

Food Recommendation System for Diabetic Patient

Mr. Sameer Maitre, Mr. Ajay Waghmare, Ms. Bhagyashree Metre, Ms. Sakshi Deshmukh, Ms. Shruti Gokhale,

Prof. L.K.Gautam

Sipna College of Engineering & Technology, Amravati.

Abstract— Blood glucose levels that are too high can cause diabetes. Our primary energy source is blood glucose, which is obtained from the food you eat. The pancreas produces the hormone insulin, which facilitates the uptake of glucose from food into our cells for use as fuel. Type-1 and Type-2 diabetes are conditions in which the body produces little to no insulin or uses it poorly. After that, glucose remains in our blood and does not enter our cells. Over time, having too much glucose in our blood can result in health issues. Patients frequently experience heart attacks or strokes, eye issues that can cause vision loss or blindness, discomfort, tingling, or numbness in their hands and feet (also known as nerve damage), renal issues that could result in our kidneys ceasing to function, teeth and gum issues, and kidney problems. A person with diabetes needs to maintain a healthy balance in their everyday activities to keep their diabetes under control and retain good health[1].

Our proposed system, uses their health records in the form of general parameters and recommends them a perfect combination of diet to maintain good health.

Introduction

A 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 objective of this work to recommend a diet to different individual[5].

Our proposed system, uses their health records and recommends them a perfect combination of diet to maintain good health.

This work is made easily accessible and available to the users in the form of a website, so that they can get their plans wherever and whenever they want to. Nowadays, a human being is suffering from various

health problems such as fitness problem, inappropriate diet, mental problems etc. Various studies depict that inappropriate and inadequate intake of diet is the major reasons of various health issues and diseases.

Literature review

The fact that Software Based Smartphone Applications for Promoting Healthy Diet and Nutrition by Steven S. Coughlin, Mary S. Whitehead, et al. [1] were put into place highlights how quickly technology has advanced, encouraging the use of smartphones in health promotion research and practice. The most popular approaches include giving criticism, setting healthy eating goals, cooking healthy meals, making grocery list decisions while keeping track of one's weight, and many others. The project also emphasizes how cellphones have the ability to enhance the precision and thoroughness of self-monitored nutritional intake in weight-control interventions and how they typically lighten the workload associated with such monitoring using conventional paper-based records. Accuracy of diet and nutrition measurements obtained using mobile devices has generally been found to be good. Participants prefer quick and easy to administer applications and those that increase awareness of food intake and weight management.

Barry M. Popkin, distinguished professor at W. R. Kenan, Jr. University, wrote a study titled "Food Consumption and its Impact on Cardiovascular Disease: Importance of Solutions" that focused on the globalized food system. In [2], we learn about:

1. The evolution of the contemporary, globalized food system and its effects on the food supply.
2. A general agreement on the evidence linking different diets and macronutrients to CVD and its associated comorbidities.
3. A description of how modifications to the world's food system can both solve the nation's present dietary-related public health issues and counteract climate change. This paper provided a state-of-the-art review of the link between specific macronutrients and foods and cardiovascular diseases (CVD) and summarized how the global food system contributes to dietary patterns that greatly increase the risks for

the population to experience ill health. In the article by Yue You, Svetlana Vladislavovna Doubova, Diana Margarita Pinto Masis, Ricardo Pérez Cuevas, Victor Hugo Borja-Aburto, and Alan Hubbard, machine learning methodology is applied to evaluate the effectiveness of the diabetic's programme for patients with type 2 diabetes in family medicine clinics in Mexico. [3] Clinic and laboratory databases are where the data is gathered.

The machine learning algorithms utilized were precisely a regression tree, and the main examination of diabetes' impact on glucose management was the outcome, which was the predicted treatment impact. The glycemic control of people with type 2 diabetes is generally discussed in this paper. Counting the number of T2D individuals utilizing databases and algorithms.

Developing a decision support system to assess diabetic patients' carbohydrate consumption by Levente Kovacs, Lorand Vajda, and Patricia Pinter [4] makes use of telemedicine. The technology was created to provide home monitoring, which is an illustration of telemedicine. A form with text fields and drop-down menus can be used to enter personal and medical information to build new patient profiles.

Vital sign changes can be tracked using automatically generated graphs. The ability to prescribe medications is supported by notifications. There are instruments to help remind the patient to take their medication or to perform other tasks, such checking their blood pressure or exercising (each patient has daily programmes set up by their expert that trigger notifications every day). The clustering technique called Improved K-means which falls under the category of point assignment algorithms which is of unsupervised the initial partitions (centroids) have been calculated in a more significant way rather than random selection. This results in reducing the number of iterations.

Proposed Methodology

The goal of this project is to develop a Diabetic Food Recommendation System that can provide personalized and relevant food recommendations for individuals with diabetes. The system will leverage machine learning techniques to analyze various factors such as the nutritional content, glycemic index, portion size, and personal preferences of users to generate tailored food recommendations.

The Diabetic Food Recommendation System will be designed to address the following challenges:

Nutritional Content: Identifying foods that are rich in essential nutrients, low in carbohydrates, and have a

balanced macronutrient profile is crucial for individuals with diabetes[3]. The recommendation system should be able to evaluate the nutritional content of different foods and provide recommendations based on the specific dietary requirements of the user.

Portion Size: Controlling portion sizes is important for managing blood sugar levels and overall calorie intake. The recommendation system should provide guidance on appropriate portion sizes for different foods, taking into consideration the user's individual needs and goals.

Personal Preferences: Taste preferences, cultural dietary habits, and individual food restrictions are important factors that influence food choices. The recommendation system should be able to account for these personal preferences and provide food recommendations that are aligned with the user's taste preferences and dietary restrictions.

The Diabetic Food Recommendation System aims to provide practical and actionable recommendations to help individuals with diabetes make informed food choices and manage their condition effectively[8]. By leveraging machine learning and techniques, the system can provide personalized, relevant, and adaptable food recommendations that align with the user's dietary requirements, taste preferences, and lifestyle, ultimately contributing to improved diabetes management outcomes.

Design

PROCESS

Food recommender systems are gaining popularity due to their importance in maintaining a healthy lifestyle. Most existing studies in the food domain focus on recommendations that suggest appropriate food items for individual users based on their preferences or health problems. In addition, recommendation features are extremely useful in the food industry. Such scenarios present numerous challenges for food recommender systems because the system must recommend food based on the height and weight of the users, which must be considered appropriately. These systems also include features for tracking nutritional consumption and persuading users to change their eating habits for the better. We present an overview of recommendation techniques for individuals and groups in the healthy food domain in this paper. Furthermore, we examine the current state-of-the-art in food recommender systems and discuss research challenges associated with the development of future food recommendation technologies.

COLLECTION OF DATA

The data has specific food related information which is related to the changes in the nutrients for the human being. The data used is observed from the lifestyle and daily records. The data collection process is responsible for the framework to do an inspection of the data collected and the data that can be compared to previously obtained data. This task further leads to the next task which is preprocessing which is applied to normalize the dataset using normalizing techniques. This task helps in dealing with data collecting and balancing to make a dataset that will be based on Machine learning.

We collect our data from Kaggle website in the form of rows and column. In our dataset there are multiple columns which contain the more information about the ingredient , prep time min, total time min , servings , course , is veg , is sugar free, is High protein , is gluten free , is sattvic, is vegan , diet, Allergic, Total Calories , website etc.

We have use Indian Food Dataset from
Kaggle.com

A	B	C	D	E	F	G	H	I	J	
1	Food	name	Ingredients	pre-Times/100	coo-Times/100	tail-Times/100	servings	cuisine	course	isVeg
2	1	Masala Korma	6 Kernels (Butter Ground Pistachio) - desiccated	15	30	45	6	Indian	Side Dish	FALSE
3	2	Spicy Tomato Rice	2 1/2 cups rice - cooked, 3 tomatoes, 1/3	5	10	15	3	South Indian	Main Course	TRUE
4	3	Rag Semiya Uppma - Rag Mithi Vermaal	2 1/2 cups Rice Vermicelli Vermaal, 1/3	20	30	50	4	South Indian	South Indian Swt.	TRUE
5	4	Gargan Chiken Curry - Andhra Style (500 grams Chicken, 2 onion - chopped, 1 Tar		30	30	45	4	Andhra	Lunch	FALSE
6	5	Andhra Style Aam Pachadi - Andhra Chut	1 tablespoon white u	10	20	30	3	South Indian Swt.	South Indian Swt.	TRUE
7	6	Padma Noha Pongal (Rice and Lentils C) 1 cup Rice - soaked for 20 minutes, 1/2 cup		10	20	30	4	South Indian Swt.	South Indian Swt.	TRUE
8	7	Udupi Style Aloo Coconut Curry	500 grams Vata Potatoes (Aloo) yuzhuthi	10	30	40	4	Udupi	Lunch	TRUE
9	8	Mexican Style Black Bean Burrito	4 Tortillas, 1/4 cup Black beans - soaked over	10	30	40	4	Mexican	Lunch	TRUE
10	9	Spicy Crumby Masala U8	10 1/8 - cut into strips, 1 cup Green Bell Pepper	10	20	30	4	Indian	Snack	TRUE
11	10	Cauliflower Lasers Chutney	1 cup cabbage leaves, 3/4 cup tomatoes, 1/8	5	20	25	2	Indian	Side Dish	TRUE
12	11	Homemade Baked Sausages (Wholemeat 8/20 grams Dry)	100 grams (such as cornmeal)	40	60	80	4	Fusion	High Protein Veg.	TRUE
13	12	Veg Chilli Cheese Burgers	2 Burger buns, 5 Pickled Jalapenos - sliced, 2	45	55	65	4	Continental	Main Course	TRUE
14	13	Andhra Style Ingonu Chutney - Andhra Style Veg	3 cups Tamarind Water, 1/2 cup Andhra Red (Sp	0	30	30	3	Andhra	Lunch	TRUE
15	14	And Feb soup - Bengali Style Fish in tomato (grams Aam Machi fish) - mhu kaku fish		5	15	20	2	Bengali	Dinner	FALSE
16	15	Sauerk Aal (Fermented Potato Curry)	5 Potatoes (Aal) - baked with skin, 2 bagpas	10	20	30	6	Punjabi	Lunch	TRUE
17	16	South Indian Onion Curry - South Ind	2 onions, 1 heugson curry seeds, 2 tableps	20	20	40	4	South Indian	Side Dish	TRUE
18	17	Bengali Egg Curry in Cardamom and Milk White Eggs - baked, 1 Creamed Sliced Egg		15	20	35	4	Indian	Lunch	FALSE
19	18	Gourd Raiti - Gourd Raiti Gourd, 2 cups curd, 1 cup gourd - peeled and kaphim.		15	30	30	3	Indian	Side Dish	TRUE
20	19	Homemade Taler Taler	10 Potatoes (Aal), 1 heugson Garlic powder	15	45	60	8	Continental	Appetizer	TRUE
21	20	Chetnad Vegetable Chutney - Chutney 1 cup rice - wash well in water, 1/2 small onion		15	45	60	4	Chetnad	Dinner	TRUE
22	21	Garlic Amla Chutney - Lakhon Amla Chutney, 6 small onions, 10 bad gourd, 2 gram		5	10	15	3	Tamil Nadu	Side Dish	TRUE
23	22	Maharashtrian Chutney - Spiced 1/2 cup Gram flour (Besan), 1/2 cup White Pea		30	30	60	4	Maharashtrian	Indian Breakfast	FALSE
24	23	Homemade Healthy Salsbury Salad 2/3 Salsbury Salad (Salsbury Salad) - 1/3		15	15	30	4	Fusion	Dinner	TRUE
25	24	South Indian Style Maragatha Pongal - 5 Desiccated - cut into 3 pieces, 1/2 cup		30	15	45	4	South Indian	Side Dish	TRUE
26	25	Asan Hango (Asin - Soften Hango) 1/2 cup Mango Pulp (Pomei), 1 cup Card G		10	15	25	2	Indian	Snack	TRUE
27	26	Chetnad Sweet Papam - Chetnad 1 cup clove mustard, 4 tablespoons cori		5	20	25	10	Chetnad	Snack	TRUE
28	27	Red Meat Samosa Curry - Salsa - 3 Cardamom (Elaichi) (Pud Salsa) 8 White		5	30	35	3	North Indian	Lunch	TRUE
29	28	Spiced Garlic Bruschetta - With Red Bell - Salsbury - sliced, 1/2 tablespoon Butter, 1/2		10	20	30	4	Italian	Appetizer	TRUE

Figure 4.1 – Dataset Screenshot 1

isSugarFree	isHighProtein	isGlutenFree	isBathic	isVegan	diet
TRUE	FALSE	FALSE	FALSE	FALSE	Diabetic Friendly
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	TRUE	FALSE	FALSE	FALSE	High Protein Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Non Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	TRUE	FALSE	FALSE	FALSE	High Protein Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	TRUE	FALSE	FALSE	FALSE	High Protein Non Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Eggitarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
TRUE	FALSE	FALSE	FALSE	FALSE	Diabetic Friendly
FALSE	TRUE	FALSE	FALSE	FALSE	High Protein Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian
FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian

Figure 4.2 – Dataset Screenshot 2

diet	allergies	totalCaloriesInCa	instructions	URL	imgURL
Diabetic Friendly	None	216	To begin making the Mar	https://www.archanasitchen.com	https://www.archanasitchen.com
Vegetarian	peanuts	102	To make tomato pulp	http://www.archa	https://www.archanasitchen.com
High Protein Vegetarian	None	216	To begin making the Ray	https://www.archanasitchen.com	https://www.archanasitchen.com
Non Vegetarian	None	1020	To begin making Gongui	http://www.archa	https://www.archanasitchen.com
Vegetarian	None	41	To make Andhra Style A	https://www.archa	https://www.archanasitchen.com
High Protein Vegetarian	None	212	To begin making Pudina	http://www.archa	https://www.archanasitchen.com
Vegetarian	lactose	101	To begin making the Uda	http://www.archa	https://www.archanasitchen.com
Vegetarian	lactose	522	To begin making the Sa	https://www.archa	https://www.archanasitchen.com
Vegetarian	None	150	To prepare Stuffed Crunc	http://www.archa	https://www.archanasitchen.com
Vegetarian	None	67	To make cauliflower leaf	http://www.archa	https://www.archanasitchen.com
Vegetarian	None	155	To begin making the hor	https://www.archa	https://www.archanasitchen.com
Vegetarian	lactose	160	To begin making the Veg	https://www.archa	https://www.archanasitchen.com
Vegetarian	None	63	To begin making the Aru	https://www.archa	https://www.archanasitchen.com
High Protein Non Vegetarian	None	232	To begin making the Aar	https://www.archa	https://www.archanasitchen.com
Vegetarian	lactose	112	To begin with Saunt Ala	https://www.archa	https://www.archanasitchen.com
Vegetarian	None	90	To make South	http://www.archa	https://www.archanasitchen.com
Vegetarian	lactose	156	To begin making the Har	https://www.archa	https://www.archanasitchen.com
Vegetarian	None	24	To prepare gourd ratl	http://www.archa	https://www.archanasitchen.com
Vegetarian	None	18	To begin making the Hor	http://www.archa	https://www.archanasitchen.com
Vegetarian	None	359	To make Chettinad vege	https://www.archa	https://www.archanasitchen.com
Vegetarian	None	70	To make Garlic Arila Ch	http://www.archa	https://www.archanasitchen.com
Diabetic Friendly	None	100	To begin making the Mel	http://www.archa	https://www.archanasitchen.com
High Protein Vegetarian	lactose	400	To begin making Subwa	http://www.archa	https://www.archanasitchen.com
Vegetarian	None	176	To begin making Muruk	http://www.archa	https://www.archanasitchen.com
Vegetarian	lactose	360	To begin making the	https://www.archa	https://www.archanasitchen.com
Vegetarian	None	1960	To make the Chettinad s	http://www.archa	https://www.archanasitchen.com
Vegetarian	lactose	103	To begin making the Mir	http://www.archa	https://www.archanasitchen.com
Vegetarian	lactose	89	To prepare Spinach Gar	http://www.archa	https://www.archanasitchen.com

Figure 4.3 - Dataset Screenshot 3

DATA PREPARATION

In this study, the data preparation stage is data pre-processing that prepares raw data before the following process (clustering and memory-based processes) to obtain clean data. One way to data pre-processing is to reduce irrelevant attributes.

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	foodID	name	Ingredient	prepTime	cookTime	totalTime	savings	cuisine	course	isVeg	isSugarcane	isHighProtein	isGlutenFree	isDietary	isVegan	diet	allergies	totalCalor	instructionURL	imgURL		
2	1	Masala Ka Karella	15	30	45	6	Indian	Side Dish	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	Diabetic	None	106	To begin in https://www.archanaskitchen.com/				
3	2	Spicy Tom 2-1/2 cup	5	10	15	3	South Indian	Main Course	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	peanuts	212	To make in https://www.archanaskitchen.com/				
4	4	Gongura C 500 grams	15	30	45	4	Andhra	Lunch	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Non Vegetarian	None	1020	To begin in https://www.archanaskitchen.com/				
5	6	Pudina Khe 1 cup Rice	10	20	30	4	South Indian	South Indian	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	High Protein	None	212	To begin in https://www.archanaskitchen.com/				
6	11	Homemade 250 grams	60	60	120	4	Fusion	High Protein	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	155	To begin in https://www.archanaskitchen.com/				
7	13	Andhra Style 2 cup Tam	0	30	30	4	Andhra	Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	63	To begin in https://www.archanaskitchen.com/				
8	14	Andhra Style 600 grams	5	15	20	2	Bengali	Dinner	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	High Protein	None	232	To begin in https://www.archanaskitchen.com/				
9	15	Sauerkraut 5 Potatoes	10	15	25	6	Punjabi	Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	lactose	112	To begin in https://www.archanaskitchen.com/				
10	16	South Indian 2 onions, 1	20	20	40	4	South Indian	Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	90	To make in https://www.archanaskitchen.com/				
11	17	Haridra 4 Whole G	15	20	35	4	Indian	Lunch	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	lactose	156	To begin in https://www.archanaskitchen.com/				
12	21	Gur Ka Amla 8 Bani, 6 s	5	10	15	3	Tamil Nadu	Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	70	To make in https://www.archanaskitchen.com/				
13	26	Chettinad 1 cup dill d	5	20	25	10	Chettinad	Snack	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	1960	To make in https://www.archanaskitchen.com/				
14	27	Mini Dal 5.0 Carame	5	30	35	3	North Indian	Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	lactose	103	To begin in https://www.archanaskitchen.com/				
15	30	Asian Style 300 grams	10	15	25	4	Thai	Side Dish	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	High Protein	peanuts	58	To begin in https://www.archanaskitchen.com/				
16	31	Chinese Dish 1 tablepo	15	25	40	4	Chinese	Dessert	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	200	To begin in https://www.archanaskitchen.com/				
17	32	Sundakkai 1/2 cup Su	30	35	65	4	South Indian	Lunch	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	Diabetic	Fructose	140	To make in https://www.archanaskitchen.com/				
18	38	Kerala pal 1 cup Ada	15	75	90	4	Kerala	Dessert	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	lactose	45	To begin in https://www.archanaskitchen.com/				
19	37	Tindora 1 cup Tind	20	15	35	1	Gujarati	Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	102	To begin in https://www.archanaskitchen.com/				
20	38	Chettinad 1 Chicken	15	20	35	3	Chettinad	Appetizer	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	High Protein	lactose	1800	To begin in https://www.archanaskitchen.com/				
21	39	Palaekka 1 cup Jack	5	20	25	4	Tamil Nadu	Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	92	To begin in https://www.archanaskitchen.com/				
22	40	Baingan 1 eggplant	25	35	60	4	Punjabi	Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	lactose	113	To start in https://www.archanaskitchen.com/				
23	42	Pocha Ma 1 tea mas	5	30	35	4	Tamil Nadu	Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	1070	To make in https://www.archanaskitchen.com/				
24	43	Short food 10 Jackfr	10	45	55	4	Goorg	Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	120	To begin in https://www.archanaskitchen.com/				
25	44	Whole WH 1 cup Who	10	45	55	4	Goorg	Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	lactose	265	To begin in https://www.archanaskitchen.com/				
26	45	Cabbage 3 Carrots	10	20	30	4	Gujarati	Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	242	To begin in https://www.archanaskitchen.com/				
27	48	Andhra Style 1 kg Tom	15	60	75	6	Andhra	Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	1456	To begin in https://www.archanaskitchen.com/				
28	50	Aamras - 13 cups Ma	10	5	15	4	North Indian	Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	Vegan	None	67	To begin in https://www.archanaskitchen.com/				
29	52	Peerkana 2 cups Bida	15	10	25	4	South Indian	Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	205	To begin in https://www.archanaskitchen.com/				

Figure 4.4 – Modified Dataset 1 chances of receiving identical recommendations exist because a user's preferences might not alter frequently. The aforementioned approaches for recommending ailments or have diets to do deal with balancing diets specifically with programs. certain

The proposed system recommends substituted foods according to nutrition and food parameters.

Based on the user's choices and the system's recommendations for personalized recipes. The algorithm of the suggested system made use of matrix factorization and latent feature vectors. By using tags that closely match the recommendations with users' tastes, prediction accuracy is attained. To balance the user's diet in accordance with his needs, the writers do not take nutrition into account. It is suggested to employ a content-based food recommender system that makes recipe recommendations based on the user's pre-established preferences[6]. Additionally,

Decision Tree Classifier

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
31	55	Pan Fried 1/2 tablepo	20	45	65	4	Continents	Appetizer	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	lactose	680	To begin in https://www.archanaskitchen.com/					
32	58	Chana Dal 200 grams	15	60	75	4	Bengali	Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	lactose	222	To begin in https://www.archanaskitchen.com/					
33	60	Bengal na 3 Masal N	15	20	35	4	Bengali	Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	170	To begin in https://www.archanaskitchen.com/					
34	61	Berechun 1.5 chaklad	10	45	55	3	South Indian	Lunch	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	High Protein	None	90	To make in https://www.archanaskitchen.com/					
35	63	Iranian Bar 4 Whole G	10	30	40	4	Middle East	Lunch	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	83	To begin in https://www.archanaskitchen.com/					
36	66	Veggie Chik 1 cup Gar	20	30	50	4	North Indian	North Indian	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	High Protein	lactose	480	To begin in https://www.archanaskitchen.com/					
37	69	Tomato 1/2 cups Tom	0	30	30	4	Continents	Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	90	To begin in https://www.archanaskitchen.com/					
38	70	Dubai Vadi 2 Onions	10	35	45	4	Maharashtri	Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	285	To begin in https://www.archanaskitchen.com/					
39	71	Raddi Sh 8 Masal N	10	30	40	4	Indian	Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	209	To begin in https://www.archanaskitchen.com/					
40	73	Matar Pane 1 cup All P	50	30	80	4	Indian	Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	lactose	180	To begin in https://www.archanaskitchen.com/					
41	76	Karwar Sh 3 Hog Plan	25	25	50	4	Coastal	Ka Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	259	To begin in https://www.archanaskitchen.com/					
42	77	Rosinated C 2 cups Cas	15	25	40	4	South Indian	Dinner	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	25	To begin in https://www.archanaskitchen.com/					
43	80	Winn Pane 1.5 cups	10	25	35	2	Kerala	Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	lactose	87	To begin in https://www.archanaskitchen.com/					
44	86	Mung Madi 500 gram	150	30	180	4	North Indian	Lunch	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Non Vegetarian	lactose	264	To begin in https://www.archanaskitchen.com/					
45	85	Kudali Chik 2-1/2 cup	10	40	50	4	South Indian	Lunch	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	High Protein	lactose	210	To make in https://www.archanaskitchen.com/					
46	98	Tamil Nadu 2 Whole G	5	30	35	4	Tamil Nadu	Appetizer	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	207	To begin in https://www.archanaskitchen.com/					
47	99	Chiken Dnd 2 cups Fre	20	20	40	4	Bengali	Dessert	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	lactose	1840	To begin in https://www.archanaskitchen.com/					
48	102	North Indi 1 cup Buta	10	30	40	2	North Indian	Lunch	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	High Protein	maashroom	152	To begin in https://www.archanaskitchen.com/					
49	103	Shimma Ch 1/2 cup C	480	60	540	4	North Indian	Main Course	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	High Protein	None	223	To begin in https://www.archanaskitchen.com/					
50	104	Capsicum 1 tomato	38	25	63	4	South Indian	Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	peanuts	119	To begin in https://www.archanaskitchen.com/					
51	105	Kerala Style 1/2 cup re	380	20	380	4	Kerala	Dinner	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	180	To make in https://www.archanaskitchen.com/					
52	107	Dahi Vadi 400 grams	45	15	60	6	North Indian	Lunch	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	High Protein	lactose	214	To begin in https://www.archanaskitchen.com/					
53	108	Chicken T 4 Hard Tac	20	0	20	2	Mexican	Dinner	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Non Vegetarian	None	410	To begin in https://www.archanaskitchen.com/					
54	110	Masala 2 1/2 cup Tom	20	30	50	4	North Indian	Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	174	To make in https://www.archanaskitchen.com/					
55	113	Muttakala 500 grams	15	30	45	3	South Indian	Side Dish	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	No Onion	None	387	To begin in https://www.archanaskitchen.com/					
56	114	Bengal na 1 Bengali B	50	40	90	4	Karnataka	Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	118	To begin in https://www.archanaskitchen.com/					
57	116	Lemon 1/4 cup Car	600	0	600	3	Continents	Snack	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	lactose	124	To begin in https://www.archanaskitchen.com/					
58	118	Dry Sran 250 grams	15	20	35	4	North Indian	Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	187	To begin in https://www.archanaskitchen.com/					
59	119	One Pot 1.1 ton 1000	15	25	40	4	South Indian	Lunch	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Non Vegetarian	None	402	To make in https://www.archanaskitchen.com/					

A supervised learning approach called a decision tree can be applied to classification and regression problems.

The method generates rules that can be represented by a tree structure using training data. It includes a root node, internal nodes, and leaf nodes like any other tree representation would. The internal node represents an attribute condition, the branches the condition's outcomes, and the leaf node the class

Figure 4.5 - Modified Dataset 2 label.

Following the if-else style rules, you start at the root node at the top and work your way down to the leaf node to arrive at the classification. Your classification problem's class label is the leaf node where you end up [9].

61	121	Togori Bnd 1 cup Acha	10	25	35	4	South Indi Lunch	TRUE	FALSE	TRUE	FALSE	FALSE	High Prote	None	140	To begin in https://www.archanaakitchen.com
62	124	Pala Chai 1 cup Char	20	30	50	4	North Indi Lunch	TRUE	FALSE	TRUE	FALSE	FALSE	High Prote	None	222	To begin in https://www.archanaakitchen.com
63	125	Pani Panna 1/2 cup Ye	15	30	45	4	South Indi Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	100	We begin in https://www.archanaakitchen.com
64	126	Maharash 1 cup Soq	60	25	85	4	Maharash Dessert	TRUE	FALSE	FALSE	FALSE	FALSE	Vegetarian	Lactose	150	To begin in https://www.archanaakitchen.com
65	127	Ragi Masa 2 cups Rag	20	20	40	4	South Indi Lunch	FALSE	TRUE	FALSE	FALSE	FALSE	Diabetic Fr	None	56	To begin in https://www.archanaakitchen.com
66	128	Dry Sweet 2 Sweet Pt	10	10	20	4	Kerala Side Dish	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	212	To begin in https://www.archanaakitchen.com
67	129	Onco Milk 8 Onco bio	10	15	25	2	Continents Snack	TRUE	FALSE	FALSE	FALSE	FALSE	Vegetarian	Lactose	262	To begin in https://www.archanaakitchen.com
68	130	Mexican 1/4 Sweet cr	5	20	25	4	Mexican Snack	TRUE	FALSE	FALSE	FALSE	FALSE	Vegetarian	Lactose	265	To begin in https://www.archanaakitchen.com
69	131	Panner Mts 1/2 cups	15	45	60	4	North Indi Dinner	TRUE	FALSE	TRUE	FALSE	FALSE	High Prote	Lactose	451	To begin in https://www.archanaakitchen.com
70	132	Thugere 5 Eggplant	5	20	25	4	Lucknow Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	Vegetarian	Lactose	222	To make in https://www.archanaakitchen.com
71	133	Rajasthan 1 cup Gar	10	30	40	4	Rajasthan Side Dish	FALSE	FALSE	FALSE	FALSE	TRUE	No Onion	Lactose	385	To begin in https://www.archanaakitchen.com
72	134	Indo Chne 250 grams	10	60	70	3	Fusion Appetizer	FALSE	FALSE	FALSE	FALSE	FALSE	High Prote	None	320	To begin in https://www.archanaakitchen.com
73	135	And Fish 1/2 cup Ma	10	40	50	2	Bengali Lunch	FALSE	FALSE	TRUE	FALSE	FALSE	High Prote	None	315	To begin in https://www.archanaakitchen.com
74	136	Shen Letts 1 cup Gree	10	20	30	4	South Indi Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	Diabetic Fr	None	29	To begin in https://www.archanaakitchen.com
75	137	Crappi Mts 1 cup Row	10	25	35	3	Gujarati Snack	TRUE	FALSE	TRUE	FALSE	FALSE	High Prote	peanuts	613	To begin in https://www.archanaakitchen.com
76	138	Maa 6 Dal 1 cup Bnd	10	150	160	4	Punjabi Dinner	TRUE	FALSE	TRUE	FALSE	FALSE	High Prote	None	139	To make in https://www.archanaakitchen.com
77	139	Pala Maa 200 grams	10	30	40	4	North Indi Lunch	TRUE	FALSE	TRUE	FALSE	FALSE	High Prote	Lactose	180	To begin in https://www.archanaakitchen.com
78	140	Dahi Bnd 1 Cup Vac	10	30	40	4	North Indi Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	High Prote	peanuts	592	To begin in https://www.archanaakitchen.com
79	141	Wheat Grit 50 grams	10	20	30	3	Indian Snack	TRUE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	25	To make in https://www.archanaakitchen.com
80	142	Chole Mts 1 cup Kala	10	30	40	2	Punjabi Lunch	FALSE	TRUE	FALSE	FALSE	FALSE	High Prote	None	223	To make in https://www.archanaakitchen.com
81	143	Rajasthan 1 Kachri, 1	5	30	35	2	Rajasthan Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	157	To make in https://www.archanaakitchen.com
82	144	Fasting 1/2 Potatoe	20	60	80	4	North Indi Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	Vegetarian	Lactose	206	To make in https://www.archanaakitchen.com
83	145	Katachi 1/2 cup lent	10	15	25	4	Maharash Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	287	To make in https://www.archanaakitchen.com
84	146	Khara 000 1 cup Whi	30	45	75	4	Karnataka Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	Vegetarian	Lactose	175	We begin in https://www.archanaakitchen.com
85	147	Caiflower 1 cabbage	10	35	45	3	Indian Dinner	TRUE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	104	To make in https://www.archanaakitchen.com
86	148	Kashmir 1 250 grams	5	30	35	4	Kashmir Lunch	TRUE	FALSE	FALSE	FALSE	FALSE	Vegetarian	Lactose	124	To make in https://www.archanaakitchen.com
87	149	Aromatic 1/2 cups Rico	20	30	50	4	Indian Lunch	FALSE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	250	To begin in https://www.archanaakitchen.com
88	150	Spicy Card 1 Water-as	10	20	30	2	Indian Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	Vegetarian	None	90	To make in https://www.archanaakitchen.com
89	151	Mustard 1/2 2 spoon	20	30	50	4	Indian Side Dish	TRUE	FALSE	FALSE	FALSE	FALSE	Vegetarian	Lactose	200	To make in https://www.archanaakitchen.com

Experiments and Results

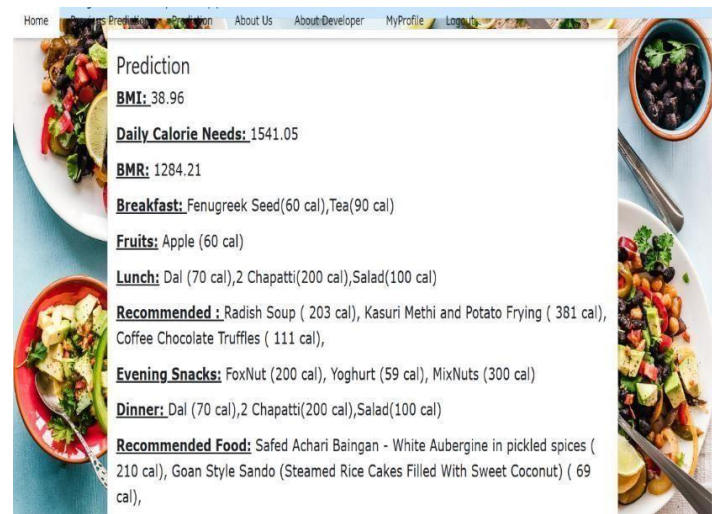
1. User's will enter the necessary information like their age, gender, weight etc. on the website.
2. The information will then go through the ML model in following manner:

2.1 Decision Tree Classifier is used to classify the food items and predict the food items based on the input.

Figure 4.6 - Modified Dataset 3. After analyzing all the data the system will respond by showing user's BMI and their **A Food Recommendation System (FRS)** current state (Overweight, Underweight,

Healthy)

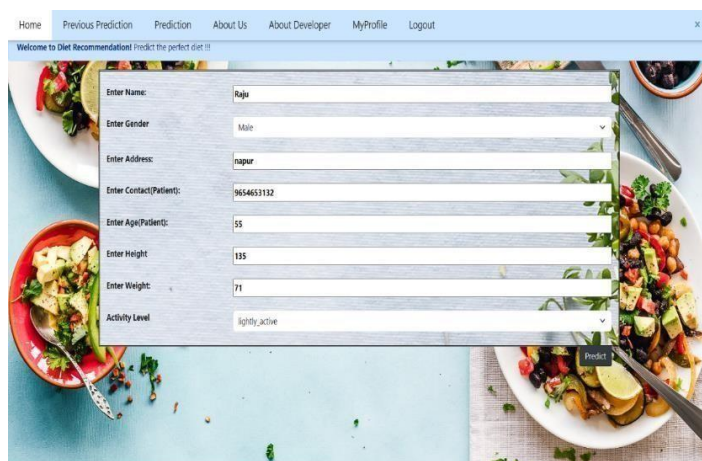
4. The System will then recommend diet to the users into three categories (breakfast, lunch, dinner) based on input
5. The Users can choose from multiple recommended items and make their diet plan.
6. After selecting food items the system will calculate selected food calories and show user's comparison between how much calories they chosen against how much they need to consume daily. 7. Accordingly then the User's will make its diet plan.



Screenshot 2: Prediction of User

Based on the parameters the food is recommended. The value is matched in the dataset and prediction is shown on web page. The various factors like BMI, BMR, calories needed are calculated.

Table No.1 - Calorie Evaluation with personal parameters



Home Previous Prediction Prediction About Us About Developer MyProfile Logout

Welcome to Diet Recommendation! Predict the perfect diet !!

Enter Name:

Enter Gender:

Enter Address:

Enter Contact(Patient):

Enter Age(Patient):

Enter Height:

Enter Weight:

Activity Level:

Screenshot 1 : Data of User

Sr. No.	Name of Person	Age	Height	Weight	Activity Level	BMI	Calorie Needed	Calorie Generated
1	Raju	55	135	71	LA	38.96	1541.05	1511
2	Riya	35	135	58	VA	31.82	1500.72	1469
3	Tejas	21	145	60	VA	28.54	1632.83	1612
4	Ajay	22	175	56	VA	18.25	1694.78	1726
5	Bhagyashree	29	130	58	LA	34.32	1513.31	1500
6	Suresh	65	142	71	S	37.2	1559.5	1563
7	Nikhil	42	163	61	LA	22.96	1601.73	1617
8	Sakshi	44	143	63	MA	30.81	1539.18	1534
9	Sameer	27	159	62	VA	24.52	1675.89	1641
10	Shruti	52	132	47	MA	26.97	1279.17	1250



Chart No. 1

Conclusion & Future Scope

By the end of our project, we concluded that if Diet Recommendation system based on diabetics was properly designed, implemented, and evaluated, it could be used as an effective tool to improve nutrition and promote a healthy lifestyle.

An accuracy of 78.488 % for food recommendation was achieved for this system.

Thesaid accuracies will provide recommendations to the users. Accuracy can be improved by adding more data into the system. The increase in the number of data values will help in the formation for classifier more precisely, thereby improving the accuracy of the system.

In the future, we plan to expand our project to include an Android application that will recommend foods for specific diseases as well as a basic exercise plan and its maintenance.

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