

HINDUSTHAN INSTITUTE OF TECHNOLOGY, COIMBATORE

DEPARTMENT OF INFORMATION TECHNOLOGY

Project Based Experiential Learning Program

(Nalaiya Thiran)

**AI POWERED NUTRITION ANALYZER FOR FITNESS
ENTHUSIASTS**

BATCH : 2019-2023

YEAR : FINAL YEAR

SEMESTER : VII

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INTRODUCTION

PROJECT REVIEW:

- The science of food and nutritional analysis has developed rapidly in recent years
- Food scientists analyze foods to obtain information about their composition, appearance, texture, flavor, shelf life, etc., and also to guarantee the quality of the product.
- the term food and nutritional analysis is often thought only to be concerned with the determination of food composition and its nutritive value/quality.
- Food is essential for human life and has been the concern of many healthcare conventions
- It is a vital part of analytical chemistry that provides information about the chemical composition, processing, quality control and contamination of food.
- 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.).

PURPOSE:

- 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.
- 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

LITERATURE SURVEY

Existing problem

S.NO	TITLE AND AUTHOR	METHODOLOGY	ADVANTAGE	DRAWBACK
1	AI Mathematical AI based Diet Analysis and Transformation Model (2018)- L.K.Gautham ,S.A.Ladhake.	The AI Based mathematical model for diet optimizing using fuzzy algorithm and search space methaheuristic algorithm	Solve the common national problems of public health problems.	In this model not to be reached well.
2	Food Recognition based on Deep Learning Algorithms(2022) Roslina Mohamad,Shahrani Shabuddin.	The model based on Convolution Neural Network(CNN).	Easily to Recognises of Training foods.	In this model backup details is not recorded on the database
3	Food Recognition and Calorie Measurement and image Processing(2019)- Karan Gigoo, Vinitha Muralidharan.	The model based on Convolution Neural Network(CNN).	In this model 78.7% testing accuracy with 93.29% training accuracy.	It is clearly lacking appropriate regulations and some ethical ,and financial transformation

4	Diet Monitoring and Health Analysis Using Artificial Intelligence(2019)- R.Divya , S.Vithiya Lakshmi .	The model based on IOT and visual seniors.	Model can be identified accurately by the classifiers.	AI cannot learn to think outside the box.
5	Healthily Me(2012) Trushar Vahisht and Mathew Cherian .	The food in plate technique and approach to life that we all need to embrace whole heartedly.	This is software and include the lifestyle tracker ,first calorie counter are valuable	It's take some time otherwise platform is good.

REFERENCES:

1. Jeukendrup A.E.,Killer S.C. The myths surrounding pre-exercise carbohydrate feeding .
2. Coyle E.F.,Coggan A.R.,Hemmert M.K.,Lowe R.C., Walters T.J. Substrate usage during prolonged exercise following a preexercise meal.
3. Ahlborg-Conus N., Felig P. Influence of glucose ingestion on fuel-hormone response during prolonged exercise.
4. Marmy-conus N., Fabris S. Preexercise glucose ingestion and glucose kinetics during exercise.
5. DeFronzo R.A., Ferrannini E., Hendler R., Felig P., Wahren J. Regulation of splanchnic and peripheral glucose uptake by insulin and hyperglycemia in man.

PROBLEM STATEMENT DEFINITION:

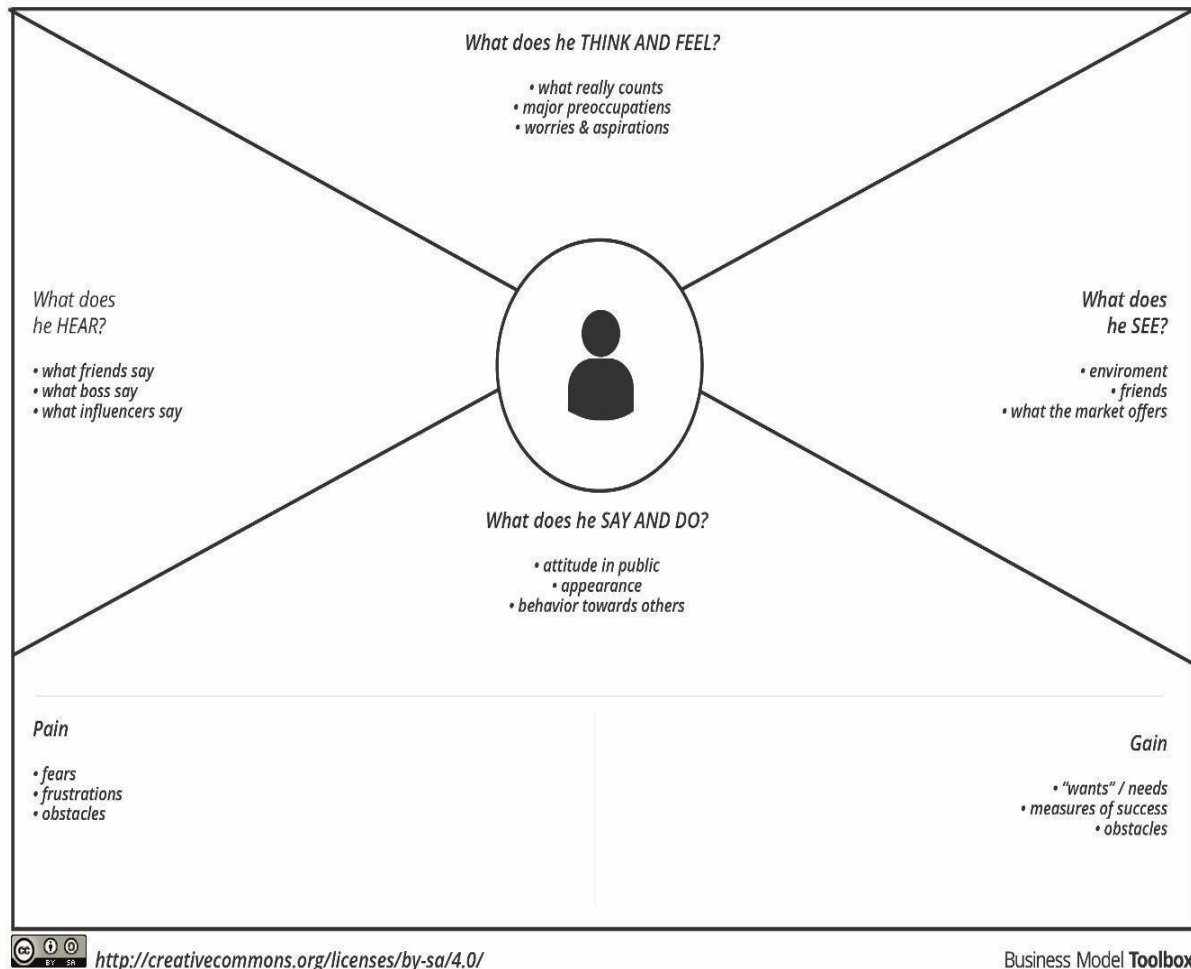
- Person 1-Diabetes person who can't control the sugar level because of busy and not able to take a food on time.
- Person 2-The person who wants classification of fruits and find the values of nutrients in food.
- Person 3-Obesity person who tries fit body and if he is a foody person , likes varieties of foods and which makes him Tired.
- Person 4- Old peoples whose try to keep good health but not able to have a proper medicine due medicine price so they become weaker.
- Person 5 - Sport person who tries to get more energy but not much knowledge in food, because of lack of food information so he can't take proper stamina.

IDEATION &AND PROPOSED SOLUTION

EMPATHY MAP CANVAS:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to helps teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

Empathy Map



IDEATION AND BRAINSTORMING:

- We need to create a application for fitness enthusiasts to monitor their nutrients intake and tracking their diet.
- An for identify the fruits and their nutrients value based on the user providing image.
- To create full functional application to track and maintain healthy life style.

- AI algorithm which understand and predict the nutritional, fitness and proteins in your body.
- From this application the user can provide and plan to prepare his own diet chart.
- AI which also helpful to avoid the human error which is imbalanced in food.
- It predicts the complex and non-linear interaction between nutrients.
- This application also reminds the water intake notification based on water content in your body.
- Articles and blogs related and fitness and healthy lifestyle.
- This application which also helps in diet and health tracking application.
- Tracking your health condition which leads improve your health and fitness of your body.
- This is easy as getting the image as input from user for processing the image.
- This is also known for a Weight management tool.
- It will calculate the proteins and calories according to the given user input.

PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement:	<p>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.</p> <p>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.</p>
2.	Idea / Solution description	<p>The idea of this application is that the user can capture the images of different fruits and vegetables, 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, Calorie intake, etc.). The above idea is achieved by using the</p>

		Convolution Neural Network (CNN) . Fruit Recognition using Colour and Texture Features .
3.	Novelty / Uniqueness	The application has several unique features. The main feature is that the user need not have to visit or consult a Nutritionist (or) a Dietician to follow a fit and healthy diet. This application has the feature of analysing the entire nutritional content of fruits and vegetables by simply scanning them. It provides for a personalized dietary requirement for individuals who have limited preferences while choosing food.
4.	Social Impact / Customer Satisfaction	This will acquire knowledge and provide information about nutrition. Now a days, no one follows the diet plan. Providing this information, they come to know about the nutrition present in each food item. It is used to schedule a diet plan by taking the image of a food item and if we send it, we can get information about each food nutrition like carbohydrates, fat, proteins, vitamins, minerals and sugar. This will help others to improve their health and fitness.
5.	Business Model (Revenue Model)	Social media is the best way to spread the word about our application and with the help of influencers we can attract normal people. Clustering and targeting the fitness people with the help of local gyms. Allowing third-party vendors(Nutritional Products) to sell their products through our app via advertisements is way to generate

		money. If the products sold through advertisements, then it is even better.
6.	Scalability of the Solution	Artificial intelligence (AI) can be used to predict investment outcomes quickly and effectively, as well as to devise strategies or establish long-term goals. Scalable AI pertains to how data models, infrastructures, and algorithms can increase or decrease their complexity, speed, or size at scale in order to best handle the requirements of the situation at hand. As improvements continue with data storage capacities as well as computing resources, AI models can be created with billions of parameters. Scaling up nutrition is a global push for action and investment to improve maternal, child nutrition and various health problems.

PROBLEM SOLUTION FIT

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) Who is your customer? i.e. working parents of 0-5 y.o. kids	6. CUSTOMER CONSTRAINTS What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.	5. AVAILABLE SOLUTIONS Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking	Explore AS, differentiate
	Focus on J&P, tap into BE, understand RC	2. JOBS-TO-BE-DONE / PROBLEMS Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.	9. PROBLEM ROOT CAUSE What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations.	
Identify strong TR & EM		3. TRIGGERS What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.	10. YOUR SOLUTION If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.	8. CHANNELS of BEHAVIOUR 8.1 ONLINE What kind of actions do customers take online? Extract online channels from #7
	4. EMOTIONS: BEFORE / AFTER How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure > confident, in control - use it in your communication strategy & design.	8.2 OFFLINE What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.		

REQUIREMENT ANALYSIS:

FUNCTIONAL REQUIREMENTS

1.System Interface

A furit classfication processing system – The system will access the user information processing system via its web services.

2.User Interfaces

User of the system will have access to graphical user interface. There is no command line user interface.

3.Hardware Interfaces

The user must have a smartphone or laptop

4.Software Interfaces

The app will be built using Python Framwork

5.Performance Requirements

The performance requirements are as follows:

- *System login shall take less than 5 seconds.*
- *Only one user can login from same device.*
- *Shall return results within 10 seconds.*
- *Diet plans shall be processed within 120 seconds.*

App will be working 24 hours a day and 7 days a week.

NON-FUNCTIONAL REQUIREMENTS

1. Reliability :

The average time of failure shall be 7 days. If the app crashes then a backup should be given in 7 days.

2. Availability :

available to users 24 hours a day, 7 days a week. If the bug appears then it should be handled within 12 hours.

3. Security :

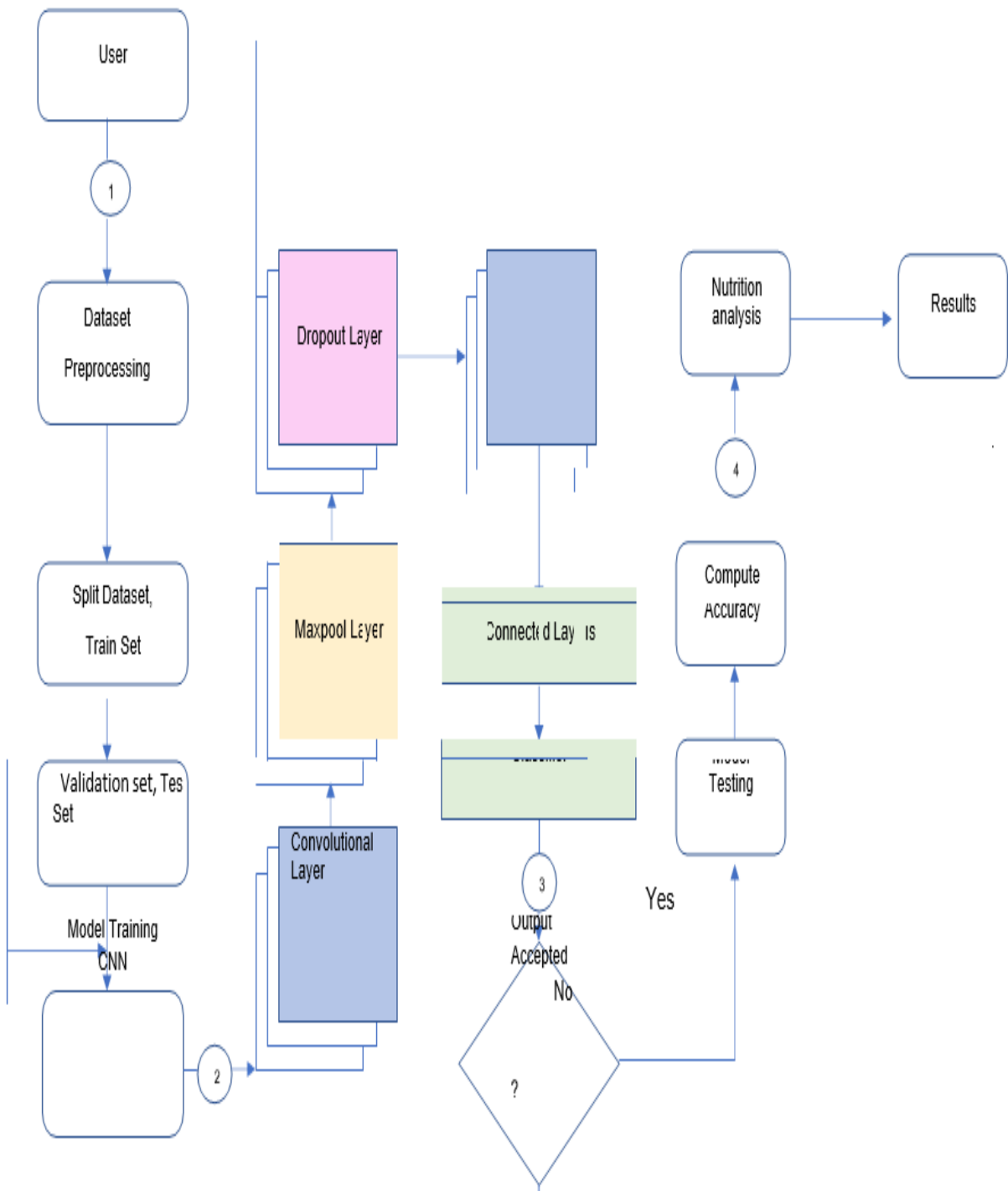
Users will be able to access only their personal information and not that of other users. Medical conditions and payment methods will be handled through a secure server to ensure the protection of user's credit card and personal information.

4. Maintainability:

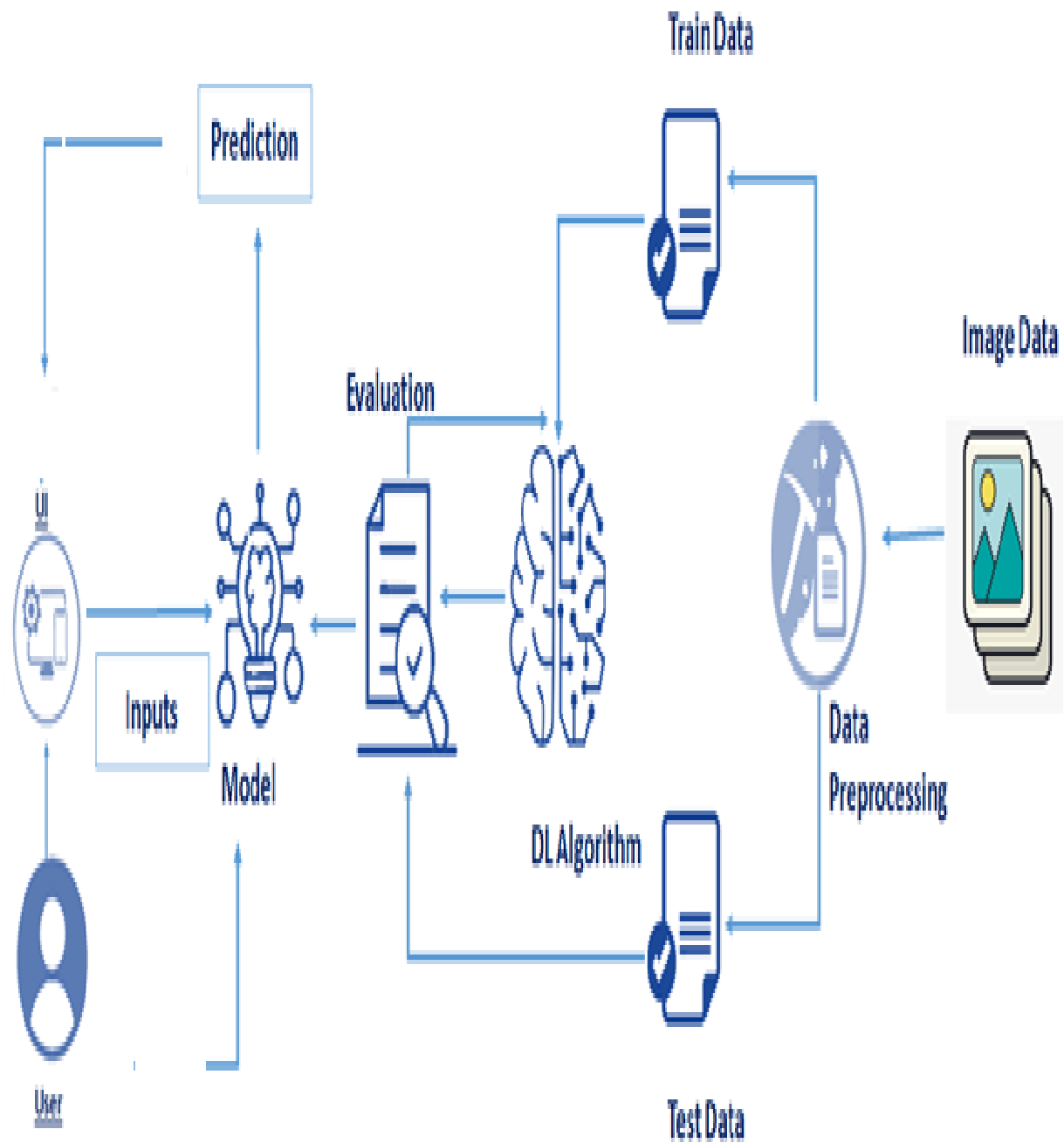
Any updates or detected fixes shall be made on server-side computers only without any patches required by the user.

PROJECT DESIGN

DATA FLOW DIAGRAMS



SOLUTION & TECHNICAL ARCHITECTURE:



USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Web user)	Upload	USN-1	As a user, I can upload the image by gallery	I can uploaded the image	High	Sprit-1
Customer (Web User)	Upload	USN-2	As a user, I can upload the image by take image using camera	I can upload the image	Low	Sprit-2
Customer (Web User)	Registration	USN-3	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account	High	Sprit-1
Customer (Web User)	Login	USN-4	As a user, I can log into the application by entering email & password	I can access my account	High	Sprit-1
Customer Care Executive	Enquiry/Customer services	USN-1	As a customer care executive, I can get the feedback and make report	I can interact with user	Medium	Sprit-1
Administrator	update	USN-1	As a administrator, I can update the performance	I can update and give more functionality	Medium	Sprit-1
Administrator	Add information	USN-2	As a administrator, I can add some extra information about the services	I can improve the access	Low	Sprit-2
Maintenance Team	Maintenance	USN-1	As a member, maintain the any technical problems or the any other issues in the system	I can maintaining the services	High	Sprit-1

PROJECT DESIGN:

Sprint Planning & Estimation

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story / Task	Priority	Team Members
Sprint-1	Registration	As a user, I can register for the application by entering my email, password, and confirming my password.	High	Team Member-1, Team Member-2
Sprint-1		As a user, I will receive confirmation email once I have registered for the application	High	Team Member-1, Team Member-2
Sprint-1		As a user, I can register for the application through Facebook	Low	Team Member-1, Team Member-2
		As a user, I can register for the application through Gmail	Medium	Team Member-1, Team Member-2
	Login	As a user, I can log into the application by entering email & password	High	Team Member-1, Team Member-2
	Dashboard	As a user, I can view my profile and update my details	Low	Team Member-1, Team Member-2
		As a user, I can change my password	High	Team Member-1
Sprint-2		As a user, I can view my personal calorie calendar	High	Team Member-3, Team Member-2
Sprint-2	Data Collections	Download Food Nutrition Dataset & data collections	High	Team Leader, Team Member-3
	Data Preprocessing	Importing The Dataset into Workspace & image preprocessing	High	Team Leader, Team Member-3
	Model Building	Initializing The Model and training and testing model	High	Team Leader, Team Member-3

		Model Evaluation, save model	Medium	Team Leader, Team Member-3
Sprint-3	Data Storage	In the application, the calorie value of different food items are stored using a database	High	Team Leader, Team Member-2
	Application Building	Create an HTML File Create an CSS File, Create an JavaScript File	High	Team Leader, Team Member-1
		Build Python Code	High	Team Leader, Team Member-3
		Showcasing Prediction On UI	Medium	Team Member-2, Team Member-1
	Nutrition Analyzer	Provide diet plans and exercise	Medium	Team Member-2, Team Member-1
Sprint-4	Diet Plan Specification	As a user, I can specify my target based on which I receive personalized diet plans	High	Team Leader, Team Member-1
	Train The Model On IBM	Register For IBM Cloud And train The ML Model On IBM	Medium	Team Leader, Team Member-2
		Integrate Flask with Scoring End Point	Medium	Team Leader, Team Member-3
		Create User acceptance testing and performance testing	High	Team Leader, Team Member-2
	Feedback Forms	reviews and ratings	Low	Team Member-1, Team Member-3

Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	05 Nov 2022

Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	19 Nov 2022

Reports from JIRA

Jira helps teams plan, assign, track, report, and manage work and brings teams together for everything from agile software development and customer support to startups and enterprises. Software teams build better with Jira Software, the #1 tool for agile teams

The screenshot displays the Jira Software interface for a project titled "AI POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS". The main view is the "Backlog", which is currently empty. The interface includes a left sidebar with navigation options like "Roadmap", "Backlog", "Board", "Code", "Project pages", "Add shortcut", and "Project settings". The top navigation bar shows "Jira Software" and various filters. A right sidebar provides help articles and documentation links. The bottom of the screen shows a Windows taskbar with the date and time as 12:10 on 19-11-2022.

CODING & SOLUTIONING

Feature 1

BMI CALCULATION:

The Body Mass Index (BMI) Calculator can be used to calculate BMI value and corresponding weight status while taking age into consideration. Use the "Metric Units" tab for the International System of Units or the "Other Units" tab to convert units into either US or metric units. Note that the calculator also computes the Ponderal Index in addition to BMI, both of which are discussed below in detail.

The screenshot displays the FIT-NUTRO BMI Calculator web application. The interface includes a sidebar with navigation options: Dashboard, INTERFACE, Track body Nutritions, ADDONS, prediction, and Diet Tracker. The main content area is titled "BMI" and contains a "BMI calculator" section. This section has input fields for "Weight:" (57) and "Height:" (169), a green "check BMI" button, and a display showing "BMI Value: 19.96" and "Normal weight". To the right, a "Result" section features a semi-circular gauge with a needle pointing to the "Normal weight" range (green). Below the gauge, a legend indicates: Under weight (yellow), Normal Weighth (green), and Over Weight (red). At the bottom, there is a section titled "Information about BMI". The browser's address bar shows the URL "127.0.0.1:5000/bmi".

(Note: Source Code given below)

Feature 2

BMR CALCULATION:

The basal metabolic rate (BMR) and calorie calculator is an excellent tool for estimating how many calories your body needs on a daily basis depending on the amount and intensity of your exercise regime.

The screenshot displays a web browser window with the address bar showing "127.0.0.1:5000/bmr". The page title is "FIT-NUTRO - BMR". The interface includes a sidebar with navigation links: Dashboard, INTERFACE, Track body Nutrients, ADDONS, prediction, and Diet Tracker. The main content area is titled "BMR" and contains a description: "The basal metabolic rate (BMR) and calorie calculator is an excellent tool for estimating how many calories your body needs on a daily basis depending on the amount and intensity of your exercise regime." Below this is a "BMR calculator" form with the following fields: Age (21), Gender (Male selected, Female unselected), Weight (64), Height (165), and Activity (Lightly active (light exercise/sports 1-3 days/week)). A green "Calculate" button is present. The result is displayed as "BMR Value: 2241.44". To the right of the form, there is a section titled "The calculator uses two formulas to calculate your body's daily calorie requirements" with two sub-sections: "1. Basal Metabolic Rate (BMR) Formula:" and "2. Harris Benedict Formula:". The bottom of the page shows a Windows taskbar with various application icons and a system clock indicating 11:01 on 18-11-2022.

BMR

The basal metabolic rate (BMR) and calorie calculator is an excellent tool for estimating how many calories your body needs on a daily basis depending on the amount and intensity of your exercise regime.

BMR calculator

Age: 21

Gender: ☒ Male ☐ Female

Weight: 64

Height: 165

Activity: Lightly active (light exercise/sports 1-3 days/week)

Calculate

BMR Value: 2241.44

The calculator uses two formulas to calculate your body's daily calorie requirements

1. Basal Metabolic Rate (BMR) Formula:
The basal metabolic rate formula takes several variables like height, weight, age and gender to calculate your calorie needs as if you did not do any exercise.

2. Harris Benedict Formula:
The Harris Benedict Formula takes the number produced by the BMR formula and multiplies it depending on your activity level.

Information about BMR

Feature 3

DIET TRACKER:

It may be worthwhile if you want to lose weight and improve health. That is because you will need to make changes to your regular habits if you want to lose weight. Nutrition tracking can help by increasing awareness of what and how much you eat and drink and holding yourself accountable.

While calorie counting focuses on precise measurements of all food portions, nutrition tracking is less obsessive and includes more emphasis on other aspects of food and eating patterns.

The screenshot shows a web browser window with the URL `127.0.0.1:5000/diet_tracker`. The application is titled "FIT-NUTRO AI" and has a sidebar menu with options: "Dashboard", "INTERFACE", "Track body Nutritions", "ADDONS", "prediction", and "Diet Tracker". The "Diet Tracker" page is active, displaying a form with the following fields:

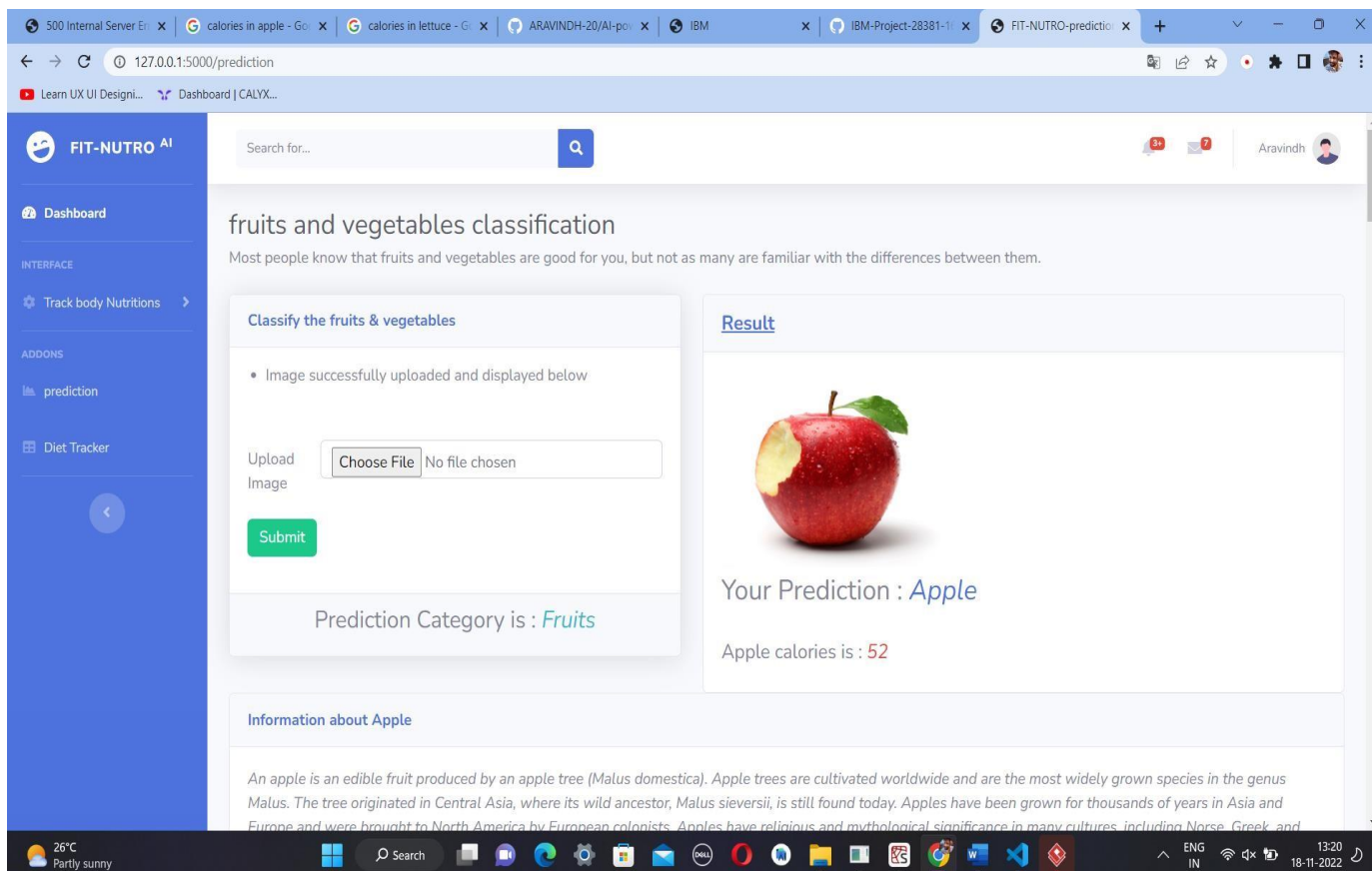
- breakfast calories:
- lunch calories:
- dinner calories:
- exercise:
- bmr:

Below the form, there is a link: "if you want calucate bmr value,Click here". A green "Submit" button is at the bottom of the form.

Feature 4

fruit and vegetable classification

Morphology is a discipline of science that focuses on the exterior structure and characteristics of living systems. It is largely concerned with the investigation of plant forms, morphological characteristics, and the relative placements of various plant components. The study of exterior aspects of flowering plants is referred to as the morphology of flowering plants. The root system and the shoot system are the two primary exterior elements of a plant. Plant morphology encompasses the structure, functions, characterizations, and other morphological components of flowering plants' roots, stems, leaves, flowers, fruits, and seedlings.



TESTING

Test Cases

Verify user is able to see login page

Verify user is able to loginto application or not?

Verify user is able to navigate to create your account page?

Verify user is able to recovery password

Veriify login page elements

Verify the BMI calculation

Verify the BMR calculation

Verify the fruit and vegetables classification

User Acceptance Testing

Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	2	5	2	1	10
Totals	26	14	13	26	79

Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pas s
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

RESULTS

Performance Metrics

Performance metrics are defined as figures and data representative of an organization's actions, abilities, and overall quality. There are many different forms of performance metrics, including sales, profit, return on investment, customer happiness, customer reviews, personal reviews, overall quality, and reputation in a marketplace. Performance metrics can vary considerably when viewed through different industries.

Performance metrics are integral to an organization's success. It's important that organizations select their chief

performance metrics and focus on these areas because these metrics help guide and gauge an organization's success. Key success factors are only useful if they are acknowledged and tracked. Business measurements must also be carefully managed to make sure that they give right answers, and that the right questions are being asked. In this project the Performance metrics have viewed the following financial measurements as indicators of success:

- *Customer satisfaction* • *Process excellence*
- *Employee satisfaction*

Organizations across most industries rely on these indicators as well as:

- *Fast, responsive time to market*
- *A loyal customer base*
- *Outstanding processes for quality and timeliness*
- *Mechanisms that ensure learning, growth, and continual improvement*

ADVANTAGES AND DISADVANTAGES:

ADVANTAGES :

1. It can increase awareness of your regular habits

Once you start tracking your meals, you can see how many calories and nutrients you have been consuming from which foods. This can lead to discoveries that can let you increase your weight loss.

For example, you might learn that your fiber and protein intakes are often low, which could explain constant hunger. Or, you might find that a high amount of your calories come from just a couple of foods, such as a morning breakfast biscuit and coffee beverage contributing over 1,000 calories.

This knowledge can enable better choices, such as adding more fiber and protein, or switching to black coffee and a breakfast sandwich on an English muffin.

2. You can learn to make good food choices

As you learn which nutrients come from which foods, and which foods are higher in calories, you can become an expert at making nutritious food choices that will get you to your goals. For example, Lark

might teach you that dietary fiber is associated with better weight loss and lower blood sugar.

You might also learn, through nutrition tracking, that high-fiber foods include vegetables, whole grains, fruit, beans, and nuts. If you know that choosing these types of foods at the supermarket and at restaurants can help you reach your weight and health goals, you might do so regularly instead of opting for less healthful choices.

3. It can increase accountability

One of the reasons why nutrition tracking works is that it can increase your feelings of accountability. Knowing that you will log what you eat may be enough to think twice before, say, taking a second slice of pizza or ordering a large instead of a medium mocha.

4. It can support mindfulness

While obsessive calorie counting can make eating less fun, it can be enlightening to notice relationships between what you eat and personal results such as your weight or how you feel. Nutrition tracking can support mindfulness by helping you focus on savoring tastes, aromas, and textures and the experience of

eating, as you begin to appreciate what food does for you and your body.

The following are the significant benefits of a diet tracking mobile app.

- *The diet and nutrition app helps people think and consider their food choice before taking a bite.*
- *Users can identify the patterns in their eating behavior and tweak their diet plan according to their diet pattern.*
- *The food and fitness apps provide general awareness about the various nutrients in food.*
- *The diet & nutrition tracking app is a targeted way to focus on health.*
- *The diet and nutrition planning application would suggest healthy food options to the users and help them build a healthy grocery list.*

DISADVANTAGES:

1. Tedious

Logging each and every bite and sip is a lot of work. Especially for athletes who eat a large amount of food to fuel

training efforts. Having to search a database for each ingredient takes a bit of work and patience. However, once you get the hang of it, it does become easier—promise.

2. Slippery Slope

Having to be confronted with your choices every day is motivating! However, for those with disordered eating tendencies, it can lead to you being overly strict, "clean" and preoccupied with your food intake. In the end, tracking your food intake is a simple and effective tool in defining problem areas of your diet, leading you to successful changes

For the best results, be honest with your recordings, write down more than the calories (energy, weight, mood, performance) and write it down in order as nutrient timing is an important factor for fitness goals. It is best to record as much info as you can, but make it work for you. If recording the brand, portion, time and every other little detail is too much, dial it back a bit and simply record the food and drink without the rest.

Of course, it is best to use this method in combination with sports dietitian care to have the healthy, individualized and sustainable results.

If at any time you feel like tracking your intake is causing you excess stress, it might not be the method for your personal success.

CONCLUSION

This study proposed an Intelligence Precision Nutrient Analysis Model based on a digital data collection framework, where the nutrient intake was analyzed by entering dietary recall data. The AI Precision Nutrient Analysis Model was used to analyze the ingredients of the fruits or vegetables and calculate nutrient intake by automatically analyzing the fruits or vegetables, and portion sizes were analyzed using a digital data semantic analysis model.

The results of this study show very little difference in nutrient intake between the model and the NNHS analysis and are highly accurate; therefore, the AI model can be used as a reference for nutrition surveys and personal nutrition analysis. In terms of data access, as there is not yet a complete set of publicly available data on food nutrient ingredients; more complete data and references on micro-nutrients should be available in the future. On the other hand, the scope of fruits and vegetables should be expanded.

FUTURE SCOPE

With people becoming conscious about their diets and fitness goals, there is a wide scope of diet and fitness apps thriving in the app world. Therefore, this time is pretty much perfect to create a diet and fitness app of your own and enter the market with a unique idea in order to lure the audience towards your app. For developing a healthcare app, you must be sure of hiring the best team of experts who have prior experience in the same field and can guide you through the development process

APPENDIX

Source Code

```
{  
  
"cells": [  
  
  {  
  
    "cell_type": "code",  
  
    "execution_count": 3,  
  
    "metadata": {  
  
      "id": "ynUOT9Yc6fQk",  
  
      "colab": {  
  
        "base_uri": "https://localhost:8080/"  
  
      },  
  
      "outputId": "f3c81b44-d267-478f-9424-b5915dd448e3"  
  
    },  
  
    "outputs": [  

```



```
{
  "output_type": "stream",
  "name": "stdout",
  "text": [
    "Mounted at /content/drive\n"
  ]
},
{
  "source": [
    "from google.colab import drive\n",
    "drive.mount('/content/drive')\n"
  ],
  "cell_type": "code",
  "source": [
    "ls"
  ],
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/"
    },
    "id": "NhP7V93wMVho",
    "outputId": "a4c7043e-d6d7-437e-c828-e1fb3fd50819"
  },
  "execution_count": 4,
  "outputs": [
```

```
{
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  "name": "stdout",
  "text": [
    "\u001b[0m\u001b[01;34mdrive\u001b[0m/ \u001b[01;34msample_data\u001b[0m/\n"
  ]
}
],
{
  "cell_type": "code",
  "source": [
    "cd//content/drive/MyDrive/Colab Notebooks/Dataset"
  ],
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/"
    },
    "id": "_VuPfwOuQYAm",
    "outputId": "cd424961-76bb-4a15-948d-a813a820e5e4"
  },
  "execution_count": 5,
  "outputs": [
    {
      "output_type": "stream",
      "name": "stdout",
      "text": [
```

```

        "/content/drive/.shortcut-targets-by-id/1LL5lvl6AsdVwW9LWVu_GXEUCoV7jYm-c/Dataset\n"
    ]
}
]
},
{
    "cell_type": "code",
    "source": [
        "ls"
    ],
    "metadata": {
        "colab": {
            "base_uri": "https://localhost:8080/"
        },
        "id": "kdGnCU-FQz8C",
        "outputId": "23c16877-4855-4f21-b6a5-5a18f1819ec6"
    },
    "execution_count": 6,
    "outputs": [
        {
            "output_type": "stream",
            "name": "stdout",
            "text": [
                "IBM_review.pptx photo-1589820296156-2454bb8a6ad1.jpg\n\u001b[0m\u001b[01;34mTRAIN_SET\u001b[0m/\n",
                "nutrition.h5 \u001b[01;34mTEST_SET\u001b[0m/\n"
            ]
        }
    ]
}

```

```

]
},
{
  "cell_type": "markdown",
  "metadata": {
    "id": "whbZ5Uw35pHw"
  },
  "source": [
    "### Importing Neccessary Libraries"
  ]
},
{
  "cell_type": "code",
  "execution_count": 7,
  "metadata": {
    "id": "60eg6zmo5pHx"
  },
  "outputs": [],
  "source": [
    "import numpy as np#used for numerical analysis\n",
    "import tensorflow #open source used for both ML and DL for computation\n",
    "from tensorflow.keras.models import Sequential #it is a plain stack of layers\n",
    "from tensorflow.keras import layers #A layer consists of a tensor-in tensor-out computation\nfunction\n",
    "#Dense layer is the regular deeply connected neural network layer\n",
    "from tensorflow.keras.layers import Dense,Flatten\n",
    "#Faltten-used fot flattening the input or change the dimension\n",
    "from tensorflow.keras.layers import Conv2D,MaxPooling2D,Dropout #Convolutional layer\n",

```

```

"#MaxPooling2D-for downsampling the image\n",
"from keras.preprocessing.image import ImageDataGenerator\n",
"\n",
"\n"
]
},
{
"cell_type": "markdown",
"metadata": {
"id": "vnVt93M05pH0"
},
"source": [
"### Image Data Agumentation"
]
},
{
"cell_type": "code",
"execution_count": 8,
"metadata": {
"id": "-VLZKCTd5pH1"
},
"outputs": [],
"source": [
"#setting parameter for Image Data agumentation to the training data\n",
"train_datagen =
ImageDataGenerator(rescale=1./255,shear_range=0.2,zoom_range=0.2,horizontal_flip=True)\n",
"#Image Data agumentation to the testing data\n",
"test_datagen=ImageDataGenerator(rescale=1./255)"
]
}
]

```

```
]
},
{
  "cell_type": "markdown",
  "metadata": {
    "id": "kpsHveuq5pH4"
  },
  "source": [
    "### Loading our data and performing data agumentation"
  ]
},
{
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  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/"
    },
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    "outputId": "965713fc-3e66-49fe-cc6b-50d163598494"
  },
  "outputs": [
    {
      "output_type": "stream",
      "name": "stdout",
      "text": [
        "Found 4138 images belonging to 5 classes.\n",

```

```

    "Found 929 images belonging to 3 classes.\n"
  ]
}
],
"source": [
  "#performing data agumentation to train data\n",
  "x_train = train_datagen.flow_from_directory(\n",
  "  r'/content/drive/MyDrive/Colab Notebooks/Dataset/TRAIN_SET',\n",
  "  target_size=(64, 64),batch_size=5,color_mode='rgb',class_mode='sparse')\n",
  "#performing data agumentation to test data\n",
  "x_test = test_datagen.flow_from_directory(\n",
  "  r'/content/drive/MyDrive/Colab Notebooks/Dataset/TEST_SET',\n",
  "  target_size=(64, 64),batch_size=5,color_mode='rgb',class_mode='sparse') "
]
},
{
  "cell_type": "code",
  "execution_count": 10,
  "metadata": {
    "colab": {
      "base_uri": "https://localhost:8080/"
    },
    "id": "szwYFmls5pH8",
    "outputId": "919ec1a0-85e1-4e2c-b99e-8659e4f7d3fe"
  },
  "outputs": [
    {

```

```
"output_type": "stream",
"name": "stdout",
"text": [
  '{'APPLES': 0, 'BANANA': 1, 'ORANGE': 2, 'PINEAPPLE': 3, 'WATERMELON': 4}\n"
]
}
],
"source": [
  "print(x_train.class_indices)#checking the number of classes"
]
},
{
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    "id": "8SliKn605pH-",
    "outputId": "2fbf4e4f-2441-449d-f753-c1f29f21737a"
  },
  "outputs": [
    {
      "output_type": "stream",
      "name": "stdout",
      "text": [
        '{'APPLES': 0, 'BANANA': 1, 'ORANGE': 2}\n"
```



```
]
}
],
"source": [
    "print(x_test.class_indices)#checking the number of classes"
]
},
{
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        "outputId": "abbe5a86-8d5f-4a40-a058-731bfc7e5db"
    },
    "outputs": [
        {
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                    "Counter({0: 995, 1: 1374, 2: 1019, 3: 275, 4: 475})"
                ]
            },
            "metadata": {},
            "execution_count": 12
        }
    ]
}
```

```
}  
],  
"source": [  
    "from collections import Counter as c\n",  
    "c(x_train.labels)"  
]  
},
```

```
{  
    "cell_type": "markdown",  
    "metadata": {  
        "id": "l3R_JW4b5pIC"  
    },  
    "source": [  
        "### Creating the model"  
    ]  
},
```

```
{  
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    "execution_count": 13,  
    "metadata": {  
        "id": "eejmbWX75pID"  
    },  
    "outputs": [],  
    "source": [  
        "# Initializing the CNN\n",  
        "classifier = Sequential()\n",  
        "\n",
```

```

"# First convolution layer and pooling\n",
"classifier.add(Conv2D(32, (3, 3), input_shape=(64, 64, 3), activation='relu'))\n",
"classifier.add(MaxPooling2D(pool_size=(2, 2)))\n",
"\n",
"# Second convolution layer and pooling\n",
"classifier.add(Conv2D(32, (3, 3), activation='relu'))\n",
"\n",
"# input_shape is going to be the pooled feature maps from the previous convolution layer\n",
"classifier.add(MaxPooling2D(pool_size=(2, 2)))\n",
"\n",
"# Flattening the layers\n",
"classifier.add(Flatten())\n",
"\n",
"# Adding a fully connected layer\n",
"classifier.add(Dense(units=128, activation='relu'))\n",
"classifier.add(Dense(units=5, activation='softmax')) # softmax for more than 2\n",
"\n"
]
},
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}
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"outputId": "5165f8ba-85e8-44c0-b37c-d3e198002dae"

},

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{

"output_type": "stream",

"name": "stdout",

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"Model: \"sequential\\\"\\n",

"_____\\n",

" Layer (type) Output Shape Param # \\n",

"=====\\n",

" conv2d (Conv2D) (None, 62, 62, 32) 896 \\n",

" \\n",

" max_pooling2d (MaxPooling2D (None, 31, 31, 32) 0 \\n",

") \\n",

" \\n",

" conv2d_1 (Conv2D) (None, 29, 29, 32) 9248 \\n",

" \\n",

" max_pooling2d_1 (MaxPooling (None, 14, 14, 32) 0 \\n",

" 2D) \\n",

" \\n",

" flatten (Flatten) (None, 6272) 0 \\n",

" \\n",

" dense (Dense) (None, 128) 802944 \\n",

" \\n",

" dense_1 (Dense) (None, 5) 645 \\n",

" \\n",

```

"=====\\n",

"Total params: 813,733\\n",

"Trainable params: 813,733\\n",

"Non-trainable params: 0\\n",

"_____\\n"

]

}

],

"source": [

"classifier.summary()#summary of our model"

]

},

{

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"id": "VTpQ5NR95pIF"

},

"source": [

"### Compiling the model"

]

},

{

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"execution_count": 15,

"metadata": {

"id": "L0sf79GD5pIH"

},

```

```

"outputs": [],

"source": [

    "# Compiling the CNN\n",

    "# categorical_crossentropy for more than 2\n",

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

]

},

{

    "cell_type": "markdown",

    "metadata": {

        "id": "s6CAbE5c5pIL"

    },

    "source": [

        "## Fitting the model"

    ]

},

{

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    },

```

```

"outputs": [

{
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  "name": "stderr",
  "text": [

    "/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:3: UserWarning:
`Model.fit_generator` is deprecated and will be removed in a future version. Please use `Model.fit`,
which supports generators.\n",

    " This is separate from the ipykernel package so we can avoid doing imports until\n"

  ]
},

{
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  "name": "stdout",
  "text": [

    "Epoch 1/10\n",

    "828/828 [=====] - 1580s 2s/step - loss: 0.6022 - accuracy:
0.7608 - val_loss: 0.6050 - val_accuracy: 0.7621\n",

    "Epoch 2/10\n",

    "828/828 [=====] - 51s 62ms/step - loss: 0.4223 - accuracy:
0.8415 - val_loss: 0.4744 - val_accuracy: 0.8149\n",

    "Epoch 3/10\n",

    "828/828 [=====] - 58s 70ms/step - loss: 0.3822 - accuracy:
0.8579 - val_loss: 0.4508 - val_accuracy: 0.8127\n",

    "Epoch 4/10\n",

    "828/828 [=====] - 50s 61ms/step - loss: 0.3606 - accuracy:
0.8594 - val_loss: 0.4128 - val_accuracy: 0.8471\n",

    "Epoch 5/10\n",

    "828/828 [=====] - 51s 61ms/step - loss: 0.3412 - accuracy:
0.8743 - val_loss: 0.4203 - val_accuracy: 0.8321\n",

```

```
"Epoch 6/10\n",  
  
"828/828 [=====] - 52s 62ms/step - loss: 0.3289 - accuracy:  
0.8729 - val_loss: 0.4781 - val_accuracy: 0.8084\n",  
  
"828/828 [=====] - 51s 62ms/step - loss: 0.3006 - accuracy:  
0.8859 - val_loss: 0.4085 - val_accuracy: 0.8461\n",  
  
"Epoch 8/10\n",  
  
"828/828 [=====] - 52s 63ms/step - loss: 0.2810 - accuracy:  
0.8862 - val_loss: 0.6500 - val_accuracy: 0.8073\n",  
  
"Epoch 9/10\n",  
  
"828/828 [=====] - 50s 60ms/step - loss: 0.2838 - accuracy:  
0.8925 - val_loss: 0.4216 - val_accuracy: 0.8332\n",  
  
"Epoch 10/10\n",  
  
"828/828 [=====] - 52s 63ms/step - loss: 0.2580 - accuracy:  
0.9016 - val_loss: 0.3874 - val_accuracy: 0.8439\n"  
  
]  
  
,  
  
{  
  
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    "text/plain": [  
  
      "<keras.callbacks.History at 0x7f4fb24f84d0>"  
  
    ]  
  
  },  
  
  "metadata": {},  
  
  "execution_count": 16  
  
}  
  
,  
  
"source": [  
  
  "\n",
```



```

"classifier.fit_generator(\n",
"    generator=x_train,steps_per_epoch = len(x_train),\n",
"    epochs=10, validation_data=x_test,validation_steps = len(x_test))# No of images in test
set"
]
},
{
    "cell_type": "markdown",
    "metadata": {
        "id": "icM7Nuc35pIO"
    },
    "source": [
        "### Saving our model"
    ]
},
{
    "cell_type": "code",
    "execution_count": 17,
    "metadata": {
        "id": "qAJYdsrI5pIQ"
    },
    "outputs": [],
    "source": [
        "# Save the model\n",
        "classifier.save('nutrition.h5')
    ]
},
{

```

```
"cell_type": "markdown",
"metadata": {
  "id": "7com28W55pHk"
},
"source": [
  "# Nutrition Image Analysis using CNN"
]
},
{
  "cell_type": "markdown",
  "metadata": {
    "id": "wnKeLh5m5pIR"
  },
  "source": [
    "### Predicting our results"
  ]
},
{
  "cell_type": "code",
  "execution_count": 18,
  "metadata": {
    "id": "3tJkyuyz5pIR"
  },
  "outputs": [],
  "source": [
    "from tensorflow.keras.models import load_model\n",
    "from tensorflow.keras.preprocessing import image\n",
```

```

"import numpy as np"
]
},
{
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  "execution_count": 19,
  "metadata": {
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      "height": 81
    },
    "id": "ISQ6tnsR5plc",
    "outputId": "81b466db-bb3d-4ce8-ac0a-d2d9366b0f49"
  },
  "outputs": [
    {
      "output_type": "execute_result",
      "data": {
        "text/plain": [
          "<PIL.Image.Image image mode=RGB size=64x64 at 0x7F4FB1C10210>"
        ]
      }
    ]
  }

```

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F4tF0zQKl8m9LuNGEXC9XjugknJlyRkqiYW45FwrtpNmi8AqpMFDKTHXi+WlrveOTL3bDettdzBtzfGDj9
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ACAmYEZWFEfrWkSLqeTYbyUyeTYS90qmcqxGUouGvtepVCOw3bVVtPzj389XTpYXH/ua/d/hQTjNy6F
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KWEp2rHvn6wwxgQ1nu+ /OUA/FVYz+fe/JVa/x/gL3v9P+9XhO4inq1bAAAAEIFTkSuQmCC\n"

```
    },  
    "metadata": {},  
    "execution_count": 19  
  }  
],  
"source": [  
  "img = image.load_img(\"/content/drive/MyDrive/Colab  
Notebooks/Dataset/TRAIN_SET/APPLES/n07740461_10067.jpg\",target_size= (64,64))#loading of  
the image\n",  
  "img"  
]  
},  
{  
  "cell_type": "code",  
  "source": [  
    "x=image.img_to_array(img)#conversion image into array"  
  ],  
  "metadata": {  
    "id": "iUjrhAx5ehSj"  
  },  
  "execution_count": 20,  
  "outputs": []  
},  
{  
  "cell_type": "code",  
  "source": [  
    "x"
```

```

},
"metadata": {
  "colab": {
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  },
  "id": "ePdw2DV6euLf",
  "outputId": "e4867481-f853-4bae-a763-93c277b5b717"
},
"execution_count": 21,
"outputs": [
  {
    "output_type": "execute_result",
    "data": {
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        "array([[255., 255., 255.],\n",
        "       [255., 255., 255.],\n",
        "       [255., 255., 255.],\n",
        "       ..., \n",
        "       [255., 255., 255.],\n",
        "       [255., 255., 255.],\n",
        "       [255., 255., 255.]],\n",
        "\n",
        "       [[255., 255., 255.],\n",
        "       [255., 255., 255.],\n",
        "       [255., 255., 255.],\n",
        "       ..., \n",
        "       [255., 255., 255.],\n",

```

" [255., 255., 255.],\n",
" [255., 255., 255.]],\n",
"\n",
" [[255., 255., 255.],\n",
" [255., 255., 255.],\n",
" [255., 255., 255.],\n",
" ..., \n",
" [255., 255., 255.],\n",
" [255., 255., 255.],\n",
" [255., 255., 255.]],\n",
"\n",
" ..., \n",
"\n",
" [[255., 255., 255.],\n",
" [255., 255., 255.],\n",
" [255., 255., 255.],\n",
" ..., \n",
" [255., 255., 255.],\n",
" [255., 255., 255.],\n",
" [255., 255., 255.]],\n",
"\n",
" [[255., 255., 255.],\n",
" [255., 255., 255.],\n",
" [255., 255., 255.],\n",
" ..., \n",
" [255., 255., 255.],\n",
" [255., 255., 255.],\n"

```

"    [255., 255., 255.]],\n",
"\n",
"    [[255., 255., 255.],\n",
"    [255., 255., 255.],\n",
"    [255., 255., 255.],\n",
"    ..., \n",
"    [255., 255., 255.],\n",
"    [255., 255., 255.],\n",
"    [255., 255., 255.]]], dtype=float32)"
]
},
"metadata": {},
"execution_count": 21
}
]
},
{
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"x.ndim"
],
"metadata": {
"colab": {
"base_uri": "https://localhost:8080/"
},
"id": "Txvgkd4aeykK",
"outputId": "f77b3b7b-d9c8-415f-b14b-a910506fe8da"
}
}

```

```
},
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"outputs": [
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    "data": {
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        "3"
      ]
    },
    "metadata": {},
    "execution_count": 22
  }
],
},
{
  "cell_type": "code",
  "source": [
    "x=np.expand_dims(x,axis=0) #expand the dimension"
  ],
  "metadata": {
    "id": "32I5ihgFfGKQ"
  },
  "execution_count": 23,
  "outputs": []
},
{
```



```
"cell_type": "code",
"source": [
  "x.ndim"
],
"metadata": {
  "colab": {
    "base_uri": "https://localhost:8080/"
  },
  "id": "dWEADK3kfV5n",
  "outputId": "e9b22a26-8b6e-418b-dfc8-44a6e25eab70"
},
"execution_count": 24,
"outputs": [
  {
    "output_type": "execute_result",
    "data": {
      "text/plain": [
        "4"
      ]
    },
    "metadata": {},
    "execution_count": 24
  }
],
{
  "cell_type": "code",
```

```
"execution_count": 25,

"metadata": {

  "id": "ImD8ff9z5ple",

  "colab": {

    "base_uri": "https://localhost:8080/"

  },

  "outputId": "52d69712-30a2-4ad6-ca19-77116a48c072"

},

"outputs": [

  {

    "output_type": "stream",

    "name": "stdout",

    "text": [

      "1/1 [=====] - 0s 125ms/step\n"

    ]

  },

  "source": [

    "pred = classifier.predict(x)"

  ],

  {

    "cell_type": "code",

    "execution_count": 26,

    "metadata": {

      "id": "psfuX7AC5ple",

      "colab": {
```

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"base_uri": "https://localhost:8080/"
},
"outputId": "aa0360ab-bf05-4b93-eb3e-714de166858f"
},
"outputs": [
{
  "output_type": "execute_result",
  "data": {
    "text/plain": [
      "array([[1., 0., 0., 0., 0.]], dtype=float32)"
    ]
  },
  "metadata": {},
  "execution_count": 26
}
],
"source": [
  "pred"
]
},
{
  "cell_type": "code",
  "source": [
    "labels=['APPLES', 'BANANA', 'ORANGE', 'PINEAPPLE', 'WATERMELON']\n",
    "labels[np.argmax(pred)]"
  ],
  "metadata": {
```

```
"colab": {
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  "height": 36
},
"id": "rSkX1-HAf2nq",
"outputId": "c3de9d3f-ae2d-486d-e905-072a913eb915"
},
"execution_count": 27,
"outputs": [
  {
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    "data": {
      "text/plain": [
        "'APPLES'"
      ],
      "application/vnd.google.colaboratory.intrinsic+json": {
        "type": "string"
      }
    },
    "metadata": {},
    "execution_count": 27
  }
]
},
"metadata": {
  "colab": {
```

```
"collapsed_sections": [],
"provenance": []
},
"kernel_spec": {
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  "language": "python",
  "name": "python3"
},
"language_info": {
  "codemirror_mode": {
    "name": "ipython",
    "version": 3
  },
  "file_extension": ".py",
  "mimetype": "text/x-python",
  "name": "python",
  "nbconvert_exporter": "python",
  "pygments_lexer": "ipython3",
  "version": "3.8.3"
}
},
"nbformat": 4,
"nbformat_minor": 0
}
```

GITHUB

<https://github.com/IBM-EPBL/IBM-Project-32813-1660212375>

Video Link

<HTTPS://UPLOADNOW.IO/F/2KFLZND>