Zomato Dataset Analysis

Importing the required libraries and loading the dataset

In [1]:
```
# import the libraries
import numpy as np
import pandas as pd
from matplotlib import pyplot as plt
import seaborn as sns
import re
```

In [77]:
```
from sklearn.impute import SimpleImputer
from sklearn.preprocessing import StandardScaler
from sklearn.cluster import KMeans
```

In [3]:
```
import warnings
warnings.filterwarnings("ignore")
```

In [4]:
```
df = pd.read_csv(r"..\Datasets\zomato.csv")
```

In [5]:
```
print(df)
```

```
                                                address  \
0      942, 21st Main Road, 2nd Stage, Banashankari, ...
1      2nd Floor, 80 Feet Road, Near Big Bazaar, 6th ...
2      1112, Next to KIMS Medical College, 17th Cross...
3      1st Floor, Annakuteera, 3rd Stage, Banashankar...
4      10, 3rd Floor, Lakshmi Associates, Gandhi Baza...
...                                                  ...
56247  Four Points by Sheraton Bengaluru, 43/3, White...
56248  Number 10, Garudachar Palya, Mahadevapura, Whi...
56249  Sheraton Grand Bengaluru Whitefield Hotel & Co...
56250  Sheraton Grand Bengaluru Whitefield Hotel & Co...
56251  ITPL Main Road, KIADB Export Promotion Industr...

                                                  name online_order  \
0                                                Jalsa          Yes
1                                       Spice Elephant          Yes
2                                      San Churro Cafe          Yes
3                                 Addhuri Udupi Bhojana           No
4                                         Grand Village           No
...                                                 ...          ...
56247  Best Brews - Four Points by Sheraton Bengaluru...           No
56248                           Vinod Bar And Restaurant           No
56249  Plunge - Sheraton Grand Bengaluru Whitefield H...           No
56250  Chime - Sheraton Grand Bengaluru Whitefield Ho...           No
56251                       The Nest - The Den Bengaluru           No

      book_table    rate votes                            phone  \
0            Yes   4.1/5   775    080 42297555\r\n+91 9743772233
1             No   4.1/5   787                      080 41714161
2             No   3.8/5   918                   +91 9663487993
3             No   3.7/5    88                   +91 9620009302
4             No   3.8/5   166  +91 8026612447\r\n+91 9901210005
...          ...     ...   ...                               ...
56247         No  3.6 /5    27                      080 40301477
56248         No     NaN     0                   +91 8197675843
56249         No     NaN     0                              NaN
56250        Yes  4.3 /5   236                      080 49652769
56251         No  3.4 /5    13                   +91 8071117272

                       location           rest_type  \
0                   Banashankari       Casual Dining
```

```
1                   Banashankari        Casual Dining
2                   Banashankari  Cafe, Casual Dining
3                   Banashankari          Quick Bites
4                   Basavanagudi        Casual Dining
...                          ...                 ...
56247                 Whitefield                 Bar
56248                 Whitefield                 Bar
56249                 Whitefield                 Bar
56250  ITPL Main Road, Whitefield                 Bar
56251  ITPL Main Road, Whitefield   Bar, Casual Dining

                                           dish_liked  \
0      Pasta, Lunch Buffet, Masala Papad, Paneer Laja...
1      Momos, Lunch Buffet, Chocolate Nirvana, Thai G...
2      Churros, Cannelloni, Minestrone Soup, Hot Choc...
3                                          Masala Dosa
4                                  Panipuri, Gol Appe
...                                                ...
56247                                              NaN
56248                                              NaN
56249                                              NaN
56250                      Cocktails, Pizza, Buttermilk
56251                                              NaN

                                  cuisines approx_cost(for two people)  \
0              North Indian, Mughlai, Chinese                        800
1                 Chinese, North Indian, Thai                        800
2                      Cafe, Mexican, Italian                        800
3                  South Indian, North Indian                        300
4                    North Indian, Rajasthani                        600
...                                       ...                        ...
56247                          Continental                      1,500
56248                          Finger Food                        600
56249                          Finger Food                      2,000
56250                          Finger Food                      2,500
56251  Finger Food, North Indian, Continental                      1,500

      listed_in(type)
0              Buffet
1              Buffet
2              Buffet
```

```
3              Buffet
4              Buffet
...               ...
56247   Pubs and bars
56248   Pubs and bars
56249   Pubs and bars
56250   Pubs and bars
56251   Pubs and bars

[56252 rows x 13 columns]
```

Understanding the data

In [6]:
```
# checking all the column details
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 56252 entries, 0 to 56251
Data columns (total 13 columns):
 #   Column                       Non-Null Count  Dtype 
---  ------                       --------------  ----- 
 0   address                      56235 non-null  object
 1   name                         56236 non-null  object
 2   online_order                 56233 non-null  object
 3   book_table                   56194 non-null  object
 4   rate                         48414 non-null  object
 5   votes                        56174 non-null  object
 6   phone                        54956 non-null  object
 7   location                     56126 non-null  object
 8   rest_type                    55914 non-null  object
 9   dish_liked                   28027 non-null  object
 10  cuisines                     56049 non-null  object
 11  approx_cost(for two people)  55731 non-null  object
 12  listed_in(type)              51642 non-null  object
dtypes: object(13)
memory usage: 5.6+ MB
```

In [7]:
```
# no. of rows and columns
df.shape
```

Out[7]: (56252, 13)

In [8]:
```
# data types
df.dtypes
```

Out[8]:
```
address                      object
name                         object
online_order                 object
book_table                   object
rate                         object
votes                        object
phone                        object
location                     object
rest_type                    object
dish_liked                   object
cuisines                     object
approx_cost(for two people)  object
listed_in(type)              object
dtype: object
```

In [9]:
```
# top rows of the dataset
df.head()
```

Out[9]:

	address	name	online_order	book_table	rate	votes	phone	location	rest_type	dish_liked	cuisines	appr t
0	942, 21st Main Road, 2nd Stage, Banashankari, ...	Jalsa	Yes	Yes	4.1/5	775	080 42297555\r\n+91 9743772233	Banashankari	Casual Dining	Pasta, Lunch Buffet, Masala Papad, Paneer Laja...	North Indian, Mughlai, Chinese	
1	2nd Floor, 80 Feet Road, Near Big Bazaar, 6th ...	Spice Elephant	Yes	No	4.1/5	787	080 41714161	Banashankari	Casual Dining	Momos, Lunch Buffet, Chocolate Nirvana, Thai G...	Chinese, North Indian, Thai	
2	1112, Next to KIMS Medical College, 17th Cross...	San Churro Cafe	Yes	No	3.8/5	918	+91 9663487993	Banashankari	Cafe, Casual Dining	Churros, Cannelloni, Minestrone Soup, Hot Choc...	Cafe, Mexican, Italian	
3	1st Floor, Annakuteera, 3rd Stage, Banashankar...	Addhuri Udupi Bhojana	No	No	3.7/5	88	+91 9620009302	Banashankari	Quick Bites	Masala Dosa	South Indian, North Indian	
4	10, 3rd Floor, Lakshmi Associates, Gandhi Baza...	Grand Village	No	No	3.8/5	166	+91 8026612447\r\n+91 9901210005	Basavanagudi	Casual Dining	Panipuri, Gol Gappe	North Indian, Rajasthani	

In [10]:
```
# botttom column
df.tail()
```

Out[10]:

	address	name	online_order	book_table	rate	votes	phone	location	rest_type	dish_liked	cuisines	appro tw
56247	Four Points by Sheraton Bengaluru, 43/3, White...	Best Brews - Four Points by Sheraton Bengaluru...	No	No	3.6 /5	27	080 40301477	Whitefield	Bar	NaN	Continental	
56248	Number 10, Garudachar Palya, Mahadevapura, Whi...	Vinod Bar And Restaurant	No	No	NaN	0	+91 8197675843	Whitefield	Bar	NaN	Finger Food	
56249	Sheraton Grand Bengaluru Whitefield Hotel & Co...	Plunge - Sheraton Grand Bengaluru Whitefield H...	No	No	NaN	0	NaN	Whitefield	Bar	NaN	Finger Food	
56250	Sheraton Grand Bengaluru Whitefield Hotel & Co...	Chime - Sheraton Grand Bengaluru Whitefield Ho...	No	Yes	4.3 /5	236	080 49652769	ITPL Main Road, Whitefield	Bar	Cocktails, Pizza, Buttermilk	Finger Food	
56251	ITPL Main Road, KIADB Export Promotion Industr...	The Nest - The Den Bengaluru	No	No	3.4 /5	13	+91 8071117272	ITPL Main Road, Whitefield	Bar, Casual Dining	NaN	Finger Food, North Indian, Continental	

In [11]:
```
# random rows
df.sample(5)
```

Out[11]:

	address	name	online_order	book_table	rate	votes	phone	location	rest_type	dish_liked
27467	604,4th Cross, Block 2, Kalyan Nagar, Bangalore	Venky's Xprs	No	No	3.7/5	35	+91 8861286181	Kalyan Nagar	Quick Bites, Meat Shop	NaN
49678	773, HAL 2nd Stage, 100 Feet Road, Indiranagar...	Vapour Pub & Brewery	No	Yes	4.2 /5	6998	+91 9900088194\n+91 9900088197	Indiranagar	Microbrewery, Pub	Pesto Pasta, Craft Beer, Wheat Beer, Cocktails...
48987	3353, 5th Cross, 12th Main, Indiranagar, Banga...	Cafe Braqa	Yes	Yes	4.1 /5	147	+91 7204874361	Indiranagar	Cafe	Ginger Tea, Cup Cake, Sandwich, Pasta, Pizza, ...
47620	('Rated 4.0'	""RATED\n A place which every bong loves to ...	daab chingri	palak chingri	railway mutton curry deserves a special appla...	none of them have disappointed me except on s...	but I don't blame them for it. Most of the Be...	('Rated 5.0'	""RATED\n This is my favourite place in Bang...	I can't say no to this food. Went here on a s...
34288	413, 100 Feet Road, Next E-Zone, Koramangala 4...	The Terrace at Gilly's Redefined	No	Yes	4.6 /5	895	080 45128809	Koramangala 4th Block	Microbrewery, Casual Dining	Cocktails, Beer, Mocktails, Biryani, Long Isla...

Conclusion

- There are 12 columns in the dataset
- 56252 rows in the dataset
- All the colums data types are same

Data Cleaning

In [12]:
```
df.head(1)
```

Out[12]:

	address	name	online_order	book_table	rate	votes	phone	location	rest_type	dish_liked	cuisines	approx_cost(two peo
0	942, 21st Main Road, 2nd Stage, Banashankari, ...	Jalsa	Yes	Yes	4.1/5	775	080 42297555\r\n+91 9743772233	Banashankari	Casual Dining	Pasta, Lunch Buffet, Masala Papad, Paneer Laja...	North Indian, Mughlai, Chinese	

Checking the duplicate values and dropping them

In [13]:
```
df.duplicated().sum()
```

Out[13]:
```
np.int64(15703)
```

In [14]:
```
df.drop_duplicates(inplace=True)
```

In [15]:
```
df.duplicated().sum()
```

Out[15]:
```
np.int64(0)
```

In [16]:
```
df.shape
```

Out[16]:
```
(40549, 13)
```

Standardize column names

In [17]:
```
df.head(1)
```

Out[17]:

	address	name	online_order	book_table	rate	votes	phone	location	rest_type	dish_liked	cuisines	approx_cost(two peo
0	942, 21st Main Road, 2nd Stage, Banashankari, ...	Jalsa	Yes	Yes	4.1/5	775	080 42297555\r\n+91 9743772233	Banashankari	Casual Dining	Pasta, Lunch Buffet, Masala Papad, Paneer Laja...	North Indian, Mughlai, Chinese	

In [18]:
```
df.columns
```

Out[18]:
```
Index(['address', 'name', 'online_order', 'book_table', 'rate', 'votes',
       'phone', 'location', 'rest_type', 'dish_liked', 'cuisines',
       'approx_cost(for two people)', 'listed_in(type)'],
      dtype='object')
```

In [19]:
```
df.columns = [c.strip().lower().replace(' ', '_').replace('(', '').replace(')', '') for c in df.columns]
```

In [20]:
```
df = df.rename(columns={
    'approx_costfor_two_people': 'approx_cost_for_two'
})
```

In [21]:
```
df.columns
```

Out[21]:
```
Index(['address', 'name', 'online_order', 'book_table', 'rate', 'votes',
       'phone', 'location', 'rest_type', 'dish_liked', 'cuisines',
       'approx_cost_for_two', 'listed_intype'],
      dtype='object')
```

In [22]:
```
df.head(1)
```

Out[22]:

	address	name	online_order	book_table	rate	votes	phone	location	rest_type	dish_liked	cuisines	approx_cost
0	942, 21st Main Road, 2nd Stage, Banashankari, ...	Jalsa	Yes	Yes	4.1/5	775	080 42297555\r\n+91 9743772233	Banashankari	Casual Dining	Pasta, Lunch Buffet, Masala Papad, Paneer Laja...	North Indian, Mughlai, Chinese	

parse rating column -> numeric (4.1/5 -> 4.1, NEW/- -> NaN)

In [23]:
```
def parse_rate(x):
    x = str(x).strip() # Convert to string & remove spaces.

    if x.upper() in {'NEW','-','--',''}:    # If the value is NEW, -, -- or empty → return NaN.
        return np.nan

    if '/' in x: # If rating looks like '4.1/5'
        try:
            return float(x.split('/')[0].strip())  # Extract '4.1' and convert to float.
        except:
            return np.nan

    try:
        return float(x) # Try converting normally (e.g. '4.3').
    except:
        return np.nan # If conversion fails → return NaN.
```

In [24]:
```
# applying on the rate column
df['rate'].apply(parse_rate)
```

Out[24]:
```
0        4.1
1        4.1
2        3.8
3        3.7
4        3.8
        ...
56247    3.6
56248    NaN
56249    NaN
56250    4.3
56251    3.4
Name: rate, Length: 40549, dtype: float64
```

In [25]:
```
# re-assigning in the column
df['rate'] = df['rate'].apply(parse_rate)
```

In [26]:
```
df.sample(2)
```

Out[26]:

	address	name	online_order	book_table	rate	votes	phone	location	rest_type	dish_liked	cuisines	appro
5399	Ground Floor, 14, HM Geneva House, Cunningham ...	KFC	Yes	No	3.6	206	080 33994444	Cunningham Road	Quick Bites	Burgers, Crispy Chicken, Chicken Zinger Burger...	Burger, Fast Food	
3767	2nd Floor, 980, 13th Cross, 2nd Stage, Banasha...	Kydz Adda	No	No	3.4	6	+91 9686888222\r\n080 26715959	Banashankari	Casual Dining	NaN	Continental	

phone -> keep first phone, digits and leading

In [27]:
```
def clean_phone(x):
    # If the value is NaN, return NaN immediately
    if pd.isna(x):
        return np.nan
```

```
    # Convert to string and split at '\r\n' or '\n' to keep only the first phone number
    s = str(x).split('\\r\\n')[0].split('\n')[0]

    # Remove all characters except digits and '+'
    s = re.sub(r'[^0-9+]', '', s)

    # If the final cleaned string is empty, return NaN; otherwise return the cleaned phone
    return s if s else np.nan
```

In [28]:
```
df['phone'].apply(clean_phone)
```

Out[28]:
```
0          08042297555
1          08041714161
2        +919663487993
3        +919620009302
4        +918026612447
             ...
56247      08040301477
56248    +918197675843
56249              NaN
56250      08049652769
56251    +918071117272
Name: phone, Length: 40549, dtype: object
```

Converting to proper data type

In [29]:
```
df.head(1)
```

Out[29]:

	address	name	online_order	book_table	rate	votes	phone	location	rest_type	dish_liked	cuisines	approx_cost_
0	942, 21st Main Road, 2nd Stage, Banashankari, ...	Jalsa	Yes	Yes	4.1	775	080 42297555\r\n+91 9743772233	Banashankari	Casual Dining	Pasta, Lunch Buffet, Masala Papad, Paneer Laja...	North Indian, Mughlai, Chinese	

In [30]:
```
df.dtypes
```

Out[30]:
```
address                object
name                   object
online_order           object
book_table             object
rate                  float64
votes                  object
phone                  object
location               object
rest_type              object
dish_liked             object
cuisines               object
approx_cost_for_two    object
listed_intype          object
dtype: object
```

In [31]:
```
# convert yes/no to boolean
df["online_order"] = df["online_order"].map({"Yes": True, "No": False})
df["book_table"] = df["book_table"].map({"Yes": True, "No": False})
```

In [32]:
```
df.sample(2)
```

Out[32]:

	address	name	online_order	book_table	rate	votes	phone	location	rest_type	dish_liked	cuisines	approx_
50075	475, Shri Krishna Temple Road, Stage 1, Indira...	The Tiny Taproom	False	False	3.5	13	+91 9886420335\n+91 7020190128	Indiranagar	Bar, Casual Dining	NaN	South Indian, North Indian, Chinese, Continental	
2341	39, 15th Cross, Besides HDFC Bank, 4th Phase, ...	Two Friends Cauldron	True	True	4.1	448	080 49652809	JP Nagar	Casual Dining	Butter Beer, Pasta, Fries, Burgers, Exotic Veg...	Continental, Italian, American	

In [33]:
```
# # CLEAN votes (e.g. "2,345" → 2345)
df["approx_cost_for_two"] = (
    df["approx_cost_for_two"]
    .str.replace(",", "", regex=False)
    .str.extract(r"(\d+)")
    .astype("float")
)
```

In [34]:
```
# CLEAN approx_cost_for_two (e.g. "1,200" → 1200)
df["votes"] = (
    df["votes"]
    .str.replace(",", "", regex=False)
    .str.extract(r"(\d+)")
    .astype("float")
)
```

In [35]:
```
cat_columns = [
    "location", "rest_type", "cuisines", "listed_intype"
]
for col in cat_columns:
```

```
    df[col] = df[col].astype("category")
```

In [36]:
```
# Converting categorical data type to stringdf
df['listed_intype'] = df['listed_intype'].astype(str)
df['rest_type'] = df['rest_type'].astype(str)
df['cuisines'] = df['cuisines'].astype(str)
df['location'] = df['location'].astype(str)
```

In [37]:
```
df.dtypes
```

Out[37]:
```
address                object
name                   object
online_order           object
book_table             object
rate                  float64
votes                 float64
phone                  object
location               object
rest_type              object
dish_liked             object
cuisines               object
approx_cost_for_two   float64
listed_intype          object
dtype: object
```

In [38]:
```
df.head(5)
```

Out[38]:

	address	name	online_order	book_table	rate	votes	phone	location	rest_type	dish_liked	cuisines	appr
0	942, 21st Main Road, 2nd Stage, Banashankari, ...	Jalsa	True	True	4.1	775.0	080 42297555\r\n+91 9743772233	Banashankari	Casual Dining	Pasta, Lunch Buffet, Masala Papad, Paneer Laja...	North Indian, Mughlai, Chinese	
1	2nd Floor, 80 Feet Road, Near Big Bazaar, 6th ...	Spice Elephant	True	False	4.1	787.0	080 41714161	Banashankari	Casual Dining	Momos, Lunch Buffet, Chocolate Nirvana, Thai G...	Chinese, North Indian, Thai	
2	1112, Next to KIMS Medical College, 17th Cross...	San Churro Cafe	True	False	3.8	918.0	+91 9663487993	Banashankari	Cafe, Casual Dining	Churros, Cannelloni, Minestrone Soup, Hot Choc...	Cafe, Mexican, Italian	
3	1st Floor, Annakuteera, 3rd Stage, Banashankar...	Addhuri Udupi Bhojana	False	False	3.7	88.0	+91 9620009302	Banashankari	Quick Bites	Masala Dosa	South Indian, North Indian	
4	10, 3rd Floor, Lakshmi Associates, Gandhi Baza...	Grand Village	False	False	3.8	166.0	+91 8026612447\r\n+91 9901210005	Basavanagudi	Casual Dining	Panipuri, Gol Gappe	North Indian, Rajasthani	

Solving the missing value problem

In [39]:
```
#-------------------------------------------numeric columns---------------------#

num_cols = df.select_dtypes(include=['int64', 'float64']).columns
```

In [40]:
```
num_cols
```

Out[40]:
```
Index(['rate', 'votes', 'approx_cost_for_two'], dtype='object')
```

In [41]:
```
#  Imputer for numeric columns → MEAN
imputer_mean = SimpleImputer(strategy='mean')
```

In [42]:
```
df[num_cols] = imputer_mean.fit_transform(df[num_cols])
```

In [43]:
```
#----------------------------------------categorical columns---------------------------------#
cat_cols = df.select_dtypes(include=['object']).columns
cat_cols
```

Out[43]:
```
Index(['address', 'name', 'online_order', 'book_table', 'phone', 'location',
       'rest_type', 'dish_liked', 'cuisines', 'listed_intype'],
      dtype='object')
```

In [44]:
```
# Imputer for categorical columns → MOST FREQUENT
imputer_mode = SimpleImputer(strategy='most_frequent')
```

In [45]:
```
df[cat_cols] = imputer_mode.fit_transform(df[cat_cols])
```

In [46]:
```
df.isnull().sum()
```

Out[46]:
```
address                0
name                   0
online_order           0
book_table             0
rate                   0
votes                  0
phone                  0
location               0
rest_type              0
dish_liked             0
cuisines               0
approx_cost_for_two    0
listed_intype          0
dtype: int64
```

Exploratory Data Analysis (EDA)

In [47]:
```
df.head(2)
```

Out[47]:

	address	name	online_order	book_table	rate	votes	phone	location	rest_type	dish_liked	cuisines	approx_co
0	942, 21st Main Road, 2nd Stage, Banashankari, ...	Jalsa	True	True	4.1	775.0	080 42297555\r\n+91 9743772233	Banashankari	Casual Dining	Pasta, Lunch Buffet, Masala Papad, Paneer Laja...	North Indian, Mughlai, Chinese	
1	2nd Floor, 80 Feet Road, Near Big Bazaar, 6th ...	Spice Elephant	True	False	4.1	787.0	080 41714161	Banashankari	Casual Dining	Momos, Lunch Buffet, Chocolate Nirvana, Thai G...	Chinese, North Indian, Thai	

Column Description

- **address**: The physical address of the restaurant.
- **name**: The name of the restaurant.
- **online_order**: Indicates whether the restaurant offers online ordering (Yes/No).
- **book_table**: Indicates if the restaurant allows table bookings (Yes/No).
- **rate**: The average rating of the restaurant, typically on a scale of 1 to 5.
- **votes**: The total number of user votes or reviews the restaurant has received.
- **phone**: The contact phone number of the restaurant.
- **location**: The city or locality where the restaurant is located.
- **rest_type**: The type of restaurant (e.g., Casual Dining, Quick Bites, etc.).
- **dish_liked**: A list of dishes liked by customers or popular dishes at the restaurant.

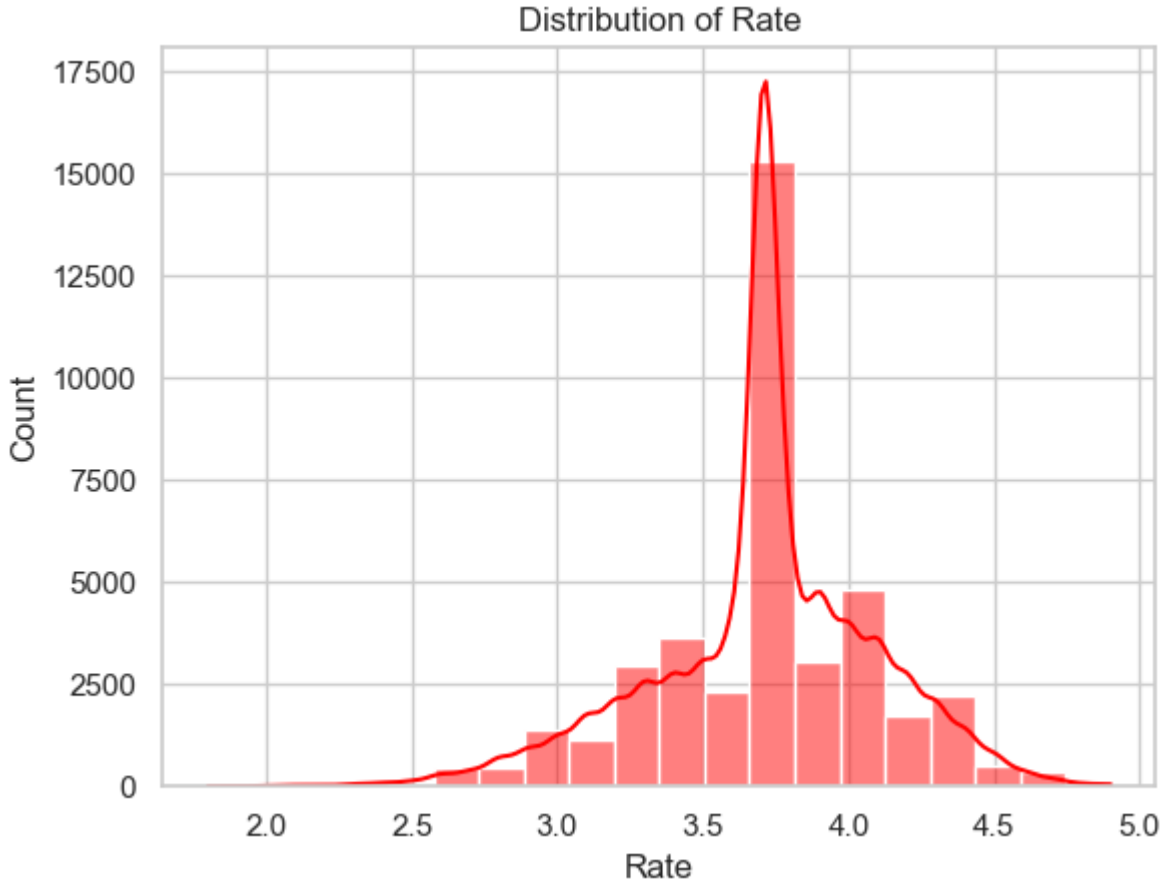
- **cuisines**: The types of cuisines the restaurant serves (e.g., Indian, Chinese, etc.).
- **approx_cost_for_two**: The approximate cost for two people at the restaurant.
- **listed_intype**: The type of listing or listing category the restaurant falls into (e.g., premium, regular).

Data Visualization

In [48]:
```
sns.set(style="whitegrid", palette="muted")
```

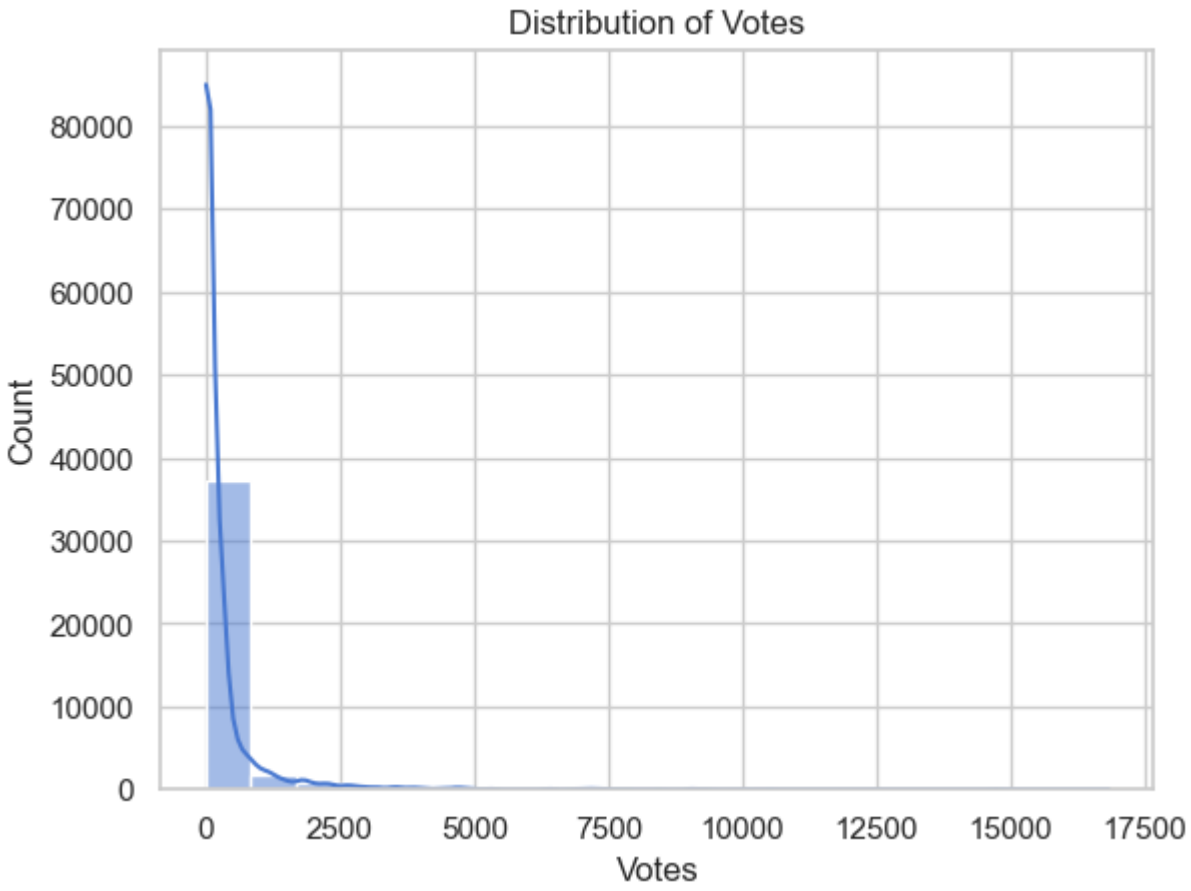
In [49]:
```
# Rate distribution
sns.histplot(df['rate'], kde=True, bins=20, color='red')
plt.title("Distribution of Rate")
plt.xlabel("Rate")
plt.ylabel("Count")
```

Out[49]:
```
Text(0, 0.5, 'Count')
```



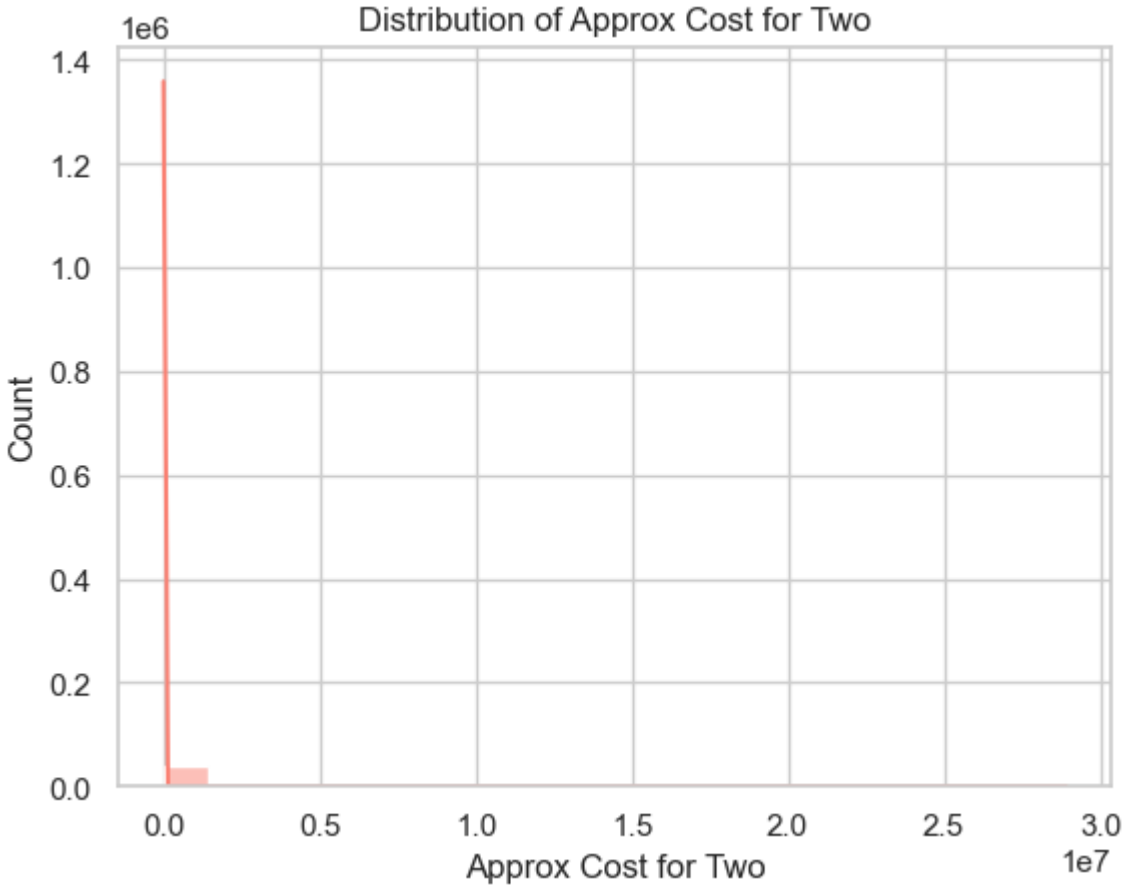
In [50]:
```
#  Votes distribution
sns.histplot(df['votes'], kde=True, bins=20)
plt.title("Distribution of Votes")
plt.xlabel("Votes")
plt.ylabel("Count")
```

Out[50]:
```
Text(0, 0.5, 'Count')
```



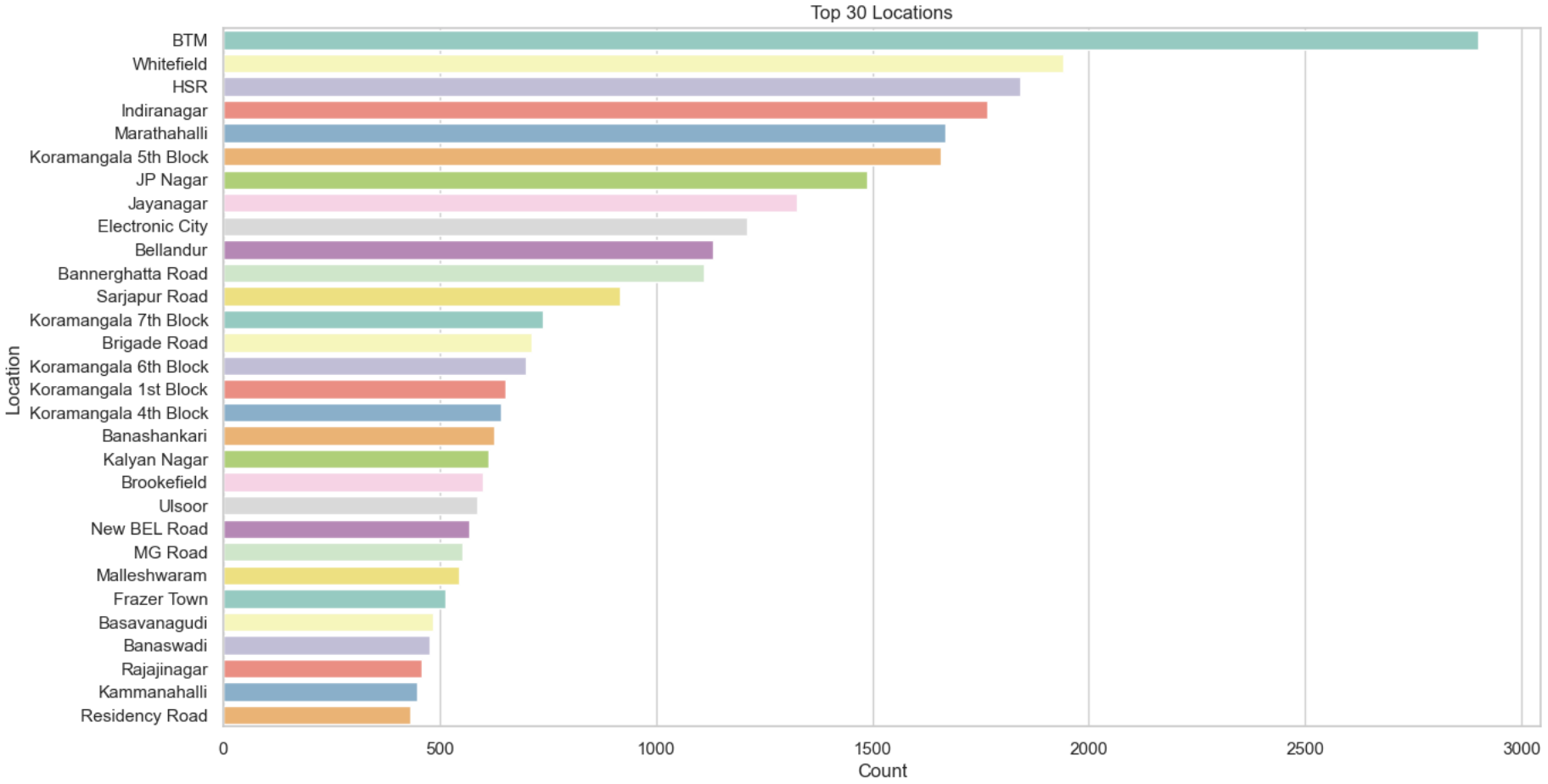
In [51]:
```
# Approx cost for two distribution
sns.histplot(df['approx_cost_for_two'], kde=True, bins=20, color='salmon')
plt.title("Distribution of Approx Cost for Two")
plt.xlabel("Approx Cost for Two")
plt.ylabel("Count")
```

Out[51]:
```
Text(0, 0.5, 'Count')
```



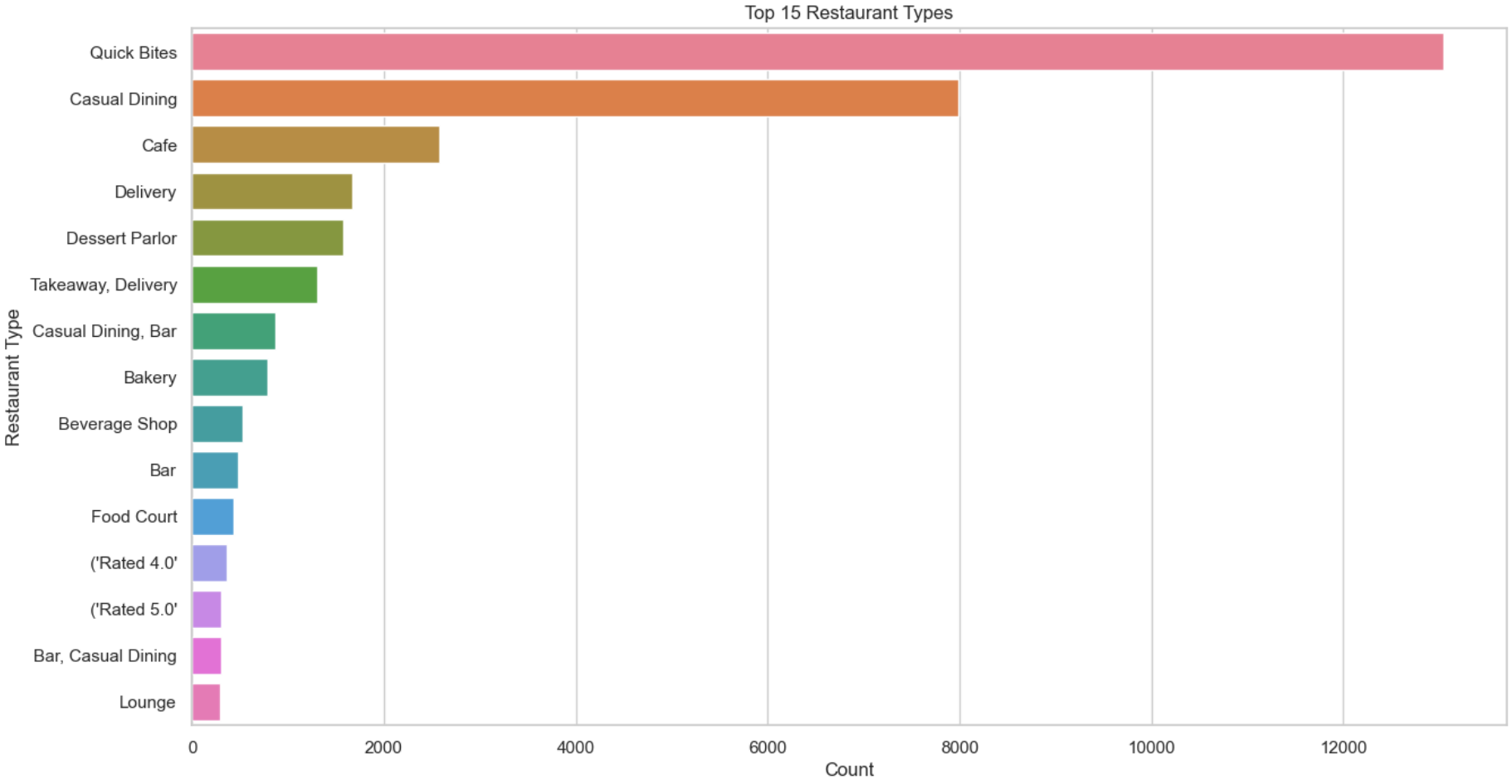
In [52]:
```
# Location count
plt.subplots( figsize=(15, 8))
sns.countplot(y='location', data=df, order=df['location'].value_counts().index[:30], palette="Set3")
plt.title("Top 30 Locations")
plt.xlabel("Count")
plt.ylabel("Location")
```

Out[52]:
```
Text(0, 0.5, 'Location')
```



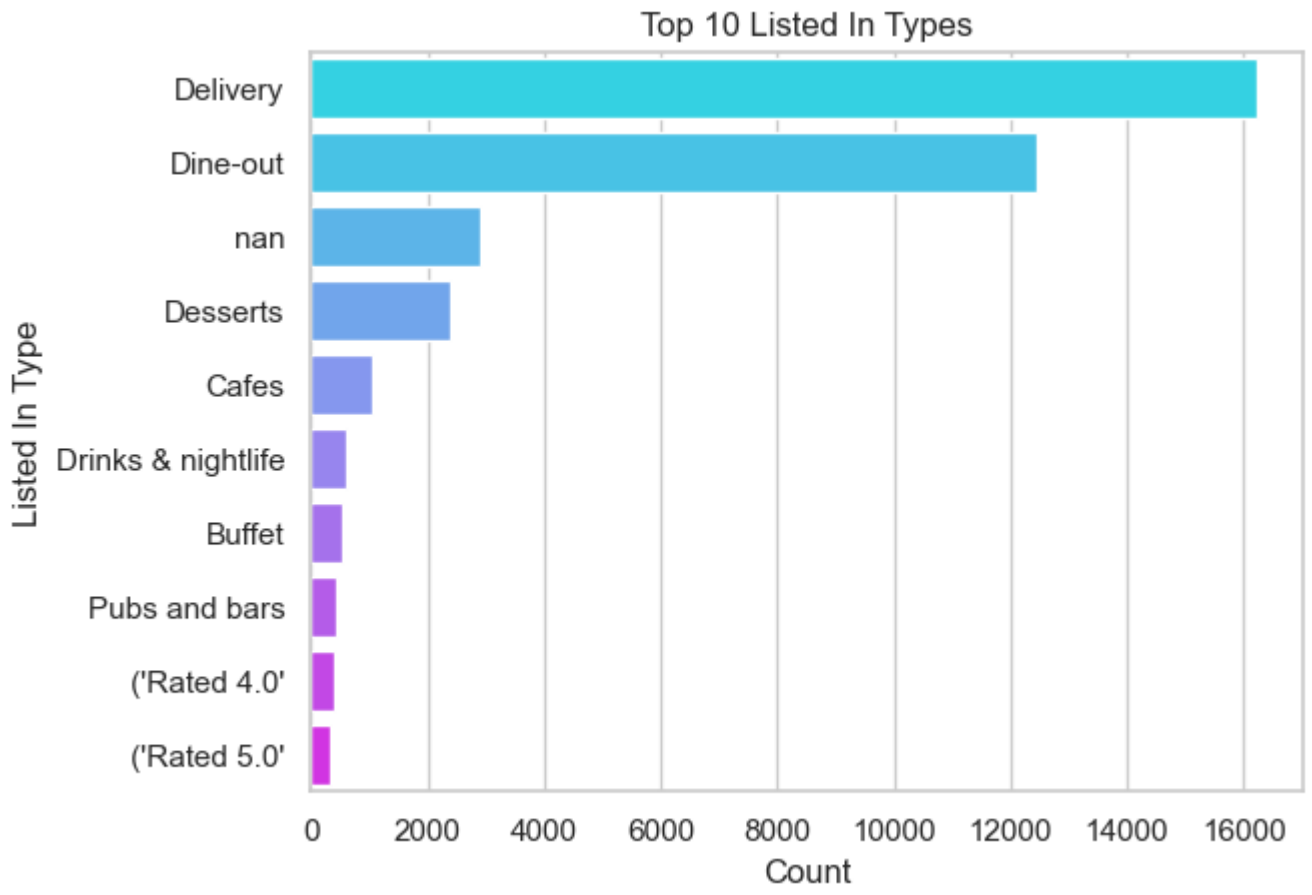
In [53]:
```
# Restaurant type count
plt.subplots(figsize=(15,8))
sns.countplot(y='rest_type', data=df, order=df['rest_type'].value_counts().index[:15], palette="husl")
plt.title("Top 15 Restaurant Types")
plt.xlabel("Count")
plt.ylabel("Restaurant Type")
```

Out[53]:
```
Text(0, 0.5, 'Restaurant Type')
```

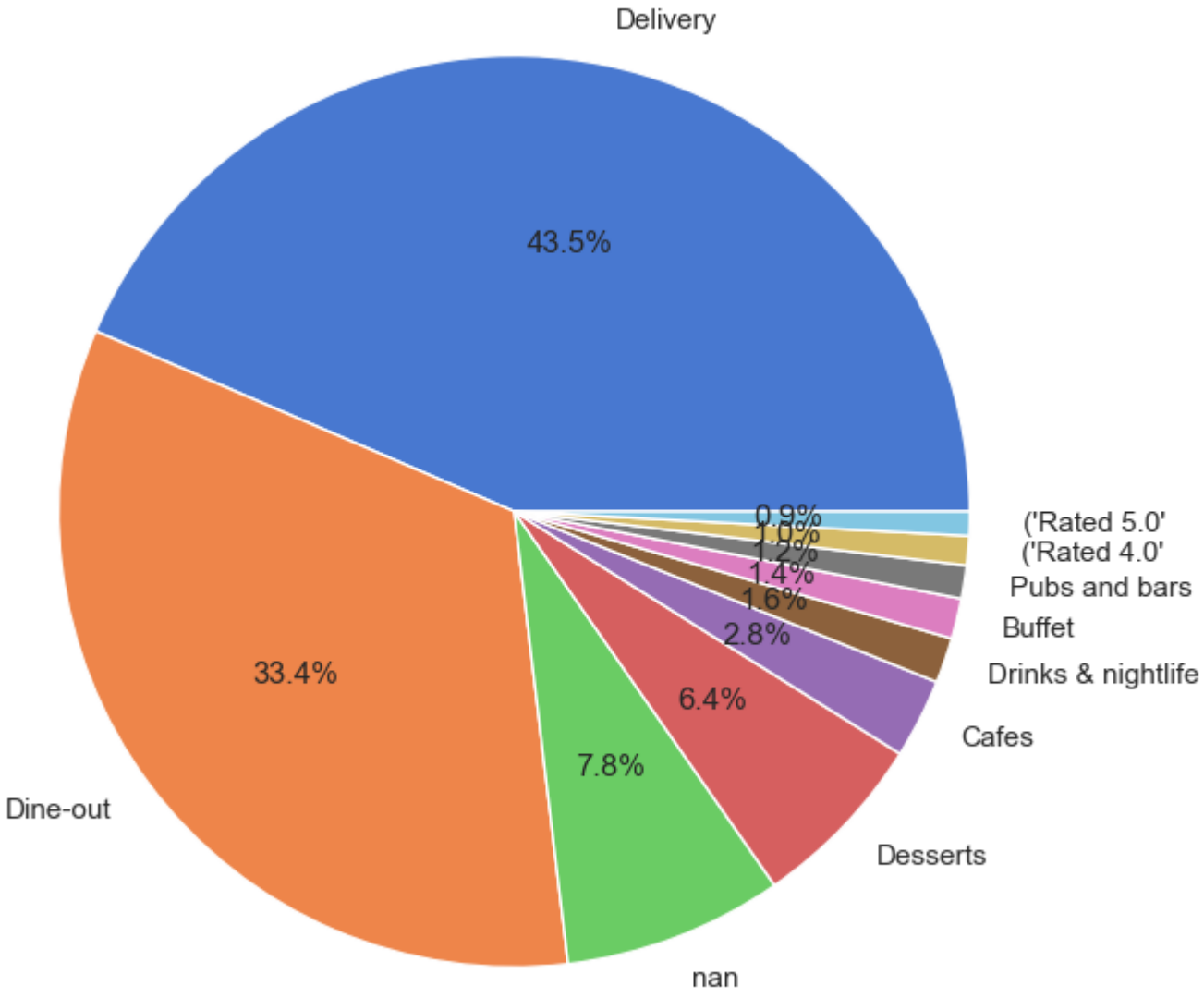


In [54]:
```
# Listed in type count
sns.countplot(y='listed_intype', data=df, order=df['listed_intype'].value_counts().index[:10], palette="cool")
plt.title("Top 10 Listed In Types")
plt.xlabel("Count")
plt.ylabel("Listed In Type")
```

Out[54]:
```
Text(0, 0.5, 'Listed In Type')
```



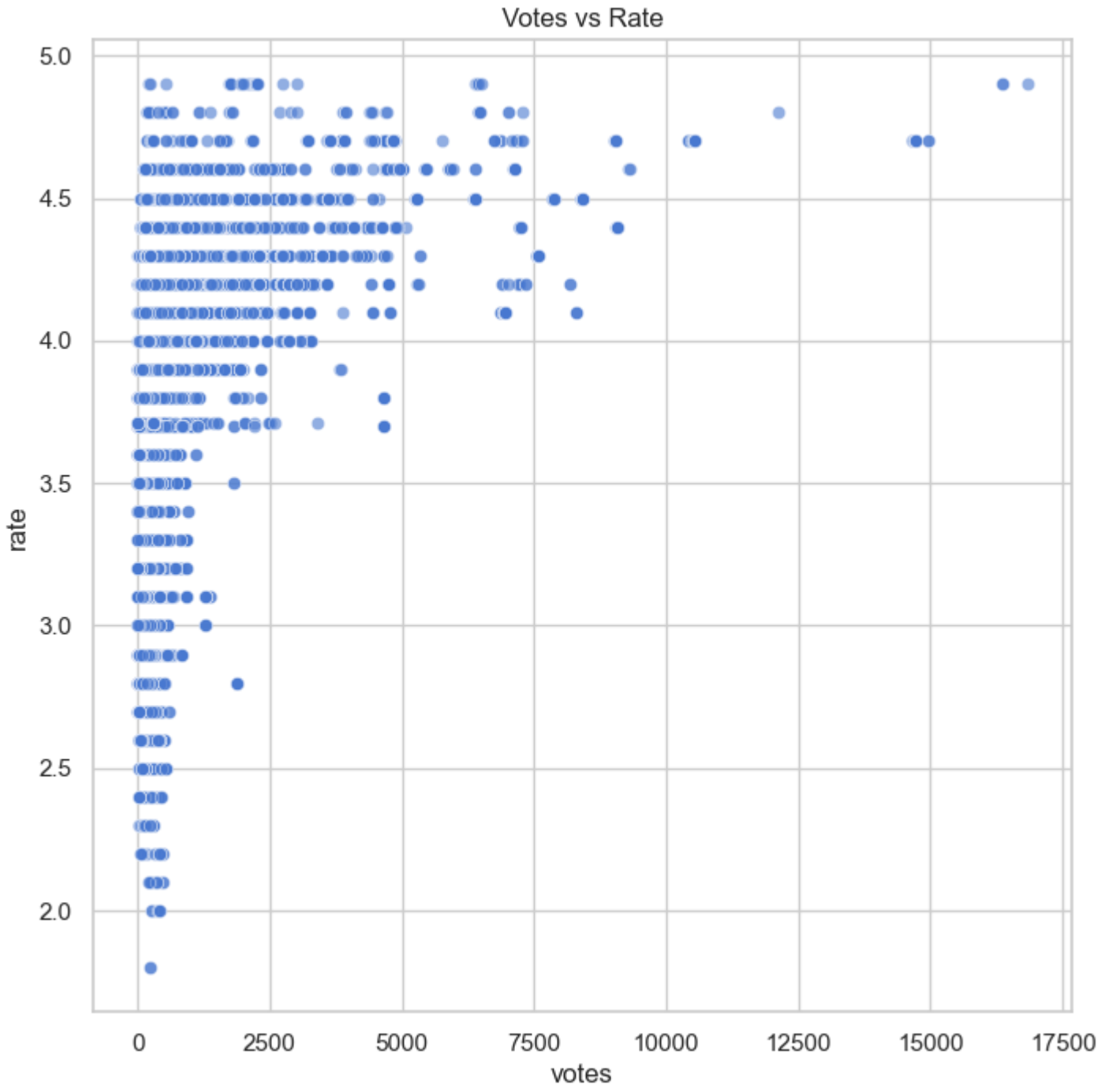
In [55]:
```
plt.subplots(figsize=(8, 8))
type_counts = df['listed_intype'].value_counts().head(10)
plt.pie(type_counts,autopct='%1.1f%%',labels=type_counts.index,)
plt.show()
```



In [56]:
```
#  1 . Votes vs Rate (scatter)
plt.subplots(figsize=(8,8))
```

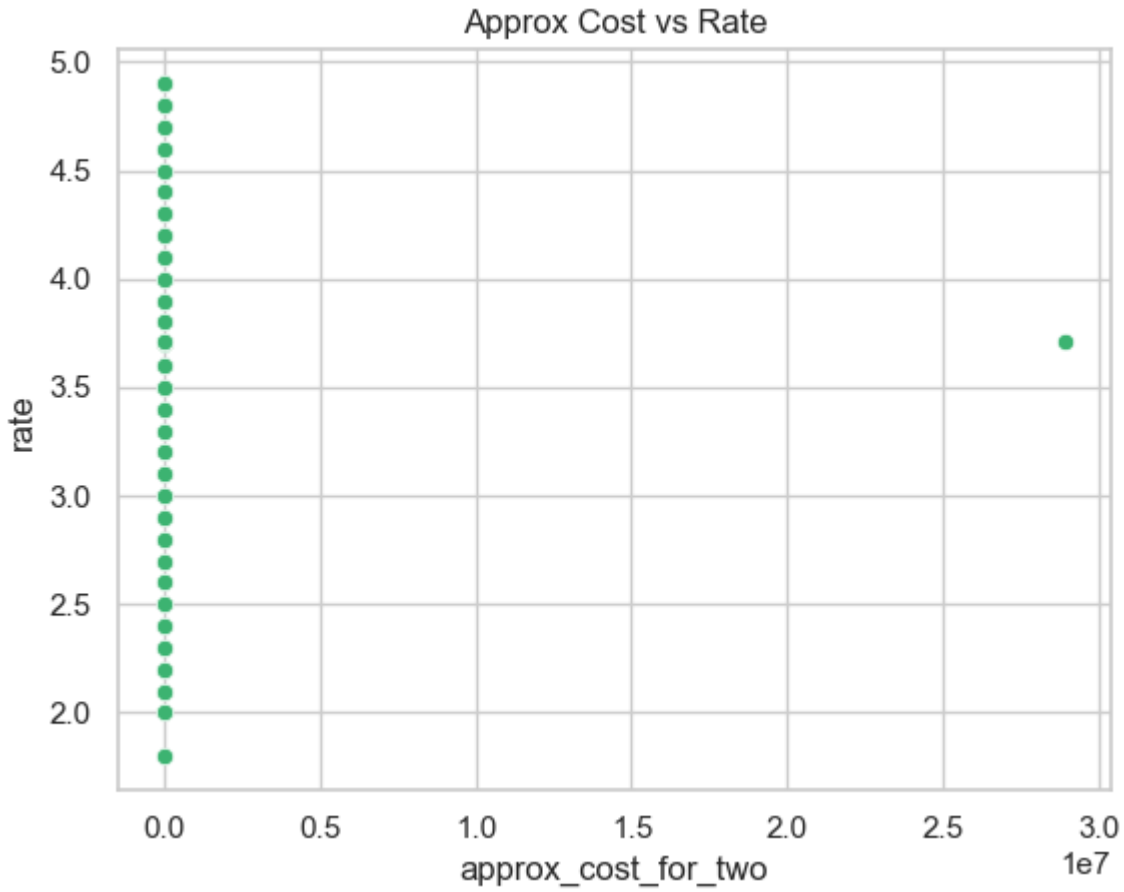
```
sns.scatterplot(x='votes', y='rate', data=df, alpha=0.6)
plt.title("Votes vs Rate")
```

Out[56]: Text(0.5, 1.0, 'Votes vs Rate')


Votes vs Rate
5.0
4.5
4.0
3.5
3.0
2.5
2.0
rate
0
2500
5000
7500
10000
12500
15000
17500
votes

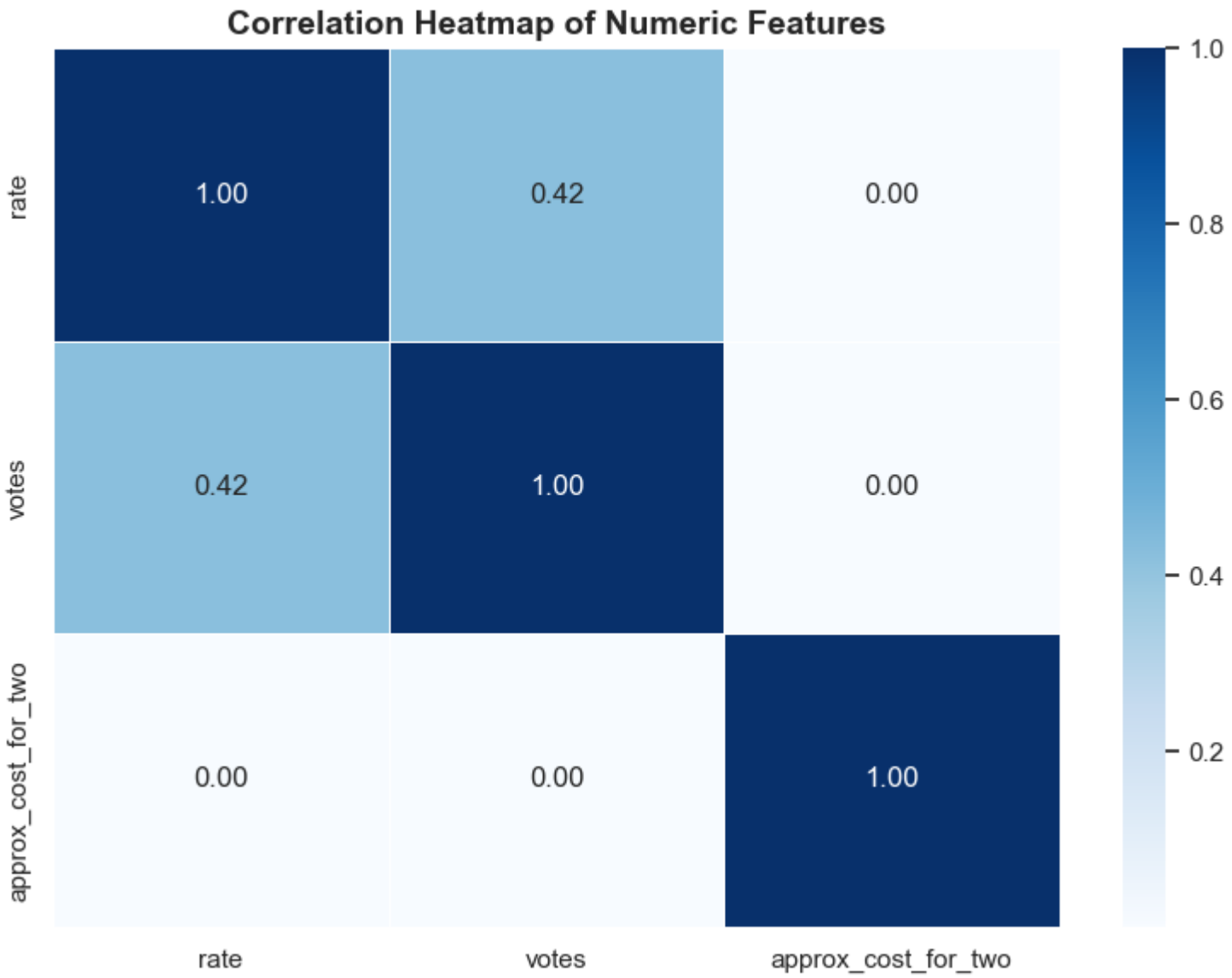
In [57]:
```
# 2. Approx cost for two vs Rate (scatter)
sns.scatterplot(x='approx_cost_for_two', y='rate', data=df, color='mediumseagreen')
plt.title("Approx Cost vs Rate")
```

Out[57]:
```
Text(0.5, 1.0, 'Approx Cost vs Rate')
```



In [58]:
```
numeric_cols = ['rate', 'votes', 'approx_cost_for_two']

# Compute correlation matrix
corr = df[numeric_cols].corr()

# Create the figure and axes
```

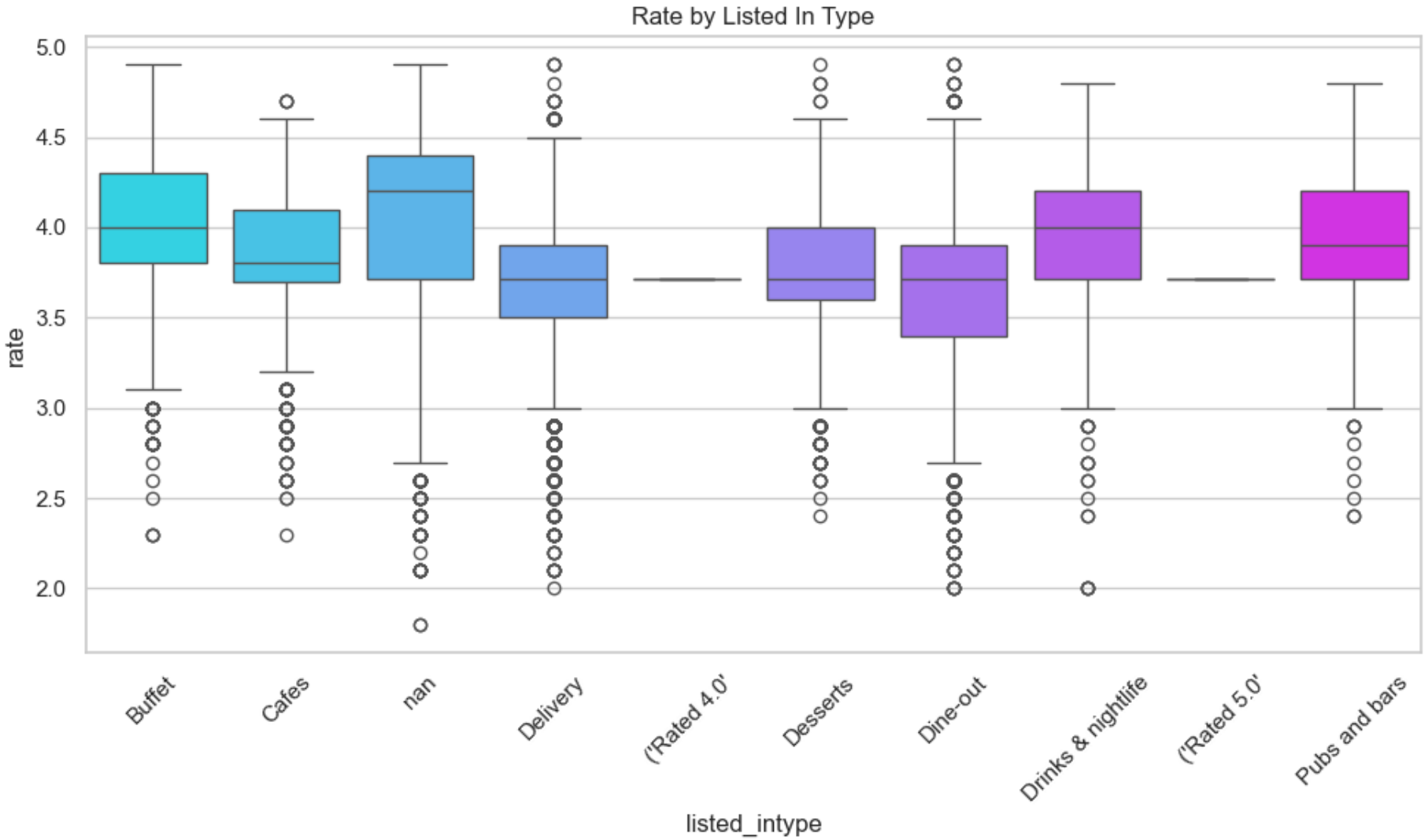
```
fig, axes = plt.subplots(figsize=(8, 6))

# Draw the heatmap
sns.heatmap(corr, annot=True, cmap='Blues', fmt=".2f", linewidths=0.5, ax=axes)

# Set title and adjust layout
axes.set_title("Correlation Heatmap of Numeric Features", fontsize=14, fontweight='bold')
plt.tight_layout()
plt.show()
```

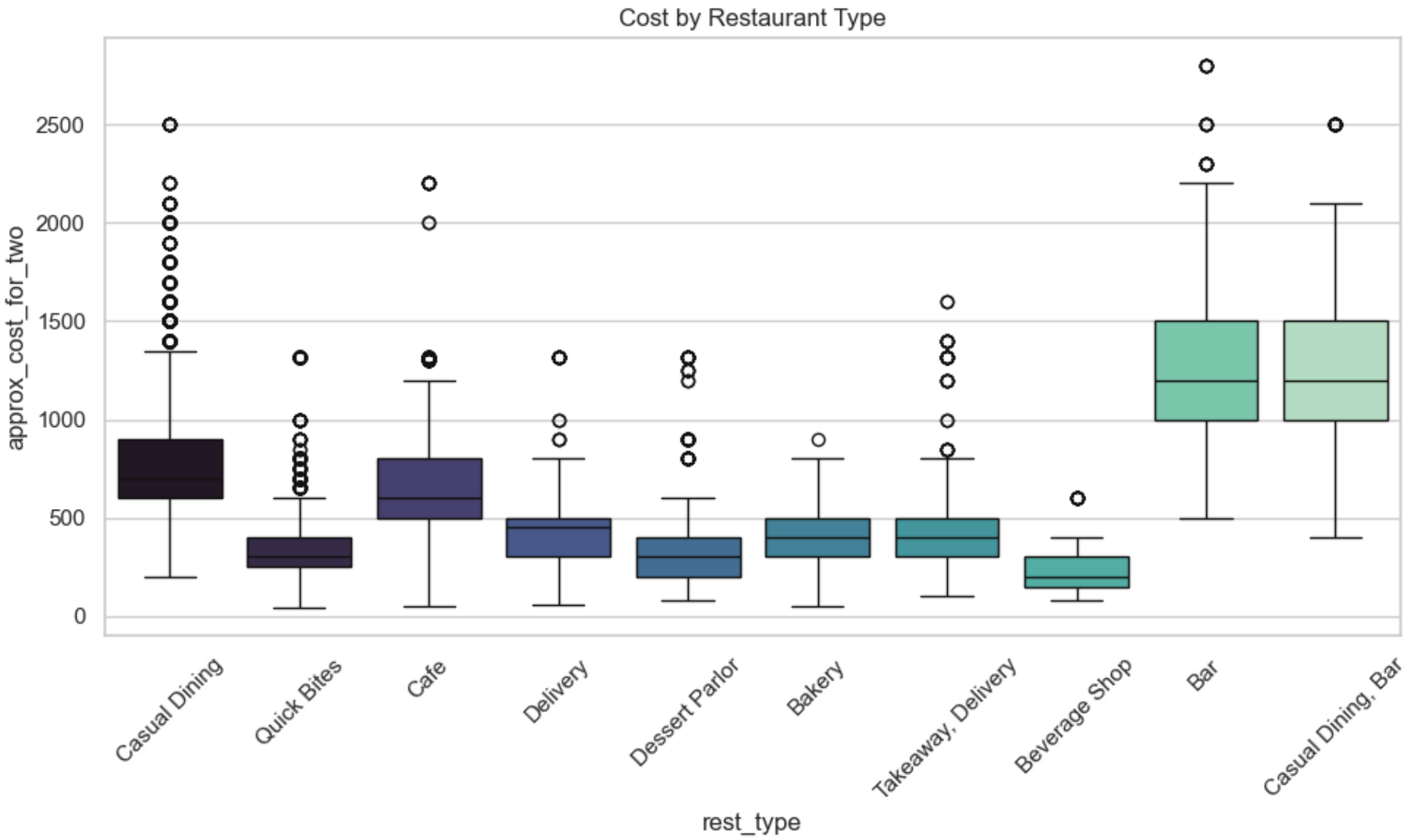


Numeric vs Categorical

In [60]:
```
plt.figure(figsize=(10,6))
top_types = df['listed_intype'].value_counts().index[:10]
```

```
sns.boxplot(x='listed_intype', y='rate', data=df[df['listed_intype'].isin(top_types)], palette="cool")
plt.title("Rate by Listed In Type")
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()

plt.figure(figsize=(10,6))
top_rest = df['rest_type'].value_counts().index[:10]
sns.boxplot(x='rest_type', y='approx_cost_for_two', data=df[df['rest_type'].isin(top_rest)], palette="mako")
plt.title("Cost by Restaurant Type")
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```


Rate by Listed In Type
rate
5.0
4.5
4.0
3.5
3.0
2.5
2.0
Buffet
Cafes
nan
Delivery
('Rated 4.0'
Desserts
Dine-out
Drinks & nightlife
('Rated 5.0'
Pubs and bars
listed_intype



Modeling

In [70]:
```
df.head(2)
```

Out[70]:

	address	name	online_order	book_table	rate	votes	phone	location	rest_type	dish_liked	cuisines	approx_cos
0	942, 21st Main Road, 2nd Stage, Banashankari, ...	Jalsa	True	True	4.1	775.0	080 42297555\r\n+91 9743772233	Banashankari	Casual Dining	Pasta, Lunch Buffet, Masala Papad, Paneer Laja...	North Indian, Mughlai, Chinese	
1	2nd Floor, 80 Feet Road, Near Big Bazaar, 6th ...	Spice Elephant	True	False	4.1	787.0	080 41714161	Banashankari	Casual Dining	Momos, Lunch Buffet, Chocolate Nirvana, Thai G...	Chinese, North Indian, Thai	

In [71]:
```
features = ['rate', 'votes', 'approx_cost_for_two']
```

In [74]:
```
X = df[features].dropna()  # drop the missing values
```

In [75]:
```
scaler = StandardScaler()
```

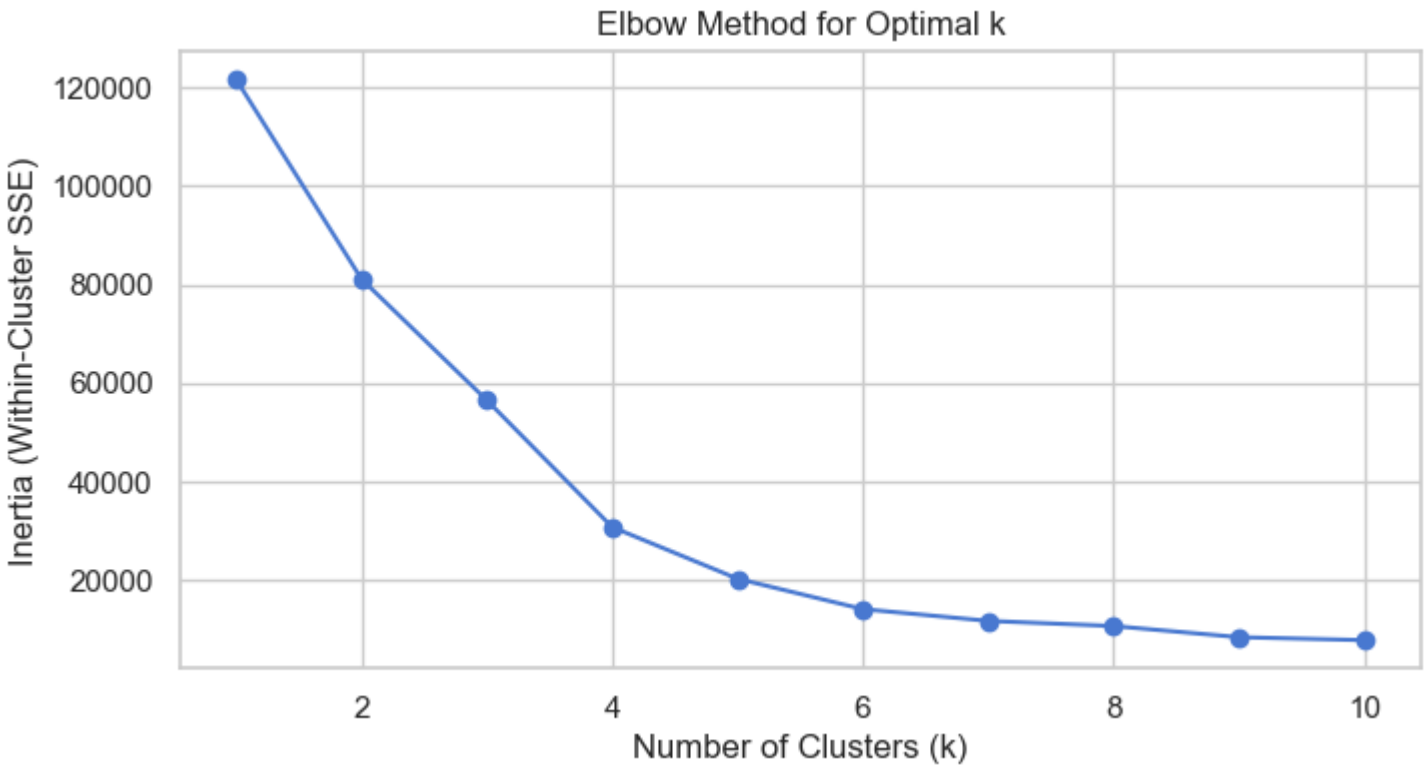
In [76]:
```
X_scaled = scaler.fit_transform(X)
```

In [78]:
```
inertia = []
K = range(1, 11)
```

In [79]:
```
for k in K:
    kmeans = KMeans(n_clusters=k, random_state=42)
    kmeans.fit(X_scaled)
    inertia.append(kmeans.inertia_)
```

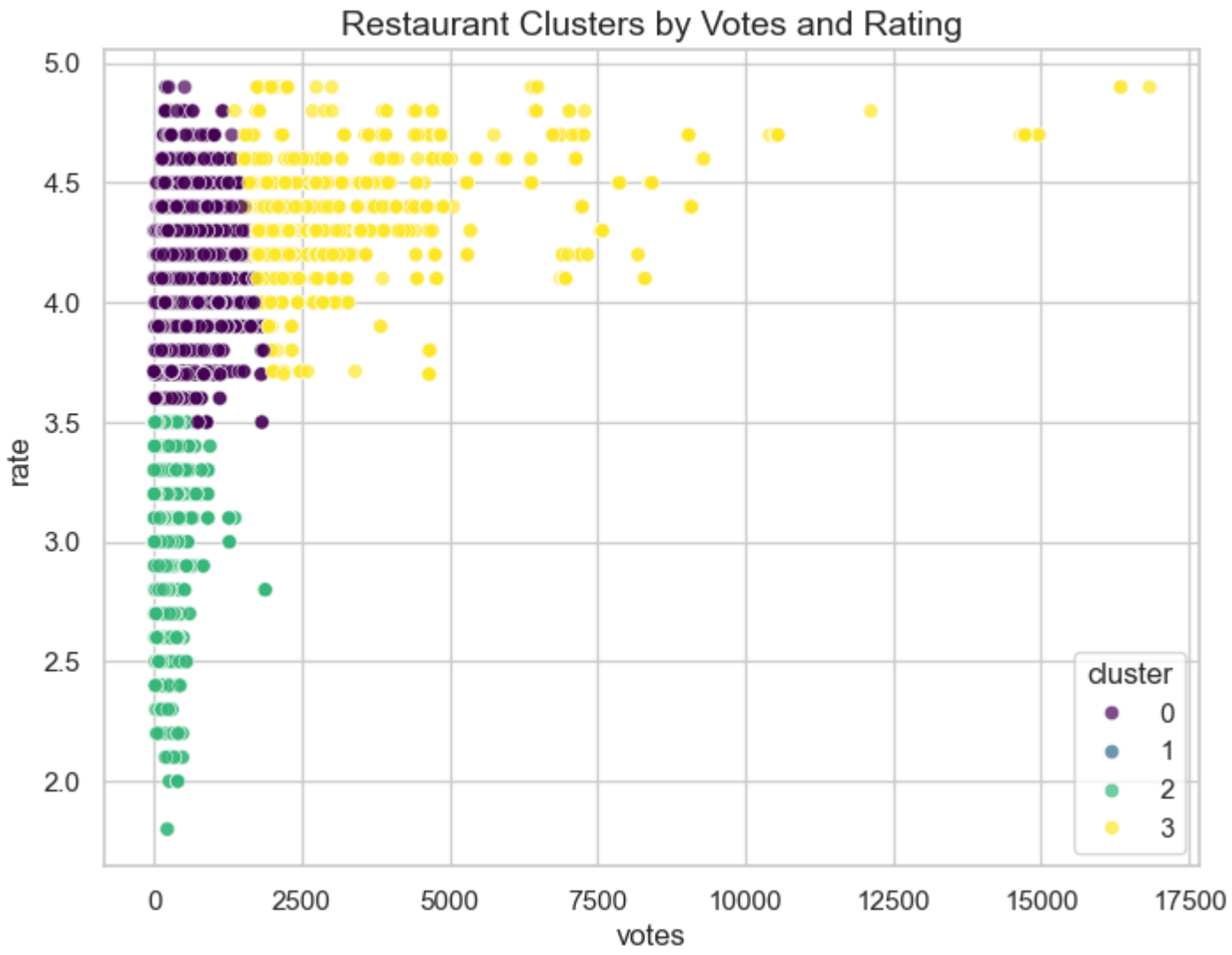
In [80]:
```
plt.figure(figsize=(8, 4))
plt.plot(K, inertia, 'bo-')
plt.xlabel("Number of Clusters (k)")
plt.ylabel("Inertia (Within-Cluster SSE)")
plt.title("Elbow Method for Optimal k")
```

```
plt.show()
```



In [81]:
```
kmeans = KMeans(n_clusters=4, random_state=42)
df['cluster'] = kmeans.fit_predict(X_scaled)
```

In [82]:
```
plt.figure(figsize=(8, 6))
sns.scatterplot(
    x='votes', y='rate',
    data=df,
    hue='cluster', palette='viridis',
    alpha=0.7
)
plt.title("Restaurant Clusters by Votes and Rating", fontsize=14)
plt.show()
```



Conclusion

Conclusion: K-Means Clustering of Restaurants

After performing K-Means clustering on the restaurant dataset using **Rate**, **Votes**, and **Approximate Cost for Two**, four distinct groups of

restaurants emerged.

Cluster Insights

Cluster	Characteristics	Interpretation
0	Moderate to high ratings (≈4.0–4.4) with low vote counts	**Decent quality local restaurants** — fairly rated but not widely reviewed or known.
1	Sparse, smaller subgroup (depending on data spread)	May represent **transitional or mixed behavior** — restaurants with varying cost-value balance.
2	Lower ratings (≈2.0–3.2) and low votes	**Underperforming eateries** — less popular or new, possibly requiring improvement or visibility.
3	High ratings (≈4.2–5.0) with very high vote counts	**Popular and trusted restaurants** — highly rated favorites with broad customer engagement.

Key Observations

- There is a **positive association** between votes and ratings — restaurants attracting many reviews tend to maintain higher ratings.
- Most restaurants operate within the **low-to-moderate vote range**, while only a few achieve exceptional popularity.
- The clusters effectively highlight **performance tiers** — from lesser-known low-rated places to high-rated, high-engagement establishments.

Business Implications

- **Cluster 3 (High-performing):** Opportunities for partnership, promotion, or benchmarking.
- **Cluster 0 & 1 (Average performers):** Focus marketing to increase visibility and encourage reviews.
- **Cluster 2 (Low-rated):** Candidates for quality improvement or rebranding to attract customers.

In [ ]:

In [ ]: