Uncovering Insights from the Yelp Dataset: An Analysis of Restaurant Businesses

Project Definition:

This project aims to use the JSON-formatted Yelp Dataset to undertake a thorough analysis using Python Programming Language. It has a massive amount of relevant data that can be pulled from it and analyzed to learn more about businesses and consumer collective feedbacks. The goal of this project is to draw valuable conclusions from a large body of data. These insights can be used for several purposes, such as discovering popular businesses, improving marketing techniques based on user experiences.

YELP DATASET

The Yelp dataset is a collection of data from the Yelp platform, a widely-used online service where individuals can provide reviews and ratings for a wide range of businesses, including restaurants, hotels, and retail stores and others.

The dataset is released as including businesses, reviews, user, tips and check-in parts for use in personal, educational, and academic purposes.

We will use businesses and review datasets for our project.

150,346 businesses

Businesses data provides details about individual businesses including their names, addresses, categories (e.g., restaurants, hotels, bars), geographical coordinates, opening hours, and various other attributes that describe the business.

6,990,280 reviews

Reviews data consists of user reviews for various businesses. It includes the text form of the review, the user's rating (usually on a rating of 1 to 5 stars), the posting date of the review, and additional information related to the review.

The dataset includes reviews collected over a period of almost 17 years: ***from February 16, 2005 , to January 19, 2022.*** This long time period indicates that people have been using the Yelp platform regularly for many years to share their opinions and experiences about various businesses.

Businesses and Reviews

While Business_id is the primary key for business table, it is foreign key for reviews table. There is one-to-many relationship from business to reviews.

Businesses Table

	Column	Type	Definition
1	**business_id**	string	business id (22 character unique)
2	**name**	string	the business's name
3	**address**	string	the full address of the business
4	**city**	string	City name
5	**state**	string	2 character state code
6	**postal code**	string	the postal code
7	**latitude**	float	latitude
8	**longitude**	float	longitude
9	**stars**	float	star rating, rounded to half-stars
10	**review_count**	integer	number of reviews
11	**is_open**	integer	0 or 1 for closed or open, respectively
12	**categories**	string	business categories

Reviews Table

	Column	Type	Definition
1	**review_id**	string	22 character unique review id
2	**user_id**	string	22 character unique user id
3	**business_id**	string	22 character business id
4	**stars**	integer	star rating
5	**date**	string	date formatted YYYY-MM-DD
6	**text**	string	the review itself
7	**useful**	integer	number of useful votes received
8	**funny**	integer	number of funny votes received
9	**cool**	integer	number of cool votes received

Businesses.json and Reviews.json

Business data sample:


```
{
   "business_id": "tnhfDv5Il8EaGSXZGiuQGg",
   "name": "Garaje",
   "address": "475 3rd St",
   "city": "San Francisco",
   "state": "CA",
   "postal code": "94107",
   "latitude": 37.7817529521,
   "longitude": -122.39612197,
   "stars": 4.5,
   "review_count": 1198,
   "is_open": 1,
   "categories": [
      "Mexican",
      "Burgers",
      "Gastropubs"
   ]
}
```


Reviews data sample:


```
{
   "review_id": "zdSx_SD6obEhz9VrW9uAWA",
   "user_id": "Ha3iJu77CxlrFm-vQRs_8g",
   "business_id": "tnhfDv5Il8EaGSXZGiuQGg",
   "stars": 4,
   "date": "2016-03-09",
   "text": "Great place to hang out after work: the prices are decent, and the ambience is fun. It's a bit loud, but very lively. The staff is friendly, and the food is good. They have a good selection of drinks.",
   "useful": 0,
   "funny": 0,
   "cool": 0
}
```

TOOLS

We performed analysis on the Yelp dataset using **Python** and utilized the following libraries:

Used to handle JSON files.

A popular library for data analysis and manipulation.

A powerful library for scientific computing.

Used for data visualization and creating graphs.

A visualization library based on matplotlib, known for creating more aesthetically pleasing and informative visualizations.

A language detection library used to identify the language of texts.

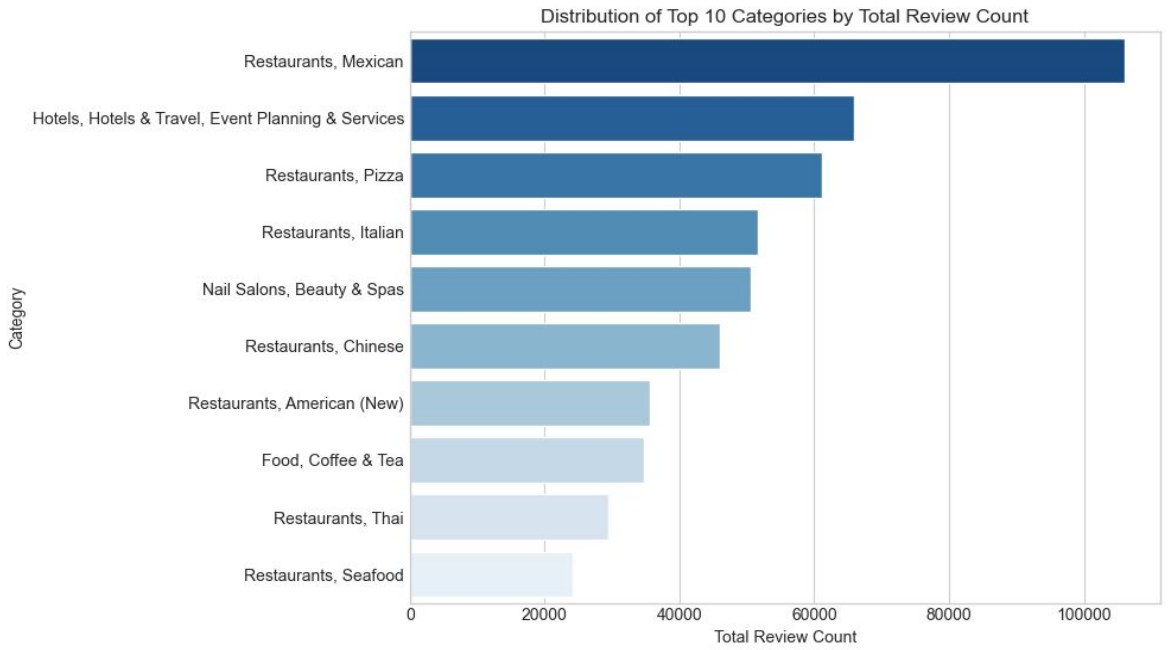
A library used for natural language processing (NLP) research and applications.

A library used to create a visual representation based on the frequencies of words in text data.

Highly Reviewed Categories Of Business Data

These data demonstrate the popularity of business categories based on customer reviews. Among the top 10 categories, 7 of them represent restaurants from different cuisines.

As we focus on customer reviews, we selected categories that include restaurants in our analysis.



In the business data, there are over 80k different type of businesses.

Restaurants Businesses

Since the Categories column have multiple attributes, we seperated only the businesses which includes ‘restaurant’ for further analysis. We define a binary column to refer if a business has restaurant attribute or not. After that, we selected if only is_restaurant column has TRUE in the data.

The sample filtered data is shown below;

business_id	name	city	stars	review_count	categories	is_restaurant
j9Kaj_6tSeXmVMYCgZithg	Noble Crust	Wesley Chapel	4.5	496	**Restaurants**, Italian, Nightlife, Southern, Bars, Breakfast & Brunch, Pizza	TRUE
EIlFs8kybcG-l60GJjNUIA	Domino's Pizza	Oldsmar	2.5	20	Pizza, Chicken Wings, **Restaurants**, Sandwiches	TRUE
z9wCTHYI2VZy9YIblwSsgg	The Silo Eatery Coffee Bakery	Tampa	4	5	Coffee & Tea, **Restaurants**, Food, Cafes, Bakeries	TRUE
4xhGQGdGqU60BIznBjqnuA	California Tacos and Taproom	Isla Vista	4	49	Mexican, Beer Bar, Bars, Sports Bars, Nightlife, **Restaurants**, Tacos	TRUE

Review Data

For our analysis, we kept specific columns such as star rating, review text, and business ID.

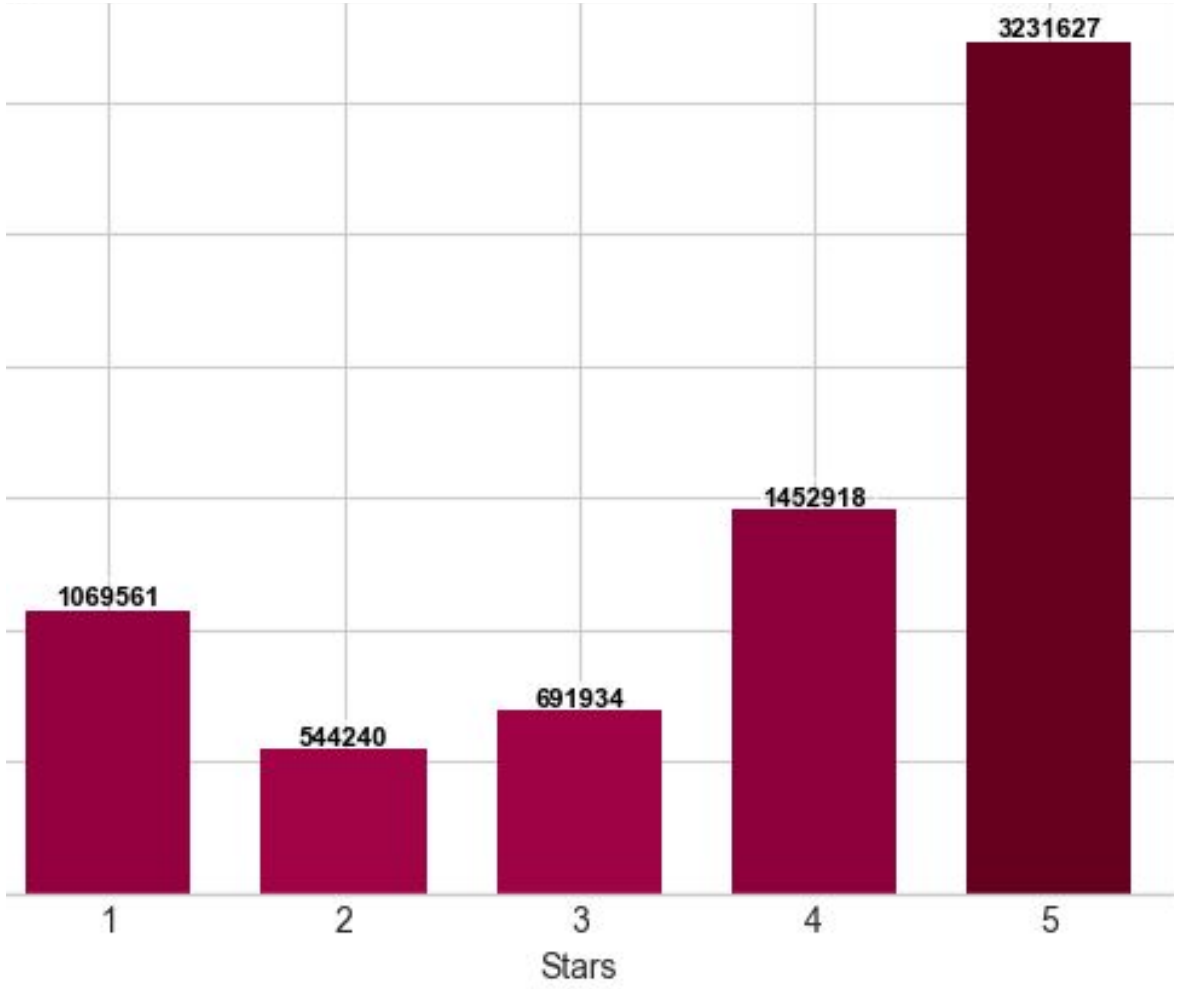
In the data each review is ranging from 1 to 5 stars. Now, let's take a visual look at some of this data:

stars	text	business_id
5	Great place for breakfast! I had the waffle, which was fluffy and perfect, and home fries which were nice and smashed and crunchy. Friendly waitstaff. Will definitely be back!	BVndHaLihEYbr76Z0CMEGw
5	Tremendous service (Big shout out to Douglas) that complemented the delicious food. Pretty expensive establishment (40-50$ avg for your main course), but its definitely backs that up with an atmosphere that's comparable with any of the top tier restaurants across the country.	YtSqYv1Q_pOltsVPSx54SA

When we filtered restaurant businesses in review data, our data declined to 4.724.471 records.

We can say that the data is mostly composed of restaurant businesses.

The Distribution Of Stars For Restaurant Businesses



We observed that most of the reviews received a **5-star rating**, indicating a high level of satisfaction.

However, it is interesting to see that there are more **1-star** reviews compared to 2- or 3-star reviews.

This suggests that customers are more motivated to write a review when they have either had an exceptionally positive experience or a very negative one.

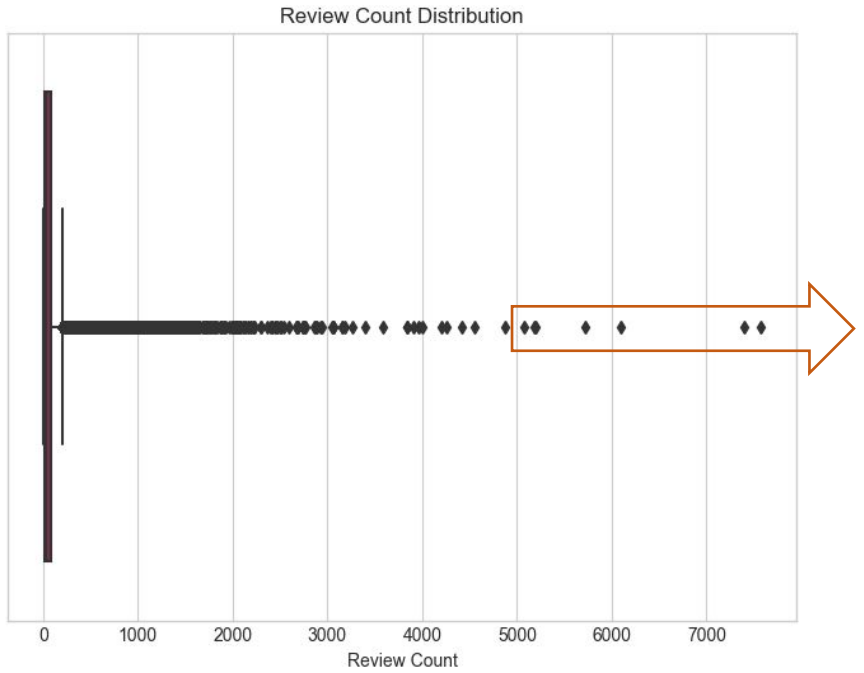
Most Popular Restaurants

Descriptive statistics of the review_count column for Restaurant businesses:

mean	min	max
87.27	5	7568

Most of the restaurants have fewer than 200 reviews, while a few businesses have more than 1,000 reviews.

review_count_bins	Business Count	Business Count %
(0, 10]	9784	18.7%
(10, 20]	9267	17.7%
(20, 30]	5798	11.1%
(30, 40]	4077	7.8%
(40, 50]	3048	5.8%
(50, 100]	8603	16.5%
(100, 200]	6243	11.9%
(200, 500]	4191	8.0%
(500, 1000]	961	1.8%
(1000, 10000]	296	0.6%



Since we are interested in most popular restaurants, we filtered the data with a more specific threshold of over 5k reviews.

Most Popular Restaurants-2

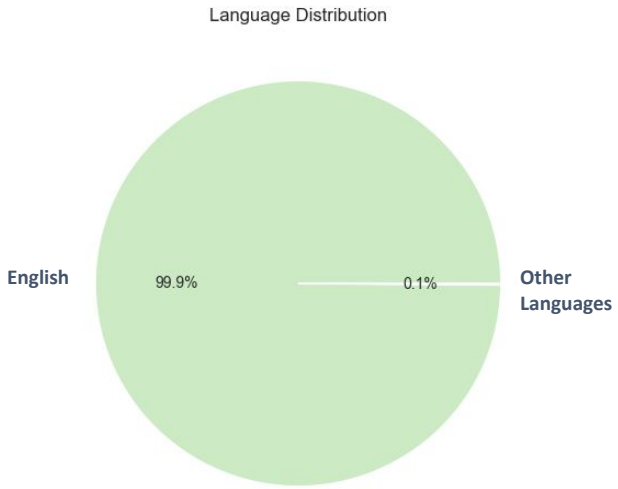
There are only 7 restaurants have at least 5k reviews in the data.

name	city	stars	review_count	categories
Acme Oyster House	New Orleans	4	7568	Live/Raw Food, Restaurants, Seafood, Cajun/Creole
Oceana Grill	New Orleans	4	7400	Restaurants, Seafood, Cajun/Creole, Breakfast & Brunch
Hattie B’s Hot Chicken	Nashville	4.5	6093	American (Traditional), Chicken Shop, Southern, Restaurants, Chicken Wings, American (New), Soul Food
Reading Terminal Market	Philadelphia	4.5	5721	…Public Markets, Food Court, Wineries, Local Flavor, Ethnic Food, Restaurants...
Ruby Slipper	New Orleans	4.5	5193	Restaurants, American (Traditional), American (New), Cafes, Breakfast & Brunch
Mother's Restaurant	**New Orleans**	**3.5**	**5185**	**Cajun/Creole, Restaurants, Event Planning & Services, Southern, Specialty Food, Soul Food, Food, Ethnic Food, American (New), Caterers, Breakfast & Brunch, Sandwiches**
Royal House	New Orleans	4	5070	Restaurants, American (New), Sandwiches, Seafood, Cajun/Creole

As it can be seen from the table, among the restaurants considered as outliers, Mother's Restaurant stands out with an overall rating of 3.5 stars. With 5185 reviews, it is evident that it is a popular restaurant.

We chose Mother’s Restaurant for our analysis to understand why customers hold significantly different reviews about the restaurant.

The Distribution of Languages



We used a language identifier module named ‘Langid’ to detect the language of the reviews. As expected, most of the reviews are in English, and we filtered out reviews in other languages.

Let’s look at the filtered data below;

text	language
Op suggestie van yelp- hier geweest op onze eerste avond in NOLA tijdens onze roadtrip (dag3). It's the best place. Wachttijden kunnen oplopen, maar waar Nederland vaak faliekant in faalt, gaat hier geweldig: er wordt door t personeel vlijmscherp in de gaten gehouden wie er aan de beurt is, zelfs voor de krukken aan de bar.	nl
Excelente comida mediterránea! El gyro es buenísimo y la ensalada griega de las mejores q he comido. Las porciones son bastantes generosas. Sitio recomendado al 100% vendré cada vez que pueda	es
点了四个菜 没一个好吃的 不适合中国人吃 口水鸡鸡肉不新鲜 毛血旺的大肠好油 酸豆角炒肉沫做的超级咸 松鼠鱼中规中矩，但卖27块钱也不便宜 总的来说就是又油又咸，吃完了以后要不停喝水。	zh
Wer auf frisch geräucherten Fisch steht, der noch warm aus dem Rauch kommt, der is(s)t hier genau richtig. Dazu gibt es richtig guten deutschen Kartoffelsalat. Die Portionen war sehr groß und der Preis mit 14-18 $ auch in Ordnung. Die Bedienung war sehr freundlich. Wem das Anglerglück hold war, der kann sich seinen Fisch auch direkt vor Ort räuchern lassen.	de

Mother’s Restaurant Sentiment Analysis

The first step is to use the NLTK library to identify "stop words" and remove them from the reviews. Stop words are commonly used words in the language (e.g., "the", "and", "in", etc.) that are not relevant for analysis. By identifying and removing these words, we cleaned the text data.

In the next step, we tokenized all the reviews. Tokenization is the process of breaking down the text into individual words or tokens. After tokenization, we counted how many times each word appears across all the reviews.

Finally, we counted each word separately for 5-star and 1-star reviews. This allowed us to understand which words are more frequent in most positive reviews and most negative reviews.

Mother’s Restaurant 1-Star Reviews

Customers with negative reviews note that sometimes the **food is served cold** and does not meet their taste expectations. Some of them express that the restaurant **doesn’t clean** and encounter **issues with customer service**, including experiencing **rude behavior**. The **taste or appearance of coffee and shrimp**, also fail to satisfy the customers. Additionally, **long waiting lines** at the restaurant contribute to customers' dissatisfaction. These negative reviews indicate that there is a need for improvements in areas like **service quality** and **food quality** to enhance customer satisfaction.

Most Common Word Combinations

Food	
Food cold	Food service
Food bland	Food mediocre
Food terrible	

Place
Place dirty
Many places
Hype place

Service
Customer service
Service terrible
Rude service

Like	
Don’t like/Didn’t like	Coffee tasted like
Food looked like	Shrimp tasted like
Like cafeteria food	

One
One star
Took one bite

Order
Order shrimp
Cold order

Line
Long line
Wait line
Line 20/30 minutes

Mother’s Restaurant 5-Star Reviews

Customers with a positive view of Mother's Restaurant use expressions like "**go back**" and "**come back**," indicating that the restaurant is a favorite among those who visit New Orleans.

Some customers even mention that it's worth waiting in line for. Most of the high ratings for the restaurant stem from the quality and deliciousness of specific dishes like **Seafood Gumbo** and **Cajun Food**, which are highly appreciated by customers. The phrase "**highly recommend place**" also showcases customers' complete satisfaction with the restaurant.

Most Common Word Combinations

Food	
Great Food, Good Food	Food Amazing
SeaFood Gumbo	Authentic Cajun Food
Soul Food	Food Worth Wait

Place	
Recommend Place	Highly Recommend Place
Love Place	Place New Orleans
Great Place	Line Place Order

New	
New Orleans	Back New Orleans
Visit New Orleans	New Orleans Mothers
Trip New Orleans	New Orleans Food

Get
Get Line
Get Line Order

Best
Best Food
Best Fried Chicken
Best Bread Pudding

Go & Back
Go Back
Must Go
Come Back