```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

```
df = pd.read_excel('/content/E Commerce Dataset.xlsx', sheet_name = 'E Comm')
df
```

	CustomerID	Churn	Tenure	PreferredLoginDevice	CityTier	WarehouseToHome	Prefe
0	50001	1	4.0	Mobile Phone	3	6.0	
1	50002	1	NaN	Phone	1	8.0	
2	50003	1	NaN	Phone	1	30.0	
3	50004	1	0.0	Phone	3	15.0	
4	50005	1	0.0	Phone	1	12.0	
...	...	...	...	...	...	...	
5625	55626	0	10.0	Computer	1	30.0	
5626	55627	0	13.0	Mobile Phone	1	13.0	
5627	55628	0	1.0	Mobile Phone	1	11.0	
5628	55629	0	23.0	Computer	3	9.0	
5629	55630	0	8.0	Mobile Phone	1	15.0	

5630 rows × 20 columns

Next steps: View recommended plots

```
df.shape
```

```
(5630, 20)
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5630 entries, 0 to 5629
Data columns (total 20 columns):
 #   Column                       Non-Null Count  Dtype  
---  ------                       --------------  -----  
 0   CustomerID                   5630 non-null   int64  
 1   Churn                        5630 non-null   int64  
 2   Tenure                       5366 non-null   float64
 3   PreferredLoginDevice         5630 non-null   object 
 4   CityTier                     5630 non-null   int64  
 5   WarehouseToHome              5379 non-null   float64
 6   PreferredPaymentMode         5630 non-null   object 
 7   Gender                       5630 non-null   object 
 8   HourSpendOnApp               5375 non-null   float64
 9   NumberOfDeviceRegistered     5630 non-null   int64  
 10  PreferedOrderCat             5630 non-null   object 
 11  SatisfactionScore            5630 non-null   int64  
 12  MaritalStatus                5630 non-null   object 
 13  NumberOfAddress              5630 non-null   int64  
 14  Complain                     5630 non-null   int64  
 15  OrderAmountHikeFromlastYear  5365 non-null   float64
 16  CouponUsed                   5374 non-null   float64
 17  OrderCount                   5372 non-null   float64
 18  DaySinceLastOrder            5323 non-null   float64
 19  CashbackAmount               5630 non-null   float64
dtypes: float64(8), int64(7), object(5)
memory usage: 879.8+ KB
```

```
df.nunique()
```

```
CustomerID                    5630
Churn                            2
Tenure                          36
PreferredLoginDevice             3
CityTier                         3
WarehouseToHome                 34
PreferredPaymentMode             7
Gender                           2
HourSpendOnApp                   6
NumberOfDeviceRegistered         6
PreferedOrderCat                 6
SatisfactionScore                5
MaritalStatus                    3
NumberOfAddress                 15
Complain                         2
OrderAmountHikeFromlastYear     16
CouponUsed                      17
OrderCount                      16
DaySinceLastOrder               22
CashbackAmount                2586
dtype: int64
```

```
columns = df.columns.to_list()
columns
```

```
['CustomerID',
 'Churn',
 'Tenure',
 'PreferredLoginDevice',
 'CityTier',
 'WarehouseToHome',
 'PreferredPaymentMode',
 'Gender',
 'HourSpendOnApp',
 'NumberOfDeviceRegistered',
 'PreferedOrderCat',
 'SatisfactionScore',
 'MaritalStatus',
 'NumberOfAddress',
 'Complain',
 'OrderAmountHikeFromlastYear',
 'CouponUsed',
 'OrderCount',
 'DaySinceLastOrder',
 'CashbackAmount']
```

```
df.select_dtypes(exclude=np.number).columns
```

```
Index(['PreferredLoginDevice', 'PreferredPaymentMode', 'Gender',
       'PreferedOrderCat', 'MaritalStatus'],
      dtype='object')
```

```
for col in  df.columns:
  if df[col].dtype == object:
    print(str(col) + ':' + str(df[col].unique()))
    print(df[col].value_counts())
    print('-----------------------------------------------------------------------------------------------------------------------------------------------')
```

```
PreferredLoginDevice:['Mobile Phone' 'Phone' 'Computer']
PreferredLoginDevice
Mobile Phone    2765
Computer        1634
Phone           1231
Name: count, dtype: int64
-----------------------------------------------------------------------------------------------------------------------------------------------
PreferredPaymentMode:['Debit Card' 'UPI' 'CC' 'Cash on Delivery' 'E wallet' 'COD' 'Credit Card']
PreferredPaymentMode
Debit Card          2314
Credit Card         1501
E wallet             614
UPI                  414
COD                  365
CC                   273
Cash on Delivery     149
Name: count, dtype: int64
-----------------------------------------------------------------------------------------------------------------------------------------------
Gender:['Female' 'Male']
Gender
Male      3384
Female    2246
```

```
Name: count, dtype: int64
----------------------------------------------------------------------------------------------------
PreferedOrderCat:['Laptop & Accessory' 'Mobile' 'Mobile Phone' 'Others' 'Fashion' 'Grocery']
PreferedOrderCat
Laptop & Accessory    2050
Mobile Phone          1271
Fashion                826
Mobile                 809
Grocery                410
Others                 264
Name: count, dtype: int64
----------------------------------------------------------------------------------------------------
MaritalStatus:['Single' 'Divorced' 'Married']
MaritalStatus
Married     2986
Single      1796
Divorced     848
Name: count, dtype: int64
----------------------------------------------------------------------------------------------------
```

```
df.select_dtypes(include=np.number).columns
```

```
Index(['CustomerID', 'Churn', 'Tenure', 'CityTier', 'WarehouseToHome',
       'HourSpendOnApp', 'NumberOfDeviceRegistered', 'SatisfactionScore',
       'NumberOfAddress', 'Complain', 'OrderAmountHikeFromlastYear',
       'CouponUsed', 'OrderCount', 'DaySinceLastOrder', 'CashbackAmount'],
      dtype='object')
```

```
for col in df.columns:
  if df[col].dtype == float or df[col].dtype == int:
    print(str(col) + ' : ' + str(df[col].unique()))
    print(df[col].value_counts())
    print('----------------------------------------------------------------------------------------------------')
```

```
188.47    7
154.73    7
          ..
174.84    1
127.74    1
145.05    1
174.28    1
173.78    1
Name: count, Length: 2586, dtype: int64
```

```
df.loc[df['PreferredLoginDevice'] == 'Phone', 'PreferredLoginDevice' ] = 'Mobile Phone'
df.loc[df['PreferedOrderCat'] == 'Mobile', 'PreferedOrderCat' ] = 'Mobile Phone'
```

```
df['PreferredLoginDevice'].value_counts()
```

```
PreferredLoginDevice
Mobile Phone    3996
Computer        1634
Name: count, dtype: int64
```

```
#as cod is also cash on delievery
#as cc is also credit card so i merged them
df.loc[df['PreferredPaymentMode'] == 'COD', 'PreferredPaymentMode' ] = 'Cash on Delivery'   # uses loc function
df.loc[df['PreferredPaymentMode'] == 'CC', 'PreferredPaymentMode' ] = 'Credit Card'
```

```
df['PreferredPaymentMode'].value_counts()
```

```
PreferredPaymentMode
Debit Card          2314
Credit Card         1774
E wallet             614
Cash on Delivery     514
UPI                  414
Name: count, dtype: int64
```

```
# convert num_cols to categories
df2 = df.copy()
for col in df2.columns:
  if col == 'CustomerID':
    continue

  else:
    if df2[col].dtype == 'int':
      df2[col] = df[col].astype(str)
```

```
df2.dtypes
```

```
CustomerID                     int64
Churn                         object
Tenure                       float64
PreferredLoginDevice          object
CityTier                      object
WarehouseToHome              float64
PreferredPaymentMode          object
Gender                        object
HourSpendOnApp               float64
NumberOfDeviceRegistered      object
PreferedOrderCat              object
SatisfactionScore             object
MaritalStatus                 object
NumberOfAddress               object
Complain                      object
OrderAmountHikeFromlastYear  float64
CouponUsed                   float64
OrderCount                   float64
DaySinceLastOrder            float64
CashbackAmount               float64
dtype: object
```

```
df.duplicated().sum()
```

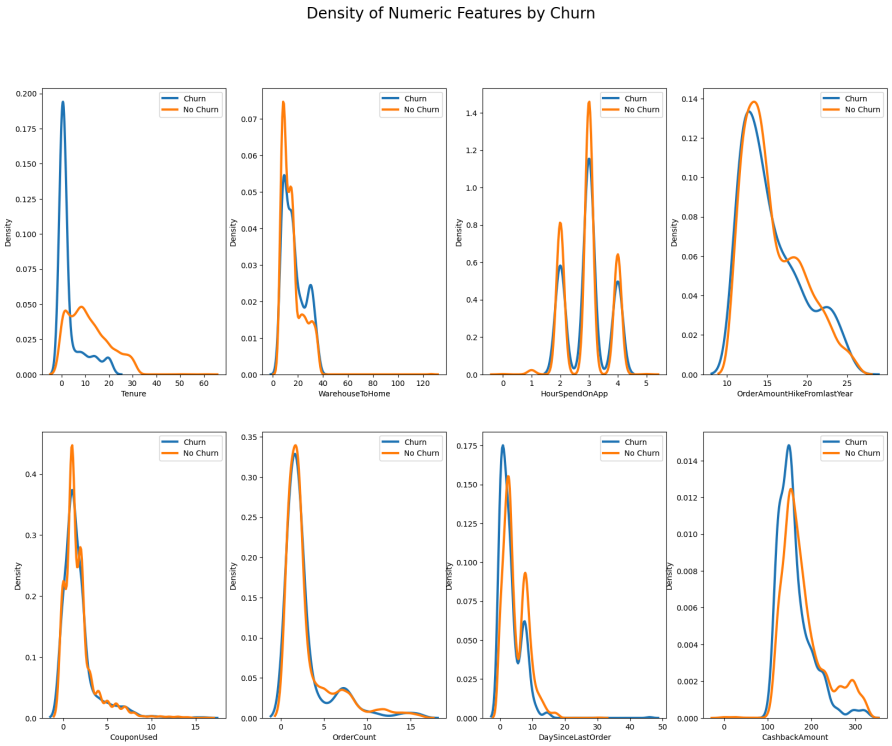
```
0
```

```
# the sum of null values
grouped_data = []
for col in columns:
```

```
        n_missing = df[col].isnull().sum()
        percentage = n_missing / df.shape[0] * 100
        grouped_data.append([col, n_missing, percentage])

    # Create a new DataFrame from the grouped data
    grouped_df = pd.DataFrame(grouped_data, columns=['column', 'n_missing', 'percentage'])

    # Group by 'col', 'n_missing', and 'percentage'
    result = grouped_df.groupby(['column', 'n_missing', 'percentage']).size()
    result
```

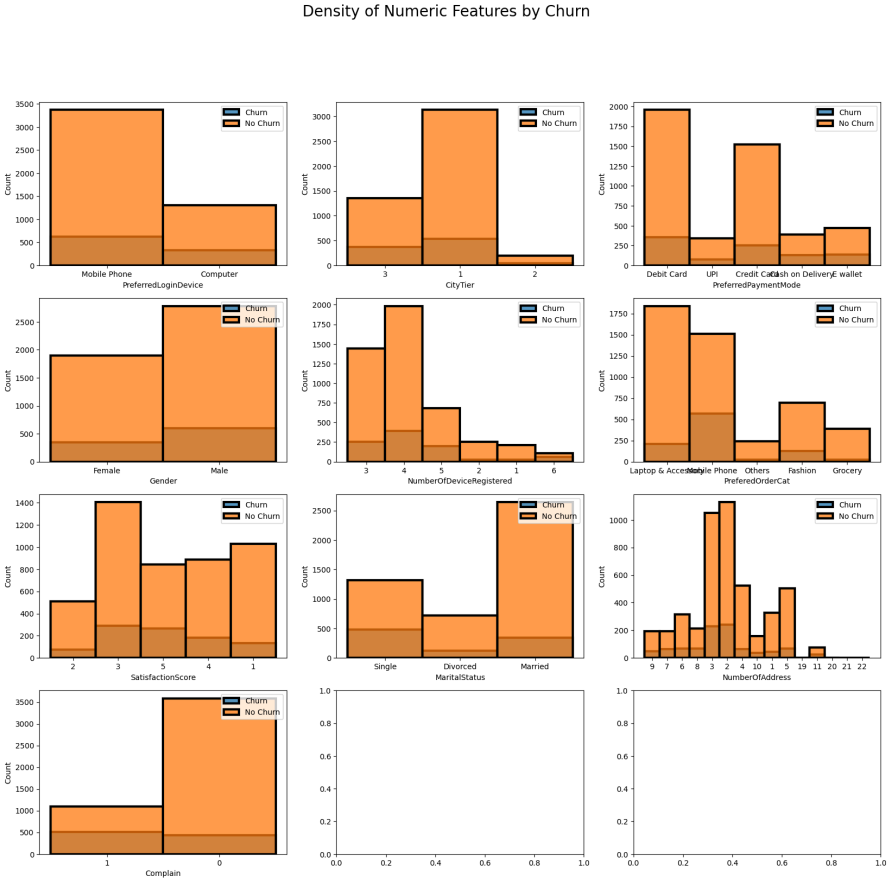
```
column                      n_missing  percentage
CashbackAmount              0          0.000000      1
Churn                       0          0.000000      1
CityTier                    0          0.000000      1
Complain                    0          0.000000      1
CouponUsed                  256        4.547069      1
CustomerID                  0          0.000000      1
DaySinceLastOrder           307        5.452931      1
Gender                      0          0.000000      1
HourSpendOnApp              255        4.529307      1
MaritalStatus               0          0.000000      1
NumberOfAddress             0          0.000000      1
NumberOfDeviceRegistered    0          0.000000      1
OrderAmountHikeFromlastYear 265        4.706927      1
OrderCount                  258        4.582593      1
PreferedOrderCat            0          0.000000      1
PreferredLoginDevice        0          0.000000      1
PreferredPaymentMode        0          0.000000      1
SatisfactionScore           0          0.000000      1
Tenure                      264        4.689165      1
WarehouseToHome             251        4.458259      1
dtype: int64
```

```
import plotly.graph_objects as go
from plotly.subplots import make_subplots
binary_cat_cols = ['Complain']
outcome = ['Churn']
cat_cols = ['PreferredLoginDevice', 'CityTier', 'PreferredPaymentMode',
       'Gender', 'NumberOfDeviceRegistered', 'PreferedOrderCat',
       'SatisfactionScore', 'MaritalStatus', 'NumberOfAddress', 'Complain']
num_cols = ['Tenure', 'WarehouseToHome', 'HourSpendOnApp', 'OrderAmountHikeFromlastYear', 'CouponUsed', 'OrderCount', 'DaySinceLastOrder', 'C


df_c = df[df['Churn']==1].copy()
df_nc = df[df['Churn']==0].copy()

fig, ax = plt.subplots(2,4,figsize=(20, 15))
fig.suptitle('Density of Numeric Features by Churn', fontsize=20)
ax = ax.flatten()

for idx,c in enumerate(num_cols):
    sns.kdeplot(df_c[c], linewidth= 3,
             label = 'Churn',ax=ax[idx])
    sns.kdeplot(df_nc[c], linewidth= 3,
             label = 'No Churn',ax=ax[idx])

    ax[idx].legend(loc='upper right')

plt.show()
```



- Tenure: Customers with longer tenure seem less likely to churn. Makes sense as longer tenure indicates satisfaction
- CityTier: Churn rate looks similar across tiers. City tier does not seem predictive of churn
- WarehouseToHome: Shorter warehouse to home distances have a lower churn rate. Faster deliveries may improve satisfaction
- HourSpendOnApp: More time spent on app correlates with lower churn. App engagement is a good sign
- NumberOfDeviceRegistered: More registered devices associates with lower churn. Access across devices improves convenience
- SatisfactionScore: Higher satisfaction scores strongly associate with lower churn, as expected. Critical driver
- NumberOfAddress: Slight downward trend in churn as number of addresses increases. More addresses indicates loyalty
- Complain: More complaints associate with higher churn, though relationship isn't very strong. Complaints hurt satisfaction
- OrderAmountHikeFromLastYear: Big spenders from last year are less likely to churn. Good to retain big customers
- CouponUsed: Coupon usage correlates with lower churn. Coupons enhance loyalty
- OrderCount: Higher order counts associate with lower churn. Frequent usage builds habits
- DaySinceLastOrder: Longer since last order correlates with higher churn. Recency is a good predictor

```
df_c = df2[df2['Churn']=='1'].copy()
df_nc = df2[df2['Churn']=='0'].copy()

fig, ax = plt.subplots(4,3,figsize=(20, 18))
fig.suptitle('Density of Numeric Features by Churn', fontsize=20)
ax = ax.flatten()

for idx,c in enumerate(cat_cols):
    sns.histplot(df_c[c], linewidth= 3,
             label = 'Churn',ax=ax[idx])
    sns.histplot(df_nc[c], linewidth= 3,
             label = 'No Churn',ax=ax[idx])

    ax[idx].legend(loc='upper right')

plt.show()
```



Which Gender has more Orders?

```
df['Gender'].value_counts()
```

```
Gender
Male      3384
Female    2246
Name: count, dtype: int64
```

```
df.groupby("Churn")["Gender"].value_counts()
```

```
Churn  Gender
0      Male      2784
       Female    1898
1      Male       600
       Female     348
Name: count, dtype: int64
```

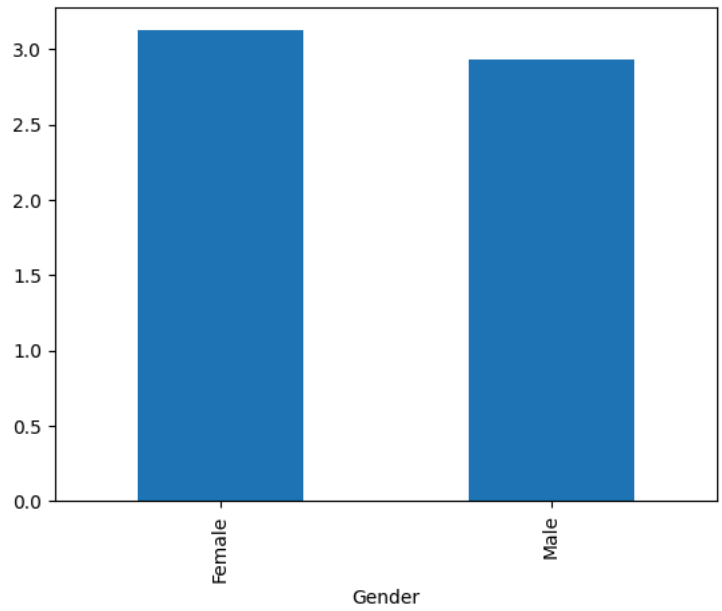
```
df.groupby("PreferredLoginDevice")["OrderCount"].value_counts()
```

```
PreferredLoginDevice  OrderCount
Computer              2.0            573
                      1.0            486
                      3.0            132
                      4.0             61
                      7.0             59
                      5.0             48
                      8.0             44
                      6.0             40
                      14.0            20
                      9.0             19
                      11.0            16
                      10.0            15
                      12.0            15
                      13.0             9
                      15.0             8
                      16.0             4
Mobile Phone          2.0           1452
                      1.0           1265
                      3.0            239
                      7.0            147
                      4.0            143
                      5.0            133
                      8.0            128
                      6.0             97
                      9.0             43
                      12.0            39
                      11.0            35
                      15.0            25
                      13.0            21
                      10.0            21
                      16.0            19
                      14.0            16
Name: count, dtype: int64
```

```
gender_orders = df.groupby('Gender')['OrderCount'].mean().plot(kind='bar')
```

```
gender_orders
```

```
<Axes: xlabel='Gender'>
```



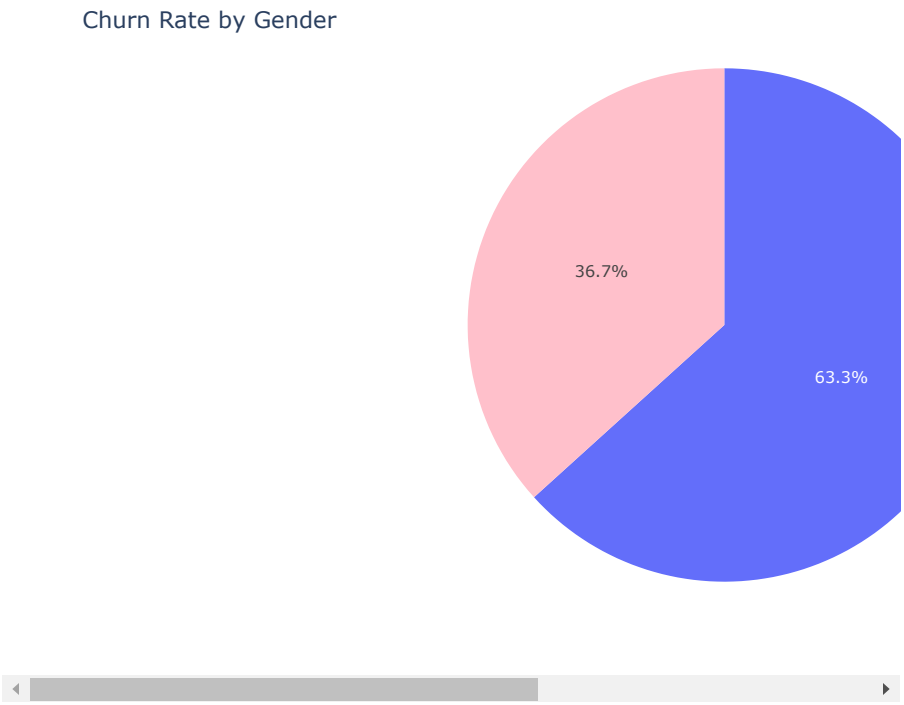

```
percentageM =600/3384 * 100
#the percentage of the leaving males out of the males
percentageM
```

```
17.73049645390071
```

```
percentageF =348/2246 * 100

percentageF  #the percentage of the leaving females out of the female
```

```
15.49421193232413
```

```
import pandas as pd
import plotly.express as px

# Create figure
fig = px.pie(df, values='Churn', names='Gender')
fig.update_traces(marker=dict(colors=['pink ', 'baby blue']))

# Update layout
fig.update_layout(
  title='Churn Rate by Gender',
  legend_title='Gender'
)

# Show plot
fig.show()
```



as we see the males are more likely to churn as we have 63.3 % churned males from the app may be the company should consider incresing the products that grap the males interest and so on.. we are going to see if there is another factors that makes the highest segment of churned customers are males

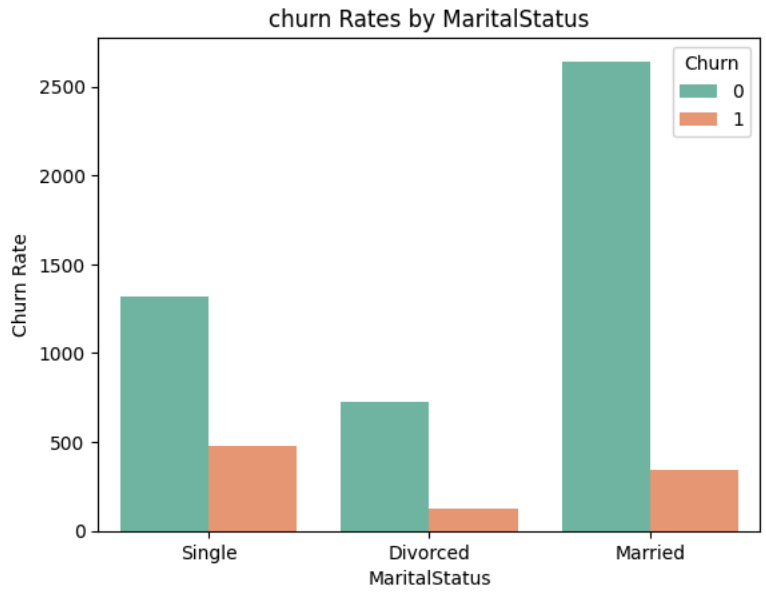
2-Which MartialStatus has the highest Churn rate?

```
df.groupby("Churn")["MaritalStatus"].value_counts()
```

```
Churn  MaritalStatus
0      Married          2642
       Single           1316
       Divorced          724
1      Single            480
       Married           344
       Divorced          124
Name: count, dtype: int64
```

```
sns.countplot(x='MaritalStatus',hue='Churn',data=df,palette='Set2')
plt.title("churn Rates by MaritalStatus")
plt.ylabel("Churn Rate")
```

```
Text(0, 0.5, 'Churn Rate')
```



the married are the highest customer segment in the comapny may be the comapny should consider taking care of the products that suits the single and the married customers as the singles are the most likely to churn from the app

3-Which CityTier has higher Tenure and OrderCount?

```
df_grouped_tenure = df.groupby('CityTier')['Tenure'].agg(['mean', 'max'])
df_grouped_tenure
```

CityTier	mean	max
1	10.528818	51.0
2	11.169725	31.0
3	9.361740	61.0

Next steps: View recommended plots

```
df_grouped_OrderCount = df.groupby('CityTier')['OrderCount'].agg(['mean', 'max'])
df_grouped_OrderCount
```

CityTier	mean	max
1	2.953255	16.0
2	2.584034	13.0
3	3.185185	16.0

Next steps: View recommended plots

citytier 2 has the highest tenure rate but the tenure rate does not seen to be a strong factor

```
df.groupby("CityTier")["OrderCount"].mean()
```

```
CityTier
1    2.953255
2    2.584034
3    3.185185
Name: OrderCount, dtype: float64
```

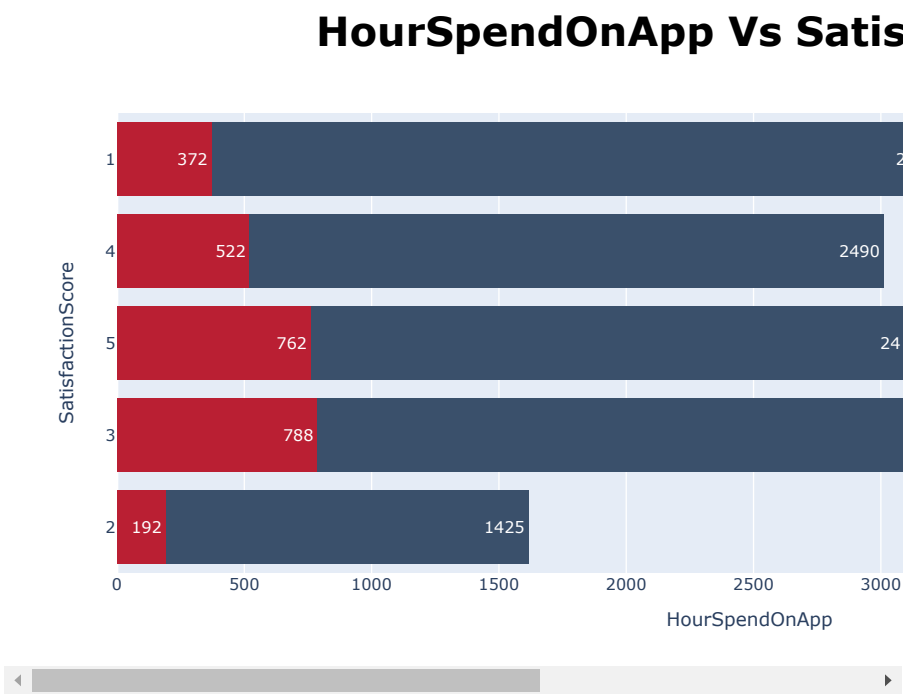
4-Is Customer with High SatisfactionScore have high HourSpendOnApp?

```
df['SatisfactionScore'].dtypes
```

```
dtype('int64')
```

```
fig = px.histogram(df2, x="HourSpendOnApp", y="SatisfactionScore", orientation="h", color="Churn" ,text_auto= True , title="<b>"+'HourSpend
```

```
# Customize the plot
fig.update_layout(hovermode='x',title_font_size=30)
fig.update_layout(
title_font_color="black",
template="plotly",
title_font_size=30,
hoverlabel_font_size=20,
title_x=0.5,
xaxis_title='HourSpendOnApp',
yaxis_title='SatisfactionScore',
)
fig.show()
```



as we see people with less satisfaction score spend less time on the app than the people of satisfaction score 5 but also i do not think there is any realation between the satisfaction score and people's spent time on the app

5-Which CityTier has the most HourSpendOnApp?

```
g = sns.FacetGrid(df, col='CityTier')
g.map(sns.distplot, 'HourSpendOnApp')
```

```
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:854: UserWarning:



`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751


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/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:854: UserWarning:



`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751


<seaborn.axisgrid.FacetGrid at 0x785a306655d0>
```
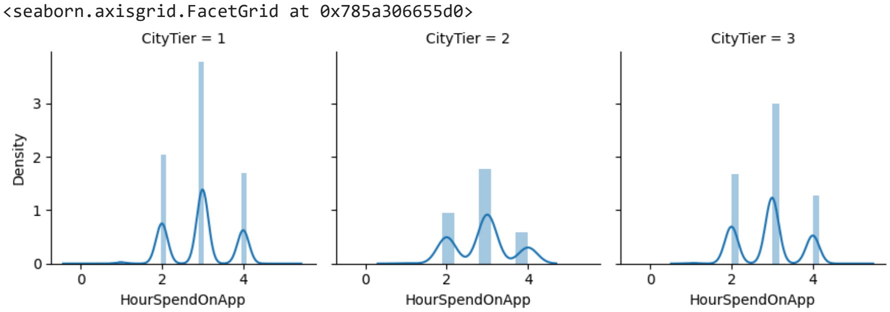



city tier 1 has the most spended hours on the app

Data Preprocessing

Handling the missing values

```
import missingno as msno
```

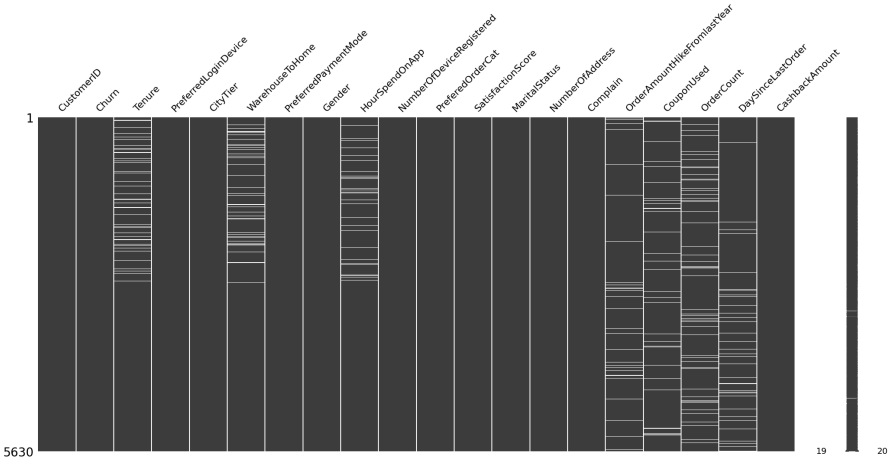
```
round((df.isnull().sum()*100) / df.shape[0],2)
```

```
CustomerID                   0.00
Churn                        0.00
Tenure                       4.69
PreferredLoginDevice         0.00
CityTier                     0.00
WarehouseToHome              4.46
PreferredPaymentMode         0.00
Gender                       0.00
HourSpendOnApp               4.53
NumberOfDeviceRegistered     0.00
PreferedOrderCat             0.00
```

```
SatisfactionScore              0.00
MaritalStatus                  0.00
NumberOfAddress                0.00
Complain                       0.00
OrderAmountHikeFromlastYear    4.71
CouponUsed                     4.55
OrderCount                     4.58
DaySinceLastOrder              5.45
CashbackAmount                 0.00
dtype: float64
```

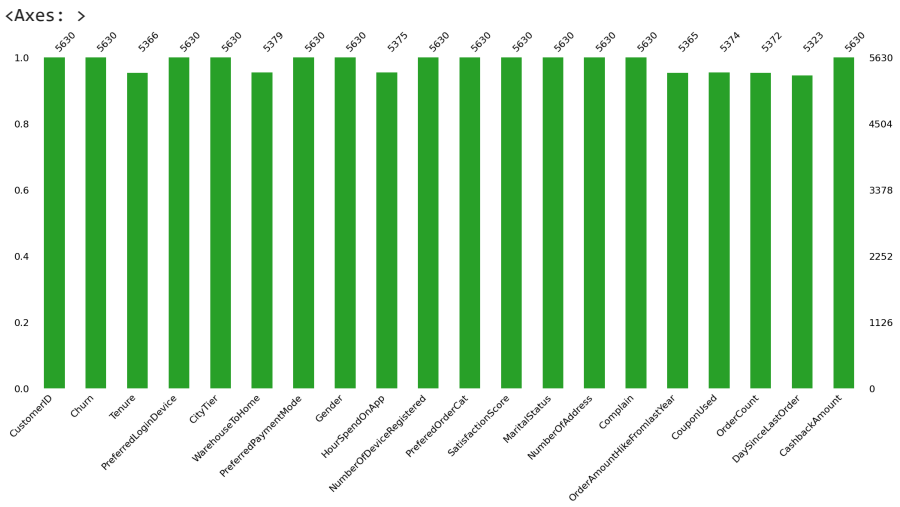
```
msno.matrix(df)
```

```
<Axes: >
```



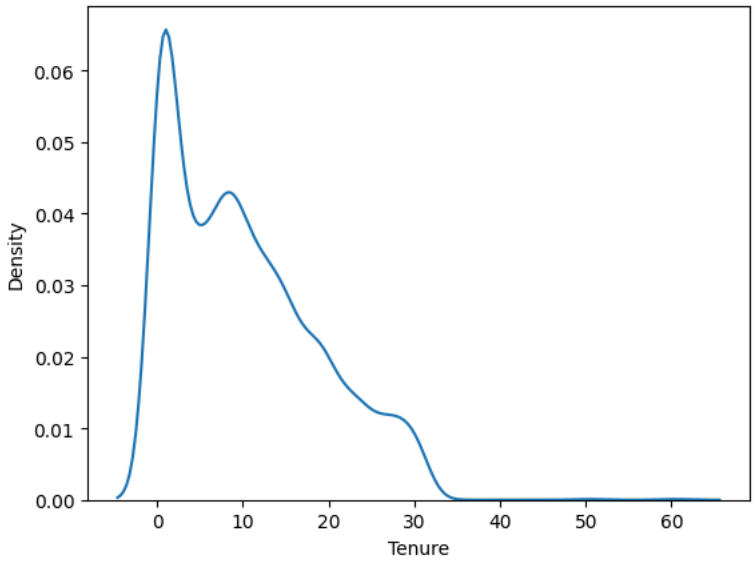

```
msno.bar(df , color = 'tab:green')
```

```
<Axes: >
```




```
sns.kdeplot(df , x='Tenure')
```

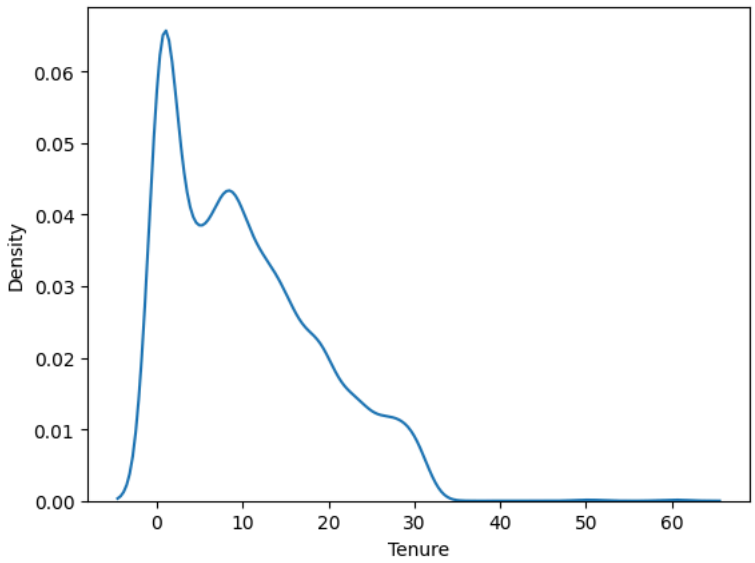
```
<Axes: xlabel='Tenure', ylabel='Density'>
```




```
df['Tenure'] = df['Tenure'].fillna(method = 'bfill')
```

```
sns.kdeplot(df , x='Tenure')
```

```
<Axes: xlabel='Tenure', ylabel='Density'>
```

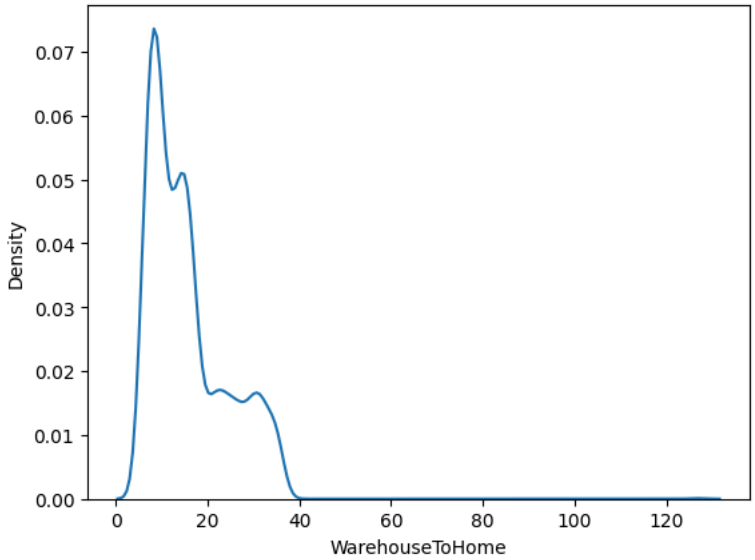



```
df['Tenure'].isnull().sum()
```

```
0
```

```
sns.kdeplot(df , x ='WarehouseToHome')
```

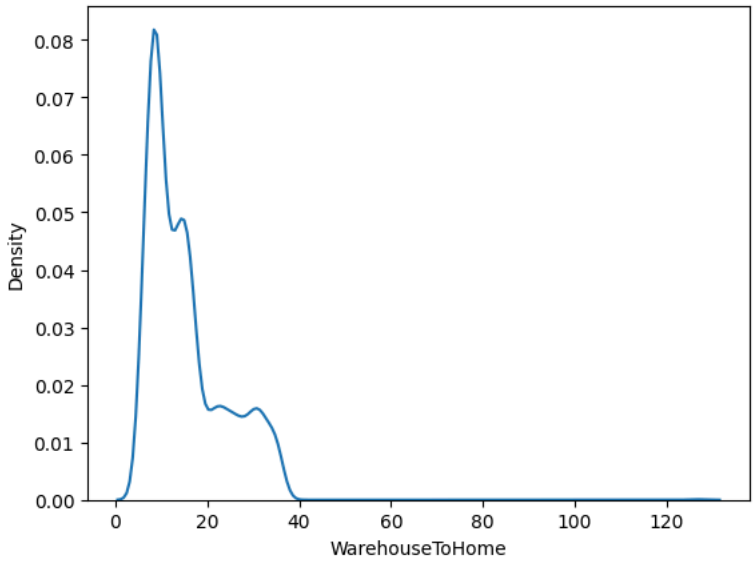
```
<Axes: xlabel='WarehouseToHome', ylabel='Density'>
```




```
from sklearn.impute import SimpleImputer
s_imp = SimpleImputer(missing_values=np.nan , strategy = 'most_frequent')
df['WarehouseToHome'] = s_imp.fit_transform(pd.DataFrame(df['WarehouseToHome']))
```

```
sns.kdeplot(df , x='WarehouseToHome')
```

```
<Axes: xlabel='WarehouseToHome', ylabel='Density'>
```

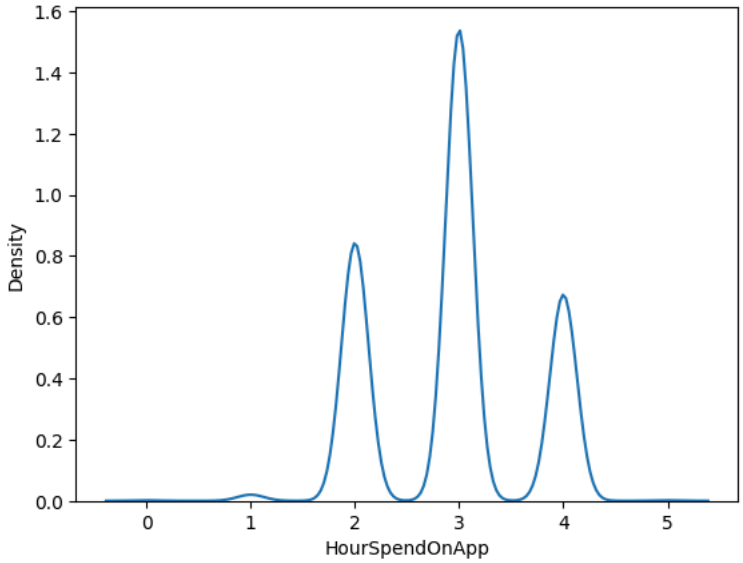



```
df['WarehouseToHome'].isnull().sum()
```

```
0
```

```
sns.kdeplot(df , x='HourSpendOnApp')
```

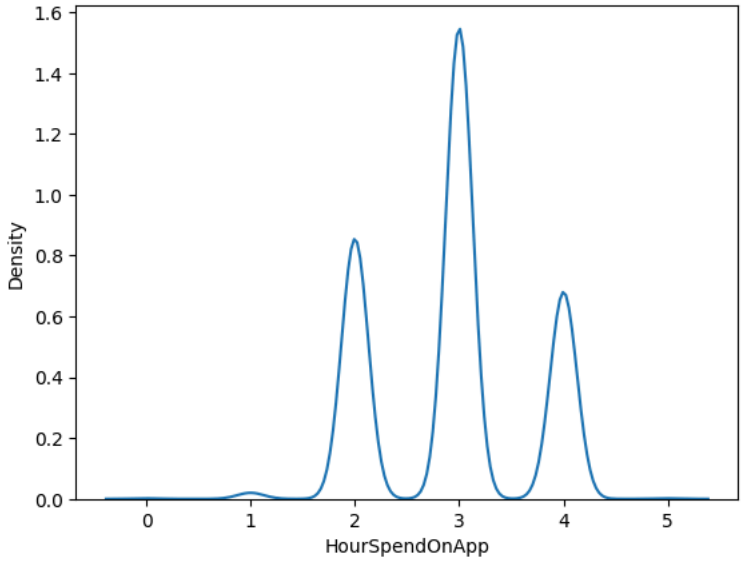
```
<Axes: xlabel='HourSpendOnApp', ylabel='Density'>
```




```
fill_list = df['HourSpendOnApp'].dropna()
df['HourSpendOnApp'] = df['HourSpendOnApp'].fillna(pd.Series(np.random.choice(fill_list , size = len(df['HourSpendOnApp'].index))))
```

```
sns.kdeplot(df , x='HourSpendOnApp')
```

```
<Axes: xlabel='HourSpendOnApp', ylabel='Density'>
```

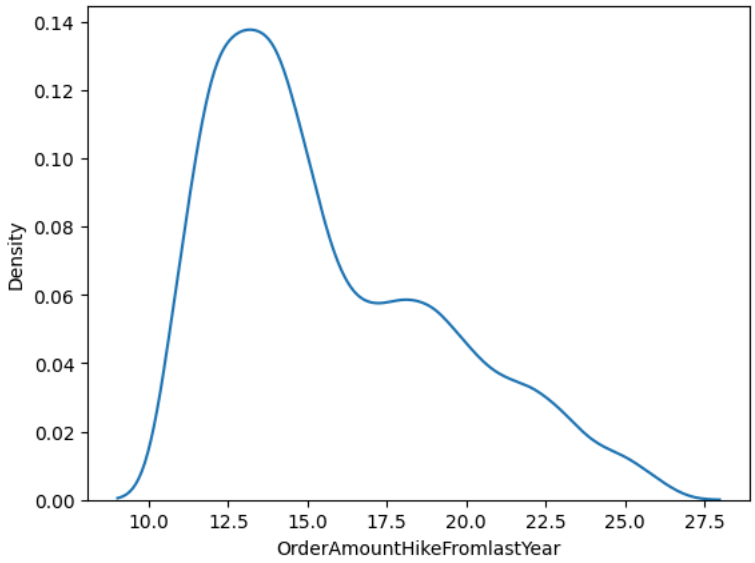



```
df['HourSpendOnApp'].isnull().sum()
```

```
0
```

```
sns.kdeplot(df , x='OrderAmountHikeFromlastYear')
```

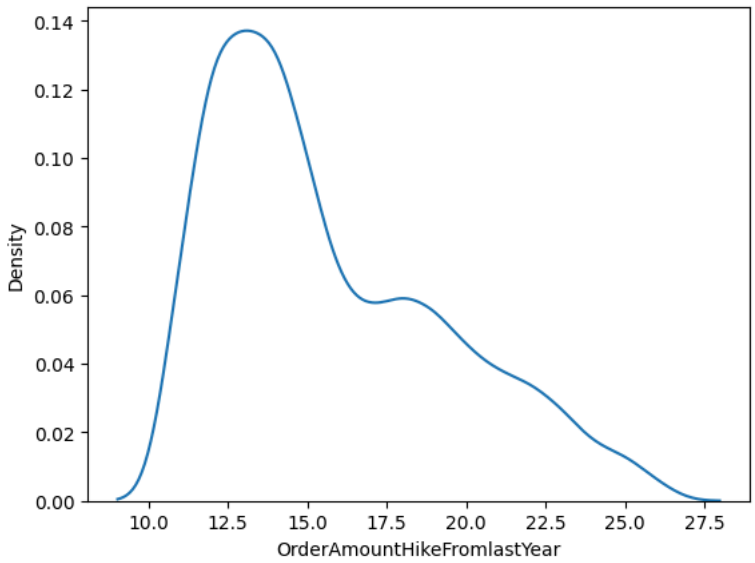
```
<Axes: xlabel='OrderAmountHikeFromlastYear', ylabel='Density'>
```




```
df['OrderAmountHikeFromlastYear'] = df['OrderAmountHikeFromlastYear'].fillna(method = 'ffill')
```

```
sns.kdeplot(df , x='OrderAmountHikeFromlastYear')
```

```
<Axes: xlabel='OrderAmountHikeFromlastYear', ylabel='Density'>
```

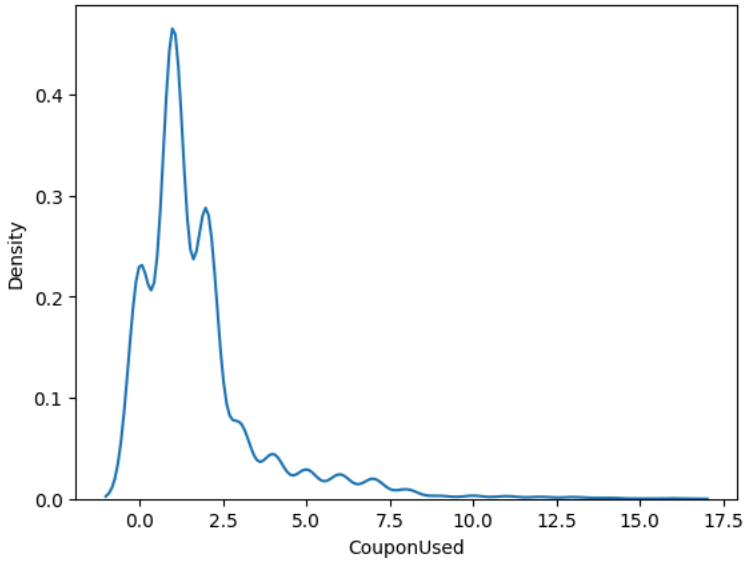



```
df['OrderAmountHikeFromlastYear'].isnull().sum()
```

```
0
```

```
sns.kdeplot(df , x='CouponUsed')
```

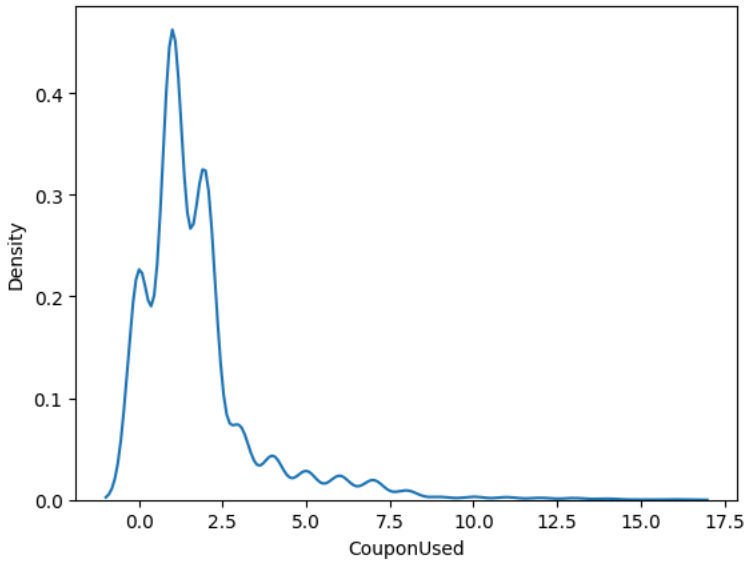
```
<Axes: xlabel='CouponUsed', ylabel='Density'>
```




```
# Impute with KNN Imputer
from sklearn.impute import KNNImputer
imputer = KNNImputer(n_neighbors=2)
df['CouponUsed']=imputer.fit_transform(df[['CouponUsed']])
```

```
sns.kdeplot(df , x='CouponUsed')
```

```
<Axes: xlabel='CouponUsed', ylabel='Density'>
```

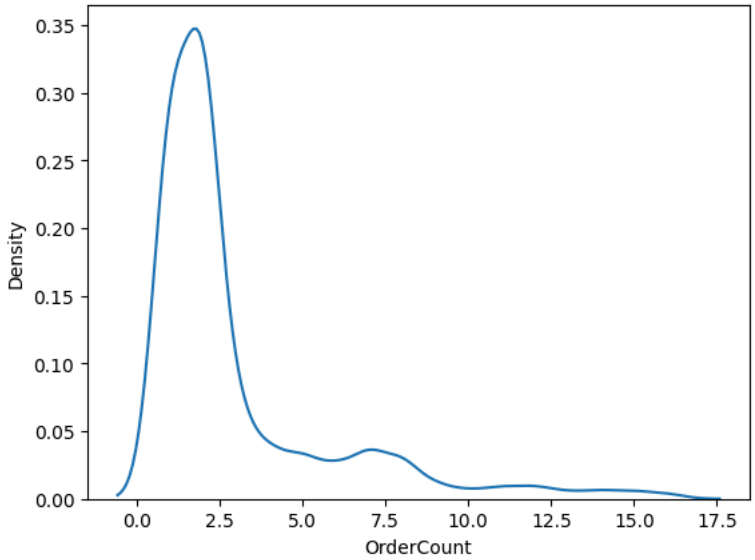



```
df['CouponUsed'].isnull().sum()
```

```
0
```

```
sns.kdeplot(df , x='OrderCount')
```

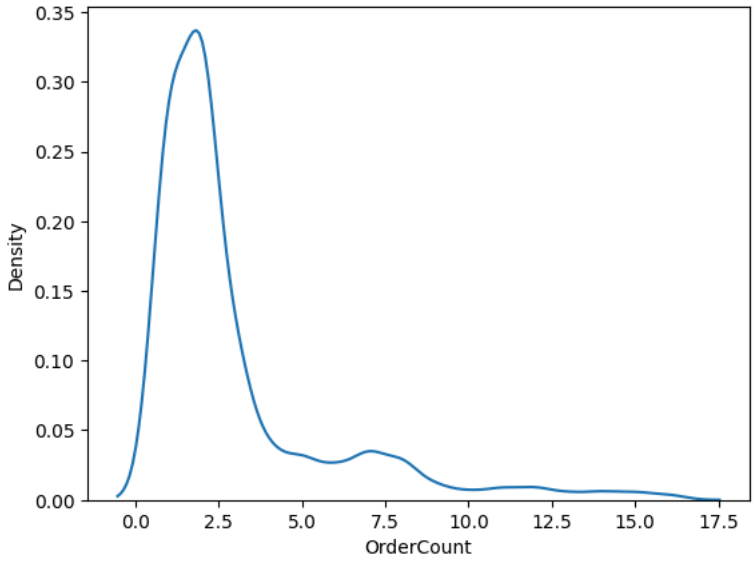
```
<Axes: xlabel='OrderCount', ylabel='Density'>
```




```
imputer_2 = KNNImputer(n_neighbors=2)
df['OrderCount']=imputer_2.fit_transform(df[['OrderCount']])
```

```
sns.kdeplot(df , x='OrderCount')
```

```
<Axes: xlabel='OrderCount', ylabel='Density'>
```

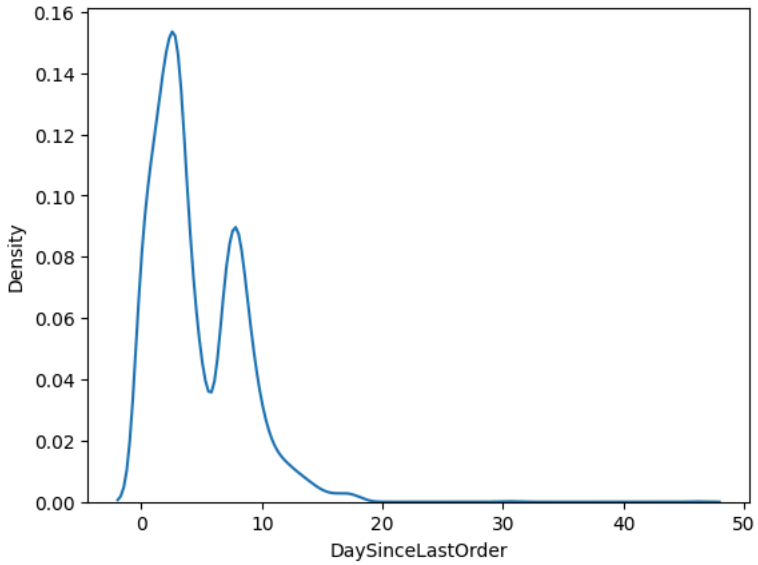



```
df['OrderCount'].isnull().sum()
```

```
0
```

```
sns.kdeplot(df , x='DaySinceLastOrder')
```

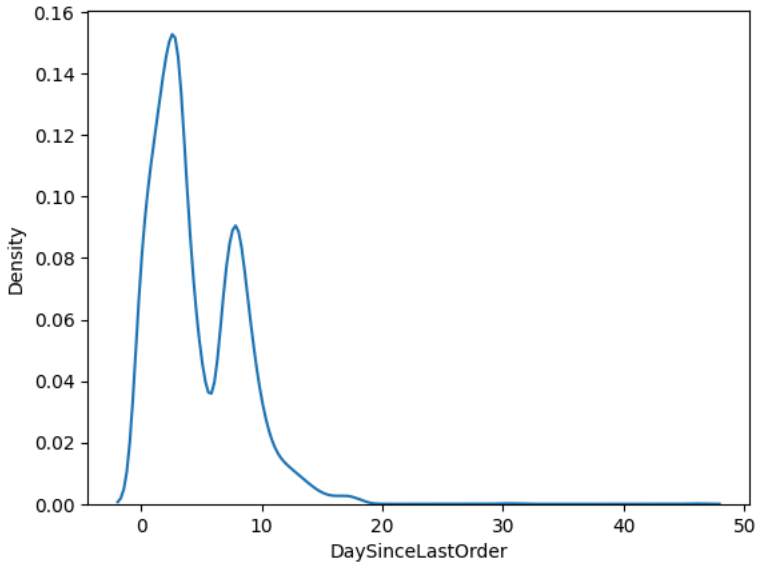
```
<Axes: xlabel='DaySinceLastOrder', ylabel='Density'>
```




```
df['DaySinceLastOrder'] = df['DaySinceLastOrder'].fillna(method = 'bfill')
```

```
sns.kdeplot(df , x='DaySinceLastOrder')
```

```
<Axes: xlabel='DaySinceLastOrder', ylabel='Density'>
```




```
df['DaySinceLastOrder'].isnull().sum()
```

```
0
```

```
df.drop('CustomerID' , axis = 1 , inplace = True)
```

```
df.shape
```

```
(5630, 19)
```

Encoding

```
from sklearn.preprocessing import LabelEncoder , OneHotEncoder
```

```
for i in df.columns:
    if df[i].dtype == 'object':
        print(df[i].value_counts())
        print('*' * 40)
```

```
PreferredLoginDevice
Mobile Phone    3996
Computer        1634
Name: count, dtype: int64
****************************************
PreferredPaymentMode
Debit Card          2314
Credit Card         1774
E wallet             614
Cash on Delivery     514
UPI                  414
Name: count, dtype: int64
****************************************
Gender
Male      3384
Female    2246
Name: count, dtype: int64
****************************************
PreferedOrderCat
Mobile Phone          2080
Laptop & Accessory    2050
Fashion                826
Grocery                410
Others                 264
Name: count, dtype: int64
****************************************
MaritalStatus
Married     2986
Single      1796
Divorced     848
Name: count, dtype: int64
```

```
**************************************
```

```
data = df[df.select_dtypes(exclude=np.number).columns]
data
```

	PreferredLoginDevice	PreferredPaymentMode	Gender	PreferedOrderCat	MaritalStat
0	Mobile Phone	Debit Card	Female	Laptop & Accessory	Sing
1	Mobile Phone	UPI	Male	Mobile Phone	Sing
2	Mobile Phone	Debit Card	Male	Mobile Phone	Sing
3	Mobile Phone	Debit Card	Male	Laptop & Accessory	Sing
4	Mobile Phone	Credit Card	Male	Mobile Phone	Sing
...	...	...	...	...	
5625	Computer	Credit Card	Male	Laptop & Accessory	Marri
5626	Mobile Phone	Credit Card	Male	Fashion	Marri
5627	Mobile Phone	Debit Card	Male	Laptop & Accessory	Marri

Next steps: View recommended plots

```
le = LabelEncoder()
```

```
for i in df.columns:
  if df[i].dtype == 'object':
    df[i] = le.fit_transform(df[i])

df.head(4)
```

	Churn	Tenure	PreferredLoginDevice	CityTier	WarehouseToHome	PreferredPaymentMode
0	1	4.0	1	3	6.0	2
1	1	0.0	1	1	8.0	4
2	1	0.0	1	1	30.0	2
3	1	0.0	1	3	15.0	2

Next steps: View recommended plots

```
for i in data.columns:
    data[i] = le.fit_transform(data[i])

data.head(4)
```

```
<ipython-input-97-9434e6d9d88e>:2: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user

<ipython-input-97-9434e6d9d88e>:2: SettingWithCopyWarning:


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<ipython-input-97-9434e6d9d88e>:2: SettingWithCopyWarning:


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Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user
```

	PreferredLoginDevice	PreferredPaymentMode	Gender	PreferedOrderCat	MaritalStatus
0	1	2	0	2	2
1	1	4	1	3	2
2	1	2	1	3	2
3	1	2	1	2	2

Next steps: View recommended plots

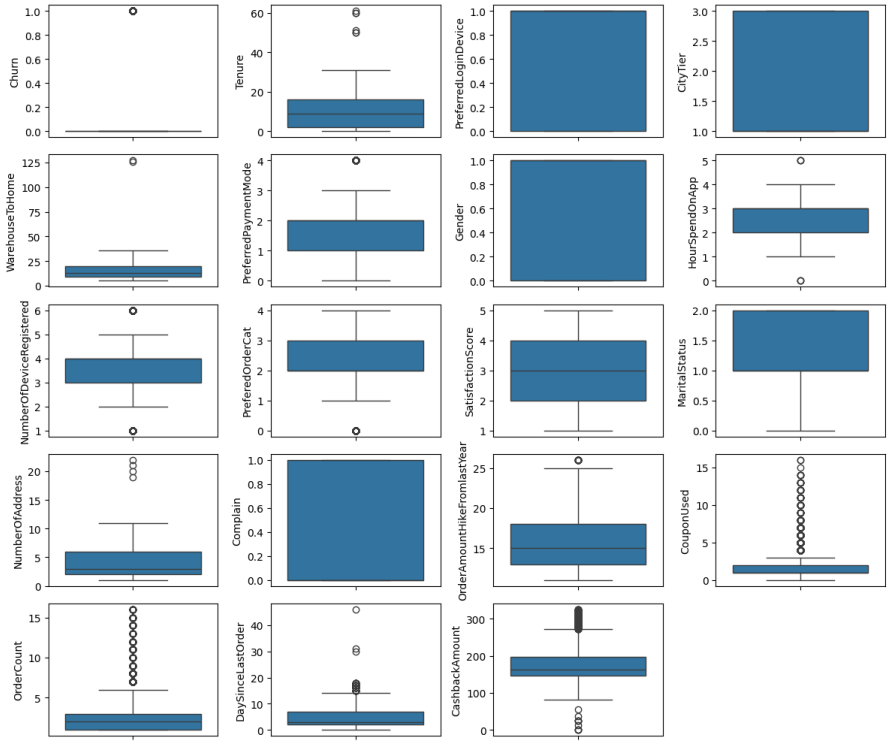
Handling Outliers

```
df.dtypes
```

```
Churn                          int64
Tenure                       float64
PreferredLoginDevice           int64
CityTier                       int64
WarehouseToHome              float64
PreferredPaymentMode           int64
Gender                         int64
HourSpendOnApp               float64
NumberOfDeviceRegistered       int64
PreferedOrderCat               int64
SatisfactionScore              int64
MaritalStatus                  int64
NumberOfAddress                int64
Complain                       int64
OrderAmountHikeFromlastYear  float64
CouponUsed                   float64
OrderCount                   float64
DaySinceLastOrder            float64
CashbackAmount               float64
dtype: object
```

```
fig = plt.figure(figsize=(12,18))
for i in range(len(df.columns)):
    fig.add_subplot(9,4,i+1)
```

```
    sns.boxplot(y=df.iloc[:,i])

plt.tight_layout()
plt.show()
```




```
def handle_outliers(df , column_name):
  Q1 = df[column_name].quantile(0.25)
  Q3 = df[column_name].quantile(0.75)
  IQR = Q3 - Q1

  # Define Upper and lower boundaries
  Upper = Q3 + IQR * 1.5
  lower = Q1 - IQR * 1.5

  # lets make filter for col values
  new_df = df[ (df[column_name] > lower) & (df[column_name] < Upper) ]

  return new_df


df.columns
```

```
    Index(['Churn', 'Tenure', 'PreferredLoginDevice', 'CityTier',
           'WarehouseToHome', 'PreferredPaymentMode', 'Gender', 'HourSpendOnApp',
           'NumberOfDeviceRegistered', 'PreferedOrderCat', 'SatisfactionScore',
           'MaritalStatus', 'NumberOfAddress', 'Complain',
           'OrderAmountHikeFromlastYear', 'CouponUsed', 'OrderCount',
```

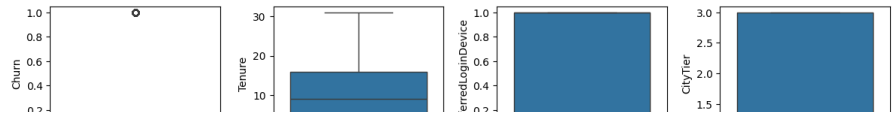
```
       'DaySinceLastOrder', 'CashbackAmount'],
      dtype='object')
```

```
cols_outliers = ['Tenure' , 'WarehouseToHome' , 'NumberOfAddress' , 'DaySinceLastOrder' , 'HourSpendOnApp' , 'NumberOfDeviceRegistered']

for col in cols_outliers:
    df = handle_outliers(df , col)

df.head(4)
```

	Churn	Tenure	PreferredLoginDevice	CityTier	WarehouseToHome	PreferredPaymentMode
0	1	4.0	1	3	6.0	2
1	1	0.0	1	1	8.0	4
2	1	0.0	1	1	30.0	2
3	1	0.0	1	3	15.0	2

Next steps: View recommended plots

```
fig = plt.figure(figsize=(12,18))
for i in range(len(df.columns)):
    fig.add_subplot(9,4,i+1)
    sns.boxplot(y=df.iloc[:,i])

plt.tight_layout()
plt.show()
```




```
corr_matrix = df.corr()
corr_matrix
```

	Churn	Tenure	PreferredLoginDevice	CityTier	Wareh
Churn	1.000000	-0.336058	-0.041250	0.069595	
Tenure	-0.336058	1.000000	0.034596	-0.065933	
PreferredLoginDevice	-0.041250	0.034596	1.000000	0.010097	
CityTier	0.069595	-0.065933	0.010097	1.000000	
WarehouseToHome	0.054768	-0.011849	-0.015852	0.014636	
PreferredPaymentMode	-0.005156	-0.016797	0.009610	0.251539	
Gender	0.038193	-0.054684	-0.012892	-0.022759	
HourSpendOnApp	0.004024	-0.008153	0.019242	-0.008230	
NumberOfDeviceRegistered	0.079116	-0.019592	-0.005323	0.007282	
PreferedOrderCat	0.105149	-0.180637	0.005137	-0.164040	