Restaurant Recommendation System

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***Abstract*— There are many recommendation systems available for problems like shopping, online video entertainment, games etc. Restaurants & Dining is one area where there is a big opportunity to recommend dining options to users based on their preferences as well as historical data. Recommendation systems are widely used as a reference in marketing products or businesses. User rating is a variable that is widely used as a reference in establishing a recommendation system. User rating can influence other users in making their choice of the same product. We explore the use of different machine learning techniques and also engineer features that perform well on this classification. The methods used in this research are: (1) Datasets Preparation, (2) Datasets Filtering, (3) Content Based Learning 4) Exploratory Data Analysis, (5) kNN (k Nearest Neighbours) Algorithm**

***Keywords*— Data Preparation, Datasets Filtering, Content Based Learning, Exploratory Data Analysis, kNN Algorithm**

I. INTRODUCTION

Zomato API Analysis is one of the most useful analyses for foodies who want to taste the best cuisines of every part of the world which lies in their budget. This analysis is also for those who want to find value-for-money restaurants in various parts of the country for cuisines. Zomato is an Indian multinational restaurant aggregator and food delivery company founded by Deepinder Goyal, Pankaj Chaddah, and Gunjan Patidar in 2008. Zomato provides information, menus, and user reviews of restaurants as well as food delivery options from partner restaurants in select cities. As of 2019, the service is available in 24 countries and more than 10,000 cities. Like most other start-ups, India's pioneering food tech unicorn Zomato has seen many peaks and troughs in its journey. While there were some illustrious moments and accomplishments, there were troubled times too, some that even brought the very existence of the company into question. In this Analysis we have used Data Exploration and Visualization techniques is taken as the basis of our experiment. Like most other start-ups, India's pioneering food tech unicorn Zomato has seen many peaks and troughs in its journey. While there were some illustrious moments and accomplishments, there were troubled times too, some that even brought the very existence of the company into question.

The rapid growth of data collection has led to a new era of information. Data is being used to create more efficient systems and this is where Recommendation Systems come into play. Recommendation Systems are a type of information filtering systems as they improve the quality of search results and provides items that are more relevant to the search item or are related to the search history of the user. They are active information filtering systems which personalize the information coming to a user based on his interests, relevance of the information etc. Recommender systems are used widely for recommending movies, articles, restaurants, places to visit, items to buy etc.

There are basically three types of recommender systems: - Demographic Filtering- They offer generalized recommendations to every user, based on movie popularity and/or genre. The System recommends the same movies to users with similar demographic features. Content Based Filtering- They suggest similar items based on a particular item. This system uses item metadata, such as genre, director, description, actors, etc. for movies, to make these recommendations.

Collaborative Filtering- This system matches persons with similar interests and provides recommendations based on this matching. Collaborative filters do not require item metadata like its content-based counterparts.

Here we will be using Case Based Recommendation

Case Based Reasoning: - Case-based recommendation is a form of content-based recommendation that is well suited to many product recommendation domains where individual products are described in terms of a well-defined set of features (e.g., price, colour, make, etc.).

II. RELATED WORK

A. Paper 1

"Recommendation System Based on Item and User Similarity on Restaurants Directory Online"

In this paper they have recommended using Collaborative filtering based on item similarity. It Captures the change in user interests over time and it is not required to understand item content but it's not a great indicator of what people like.

Paper 2

"Restaurant Recommendation System for User Preference and Services Based on Rating and Amenities"

In this paper it is recommended to use Sentimental Analysis Using NLP. This make it Easier to drill down into different customer segments of the restaurants and get a better understanding of sentiment in these segments. But, It is not a complete replacement for reading survey responses. Often, there are useful nuances in the comments themselves.

III. PROBLEM STATEMENT

Build a restaurant recommendation system based on the various inputs from the user like location, type of dish, cost etc.

IV. METHODOLOGY

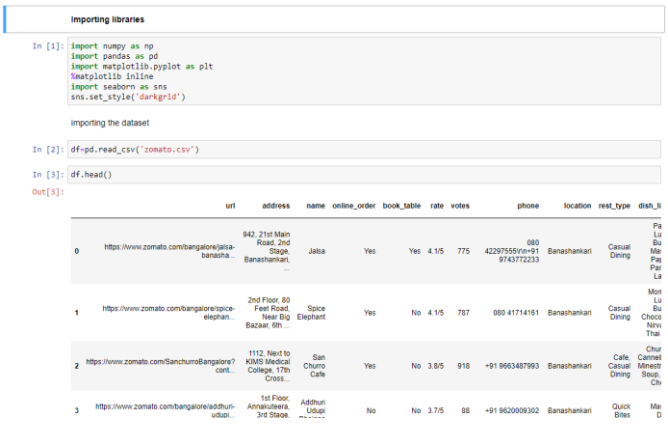
The following are the steps followed to build the required recommendation model

1. Loading the data from the CSV file
2. Understanding the data
3. Data cleaning
4. Exploratory data analysis with data visualization
5. Preparing the model
6. Integrating frontend and backend

1. LOADING THE DATA FROM CSV FILE

The required libraries are imported, and the dataset is loaded using pandas.

The dataset contains all the information about the restaurants that are in collaboration with Zomato



Importing libraries

```
In [1]: import numpy as np
        import pandas as pd
        import matplotlib.pyplot as plt
        %matplotlib inline
        import seaborn as sns
        sns.set_style('darkgrid')
```

importing the dataset

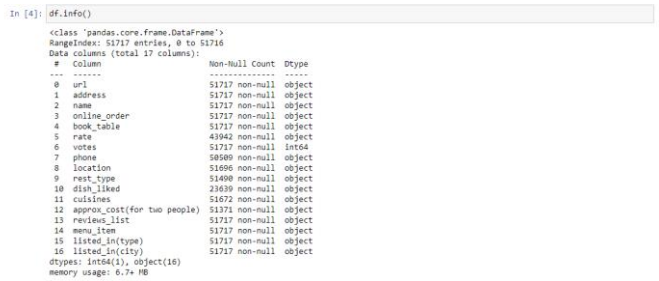
```
In [2]: df=pd.read_csv('zomato.csv')
In [3]: df.head()
```

Out[3]:

	url	address	name	online_order	book_table	rate	votes	phone	location	rest_type	dish_li
0	https://www.zomato.com/bangalore/jalsa-banasha...	942, 21st Main Road, 2nd Stage, Banashankari, ...	Jalsa	Yes	Yes	4.1/5	775	080 42297555\r\n+91 9743772233	Banashankari	Casual Dining	Pa Lu Bu Ma Pa Par La
1	https://www.zomato.com/bangalore/spice-elephan...	2nd Floor, 80 Feet Road, Near Big Bazaar, 6th ...	Spice Elephant	Yes	No	4.1/5	787	080 41714161	Banashankari	Casual Dining	Mon Lu Bu Choco Nirv Thai
2	https://www.zomato.com/SanchurroBangalore?cont...	1112, Next to KIMS Medical College, 17th Cross, ...	San Churro Cafe	Yes	No	3.8/5	918	+91 9663487993	Banashankari	Cafe, Casual Dining	Chur Canneli Minestr Soup, Chi
3	https://www.zomato.com/bangalore/addhuri-udupi...	1st Floor, Annakuteera, 3rd Stage,	Addhuri Udupi	No	No	3.7/5	88	+91 9620009302	Banashankari	Quick Bites	Ma D

2. UNDERSTANDING THE DATA

The dataset contains 17 variables and 51,717 rows all of which were scraped from the Zomato website. The dataset contains details of more than 50,000 restaurants in Bengaluru in each of its neighborhood.



```
In [4]: df.info()
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 51717 entries, 0 to 51716
Data columns (total 17 columns):
 #   Column                       Non-Null Count  Dtype
---  ------                       --------------  -----
 0   url                          51717 non-null  object
 1   address                      51717 non-null  object
 2   name                         51717 non-null  object
 3   online_order                 51717 non-null  object
 4   book_table                   51717 non-null  object
 5   rate                         43942 non-null  object
 6   votes                        51717 non-null  int64
 7   phone                        50509 non-null  object
 8   location                     51696 non-null  object
 9   rest_type                    51490 non-null  object
 10  dish_liked                   23639 non-null  object
 11  cuisines                     51672 non-null  object
 12  approx_cost(for two people)  51371 non-null  object
 13  reviews_list                 51717 non-null  object
 14  menu_item                    51717 non-null  object
 15  listed_in(type)              51717 non-null  object
 16  listed_in(city)              51717 non-null  object
dtypes: int64(1), object(16)
memory usage: 6.7+ MB
```

3. DATA CLEANING

```
In [5]: df.isnull().sum()
```

Out[5]:

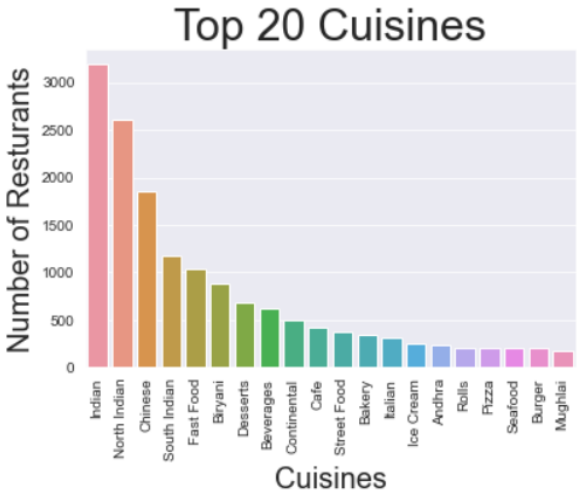
url	0
address	0
name	0
online_order	0
book_table	0
rate	7775
votes	0
phone	1208
location	21
rest_type	227
dish_liked	28078
cuisines	45
approx_cost(for two people)	346
reviews_list	0
menu_item	0
listed_in(type)	0
listed_in(city)	0

dtype: int64

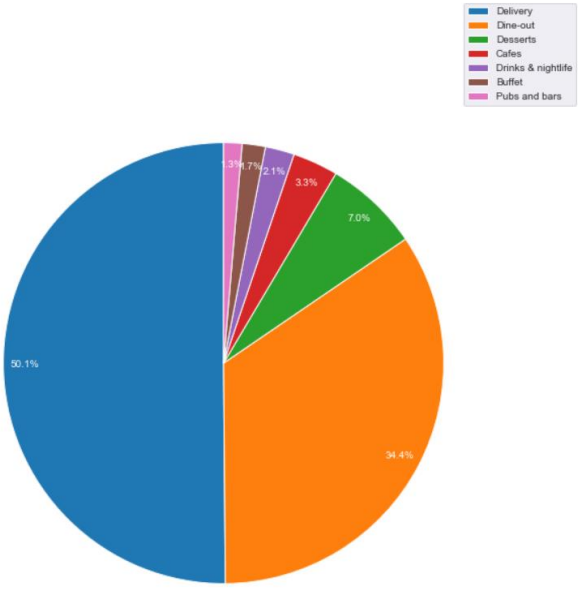
Due to a large number of missing data, cleaning had to be performed on the dataset by using various methods for all the different attributes.

4. EXPLORATORY DATA ANALYSIS AND DATA VISUALIZATION

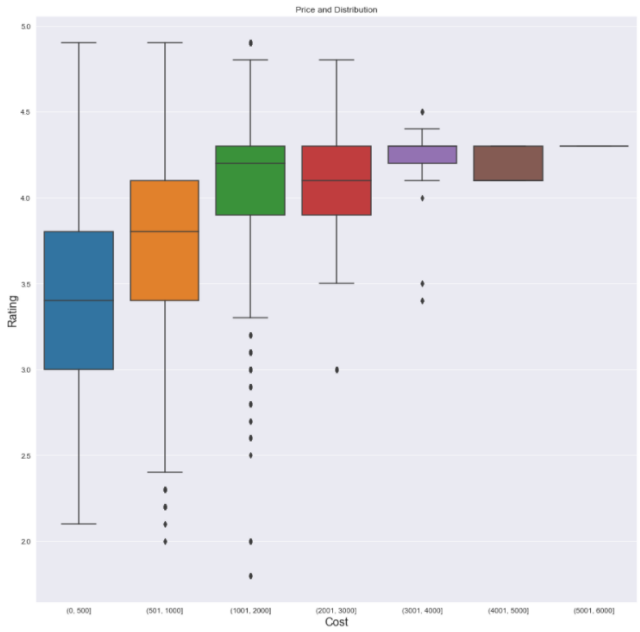
a. This plot shows the top 20 cuisines that are available across all the restaurants



b. This visualization shows the different types of restaurants and their distribution.



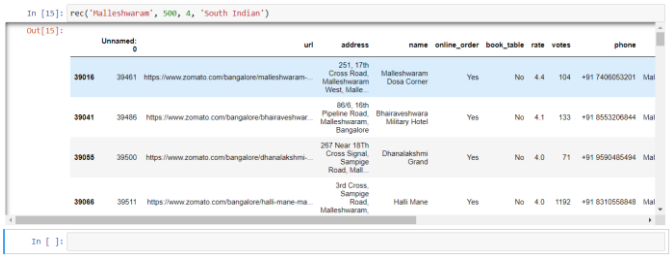
c. This boxplot shows the relationship between the rating and the restaurant and the cost for two people



d. Correlation

5. PREPARING THE MODEL

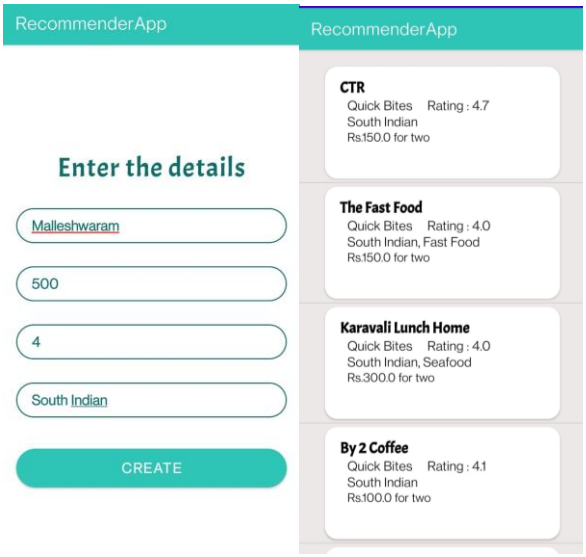
In product recommendation, the system's task is to find a product description that suits the query of a customer as much as possible. In addition, the conventional view of CBR is not reflected in these product recommenders as the stored cases do not model problem-solution components of the past cases. They are usually just product descriptions. The recommender directly matches a problem (user query) to possible solutions (products). This works fine for product recommendation since problems and solutions are defined by identical terms

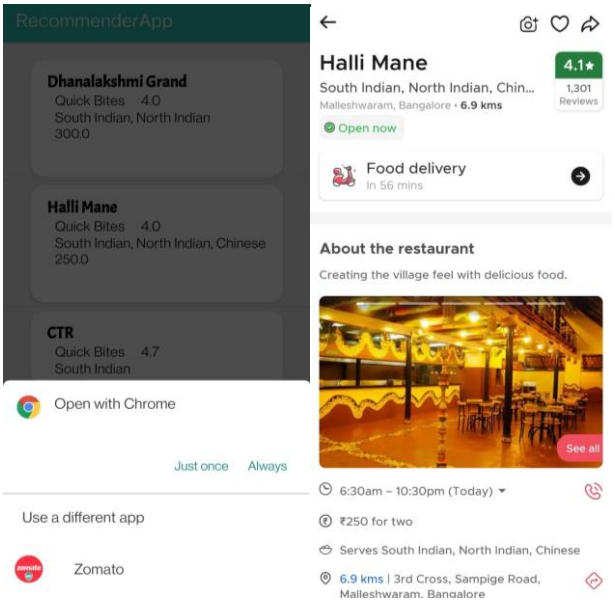


Here the model is asked to recommend the restaurants that are in the locality ‘Malleshwaram’, with the average rating higher that 4, with the cost for two people less than Rs 500 and that serves south indian food.The ranking of the recommendations is done on the basis of average ratings.

RESULT

When the user makes his request through the app, with all his filters, the app requests the api with the constraints and the api returns all the restaurants that satisfies the given constraints and displays it on the app.





Conclusions

In conclusion we were able to recommend the restaurant by successfully analysing the dataset using various methods of data cleaning and EDA methods. We have learnt about working of Case Based Reasoning, To recommend restaurents based on the user’s input. We also learnt that in CBR, the intelligent reuse of knowledge to already solved problems, cases relies on the premise, more similar problems are more similar their solutions will be.

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