
Balanced Diet Grocery Recommendation Algorithm

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1 Problem statement

With the development of science and technology and the progress of society, people have more convenient lifestyles, but what follows is that under the pressure of work or study, the energy that can be spent on their physical and mental health is less and less. So we came up with an idea, can we use products of rapidly evolving technology to help people care for their physical and mental health. This idea leads to shopping recommendations.

Online shopping is an excellent proof of the development of technology. After many attempts, we believe that most shopping apps or websites only recommend items that customers like or prone to repurchase. People usually search on the Internet (another tremendous technological creation) or go to the hospital to seek medical help after they feel unwell, but the efforts made at this time can only be called remedial.

In today's fast-paced lifestyle, people usually don't pay attention to the nutrients they consume in their daily diet, especially now that there are so many fast food options[6], which leads people to focus on what they want to eat instead of what they need to eat. Prolonged unbalanced nutritional intake can lead to overweight and obesity, heart disease and stroke, type 2 diabetes, cancer, etc[5], so reminding people when they shop can effectively prevent such things from happening.

In summary, we want to focus on balanced diet grocery recommendations. By retrieving part of the consumer's consumption records and the nutritional value of the purchased products, the intake ratio of various nutrients is calculated and compared with the optimal nutritional intake ratio to obtain the nutrients that customers need to supplement. Extract information from consumption records and obtain consumers' consumption habits, and recommend products with nutrients that consumers lack.

1.1 Topic and goals

Our goal is to retrieve information from consumers' food consumption records, and make inferences about consumers' consumption habits and preferences, and select foods or find similar foods from it that are closer to consumers' nutritional needs as priority recommendations. To achieve this goal, we separate the project into two modules.

Module 1: Recommend products that customers want to buy based on their purchase records.

Module 2: Recommend products that are beneficial to their health using a balanced diet standard based on nutrition intake.

2 Method introduction

We could use IR method for text retrieval in shopping records and nutrition. For shopping records, we may add assign more importance over the products that have significant proportion comparing with the ones of the same kind. Similarly, basing on the nutrition proportion, we could label the products whose main factors include the nutrition with significant proportion. We are still learning more new IR methods to build models.

3 Experiments

3.1 Implementation

For module 1, we would like to build two models. One is for the shopping cart products prediction, while the other one is for the shopping cart products recommendation. The recommendation will include more new product that customers may be interested in but bought before.

For module 2, we find a balance diet standard mainly based on the nutrition intake. We will Use the standard as the loss function or matrix to train two new models based on models built in module 1.

We compare two the results from two models in module 1 with ones in module 2 to see if there is an improvement of recommendation in terms of balanced diet.

3.2 Dataset

The nutrition values we use in the algorithm of each food are based on [4], which source data is from [3]. After infer customers' preference from shopping cart database [1], we compare their nutrition intake with nutrition requirement [2] to determine the recommended food list.

3.3 Evaluation

In module 1, we compare the output from two models with the actual shopping records. We evaluate the similarity based on not only the number of common products but also the similarity between products.

In module 2, we compute balance diet recommendation list based on nutrition of foods and the recommendation lists form module 1 for each customer, and calculate the similarity between the two recommendation list. If the similarity is within the acceptable range, and the total nutrient intake ratio is closer to the nutrient intake standard than the recommendation lists of module 1, it is considered successful.

4 Plan of Project

4.1 Anticipated division of work

Two people on the team. One would focus on one model in each module. We will discuss the method and the standard of balanced diet together.

4.2 Challenges and difficulties

People's preferences and needs will change, and the living habits and nutrients they need to take in different periods are also different. It is difficult to infer the needs of nutrition simply based on shopping records. However, a possible solution is recommend based on nutrition intake ratio so we have need to care about the amount of people.

Another challenge is combining datasets. It will be a huge workload to label the nutrition of food to the products in shopping carts dataset based on nutrition dataset, since there are tons of products where most of them have different product names.

We need to learn more IR methods. We have no need to access special kinds of resources.

4.3 Milestones

Section	Time
coding for module 1	Oct 21
coding for module 2 data	Oct 28
testing	Nov 04
project update - draft 1	Nov 09
Modify details and report content	Nov 09 - Dec 14
final project report	Dec 14

References

- [1] *3 Million Instacart Orders, Open Sourced*. May 2017. URL: <https://tech.instacart.com/3-million-instacart-orders-open-sourced-d40d29ead6f2>.
- [2] Center for Food Safety and Applied Nutrition. *Daily value on the New Nutrition Facts Label*. URL: <https://www.fda.gov/food/new-nutrition-facts-label/daily-value-new-nutrition-and-supplement-facts-labels>.
- [3] *Fooddata Central Download Data*. Sept. 2022. URL: <https://fdc.nal.usda.gov/download-datasets.html>.
- [4] *Nutritional values for common foods and products*. Sept. 2022. URL: <https://www.nutritionvalue.org/>.
- [5] *Poor nutrition*. Sept. 2022. URL: <https://www.cdc.gov/chronicdisease/resources/publications/factsheets/nutrition.htm>.
- [6] Giovanni Sogari et al. "College students and eating habits: A study using an ecological model for healthy behavior". In: *Nutrients* 10.12 (2018), p. 1823.