Quantium Data Analysis Intenrship_Task 1

December 15, 2023

0.1 Quantium Virtual Internship

[1]:
```
# import statements
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import datetime as dt
import seaborn as sns
```

[34]:
```
# import dataset
chips = pd.read_excel(r"C:\Users\REYOK\Desktop\Quantium\QVI_transaction_data.
 ↪xlsx")
chips_dem = pd.read_csv(r"C:
 ↪\Users\REYOK\Desktop\Quantium\QVI_purchase_behaviour.csv")
```

[35]:
```
# Exploring the datasets
chips.head(6)
```

[35]:
```
    DATE  STORE_NBR  LYLTY_CARD_NBR  TXN_ID  PROD_NBR  \
0  43390          1            1000       1         5
1  43599          1            1307     348        66
2  43605          1            1343     383        61
3  43329          2            2373     974        69
4  43330          2            2426    1038       108
5  43604          4            4074    2982        57

                                  PROD_NAME  PROD_QTY  TOT_SALES
0    Natural Chip        Compny SeaSalt175g         2        6.0
1                  CCs Nacho Cheese    175g         3        6.3
2    Smiths Crinkle Cut  Chips Chicken 170g         2        2.9
3    Smiths Chip Thinly  S/Cream&Onion 175g         5       15.0
4  Kettle Tortilla ChpsHny&Jlpno Chili 150g         3       13.8
5  Old El Paso Salsa   Dip Tomato Mild 300g         1        5.1
```

[36]:
```
# exploring data types and for missing values
chips.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 264836 entries, 0 to 264835
```

```
Data columns (total 8 columns):
 #   Column          Non-Null Count   Dtype
---  ------          --------------   -----
 0   DATE            264836 non-null  int64
 1   STORE_NBR       264836 non-null  int64
 2   LYLTY_CARD_NBR  264836 non-null  int64
 3   TXN_ID          264836 non-null  int64
 4   PROD_NBR        264836 non-null  int64
 5   PROD_NAME       264836 non-null  object
 6   PROD_QTY        264836 non-null  int64
 7   TOT_SALES       264836 non-null  float64
dtypes: float64(1), int64(6), object(1)
memory usage: 16.2+ MB
```

[37]:

```
chips_dem.head(6)
```

[37]:

```
   LYLTY_CARD_NBR               LIFESTAGE PREMIUM_CUSTOMER
0            1000   YOUNG SINGLES/COUPLES          Premium
1            1002   YOUNG SINGLES/COUPLES       Mainstream
2            1003          YOUNG FAMILIES           Budget
3            1004   OLDER SINGLES/COUPLES       Mainstream
4            1005  MIDAGE SINGLES/COUPLES       Mainstream
5            1007   YOUNG SINGLES/COUPLES           Budget
```

[38]:

```
# exploring data types and for missing values
chips_dem.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 72637 entries, 0 to 72636
Data columns (total 3 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   LYLTY_CARD_NBR    72637 non-null  int64
 1   LIFESTAGE         72637 non-null  object
 2   PREMIUM_CUSTOMER  72637 non-null  object
dtypes: int64(1), object(2)
memory usage: 1.7+ MB
```

[39]:

```
# exploring column and counts
chips_dem['LIFESTAGE'].value_counts()
```

[39]:

```
RETIREES                  14805
OLDER SINGLES/COUPLES     14609
YOUNG SINGLES/COUPLES     14441
OLDER FAMILIES             9780
YOUNG FAMILIES             9178
MIDAGE SINGLES/COUPLES     7275
NEW FAMILIES               2549
```

```
Name: LIFESTAGE, dtype: int64
```

[40]:

```
# exploring column and counts
chips_dem['PREMIUM_CUSTOMER'].value_counts()
```

[40]:

```
Mainstream    29245
Budget        24470
Premium       18922
Name: PREMIUM_CUSTOMER, dtype: int64
```

[41]:

```
# Convert "DATE" column into datetime
chips['DATE'] = pd.TimedeltaIndex(chips['DATE'], unit='d') + dt.
 ↪datetime(1899,12,30)
chips.head(6)
```

[41]:

```
        DATE  STORE_NBR  LYLTY_CARD_NBR  TXN_ID  PROD_NBR  \
0 2018-10-17          1            1000       1         5
1 2019-05-14          1            1307     348        66
2 2019-05-20          1            1343     383        61
3 2018-08-17          2            2373     974        69
4 2018-08-18          2            2426    1038       108
5 2019-05-19          4            4074    2982        57

                                  PROD_NAME  PROD_QTY  TOT_SALES
0    Natural Chip        Compny SeaSalt175g         2        6.0
1                  CCs Nacho Cheese    175g         3        6.3
2    Smiths Crinkle Cut  Chips Chicken 170g         2        2.9
3    Smiths Chip Thinly  S/Cream&Onion 175g         5       15.0
4  Kettle Tortilla ChpsHny&Jlpno Chili 150g         3       13.8
5  Old El Paso Salsa   Dip Tomato Mild 300g         1        5.1
```

[ ]:

```

```

[42]:

```
# Examin PROD_NAME
chips['PROD_NAME'].unique()
```

[42]:

```
array(['Natural Chip        Compny SeaSalt175g',
       'CCs Nacho Cheese    175g',
       'Smiths Crinkle Cut  Chips Chicken 170g',
       'Smiths Chip Thinly  S/Cream&Onion 175g',
       'Kettle Tortilla ChpsHny&Jlpno Chili 150g',
       'Old El Paso Salsa   Dip Tomato Mild 300g',
       'Smiths Crinkle Chips Salt & Vinegar 330g',
       'Grain Waves         Sweet Chilli 210g',
       'Doritos Corn Chip Mexican Jalapeno 150g',
       'Grain Waves Sour    Cream&Chives 210G',
       'Kettle Sensations   Siracha Lime 150g',
       'Twisties Cheese     270g', 'WW Crinkle Cut      Chicken 175g',
       'Thins Chips Light&  Tangy 175g', 'CCs Original 175g',
       'Burger Rings 220g', 'NCC Sour Cream &    Garden Chives 175g',
       'Doritos Corn Chip Southern Chicken 150g',
       'Cheezels Cheese Box 125g', 'Smiths Crinkle      Original 330g',
       'Infzns Crn Crnchers Tangy Gcamole 110g',
       'Kettle Sea Salt     And Vinegar 175g',
       'Smiths Chip Thinly  Cut Original 175g', 'Kettle Original 175g',
       'Red Rock Deli Thai  Chilli&Lime 150g',
       'Pringles Sthrn FriedChicken 134g', 'Pringles Sweet&Spcy BBQ 134g',
       'Red Rock Deli SR    Salsa & Mzzrlla 150g',
       'Thins Chips         Originl saltd 175g',
       'Red Rock Deli Sp    Salt & Truffle 150G',
       'Smiths Thinly       Swt Chli&S/Cream175G', 'Kettle Chilli 175g',
       'Doritos Mexicana    170g',
       'Smiths Crinkle Cut  French OnionDip 150g',
       'Natural ChipCo      Hony Soy Chckn175g',
       'Dorito Corn Chp     Supreme 380g', 'Twisties Chicken270g',
       'Smiths Thinly Cut   Roast Chicken 175g',
       'Smiths Crinkle Cut  Tomato Salsa 150g',
       'Kettle Mozzarella   Basil & Pesto 175g',
       'Infuzions Thai SweetChili PotatoMix 110g',
       'Kettle Sensations   Camembert & Fig 150g',
       'Smith Crinkle Cut   Mac N Cheese 150g',
       'Kettle Honey Soy    Chicken 175g',
       'Thins Chips Seasonedchicken 175g',
       'Smiths Crinkle Cut  Salt & Vinegar 170g',
       'Infuzions BBQ Rib   Prawn Crackers 110g',
       'GrnWves Plus Btroot & Chilli Jam 180g',
       'Tyrrells Crisps     Lightly Salted 165g',
       'Kettle Sweet Chilli And Sour Cream 175g',
       'Doritos Salsa       Medium 300g', 'Kettle 135g Swt Pot Sea Salt',
       'Pringles SourCream  Onion 134g',
       'Doritos Corn Chips  Original 170g',
       'Twisties Cheese     Burger 250g',
       'Old El Paso Salsa   Dip Chnky Tom Ht300g',
       'Cobs Popd Swt/Chlli &Sr/Cream Chips 110g',
       'Woolworths Mild     Salsa 300g',
       'Natural Chip Co     Tmato Hrb&Spce 175g',
       'Smiths Crinkle Cut  Chips Original 170g',
       'Cobs Popd Sea Salt  Chips 110g',
       'Smiths Crinkle Cut  Chips Chs&Onion170g',
       'French Fries Potato Chips 175g',
       'Old El Paso Salsa   Dip Tomato Med 300g',
       'Doritos Corn Chips  Cheese Supreme 170g',
       'Pringles Original   Crisps 134g',
       'RRD Chilli&         Coconut 150g',
       'WW Original Corn    Chips 200g',
       'Thins Potato Chips  Hot & Spicy 175g',
       'Cobs Popd Sour Crm  &Chives Chips 110g',
       'Smiths Crnkle Chip  Orgnl Big Bag 380g',
       'Doritos Corn Chips  Nacho Cheese 170g',
       'Kettle Sensations   BBQ&Maple 150g',
       'WW D/Style Chip     Sea Salt 200g',
       'Pringles Chicken    Salt Crips 134g',
       'WW Original Stacked Chips 160g',
       'Smiths Chip Thinly  CutSalt/Vinegr175g', 'Cheezels Cheese 330g',
       'Tostitos Lightly    Salted 175g',
       'Thins Chips Salt &  Vinegar 175g',
       'Smiths Crinkle Cut  Chips Barbecue 170g', 'Cheetos Puffs 165g',
       'RRD Sweet Chilli &  Sour Cream 165g',
       'WW Crinkle Cut      Original 175g',
       'Tostitos Splash Of  Lime 175g', 'Woolworths Medium   Salsa 300g',
       'Kettle Tortilla ChpsBtroot&Ricotta 150g',
       'CCs Tasty Cheese    175g', 'Woolworths Cheese   Rings 190g',
       'Tostitos Smoked     Chipotle 175g', 'Pringles Barbeque   134g',
       'WW Supreme Cheese   Corn Chips 200g',
       'Pringles Mystery    Flavour 134g',
       'Tyrrells Crisps     Ched & Chives 165g',
       'Snbts Whlgrn Crisps Cheddr&Mstrd 90g',
       'Cheetos Chs & Bacon Balls 190g', 'Pringles Slt Vingar 134g',
       'Infuzions SourCream&Herbs Veg Strws 110g',
       'Kettle Tortilla ChpsFeta&Garlic 150g',
       'Infuzions Mango     Chutny Papadums 70g',
       'RRD Steak &         Chimuchurri 150g',
       'RRD Honey Soy       Chicken 165g',
       'Sunbites Whlegrn    Crisps Frch/Onin 90g',
       'RRD Salt & Vinegar  165g', 'Doritos Cheese      Supreme 330g',
       'Smiths Crinkle Cut  Snag&Sauce 150g',
       'WW Sour Cream &OnionStacked Chips 160g',
       'RRD Lime & Pepper   165g',
       'Natural ChipCo Sea  Salt & Vinegr 175g',
       'Red Rock Deli Chikn&Garlic Aioli 150g',
       'RRD SR Slow Rst     Pork Belly 150g', 'RRD Pc Sea Salt     165g',
       'Smith Crinkle Cut   Bolognese 150g', 'Doritos Salsa Mild  300g'],
      dtype=object)
```

[43]:
```
# seperating chips weight
chips['WEIGHT'] = chips['PROD_NAME'].str[-4:]
chips['WEIGHT'].value_counts()
```

[43]:
```
175g    64929
150g    41633
134g    25102
```

```
110g    22387
170g    19983
165g    15297
300g    15166
330g    12540
380g     6418
270g     6285
200g     4473
Salt     3257
250g     3169
210g     3167
210G     3105
 90g     3008
190g     2995
160g     2970
220g     1564
 70g     1507
150G     1498
180g     1468
175G     1461
125g     1454
Name: WEIGHT, dtype: int64
```

[44]:

```
# correcting the data
chips['WEIGHT'] = chips['WEIGHT'].replace({'Salt':'135g', '175G':'175g', '150G':
 ↪'150g', '210G':'210g'})
chips['WEIGHT'].value_counts()
```

[44]:

```
175g    66390
150g    43131
134g    25102
110g    22387
170g    19983
165g    15297
300g    15166
330g    12540
380g     6418
270g     6285
210g     6272
200g     4473
135g     3257
250g     3169
 90g     3008
190g     2995
160g     2970
220g     1564
 70g     1507
```

```
180g     1468
125g     1454
Name: WEIGHT, dtype: int64
```

[45]:

```
# drooping 'salsa' from the datasets because is not a chip

index_drop = chips[chips['PROD_NAME'] == 'Old El Paso Salsa'].index

chips = chips.drop(index_drop)
```

[46]:

```
# confirming salsa was dropped
chips[chips["PROD_NAME"] == "Old El Paso Salsa"].count()
```

[46]:

```
DATE              0
STORE_NBR         0
LYLTY_CARD_NBR    0
TXN_ID            0
PROD_NBR          0
PROD_NAME         0
PROD_QTY          0
TOT_SALES         0
WEIGHT            0
dtype: int64
```

[47]:

```
# seperating chips Brand
chips["BRAND"] = chips['PROD_NAME'].str.split().str.get(0)
chips["BRAND"].value_counts()
```

[47]:

```
Kettle        41288
Smiths        28860
Pringles      25102
Doritos       24962
Thins         14075
RRD           11894
Infuzions     11057
WW            10320
Cobs           9693
Tostitos       9471
Twisties       9454
Old            9324
Tyrrells       6442
Grain          6272
Natural        6050
Red            5885
Cheezels       4603
CCs            4551
Woolworths     4437
```

```
Dorito          3185
Infzns          3144
Smith           2963
Cheetos         2927
Snbts           1576
Burger          1564
GrnWves         1468
Sunbites        1432
NCC             1419
French          1418
Name: BRAND, dtype: int64
```

[49]:

```
# correcting the duplicate brand name
chips["BRAND"] = chips["BRAND"].replace({'Red':'RRD', 'Smith':'Smiths',␣
 ↪'Dorito':'Doritos', 'Infzns':'Infuzions', 'Snbts':'Sunbites', 'Grain':
 ↪'GrnWves', 'WW':'Woolworths', 'NCC':'Natural'})
chips["BRAND"].value_counts()
```

[49]:

```
Kettle        41288
Smiths        31823
Doritos       28147
Pringles      25102
RRD           17779
Woolworths    14757
Infuzions     14201
Thins         14075
Cobs           9693
Tostitos       9471
Twisties       9454
Old            9324
GrnWves        7740
Natural        7469
Tyrrells       6442
Cheezels       4603
CCs            4551
Sunbites       3008
Cheetos        2927
Burger         1564
French         1418
Name: BRAND, dtype: int64
```

[50]:

```
# lets check the date column
chips_date = chips.sort_values(by='DATE')

# Calculate the expected date range
start_date = chips_date['DATE'].min()
end_date = chips_date['DATE'].max()
```

```
expected_date_range = pd.date_range(start=start_date, end=end_date, freq='D')

# Compare the actual date range with the expected date range
if expected_date_range.equals(chips_date['DATE']):
    print(f"The {DATE} column contains a complete range of dates.")
else:
    # Identify missing dates or gaps
    missing_dates = expected_date_range[~expected_date_range.
 ↪isin(chips_date['DATE'])]
    print(f"The {'DATE'} column has the following missing dates or gaps:")
    print(missing_dates)
```

```
The DATE column has the following missing dates or gaps:
DatetimeIndex(['2018-12-25'], dtype='datetime64[ns]', freq='D')
```

[51]:
```
# adding the missing date and creating a datetime column
chips['SHORT_DATE'] = pd.to_datetime(chips['DATE']).dt.strftime("%Y-%m-%d")
chips_christmas = {"SHORT_DATE": "2018-12-25"}
chips = chips.append(chips_christmas, ignore_index=True)
chips["SHORT_DATE"].value_counts(dropna=False)
```

```
C:\Users\REYOK\AppData\Local\Temp\ipykernel_2088\3988055390.py:4: FutureWarning:
The frame.append method is deprecated and will be removed from pandas in a
future version. Use pandas.concat instead.
  chips = chips.append(chips_christmas, ignore_index=True)
```

[51]:
```
2018-12-24    939
2018-12-23    917
2018-12-22    915
2018-12-19    906
2018-12-18    862
             …
2019-06-24    662
2019-06-13    659
2018-10-18    658
2018-11-25    648
2018-12-25      1
Name: SHORT_DATE, Length: 365, dtype: int64
```

[52]:
```
chips
```

[52]:
```
              DATE  STORE_NBR  LYLTY_CARD_NBR    TXN_ID  PROD_NBR  \
0       2018-10-17        1.0          1000.0       1.0       5.0
1       2019-05-14        1.0          1307.0     348.0      66.0
2       2019-05-20        1.0          1343.0     383.0      61.0
3       2018-08-17        2.0          2373.0     974.0      69.0
4       2018-08-18        2.0          2426.0    1038.0     108.0
…            …          …               …         …         …
```

```
264832 2018-08-13      272.0         272358.0  270154.0      74.0
264833 2018-11-06      272.0         272379.0  270187.0      51.0
264834 2018-12-27      272.0         272379.0  270188.0      42.0
264835 2018-09-22      272.0         272380.0  270189.0      74.0
264836        NaT        NaN              NaN       NaN       NaN

                                       PROD_NAME  PROD_QTY  TOT_SALES WEIGHT  \
0         Natural Chip        Compny SeaSalt175g       2.0        6.0   175g
1                       CCs Nacho Cheese    175g       3.0        6.3   175g
2         Smiths Crinkle Cut  Chips Chicken 170g       2.0        2.9   170g
3         Smiths Chip Thinly  S/Cream&Onion 175g       5.0       15.0   175g
4       Kettle Tortilla ChpsHny&Jlpno Chili 150g       3.0       13.8   150g
…                                            …       …         …    …
264832            Tostitos Splash Of  Lime 175g       1.0        4.4   175g
264833                  Doritos Mexicana    170g       2.0        8.8   170g
264834   Doritos Corn Chip Mexican Jalapeno 150g       2.0        7.8   150g
264835            Tostitos Splash Of  Lime 175g       2.0        8.8   175g
264836                                       NaN       NaN        NaN    NaN

           BRAND  SHORT_DATE
0        Natural  2018-10-17
1            CCs  2019-05-14
2         Smiths  2019-05-20
3         Smiths  2018-08-17
4         Kettle  2018-08-18
…           …         …
264832  Tostitos  2018-08-13
264833   Doritos  2018-11-06
264834   Doritos  2018-12-27
264835  Tostitos  2018-09-22
264836       NaN  2018-12-25

[264837 rows x 11 columns]
```

[53]:

```
chips.sort_values(by='TOT_SALES')
```

[53]:

```
             DATE  STORE_NBR  LYLTY_CARD_NBR    TXN_ID  PROD_NBR  \
204061 2019-05-16       41.0         41280.0   38218.0      35.0
81945  2019-05-05        9.0          9179.0    8587.0      76.0
112186 2019-03-24      188.0        188046.0  189373.0      35.0
117979 2018-08-14      247.0        247086.0  249122.0      76.0
185349 2018-08-19      183.0        183209.0  186061.0      76.0
…             …        …             …       …       …
5179   2018-08-15       94.0         94148.0   93390.0      14.0
150683 2019-05-20      118.0        118021.0  120799.0      14.0
69763  2019-05-20      226.0        226000.0  226210.0       4.0
69762  2018-08-19      226.0        226000.0  226201.0       4.0
```

```
264836        NaT        NaN             NaN       NaN       NaN

                                     PROD_NAME  PROD_QTY  TOT_SALES WEIGHT  \
204061          Woolworths Mild     Salsa 300g       1.0        1.5   300g
81945           Woolworths Medium   Salsa 300g       1.0        1.5   300g
112186          Woolworths Mild     Salsa 300g       1.0        1.5   300g
117979          Woolworths Medium   Salsa 300g       1.0        1.5   300g
185349          Woolworths Medium   Salsa 300g       1.0        1.5   300g
…                                        …       …        …    …
5179    Smiths Crnkle Chip  Orgnl Big Bag 380g       5.0       29.5   380g
150683  Smiths Crnkle Chip  Orgnl Big Bag 380g       5.0       29.5   380g
69763         Dorito Corn Chp     Supreme 380g     200.0      650.0   380g
69762         Dorito Corn Chp     Supreme 380g     200.0      650.0   380g
264836                                     NaN       NaN        NaN    NaN

             BRAND  SHORT_DATE
204061  Woolworths  2019-05-16
81945   Woolworths  2019-05-05
112186  Woolworths  2019-03-24
117979  Woolworths  2018-08-14
185349  Woolworths  2018-08-19
…            …         …
5179        Smiths  2018-08-15
150683      Smiths  2019-05-20
69763      Doritos  2019-05-20
69762      Doritos  2018-08-19
264836         NaN  2018-12-25

[264837 rows x 11 columns]
```

[54]:

```
# Looking at the output above looks like we have an outliers
chips[chips["LYLTY_CARD_NBR"] == 226000]
```

[54]:

```
            DATE  STORE_NBR  LYLTY_CARD_NBR    TXN_ID  PROD_NBR  \
69762 2018-08-19      226.0        226000.0  226201.0       4.0
69763 2019-05-20      226.0        226000.0  226210.0       4.0

                              PROD_NAME  PROD_QTY  TOT_SALES WEIGHT    BRAND  \
69762  Dorito Corn Chp     Supreme 380g     200.0      650.0   380g  Doritos
69763  Dorito Corn Chp     Supreme 380g     200.0      650.0   380g  Doritos

       SHORT_DATE
69762  2018-08-19
69763  2019-05-20
```

[55]:

```
# Dropping the outliers from the dataset
chips = chips.drop([69762, 69763])
chips = chips.reset_index(drop=True)
```

[56]:
```
chips.sort_values(by='TOT_SALES')
```

[56]:
```
             DATE  STORE_NBR  LYLTY_CARD_NBR    TXN_ID  PROD_NBR  \
27969  2018-07-30      255.0        255043.0  254583.0      35.0
253544 2019-03-07      205.0        205164.0  204236.0      35.0
186492 2019-01-28       18.0         18098.0   15308.0      35.0
98642  2019-02-18      266.0        266479.0  264307.0      35.0
78589  2018-09-02      220.0        220445.0  220012.0      76.0
…             …          …               …         …         …
55558  2019-05-14      190.0        190113.0  190914.0      14.0
117848 2019-05-19      194.0        194308.0  194516.0      14.0
184967 2019-05-20       44.0         44350.0   40394.0      14.0
150681 2019-05-20      118.0        118021.0  120799.0      14.0
264834        NaT        NaN             NaN       NaN       NaN

                                     PROD_NAME  PROD_QTY  TOT_SALES WEIGHT  \
27969          Woolworths Mild     Salsa 300g       1.0        1.5   300g
253544         Woolworths Mild     Salsa 300g       1.0        1.5   300g
186492         Woolworths Mild     Salsa 300g       1.0        1.5   300g
98642          Woolworths Mild     Salsa 300g       1.0        1.5   300g
78589          Woolworths Medium   Salsa 300g       1.0        1.5   300g
…                                          …         …          …      …
55558   Smiths Crnkle Chip  Orgnl Big Bag 380g       5.0       29.5   380g
117848  Smiths Crnkle Chip  Orgnl Big Bag 380g       5.0       29.5   380g
184967  Smiths Crnkle Chip  Orgnl Big Bag 380g       5.0       29.5   380g
150681  Smiths Crnkle Chip  Orgnl Big Bag 380g       5.0       29.5   380g
264834                                     NaN       NaN        NaN    NaN

             BRAND  SHORT_DATE
27969   Woolworths  2018-07-30
253544  Woolworths  2019-03-07
186492  Woolworths  2019-01-28
98642   Woolworths  2019-02-18
78589   Woolworths  2018-09-02
…                …           …
55558       Smiths  2019-05-14
117848      Smiths  2019-05-19
184967      Smiths  2019-05-20
150681      Smiths  2019-05-20
264834         NaN  2018-12-25

[264835 rows x 11 columns]
```

[57]:
```
# merging both datasets
chips_merged = pd.merge(chips, chips_dem, on= "LYLTY_CARD_NBR", how="left")
```

```
chips_merged
```

[57]:

```
             DATE  STORE_NBR  LYLTY_CARD_NBR    TXN_ID  PROD_NBR  \
0      2018-10-17        1.0          1000.0       1.0       5.0
1      2019-05-14        1.0          1307.0     348.0      66.0
2      2019-05-20        1.0          1343.0     383.0      61.0
3      2018-08-17        2.0          2373.0     974.0      69.0
4      2018-08-18        2.0          2426.0    1038.0     108.0
…           …        …             …       …       …
264830 2018-08-13      272.0        272358.0  270154.0      74.0
264831 2018-11-06      272.0        272379.0  270187.0      51.0
264832 2018-12-27      272.0        272379.0  270188.0      42.0
264833 2018-09-22      272.0        272380.0  270189.0      74.0
264834        NaT        NaN             NaN       NaN       NaN

                                       PROD_NAME  PROD_QTY  TOT_SALES WEIGHT  \
0         Natural Chip        Compny SeaSalt175g       2.0        6.0   175g
1                       CCs Nacho Cheese    175g       3.0        6.3   175g
2         Smiths Crinkle Cut  Chips Chicken 170g       2.0        2.9   170g
3         Smiths Chip Thinly  S/Cream&Onion 175g       5.0       15.0   175g
4       Kettle Tortilla ChpsHny&Jlpno Chili 150g       3.0       13.8   150g
…                                          …       …        …    …
264830             Tostitos Splash Of  Lime 175g       1.0        4.4   175g
264831                  Doritos Mexicana    170g       2.0        8.8   170g
264832   Doritos Corn Chip Mexican Jalapeno 150g       2.0        7.8   150g
264833             Tostitos Splash Of  Lime 175g       2.0        8.8   175g
264834                                       NaN       NaN        NaN    NaN

           BRAND  SHORT_DATE               LIFESTAGE PREMIUM_CUSTOMER
0        Natural  2018-10-17   YOUNG SINGLES/COUPLES          Premium
1            CCs  2019-05-14  MIDAGE SINGLES/COUPLES           Budget
2         Smiths  2019-05-20  MIDAGE SINGLES/COUPLES           Budget
3         Smiths  2018-08-17  MIDAGE SINGLES/COUPLES           Budget
4         Kettle  2018-08-18  MIDAGE SINGLES/COUPLES           Budget
…          …         …                     …              …
264830  Tostitos  2018-08-13   YOUNG SINGLES/COUPLES          Premium
264831   Doritos  2018-11-06   YOUNG SINGLES/COUPLES          Premium
264832   Doritos  2018-12-27   YOUNG SINGLES/COUPLES          Premium
264833  Tostitos  2018-09-22   YOUNG SINGLES/COUPLES          Premium
264834       NaN  2018-12-25                     NaN              NaN

[264835 rows x 13 columns]
```

[58]:

```
# reorganizing the columns
chips_final = chips_merged[["SHORT_DATE", "STORE_NBR", "LYLTY_CARD_NBR",␣
 ↪"TXN_ID", "LIFESTAGE", "PREMIUM_CUSTOMER", "PROD_NBR", "PROD_NAME", "BRAND",␣
 ↪"WEIGHT", "PROD_QTY", "TOT_SALES"]]
```

```
chips_final
```

[58]:

```
        SHORT_DATE  STORE_NBR  LYLTY_CARD_NBR    TXN_ID  \
0       2018-10-17        1.0          1000.0       1.0
1       2019-05-14        1.0          1307.0     348.0
2       2019-05-20        1.0          1343.0     383.0
3       2018-08-17        2.0          2373.0     974.0
4       2018-08-18        2.0          2426.0    1038.0
…            …        …             …       …
264830  2018-08-13      272.0        272358.0  270154.0
264831  2018-11-06      272.0        272379.0  270187.0
264832  2018-12-27      272.0        272379.0  270188.0
264833  2018-09-22      272.0        272380.0  270189.0
264834  2018-12-25        NaN             NaN       NaN

                     LIFESTAGE PREMIUM_CUSTOMER  PROD_NBR  \
0        YOUNG SINGLES/COUPLES          Premium       5.0
1       MIDAGE SINGLES/COUPLES           Budget      66.0
2       MIDAGE SINGLES/COUPLES           Budget      61.0
3       MIDAGE SINGLES/COUPLES           Budget      69.0
4       MIDAGE SINGLES/COUPLES           Budget     108.0
…                        …              …       …
264830   YOUNG SINGLES/COUPLES          Premium      74.0
264831   YOUNG SINGLES/COUPLES          Premium      51.0
264832   YOUNG SINGLES/COUPLES          Premium      42.0
264833   YOUNG SINGLES/COUPLES          Premium      74.0
264834                     NaN              NaN       NaN

                                       PROD_NAME     BRAND WEIGHT  PROD_QTY  \
0         Natural Chip        Compny SeaSalt175g   Natural   175g       2.0
1                       CCs Nacho Cheese    175g       CCs   175g       3.0
2         Smiths Crinkle Cut  Chips Chicken 170g    Smiths   170g       2.0
3         Smiths Chip Thinly  S/Cream&Onion 175g    Smiths   175g       5.0
4       Kettle Tortilla ChpsHny&Jlpno Chili 150g    Kettle   150g       3.0
…                                           …       …    …       …
264830             Tostitos Splash Of  Lime 175g  Tostitos   175g       1.0
264831                  Doritos Mexicana    170g   Doritos   170g       2.0
264832   Doritos Corn Chip Mexican Jalapeno 150g   Doritos   150g       2.0
264833             Tostitos Splash Of  Lime 175g  Tostitos   175g       2.0
264834                                       NaN       NaN    NaN       NaN

        TOT_SALES
0             6.0
1             6.3
2             2.9
3            15.0
4            13.8
```

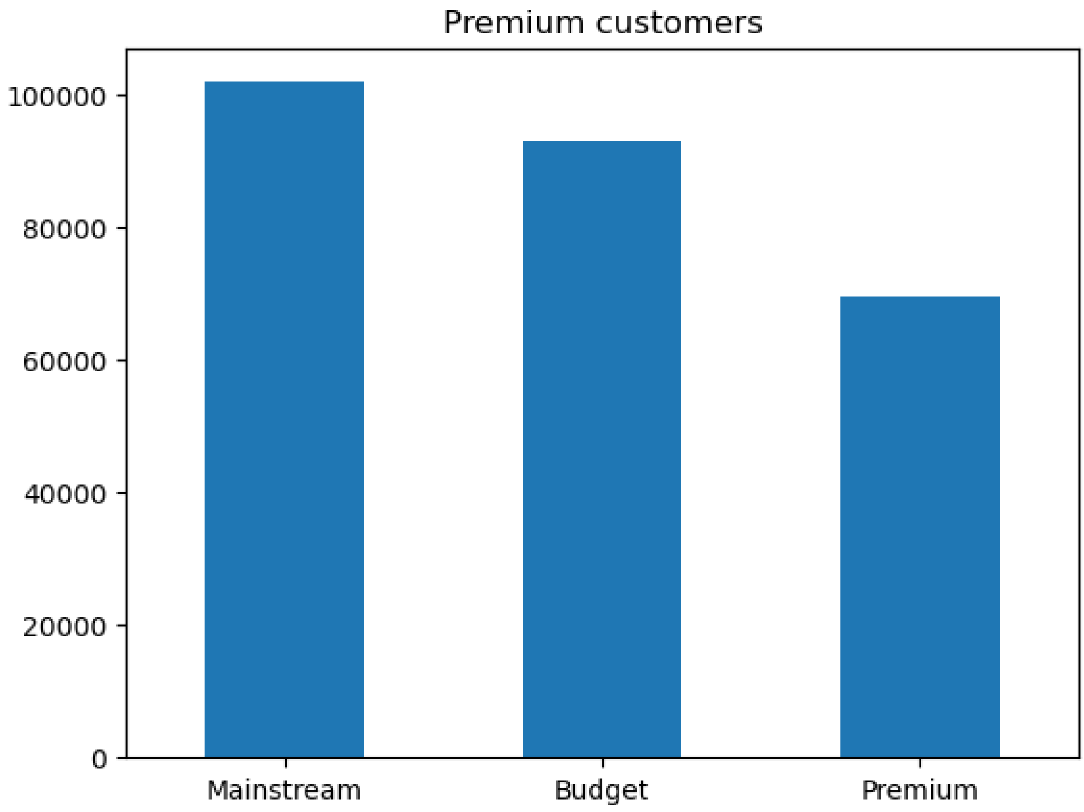
```
…              …
264830         4.4
264831         8.8
264832         7.8
264833         8.8
264834         NaN

[264835 rows x 12 columns]
```

[59]:

```
# saving to csv
chips_final.to_csv('chips_final.csv')
```

[60]:

```
# the data set is ready we can explore it and gather some indight
pc_vc = chips_final['PREMIUM_CUSTOMER'].value_counts()
pc_vc.plot(kind='bar')
plt.xticks(rotation=360)
plt.title('Premium customers')
plt.show()
```

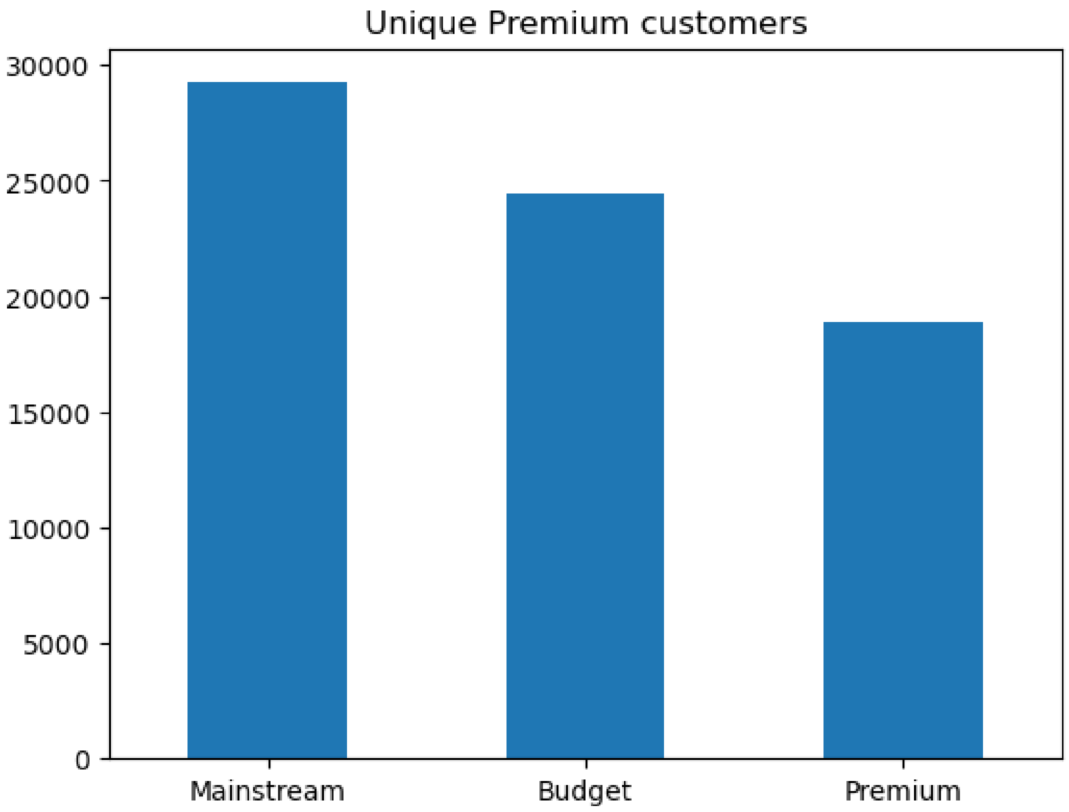


[61]:

```
# creating a dataset of just unique member number and counting it by premium␣
 ↪customer
unique_member = chips_final.drop_duplicates(subset='LYLTY_CARD_NBR')
```

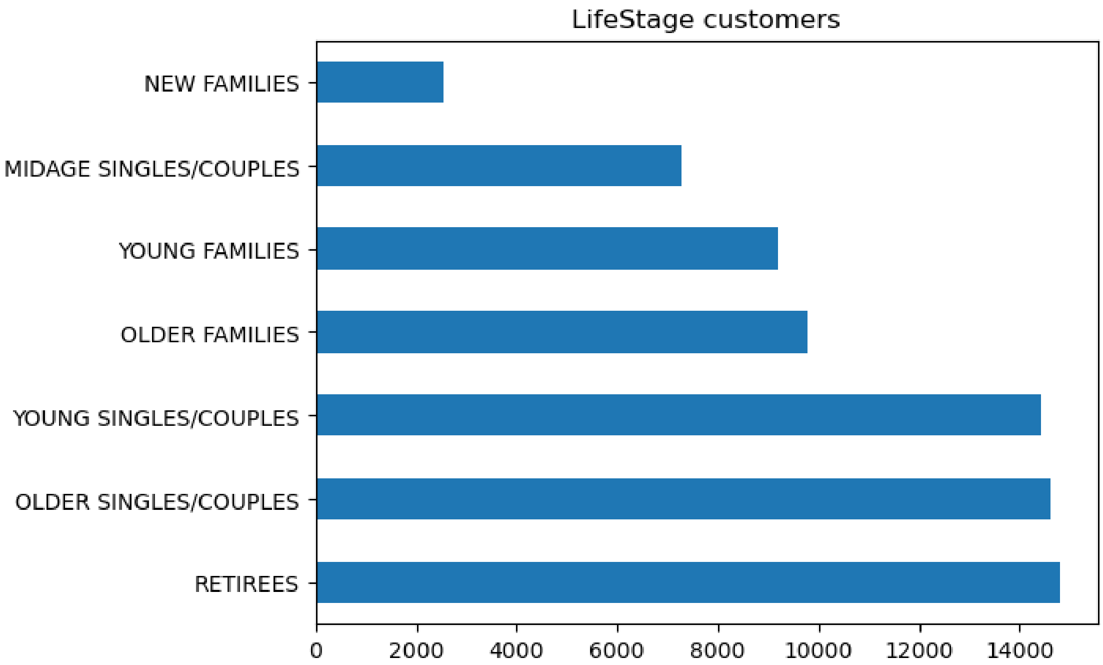
[62]:

```
um_vc = unique_member['PREMIUM_CUSTOMER'].value_counts()
um_vc.plot(kind='bar')
plt.xticks(rotation=360)
plt.title('Unique Premium customers')
plt.show()
```



[63]:

```
# viewing the lifestage customer segment
um_ls = unique_member['LIFESTAGE'].value_counts()

um_ls.plot(kind='barh')
plt.xticks(rotation=360)
plt.title('LifeStage customers')
plt.show()
```



[64]:

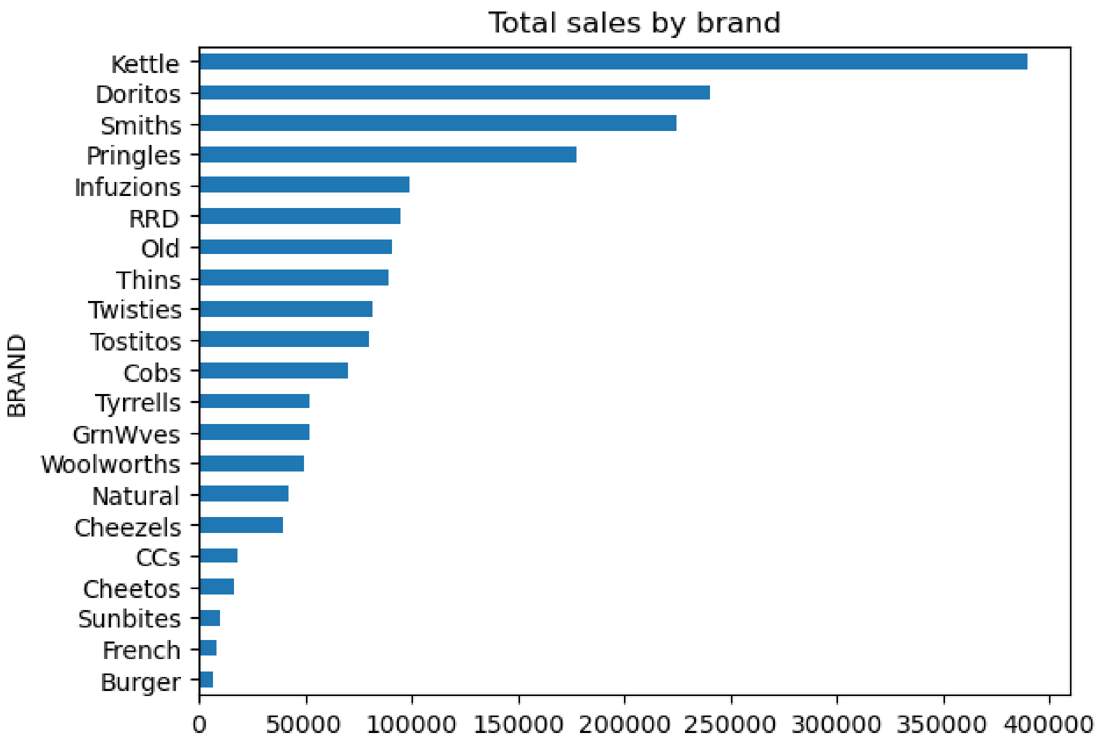
```
# grouping by brand
chips_br = chips_final.groupby('BRAND')
```

[65]:

```
# totaling the sales with each brand
chips_sales_brand = chips_br['TOT_SALES'].sum()
```

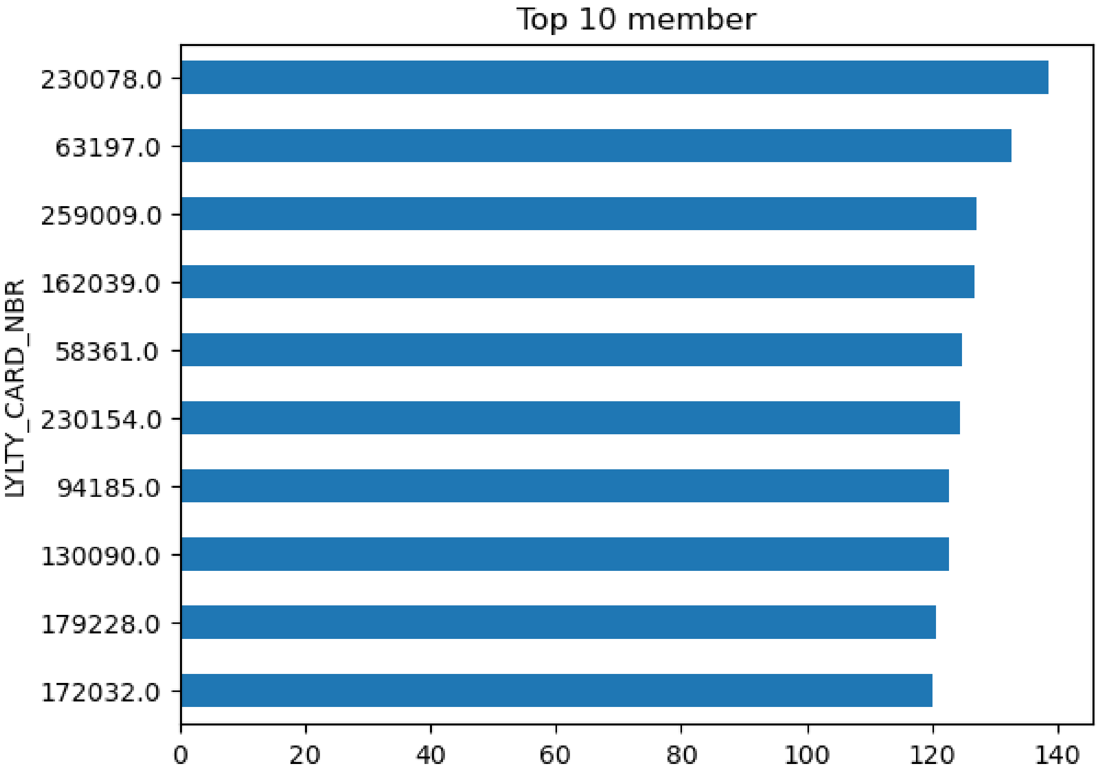
[66]:

```
# viewing the the top sold brand
chips_sales_brand.sort_values().plot(kind='barh')
plt.xticks(rotation=360)
plt.title('Total sales by brand')
plt.show()
```



[67]:
```
# groubing by NBR
chips_nbr = chips_final.groupby('LYLTY_CARD_NBR')
chips_sales_nbr = chips_nbr['TOT_SALES'].sum()
```

[68]:
```
# plot the top 10 member by sales
chips_sorted = chips_sales_nbr.sort_values()

chips_sorted.tail(10).plot(kind='barh')
plt.title('Top 10 member')
plt.show()
```

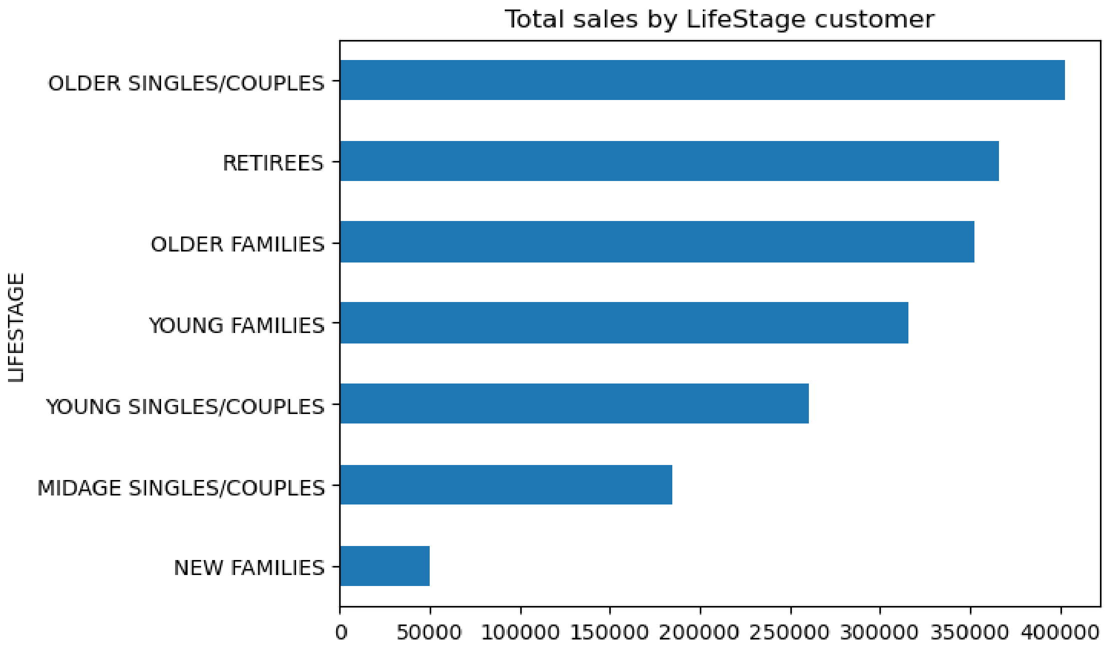


```
[69]: chips_sorted.describe()
```

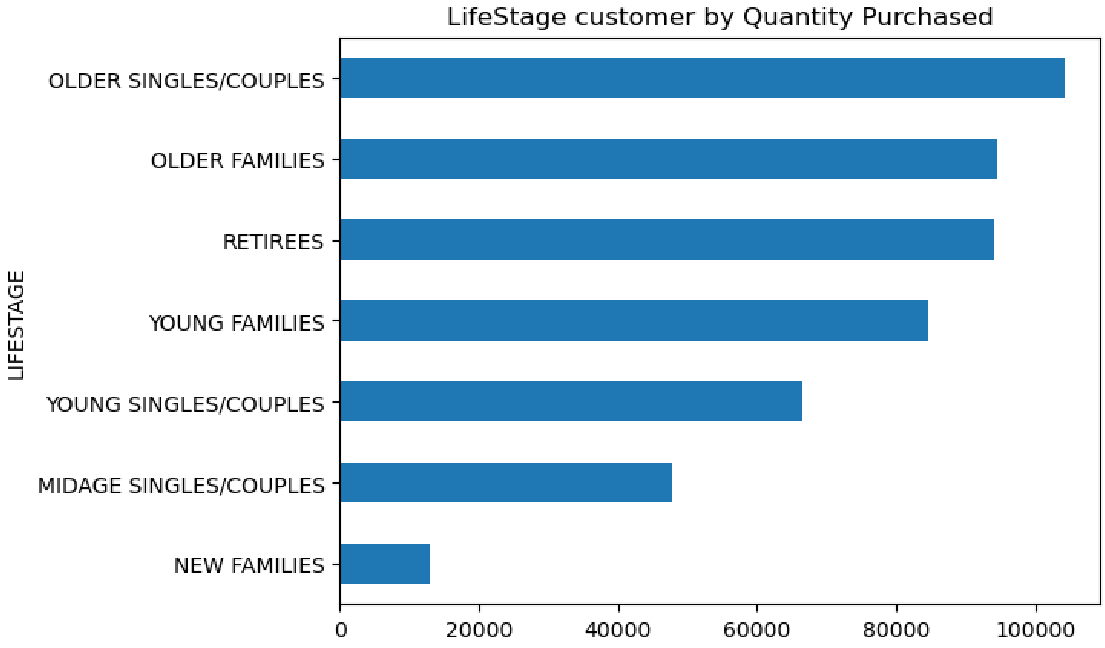
```
[69]: count    72636.000000
      mean        26.613731
      std         20.271119
      min          1.500000
      25%          9.100000
      50%         21.700000
      75%         40.000000
      max        138.600000
      Name: TOT_SALES, dtype: float64
```

```
[70]: # groubing by lifestage and extracting by tot sales
      chips_ls = chips_final.groupby('LIFESTAGE')
      chips_sales_ls = chips_ls['TOT_SALES'].sum()
```

```
[71]: chips_sales_ls.sort_values().plot(kind='barh')
      plt.xticks(rotation=360)
      plt.title('Total sales by LifeStage customer')
      plt.show()
```

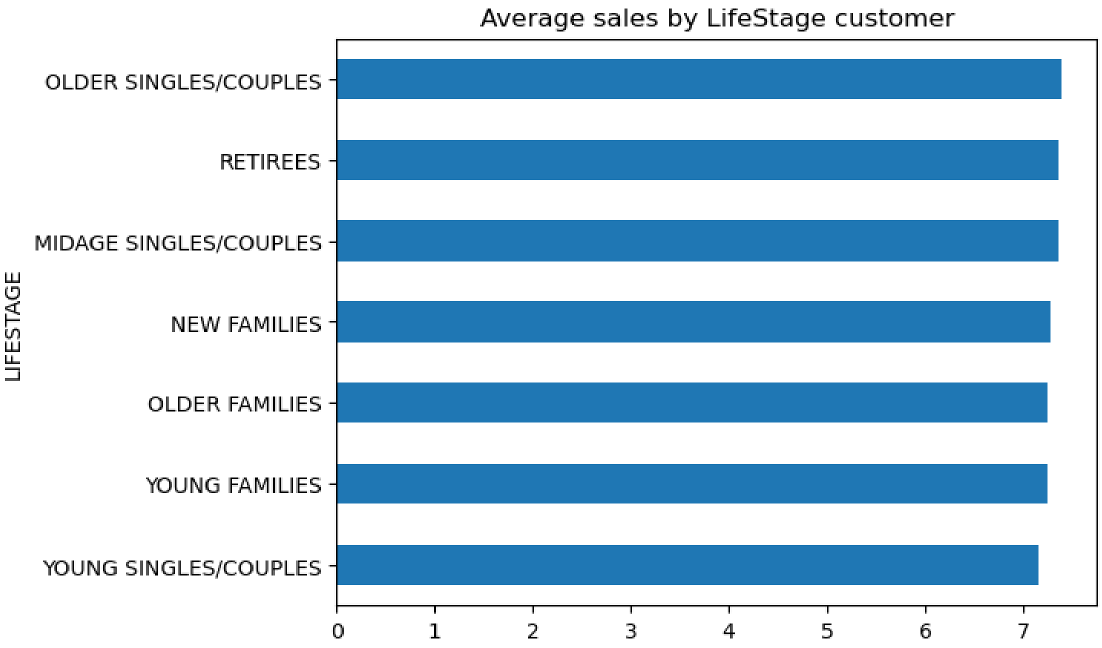


```
[72]: chips_ls_qty = chips_ls['PROD_QTY'].sum()

      chips_ls_qty.sort_values().plot(kind='barh')
      plt.xticks(rotation=360)
      plt.title('LifeStage customer by Quantity Purchased')
      plt.show()
```



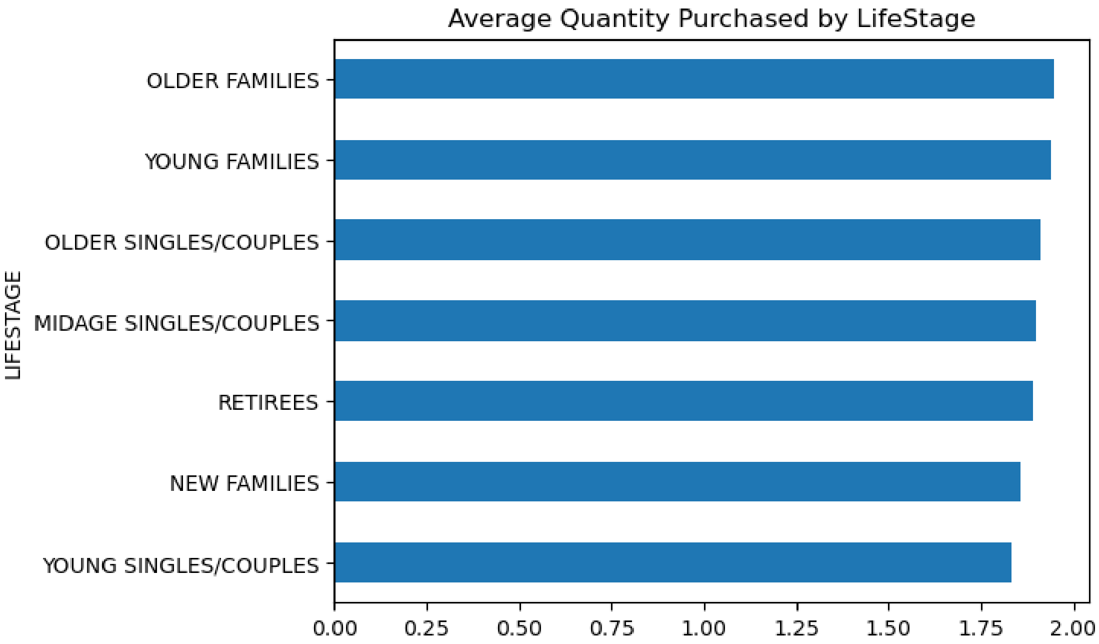
[73]:

```python
# viewing the average sales by lifstage
chips_avg_sales_ls = chips_ls['TOT_SALES'].mean()
chips_avg_sales_ls.sort_values().plot(kind='barh')
plt.xticks(rotation=360)
plt.title('Average sales by LifeStage customer')
plt.show()
```



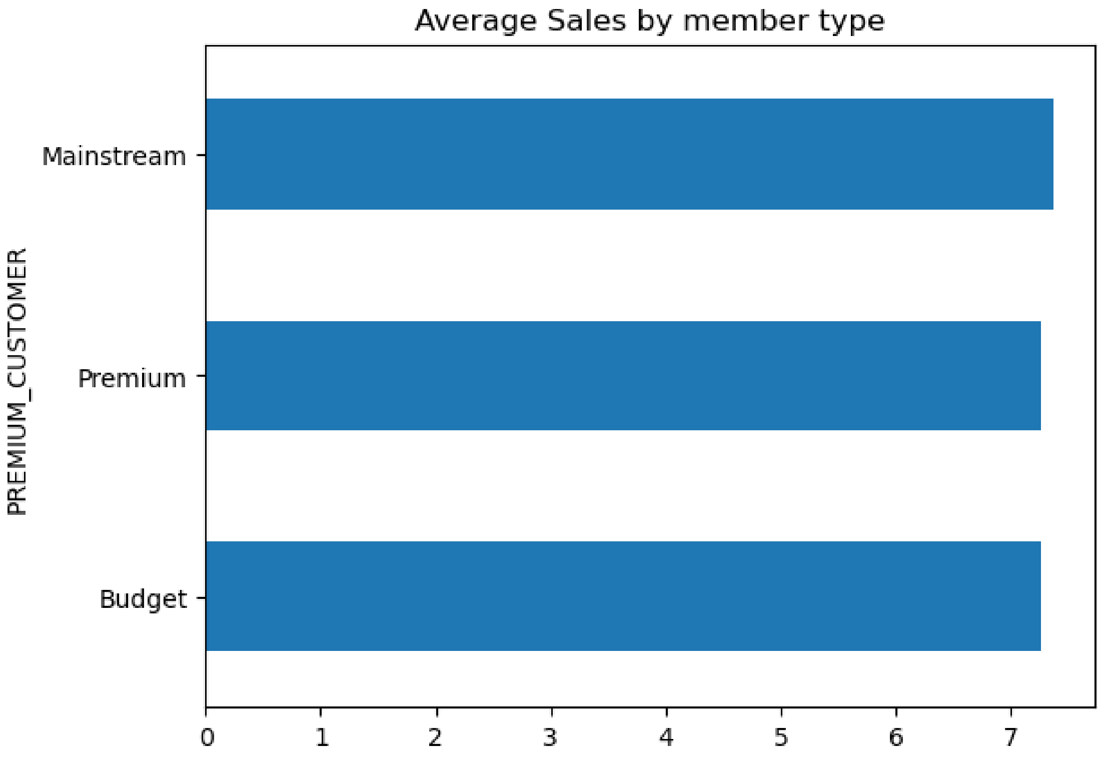
[74]:

```python
# viewing the Average quantity purchased by lifestage
chips_ls_avg_qty = chips_ls['PROD_QTY'].mean()

chips_ls_avg_qty.sort_values().plot(kind='barh')
plt.xticks(rotation=360)
plt.title('Average Quantity Purchased by LifeStage')
plt.show()
```



[75]:

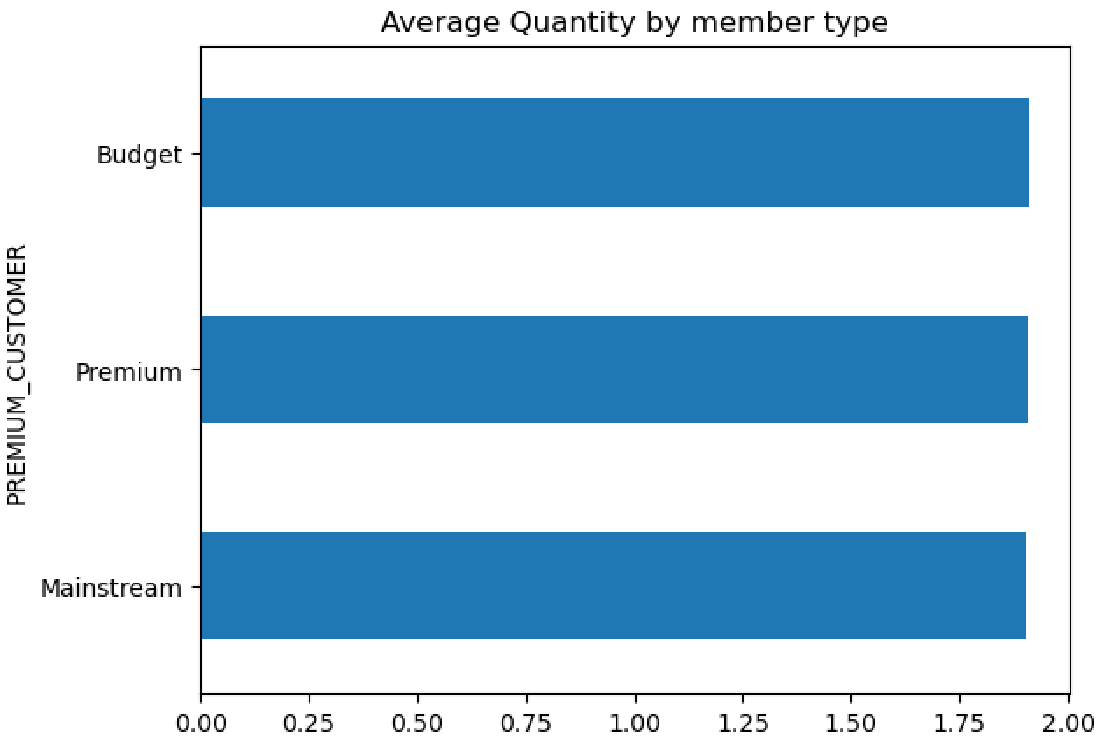
```python
# viewing the average sales by member type
chips_pt = chips_final.groupby('PREMIUM_CUSTOMER')
chips_pt_avg_sales = chips_pt['TOT_SALES'].mean()
chips_pt_avg_sales.sort_values().plot(kind='barh')
plt.xticks(rotation=360)
plt.title('Average Sales by member type')
plt.show()
```



[76]:
```
chips_pt_avg_sales.round(3)
```

[76]:
```
PREMIUM_CUSTOMER
Budget        7.259
Mainstream    7.361
Premium       7.263
Name: TOT_SALES, dtype: float64
```

[77]:
```
chips_pt_avg_qty = chips_pt['PROD_QTY'].mean()
chips_pt_avg_qty.sort_values().plot(kind='barh')
plt.xticks(rotation=360)
plt.title('Average Quantity by member type')
plt.show()
```



[78]:
```
chips_pt_avg_qty.round(3)
```

[78]:
```
PREMIUM_CUSTOMER
Budget        1.910
Mainstream    1.902
Premium       1.906
Name: PROD_QTY, dtype: float64
```

[79]:
```
# viewing total sales by premium customer and brand
pd.set_option('display.max_rows', None)
pd.set_option('display.max_columns', None)
chips_pt['BRAND'].value_counts()
```

[79]:
```
PREMIUM_CUSTOMER  BRAND
Budget            Kettle        14154
                  Smiths        11548
                  Doritos        9818
                  Pringles       8620
                  RRD            6480
                  Woolworths     5486
                  Thins          4931
                  Infuzions      4922
                  Cobs           3274
                  Tostitos       3236
                  Twisties       3229
                  Old            3203
                  Natural        2785
                  GrnWves        2656
                  Tyrrells       2195
                  CCs            1679
                  Cheezels       1626
                  Sunbites       1146
                  Cheetos        1051
                  Burger          579
                  French          539
Mainstream        Kettle        16423
                  Smiths        11842
                  Doritos       11192
                  Pringles       9903
                  RRD            6462
                  Infuzions      5550
                  Thins          5436
                  Woolworths     5193
                  Cobs           3889
                  Twisties       3785
                  Tostitos       3737
                  Old            3725
                  GrnWves        3037
                  Natural        2657
                  Tyrrells       2583
                  Cheezels       1735
                  CCs            1631
                  Cheetos        1111
                  Sunbites       1042
                  Burger          548
                  French          507
Premium           Kettle        10711
                  Smiths         8433
                  Doritos        7135
                  Pringles       6579
                  RRD            4837
                  Woolworths     4078
                  Infuzions      3729
                  Thins          3708
                  Cobs           2530
                  Tostitos       2498
                  Twisties       2440
                  Old            2396
                  GrnWves        2047
                  Natural        2027
```

```
Tyrrells       1664
Cheezels       1242
CCs            1241
Sunbites        820
Cheetos         765
Burger          437
French          372
Name: BRAND, dtype: int64
```

[80]:

```
# creating pivot table and looking for difference in purchase behavior between␣
↪brands

customer_type_count = chips_final['PREMIUM_CUSTOMER'].value_counts()
pivot_table = chips_final.pivot_table(index='PREMIUM_CUSTOMER',␣
↪columns='BRAND', aggfunc='size', fill_value=0)
percentage_difference = (pivot_table / customer_type_count[:, np.newaxis]) * 100
percentage_difference
```

```
C:\Users\REYOK\AppData\Local\Temp\ipykernel_2088\1656387506.py:5: FutureWarning:
Support for multi-dimensional indexing (e.g. `obj[:, None]`) is deprecated and
will be removed in a future version.  Convert to a numpy array before indexing
instead.
  percentage_difference = (pivot_table / customer_type_count[:, np.newaxis]) *
100
```

[80]:

```
BRAND                 Burger       CCs   Cheetos  Cheezels      Cobs    Doritos  \
PREMIUM_CUSTOMER
Budget              0.567714  1.646272  1.030513  1.594305  3.210182   9.626623
Mainstream          0.588254  1.750808  1.192610  1.862447  4.174673  12.014127
Premium             0.627072  1.780769  1.097734  1.782204  3.630415  10.238345

BRAND                 French   GrnWves  Infuzions     Kettle   Natural  \
PREMIUM_CUSTOMER
Budget              0.528494  2.604228   4.826058  13.878103  2.730713
Mainstream          0.544243  3.260088   5.957684  17.629378  2.852174
Premium             0.533800  2.937336   5.350916  15.369714  2.908637

BRAND                    Old   Pringles       RRD     Smiths  Sunbites  \
PREMIUM_CUSTOMER
Budget              3.140566   8.451975  6.353689  11.322901  1.123662
Mainstream          3.998626  10.630441  6.936677  12.711874  1.118542
Premium             3.438132   9.440514  6.940837  12.100905  1.176656

BRAND                  Thins  Tostitos  Twisties  Tyrrells  Woolworths
PREMIUM_CUSTOMER
Budget              4.834883  3.172922  3.166059  2.152214    5.379064
Mainstream          5.835310  4.011507  4.063033  2.772738    5.574460
```

```
Premium           5.320782  3.584497  3.501270  2.387751    5.851713
```

There is not much difference from lifestage and member type when it comes to average sales and quantity

```
[81]: # exploring the wwight bag purchased
      chips_final['WEIGHT'].value_counts()
```

```
[81]: 175g    66390
      150g    43131
      134g    25102
      110g    22387
      170g    19983
      165g    15297
      300g    15166
      330g    12540
      380g     6416
      270g     6285
      210g     6272
      200g     4473
      135g     3257
      250g     3169
       90g     3008
      190g     2995
      160g     2970
      220g     1564
       70g     1507
      180g     1468
      125g     1454
      Name: WEIGHT, dtype: int64
```

```
[82]: chips_final['WEIGHT'] = chips_final['WEIGHT'].astype(str)
```

```
C:\Users\REYOK\AppData\Local\Temp\ipykernel_2088\1537273977.py:1:
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_guide/indexing.html#returning-a-view-versus-a-copy
  chips_final['WEIGHT'] = chips_final['WEIGHT'].astype(str)
```

```
[83]: # creating custom category of chips bag size

      weight_category_map= {
          ' 70g':'Extra Small',
          ' 90g':'Extra Small',
          '110g':'Small',
          '125g':'Small',
          '134g':'Small',
          '135g':'Small',
          '150g':'Small',
          '160g':'Small',
          '165g':'Small',
          '170g':'Small',
          '175g':'Small',
          '180g':'Small',
          '190g':'Small',
          '200g':'Medium',
          '210g':'Medium',
          '220g':'Medium',
          '250g':'Medium',
          '270g':'Medium',
          '300g':'Large',
          '330g':'Large',
          '380g':'Large',
          'nan' : np.nan
      }
      chips_final['BAG_SIZE'] = chips_final['WEIGHT'].map(weight_category_map)
```

[84]:

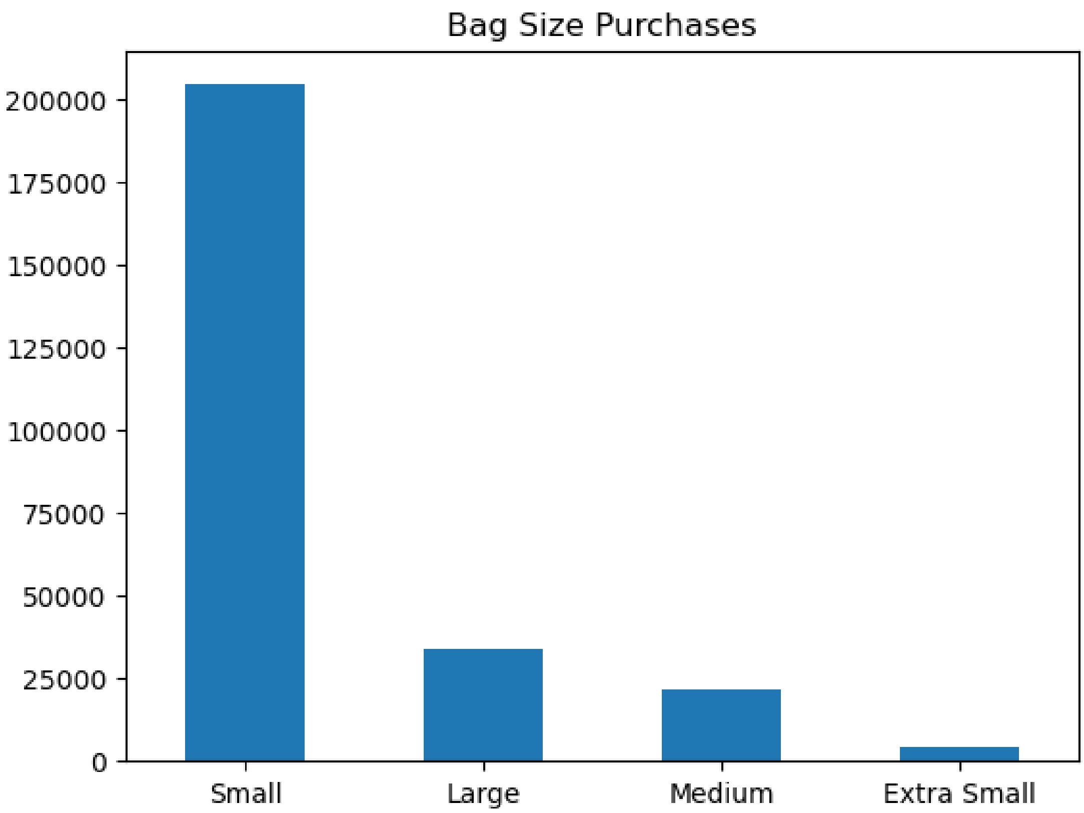
```
chips_final['BAG_SIZE'].value_counts()
```

[84]:

```
Small          204434
Large           34122
Medium          21763
Extra Small      4515
Name: BAG_SIZE, dtype: int64
```

[85]:

```
chips_bs = chips_final['BAG_SIZE'].value_counts()

chips_bs.plot(kind='bar')
plt.xticks(rotation=360)
plt.title('Bag Size Purchases')
plt.show()
```



[86]:

```
# saving to csv with new bag size column
chips_final.to_csv('chips_final.csv')
```

Preliminary notes: - Largest customer type is Mainstream group - Largest Membership group is the older population - Top 10 members spent over 120 Dollars in chips within a year - Top 4 Brand sold are: Kattle, Doritos, Smiths, and Pringles - older individuals purchased the most chips wich include single individuals and families, New families purchased the least on chips - The most purchased sized chips were the small bags and then large bags. The common medium bags and extra small were sold the least