Capstone Project 4

Zomato Restaurant Clustering and Sentiment Analysis

Individual Project:

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Problem Statement

The Project focuses on analyzing the Zomato restaurant data. You have to analyze the sentiments of the reviews given by the customer in the data and made some useful conclusion in the form of Visualizations. Also, cluster the zomato restaurants into different segments. The Analysis also solves some of the business cases that can directly help the customers finding the Best restaurant in their locality and for the company to grow up and work on the fields they are currently lagging in.

This could help in clustering the restaurants into segments. Also the data has valuable information around cuisine and costing which can be used in cost vs. benefit analysis

Data could be used for sentiment analysis. Also the metadata of reviewers can be used for identifying the critics in the industry.

Business Problem Analysis

- To assure Zomato's success it is important for the company to analyze its datasets and make appropriate strategic decisions.

- The problem statement here asks us to cluster the restaurants to help customers find the best restaurants in their city and according to their taste and requirement. This will help Zomato in building a good recommendation system for their customers. Do a cost-benefit analysis using the cuisines and costs of the restaurants.

- It is important to do sentiment analysis to get an idea about how people really feel about a particular restaurant and understand the fields they are lagging in. To identify the industry critics and especially work on their reviews to build a reputation worth praising.

Data Summary

Restaurant Names and Metadata

1. Name : Name of Restaurants
2. Links : URL Links of Restaurants
3. Cost : Per person estimated Cost of dining
4. Collection : Tagging of Restaurants w.r.t. Zomato categories
5. Cuisines : Cuisines served by Restaurants
6. Timings : Restaurant Timings

Restaurant Reviews

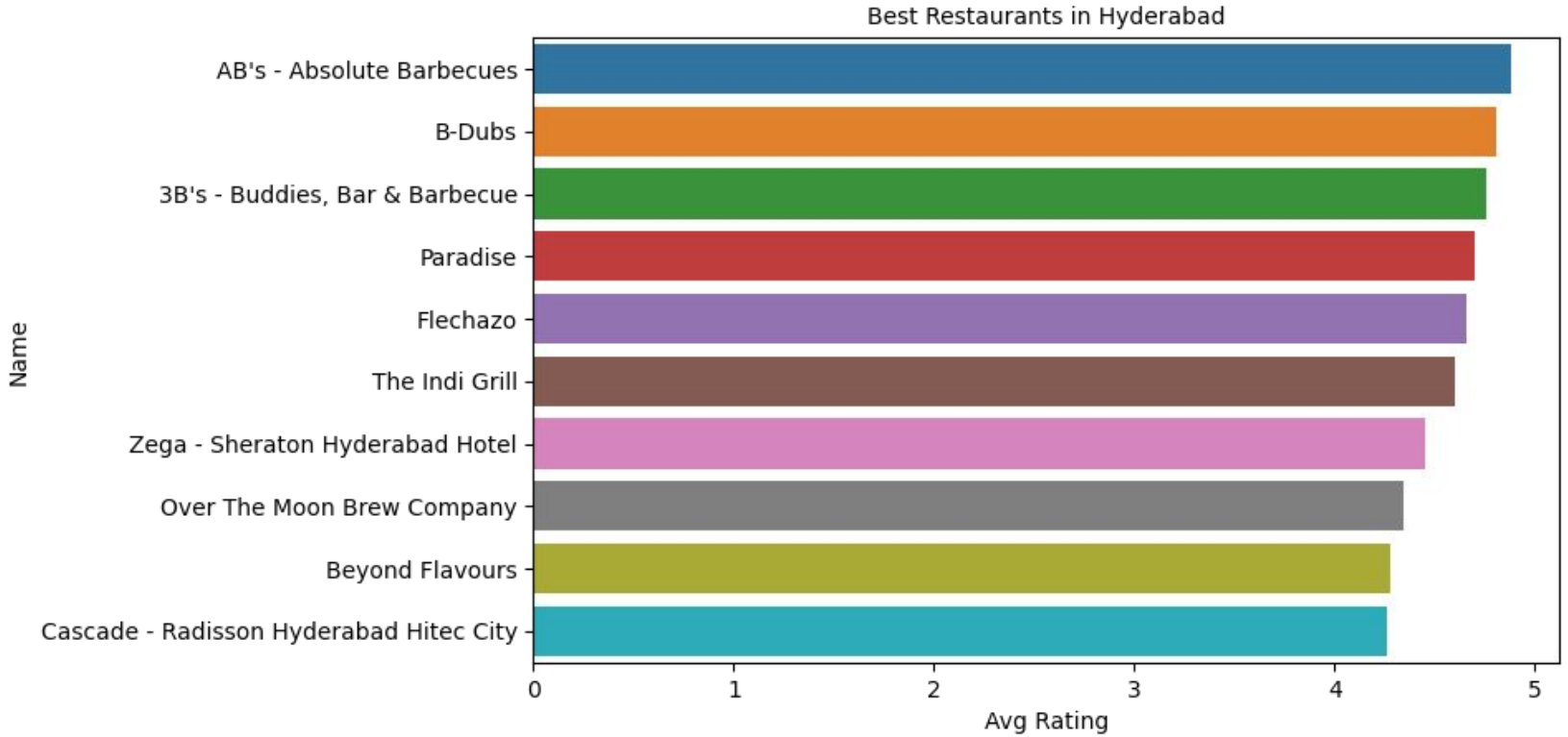
1. Restaurant : Name of the Restaurant
2. Reviewer : Name of the Reviewer
3. Review : Review Text
4. Rating : Rating Provided by Reviewer
5. MetaData : Reviewer Metadata - No. of Reviews and followers
6. Time: Date and Time of Review
7. Pictures : No. of pictures posted with review

Methodology

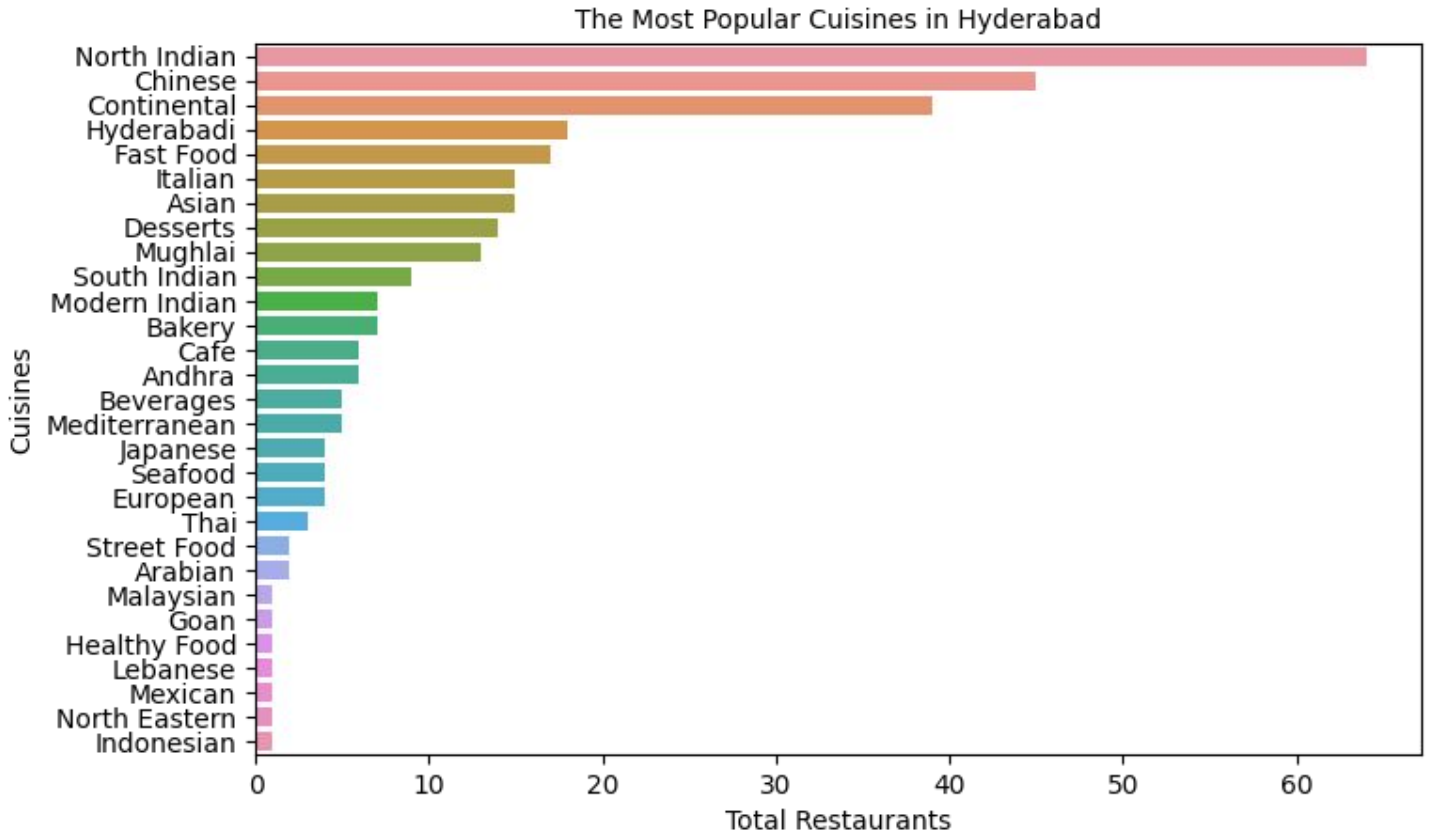
- Business Problem Analysis
- Data Collection
- Data Cleaning and Preprocessing
- Feature Engineering
- Exploratory Data Analysis
  - Best Restaurants in the City
  - The Most Popular Cuisines in Hyderabad
  - Restaurants and their Costs
  - Cost-Benefit Analysis
  - Hypotheses Generation on visualized data for Clustering
- Restaurant Clustering
  - K means Clustering on Cost and Ratings
  - Multi-Dimensional K means Restaurant Clustering
    - Principal Component Analysis
    - Silhouette Score
    - K means Clustering
    - Cluster Exploration
- Sentiment Analysis
  - Exploratory Data Analysis
    - Critics in the Industry
  - Text Pre-Processing and Text Visualization
  - Modeling
- Conclusion

Exploratory Data Analysis

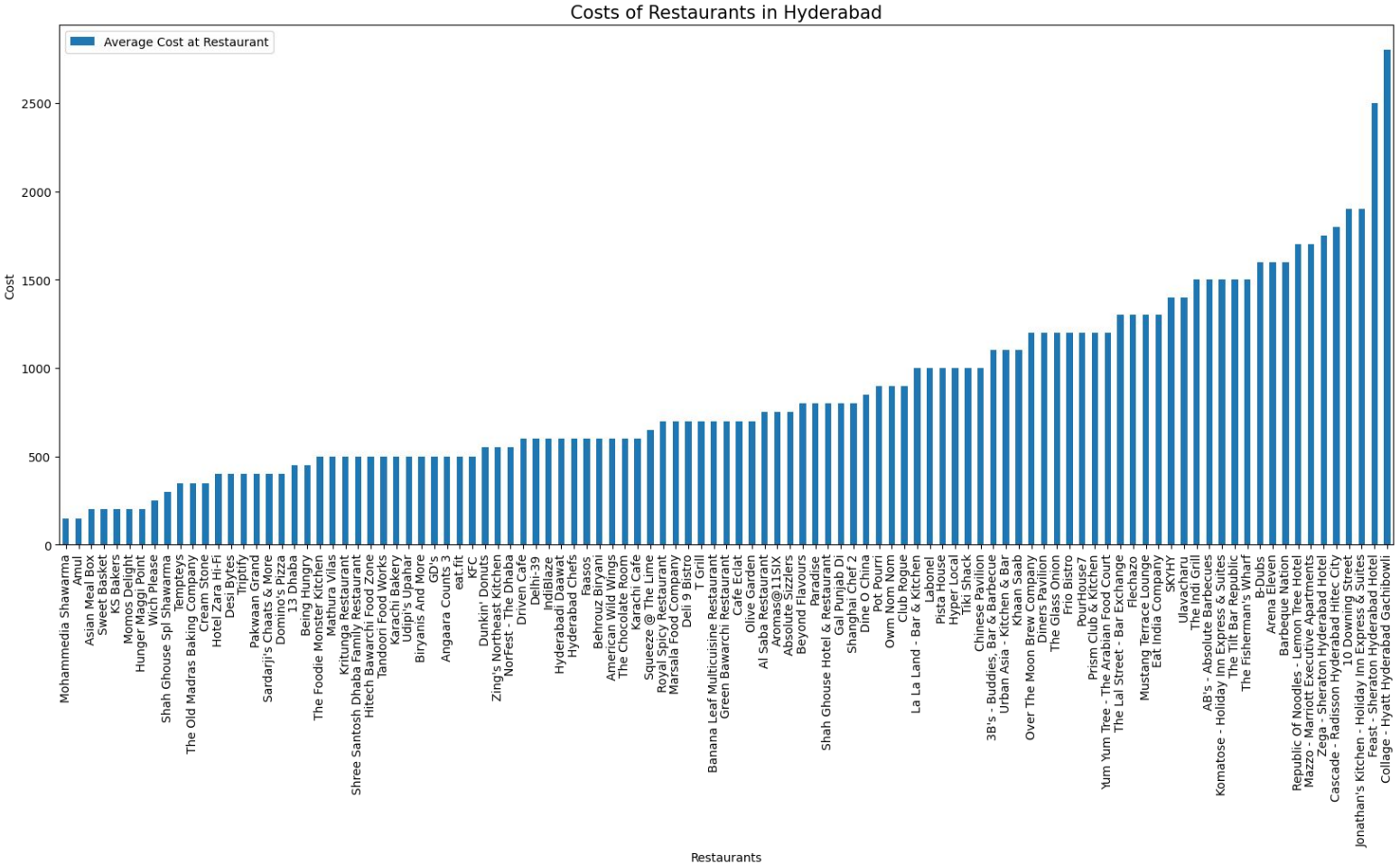
Best Restaurants in the City



The Most Popular Cuisines in Hyderabad



Restaurants and their Costs



Restaurants and their Costs

Top 5 Cheapest Restaurants

	Name	Cost
89	Mohammedia Shawarma	150.0
23	Amul	150.0
54	Asian Meal Box	200.0
101	Sweet Basket	200.0
59	KS Bakers	200.0

Top 5 Costliest Restaurants

	Name	Cost
92	Collage - Hyatt Hyderabad Gachibowli	2800.0
56	Feast - Sheraton Hyderabad Hotel	2500.0
21	Jonathan's Kitchen - Holiday Inn Express & Suites	1900.0
18	10 Downing Street	1900.0
91	Cascade - Radisson Hyderabad Hitec City	1800.0

Cost-Benefit Analysis

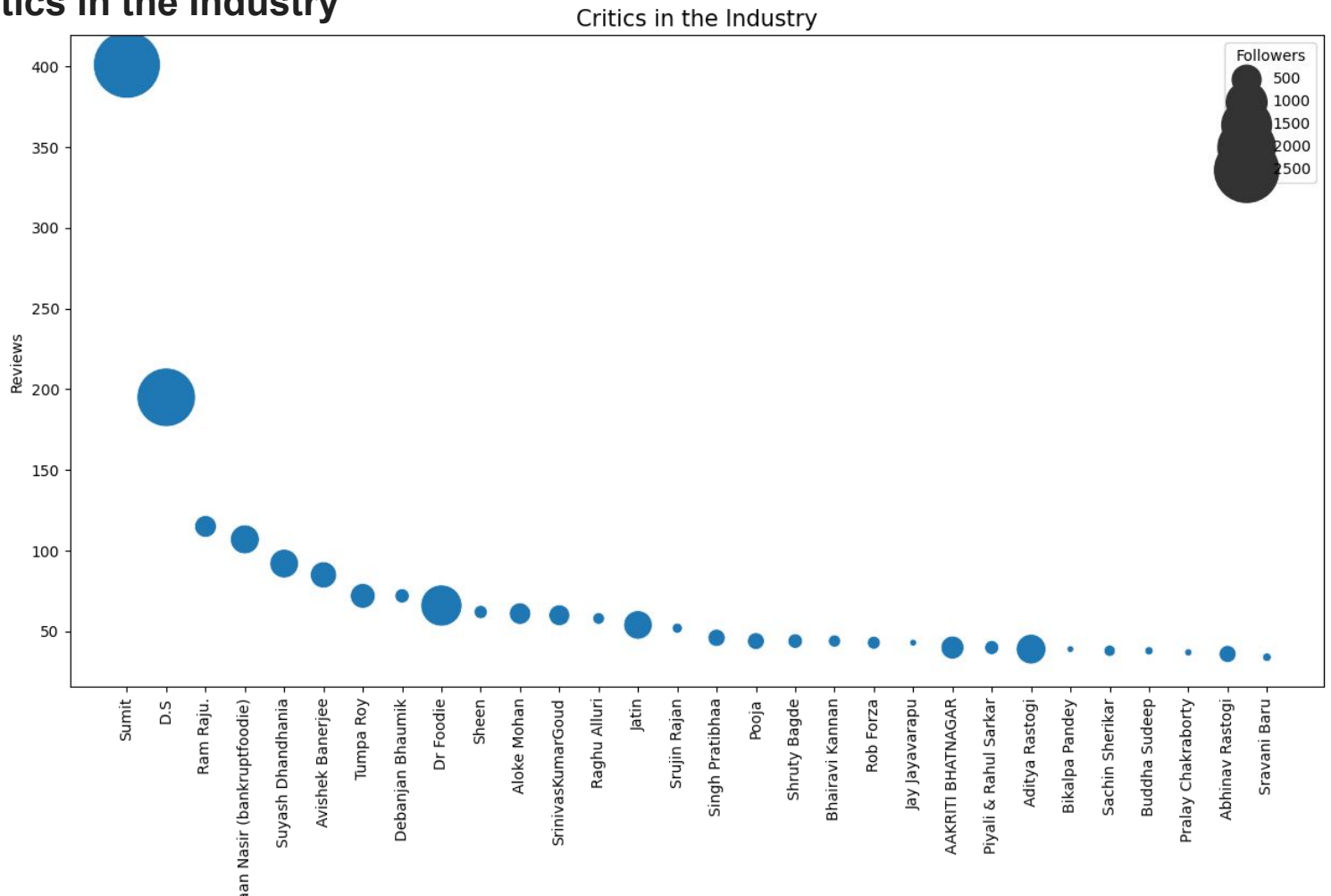
- A Cost-Benefit Analysis is a process of analyzing the worth of a decision by estimating the costs incurred in implementing that decision and comparing them with the benefits of that decision. If the projected benefits outweigh the costs, you'll be making money out of that decision and if not, it's important to strategize a better plan.

- The data that we have consists of per-person cost, cuisines available at the restaurant, and an average rating of the restaurant. If a restaurant isn't performing well in terms of rating and has a high per-person cost and a low number of popular cuisines, this is going to be a problem for Zomato. Since negative reviews would be an intangible cost to the company and with that the company will start to lose daily application users. The application users are an asset to the company, Zomato gets advertising by different restaurants because of the large audience they have.

- All in all, it is important to separate out the restaurants that Zomato needs to work on in order to improve its overall customer experience and if improvement strategies don't work out, they need to delist those restaurants themselves.

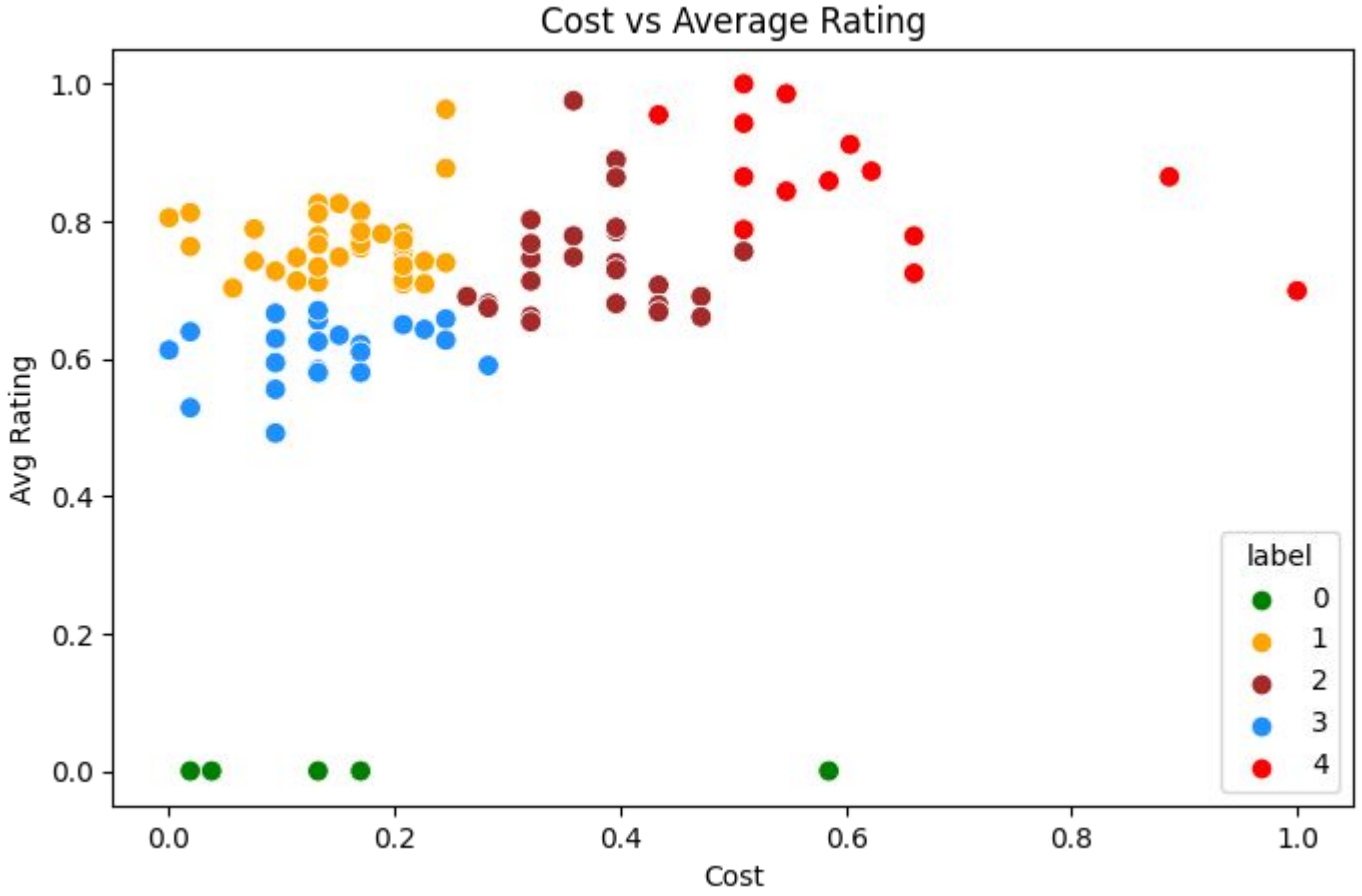

Restaurants with Low Ratings
Cost
150.0
200.0
400.0
500.0
600.0
900.0
Avg Rating
3.0
2.9
2.8
2.7
2.6
2.5
2.4
Hotel Zara Hi-Fi
Asian Meal Box
Pakwaan Grand
Mathura Vilas
Behrouz Biryani
The Chocolate Room
hree Santosh Dhaba Family Restaurant
KFC
Club Rogue
Desi Bytes
Delhi-39
Mohammedia Shawarma

Critics in the Industry



Positive and Negative Word Clouds

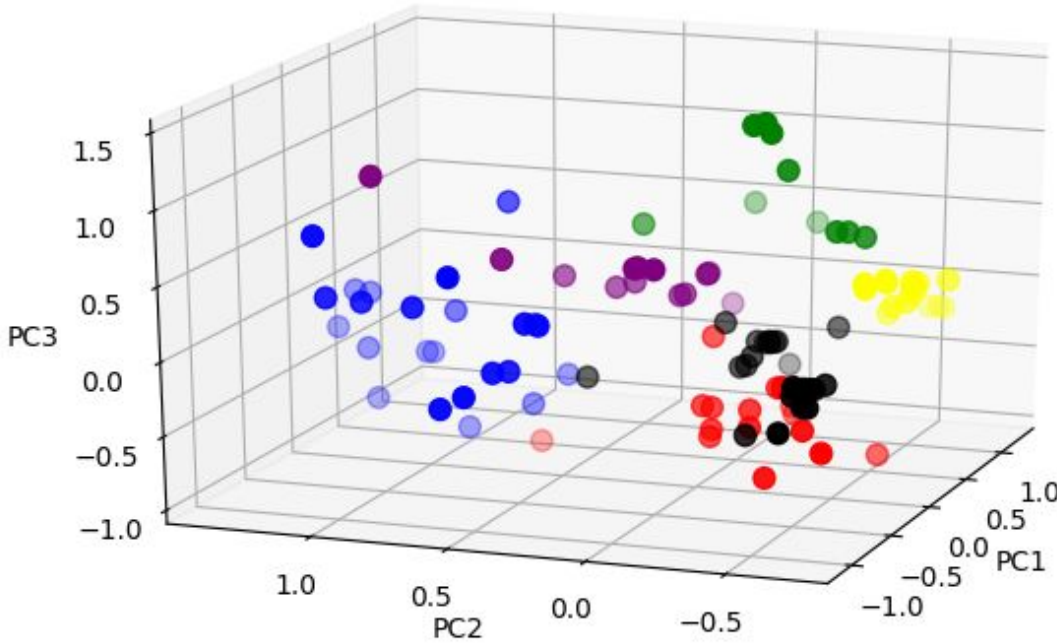
Restaurant Clustering



Cluster 0:
Color: Purple
Cuisines: Fast food and Continental
Average Rating: 3.42
Average Cost: 942 INR
Median Cost: 600 INR

Cluster 1:
Color: Red
Cuisines: North Indian and Complimentary
Average Rating: 3.63
Average Cost: 823 INR

Cluster 2:
Color: Blue
Cuisines: North Indian, Chinese and Continental
Average Rating: 3.77
Average Cost: 1331 INR



Cluster 3:
Color: Green
Cuisines: Chinese, Thai, Asian, Malaysian etc
Average Rating: 3.18
Average Cost: 890 INR

Custer 4:
Color: Yellow
Cuisines: Cafe, Bakeries, Desserts, etc
Average Rating: 3.14
Average Cost: 406 INR

Custer 5:
Color: Black
Cuisines: North Indian, Chines
Hyderabadi
Average Rating: 3.24
Average Cost: 674 INR

Sentiment Analysis:

```
Results for Logistic Regression
0.8674033149171271
[[ 628  100]
 [ 164 1099]]
              precision    recall  f1-score   support

           0       0.79      0.86      0.83       728
           1       0.92      0.87      0.89      1263

    accuracy                           0.87      1991
   macro avg       0.85      0.87      0.86      1991
weighted avg       0.87      0.87      0.87      1991
```

```
Results for Random Forest
0.8779507785032646
[[ 542  186]
 [  57 1206]]
              precision    recall  f1-score   support

           0       0.90      0.74      0.82       728
           1       0.87      0.95      0.91      1263

    accuracy                           0.88      1991
   macro avg       0.89      0.85      0.86      1991
weighted avg       0.88      0.88      0.87      1991
```

Evaluation:

- In the business problem, predicting the negative sentiments correctly is really important but is more important for the models to reduce the number of false positives.
- False positives indicate that the reviews were actually negative but they were categorized as positive and this will lead to missing a complaint to work on.
- Even though the number of false negatives is higher in the case of Random Forest than Logistic Regression, it is performing better in terms of reducing False positives. This indicates that Random Forest is penalizing False positives more just as we want.

Conclusion and Recommendations:

Some important conclusions drawn from the analysis are as follows:

- The best restaurants in Hyderabad are AB's - Absolute Barbecues, B-Dubs, and 3B's - Buddies, Bar & Barbecue..
- The most popular cuisines are the cuisines which most of the restaurants are willing to provide. The most popular cuisines in Hyderabad are North Indian, Chinese, Continental, and Hyderabadi.
- he restaurants in Hyderabadi have a flexible per person cost of 150 INR to 2800 INR. The cheapest is the food joint called Mohammedia Shawarma and the costliest restaurant is Collage - Hyatt Hyderabad Gachibowli.
- Restaurant Clustering was done in two approaches. First with just two features and then with all of them. K means Clustering worked well in the first approach but as we increase the dimensions, it isn't able to distinguish the clusters hence principal component analysis was done and then clustered into 6 clusters. The similarities in the data points within the clusters were pretty great.
- Even though the number of false negatives is higher in the case of Random Forest than Logistic Regression, it is performing better in terms of reducing False positives. Random Forest works better here.

Recommendations:

- Restaurants with negative reviews should be worked with in order to arrive at a win-win situation.
- Ratings should be collected on a category basis such as rating for packaging, delivery, taste, quality, quantity, service, etc. This would help in targeting specific fields that are lagging.

References:

- Machine Learning Mastery
- GeeksforGeeks
- Analytics Vidhya Blogs
- Towards Data Science Blogs
- Built in Data Science Blogs
- Scikit-Learn Org