Diet Recommendation System

A MINI PROJECT REPORT

18CSC207J - ADVANCED PROGRAMMING PRACTICE

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BONAFIDE CERTIFICATE

Certified that Mini project report titled **"Diet Recommendation System"** is the bona fide work of **Ritansh Bagal RA2111033010061, Priyansh Agarwal RA2111033010062, Khushi Padia RA2111033010062, K Kalaiarasi RA2111033010060** who carried out the minor project under my supervision. Certified further, that to the best of my knowledge, the work reported herein does not form any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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ABSTRACT

Your food choices each day affect your health — how you feel today, tomorrow, and in the future. Good nutrition is an important part of leading a healthy lifestyle. Combined with physical activity, your diet can help you to reach and maintain a healthy weight, reduce your risk of chronic diseases (like heart disease and cancer), and promote your overall health. A balanced diet is one that gives your body the nutrients it needs to function correctly. The number of calories in a food is a measurement of the amount of energy stored in that food. Your body uses calories from food for walking, thinking, breathing, and other important functions. The average person needs to eat about 2,000 calories every day to maintain their weight. However, a person's specific daily calorie intake can vary depending on their age, gender, and physical activity level. Men generally need more calories than women, and people who exercise need more calories than people who don't.

A diet recommendation system is an intelligent software application that suggests personalized dietary plans to individuals based on their unique needs, goals, and preferences. This system uses various methods such as machine learning algorithms, nutritional analysis to provide the most appropriate recommendations. The system can take into account various factors such as age, gender, height, weight, body mass index, health conditions, and food preferences to create a customized diet plan that can help users achieve their desired outcomes. By leveraging the latest advancements in technology and nutrition science, diet recommendation systems can be a valuable tool for individuals who are looking to improve their health and wellbeing through better nutrition.

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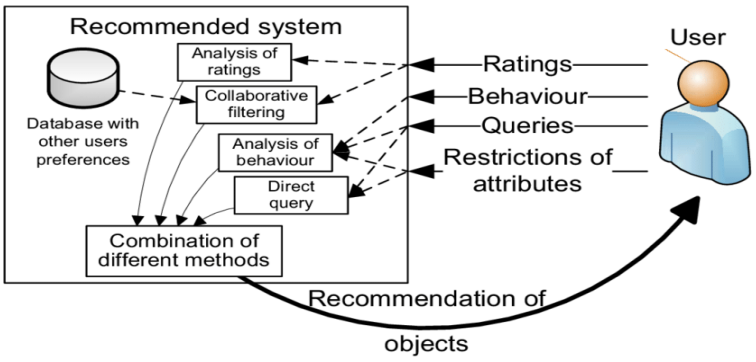
CHAPTER 1

INTRODUCTION

One of the major factors for a healthy life is daily diet and food, specifically, for the people suffering from some minor or major diseases. eHealth initiatives and research efforts aim to offer various pervasive applications for novice end users to improve their health. Various studies depict that inappropriate and inadequateintake of diet is the major reasons of various health issues and diseases. A study conducted by World Health Organization (WHO) estimates that around 30% of thetotal population of the world is suffering from various diseases, and 60% deaths each year in children are related to malnutrition. Another study by WHO reports that inadequate and imbalanced intake of food causes around 9% of heart attack deaths, about 11% of ischemic heart disease deaths, and 14% of gastrointestinal cancer deaths worldwide. Moreover, around 0.25 billion children are suffering from Vitamin-A deficiency, 0.2 billion people are suffering from iron deficiency (anemia), and 0.7 billion people are suffering from iodine deficiency. The main focus of this work is to provide dietary assistance to different people who are suffering from common diseases or maybe no diseases. A recommender system, or a recommendation system (sometimes replacing 'system' with a synonym such as platform or engine), is a subclass of information filtering system that seeks to predict the "rating" or "preference" a user would give to an item. They are primarily used in commercial applications.



The recommendation process has basically three stages that are Information Collection Phase, Learning Phase and Recommendation Phase. The information is firstly collected about a particular problem and the various solutions related to that problem are categorized. After the collection of information Learning Phase comesin which various conclusions are made out of that information which is gathered and in last phase i.e. Recommendation Phase an output is given in which various recommendations are made. In our system since it is a diet recommendation systemso the recommendations will be about the diet plan like what all things you should eat, what is your BMI (Body Mass Index) which states whether you are healthy,overweight, or under-weight.

CHAPTER 2

LITERATURE SURVEY

Personalization is Key: One of the most important factors in creating an effective diet recommendation system is personalization. A study published in the Journal of the Academy of Nutrition and Dietetics found that personalized dietary advice was more effective than generalized advice in improving adherence to dietary recommendations and achieving better health outcomes.

Machine Learning Algorithms: Many diet recommendation systems use machine learning algorithms to analyze large datasets of dietary and health information. A study published in the Journal of Medical Systems found that a machine learning-based diet recommendation system was able to provide personalized dietary recommendations that were highly correlated with the user's dietary habits and preferences.

User Feedback: Diet recommendation systems can also use user feedback to improve their recommendations over time. A study published in the Journal of Biomedical Informatics found that incorporating user feedback into a diet recommendation system resulted in more accurate and personalized recommendations.

Integration with Wearable Devices: Some diet recommendation systems also integrate with wearable devices such as fitness trackers and smartwatches to track the user's physical activity and monitor their progress. A study published in the Journal of Medical Internet Research found that a diet recommendation system that integrated with a wearable device was able to improve user compliance with dietary recommendations and increase physical activity levels.

CHAPTER 3

SYSTEM ARCHITECTURE AND DESIGN

A diet recommendation system can be designed as a web application or a mobile app that provides personalized diet plans based on the user's health condition, body type, lifestyle, and dietary preferences. Here's a high-level system architecture for a diet recommendation system:-

User interface: The system's user interface should be designed in such a way that it is user-friendly and intuitive. It should provide users with an easy way to input their health data, food preferences, and other relevant information.

Database: A database should be created to store user data, such as their age, gender, height, weight, body mass index (BMI), and medical history. The database should also store information about various foods, including their nutritional value, calories, and ingredients.

Recommendation engine: The recommendation engine should be the core component of the system, which will process user data and provide personalized diet plans. The recommendation engine should be designed using machine learning algorithms that analyze user data and generate recommendations based on user preferences and health data.

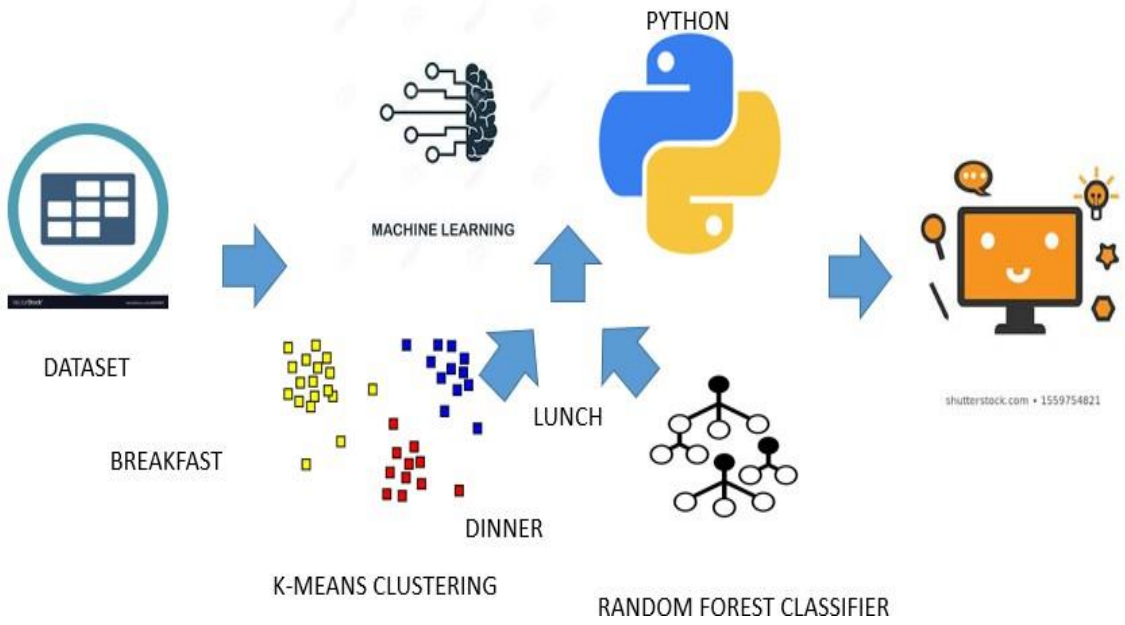
Integration with wearable devices: The system can also be integrated with wearable devices, such as fitness trackers or smartwatches, to gather additional data about the user's physical activity levels, heart rate, and sleep patterns.

Third-party integration: The system can also be integrated with third-party services, such as recipe websites, to provide users with a variety of meal options.

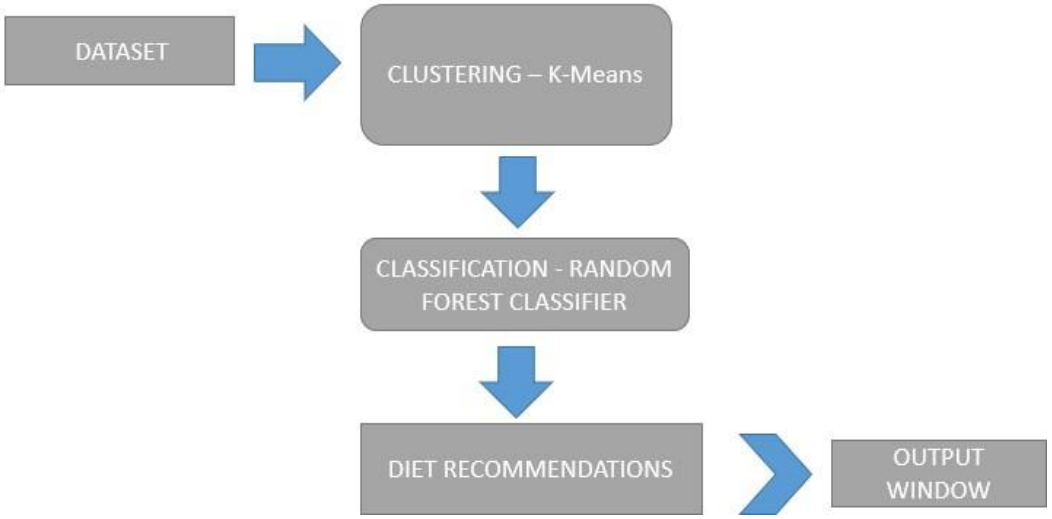
Security: The system should be designed with security in mind to ensure that user data is protected. Data encryption and access control mechanisms should be implemented to ensure that only authorized users can access user data.

Feedback mechanism: The system should have a feedback mechanism that allows users to provide feedback on the recommendations they receive. The feedback mechanism will help improve the recommendation engine by learning from user feedback.

SYSTEM ARCHITECTURE



SYSTEM WORKFLOW



CHAPTER 4

METHODOLOGY

Techniques used for building a Recommendation System-

1.1 **Content based Filtering Method-** The content-based method is a domain-dependent algorithm which focuses on much more on the evaluation of the characteristics of things to produce predictions. When files like pages, publications as well as news are being suggested, the content-based filtering strategy is probably the most profitable. In a content-based filtering technique, the suggestion is made based upon the person profiles with features obtained from the information in the things the person has examined in previous times.

1.2 **Collaborative based Filtering Method-** Collaborative filtering is adomain-independent prediction technique for content that cannot easily and adequately be described by metadata such as movies and music. Collaborative filtering technique works by building a database (user-item matrix) of preferences for items by users. In the newer, narrower sense, collaborative filtering is a method of making automatic predictions(filtering) about the interests of a user by collecting preferences or taste information from many users (collaborating). The underlying assumption of the collaborative filtering approach is that if a person *A* has the same opinion as a person *B* on an issue, A is more likely to have B's opinion on a different issue than that of a randomly chosen person.

a. **Memory based Filtering Method-** The items that have been previously rated by the user before play a pertinent part in looking for a neighbor that shares appreciation with him. When a neighbor of a person is found, various algorithms could be utilized combining the tastes of friends to produce recommendations. Because of the usefulness of these strategies, they've accomplished extensive results in real-life applications.

b. **Model based Filtering Method-** In this approach, models are developed using different data mining, machine learning algorithms to predict users' rating of unrated items. There are many model-based CF algorithms. Bayesian networks, clustering models, latent semanticmodels such as singular value decomposition and probabilistic latent

1.3 **Hybrid based Filtering Method-** A number of applications combine the memory-based and the model-based CF algorithms. These overcome the limitations of native CF approaches and improve prediction performance. Importantly, they overcome the CF problems such as sparsity and loss of information. However, they have increased complexity and are expensive to implement. Usually most commercial recommender systems are hybrid, for example, the Google news recommender system.

CHAPTER 5

CODING AND TESTING

This project has been developed using Machine Learning algorithms. KMeans clustering was used to cluster the food according to calories and then Random Forest Classifier is used to classify the food items and predict the food items based on input given.

Header files used:

```
import pandas as pd
import numpy as np
from tkinter import *
from sklearn.cluster import KMeans
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier
import os
```

✓ 4.7s Python

Pandas was used to read datasets.

Numpy was used to convert features into numpy and then perform the furtheroperations.

Tkinter was used to create interface.

KMeans was used to solve clustering.

Train_test_split was used to divide the dataset into train and test portions to trainand test the model.

RandomForestClassifier used to predict the food items based on clustered data.

Reading the dataset:

```
data=pd.read_csv('food.csv')
data.head()

Breakfastdata=data['Breakfast']
BreakfastdataNumpy=Breakfastdata.to_numpy()

Lunchdata=data['Lunch']
LunchdataNumpy=Lunchdata.to_numpy()

Dinnerdata=data['Dinner']
DinnerdataNumpy=Dinnerdata.to_numpy()
Food_itemsdata=data['Food_items']
```

Applying KMeans for clustering on Lunch_data, Breakfast_data,Dinner data:

```
Datacalorie=breakfastfoodseparatedIDdata[1:,1:len(breakfastfoodseparatedIDdata)]

X = np.array(Datacalorie)
kmeans = KMeans(n_clusters=3, random_state=0).fit(X)

XValu=np.arange(0,len(kmeans.labels_))


brklbl=kmeans.labels_

inp=[]

datafin=pd.read_csv('nutrition_distriution.csv')


dataTog=datafin.T
bmicls=[0,1,2,3,4]
agecls=[0,1,2,3,4]
weightlosscat = dataTog.iloc[[1,2,7,8]]
weightlosscat=weightlosscat.T
weightgaincat= dataTog.iloc[[0,1,2,3,4,7,9,10]]
weightgaincat=weightgaincat.T
healthycat = dataTog.iloc[[1,2,3,4,6,7,9]]
healthycat=healthycat.T
weightlosscatDdata=weightlosscat.to_numpy()
weightgaincatDdata=weightgaincat.to_numpy()
```

Applying Random Forest Classifier:

```
X_train=weightlossfin# Features
y_train=yt # Labels

#Create a Gaussian Classifier
clf=RandomForestClassifier(n_estimators=100)

#Train the model using the training sets y_pred=clf.predict(X_test)
clf.fit(X_train,y_train)

#print (X_test[1])
X_test2=X_test
y_pred=clf.predict(X_test)


print ('SUGGESTED FOOD ITEMS ::')
for ii in range(len(y_pred)):
    if y_pred[ii]==2:     #weightloss
        print (Food_itemsdata[ii])
        findata=Food_itemsdata[ii]
        if int(veg)==1:
            datanv=['Chicken Burger']
            for it in range(len(datanv)):
                if findata==datanv[it]:
                    print('VegNovVeg')

print('\n Thank You for taking our recommendations. :)')
```

Creating Interface:

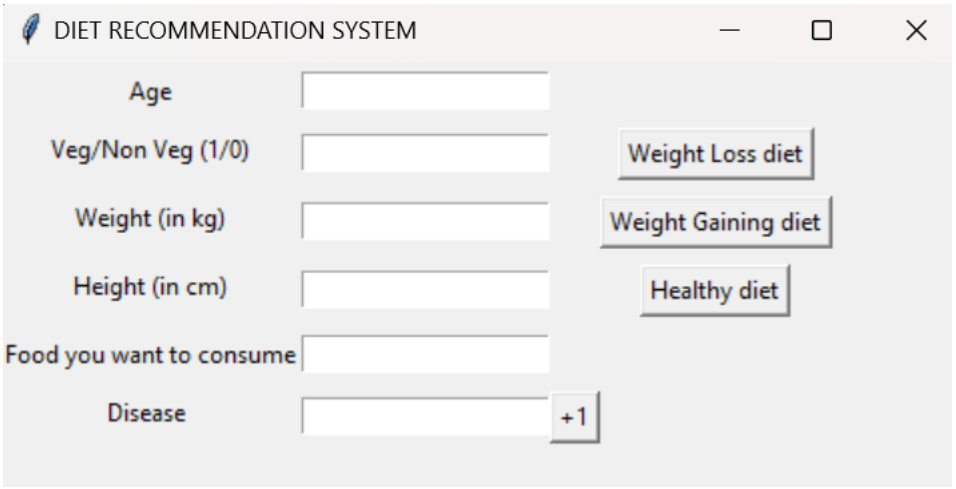
```
if __name__ == '__main__':
    main_win = Tk()

    Label(main_win,text="Age").grid(row=0,column=0,sticky=N,pady=4)
    Label(main_win,text="Veg/Non Veg (1/0)").grid(row=1,column=0,sticky=N,pady=4)
    Label(main_win,text="Weight (in kg)").grid(row=2,column=0,sticky=N,pady=4)
    Label(main_win,text="Height (in cm)").grid(row=3,column=0,sticky=N,pady=4)
    Label(main_win,text="Food you want to consume").grid(row=4,column=0,sticky=N,pady=4)
    Label(main_win,text="Disease ").grid(row=5,column=0,sticky=N,pady=4)


    e1 = Entry(main_win)
    e2 = Entry(main_win)
    e3 = Entry(main_win)
    e4 = Entry(main_win)
    e5 = Entry(main_win)
    e6 = Entry(main_win)

    e1.grid(row=0, column=1)
    e2.grid(row=1, column=1)
    e3.grid(row=2, column=1)
    e4.grid(row=3, column=1)
    e5.grid(row=4, column=1)
    e6.grid(row=5, column=1)
```

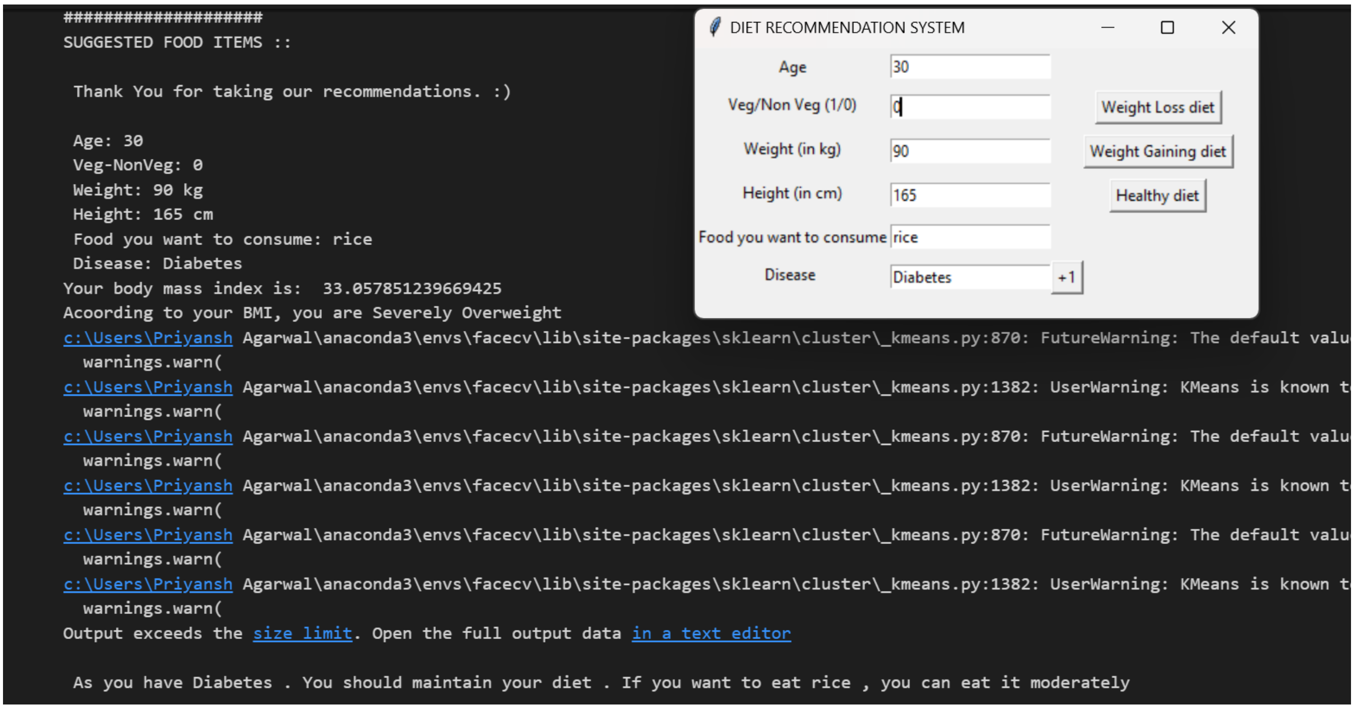
Taking Input:

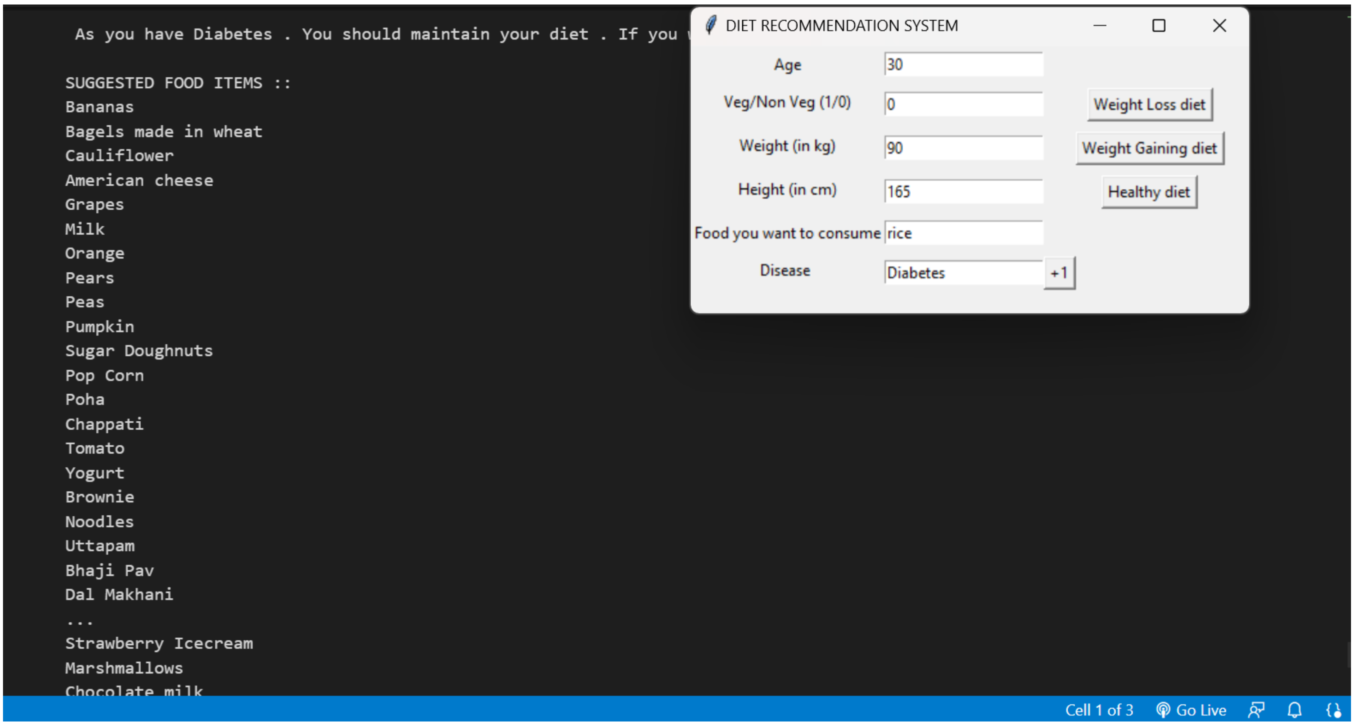


CHAPTER 6

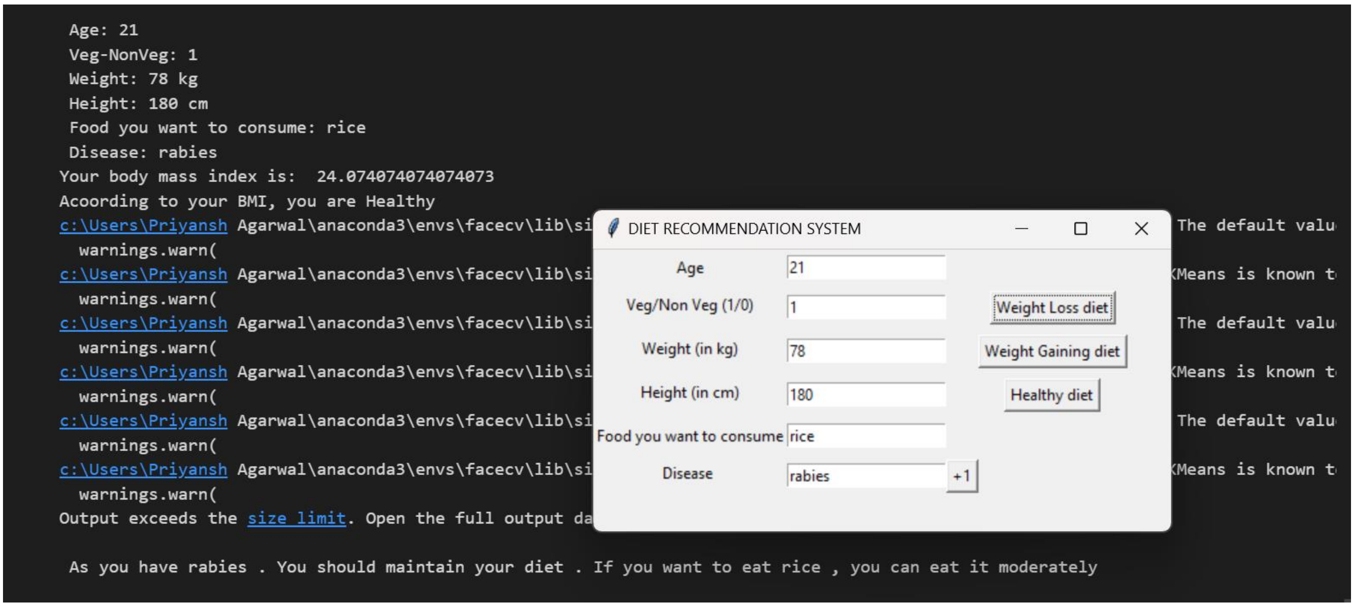
SCREENSHOTS AND RESULTS

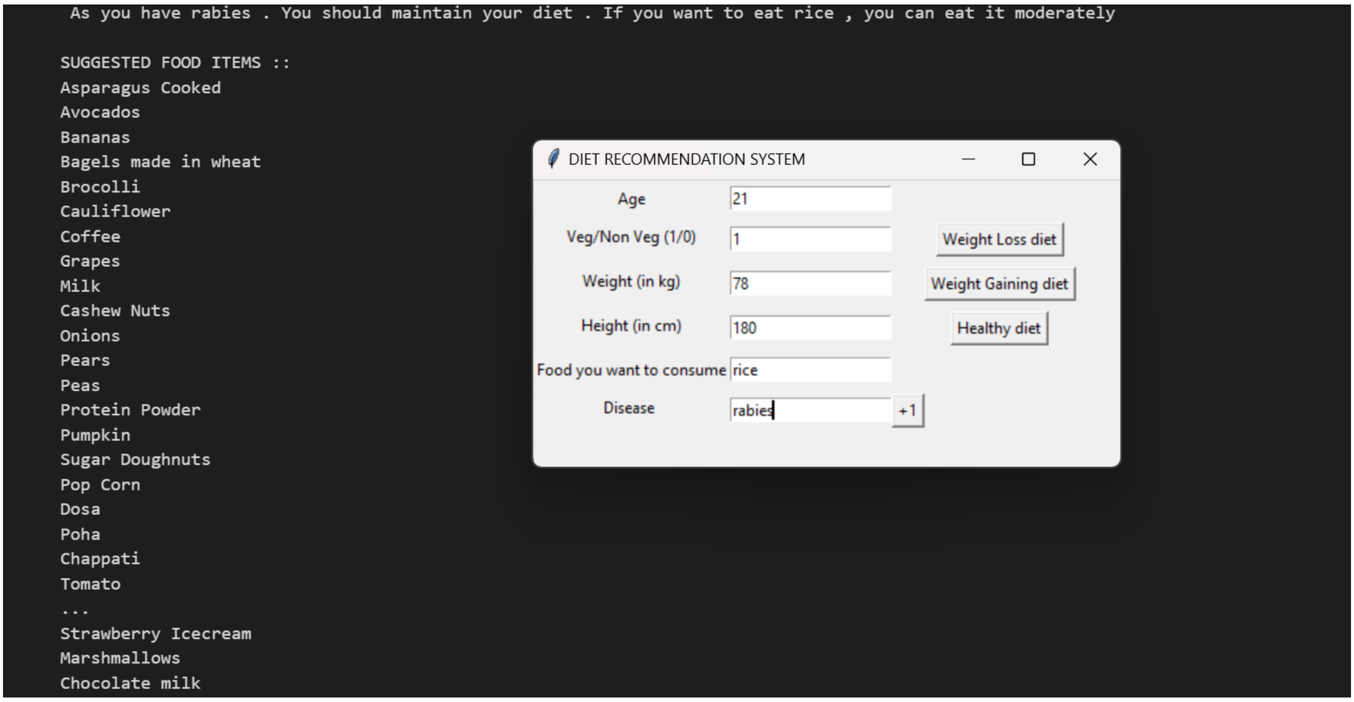
Predicting food items for Weight Loss Diet Plan:





Predicting Food Items for Healthy food items:





CHAPTER 7

CONCLUSION AND FUTURE ENHANCEMENTS

In conclusion, a diet recommendation system can be a valuable tool for individuals who are looking to improve their nutrition and overall health. By utilizing data about an individual's goals, preferences, and dietary needs, such a system can generate personalized meal plans and dietary recommendations.

However, there are several areas in which a diet recommendation system could be improved in the future. These include:

1. **More comprehensive data:** To provide the most accurate recommendations, a diet recommendation system should be able to access a wider range of data, including information about an individual's medical history, genetics, and lifestyle habits.
2. **Integration with wearable technology:** Wearable technology can provide real-time data about an individual's physical activity and nutrition intake, which can be used to refine dietary recommendations.
3. **Incorporation of user feedback:** A diet recommendation system should allow users to provide feedback about their meal plans and preferences, which can be used to improve the accuracy of future recommendations.
4. **Consideration of environmental impact:** In addition to personal health goals, a diet recommendation system could also take into account the environmental impact of certain dietary choices, such as the carbon footprint of different food options.

Overall, a diet recommendation system has the potential to be a powerful tool for promoting healthy eating habits and improving overall health outcomes. Continued development and enhancement of such systems could have significant benefits for individuals and society as a whole.

REFERENCES

Here are some references that you may find useful for a diet recommendation system:

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5. Chen, J., Cade, J. E., Allman-Farinelli, M., & The Eat-Lancet Commission. (2019). Diet quality indicators for human diets: a systematic review. BMC public health, 19(1), 1-21.

I hope these references are helpful in your research on diet recommendation systems.