

A Food Recommendation System Based on the User's Calories and Macros

Pouami Das¹, Pratap Nair², Aditya Sanjay Gujral³, Tushar Jawale⁴, Rohit Ludbe⁵

Assistant Professor, Department of Computer Engineering^{1,2}

Students, Department of Computer Engineering^{3,4,5}

K. C. College of Engineering & Management Studies & Research, Mumbai, Maharashtra, India

poulami.das@kccemsr.edu.in, pratap.nair@kccemsr.edu.in, aditya.gujral2001@gmail.com,

Abstract: Obesity is one of the largest contributing factors to the four big killers namely heart disease, cancer, Alzheimer's and diabetes. Reduction in body fat and weight has been shown to improve a person's resistance to a myriad of health complications. Even though a healthy and sustainable diet is an ideal way to lose weight research from has shown that when calories are equated being in a hypocaloric state gives all the benefits of a perfect diet. Using the user's data we aim to help the user maintain their diet and make smarter choices. This paper aims to compare different algorithms to find out which algorithm gives the best result.

Keywords: Meal Recommendation, Recommendation Systems, Nutritional Information, Machine Learning, K Nearest Neighbour.

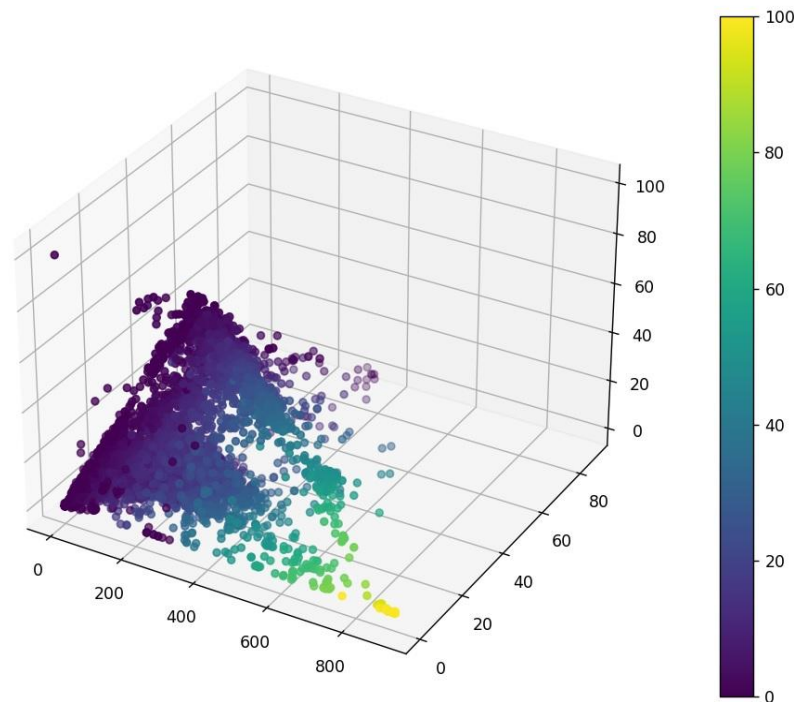
I. INTRODUCTION

Obesity is shown to increase all-cause mortality(death from all causes) and when compared to people with a healthy weight people with obesity are at a much higher risk of heart disease, type 2 diabetes, cancer, Alzheimer's disease, stroke, osteoarthritis among other diseases. Obese people also generally have a lower quality of life. According to the Centers for Disease Control and Prevention, the rate of hospitalization for people with obesity is 3.07 times greater than that of people with a healthy weight and have a 1.42 times greater risk of serious illness(including death). Other than that research from oxford university has shown that low levels of obesity can reduce a person's lifespan by three years and severe levels of obesity can reduce a person's life span by ten years. Losing excess amount of weight can not only increase the lifespan of a person but can also increase the quality of their life. Research from has shown that a hypocaloric state(caloric deficit) is what dictates the amount of weight lost by a person. Research has also shown that the type and source of calories a person eats don't matter as long as they are in a caloric deficit when it comes to weight loss. The macronutrient intake of a person is a distant second as eating a balanced diet can help people to maintain more lean mass and lose their body fat. Lean mass is shown to improve a person's quality of life. In this paper, we design a meal recommender system that allows the user to pick a meal to reach the ideal amount of calories the user must be eating based on the user's total daily energy expenditure, the macronutrient intake and the number of calories consumed by the user. We compare different recommendation system using k nearest neighbour to see which approach gives the best and most accurate results.

II. METHODOLOGY

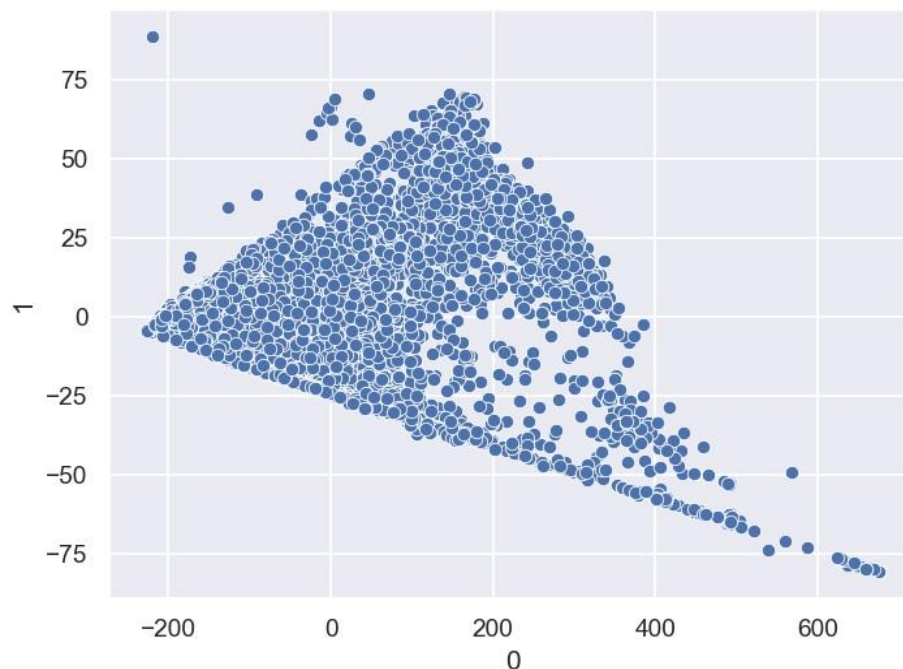
In order to use the recommendation system the user has to input their TDEE(Total daily energy expenditure), calories consumed throughout the day, protein consumed, carbohydrate consumed and fats consumed throughout the day, number of meals the user wants to eat and the number of meals eaten by the user. In order to get this data we use a calorie counting application that saves the data provided by the user. Once the data is obtained we calculate the calories and macros for the ideal meal for the user.

After the calculation of calories and macros we add this ideal meal to the data set and find the closest meal to that ideal meal using k nearest neighbour algorithm. But just using k nearest neighbour for finding the best meal for the user can fail if the intake of any macronutrient is disproportionately high. Sending the ideal meal into extremes of the data and skewing the results. For instance if a user has consumed a higher amount of carbohydrates the ideal meal can have extremely low carbohydrates which can give inappropriate results



Even using cosine similarity the the output is still skewed by the disproportionate amount of carbohydrates consumed in the earlier meals. The same problem can occur if the user eats too much protein and fats.

This limitation can be overcome using PCA(Principal component analysis) that can be used to reduce the dimensionality of the graph and consider calories and protein as one entity while considering carbohydrates and fats as one entity. This converts the above graph into a 2d graph and even consuming high amounts of a macronutrient is solved.



Hence using PCA and k nearest neighbour we can easily find the best meal for the user

III. LITERATURE REVIEW

Sr No	Year of Publication	Author	Paper Name	Conclusion
1.	2014	Celeste E. Naude, Anel Schoonees, Marjanne Senekal, Taryn Young, Paul Garner and Jimmy Volmink D. William Cameron, Editor	Low Carbohydrate versus Isoenergetic Balanced Diets for Reducing Weight and Cardiovascular Risk: A Systematic Review and Meta-Analysis	Trials show weight loss in the short-term irrespective of whether the diet is low CHO or balanced. There is probably little or no difference in weight loss and changes in cardiovascular risk factors up to two years of follow-up when overweight and obese adults, with or without type 2 diabetes, are randomised to low CHO diets and isoenergetic balanced weight loss diets.
2.	2015	W S Leslie, R Taylor, L Harris, M E J Lean	Weight losses with low-energy formula diets in obese patients with and without type 2 diabetes: systematic review and meta-analysis	Weight losses with liquid-formula diets are very similar for VLCD and LELD and for obese subjects with or without T2DM. They can potentially achieve new weight loss/maintenance targets of >15-20% for people with severe and medically complicated obesity.
3.	2021	Pradeep Kumar Singh, Pijush Kanti Dutta Pramanik, Avick Kumar Dey and Prasenjit Choudhury	Recommender systems: an overview, research trends, and future directions	The technologies such as IoT, AI, and cognitive computing have given it a fresh vivacity. We are optimistic that in near future research on RS will witness several new and innovative avenues.
4.	2020	Bin Li, Sailuo Wan, Hua Xia, Fengshou Qian	The Research for Recommendation System Based on Improved KNN Algorithm	In the study, we introduced the background and significance of the recommendation system, and summarized and reviewed the research and development of the recommendation system and the results obtained. And then different recommendation systems were described in detail. The KNN algorithm was improved by two aspects of data sparsity and global effect factors. Although some progress had been made in this study, issues such as the diversity of recommended items and the sparseness of data need to be further addressed. At the same time, in this study, only the user's scoring information was considered, and other user's own information was not used, such as the user's own characteristics (e.g. gender, age, etc.) and the time of scoring the item. In future research, more factors could be considered to obtain better results.

IV. CONCLUSION

We can get quite good results using the k nearest neighbour algorithm and using PCA to get the meal most suitable for the user based on the macros and the calories of the user. This tool could help the user maintain a good diet even if the user has consumed meals that are not ideal before improving the health of the user and helping the user lose weight.