DIET4U- A healthy diet recommender

Project report submitted in partial fulfillment
of the requirements for the degree of

Bachelor of Technology
in
Engineering

by

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CERTIFICATE

This is to certify that the project entitled DIET4U-A healthy diet recommender , submitted by Shashank Sharma(15uec056),Nishank Bhati(15ucs86),Sparsh Agarwal(15ucc038) in partial fulfillment of the requirement of degree in Bachelor of Technology (B. Tech), is a bonafide record of work carried out by them at the Department of Computer Science and Engineering, The LNM Institute of Information Technology, Jaipur, (Rajasthan) India, during the academic session 2017-2018 under my supervision and guidance and the same has not been submitted elsewhere for award of any other degree. In my/our opinion, this thesis is of standard required for the award of the degree of Bachelor of Technology (B. Tech).

09/05/2019
Date

Preety Singh
Adviser: Dr. Preety Singh

Dedicated to My Family and Friends

Acknowledgments

We express our heartiest thanks and deep regards to our supervisor Dr. Preety Singh for her continuous guidance, inspiration and constructive suggestions which were very crucial for this project.

Her encouraging remarks helped us in improving our skills and also overcome the obstacles at different stages of the project. We would also like to thank our family and friends who encouraged us to complete our goal.

Abstract

The rapid growth in today's lifestyles and food variety is main issue that people are suffering from various health related diseases.The recommendar system developed not only provides a healthy diet to the user but also helps them to nourish properly by intake of healthy food. Moreover proper selection of food items for patients suffering from various health related issues will also be guided with this system. We present a food recommendation system, called Diet4U, for dietary recommendations based on user's interest.The system developed not only provides diet planning but it also recommends items based on user's ratings.It in developed on a mobile application so that it can be used easily in normal day to day life.With the help of this we can promote healthy eating towards the future generations.

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Chapter *1*

Introduction

1.1 The Area of Work

Being healthy is becoming a central subject in life of every individual nowadays.Since more recipes and varieties are increasing on a very faster rate , everyone is confused what to adapt to live a healthy life.This process of choosing a healthy diet plan is very time consuming and also people are not knowledgeable enough to choose a good healthy diet.There a Recommender system is proposed which suggests food items on the basis of user's taste as well as it also keeps nutritional factors in account.This system will also be useful for individuals who want to gain weight and also who are affected by diseases such as obesity. We will be analysing different algorithms for similarity measurements and discuss about various systems.We will also show some results regarding the proposed work.

1.2 Problem Addressed

According to the study , around 2.2 Billion people in this world are overweight or obese.The good eating habits in an individual must start when he start to take care of himself. Hostel life is clearly one of such example.So we are building a diet planner for hostel students which will recommend them diet as per mess menu by taking physical parameters as input.

1.3 Recommender System through Collaborative Filtering

The main idea on which collaborative filtering works is to recommend items based on similarity of users.We will be discussing different parameters which are considered .Firstly we will be measuring similarity between the users or food items. Then to measure the similarity between two pairs of vectors we will be measuring cosine similarity. After that we will be using model based collaborative filtering for identification of similar users and items.

1.3.1 Measuring Similarity

If we are given two points then simplest way to find similarity is to find euclidean distance or manhattan distance metric. Higher the similarity more closer the items are. With cosine similarity, we evaluate similarity based on the angles between the two vectors.The smaller the angle more similar the vectors are. Cosine similarity is only a measurement of similarity not the magnitude. We will restrict our vectors to non negative values that is between 1-5 as food ratings will be usually on a 1-5 scale.

1.3.1.1 Cosine Similarity

We want a metric of distance that falls between 0 and 1. The range of cosine function range from -1 to 1. If the two vectors have same orientation that means they have 0 angle ,then they will be similar.Similarity is 0 when the vectors are orthogonal to each other means angle is 90.

1.3.1.2 Model Based Collaborative Filtering

Now since we have defined a method for similarity measurement we will use it to identify similar users. We have a nxm matrix consisting of the ratings of n users and m food items. Each element of the matrix denotes how user i rated item j.Each item is expected to be an integer from 1-5 and 0 if user has not rated a particular movie. For each user we recommend food items that are not rated yet. To do this,we will effectively use an approach that is similar to weighted K-nearest neighbours. We will recommend food items that are not yet rated by the user. For every food item j which the user i has not yet rated , we find set of users X similar to i and have rated food item j. For users of set X we take its rating for food item j and multiply by cosine similarity of user i and user from set X.After that we sum all these rating and divide by total users in X to get weighted rating for food item j. After that food items with higher weighted ratings are favoured to the user.

1.3.1.3 Content Based Recommendation

In Content Based Recommendation we measure how similar two items are based on their metadata tags. For example in food items metadata tags could be fat content, protein content,etc. For measuring similarity we actually count a ratio of number of items that are common and items which could possibly be shared. Now since we have data on similarity of metadata tags , food items can be easily recommended to the users.

1.3.1.4 Euclidean Distance Score

Distance between two points is length of line segment connecting them.

In the Euclidean Space the axes are the ranked items(breakfast items) and points represent the score given by the persons to the items.

We define preference space for each distinct pair of items and only people which have ranked both items belong to the preference space.

1.4 Pearson Correlation Coefficient (PCC)

Drawback of Euclidean Distance based comparison If a person gives higher scores than the others or if one is harsher than the other, it will classify them as dissimilar. There can still be a perfect correlation between them if differences between their rankings are consistent.

PCC measures correlation between two variables X and Y. Its value lies between +1 and 1. +1 represents total positive linear correlation, 0 represents no linear correlation, and 1 is total negative linear correlation.

1.4.1 PCC Working

We have database of common ranked food items between two people. PCC helps to find similarity for a pair of users by considering the correlation between user ratings. To understand how related two persons are we proceed by plotting their preferences (treating each item as a point whose coordinates are determined by the rating on this item by both users.) Now we need to find the best fit straight line over those points. The positive slope of the line shows positive correlation between those points and negative shows negative correlation.

1.4.2 Predicting Ratings from Similarity Measures

We figured out how similar two people are using these similarity measures.

We measure every person against a given person and find the closest people to that specific person.

But our main objective is to predict the rating a person would give to an unrated item.

Take a weighted sum of the ratings given by other persons where the weights are their respective similarity measures.

Chapter *2*

Litrature Survey

1. **El-Dosuky M.A. et al [1]:** This research paper was based on designing recommender systems considering user preferences and uses the approach of knowledge based recommendation.It proposes a methodology for personalized nutrition management using knowledge based recommendation system.

2. **Freyne J. et al [2]:** This research paper was based on designing recommender systems considering user preferences and uses the approach of collaborative filtering recommendation.It proposes a methodology to improve the quality of recommendations and includes the use of machine learning based techniques.It also demands an understanding for user reasoning and similarity.

3. **Ueta T. et al [3]:** This research paper was based on designing recommender systems considering nutritional needs of users and uses the approach of goal-oriented recipe recommendation.It suggests right type of nutrients and meals to treat users health problems.It helps users to recover them from their health problems like obesity,cardiac illness etc.

4. **Elsweiler D. et al [4]:** This research paper was based on designing recommender systems by balancing nutritional requirements of of users and their preferences and comes under the category of content based recommending system.It applies various approaches like machine learning,KNN etc to bring healthiness aspect in the recommender systems.

Chapter *3*

Proposed Work

We propose the following work done by the mobile application:

1. First of all we had taken inputs from user about various parameters like gender, age, height, weight and blood pressure.

2. Based on the inputs we had calculated various quantity which represent the health condition of an individual BMR (Basal Metabolism Rate), AMR (Active Metabolism Rate) and BMI (Body Mass Index or metric BMI).

3. Now based on these parameters we partition our recommendation into 3 categories i.e. Gain Weight, Loose Weight and constant weight.

4. Flow goes like this

- For loosing the weight we must decrease our calorie intake.
- For gaining the weight we must increase our calorie intake.
- For constant weight our calorie intake must remain close to constant.

5. We have created our own database of nutrients by our mess menu by taking data from HealthifyMe App which do contains nutrients data about various Indian cuisines.

6. By using that data our system will recommend amount of each item to be eaten during particular meal on particular day as per our mess menu.

3.1 Technical Details of the Applications

Here are some details of the app:

1. Compile SDK version used 26.

2. Target SDK version 28.

3. Min SDK version 17 (Compatibility with Android 4.2).

4. Database used = SQLite and Layout used = LinearLayout

5. Dataset : College Mess Menu (Nutrition values were filled manually).

3.2 App Requirements

Here are some app requirements:

1. For android user:

(i) Minimum RAM 1GB and free space of 10MB.

(ii) Android 4.2 and above. (Supported in ¿95

2. For development:

(i) 4 GB RAM.

(ii) Android studio 2.0 and higher.

3.3 Reason for choosing android

Some points are:

1. Android is open source.
2. All development tools for android are free.
3. Our targeted audience (College Students) mainly uses android based smart phones.
4. Huge resource available.
5. Development is possible mainly on all platforms while iOS development is possible only on MAC.

3.4 Our Application Components

1. Activities: Visual interface focused on single thing a user can do.Total 29 activities are used in our projects to cover maximum possible use cases.

2. Databases:- SQLite is an open-source relational database i.e. used to perform database operations on android devices such as storing, manipulating or retrieving data from the database. It is embedded in the android by default so there is no need of any setup.

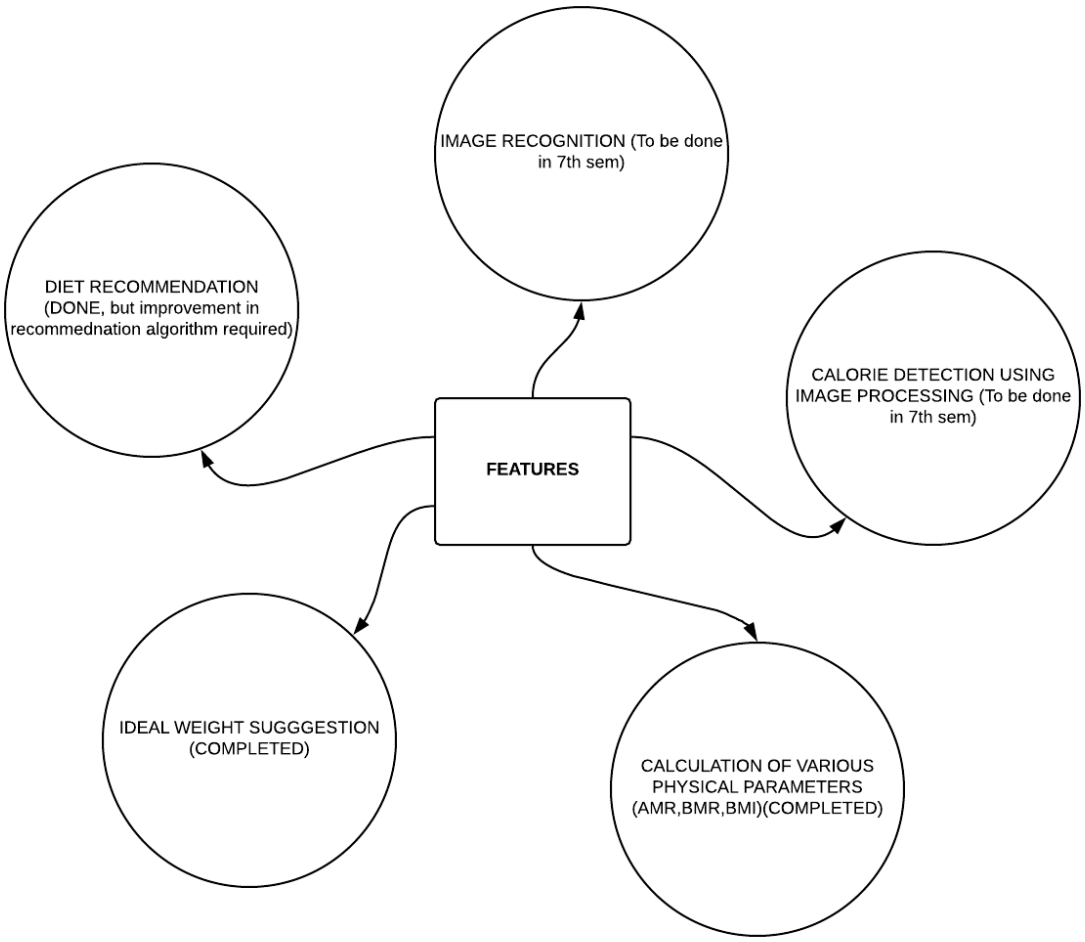

Figure 3.1 Project Objectives

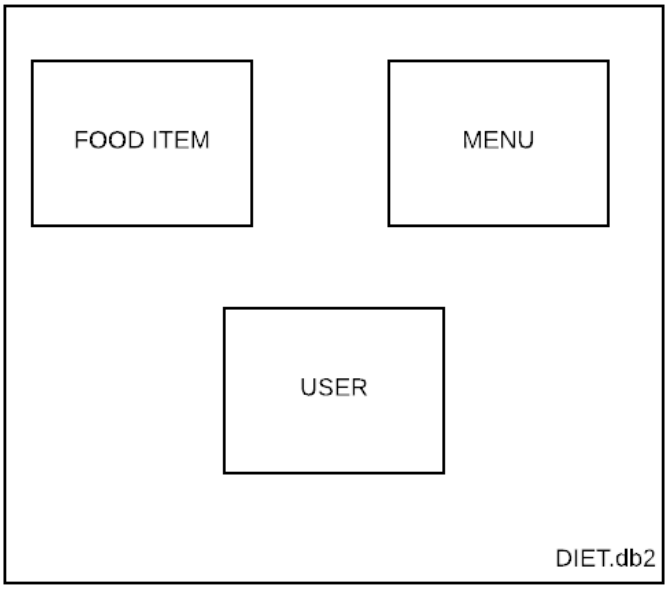

Figure 3.2 Database Information

Chapter *4*

Simulation and Results

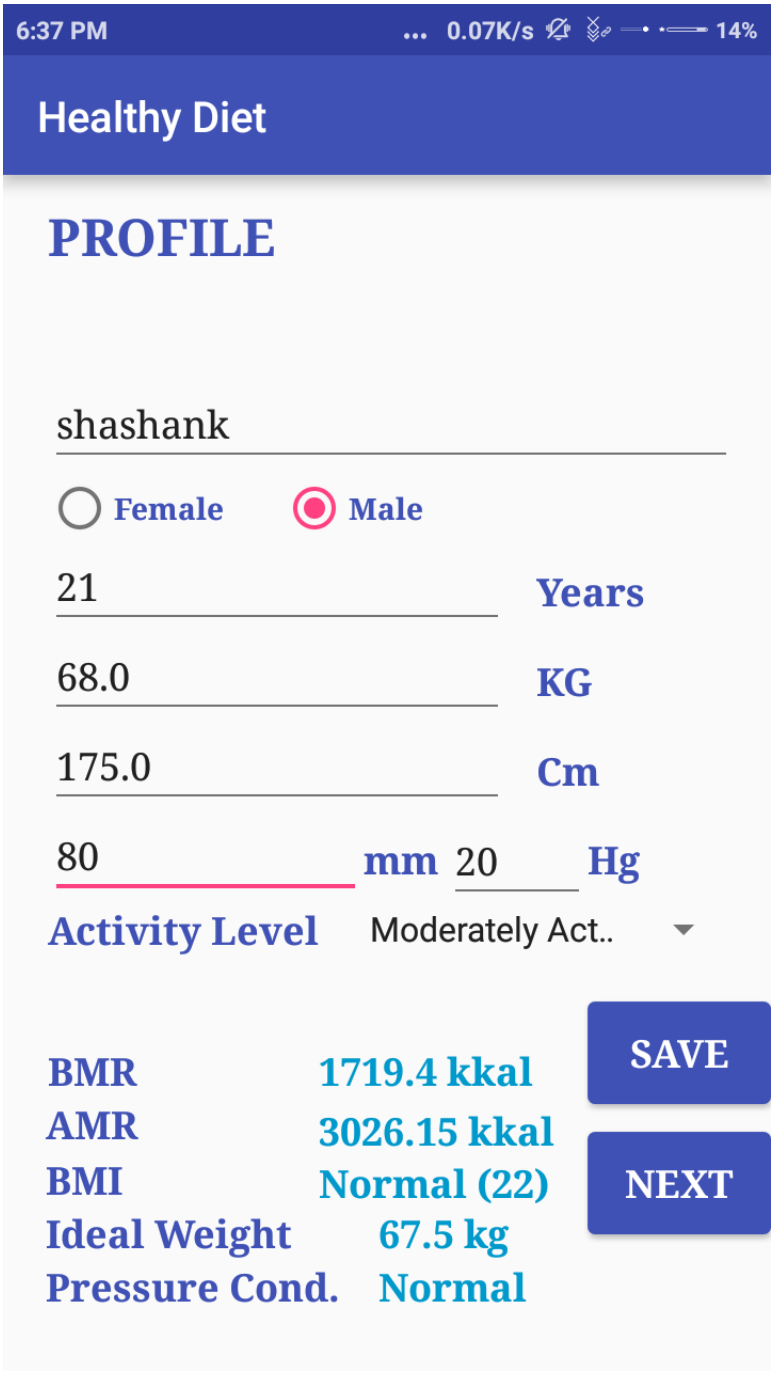

Figure 4.1 Profile Page

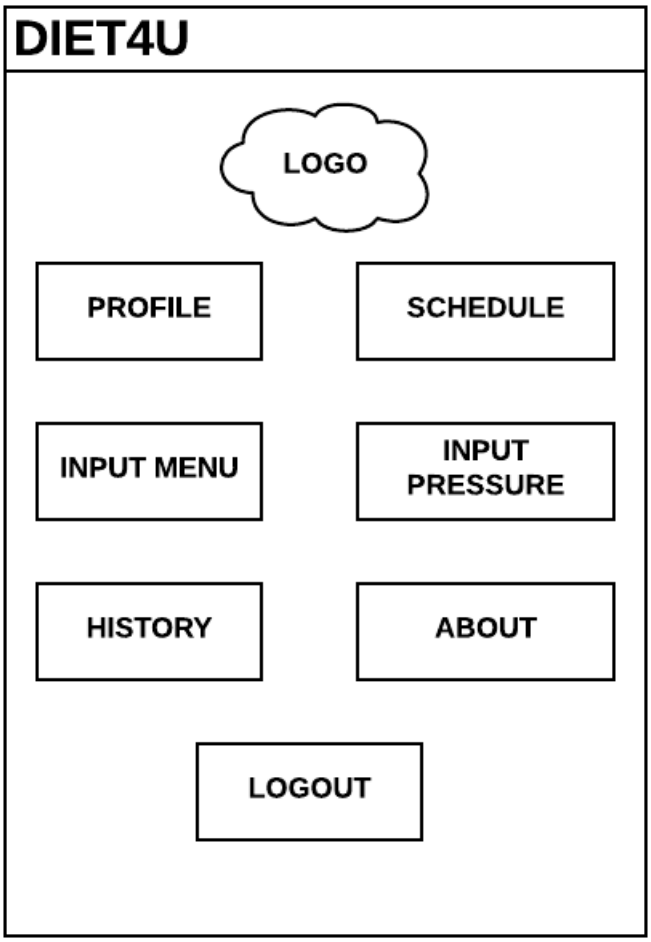

Figure 4.2 Options Page

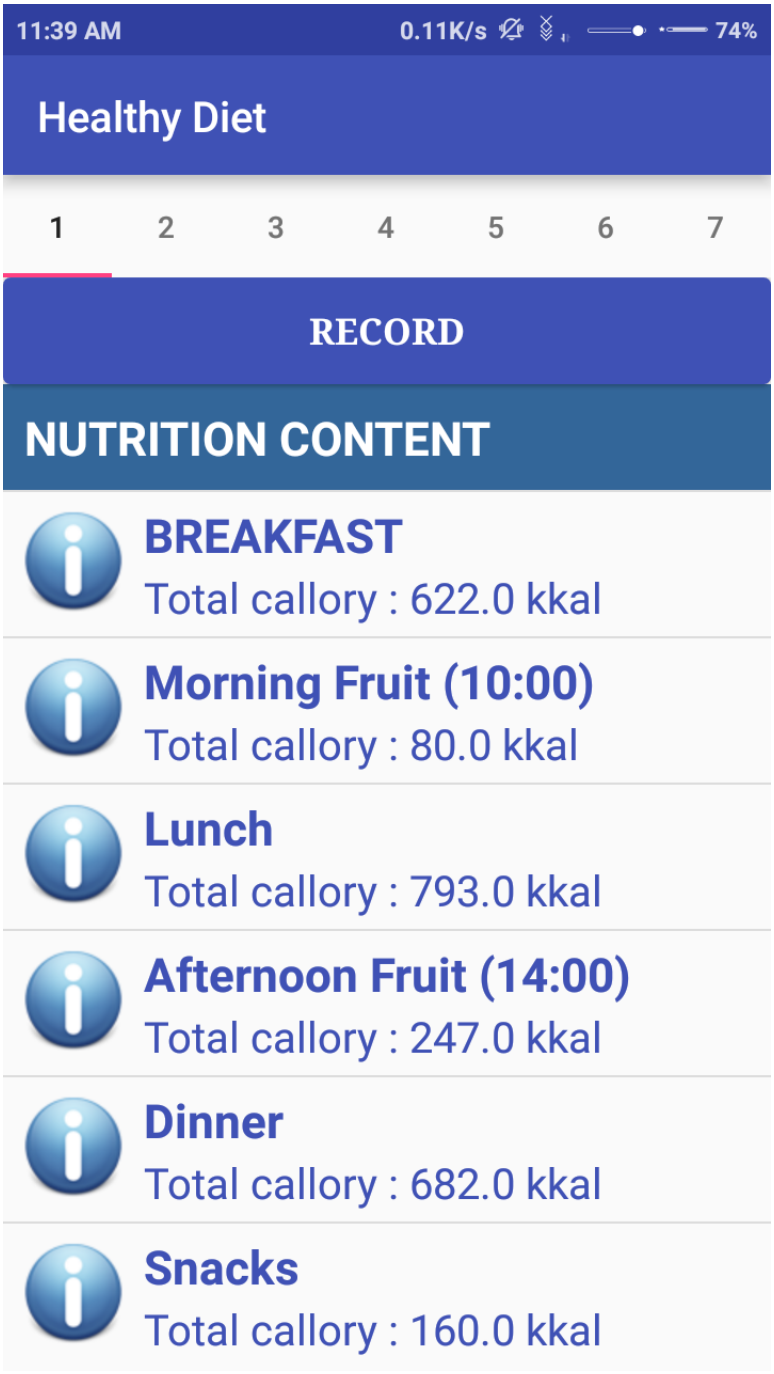

Figure 4.3 Calorie Requirements

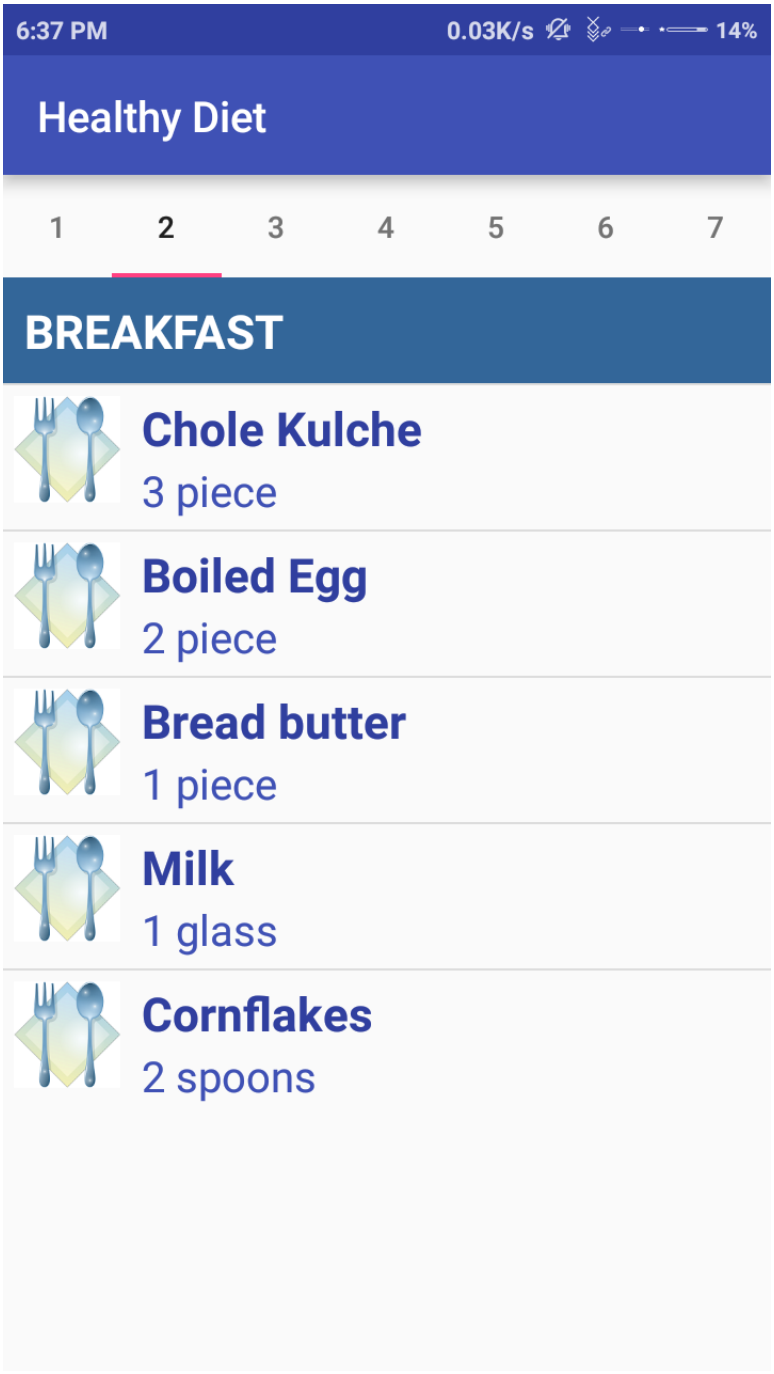

Figure 4.4 Recommended Diet

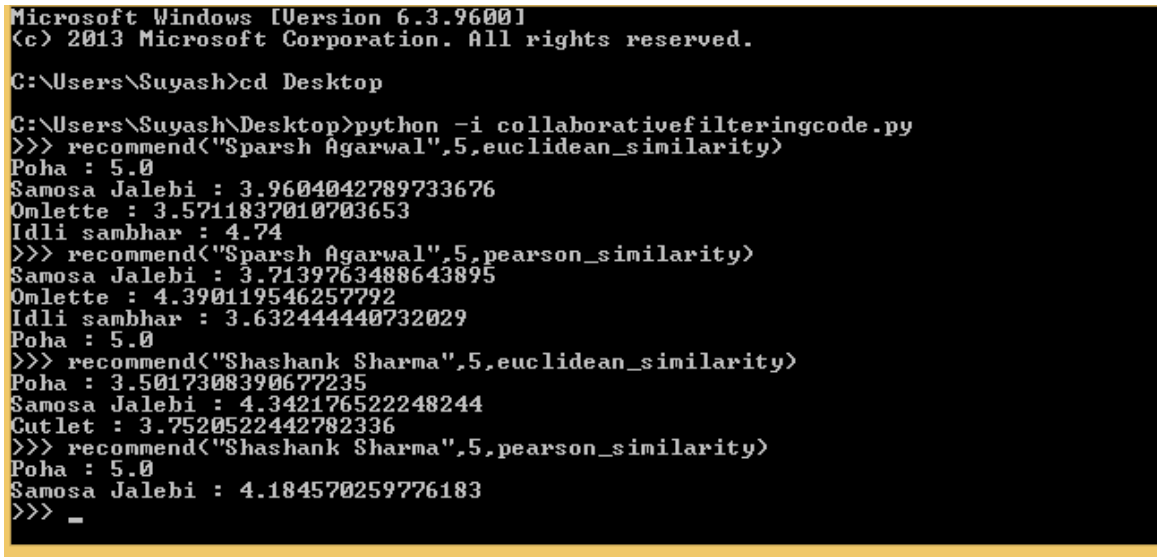

Figure 4.5 Collaborative filtering Recommendation

Chapter *5*

Conclusions and Future Work

1. User information : likes, dislikes, food consumption, or nutritional needs)

2. No. of recipes in the system : The dataset for the food items should be large as error may occur while working on a small dataset.

3. Accuracy of nutritional information of recipes :same food items may be used in different in many different recipes then we get different values for them.

4. A set of constraints or rules : To improve the quality of recommendations we can specify certain conditions which have to be followed.

5.1 Scope of further work

1. To build a food recognition system

2. To calculate calorie and other nutritional facts in food items using food images.

3. To integrate these features in the existing food recommender application.

Bibliography

[1] M.Z.and Hamza T.T.and El-Bassiouny A.H. El-Dosuky, M.A.and Rashad. Food recommendation using ontology and heuristics. 2012.

[2] S.and Smith G. Freyne, J.and Berkovsky. Recipe recommendation: Accuracy and reasoning, 19th international conference, umap 2011. 2011.

[3] T. Ueta, M. Iwakami, and T Ito. A recipe recommendation system based on automatic nutrition information extraction, proceedings of the 5th international conference on knowledge science, engineering and management. 2011.

[4] D. Elsweiler, M. Harvey, B. Ludwig, and A. Said. Bringing the healthy into food recommenders. 2015.