


```

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score, precision_score, recall_score, confusion_matrix, classification_report
from sklearn.ensemble import RandomForestClassifier
from xgboost import XGBClassifier
from sklearn.preprocessing import StandardScaler

```

```
! pip install xGBoost
```

```

Requirement already satisfied: xGBoost in /usr/local/lib/python3.12/dist-packages (3.1.1)
Requirement already satisfied: numpy in /usr/local/lib/python3.12/dist-packages (from xGBoost) (2.0.2)
Requirement already satisfied: nvidia-ncl-cu12 in /usr/local/lib/python3.12/dist-packages (from xGBoost) (2.27.3)
Requirement already satisfied: scipy in /usr/local/lib/python3.12/dist-packages (from xGBoost) (1.16.3)

```

```
food=pd.read_csv('/content/Foodpanda Analysis Dataset.csv')
```

```
display(food)
```

| | customer_id | gender | age | city | signup_date | order_id | order_date | restaurant_name | dish_name | category | quantity | price | payment_method | order_frequency | last_order_da |
|------|-------------|--------|----------|-----------|-------------|----------|------------|-----------------|-----------|-----------|----------|---------|----------------|-----------------|---------------|
| 0 | C5663 | Male | Adult | Peshawar | 1/14/2024 | O9663 | 8/23/2023 | McDonald's | Burger | Italian | 5 | 1478.27 | Cash | 38 | 7/19/2023 |
| 1 | C2831 | Male | Adult | Multan | 7/7/2024 | O6831 | 8/23/2023 | KFC | Burger | Italian | 3 | 956.04 | Wallet | 24 | 11/25/2023 |
| 2 | C2851 | Other | Senior | Multan | 6/20/2025 | O6851 | 8/23/2023 | Pizza Hut | Fries | Italian | 2 | 882.51 | Cash | 42 | 5/10/2023 |
| 3 | C1694 | Female | Senior | Peshawar | 9/5/2023 | O5694 | 8/23/2023 | Subway | Pizza | Dessert | 4 | 231.30 | Card | 27 | 7/24/2023 |
| 4 | C4339 | Other | Senior | Lahore | 12/29/2023 | O8339 | 8/24/2023 | KFC | Sandwich | Dessert | 1 | 1156.69 | Cash | 35 | 12/21/2023 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 5995 | C6849 | Male | Adult | Multan | 11/25/2024 | O10849 | 8/22/2025 | Pizza Hut | Burger | Italian | 4 | 875.71 | Cash | 28 | 11/29/2023 |
| 5996 | C3787 | Female | Adult | Islamabad | 1/28/2025 | O7787 | 8/22/2025 | KFC | Pizza | Italian | 5 | 1118.26 | Cash | 12 | 6/8/2023 |
| 5997 | C2841 | Other | Teenager | Islamabad | 10/19/2023 | O6841 | 8/22/2025 | KFC | Sandwich | Italian | 4 | 1005.83 | Card | 31 | 12/30/2023 |
| 5998 | C1624 | Male | Adult | Islamabad | 6/17/2024 | O5624 | 8/22/2025 | KFC | Fries | Fast Food | 4 | 1226.10 | Card | 37 | 12/27/2023 |
| 5999 | C2068 | Female | Adult | Multan | 3/15/2025 | O6068 | 8/22/2025 | Burger King | Fries | Fast Food | 3 | 1131.27 | Card | 2 | 6/13/2023 |

6000 rows × 20 columns

Next steps: [Generate code with food](#) [New interactive sheet](#)

```

food.info()
food.fillna('NaN',inplace=True)
food.columns

```

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6000 entries, 0 to 5999
Data columns (total 20 columns):
 #   Column      Non-Null Count  Dtype  
--- 
 0   customer_id  6000 non-null   object 
 1   gender       6000 non-null   object 
 2   age          6000 non-null   object 
 3   city         6000 non-null   object 
 4   signup_date  6000 non-null   object 
 5   order_id     6000 non-null   object 
 6   order_date   6000 non-null   object 
 7   restaurant_name  6000 non-null   object 
 8   dish_name    6000 non-null   object 
 9   category     6000 non-null   object 
 10  quantity     6000 non-null   int64  
 11  price        6000 non-null   float64
 12  payment_method  6000 non-null   object 
 13  order_frequency  6000 non-null   int64  
 14  last_order_date  6000 non-null   object 
 15  loyalty_points  6000 non-null   int64  
 16  churned      6000 non-null   object 
 17  rating        4032 non-null   float64
 18  rating_date   6000 non-null   object 
 19  delivery_status  6000 non-null   object 
dtypes: float64(2), int64(3), object(15)
memory usage: 937.6+ KB
/tmipython-input-3008993390.py:2: FutureWarning: Setting an item of incompatible dtype is deprecated and will raise an error in a future version of pandas. Value 'NaN' has dtype incompatible with the rest of the array.
  food.fillna('NaN',inplace=True)
Index(['customer_id', 'gender', 'age', 'city', 'signup_date', 'order_id',
       'order_date', 'restaurant_name', 'dish_name', 'category', 'quantity',
       'price', 'payment_method', 'order_frequency', 'last_order_date',
       'loyalty_points', 'churned', 'rating', 'rating_date',
       'delivery_status'],
      dtype='object')

```

```

specific=food.groupby(['restaurant_name','category','churned','payment_method']).get_group(('KFC','Italian','Active','Cash'))
disactive=food.groupby(['restaurant_name','category','churned','payment_method']).get_group(('KFC','Italian','Inactive','Cash'))
not_cash=food.groupby(['restaurant_name','churned','payment_method']).get_group(('KFC','Active','Wallet'))
display(specific)

```

| | customer_id | gender | age | city | signup_date | order_id | order_date | restaurant_name | dish_name | category | quantity | price | payment_method | order_frequency | last_order_da |
|------|-------------|--------|----------|-----------|-------------|----------|------------|-----------------|-----------|----------|----------|---------|----------------|-----------------|---------------|
| 62 | C3011 | Male | Teenager | Islamabad | 7/19/2025 | O7011 | 8/30/2023 | KFC | Pizza | Italian | 4 | 343.94 | Cash | 20 | 1/27/2023 |
| 245 | C1743 | Female | Teenager | Karachi | 9/15/2023 | O5743 | 9/19/2023 | KFC | Fries | Italian | 3 | 1223.56 | Cash | 32 | 1/27/2023 |
| 459 | C1901 | Female | Teenager | Multan | 7/22/2024 | O5901 | 10/16/2023 | KFC | Sandwich | Italian | 5 | 328.98 | Cash | 31 | 8/18/2023 |
| 488 | C3999 | Male | Teenager | Karachi | 3/4/2024 | O7999 | 10/19/2023 | KFC | Pasta | Italian | 1 | 503.13 | Cash | 15 | 9/19/2023 |
| 763 | C2416 | Other | Senior | Lahore | 6/10/2024 | O6416 | 11/19/2023 | KFC | Burger | Italian | 4 | 1391.02 | Cash | 49 | 4/20/2023 |
| 1273 | C3114 | Other | Teenager | Lahore | 5/7/2024 | O7114 | 1/21/2024 | KFC | Pasta | Italian | 3 | 1399.39 | Cash | 14 | 12/22/2023 |
| 1543 | C4349 | Other | Adult | Multan | 8/7/2024 | O8349 | 2/25/2024 | KFC | Pizza | Italian | 2 | 908.07 | Cash | 13 | 10/23/2023 |
| 1554 | C2968 | Male | Senior | Karachi | 10/4/2024 | O6968 | 2/26/2024 | KFC | Pizza | Italian | 5 | 268.80 | Cash | 5 | 12/13/2023 |
| 1615 | C3591 | Female | Adult | Karachi | 4/4/2025 | O7591 | 3/5/2024 | KFC | Pizza | Italian | 3 | 879.03 | Cash | 22 | 4/17/2023 |
| 2112 | C4510 | Female | Senior | Lahore | 1/3/2025 | O8510 | 5/7/2024 | KFC | Burger | Italian | 1 | 896.27 | Cash | 11 | 2/11/2023 |
| 2382 | C4648 | Female | Teenager | Lahore | 5/1/2024 | O8648 | 6/11/2024 | KFC | Fries | Italian | 4 | 188.64 | Cash | 36 | 8/28/2023 |
| 2413 | C6182 | Female | Adult | Peshawar | 4/17/2025 | O10182 | 6/15/2024 | KFC | Fries | Italian | 1 | 646.32 | Cash | 18 | 12/30/2023 |

| | | | | | | | | | | | | | | | |
|------|-------|--------|----------|-----------|------------|--------|------------|-----|----------|---------|---|---------|------|----|------------|
| 2509 | C1105 | Male | Teenager | Karachi | 10/11/2024 | O5105 | 6/26/2024 | KFC | Sandwich | Italian | 3 | 1146.47 | Cash | 18 | 1/5/2024 |
| 2700 | C3647 | Male | Senior | Islamabad | 4/12/2025 | O7647 | 7/19/2024 | KFC | Pizza | Italian | 1 | 1039.54 | Cash | 4 | 4/13/2024 |
| 2879 | C6256 | Male | Adult | Peshawar | 10/29/2023 | O10256 | 8/8/2024 | KFC | Burger | Italian | 4 | 1165.45 | Cash | 32 | 8/9/2024 |
| 3003 | C2934 | Female | Senior | Karachi | 1/21/2025 | O6934 | 8/22/2024 | KFC | Burger | Italian | 2 | 1069.58 | Cash | 47 | 5/28/2024 |
| 3025 | C3566 | Female | Senior | Islamabad | 1/3/2025 | O7566 | 8/25/2024 | KFC | Burger | Italian | 3 | 516.58 | Cash | 20 | 3/22/2024 |
| 3218 | C4502 | Other | Senior | Multan | 11/18/2024 | O8502 | 9/14/2024 | KFC | Sandwich | Italian | 2 | 782.07 | Cash | 1 | 12/9/2024 |
| 3222 | C3652 | Female | Adult | Islamabad | 1/5/2025 | O7652 | 9/14/2024 | KFC | Sandwich | Italian | 1 | 1438.90 | Cash | 1 | 6/18/2024 |
| 3523 | C5202 | Male | Teenager | Peshawar | 12/22/2023 | O9202 | 10/22/2024 | KFC | Sandwich | Italian | 3 | 1274.31 | Cash | 29 | 12/29/2024 |
| 3701 | C2579 | Female | Senior | Islamabad | 7/1/2025 | O6579 | 11/13/2024 | KFC | Sandwich | Italian | 1 | 333.02 | Cash | 28 | 12/18/2024 |
| 3890 | C2634 | Other | Teenager | Islamabad | 4/29/2024 | O6634 | 12/6/2024 | KFC | Sandwich | Italian | 3 | 1351.90 | Cash | 47 | 9/30/2024 |
| 4055 | C3939 | Female | Teenager | Multan | 3/2/2025 | O7939 | 12/27/2024 | KFC | Fries | Italian | 5 | 1013.38 | Cash | 12 | 10/28/2024 |
| 4060 | C2264 | Female | Teenager | Peshawar | 3/7/2025 | O6264 | 12/28/2024 | KFC | Burger | Italian | 4 | 1227.77 | Cash | 35 | 12/24/2024 |
| 4116 | C6366 | Female | Teenager | Lahore | 5/11/2025 | O10366 | 1/3/2025 | KFC | Fries | Italian | 3 | 266.28 | Cash | 45 | 12/7/2024 |
| 4223 | C4961 | Other | Senior | Lahore | 9/29/2023 | O8961 | 1/16/2025 | KFC | Burger | Italian | 3 | 1461.03 | Cash | 24 | 4/1/2025 |
| 4303 | C1834 | Other | Senior | Peshawar | 6/6/2025 | O5834 | 1/27/2025 | KFC | Fries | Italian | 5 | 1101.92 | Cash | 5 | 2/6/2025 |
| 4539 | C2633 | Male | Adult | Multan | 7/23/2024 | O6633 | 2/22/2025 | KFC | Sandwich | Italian | 1 | 738.36 | Cash | 7 | 5/28/2024 |
| 4734 | C6530 | Female | Adult | Lahore | 7/14/2025 | O10530 | 3/18/2025 | KFC | Fries | Italian | 3 | 990.73 | Cash | 15 | 12/4/2024 |
| 4761 | C5504 | Other | Teenager | Multan | 6/12/2024 | O9504 | 3/20/2025 | KFC | Fries | Italian | 5 | 1133.47 | Cash | 30 | 1/13/2025 |
| 4801 | C5012 | Female | Senior | Lahore | 10/10/2023 | O9012 | 3/24/2025 | KFC | Burger | Italian | 3 | 1470.56 | Cash | 20 | 4/11/2024 |
| 5049 | C4376 | Male | Teenager | Islamabad | 12/26/2024 | O8376 | 4/24/2025 | KFC | Sandwich | Italian | 1 | 295.14 | Cash | 8 | 5/14/2024 |
| 5198 | C2148 | Other | Senior | Lahore | 12/4/2023 | O6148 | 5/14/2025 | KFC | Pizza | Italian | 4 | 1073.46 | Cash | 25 | 5/2/2025 |
| 5377 | C1470 | Male | Teenager | Karachi | 1/25/2025 | O5470 | 6/6/2025 | KFC | Sandwich | Italian | 4 | 388.34 | Cash | 14 | 1/5/2025 |
| 5720 | C3489 | Male | Teenager | Lahore | 5/17/2025 | O7489 | 7/20/2025 | KFC | Pizza | Italian | 5 | 364.08 | Cash | 31 | 2/9/2025 |

disactive.set_index('customer_id')

| customer_id | gender | age | city | signup_date | order_id | order_date | restaurant_name | dish_name | category | quantity | price | payment_method | order_frequency | last_order_date | location |
|-------------|--------|----------|-----------|-------------|----------|------------|-----------------|-----------|----------|----------|---------|----------------|-----------------|-----------------|----------|
| C2454 | Other | Teenager | Karachi | 12/4/2023 | O6454 | 8/27/2023 | KFC | Pizza | Italian | 1 | 249.90 | Cash | 20 | 3/22/2025 | |
| C2522 | Other | Teenager | Peshawar | 3/25/2025 | O6522 | 9/10/2023 | KFC | Sandwich | Italian | 4 | 589.82 | Cash | 28 | 12/11/2024 | |
| C4401 | Male | Adult | Karachi | 9/28/2024 | O8401 | 9/16/2023 | KFC | Burger | Italian | 3 | 923.55 | Cash | 18 | 5/15/2025 | |
| C2341 | Female | Adult | Multan | 8/31/2023 | O6341 | 9/29/2023 | KFC | Pasta | Italian | 2 | 828.19 | Cash | 49 | 5/3/2025 | |
| C3226 | Other | Senior | Lahore | 3/17/2025 | O7226 | 10/18/2023 | KFC | Pasta | Italian | 4 | 1350.64 | Cash | 45 | 4/16/2025 | |
| C3593 | Other | Teenager | Karachi | 7/25/2025 | O7593 | 10/30/2023 | KFC | Sandwich | Italian | 4 | 802.08 | Cash | 26 | 5/18/2025 | |
| C2214 | Other | Teenager | Lahore | 5/23/2025 | O6214 | 11/15/2023 | KFC | Sandwich | Italian | 2 | 287.77 | Cash | 5 | 4/14/2025 | |
| C3329 | Female | Teenager | Islamabad | 9/11/2024 | O7329 | 12/8/2023 | KFC | Pizza | Italian | 5 | 1094.39 | Cash | 15 | 8/28/2024 | |
| C6117 | Male | Teenager | Multan | 7/2/2025 | O10117 | 12/20/2023 | KFC | Pizza | Italian | 5 | 1446.48 | Cash | 22 | 2/8/2025 | |
| C6807 | Female | Adult | Islamabad | 5/17/2024 | O10807 | 12/29/2023 | KFC | Burger | Italian | 4 | 863.09 | Cash | 17 | 3/30/2025 | |
| C4256 | Male | Teenager | Lahore | 9/27/2024 | O8256 | 2/12/2024 | KFC | Sandwich | Italian | 2 | 967.79 | Cash | 41 | 10/11/2024 | |
| C2508 | Other | Teenager | Karachi | 3/5/2024 | O6508 | 2/16/2024 | KFC | Burger | Italian | 2 | 178.97 | Cash | 21 | 2/20/2025 | |
| C3547 | Male | Senior | Karachi | 10/6/2023 | O7547 | 2/24/2024 | KFC | Burger | Italian | 5 | 1229.12 | Cash | 17 | 1/26/2025 | |
| C4075 | Female | Teenager | Multan | 4/28/2025 | O8075 | 3/5/2024 | KFC | Sandwich | Italian | 4 | 440.27 | Cash | 48 | 3/5/2025 | |
| C5002 | Male | Teenager | Lahore | 4/7/2025 | O9002 | 4/11/2024 | KFC | Pasta | Italian | 2 | 757.35 | Cash | 20 | 12/30/2024 | |
| C3297 | Other | Teenager | Multan | 9/14/2024 | O7297 | 4/13/2024 | KFC | Pizza | Italian | 2 | 564.24 | Cash | 48 | 4/12/2025 | |
| C6417 | Female | Teenager | Lahore | 4/12/2025 | O10417 | 4/14/2024 | KFC | Sandwich | Italian | 5 | 532.05 | Cash | 19 | 1/5/2025 | |
| C5556 | Female | Adult | Lahore | 4/8/2024 | O9556 | 4/26/2024 | KFC | Pizza | Italian | 4 | 285.59 | Cash | 45 | 12/24/2024 | |
| C2854 | Other | Adult | Islamabad | 4/5/2025 | O6854 | 6/8/2024 | KFC | Burger | Italian | 3 | 1391.23 | Cash | 50 | 7/2/2025 | |
| C5178 | Male | Adult | Lahore | 1/29/2025 | O9178 | 6/13/2024 | KFC | Burger | Italian | 2 | 1246.35 | Cash | 29 | 7/21/2025 | |
| C5387 | Male | Senior | Peshawar | 3/8/2025 | O9387 | 6/15/2024 | KFC | Burger | Italian | 5 | 502.34 | Cash | 15 | 11/18/2024 | |
| C2424 | Male | Teenager | Karachi | 4/14/2025 | O6424 | 6/18/2024 | KFC | Fries | Italian | 2 | 1076.49 | Cash | 18 | 5/8/2025 | |
| C6881 | Other | Senior | Karachi | 5/31/2024 | O10881 | 7/6/2024 | KFC | Pizza | Italian | 5 | 874.38 | Cash | 36 | 6/18/2025 | |
| C3404 | Male | Senior | Lahore | 12/20/2023 | O7404 | 8/30/2024 | KFC | Pasta | Italian | 5 | 522.36 | Cash | 12 | 10/4/2024 | |
| C2001 | Female | Senior | Lahore | 1/31/2024 | O6001 | 10/14/2024 | KFC | Pizza | Italian | 5 | 1131.71 | Cash | 19 | 6/4/2025 | |
| C1500 | Female | Senior | Islamabad | 2/11/2025 | O5500 | 11/6/2024 | KFC | Sandwich | Italian | 2 | 1391.72 | Cash | 18 | 3/3/2025 | |
| C5560 | Other | Senior | Multan | 5/27/2025 | O9560 | 11/9/2024 | KFC | Burger | Italian | 4 | 1046.88 | Cash | 35 | 12/26/2024 | |
| C6745 | Female | Teenager | Islamabad | 6/8/2025 | O10745 | 11/14/2024 | KFC | Pizza | Italian | 3 | 1121.35 | Cash | 5 | 4/4/2025 | |
| C5440 | Other | Senior | Multan | 7/24/2024 | O9440 | 11/23/2024 | KFC | Pasta | Italian | 3 | 498.08 | Cash | 49 | 10/26/2024 | |
| C1288 | Other | Senior | Peshawar | 2/18/2024 | O5288 | 12/20/2024 | KFC | Burger | Italian | 4 | 541.53 | Cash | 9 | 9/15/2024 | |
| C1049 | Female | Senior | Karachi | 11/20/2023 | O5049 | 12/20/2024 | KFC | Pasta | Italian | 5 | 1153.27 | Cash | 39 | 5/14/2025 | |
| C4558 | Other | Adult | Islamabad | 9/8/2023 | O8558 | 12/30/2024 | KFC | Pasta | Italian | 2 | 1288.61 | Cash | 6 | 11/26/2024 | |
| C3364 | Female | Adult | Lahore | 11/18/2023 | O7364 | 1/10/2025 | KFC | Sandwich | Italian | 3 | 708.98 | Cash | 13 | 1/11/2025 | |
| C1415 | Male | Senior | Peshawar | 12/19/2024 | O5415 | 1/11/2025 | KFC | Burger | Italian | 4 | 683.08 | Cash | 30 | 4/6/2025 | |
| C6634 | Other | Teenager | Lahore | 11/6/2023 | O10634 | 1/21/2025 | KFC | Pasta | Italian | 2 | 1154.77 | Cash | 21 | 4/23/2025 | |
| C5801 | Female | Adult | Peshawar | 3/1/2024 | O9801 | 1/24/2025 | KFC | Burger | Italian | 2 | 923.16 | Cash | 35 | 5/3/2025 | |
| C3587 | Other | Adult</ | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|-------|--------|----------|-----------|-----------|--------|-----------|-----|--------|---------|---|---------|------|----|------------|
| C4988 | Male | Adult | Lahore | 8/31/2023 | O8988 | 6/6/2025 | KFC | Pasta | Italian | 3 | 1116.36 | Cash | 45 | 10/23/2024 |
| C2077 | Other | Teenager | Karachi | 8/16/2024 | O6077 | 6/12/2025 | KFC | Burger | Italian | 4 | 633.75 | Cash | 11 | 2/23/2025 |
| C3959 | Female | Senior | Peshawar | 4/14/2024 | O7959 | 7/1/2025 | KFC | Fries | Italian | 3 | 679.72 | Cash | 24 | 10/7/2024 |
| C5988 | Male | Senior | Lahore | 5/11/2025 | O9988 | 7/11/2025 | KFC | Burger | Italian | 5 | 986.95 | Cash | 24 | 9/30/2024 |
| C6116 | Other | Senior | Multan | 10/2/2023 | O10116 | 7/26/2025 | KFC | Fries | Italian | 3 | 333.35 | Cash | 11 | 12/29/2024 |
| C2989 | Male | Teenager | Lahore | 4/27/2024 | O6989 | 8/20/2025 | KFC | Pizza | Italian | 1 | 589.25 | Cash | 15 | 1/6/2025 |
| C3787 | Female | Adult | Islamabad | 1/28/2025 | O7787 | 8/22/2025 | KFC | Pizza | Italian | 5 | 1118.26 | Cash | 12 | 6/8/2025 |

```
x = food.drop('churned', axis=1).replace({'Active': 1, 'Inactive': 0})
y = food['churned']
```

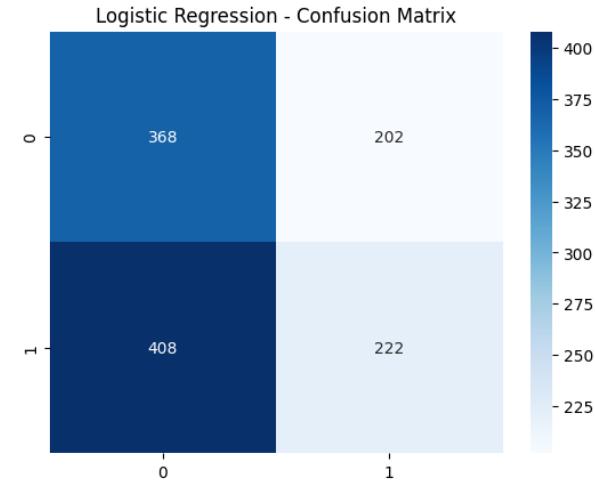
```
X_train,X_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=42)
```

```
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
```

```
print("\n--- Logistic Regression ---")
log_model = LogisticRegression()
log_model.fit(X_train, y_train)
y_pred_log = log_model.predict(X_test)
print(classification_report(y_test, y_pred_log))
print("Accuracy:", accuracy_score(y_test, y_pred_log))
print("Precision:", precision_score(y_test, y_pred_log, pos_label=1))
print("Recall:", recall_score(y_test, y_pred_log, pos_label=1))
sns.heatmap(confusion_matrix(y_test, y_pred_log), annot=True, fmt='d', cmap='Blues')
plt.title("Logistic Regression - Confusion Matrix")
plt.show()
```

| | precision | recall | f1-score | support |
|--------------|-----------|--------|----------|---------|
| 0 | 0.47 | 0.65 | 0.55 | 570 |
| 1 | 0.52 | 0.35 | 0.42 | 630 |
| accuracy | | | 0.49 | 1200 |
| macro avg | 0.50 | 0.50 | 0.48 | 1200 |
| weighted avg | 0.50 | 0.49 | 0.48 | 1200 |

Accuracy: 0.4916666666666664
Precision: 0.5235849056603774
Recall: 0.3523809523809524

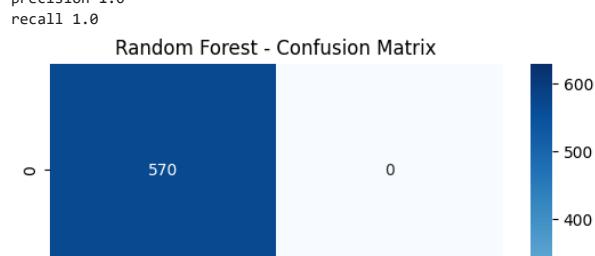


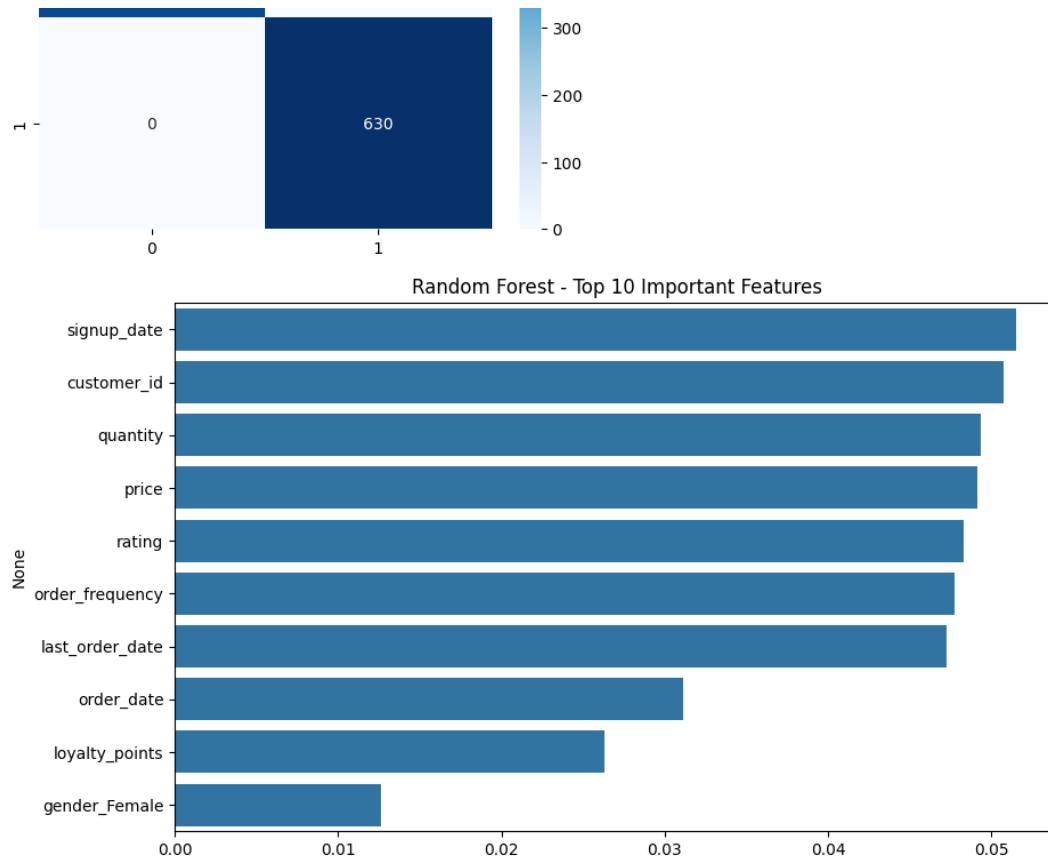
```
print("-----randomforest-----")
rf_model=RandomForestClassifier()
rf_model.fit(X_test,y_test)
y_pred=rf_model.predict(X_test)
print(classification_report(y_test,y_pred))
print("accuracy",accuracy_score(y_test,y_pred))
print("precision",precision_score(y_test,y_pred, pos_label=1))
print("recall",recall_score(y_test,y_pred, pos_label=1))
sns.heatmap(confusion_matrix(y_test,y_pred), annot=True, fmt='d', cmap='Blues')
plt.title("Random Forest - Confusion Matrix")
importances = rf_model.feature_importances_
indices = np.argsort(importances)[::-1]

plt.figure(figsize=(10,6))
sns.barplot(x=importances[indices][:10], y=x.columns[indices][:10])
plt.title("Random Forest - Top 10 Important Features")
plt.show()
```

| | precision | recall | f1-score | support |
|--------------|-----------|--------|----------|---------|
| 0 | 1.00 | 1.00 | 1.00 | 570 |
| 1 | 1.00 | 1.00 | 1.00 | 630 |
| accuracy | | | 1.00 | 1200 |
| macro avg | 1.00 | 1.00 | 1.00 | 1200 |
| weighted avg | 1.00 | 1.00 | 1.00 | 1200 |

accuracy 1.0
precision 1.0
recall 1.0





```

print("-----XGBooster classifier-----")
y_train_numeric = y_train.replace({'Active': 0, 'Inactive': 1})
y_test_numeric = y_test.replace({'Active': 0, 'Inactive': 1})

xgb_model=XGBClassifier()
xgb_model.fit(X_train,y_train_numeric)
xgb_pred=xgb_model.predict(X_test)
print(classification_report(y_test_numeric,xgb_pred))
print('accuracy',accuracy_score(y_test_numeric,xgb_pred))
print('precision',precision_score(y_test_numeric,xgb_pred, pos_label=1))
print('recall',recall_score(y_test_numeric,xgb_pred, pos_label=1))
sns.heatmap(confusion_matrix(y_test_numeric,xgb_pred), annot=True, fmt='d', cmap='Blues')
plt.title("XGBoost Classifier - Confusion Matrix")
#plt.show()
xgb_importances = xgb_model.feature_importances_
indices = np.argsort(xgb_importances)[::-1]
plt.figure(figsize=(10,6))
sns.barplot(x=xgb_importances[indices][:10], y=x.columns[indices][:10])
plt.title("XGBoost - Top 10 Important Features")
plt.show()

```

```

-----XGBooster classifier-----
      precision    recall  f1-score   support

          0       0.45     0.50      0.48     570
          1       0.50     0.45      0.48     630

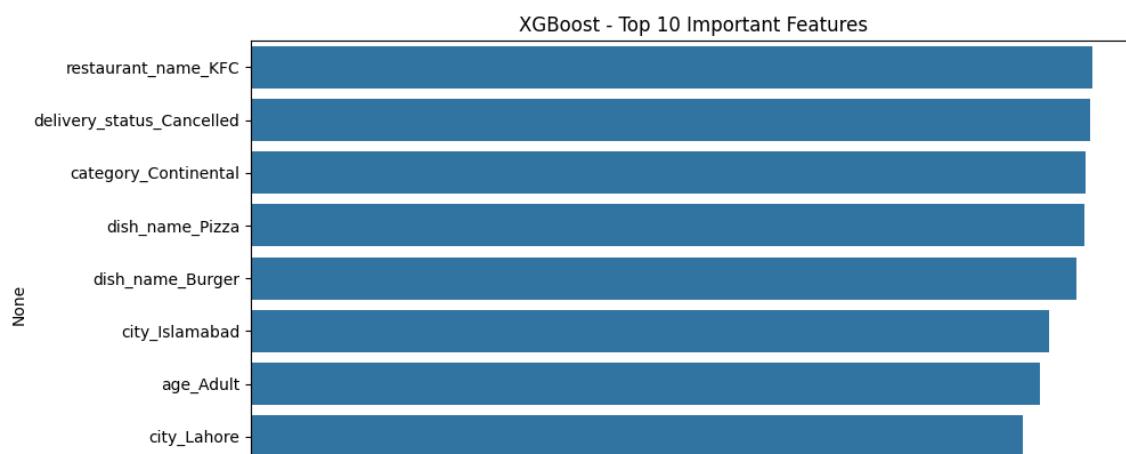
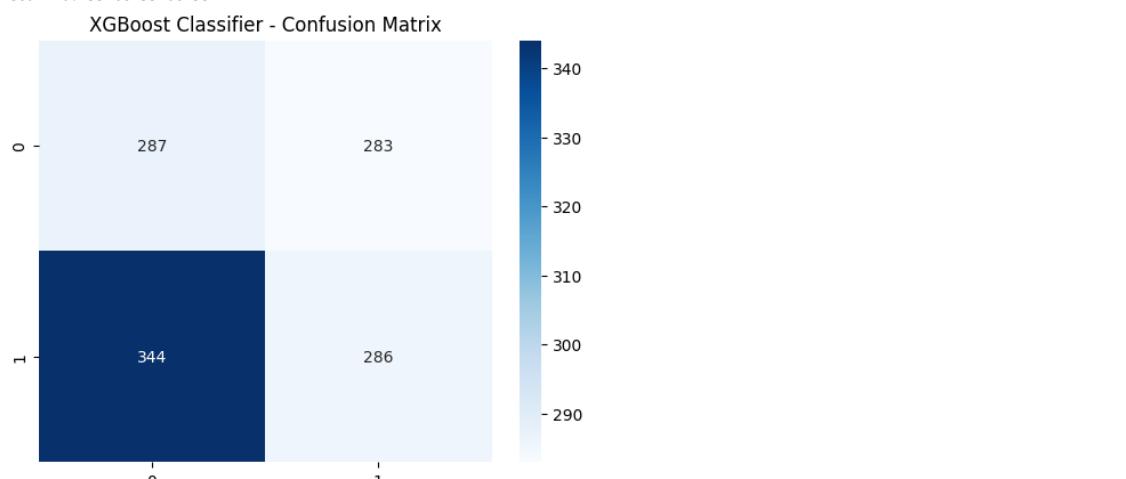
   accuracy                           0.48     1200
  macro avg       0.48     0.48      0.48     1200
weighted avg       0.48     0.48      0.48     1200

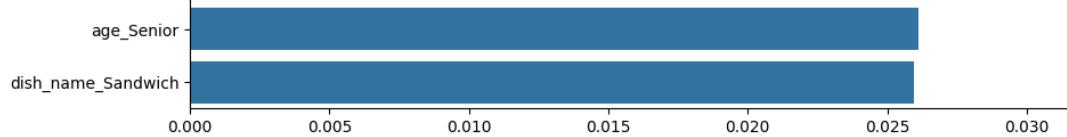
```

```

accuracy 0.4775
precision 0.5026362038664324
recall 0.45396825396825397

```





```
log_acc = accuracy_score(y_test, y_pred_log)
rf_accuracy = accuracy_score(y_test, y_pred)
xg_accuracy = accuracy_score(y_test_numeric, xgb_pred)

log_pre = precision_score(y_test, y_pred_log, pos_label=1)
rf_pre = precision_score(y_test, y_pred, pos_label=1)
xg_precision = precision_score(y_test_numeric, xgb_pred, pos_label=1)

log_recall = recall_score(y_test, y_pred_log, pos_label=1)
rf_recall = recall_score(y_test, y_pred, pos_label=1)
xg_recall = recall_score(y_test_numeric, xgb_pred, pos_label=1)

print("--- Model Comparison ---")
print("Logistic Regression - Accuracy:", log_acc, "Precision:", log_pre, "Recall:", log_recall)
print("Random Forest - Accuracy:", rf_accuracy, "Precision:", rf_pre, "Recall:", rf_recall)
print("XGBoost - Accuracy:", xg_accuracy, "Precision:", xg_precision, "Recall:", xg_recall)

--- Model Comparison ---
Logistic Regression - Accuracy: 0.4916666666666664 Precision: 0.5235849056603774 Recall: 0.3523809523809524
Random Forest - Accuracy: 1.0 Precision: 1.0 Recall: 1.0
XGBoost - Accuracy: 0.4775 Precision: 0.5026362038664324 Recall: 0.45396825396825397
```