotdelete-pr-ohyztlr8kisyqz'
object_key = 'Nutrition
classifier_zipped.zip'

streaming_body_1 = cos_client.get_object(Bucket=bucket, Key=object_key)['Body']

# Your data file was loaded into a botocore.response.StreamingBody object.
# Please read the documentation of ibm_boto3 and pandas to learn
more about the possibilities to load the data.
# ibm_boto3 documentation:
https://ibm.github.io/ibm-cos-sdk-python/ #
pandas documentation:
http://pandas.pydata.org/


if not hasattr(streaming_body_1,"_iter_"):streaming_body_1._iter=
types.MethodType(_iter_,streaming_body_1)

from io import BytesIO
from zipfile import ZipFile
unzip = ZipFile(BytesIO(streaming_body_1.read()),'r') file_paths =
unzip.namelist()
for path in file_paths: unzip.extract(path)
```

```
import os
filenames = os.listdir('/home/wsuser/work/Nutrition  classifier/TEST_SET')
```

Applying preprocessing to train and test set

```
x_train=train_datagen.flow_from_directory(r'/home/wsuser/work/Nutrition
                                          In [54]:
                                          In [55]:
                                          In [56]:
                                          In [57]:

classifier/TRAIN_SET',target_size=(64,64),batch_size=5,color_mode
='rgb',class_mode='sparse') x_test =
train_datagen.flow_from_directory(r'/home/wsuser/work/Nutrition
classifier/TEST_SET',target_size=(64,64),batch_size=5,color_mode='
rgb',class_mode='sparse') Found 2626 images belonging to 5 classes.
Found 1055 images belonging to 5 classes.



print(x_test.class_indices)
{'APPLES': 0, 'BANANA': 1, 'ORANGE': 2, 'PINEAPPLE': 3, 'WATERMELON': 4}

from collections import Counter as c
c(x_train.labels)

Counter({0: 606, 1: 445, 2: 479, 3: 621, 4: 475})

import numpy as np
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras import layers
from tensorflow.keras.layers import Dense,Flatten
from tensorflow.keras.layers import Conv2D,MaxPooling2D,Dropout
from keras.preprocessing.image import ImageDataGenerator
```

Model Creation

```
model=Sequential()
classifier=Sequential()

classifier.add(Conv2D(32,(3,3),input_shape=(64,64,3),activation='relu'))
classifier.add(MaxPooling2D(pool_size=(2,2)))
classifier.add(Conv2D(32,(3,3),activation='relu'))
classifier.add(MaxPooling2D(pool_size=(2,2)))
classifier.add(Flatten())
classifier.add(Dense(units=128,activation='relu'))
classifier.add(Dense(units=5,activation='softmax'))

classifier.summary()
Model:
"sequential_3"
```

In [58]:

In [59]:

Out[59]:

In [60]:

In [61]:

In [62]:

In [63]:

```
 Layer (type)Output ShapeParam #
=================================================================
====
 conv2d_2 (Conv2D)(None, 62, 62, 32)896

 max_pooling2d_2 (MaxPooling  (None, 31, 31, 32)0
 2D)

 conv2d_3 (Conv2D)(None, 29, 29, 32)9248

 max_pooling2d_3 (MaxPooling  (None, 14, 14, 32)0
 2D)
```

flatten_1 (Flatten)(None, 6272)0

dense_2 (Dense)(None, 128)802944

dense_3 (Dense)(None, 5)645

==========
====
Total params: 813,733
Trainable params: 813,733
Non-trainable params: 0

In [64]:

```
classifier.compile(optimizer='adam',loss='sparse_categorical_crossentropy',metrics
=['accuracy'])
```

In [65]:

```
classifier.fit_generator(generator=x_train,steps_per_epoch=len(x_train),epochs=
2
,validation_data=x_test,validation_steps=len(x_test))
classifier.fit_generator(generator=x_train,steps_per_epoch=len(x_train),epochs= 2
,validation_ data=x_test,validation_steps=len(x_test))
```

Epoch 1/2
526/526 [==========] - 32s 59ms/step - loss: 0.1204 -
accuracy: 0.
9539 - val_loss: 0.0825 -
val_accuracy: 0.9611
Epoch 2/2
526/526 [==========] - 32s 61ms/step - loss: 0.0455 -
accuracy: 0.
9863 - val_loss: 0.0702 - val_accuracy: 0.9754

<keras.callbacks.History at 0x7fc5ba836e80>

```
classifier.save('/home/wsuser/work/nutrition.h5')

!tar -zcvf image-classification-model_new.tgz nutrition.h5 nutrition.h5

ls -1
image-classification-model_new.tgz
'Nutrition classifier'/
nutrition.h5
```

Creating Cloud Deployment Space

```
! pip install watson-machine-learning-client --upgrade


from ibm_watson_machine_learning import APIClient wml_credintials = {
   "url" : "https://us-south.ml.cloud.ibm.com",
   "apikey" : "3EMrL-7wESBZLFCk0abidBdj4Pnlz-7Hsiqd3E39NCQX"
                                        Out[65]:

                                         In [17]:

                                         In [18]:


                                         In [19]:


                                         In [20]:

}


client = APIClient(wml_credintials)

def guid_from_space_name(client,space_name):
   space = client.spaces.get_details()
   return(next(item for item in space['resources'] if item['entity']['name'] ==
```

space_name)['metadata']['id'])

space_uid = guid_from_space_name(client , 'imageclassification') print("Space UID = "+ space_uid)
Space UID = 68f147b7-3c13-4157-be5a-85a5c50f29ee

client.set.default_space(space_uid)

'SUCCESS'

In [22]:

In [23]:

In [24]:

Out[24]:

In [25]:

software_spec_uid = client.software_specifications.get_uid_by_name("tensorflow_rt22.1- py3.9")
software_spec_uid

Out[25]:

'acd9c798-6974-5d2f-a657-ce06e986df4d'

Deploying Model into Deployment Space

model_details = client.repository.store_model(model = 'image-classification- model_new.tgz' , meta_props = {
client.repository.ModelMetaNames.NAME:"CNN",
client.repository.ModelMetaNames.TYPE : "tensorflow_2.7",
client.repository.ModelMetaNames.SOFTWARE_SPEC_UID : software_spec_uid
})

model_id = client.repository.get_model_uid(model_details) model_id

'bbd12864-53fb-4b64-ab1f-11d45246f865'

Downloading the model

client.repository.download(model_id, 'nutrition_analyzer2_model.h5')
In [28]:

Out[28]:

In [29]:

GitHub Link : https://github.com/IBM-EPBL/IBM-Project-3466-1668781480