For
FnB
Business

FINAL PROJECT

An Analysis of Restaurant's Monthly Revenue

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Business Undertanding

POV as an FnB Consultant

Purpose: To give an understanding on how to build an FnB business and how to improve their FnB business.

Goal:

To increase the revenue and profit of an FnB business based on each FnB data.

Research Question:

1. **How to find the pattern on which we could improve the revenue of an FnB business?**
2. **What are the strategies to improve FnB business?**

Data Understanding

“RESTAURANT_REVENUE”

source:
https://www.kaggle.com/datasets/mrsimple07/restaurants-revenue-prediction

Restaurant_Revenue.csv
Number_of_Customers
Menu_Price
Marketing_Spend
Average_Customer_Spending
Promotions
Reviews
Monthly_Revenue

Content:

The Restaurant Revenue Prediction Dataset is a comprehensive collection of simulated data designed for predicting monthly revenue for a set of fictitious restaurants. This dataset was created for educational and illustrative purposes, allowing data enthusiasts to explore and experiment with machine learning algorithms for regression tasks.

The dataset has
1000 columns,
in which one column represent a restaurant with
8 features

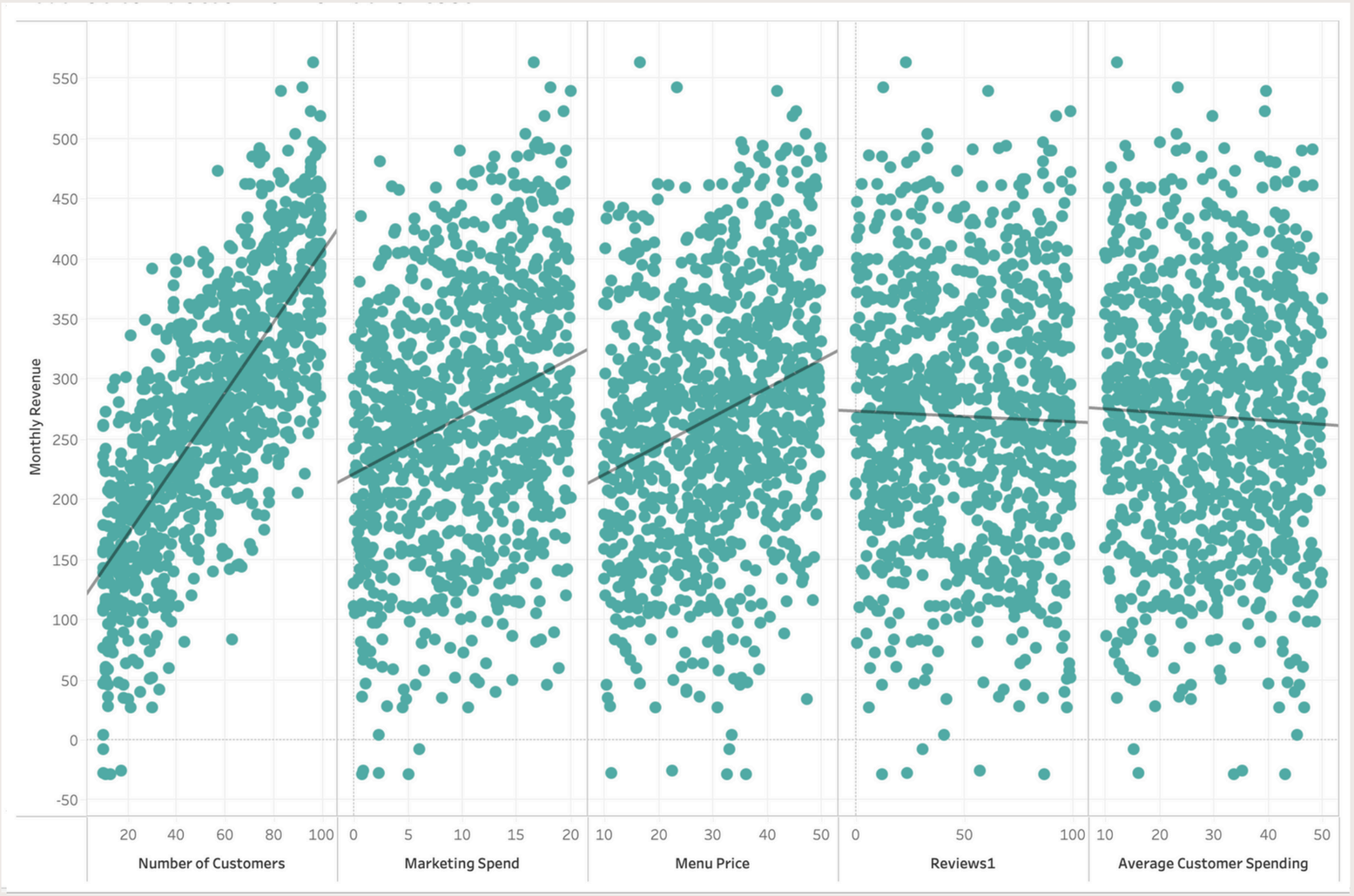
Drop columns that has montlhy revenue below as it is not possible.

The dataset has
995 columns,
in which one column represent a restaurant with
8 features

This dataset has no missing values.

What are features that affect monthly revenue?

Exploratory Data Analysis



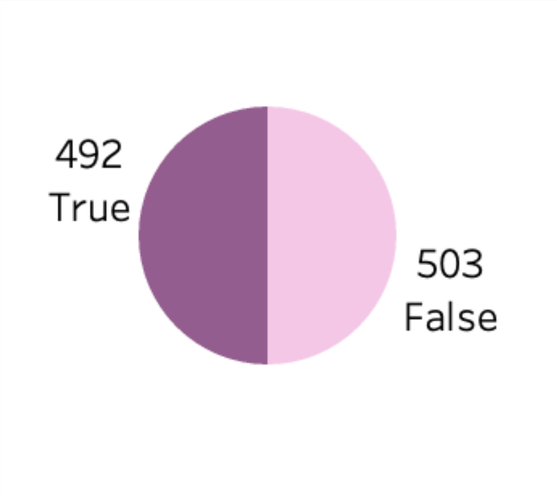
The scatter plot and trend line to see the correlations of some features with monthly revenue.

As we could see, **number of customers, marketing spend, and menu prices** are the one who affect the monthly revenue the most. Even though it has a significant amount of data, the trend line could catch a linear trend for it.

However, reviews and average customer spending does not really affect a monthly revenue.

How about promotions?

Exploratory Data Analysis

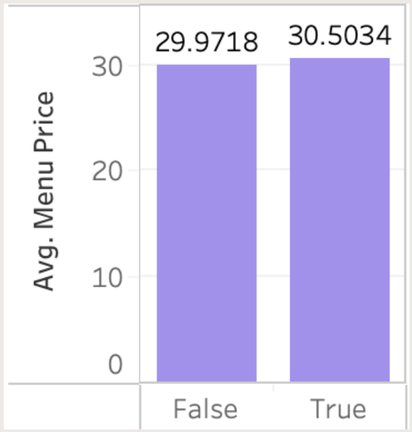


We could see that there are 503 restaurants that didn't do a promotion and 492 that did a promotion

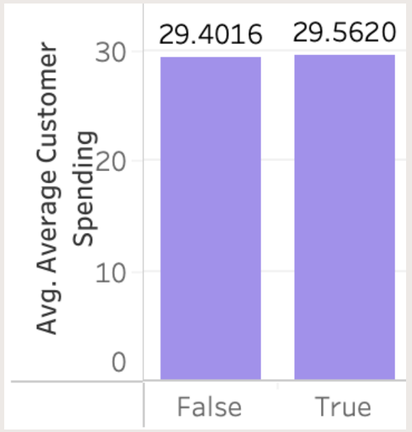
Let's see the average of each features correlate with promotions!

How about promotions?

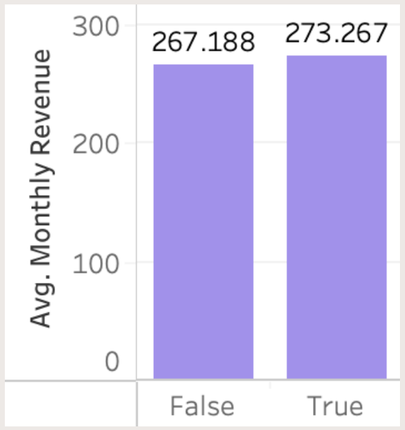
Exploratory Data Analysis



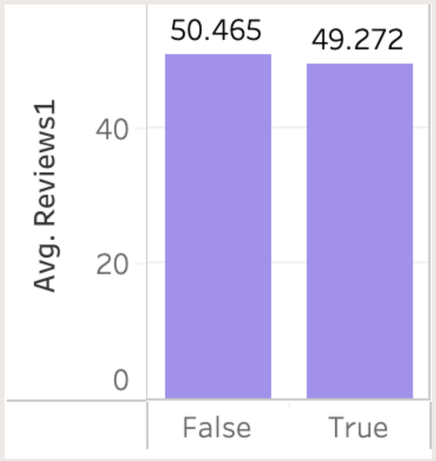
Restaurants that done a promotion has a slightly higher menu price.



Customer of a restaurant that done a promotion spent a slightly more money.



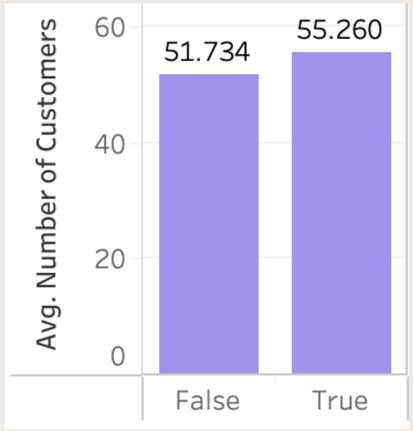
Restaurants that done a promotion has a slightly higher average monthly revenue.



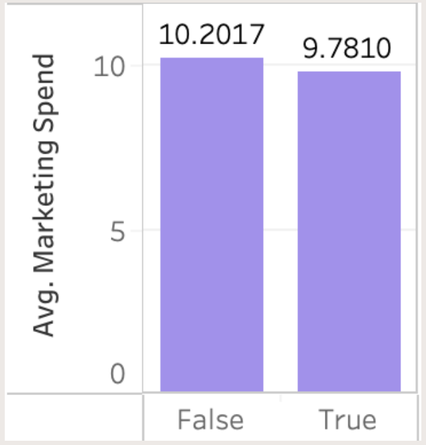
The review for restaurant that did not do a promotion is slightly higher.

How about promotions?

Exploratory Data Analysis



Restaurants that done a promotion has a slightly higher average of number of customers



Restaurants that did not use promotion tend to spend more on marketing spend! It indicates that they most likely to do other marketing strategies than using a promotion.

What does it tells us?

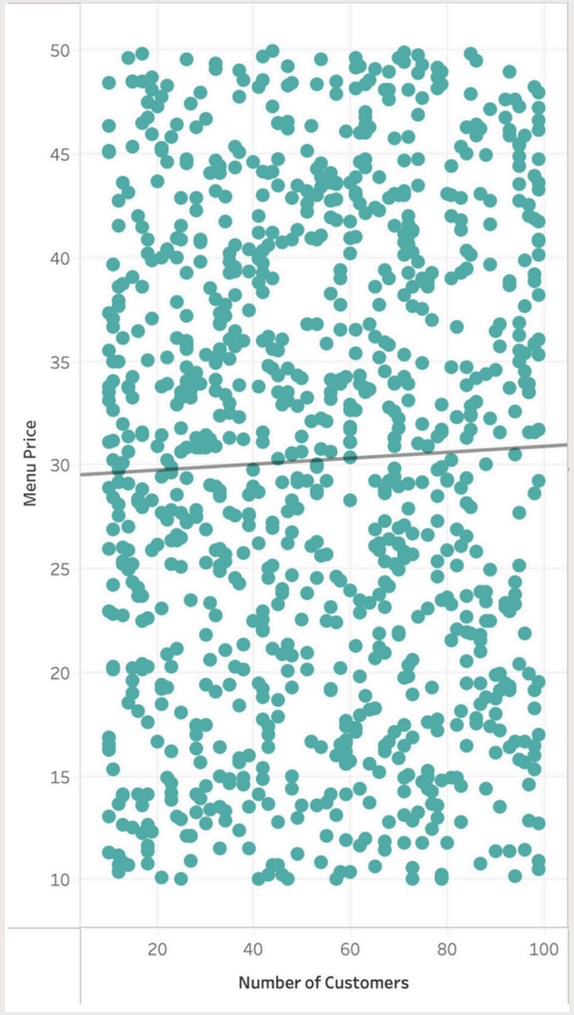
It shows that restaurant that done a promo have a slightly higher number on most of the features. With that, it might indicate that promotion do make monthly revenue or sales higher. However, the number that shows only tells an average of every restaurant that did or did not do a promotion. Thus, we need to do some evaluation to see a better correlation between promotion and monthly revenue.

T-statistic: 0.9389555570682818
P-value: 0.3479820933630694

The value of t-stats and p-value tells that there is not enough evidence to tell that promotion has a significant correlation to the monthly revenue.

Is a less menu price gives a higher amount of customer?

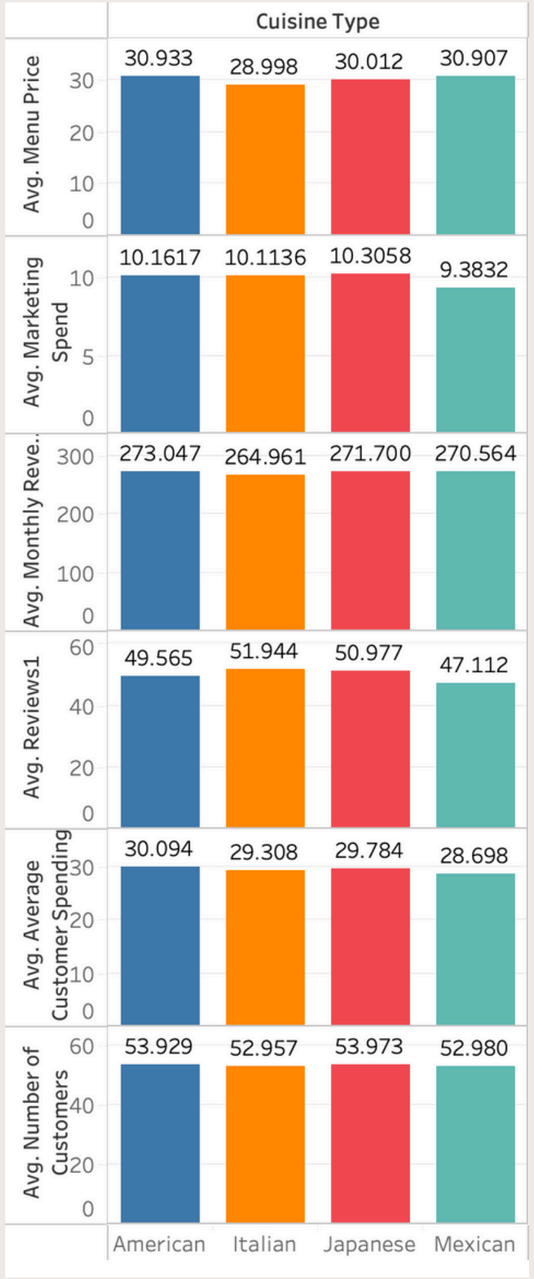
Exploratory Data Analysis



The trend line suggests that the higher menu price give a higher number of customer. However, the correlation of them is only 0.03. Which recommends that they do not have a positive correlation. So, the trend line could not be relied to determine their relationship.

So, the idea of restaurant gives a lower price to attract more customer could be rejected. Then, why most of it has a high price with a high number of customer?

We could explore it by trying to dive more on each cuisine type!



Let's take a look on each cuisine types!

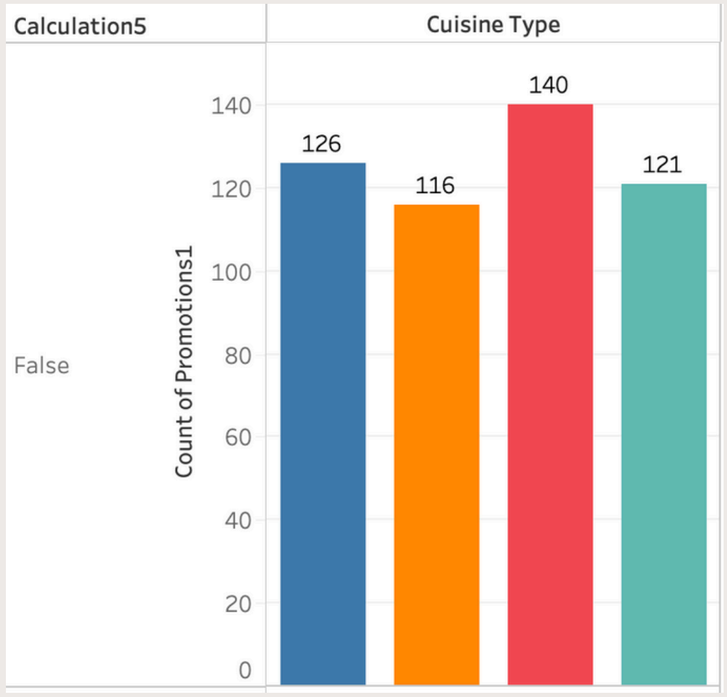
Exploratory Data Analysis

- **American restaurant is the most expensive of all of the others**
- **Japanese restaurant spent the most on marketing**
- **American restaurant has a higher average of monthly revenue**
- **Italian restaurant has a highest number of revenue**
- **American restaurant has a greater average of the average customer spending**
- **Japanese restaurant has the highest average number of customers**

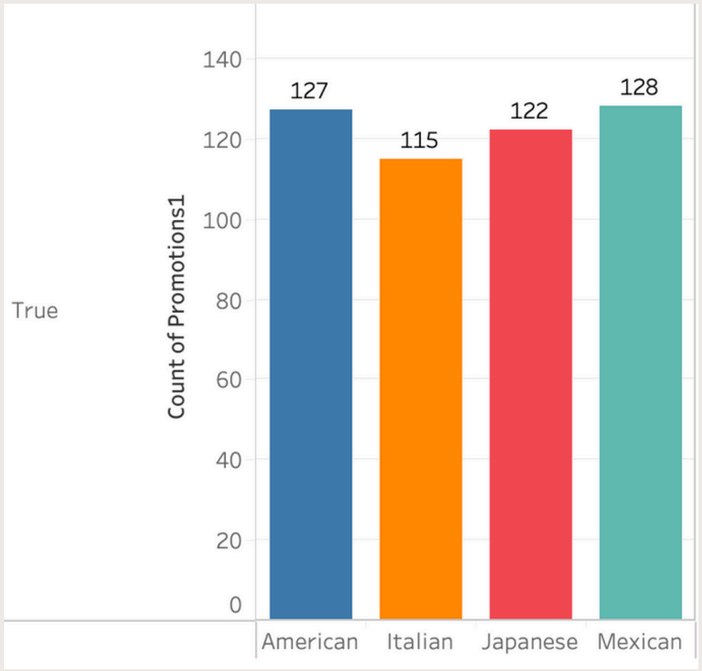
However, the number did not suggest that having a specific cuisine restaurant will lead you to more revenue!!

Let’s compare each cuisine based on their choice of doing promotions!

Exploratory Data Analysis



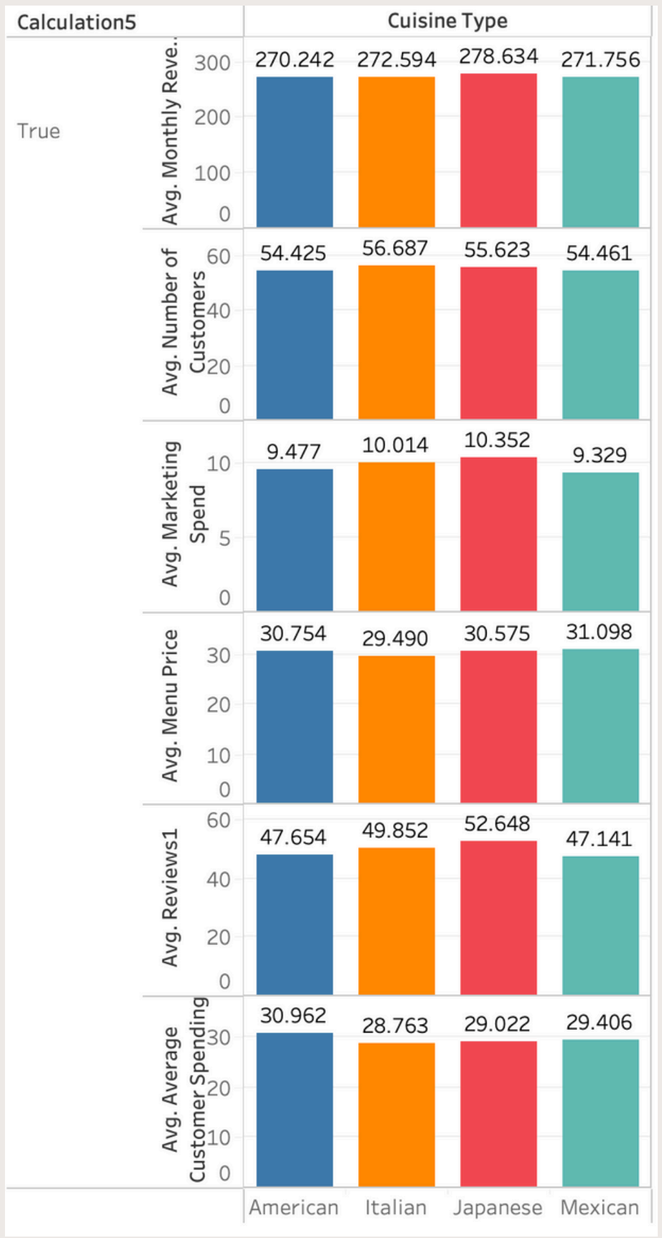
- More American restaurant that do promotion
- More Mexican restaurant that do promotion
- More Japanese restaurant that do not do promotion
- More Italian restaurant that do not promotion

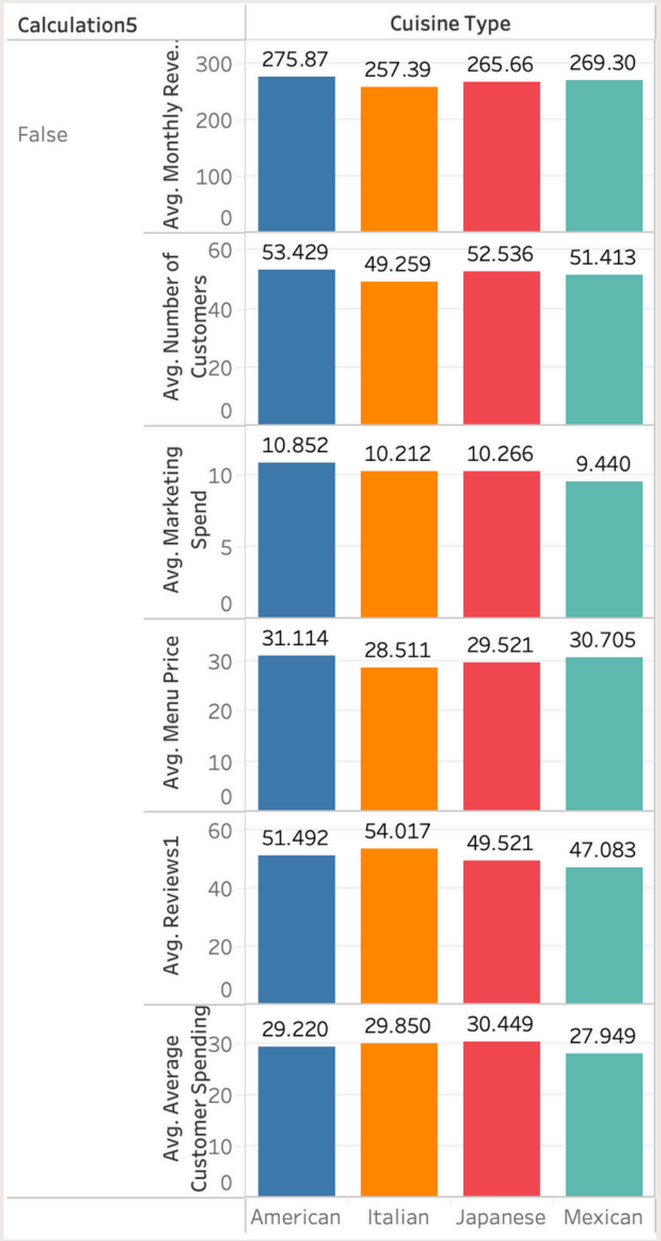


Japanese: 140
American: 126
Mexican: 121
Italian: 116

Japanese: 122
American: 127
Mexican: 128
Italian: 115

Promotions vs No Promotion



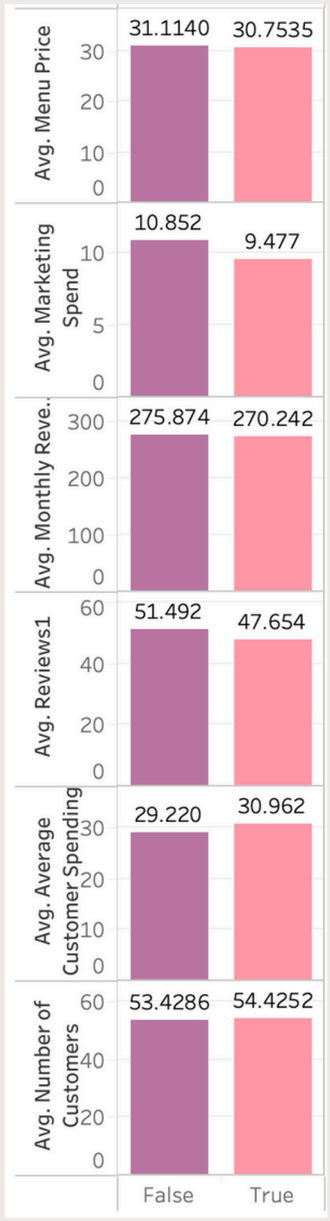


Exploratory Data Analysis

Monthly Revenue: Japanese vs American
Number of Customer: Italian vs American
Marketing Spend: Japanese vs American
Menu Price: Mexican vs American
Reviews: Japanese vs Italian
Avg cust spending: American vs Japanese

American Restaurant

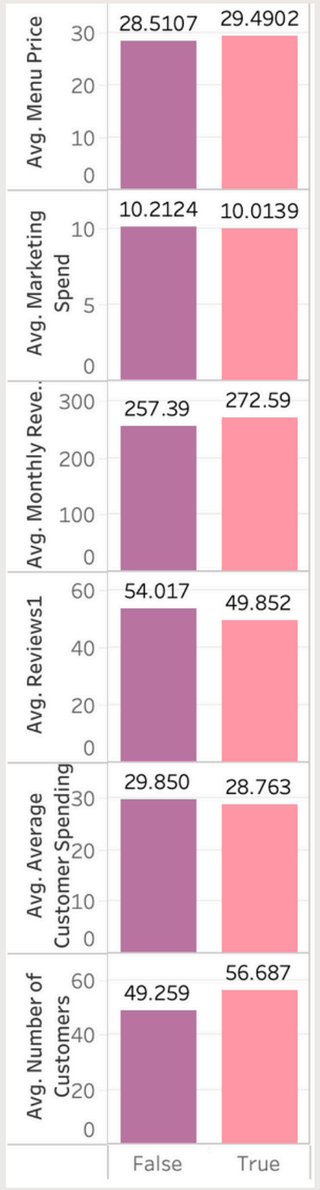
Exploratory Data Analysis



- American restaurant that did not do a promotion tend to have a higher average menu price
- American restaurant that did not do a promotion spent more money on marketing
- American restaurant that did not do a promotion have a higher average of monthly revenue
- American restaurant that did not do a promotion have a higher number of reviews
- The number of an average customer spending in an american restaurant with promotion is higher

For America, they have a higher average number of most of its features where it did not do a promotion. It might suggest that the marketing spend for other strategies has a bigger impact than doing a promotion that might lead to a higher menu price. It might also be the reason why number of customer is slightly lower than those who did promotion. However, as they have a higher price, even with a quite lower number of customer, it could lead to a high monthly revenue.

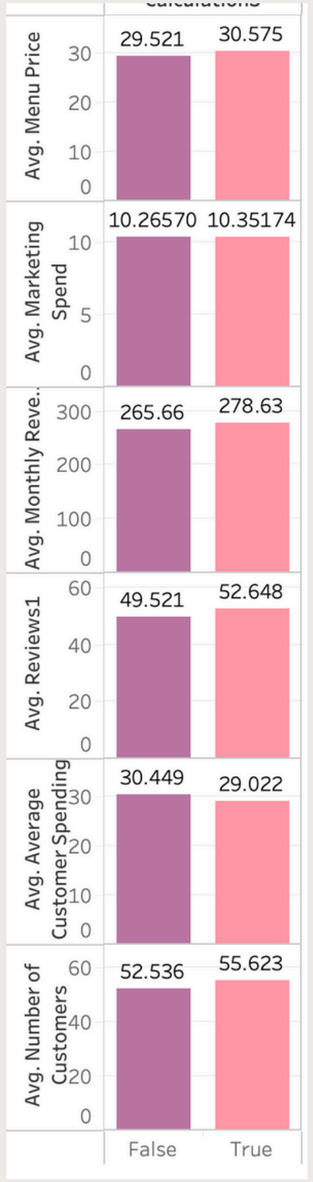
Italian Restaurant



Exploratory Data Analysis

- Italian restaurant that did a promotion tend to have a higher average menu price
- Italian restaurant that did not do a promotion spent more money on marketing
- Italian restaurant that did a promotion have a higher average of monthly revenue
- Italian restaurant that did not do a promotion have a higher number of reviews
- The number of an average customer spending in an american restaurant without promotion is higher
- Italian restaurant that did a promotion has a higher average number of customer

For Italian Restaurant, a promotion with a decent marketing spend might also lead to a high number of customer. It has a quite significat difference number of customer that restaurant who did not do a promotion. Thus, we could suggest that doing a promotion and marketing in italian restaurant could lead to a high number of revenue.



Japanese Restaurant

Exploratory Data Analysis

- Japanese restaurant that did a promotion tend to have a higher average menu price
- Japanese restaurant that did a promotion spent more money on marketing
- Japanese restaurant that did a promotion have a higher average of monthly revenue
- Japanese restaurant that did not do a promotion have a higher number of reviews
- The number of an average customer spending in an Japanese restaurant without promotion is higher
- Japanese restaurant that did a promotion has a higher average number of customer

For Japanese Restaurant, a promotion with a high marketing spend might also lead to a high number of customer and a higher price. We could suggest that doing a promotion and marketing strategies in japanese restaurant could lead to a high number of revenue.

Mexican Restaurant

Exploratory Data Analysis

- Mexican restaurant that did a promotion tend to have a higher average menu price
- Mexican restaurant that did not do a promotion spent more money on marketing
- Mexican restaurant that did a promotion have a higher average of monthly revenue
- Mexican restaurant that did a promotion have a higher number of reviews
- The number of an average customer spending in an Mexican restaurant with promotion is higher
- Mexican restaurant that did a promotion has a higher average number of customer

For Mexican Restaurant, a promotion with a decent marketing spend might also lead to a high number of customer. We could suggest that doing a promotion and marketing in italian restaurant could lead to a high number of revenue.

What did we get form EDA?

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1. Monthly revenue is affected by number of customer, marketing spending, and the menu price
2. In general, promotion does not affect monthly revenue that much
3. However, we need to dive more to explore about each cuisine restaurant. Even though there is no significant different of number between restaurant, we could know more pattern to the specific types of restaurant.
4. In each types of restaurant, the number between who did and did not do a promotion is quite similar.
5. However, we could see the performance between each types of restaurants. In which, in some types of restaurant, marketing spending and promotion might affect the number of customer and menu prices.
6. The similar menu prices might indicates that the differences is just slightly because of marketing or promotion, not the menu. It might suggests that they might sell the same type of menu and do not have an unique menu that make them stand out.

Feature Engineering

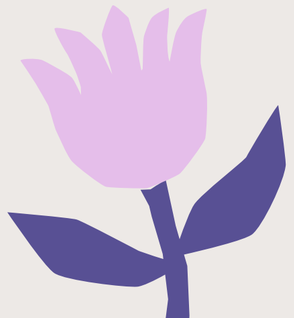
1. **Popularity: Based on Number of Customer**
   - **Low**
   - **Medium**
   - **High**
   - **Very High**

2. Net Profit: To know the profit of each restaurant

Calculate: Revenue - Marketing Spend

3. ROI: Percentage of the profit coming from investment (Marketing Spending)

Reasons: To improve the silhoutte score for clustering



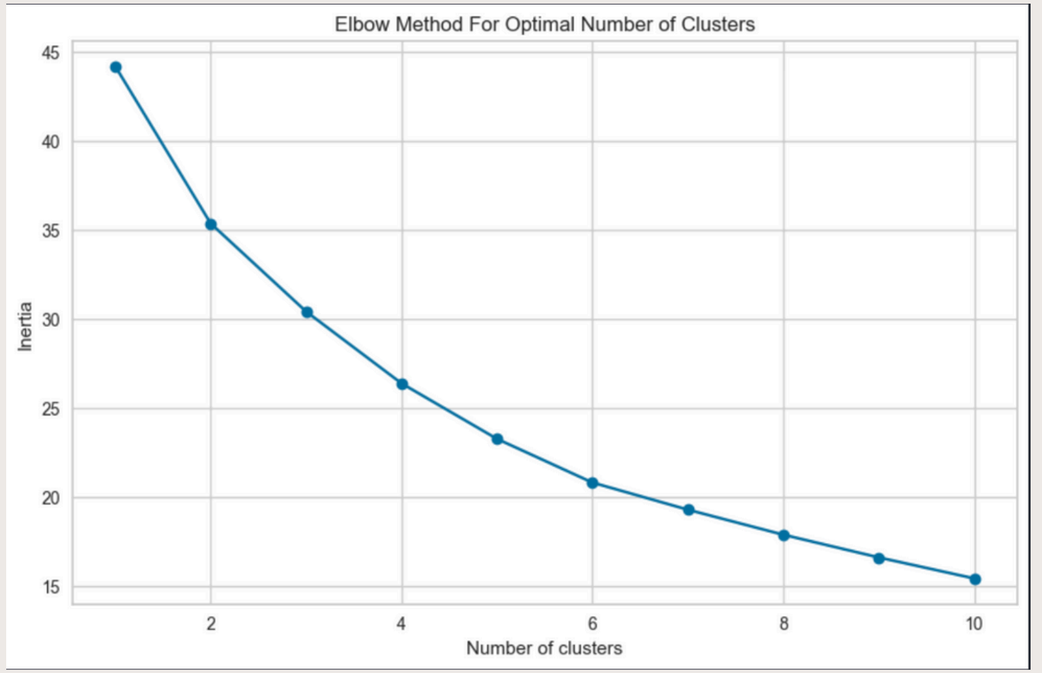
Let’s do CLUSTERING to give a business recommendation!

1 Data Preprocessing

Using all of the features to enhance clustering

- Log Transformation
- Polynomial Features
- Standarization

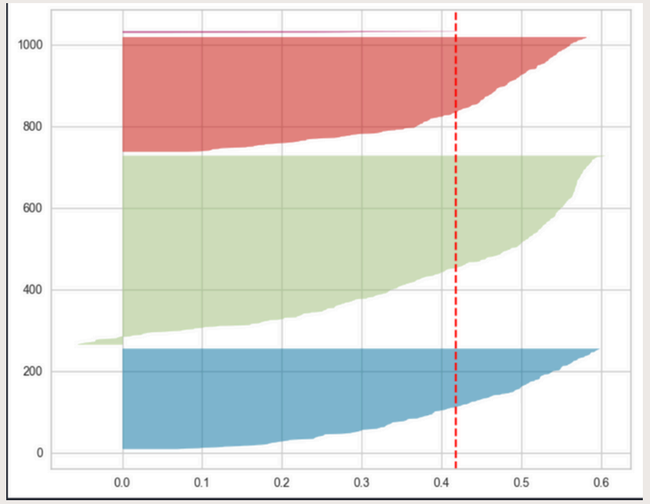
2 Elbow Method

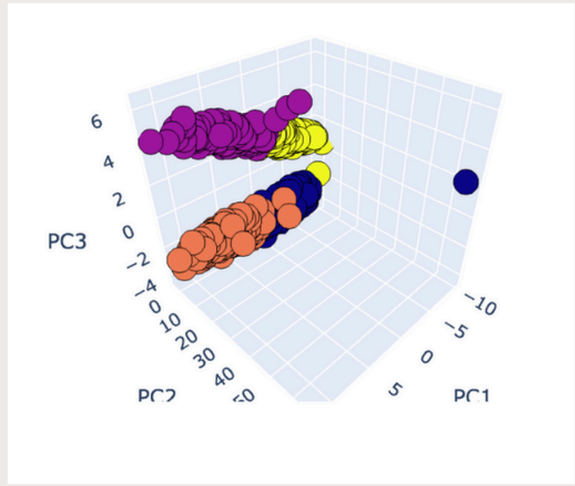


Checking the silhouette score!

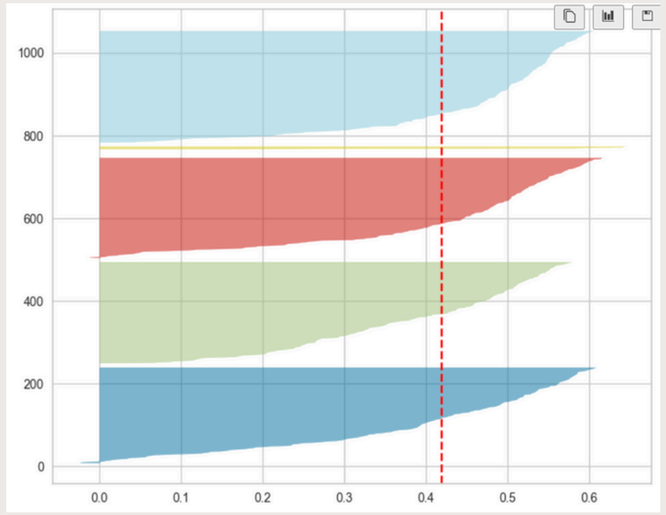
Silhouette score for 2 clusters: 0.3900
Silhouette score for 3 clusters: 0.4085
Silhouette score for 4 clusters: 0.4181
Silhouette score for 5 clusters: 0.4160
Silhouette score for 6 clusters: 0.4194
Silhouette score for 7 clusters: 0.3985
Silhouette score for 8 clusters: 0.4146
Silhouette score for 9 clusters: 0.4014
Silhouette score for 10 clusters: 0.3853

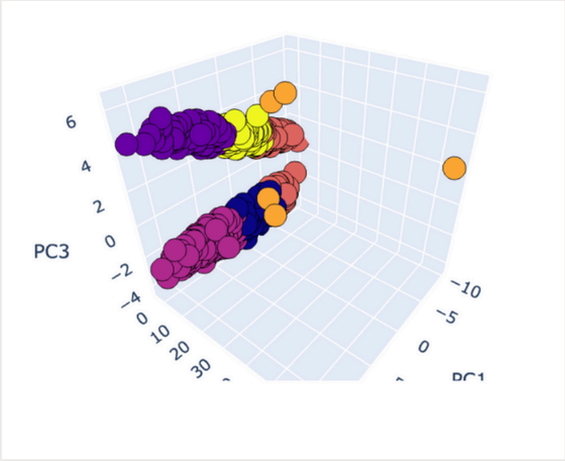
K = 4





K = 6





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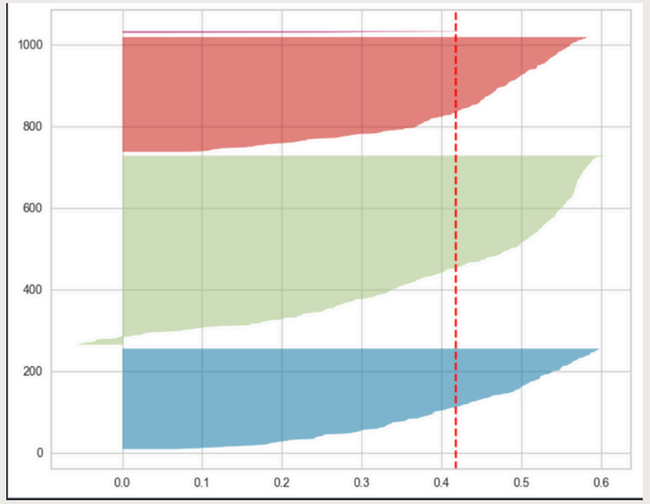

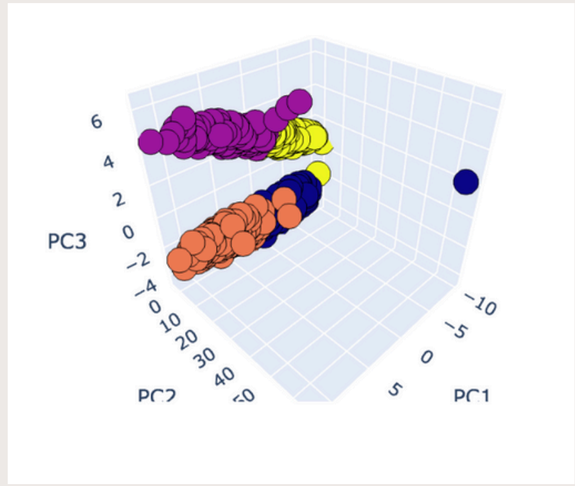

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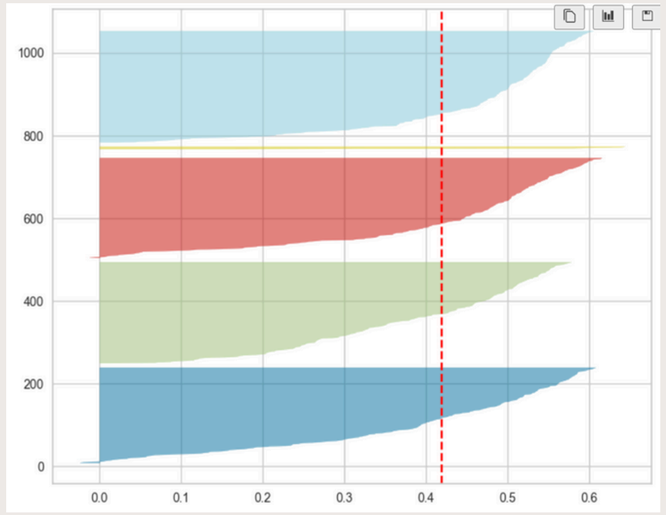
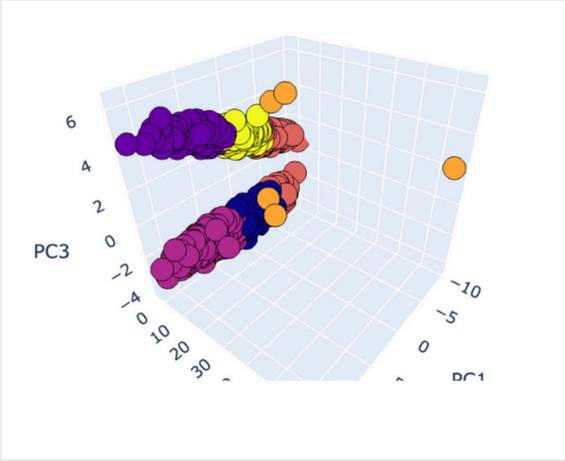
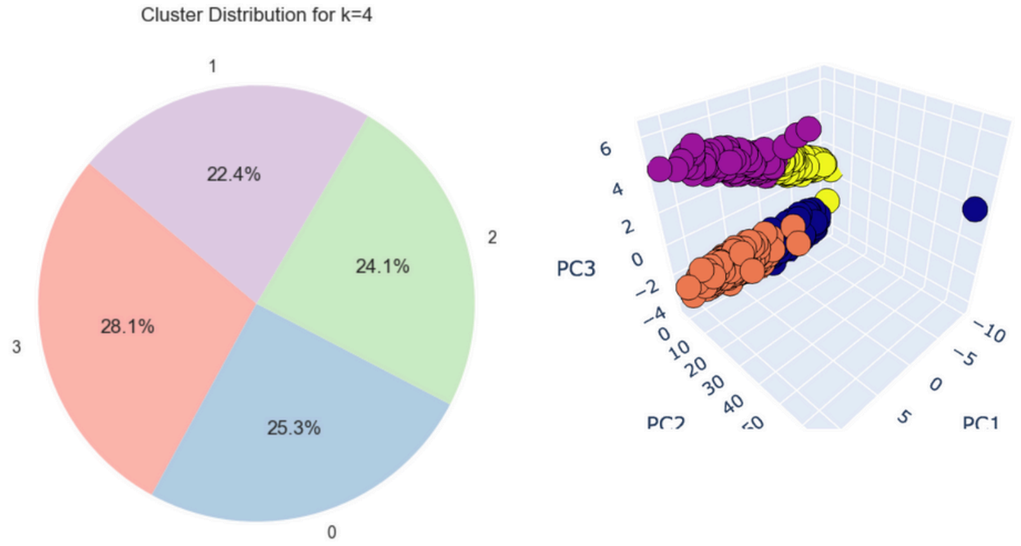


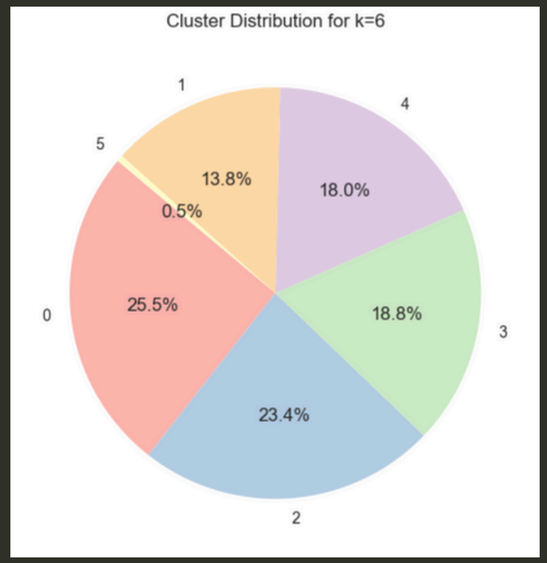


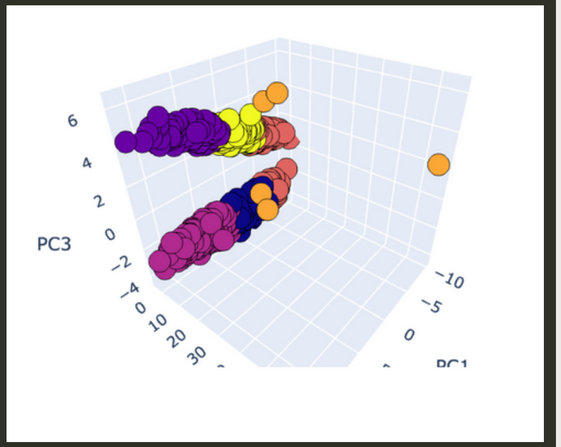
Cluster Visualisation

K = 4



K = 6





Cluster Insights

Cluster_4	Number_of_Customers	Menu_Price	Marketing_Spend	Cuisine_Type	Average_Customer_Spending	Promotions	Reviews	Monthly_Revenue	Popularity	Net_Profit	ROI	Cluster_6
0	35.146825	28.964733	9.355013	1.424603	28.265754	1.0	48.464286	205.974589	0.670635	196.619576	18813.620600	0.051587
1	77.233184	31.689826	10.358455	1.704036	29.011274	0.0	49.677130	350.932116	2.488789	340.573661	15156.018348	1.789238
2	76.379167	32.119024	10.228197	1.620833	30.922997	1.0	50.120833	343.923164	2.508333	333.694967	11554.308952	1.983333
3	31.425000	28.603569	10.076871	1.475000	29.712537	0.0	51.092857	200.491944	0.550000	190.415074	4963.423443	3.632143

Cluster_6	Number_of_Customers	Menu_Price	Marketing_Spend	Cuisine_Type	Average_Customer_Spending	Promotions	Reviews	Monthly_Revenue	Popularity	Net_Profit	ROI	Cluster_4
0	35.940945	29.071233	9.360579	1.452756	28.025384	1.000000	48.259843	208.909256	0.704724	199.548677	7.453325e+03	0.039370
1	84.737226	32.614370	11.328740	1.715328	30.427883	0.000000	50.781022	381.355138	2.802920	370.026399	6.178811e+03	1.000000
2	76.596567	32.378922	10.423913	1.605150	31.219250	1.000000	50.424893	346.170725	2.515021	335.746812	7.079243e+03	2.000000
3	53.352941	30.761802	9.516019	1.732620	27.861138	0.000000	48.331551	282.618435	1.481283	273.102415	8.668933e+03	2.101604
4	23.899441	27.108150	10.087115	1.301676	30.272092	0.011173	52.324022	160.640238	0.234637	150.553123	5.185667e+03	2.966480
5	74.000000	16.428514	0.040885	1.200000	28.724788	0.600000	51.600000	254.425664	2.400000	254.384779	1.069037e+06	1.200000

As there is only a slight difference between cluster 4 and 6, I decided to analyze cluster 4.

Cluster Insight

Cluster_4	Number_of_Customers	Menu_Price	Marketing_Spend	Cuisine_Type	Average_Customer_Spending	Promotions	Reviews	Monthly_Revenue	Popularity	Net_Profit	ROI	Cluster_6
0	35.146825	28.964733	9.355013	1.424603	28.265754	1.0	48.464286	205.974589	0.670635	196.619576	18813.620600	0.051587
1	77.233184	31.689826	10.358455	1.704036	29.011274	0.0	49.677130	350.932116	2.488789	340.573661	15156.018348	1.789238
2	76.379167	32.119024	10.228197	1.620833	30.922997	1.0	50.120833	343.923164	2.508333	333.694967	11554.308952	1.983333
3	31.425000	28.603569	10.076871	1.475000	29.712537	0.0	51.092857	200.491944	0.550000	190.415074	4963.423443	3.632143

CLUSTER 0:

1. DECENT NUMBER OF CUST
2. LOW MENU PRICE
3. LOW MARKETING SPEND
4. LOW AVERAGE CUST SPENDING
5. USING PROMOTION
6. MODERATE REVENUE, NET PROFIT, ROI
7. LOW TO MEDIUM POPULARITY

Casual Restaurant

CLUSTER I:

1. HIGH NUMBER OF CUST
2. HIGH MENU PRICE
3. HIGH MARKETING SPEND
4. MODERATE AVERAGE CUST SPENDING
5. NO PROMOTION
6. HIGH REVENUE, NET PROFIT, ROI
7. HIGH TO VERY HIGH POPULARITY

Fine Dining

CLUSTER 2:

1. HIGH NUMBER OF CUST
2. HIGH MENU PRICE
3. HIGH MARKETING SPEND
4. HIGH AVERAGE CUST SPENDING
5. PROMOTION
6. HIGH REVENUE, NET PROFIT, ROI
7. HIGH TO VERY HIGH POPULARITY

Premium Restaurant

CLUSTER 3:

1. LOW NUMBER OF CUST
2. LOW MENU PRICE
3. HIGH MARKETING SPEND
4. MODERATE AVERAGE CUST SPENDING
5. NO PROMOTION
6. LOW REVENUE, NET PROFIT, ROI
7. LOW TO MEDIUM POPULARITY

Nugu Restaurant

RecoMMendationS!!!

Casual Restaurant

1. Spend more on marketing spending
2. Using social media to improve marketing as it is easier to use and could target more people
3. Variate the menu

Fine Dining

1. Introduce a premium menu to improve the average customer spending
2. Give a loyalty program to keep the customer
3. Held an event only to loyal customer to keep the exclusivity of the restaurant
4. Keep improving the quality service

Fine Dining

1. Analyze the marketing strategies to keep it working
2. Make exclusive menu for every season/event to keep the customer interested
3. Using a stample card to make customer keep coming to the restaurant

Nugu Restaurant

1. Engange with the customer to see the demand
2. Use the demand to rebrand the restaurant
3. Use promotions to expand the customer
4. Use social media marketing
5. Improve the quality service

THANK YOU

for further questions:

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