FEATURE ENGINEERING AND DATA PRE-PROCESSING!

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

In [2]:
```
def load_train():
    data = pd.read_csv(r'Downloads/application_train.csv')
    return data

df=load_train()
print(df.shape)
```

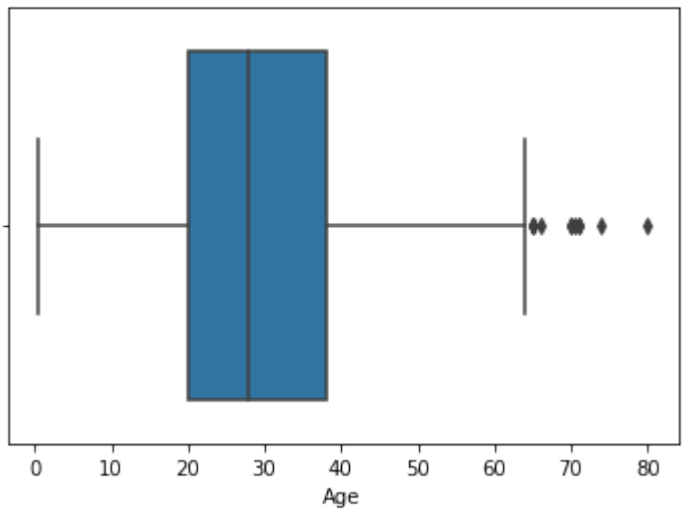
```
(307511, 122)
```

In [3]:
```
def load_titanic():
    data = pd.read_csv(r'Downloads/titanic (1).csv')
    return data

df=load_titanic()
print(df.shape)
```

```
(891, 12)
```

In [4]:
```
sns.boxplot(x=df["Age"])
plt.show()
```



In [6]:
```
q1 = df["Age"].quantile(0.25)
q3 = df["Age"].quantile(0.75)
iqr = q3 - q1
up = q3 + 1.5 * iqr
low = q1 - 1.5 * iqr

print(df[(df["Age"] < low) | (df["Age"] > up)])
```

```
     PassengerId  Survived  Pclass                                Name
\
33            34         0       2               Wheadon, Mr. Edward H
54            55         0       1      Ostby, Mr. Engelhart Cornelius
96            97         0       1           Goldschmidt, Mr. George B
116          117         0       3                Connors, Mr. Patrick
280          281         0       3                    Duane, Mr. Frank
456          457         0       1           Millet, Mr. Francis Davis
493          494         0       1             Artagaveytia, Mr. Ramon
630          631         1       1  Barkworth, Mr. Algernon Henry Wilson
672          673         0       2          Mitchell, Mr. Henry Michael
745          746         0       1        Crosby, Capt. Edward Gifford
851          852         0       3                 Svensson, Mr. Johan

      Sex   Age  SibSp  Parch      Ticket     Fare Cabin Embarked
33   male  66.0      0      0  C.A. 24579  10.5000   NaN        S
54   male  65.0      0      1      113509  61.9792   B30        C
96   male  71.0      0      0    PC 17754  34.6542    A5        C
116  male  70.5      0      0      370369   7.7500   NaN        Q
280  male  65.0      0      0      336439   7.7500   NaN        Q
456  male  65.0      0      0       13509  26.5500   E38        S
493  male  71.0      0      0    PC 17609  49.5042   NaN        C
630  male  80.0      0      0       27042  30.0000   A23        S
672  male  70.0      0      0  C.A. 24580  10.5000   NaN        S
745  male  70.0      1      1   WE/P 5735  71.0000   B22        S
851  male  74.0      0      0      347060   7.7750   NaN        S
```

In [7]:
```
print(df[(df["Age"] < low) | (df["Age"] > up)].index)
```

```
Int64Index([33, 54, 96, 116, 280, 456, 493, 630, 672, 745, 851], dtype='i
nt64')
```

In [8]:
```
print(df[(df["Age"] < low) | (df["Age"] > up)].any(axis = None))
```

```
True
```

In [9]:
```
print(df[(df["Age"] < low)].any(axis = None))
```

```
False
```

In [10]:
```
def outlier_thresholds(dataframe, col_name, q1=0.25, q3=0.75):
    quartile1 = dataframe[col_name].quantile(q1)
    quartile3 = dataframe[col_name].quantile(q3)
    interquantile_range = quartile3 - quartile1
    up_limit = quartile3 + 1.5 * interquantile_range
    low_limit = quartile1 - 1.5 * interquantile_range
    return low_limit, up_limit
print(outlier_thresholds(df, "Age"))
```

```
(-6.6875, 64.8125)
```

In [11]:
```
low, up = outlier_thresholds(df, "Fare")
print(df[(df["Fare"] < low) | (df["Fare"] > up)].head())

def check_outlier(dataframe, col_name):
    low_limit, up_limit = outlier_thresholds(dataframe, col_name)
    if dataframe[(dataframe[col_name] > up_limit) | (dataframe[col_name] <
        return True
    else:
        return False

print(check_outlier(df, "Age"))
print(check_outlier(df, "Fare"))
```

```
    PassengerId  Survived  Pclass  \
1             2         1       1
27           28         0       1
31           32         1       1
34           35         0       1
52           53         1       1

                                                 Name     Sex   Age  SibS
p  \
1   Cumings, Mrs. John Bradley (Florence Briggs Th...  female  38.0
1
27                      Fortune, Mr. Charles Alexander    male  19.0
3
31     Spencer, Mrs. William Augustus (Marie Eugenie)  female   NaN
1
34                             Meyer, Mr. Edgar Joseph    male  28.0
1
52           Harper, Mrs. Henry Sleeper (Myna Haxtun)  female  49.0
1

    Parch    Ticket      Fare        Cabin Embarked
1       0  PC 17599   71.2833          C85        C
27      2     19950  263.0000  C23 C25 C27        S
31      0  PC 17569  146.5208          B78        C
34      0  PC 17604   82.1708          NaN        C
52      0  PC 17572   76.7292          D33        C
True
True
```

In [12]:
```
def grab_col_names(dataframe, cat_th=10, car_th=20):
    cat_cols = [col for col in dataframe.columns if dataframe[col].dtypes =
    num_but_cat = [col for col in dataframe.columns if dataframe[col].nunic
    cat_but_car = [col for col in dataframe.columns if dataframe[col].nunic
    cat_cols = cat_cols + num_but_cat
    cat_cols = [col for col in cat_cols if col not in cat_but_car]
    num_cols = [col for col in dataframe.columns if dataframe[col].dtypes

    print(f"Observations: {dataframe.shape[0]}")
    print(f"Variables: {dataframe.shape[1]}")
    print(f"cat_cols: {len(cat_cols)}")
    print(f"num_cols: {len(num_cols)}")
    print(f"cat_but_car: {len(cat_but_car)}")
    print(f"num_but_cat: {len(num_but_cat)}")

    return cat_cols, num_cols, cat_but_car

cat_cols, num_cols, cat_but_car = grab_col_names(df)
num_cols = [col for col in num_cols if col not in "PassengerId"]
print(num_cols)
for col in num_cols:
    print(col, check_outlier(df, col))
```

```
Observations: 891
Variables: 12
cat_cols: 6
num_cols: 3
cat_but_car: 3
num_but_cat: 4
['Age', 'Fare']
Age True
Fare True
```

In [14]:
```
dff = load_train()

cat_cols, num_cols, cat_but_car = grab_col_names(dff)
num_cols.remove('SK_ID_CURR')
print()
print()
for col in num_cols:
    print(col, check_outlier(dff, col))
```

```
Observations: 307511
Variables: 122
cat_cols: 54
num_cols: 67
cat_but_car: 1
num_but_cat: 39


CNT_CHILDREN True
AMT_INCOME_TOTAL True
AMT_CREDIT True
AMT_ANNUITY True
AMT_GOODS_PRICE True
REGION_POPULATION_RELATIVE True
DAYS_BIRTH False
DAYS_EMPLOYED True
DAYS_REGISTRATION True
DAYS_ID_PUBLISH False
OWN_CAR_AGE True
CNT_FAM_MEMBERS True
HOUR_APPR_PROCESS_START True
EXT_SOURCE_1 False
EXT_SOURCE_2 False
EXT_SOURCE_3 False
APARTMENTS_AVG True
BASEMENTAREA_AVG True
YEARS_BEGINEXPLUATATION_AVG True
YEARS_BUILD_AVG True
COMMONAREA_AVG True
ELEVATORS_AVG True
ENTRANCES_AVG True
FLOORSMAX_AVG True
FLOORSMIN_AVG True
LANDAREA_AVG True
LIVINGAPARTMENTS_AVG True
LIVINGAREA_AVG True
NONLIVINGAPARTMENTS_AVG True
NONLIVINGAREA_AVG True
APARTMENTS_MODE True
BASEMENTAREA_MODE True
YEARS_BEGINEXPLUATATION_MODE True
YEARS_BUILD_MODE True
COMMONAREA_MODE True
ELEVATORS_MODE True
ENTRANCES_MODE True
FLOORSMAX_MODE True
FLOORSMIN_MODE True
LANDAREA_MODE True
LIVINGAPARTMENTS_MODE True
LIVINGAREA_MODE True
NONLIVINGAPARTMENTS_MODE True
NONLIVINGAREA_MODE True
APARTMENTS_MEDI True
BASEMENTAREA_MEDI True
YEARS_BEGINEXPLUATATION_MEDI True
YEARS_BUILD_MEDI True
COMMONAREA_MEDI True
ELEVATORS_MEDI True
ENTRANCES_MEDI True
FLOORSMAX_MEDI True
FLOORSMIN_MEDI True
```

```
LANDAREA_MEDI True
LIVINGAPARTMENTS_MEDI True
LIVINGAREA_MEDI True
NONLIVINGAPARTMENTS_MEDI True
NONLIVINGAREA_MEDI True
TOTALAREA_MODE True
OBS_30_CNT_SOCIAL_CIRCLE True
DEF_30_CNT_SOCIAL_CIRCLE True
OBS_60_CNT_SOCIAL_CIRCLE True
DAYS_LAST_PHONE_CHANGE True
AMT_REQ_CREDIT_BUREAU_MON True
AMT_REQ_CREDIT_BUREAU_QRT True
AMT_REQ_CREDIT_BUREAU_YEAR True
```

In [15]:
```
def grab_outliers(dataframe, col_name, outlier_index=False, f = 5):
    low, up = outlier_thresholds(dataframe, col_name)

    if dataframe[((dataframe[col_name] < low) | (dataframe[col_name] > up)]
        print(dataframe[((dataframe[col_name] < low) | (dataframe[col_name]
    else:
        print(dataframe[((dataframe[col_name] < low) | (dataframe[col_name]

    if outlier_index:
        out_index = dataframe[((dataframe[col_name] < low) | (dataframe[co]
        return out_index
age_index = grab_outliers(df, "Age", True)
print(age_index)
```

```
     PassengerId  Survived  Pclass                               Name   Sex
\
33            34         0       2            Wheadon, Mr. Edward H  male
54            55         0       1  Ostby, Mr. Engelhart Cornelius  male
96            97         0       1       Goldschmidt, Mr. George B  male
116          117         0       3             Connors, Mr. Patrick  male
280          281         0       3                 Duane, Mr. Frank  male

      Age  SibSp  Parch      Ticket     Fare Cabin Embarked
33   66.0      0      0  C.A. 24579  10.5000   NaN        S
54   65.0      0      1      113509  61.9792   B30        C
96   71.0      0      0    PC 17754  34.6542    A5        C
116  70.5      0      0      370369   7.7500   NaN        Q
280  65.0      0      0      336439   7.7500   NaN        Q
Int64Index([33, 54, 96, 116, 280, 456, 493, 630, 672, 745, 851], dtype='i
nt64')
```

In [21]:
```
df = load_titanic()
low, up = outlier_thresholds(df,"Fare")
print(df.shape)
print(df[~((df["Fare"] < low) | (df["Fare"] > up))].shape) #(775,12)
def remove_outlier(dataframe, col_name):
    low_limit, up_limit = outlier_thresholds(dataframe, col_name)
    df_without_outliers = dataframe[~((dataframe[col_name] < low_limit) |
    return df_without_outliers
cat_cols, num_cols, cat_but_car = grab_col_names(df)
num_cols.remove('PassengerId')

for col in num_cols:
    df = remove_outlier(df,col)
print(df.shape)

def replace_with_thresholds(dataframe, variable):
    low_limit, up_limit = outlier_thresholds(dataframe, variable)
    dataframe.loc[(dataframe[variable] < low_limit), variable] = low_limit
    dataframe.loc[(dataframe[variable] > up_limit), variable] = up_limit

df = load_titanic()
cat_cols, num_cols, cat_but_car = grab_col_names(df)
num_cols.remove('PassengerId')
for col in num_cols:
    print(col, check_outlier(df, col))

for col in num_cols:
    replace_with_thresholds(df, col)
for col in num_cols:
    print(col, check_outlier(df, col))
```

```
(891, 12)
(775, 12)
Observations: 891
Variables: 12
cat_cols: 6
num_cols: 3
cat_but_car: 3
num_but_cat: 4
(765, 12)
Observations: 891
Variables: 12
cat_cols: 6
num_cols: 3
cat_but_car: 3
num_but_cat: 4
Age True
Fare True
Age False
Fare False
```

In [ ]:

In [ ]: