REPORT

A NOVEL METHOD FOR AI -POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

TEAM ID: PNT2022TMID00650

TABLE OF CONTENTS

AI-POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

<div align="center">**CHAPTER -1**</div>

1.1 **PROJECT OVERVIEW**

Food is essential for human life and has been the concern of many healthcare conventions. N owadays new dietary assessment and nutrition analysis tools enable
more opportunities to help people understand their daily eating habits, exploringnutrition pat terns and maintaina healthy diet.
Nutritional analysis is the process of determining the nutritional contentof food. It is a vital p art of analyticalchemistry that provides information about the chemicalcomposition, processi ng, qualitycontrol and contamination of food

1.2 PURPOSE

The main aim of the project is to building a model which is used for classifying the
fruit depends onthe different characteristics like colour, shape, texture etc. Here the user ca n capture the images ofdifferent fruits and then the image will be sent the trained model. Th emodel analyses the image and detect the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.).

1. **LITERATURE SURVEY**

    a. ## Existing problem

Neutrino delivers nutrition-
based data services and analytics to its users and wants to turninto a
leading source of the nutrition-related platform. The platform employs NLP
and mathematical models from the optimization theory as well as predictive
analysis to enableindividualized data compilation.
The application relies on Artificial Intelligence to produce custom data
related to smart calorie counter powered by AI. Their artificial intelligence
learns an individual's
tastes, preferences, andbody type. All of this is packaged in a comprehensiv e nutrition and activitytracker.

2.3 Problem Statement Definition

The main aim of the project is to building a model which is used for classifying the
fruit depends onthe different characteristics like colour, shape, texture etc.
 Here the user can capture the images ofdifferent fruits and then the imag e will be sent the trained model. Themodel analyses the image and detect the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.).

<div align="center">**IDEATION PHASE & PROPOSED SOLUTION**</div>

EMPATHY MAP

BRAINSTORMING
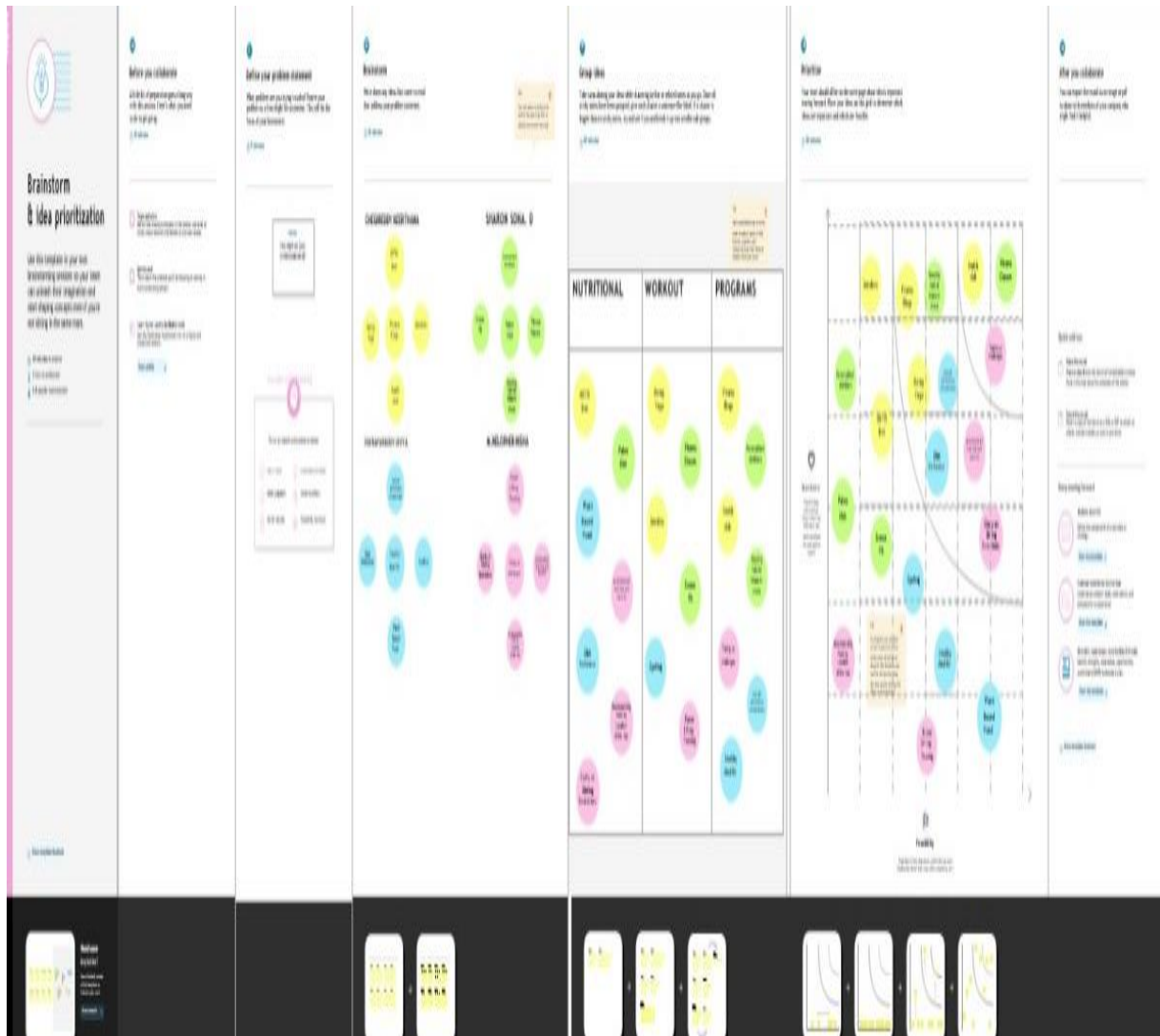
3.2 PROPOSED SOLUTION

S.NO	PARAMETERS	SOLUTIONS
1.	Problem Statement	• Main objective is to detect the nutrition in a fruit from camera captured image. • The identification of nutrition and calories from a image is quite an interesting field. • Since nutrition monitoring plays an important role in leading healthy lifestyle, this product has the potential to become an essential in our day to day life.
2.	Idea / Solution description	• The solution is to develop AI-powered nutrition analyzer application. • By giving the image of the fruit as the input to the application, it will display the nutrition content in it. • By training the model with various inputs, image processing can be improved as well as the accuracy of the result.
3.	Novelty / Uniqueness	• Personalized nutrition for individuals. • Providing science based guidance for healthy living. • Balanced food diet and measured intake. • 24/7 support. • Serving size.
4.	Social Impact / Customer Satisfaction	• Economically stable product. • Change one's view towards health and fitness. • Quality of service. • High fiber food. • Accurate amount of nutrition.
5.	Business Model (Revenue Model)	• User friendly interface which improves the constant use of the product. • Hence, Economical growth improves. • Product will be delivered in pocket size which results in consuming low memory. • Nutrition and fitness related ads to earn profit
6.	Scalability of the Solution	• Offers ingredients substance detail in food • Suggest best health solution and meal plans for different criteria proposed by different individuals. • Virtualization of your long term plan to provide motivation to the customer.

Problem Solution fit

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer'sproblem. It helps entrepreneurs, marketers and corporateinnovators identify beh avioralpatterns

Purpose:

- Solve complex problemsin a way that fits the state of your customers.

- Succeed faster and increase your solution adoption by tapping into existing and channels of behaviour.

- Sharpen your communication and marketing strate gywith the righttriggers andmessaging.

Increase touch-points with your company by finding the right problem-behavior fit andbuilding trust by solving frequent annoyances, or urgent orcostly problems.

S. NO	PARAMETER	DESCRIPTION
1	Problem Statement (Problem to besolved)	An enthusiast must use an AI based analysing software to identify the nutritional content, color,texture,form and other characteristics of food to be taken
2	Idea / Solution description	The main aim of the project is to provide proper and clear identification nutritional content of vitamins
3	Novelty / Uniqueness	The AI based model using DL algorithm detects object in an image or text and provides an enthusiastic individual fitness/foodplan based on nutritional requirements
4	Social Impact / Custome r Satisfaction	Feature of providingacalorie measurement makesan indi vidual to recreate or followthe schedule of fitness and diet.
5	Business Model (Revenue Model)	It is a free platform for the users to make use of the application to know about thecalorie and fitness level.

1. **REQUIREMENT ANALYSIS**

Functional requirement:

It will generate the diet plan as well as monitor the user's health to classify the category of the disease and to create the diet plan. It will also reduce the cost of consulting the person nutritionist.

The task of food detection/classification is not easy as it seems. All possible options related to the given Image.

Image classification, object detection, segmentation, face recognition.

Classification of crystal structure using a convolutional neural network

Nutrition is vital to the growth of the human body. Nutritional analysis guaranteesthat theme al meets the appropriate vitamin and mineral requirements, and the examination of nutrition in food aids in understanding the fat proportion, carbohydrate dilution, pretensioner, sugar, and so on. Another thing to keep inmind is not to exceed our daily calorie requirements

Computer-Assisted Nutritional Recognize Food Images – In order to solve this issue, a brand-new Convolutional Neural Network (CNN)- based food picture identificationsystem was

created, as described in this study.
We utilized our suggested strategyon two setsof actualfood picture data.

- You take a picture, dial in data such as whether you are e ating breakfast or lunchand add aquicktext label, and the app estimates the calorie content.
- This software collaborated with IBM's natural languagec apability to provide24- hourassistance and dietaryrecommendations.

  created, as described in this study.
  We utilized our suggested strategyon two setsof actualfoo d picture data.

- Here the user can capture the images of different fruits and then the image will be sent to the trained model. The model analyses the image and detects the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.)
- The Ultimate Workout at Home Solution This fitness AI software is designed
  with personalized training regimensfor each individual. It bega n as "gym only software,"but hasnow improvedits system to sat isfy "at home fitness" expectations.
- You take a picture, dial in data such as whether you are eating breakfast or lunchand add aquicktext label, and the app estimat es the calorie content.
- This software collaborated with IBM's natural languagec apability to provide24- hourassistance and dietaryrecommendations.
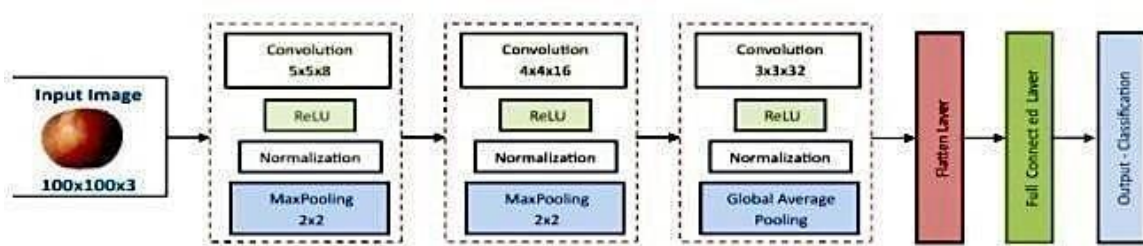
- The comparison of the proposed model with the conventional models shows
  thatthe resultsofthis model are exceptionally good and promisi ngto use in real-worldapplications.

- This sort of higher accuracyand precision will work to boost the machine'sgeneralefficiency in fruit recogniti on more appropriately.
- A generic model for the dietaryprotein requirement (as with a ny nutrient)defines therequirement in termsof the ne eds of the organism,
- i.e. metabolic demands, and the dietary amount which will satisfythose needs, i.e.efficien cy of utilization, thus: dietary requirement = metabolic demand/effi ciency ofutilization.

NON-FUNCTIONAL REQUIREMENTS

FR NO	NON-FUNCTIONAL REQUIREMENTS	DESCRIPTION
NFR-1	Usability	The ways in which the system will accessible to users withparticular or nonstandard accessibilityr equirements
NFR-2	Security	Extend to which data needs to beprotected and kept confidential.
NFR-3	Capacity	Ability to continue to function well as it changes sin according to input that we give
NFR-4	Performance	Fast response is achieved
NFR-5	Scalability	Ability of the application to handle an increase in workload without performance degradation, or it's ability to quickly enlarge

PROJECT DESIGN

Data Flow Diagrams:
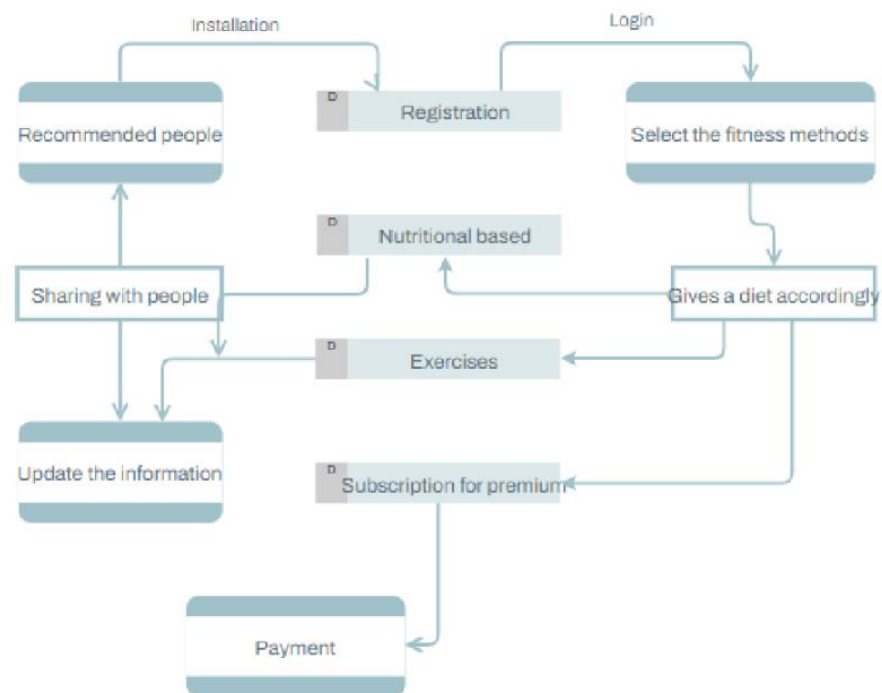
Solution Architecture:

User Stories

Use the below template to list all the user stories for the product.

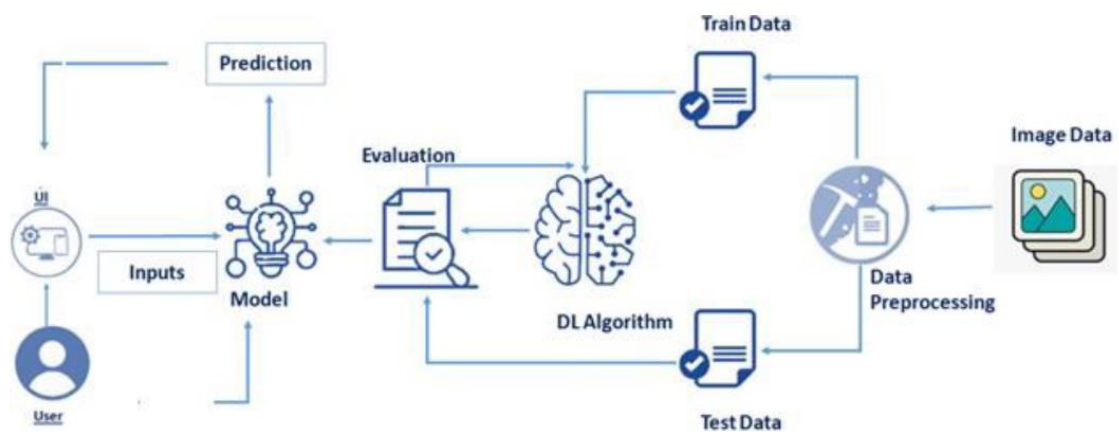| User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can login the Application by entering password	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can login the Application by entering password	High	Sprint-1
	Dashboard	USN-6	As a user I can view my calorie intake by clicking photo of the food I eat	Access the proper information about the nutrition and the calorie intake	High	Sprint-2
	Diet and Exercises	USN-7	As a user, I can select my diet and exercises	Making it more accessible to continue the diet	High	Sprint-2
	Package DB, Dashboard	USN-8	As a user I can choose variety of packages	Selecting an appropriate package	Medium	Sprint-2
Customer Care Executive	Feedbacks	USN-9	As a customer care executive, I collect feedbacks from customers	Maintaining proper environment for the customers	High	Sprint-2
Dietitian	Customer Record	USN-10	As a dietitian, I provide daily plans for the betterment of the user	Positive results from use	High	Sprint-2
Administrator	Dashboard	USN-11	As an administrator I take care of all the operations which takes place in the app	Zero issues from the user	High	Sprint-2

6 PROJECT PLANNING :

6.1 Spirit Delivery Plan:

Every project manager should consider the delivery strategy of the project deliverables as astrategic component. Every project's objective is to deliver a product that fulfils a certain need. The word "purpose" can be used to refer to a wide range of objectives, including those for a chair, a building, a translation, etc. Delivery planning is one of the activities used in Project Spirit to finish the project and display the projected timeline. This delivery plan aids in comprehending the team members' workflow and project procedure. Each individual module is given to a team member so they can showcase their efforts and contributions to the project's development.

Delivery Plan

Spirit Model Planning

Spirit One
- The team should conduct a proof of concept.
- The team should start by outlining the milestones.
- The team should monitor the process efficiency.

Spirit Two
- The team make any fix or adjustment to the process.
- The team should make the prototype for their project.
- The team should start by analysis the project Specification.

Spirit Three
- The team mates should understand the project Flow.
- The team should monitor the process of work.
- The team should follow the project Management System.

Spirit Four
- The team will show the Demo process to team mentor.
- The team mates will updating the project modules in cloud.
- The team make to deploy the final Model for the Testing Process.

Milestone:

Thanks to modern technology, artificial intelligence (AI) model performance is improving. The development of a model that is used to categorise fruit is dependent on various traits, including colour, shape, texture, etc. Here, users can take pictures of various fruits, which are subsequentlyuploaded to a trained algorithm for analysis. The algorithm examines the image and determines the nutritious content of fruits, such as sugar, fibre, protein, calories, etc.).

Activity List:

In Project Management Planning is an Important task to scheduling the phrase of the project to the Team Member. In this Activity can shows the various activity are allocated and Done by the Team Members! In Project we can Split into the Four Step of Phrases are

Phrase 1: Information Collection and Requirement Analysis.Phrase 2: Project Planning and Developing Modules.
Phrase 3: Implementing the High Accuracy Deep Learning Algorithm to Perform. Phrase 4: Deploying the Model on Cloud and Testing the Model and UI Performance
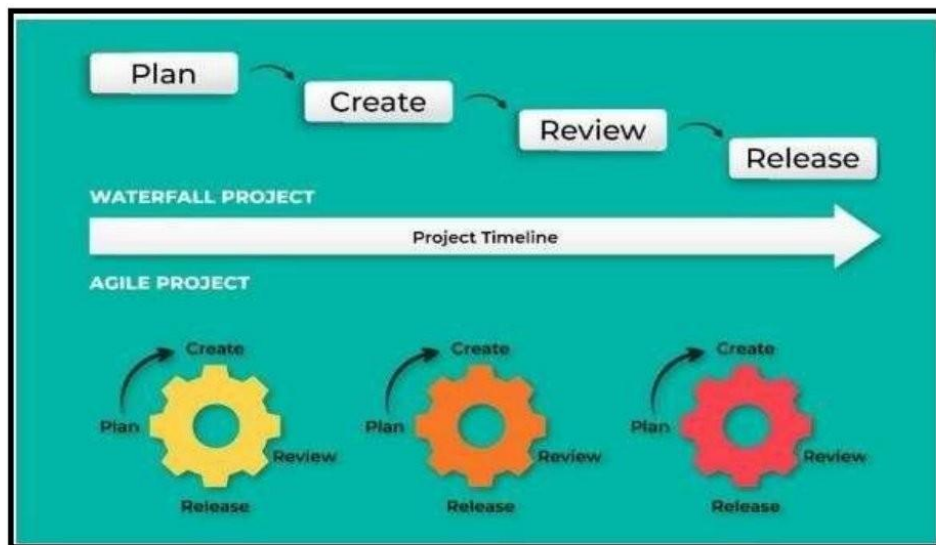
7 CODING AN SOLUTIONING:

7.1 Import The ImageDataGenerator Library

Image data augmentation is a technique that can be used to artificially expand the size of a training dataset by creating modified versions of images in the dataset.

The Keras deep learning neural network library provides the capability to fit models using image data augmentation via the ImageDataGenerator class. Let us import the ImageDataGenerator class from Keras.

```
from keras.preprocessing.image import ImageDataGenerator
```

7.2 Configure ImageDataGenerator Class

ImageDataGenerator class is instantiated and the configuration for the types of data augmentation.

There are five main types of data augmentation techniques for image data; specifically:

Image shifts via the width_shift_range and height_shift_range arguments.
The image flips via the horizontal_flip and vertical_flip arguments.
Image rotations via the rotation_range argument
Image brightness via the brightness_range argument.

Image zoom via the zoom_range argument.An instance of the ImageDataGenerator class can be constructed for train and test.

```
train_datagen= ImageDataGenerator(rescale=1./255,shear_range=0
.2,zoom_range=0.2,horizontal_flip=True)
test_datagen=ImageDataGenerator(rescale=1./255)
```

7.3 Apply Image DataGenerator Functionality To Trainset And Testset

Let us apply ImageDataGenerator functionality to Trainset and Testset by using the following code
For Training set using flow_from_directory function.
This function will return batches of images from the subdirectories'apples', 'banana', 'orange', 'pineapple', 'watermelon' together with labels 0 to 4{'apples': 0, 'banana': 1, 'orange': 2, 'pineapple': 3, 'watermelon': 4}

```
x_train=train_datagen.flow_from_directory(
    r'/content/drive/MyDrive/TRAIN_SET',target_size=(64,64),ba
tch_size=5,color_mode='rgb',class_mode='sparse'
)

x_test=test_datagen.flow_from_directory(
    r'/content/drive/MyDrive/TRAIN_SET',target_size=(64,64),ba
tch_size=5,color_mode='rgb',class_mode='sparse'
)
```

```
print(x_train.class_indices)
print(x_test.class_indices)
from collections import Counter as c
c(x_train .labels)
```

7.4 Initializing The Model

Keras has 2 ways to define a neural network:

- Sequential
- Function API

The Sequential class is used to define linear initializations of network layers which then, collectively, constitute a model. In our example below, we will use the Sequential constructor to create a model, which will then have layers added to it using the add() method.

```
model = models.Sequential()
```

7.5 Compiling the model and Fitting the model

```
#Compiling the model
model.compile(optimizer='adam',
              loss=tf.keras.losses.SparseCategoricalCrossentropy
(from_logits=True),
              metrics=['accuracy'])
#Fitting the model
history = model.fit(train_images, train_labels, epochs=10,
                    validation_data=(test_images, test_labels))
```

7.6 Test The Model

Evaluation is a process during the development of the model to check whether the model is the best fit for the given problem and corresponding data.
Load the saved model using load_model

```
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
model=load_model('nutrition.h5')
```

8 ADVANTAGES AND DISADVANTAGES:
ADVANTAGES:

Yet people consume foods, not nutrients, so it is helpful to view food or a meal as more than just a set of nutrients that impact our health. Some weight-loss diets have assigned a negative connotation to certain nutrients, such as low-fat or low-carbohydrate diets. This can create a view that a specific nutrient is bad, regardless of the role it plays when foods containing that nutrient are consumed as part of a healthy, balanced diet. This model helps in analysing a nutrition in the food.

DISADVANTAGES:

Like anything, there are always drawbacks. In some cases the predicting algorithm may gives the wrong output.

9 CONCLUSION

The good nutrition is fundamental for children's current and future health, as well as their development and learning. The benefits of developing healthy dietary and lifestyle patterns from an early age onwards can positively impact on people's nutrition and health throughout their adult lives, and enhance the productivity of individuals and nations. Nutrition education is an important element in an overall strategy aimed at improving food security and preventing all forms of malnutrition.

Most countries in the region implement school health and nutrition programmes, including school feeding, deworming, vitamin and mineral supplementation, etc. Innovative, creative and effective school nutrition education programmes exist in some countries in the region. However, these are often small-scale and implemented as pilot projects, focus on children with special needs and prioritize the transfer of knowledge over the promotion of active learning and the creation of appropriate attitudes, life skills and behaviors.

10 APPENDIX

MODEL BUILDING:

```python
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)
x_train=train_datagen.flow_from_directory(
    r'/content/drive/MyDrive/TRAIN_SET',target_size=(64,64),batch_size=5,color_mode='rgb',class_mode='sparse'
)

x_test=test_datagen.flow_from_directory(
    r'/content/drive/MyDrive/TRAIN_SET',target_size=(64,64),batch_size=5,color_mode='rgb',class_mode='sparse'
)


print(x_train.class_indices)

print(x_test.class_indices)

from collections import Counter as c
```

```python
c(x_train .labels)


import numpy as np


import tensorflow
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
import tensorflow as tf

from tensorflow.keras import datasets, layers, models
import matplotlib.pyplot as plt
(train_images, train_labels), (test_images, test_labels) = datasets.cif
ar10.load_data()

# Normalize pixel values to be between 0 and 1
train_images, test_images = train_images / 255.0, test_images / 255.0
model = models.Sequential()
model.add(layers.Conv2D(32, (3, 3), activation='relu', input_shape=(32,
 32, 3)))
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Conv2D(64, (3, 3), activation='relu'))
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Conv2D(64, (3, 3), activation='relu'))
model.add(layers.Flatten())
model.add(layers.Dense(64, activation='relu'))
model.add(layers.Dense(10))
model.summary()
#Compiling the model
model.compile(optimizer='adam',
              loss=tf.keras.losses.SparseCategoricalCrossentropy(from_l
ogits=True),
              metrics=['accuracy'])
#Fitting the model
history = model.fit(train_images, train_labels, epochs=10,
                    validation_data=(test_images, test_labels))
#Saving our model
model.save('nutrition.h5')
#Prediciting our results
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
model=load_model('nutrition.h5')
img=image.load_img('/content/drive/MyDrive/1_100.jpg',target_size=(70,7
0))
```

```
img
x= image.img_to_array(img)
x = np.expand_dims(x, axis=0)
index=['APPLES', 'BANANA', 'ORANGE', 'PINEAPPLE', 'WATERMELON']
result=str(index[0])
result
```

Flask Application And Loading Our Model By Using Load_model Method

app.py

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

import numpy as np

import requests
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='template') #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():
    print("Loaded model from disk")
    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 lanuch():
    if request.method=='POST':
        f=request.files['file'] # requesting the file
        f
        basepath=os.path.dirname('__file__') #storing the file directory
        print(basepath)
        filepath=os.path.join(basepath,"test",f.filename)
```

```python
        #storing the file in uploads folder
        f.save(filepath) #saving the file

        img=image.load_img(filepath,target_size=(32,32)) #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(model.predict(x), axis=1)
        print("prediction",pred) #printing the prediction
        index=['APPLE','BANANA','ORANGE','BANANA','WATERMELON','WATERMELON','W
ATERMELON','APPLE','BANANA','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": "85887549f4msh51e7315b280a87ep1f43e0jsn585c940f2ea6",
    "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__":
    # running the app
    app.run(debug=False)
```

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-	13674-1659525295.git

DEMO LINK:

https://drive.google.com/drive/folders/1IppP1M8puzH445vCIdAkL25TqbTuO12L?usp=sharing