Cognizant Task 1

June 13, 2024

1 Task 1 EDA

[3]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
import statsmodels.api as sm
```

[4]:
```
#Read csv file into a DF
df = pd.read_csv('sample_sales_data.csv')
df.head()
```

[4]:
```
   Unnamed: 0                        transaction_id            timestamp  \
0           0  a1c82654-c52c-45b3-8ce8-4c2a1efe63ed  2022-03-02 09:51:38
1           1  931ad550-09e8-4da6-beaa-8c9d17be9c60  2022-03-06 10:33:59
2           2  ae133534-6f61-4cd6-b6b8-d1c1d8d90aea  2022-03-04 17:20:21
3           3  157cebd9-aaf0-475d-8a11-7c8e0f5b76e4  2022-03-02 17:23:58
4           4  a81a6cd3-5e0c-44a2-826c-aea43e46c514  2022-03-05 14:32:43

                             product_id category customer_type  unit_price  \
0  3bc6c1ea-0198-46de-9ffd-514ae3338713    fruit          gold        3.99
1  ad81b46c-bf38-41cf-9b54-5fe7f5eba93e    fruit      standard        3.99
2  7c55cbd4-f306-4c04-a030-628cbe7867c1    fruit       premium        0.19
3  80da8348-1707-403f-8be7-9e6deeccc883    fruit          gold        0.19
4  7f5e86e6-f06f-45f6-bf44-27b095c9ad1d    fruit         basic        4.49

   quantity  total payment_type
0         2   7.98     e-wallet
1         1   3.99     e-wallet
2         2   0.38     e-wallet
3         4   0.76     e-wallet
4         2   8.98   debit card
```

1.0.1 Date cleaning

Check for data types, missing values, duplicated rows and typos.

[5]:
```
df.dtypes
```

[5]:
```
Unnamed: 0          int64
transaction_id     object
timestamp          object
product_id         object
category           object
customer_type      object
unit_price        float64
quantity            int64
total             float64
payment_type       object
dtype: object
```

[6]:
```
#only need to change timestamp to date format
df['timestamp']=pd.to_datetime(df['timestamp'])
```

[7]:
```
#check data types
df.dtypes
```

[7]:
```
Unnamed: 0                 int64
transaction_id            object
timestamp         datetime64[ns]
product_id                object
category                  object
customer_type             object
unit_price               float64
quantity                   int64
total                    float64
payment_type              object
dtype: object
```

[8]:
```
#check null values
df.isna().sum()
```

[8]:
```
Unnamed: 0        0
transaction_id    0
timestamp         0
product_id        0
category          0
customer_type     0
unit_price        0
quantity          0
total             0
payment_type      0
dtype: int64
```

[9]:
```
#Check for duplicates
df.duplicated().sum()
```

[9]:
```
0
```

[10]:
```
#check for typos
df.customer_type.value_counts()
```

[10]:
```
customer_type
non-member    1601
standard      1595
premium       1590
basic         1526
gold          1517
Name: count, dtype: int64
```

[11]:
```
#check for typos
df.category.value_counts()
```

[11]:
```
category
fruit                   998
vegetables              846
packaged foods          507
baked goods             443
canned foods            431
refrigerated items      425
kitchen                 382
meat                    382
dairy                   375
beverages               301
cheese                  293
cleaning products       292
baking                  264
snacks                  263
frozen                  263
seafood                 253
medicine                243
baby products           224
condiments and sauces   181
personal care           177
pets                    161
spices and herbs        125
Name: count, dtype: int64
```

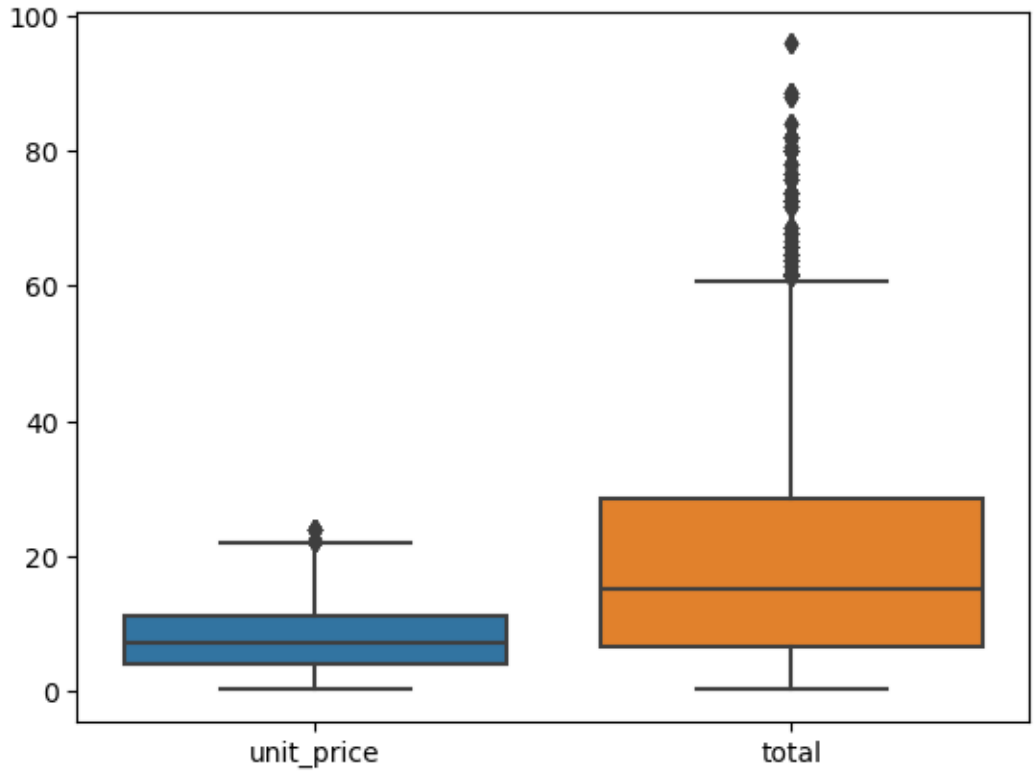
1.1 Descriptive Statistics

[7]:
```
#get summary stats for data
df.describe()
```

[7]:
```
         Unnamed: 0                      timestamp   unit_price     quantity  \
count   7829.000000                           7829  7829.000000  7829.000000
mean    3914.000000  2022-03-04 13:41:47.803550976     7.819480     2.501597
min        0.000000            2022-03-01 09:00:13     0.190000     1.000000
25%     1957.000000            2022-03-02 16:31:31     3.990000     1.000000
50%     3914.000000            2022-03-04 14:03:33     7.190000     3.000000
75%     5871.000000            2022-03-06 11:34:45    11.190000     4.000000
max     7828.000000            2022-03-07 19:59:54    23.990000     4.000000
std     2260.181962                            NaN     5.388088     1.122722

              total
count   7829.000000
mean      19.709905
min        0.190000
25%        6.570000
50%       14.970000
75%       28.470000
max       95.960000
std       17.446680
```

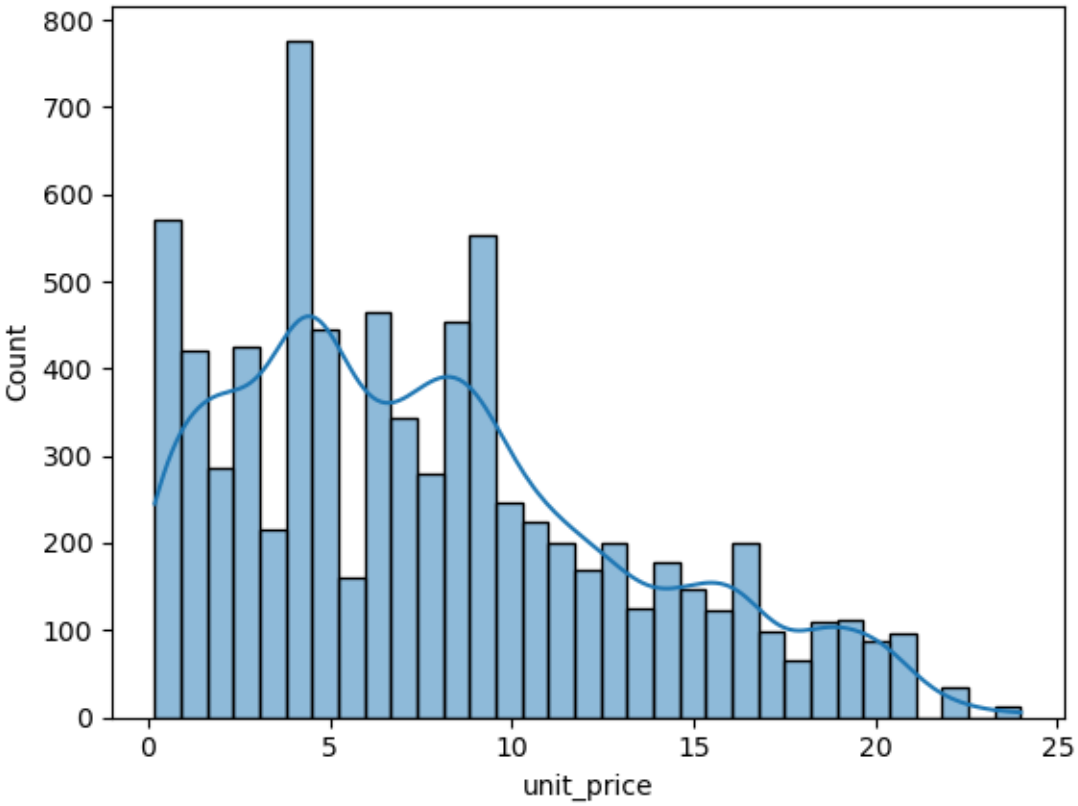
[188]:
```
#combine unit pirce and total columns into data frame
des = pd.DataFrame({'unit_price': df.unit_price, 'total': df.total })
```

[189]:
```
#create a box plot
sns.boxplot(data = des )
plt.show();
```



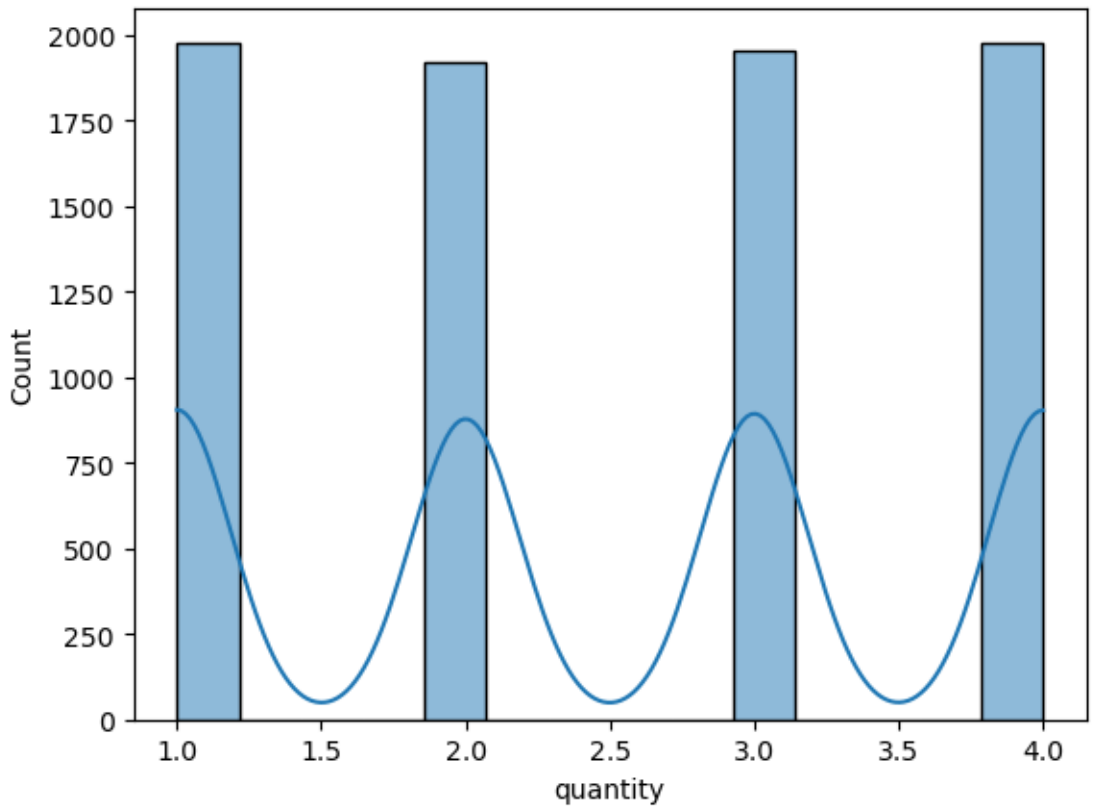
[54]:
```
#create a histplot to see distribution of unit price
sns.histplot(df.unit_price, kde= True)
plt.show();
```

```
C:\Users\natha\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119:
FutureWarning: use_inf_as_na option is deprecated and will be removed in a
future version. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
```



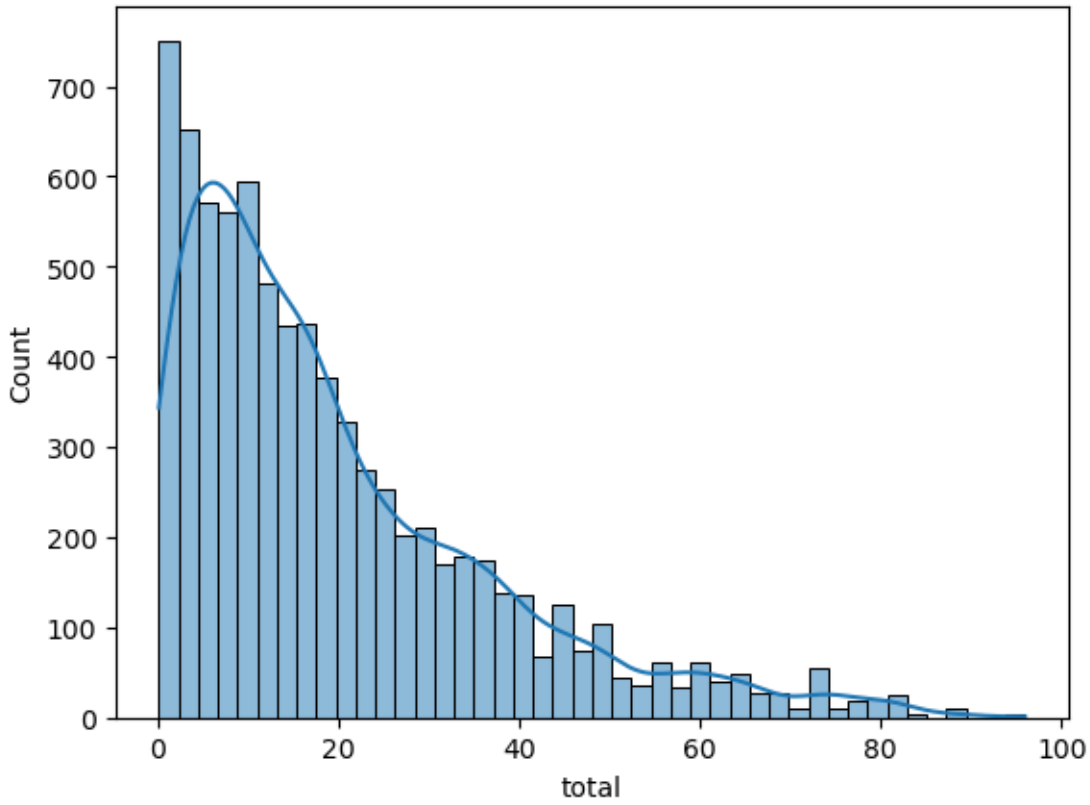
[55]:
```
#create a histplot to see distribution of quantity
sns.histplot(df.quantity, kde= True)
plt.show();
```

```
C:\Users\natha\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119:
FutureWarning: use_inf_as_na option is deprecated and will be removed in a
future version. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
```



[56]:
```
#create a histplot to see distribution of total
sns.histplot(df.total, kde= True)
plt.show();
```

```
C:\Users\natha\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119:
FutureWarning: use_inf_as_na option is deprecated and will be removed in a
future version. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
```



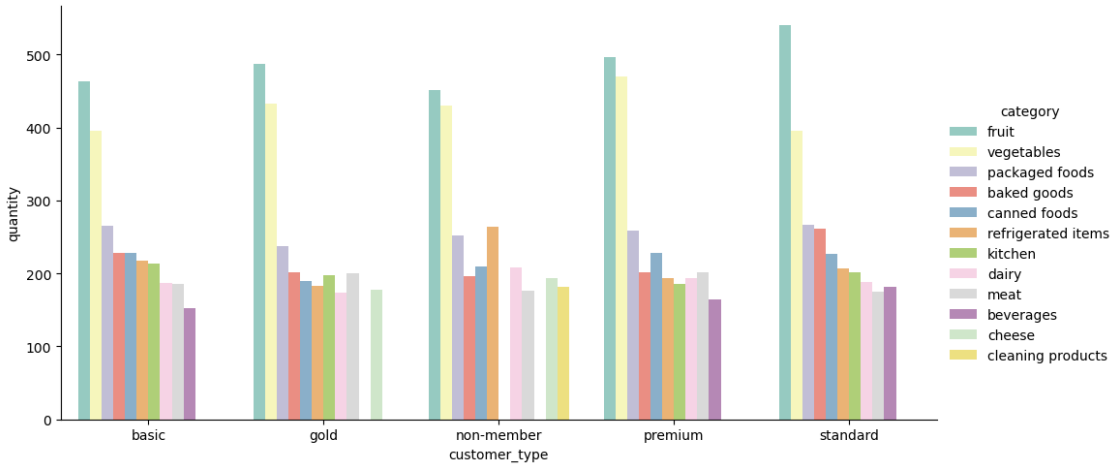
[64]:
```
df.head()
```

[64]:
```
   Unnamed: 0                        transaction_id           timestamp  \
0           0  a1c82654-c52c-45b3-8ce8-4c2a1efe63ed 2022-03-02 09:51:38
1           1  931ad550-09e8-4da6-beaa-8c9d17be9c60 2022-03-06 10:33:59
2           2  ae133534-6f61-4cd6-b6b8-d1c1d8d90aea 2022-03-04 17:20:21
3           3  157cebd9-aaf0-475d-8a11-7c8e0f5b76e4 2022-03-02 17:23:58
4           4  a81a6cd3-5e0c-44a2-826c-aea43e46c514 2022-03-05 14:32:43

                             product_id category customer_type  unit_price  \
0  3bc6c1ea-0198-46de-9ffd-514ae3338713    fruit          gold        3.99
1  ad81b46c-bf38-41cf-9b54-5fe7f5eba93e    fruit      standard        3.99
2  7c55cbd4-f306-4c04-a030-628cbe7867c1    fruit       premium        0.19
3  80da8348-1707-403f-8be7-9e6deeccc883    fruit          gold        0.19
4  7f5e86e6-f06f-45f6-bf44-27b095c9ad1d    fruit         basic        4.49

   quantity  total payment_type
0         2   7.98     e-wallet
1         1   3.99     e-wallet
2         2   0.38     e-wallet
3         4   0.76     e-wallet
```

```
4          2    8.98    debit card
```

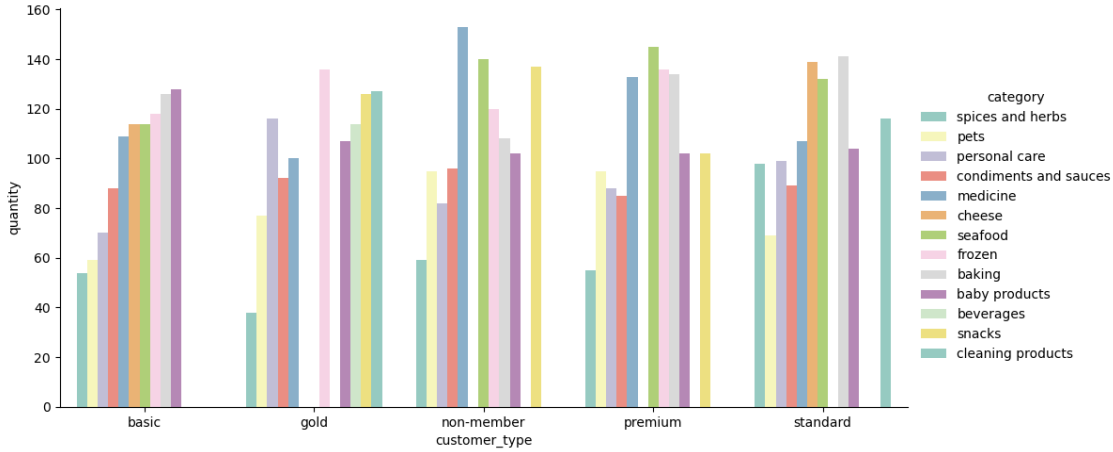
[184]:
```
#sort customer_type and category into groups with the top 10 categories by␣
 ↪quantity
df_quant_top = df.groupby(['customer_type', 'category'])['quantity'].sum().
 ↪groupby('customer_type', group_keys = False).nlargest(10).reset_index()
```

[185]:
```
#Create Catplot to view top categories for each customer type
sns.catplot(data = df_quant_top, x = 'customer_type', y='quantity',␣
 ↪hue='category', kind='bar', aspect = 2, palette='Set3')
plt.show();
```



[186]:
```
#sort customer_type and category into groups with bottom top 10 categories by␣
 ↪quantity
df_quant_bot = df.groupby(['customer_type', 'category'])['quantity'].sum().
 ↪groupby('customer_type', group_keys = False).nsmallest(10).reset_index()
```

[187]:
```
#Create Catplot to view bottom categories for each customer type
sns.catplot(data = df_quant_bot, x = 'customer_type', y='quantity',␣
 ↪hue='category', kind='bar', aspect = 2, palette='Set3')
plt.show();
```



[190]:
```
df.head()
```

[190]:
```
   Unnamed: 0                        transaction_id           timestamp  \
0           0  a1c82654-c52c-45b3-8ce8-4c2a1efe63ed 2022-03-02 09:51:38
1           1  931ad550-09e8-4da6-beaa-8c9d17be9c60 2022-03-06 10:33:59
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3           3  157cebd9-aaf0-475d-8a11-7c8e0f5b76e4 2022-03-02 17:23:58
4           4  a81a6cd3-5e0c-44a2-826c-aea43e46c514 2022-03-05 14:32:43

                             product_id category customer_type  unit_price  \
0  3bc6c1ea-0198-46de-9ffd-514ae3338713    fruit          gold        3.99
1  ad81b46c-bf38-41cf-9b54-5fe7f5eba93e    fruit      standard        3.99
2  7c55cbd4-f306-4c04-a030-628cbe7867c1    fruit       premium        0.19
3  80da8348-1707-403f-8be7-9e6deeccc883    fruit          gold        0.19
4  7f5e86e6-f06f-45f6-bf44-27b095c9ad1d    fruit         basic        4.49

   quantity  total payment_type
0         2   7.98     e-wallet
1         1   3.99     e-wallet
2         2   0.38     e-wallet
3         4   0.76     e-wallet
4         2   8.98   debit card
```

[198]:
```
df.dtypes
```

[198]:
```
Unnamed: 0          int64
transaction_id     object
timestamp           int32
product_id         object
category           object
customer_type      object
```

```
unit_price        float64
quantity            int64
total             float64
payment_type       object
dtype: object
```

[225]:
```
#convert timestamp to date day column extracting the day
df['dateday']= df.timestamp.dt.to_period('d').dt.to_timestamp()
```

[226]:
```
df.head()
```

[226]:
```
   Unnamed: 0                        transaction_id            timestamp  \
0           0  a1c82654-c52c-45b3-8ce8-4c2a1efe63ed 2022-03-02 09:51:38
1           1  931ad550-09e8-4da6-beaa-8c9d17be9c60 2022-03-06 10:33:59
2           2  ae133534-6f61-4cd6-b6b8-d1c1d8d90aea 2022-03-04 17:20:21
3           3  157cebd9-aaf0-475d-8a11-7c8e0f5b76e4 2022-03-02 17:23:58
4           4  a81a6cd3-5e0c-44a2-826c-aea43e46c514 2022-03-05 14:32:43

                             product_id category customer_type  unit_price  \
0  3bc6c1ea-0198-46de-9ffd-514ae3338713    fruit          gold        3.99
1  ad81b46c-bf38-41cf-9b54-5fe7f5eba93e    fruit      standard        3.99
2  7c55cbd4-f306-4c04-a030-628cbe7867c1    fruit       premium        0.19
3  80da8348-1707-403f-8be7-9e6deeccc883    fruit          gold        0.19
4  7f5e86e6-f06f-45f6-bf44-27b095c9ad1d    fruit         basic        4.49

   quantity  total payment_type    dateday
0         2   7.98     e-wallet 2022-03-02
1         1   3.99     e-wallet 2022-03-06
2         2   0.38     e-wallet 2022-03-04
3         4   0.76     e-wallet 2022-03-02
4         2   8.98   debit card 2022-03-05
```

[ ]:
```

```

[227]:
```
#Group day by quantity
df_time_series = df.groupby(['dateday'])['quantity'].sum().reset_index()
df_time_series
```

[227]:
```
     dateday  quantity
0 2022-03-01      2904
1 2022-03-02      2921
2 2022-03-03      2723
3 2022-03-04      2776
4 2022-03-05      2707
5 2022-03-06      2781
6 2022-03-07      2773
```

[230]:
```
#Show lineplot of quantity sold on each day.
plt.figure(figsize=(10,6))
sns.lineplot(data = df_time_series, x = 'dateday', y='quantity')
plt.show()
```

```
C:\Users\natha\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119:
FutureWarning: use_inf_as_na option is deprecated and will be removed in a
future version. Convert inf values to NaN before operating instead.
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  with pd.option_context('mode.use_inf_as_na', True):
```

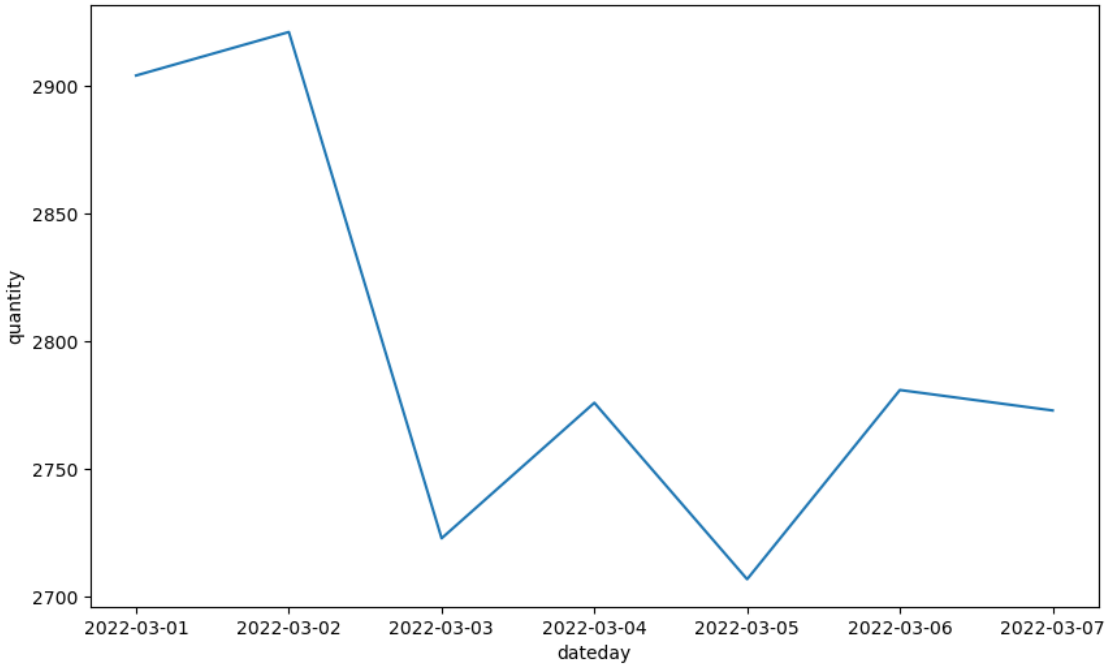

[231]:
```
#Group day by total
df_time_series = df.groupby(['dateday'])['total'].sum().reset_index()
df_time_series
```

[231]:

	dateday	total
0	2022-03-01	22183.96
1	2022-03-02	22500.79
2	2022-03-03	21405.47
3	2022-03-04	22262.64
4	2022-03-05	21803.03
5	2022-03-06	21865.79

```
6 2022-03-07  22287.17
```

[233]:
```
#Show lineplot for totals on each day
plt.figure(figsize=(10,6))
sns.lineplot(data = df_time_series, x = 'dateday', y='total')
plt.show()
```

```
C:\Users\natha\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119:
FutureWarning: use_inf_as_na option is deprecated and will be removed in a
future version. Convert inf values to NaN before operating instead.
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future version. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
```

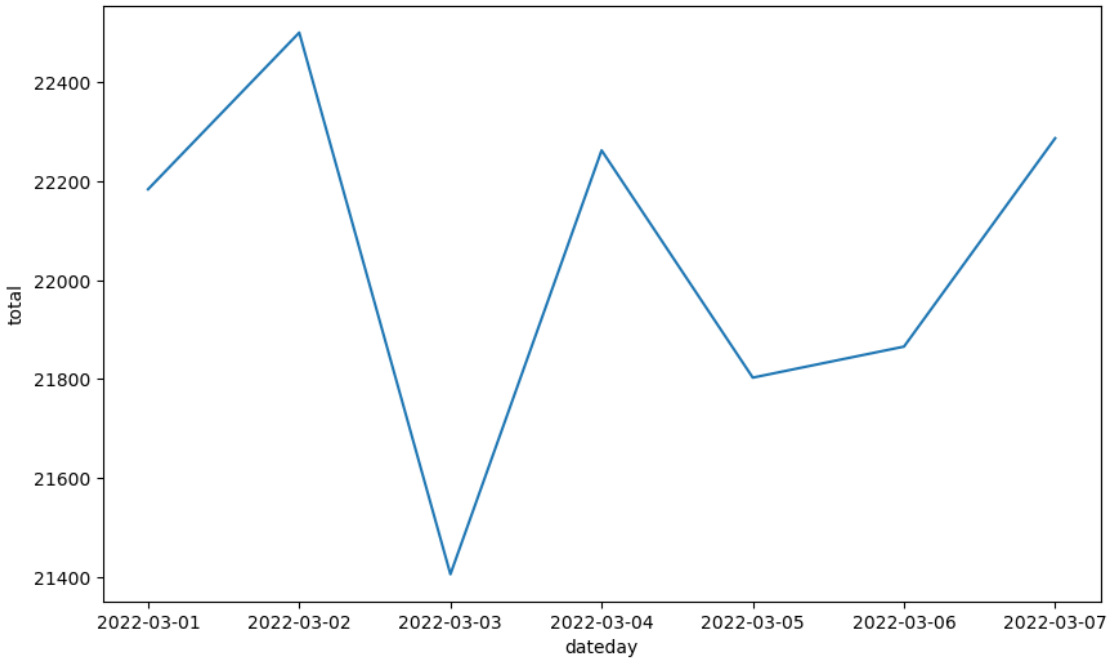

[235]:
```
#Extract hour from day
df['hour']=df['timestamp'].dt.hour
```

[236]:
```
#Group hour by quantity to find quantity sold for each hour
df_time_series = df.groupby(['hour'])['quantity'].sum().reset_index()
df_time_series
```

[236]:

	hour	quantity
0	9	1825
1	10	1764

```
2     11      1907
3     12      1793
4     13      1698
5     14      1768
6     15      1711
7     16      1812
8     17      1757
9     18      1785
10    19      1765
```

[237]:
```
#Plot to see quantity sold each hour
plt.figure(figsize=(10,6))
sns.lineplot(data = df_time_series, x = 'hour', y='quantity')
plt.show()
```

```
C:\Users\natha\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119:
FutureWarning: use_inf_as_na option is deprecated and will be removed in a
future version. Convert inf values to NaN before operating instead.
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  with pd.option_context('mode.use_inf_as_na', True):
```
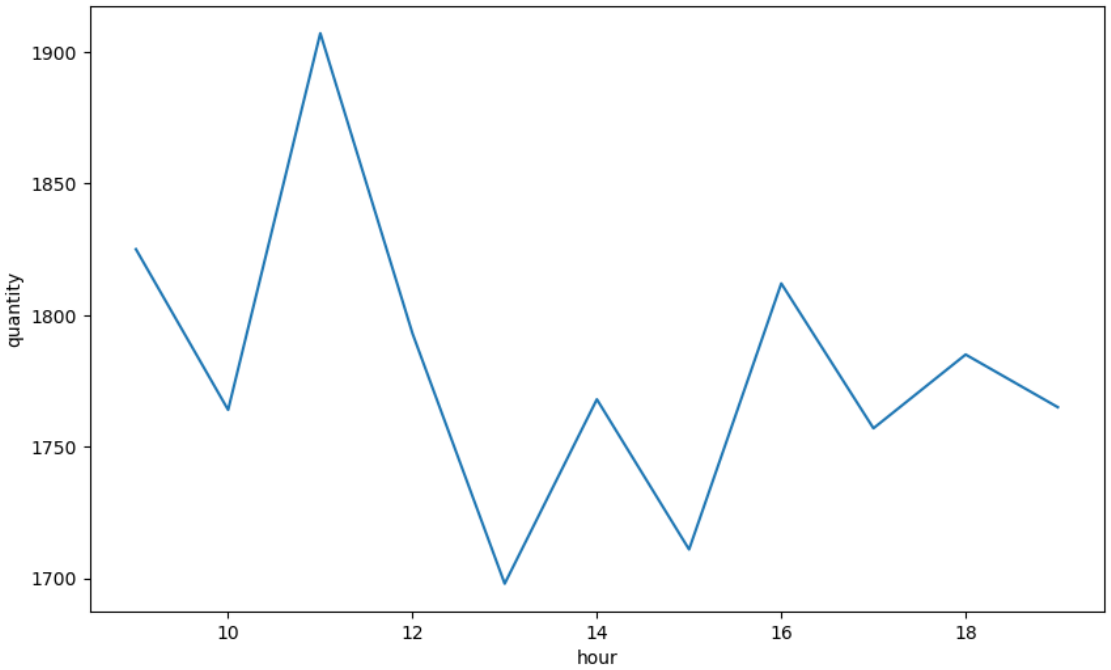



[298]:
```
#Group category and hour by quantity and select top 5 hours which show top 5␣
 ↪categories for each hour
df_cat_hour = df.groupby(['category','hour'])['quantity'].sum().groupby('hour',␣
 ↪group_keys=False).nlargest(5).reset_index()
#convert hour to string type
df_cat_hour['hour']= df_cat_hour['hour'].astype(str)
```

[299]:
```
df_cat_hour
```

[299]:

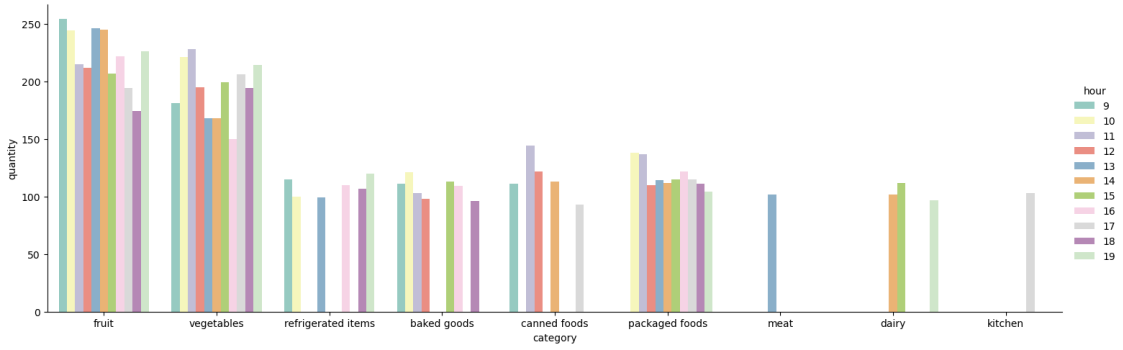
	category	hour	quantity
0	fruit	9	254
1	vegetables	9	181
2	refrigerated items	9	115
3	baked goods	9	111
4	canned foods	9	111
5	fruit	10	244
6	vegetables	10	221
7	packaged foods	10	138
8	baked goods	10	121
9	refrigerated items	10	100
10	vegetables	11	228
11	fruit	11	215
12	canned foods	11	144
13	packaged foods	11	137
14	baked goods	11	103
15	fruit	12	212
16	vegetables	12	195
17	canned foods	12	122
18	packaged foods	12	110
19	baked goods	12	98
20	fruit	13	246
21	vegetables	13	168
22	packaged foods	13	114
23	meat	13	102
24	refrigerated items	13	99
25	fruit	14	245
26	vegetables	14	168
27	canned foods	14	113
28	packaged foods	14	112
29	dairy	14	102
30	fruit	15	207
31	vegetables	15	199
32	packaged foods	15	115
33	baked goods	15	113
34	dairy	15	112
35	fruit	16	222
36	vegetables	16	150

```
37      packaged foods   16       122
38  refrigerated items   16       110
39        baked goods    16       109
40          vegetables   17       206
41               fruit   17       194
42      packaged foods   17       115
43             kitchen   17       103
44        canned foods   17        93
45          vegetables   18       194
46               fruit   18       174
47      packaged foods   18       111
48  refrigerated items   18       107
49        baked goods    18        96
50               fruit   19       226
51          vegetables   19       214
52  refrigerated items   19       120
53      packaged foods   19       104
54               dairy   19        97
```

[300]:
```
df_cat_hour.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 55 entries, 0 to 54
Data columns (total 3 columns):
 #   Column    Non-Null Count  Dtype 
---  ------    --------------  ----- 
 0   category  55 non-null     object
 1   hour      55 non-null     object
 2   quantity  55 non-null     int64 
dtypes: int64(1), object(2)
memory usage: 1.4+ KB
```

[303]:
```
#show catplot to visual top 5 categories for each hour
sns.catplot(data=df_cat_hour, x='category',y='quantity', hue='hour', aspect =␣
 ↪3, kind='bar',palette = 'Set3')
plt.show()
```



[ ]: