Movie Ticket based Restaurant Recommendation System

Sachin Dhande

Application Architect

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1. Introduction :

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 present geographic location.

The goal for this project is to recommend Restaurant, Bar, Café which are nearby Movie Theater and people who has booked movie ticket in particular Movie Theater. Mostly people who go for movies in Theater eat in Restaurant, Bar, Cafe after movies show. Probability of people eating out after Movie show is very high.

This system will recommend targeted customers (who has booked Movie Show) a Restaurant, Bar, Café nearby to Movie Theater. Recommendation will be before end of movie show so that customer can readily choose from recommended option instead manual looking out for restaurant after show.

This predictive recommendation will improve business of Restaurant, Bar, Café in nearby location to Movie Theater. It will also provide commission profit to Movies Theater. Also Movie watcher customer satisfaction will be improved as he will not have to manually search for Restaurant it will be readily available in form of SMS on their Mobiles before show end time.

This system will predict recommendation based on people's Age, Gender, Movies category (language) and Movie's show end time.

Below are few sample example of recommendation

i)   If movie show end time is in after noon it will recommend Restaurant for dinner,

ii)   If movie show time is evening it will recommend Café shop.

iii)   If booked movie is Chinese movie it will recommend Chinese Restaurant

2. Data :

The customers who have booked online movie ticket using different websites or mobile application like BookMyShow, TicketBooking are readily available in movie theater database. Those Movie Theater data consists of basic booking information like Name of customer, age of customer, movies name, movies theater address, pin code of Movies Theater, Address of Movie's Theater, Movie's show time, Movies category, Ticket ID, No of seats booked. This data has good insight to predict recommendation to Movie watching customers.

Other source of data, Foursqure APIs will provide the details about Restaurants, Bars, Café with in radius of 500 m from Movie Theater's geographic location (latitude, longitude). Foursquare APIs lets the user search for restaurants, nightlife spots, shops and other places of interest in their surrounding area. It is also possible to search other areas by entering the name of a remote location.

Regular endpoints include basic venue firmographic data, category, and ID. Premium endpoints include rich content such as ratings, URLs, photos, tips, menus, etc. Restrictions apply based on your account type, with further details documented on our rate limits page. Foursquare APIs lets the user search for restaurants, nightlife spots, shops and other places of interest in their surrounding area. It is also possible to search other areas by entering the name of a remote location.

3. Methodology :

As this project's goal is to provide recommendation based on key attributes of movies ticket booking such as Movies end time, Movies category, Customer age and gender. The problem question mostly based on answers of key values filed like Yes or No answers as Decision Tree Classification model seems to be best fitted for this problem.

As recommendation decision will be taken based Movies ticket attribute, for example,

i)   Wheather Movies show end time is falls in Afternoon ? (Yes/No).

ii)   Does Movies show end time falls in Night ? (Yes/No)

iii)   Customer age is young ?(Yes / No)

iv)   Gender Male or Female ?

First step started with collecting data from Movie Theater Booking database. Check the data for any anomalies in the data and outliers of the data points on key attribute fields used for prediction model. For case study took 1 Movie Theater Data and 2 shows data. Check the average age of ticket booking data movie show wise using Histogram.
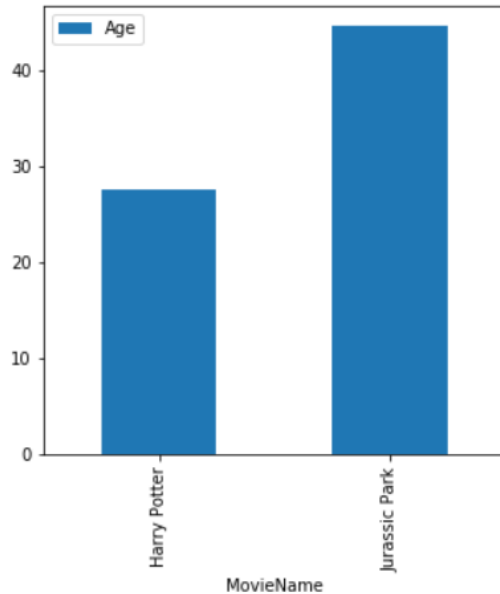
Check any outlier in movies booking data for both the shows using box plots.
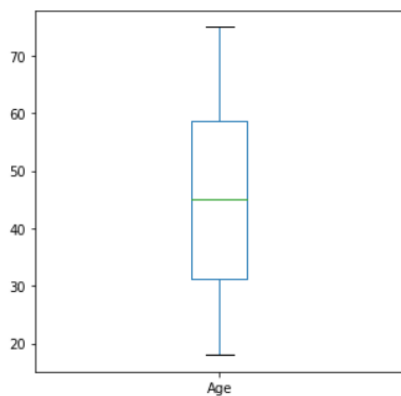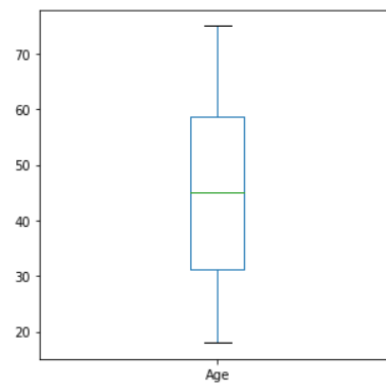
Jurassic Park	Harry Potter

Next check movies end time, it is categorical variable having categorical values in the range from 00:00:00: hours to 23:59:59 hours. To use this value we need to divide Movies show end time into different Bins to use in Classification Model.

Table 1: Sample Movies Name and Movies End Time

|	MovieName	MovieEndTime
0	Jurassic Park	21:00:00
1	Jurassic Park	21:00:00
2	Jurassic Park	21:00:00
3	Jurassic Park	21:00:00

Using Lets divide this data in different bins

i) 10 Hours to 17 Hours ===> Afternoon (1)

ii) 17 Hours to 20 Hours ===> Evening (2)

iii) 20 Hours to 01 Hours ===> Night   (3)

iv) 01 Hours to 10 Hours ===> Morning (4)

Check the data after converting into MovieBin

Table 2: Sample Movies Name, Movies End Time and Movie Bins converted

	MovieName	MovieEndTime	MovieBin
0	Jurassic Park	21:00:00	3.0
1	Jurassic Park	21:00:00	3.0
2	Jurassic Park	21:00:00	3.0
3	Jurassic Park	21:00:00	3.0

Now the movies booking data is fine to use in model, next get the location data API from Foursquare to get geo information surrounding Movie Theater and plot it using folium map.
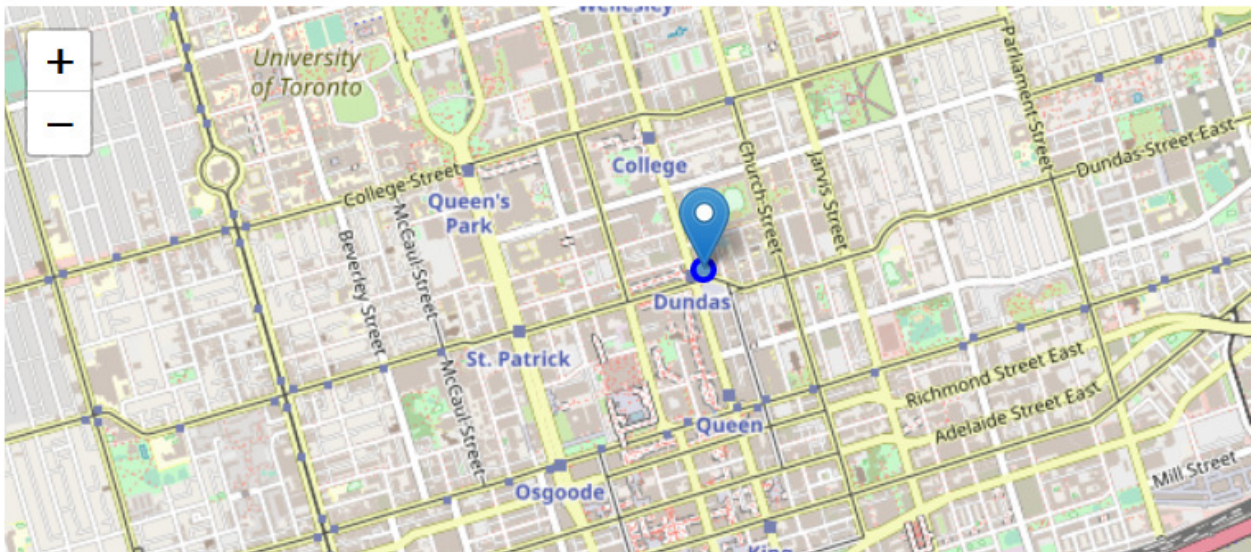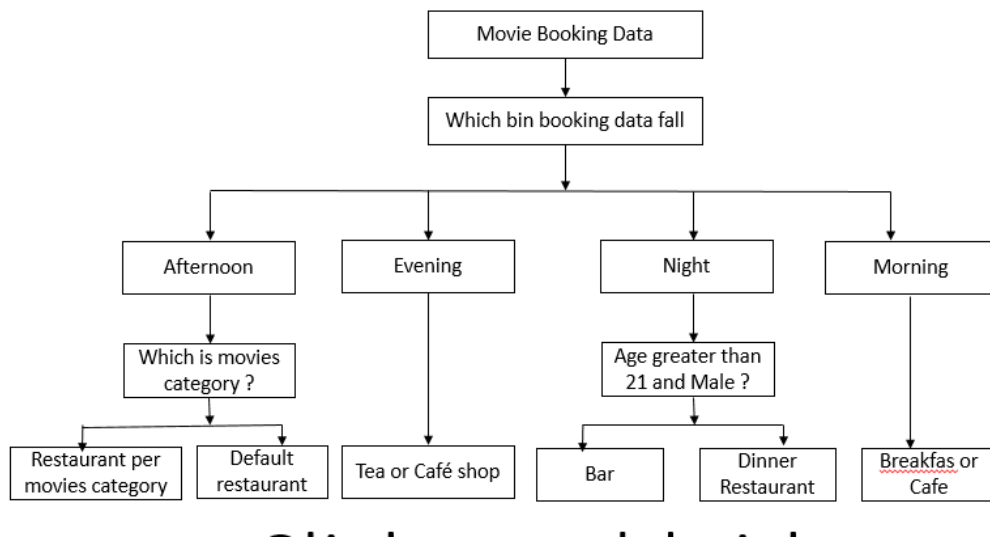
Once we get geographical location (latitude, longitude) explore the surrounding spots within range of 500 meters from Movies Theater.

Filter any non-required location like Bookstore, Cloth Shop, Hospital etc and keep only required data for Restaurant, Bar, Café and Tea shops.

	name	categories	lat	lng
4	Salad King	Thai Restaurant	43.657533	-79.381585
5	Yonge-Dundas Square	Plaza	43.656125	-79.380622
7	Urban Herbivore	Vegetarian / Vegan Restaurant	43.654972	-79.380856
8	DAVIDsTEA	Tea Room	43.656586	-79.381167
9	Barberian's Steak House	Steakhouse	43.657755	-79.382177
11	The Queen and Beaver Public House	Gastropub	43.657472	-79.383524

As now both data sets Movies Ticket Booking and geographic location surrounding movie there are ready, use Decision Tree Classification mode to predict recommended results.

```
                    ┌──────────────────────┐
                    │  Movie Booking Data  │
                    └──────────┬───────────┘
                    ┌──────────┴──────────────┐
                    │ Which bin booking data fall │
                    └──────────┬──────────────┘
```

Figure: Decision tree for Movie Booking Data — bins: Afternoon, Evening, Night, Morning

4. Result :

In this section we will analyze 2 results we got results from Decision Tree Classification model for two different set of data set

i) Let's below table shows sample input data for customer 1.

Table 3: Input data for model.

MovieName	MovieCategory	MovieStarTime	MovieEndTime	Date	CustName	Gender	Age	Mobile	Ticktcount	Scree
Jurassic Park	American	18:00:00	21:00:00	20-Oct-18	AAAA	M	23	9890098900	2	

Looking at above data it falls into Night bin (21:00:00), Gender is Male and Age is greater than 21. Now let's see the resulted recommended restaurant for this data set.

Table 4: Output data for model.

	name	categories	lat	lng
32	The 3 Brewers	Beer Bar	43.655474	-79.380413
45	Duke's Refresher + Bar	Bar	43.658980	-79.382949
53	Jugo Juice	Juice Bar	43.656047	-79.380491
73	VIP Lounge & Billiards Club	Bar	43.658907	-79.382042
81	Reds Midtown Tavern	Wine Bar	43.659128	-79.382266

As expected it has recommended Bars nearby to Movie Theater.

ii) See the sample input data for second customer.

Table 5: Input data for model.

MovieName	MovieCategory	MovieStarTime	MovieEndTime	Date	CustName	Gender	Age	Mobile	Ticktcount	Scre
Harry Potter	English	15:00:00	18:00:00	20-Oct-18	LLLL	F	30	8880188801	3	

Above data it falls into Evening bin (18:00:00), Gender is Female and Age is greater than 20. Now let's see the resulted recommended restaurant for this data set.

Table 6 : Output data for model

	name	categories	lat	lng
8	DAVIDsTEA	Tea Room	43.656586	-79.381167
18	The Black Canary Espresso Bar	Café	43.657029	-79.381385
25	Balzac's Coffee	Café	43.657854	-79.379200
34	Page One Cafe	Café	43.657772	-79.376073
43	Oakham Café	Café	43.658078	-79.378315

As the data falls in evening bin as expected it has recommended Tea and Café shops to customer.

From above two samples it seems model is working fine and recommendations are in line with key variables.

5. **Discussion :**

Looking at the above two sample predictive recommendation results we can see that recommendations were as per the time of the day, movies category, customer age and gender.

Earlier customer has to depend upon manual search after movie show end to lookout for Restaurant, Bar or Café shop. Due to this movie ticket based recommendation model customer is getting most valued information via SMS on their mobile before movie end time. This will save the valuable time for customer. Also help grow business of Restaurant, Bar and Café shop and Movie Theater owner.

6. **Conclusion :**

The recommendation model is predicting the results more accurately as per the key attributes it is going to increase business profit for Restaurant, Bar and Café owner surround the Movies Theater. Customer will be more satisfied by provide recommendation rather than manually searching in geographical area. This model will be more helpful to people who are new to this location. In future this system can be used in app to provide the direction to the customer from Theater Location.

7. **Reference :**

i)   https://foursquare.com/

ii) www.CineplexCinema.com