

Profiting Restaurants via Personalized Recommendation

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1 Description

The outbreak of COVID-19 has disrupted the food industry. There has been a decline in the number of people visiting restaurants. Moreover, they have started ordering food online. The restaurant owners are facing fear and are not able to make firm decisions due to these unpredictable times. Few operational restaurants are facing financial constraints and losses. Our motivation is to help restaurant owners decide which dishes to add to the menu, and also optimize the path to procure ingredients for the dishes to maximize profit.

2 Innovation in the Idea

The most innovative aspect of the idea is the fact that the dishes recommended would also take into account the optimization of the ingredients supply chain to provide restaurant owners with a way to procure ingredients for the dishes in a cost-effective manner. To solve this problem, we extract the ingredients required to make the dishes from the dataset and locate suppliers in COVID safe locations selling those ingredients. Then, suggest a path minimizing the distance traveled in transporting the ingredients from the supplier to the restaurant location (FoodMiles metric).

3 Hypothesis

According to the study [1], the restaurant owners are facing issues procuring stock for the dishes on the menu. The study also highlights the difficulty in deciding due to the unpredictability of the outcomes of the pandemic.

Our work focuses on increasing profit by giving importance to factors like menu size and money spent on the procurement of ingredients for the dishes. We believe that adding the top-rated dishes according to the cuisine and neighborhood in the menu and only preparing for these dishes can save a lot of money and resources. We also focus on finding a supplier at COVID safe locations to minimize health risks.

4 Literature Survey

Our collective analysis of this project literature gave us some insight into the nooks and nuances of this project. We tried to understand the rationale behind

ingredient combination for different recipes [2, 3, 4], and how the recipes evolve [5, 6, 7] and if the location is nearby [8, 9, 10]. We also referred studies [11, 12, 13] to understand the food supply chain process. There is some work done on flavor combinations for various recipes using various computational tools [15, 16].

5 Deviation from Proposal

Following the advice of Professor Andres, we are now trying to tackle supply chain management as an optimization problem based on the FoodMiles metric. However, we feel that this project consists of both as we have two parts to this project: 1) Recommending Dishes, and 2) Supply Chain Path Recommendation. The latter being the optimization problem and the former being the Recommendation Problem.

6 Experimental Setup

6.1 Task-specific Acquired Datasets

The task of recommending dishes was carried out focusing on two factors:

- **Frequently ordered dishes in the Neighborhood**
To accomplish this task, data was scraped from Postmates’s website.
- **Dishes belonging to the same Cuisine**
To make possible and validate the aforementioned task, data was collected through the Zomato API which provides details about the dishes from the top-rated restaurants serving the same cuisine.
- **Dishes sharing the same ingredients**
To accomplish this task, simplified-recipes-1M Dataset will be used.
- **Information about suppliers**
To accomplish this task, United States Department of Agriculture (USDA) Organic Integrity Database which contains information for every organic product recognized by the USDA will be used.

6.2 Evaluation Metric

We plan to evaluate the performance of our system through an online survey wherein we will provide users the choice to select a few dishes from the list of various dishes that we recommend since we do not have the ground truth data available. We’ll then compare the results of the same dataset with our system against the selections by the users/restaurant owners.

6.3 Results and Analysis

The first step of the project was to extract the 5 frequently ordered dishes in the neighborhood by scraping the Postmates’s website. The data was currently scraped for location of Los Angeles. The trends in the dataset are displayed in Fig 1. Fig 2a showcases the number of restaurants serving different cuisines.

Content-based Recommendation technique was employed to extract 5 most similar dishes based on the Cuisine for a particular restaurant. The most common ingredients observed in the data pertaining to the ingredients used in different dishes are demonstrated in Fig 2b.



Figure 1: Frequently ordered dishes

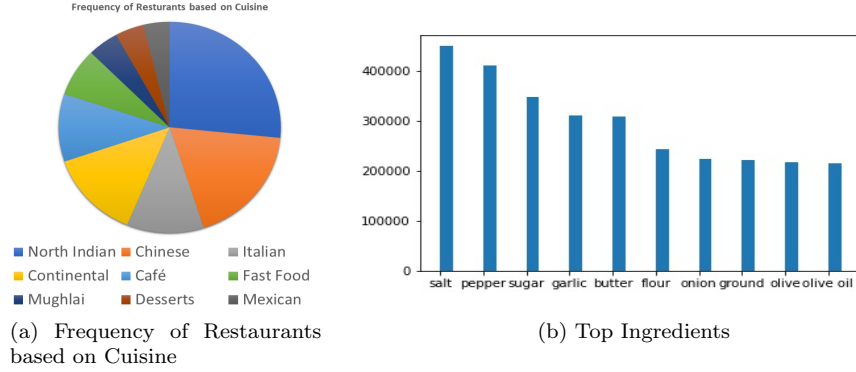


Figure 2: Dataset statistical analysis

7 Milestones

7.1 Action Plan

The tasks that we are planning to complete include:

- Implement a system to extract ingredients from the recommended dishes and suggest other dishes based on the same set of ingredients.
- Setup an environment/platform for performing online evaluations to check the validity of the recommendation system and complete the second part of the project by optimization of the supply chain.

7.2 Risks

- Feasibility of the online Evaluation system.
- We suspect that we might face some challenges with the inconsistencies in the name of the products at different locations and due to limited availability of the ingredients of dishes dataset.

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