

Course-End Project: Feature Engineering

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

importing different libraries for data processing operations

IMPORTING THE DATA FILE

```
In [2]: data=pd.read_csv("PEP1.csv")
```

```
In [3]: print(data)
```

	Id	MSSubClass	MSZoning	LotFrontage	LotArea	Street	Alley	LotShape	\
0	1	60	RL	65.0	8450	Pave	NaN	Reg	
1	2	20	RL	80.0	9600	Pave	NaN	Reg	
2	3	60	RL	68.0	11250	Pave	NaN	IR1	
3	4	70	RL	60.0	9550	Pave	NaN	IR1	
4	5	60	RL	84.0	14260	Pave	NaN	IR1	
...	
1455	1456	60	RL	62.0	7917	Pave	NaN	Reg	
1456	1457	20	RL	85.0	13175	Pave	NaN	Reg	
1457	1458	70	RL	66.0	9042	Pave	NaN	Reg	
1458	1459	20	RL	68.0	9717	Pave	NaN	Reg	
1459	1460	20	RL	75.0	9937	Pave	NaN	Reg	

	LandContour	Utilities	...	PoolArea	PoolQC	Fence	MiscFeature	MiscVal	\
0	Lvl	AllPub	...	0	NaN	NaN	NaN	0	
1	Lvl	AllPub	...	0	NaN	NaN	NaN	0	
2	Lvl	AllPub	...	0	NaN	NaN	NaN	0	
3	Lvl	AllPub	...	0	NaN	NaN	NaN	0	
4	Lvl	AllPub	...	0	NaN	NaN	NaN	0	
...	
1455	Lvl	AllPub	...	0	NaN	NaN	NaN	0	
1456	Lvl	AllPub	...	0	NaN	MnPrv	NaN	0	
1457	Lvl	AllPub	...	0	NaN	GdPrv	Shed	2500	
1458	Lvl	AllPub	...	0	NaN	NaN	NaN	0	
1459	Lvl	AllPub	...	0	NaN	NaN	NaN	0	

	MoSold	YrSold	SaleType	SaleCondition	SalePrice
0	2	2008	WD	Normal	208500
1	5	2007	WD	Normal	181500
2	9	2008	WD	Normal	223500
3	2	2006	WD	Abnorml	140000
4	12	2008	WD	Normal	250000
...
1455	8	2007	WD	Normal	175000
1456	2	2010	WD	Normal	210000
1457	5	2010	WD	Normal	266500
1458	4	2010	WD	Normal	142125
1459	6	2008	WD	Normal	147500

[1460 rows x 81 columns]

IDENTIFYING THE SHAPE OF THE DATA

```
In [4]: data.shape
```

```
Out[4]: (1460, 81)
```

THE SHAPE IS 1460 ROWS AND 81 COLUMNS

IDENTIFYING THE NULL VALUES IN THE DATA

```
In [5]: data.isnull().sum()
```

```
Out[5]: Id                0
MSSubClass              0
MSZoning                0
LotFrontage            259
LotArea                0
...
MoSold                 0
YrSold                 0
SaleType               0
SaleCondition          0
SalePrice              0
Length: 81, dtype: int64
```

IDENTIFYING VARIABLE WITH UNIQUE VALUES

```
In [6]: data.nunique()
```

```
Out[6]: Id                1460
MSSubClass              15
MSZoning                5
LotFrontage            110
LotArea                1073
...
MoSold                 12
YrSold                 5
SaleType               9
SaleCondition          6
SalePrice              663
Length: 81, dtype: int64
```

SEPARATING NUMERICAL AND CATEGORICAL VALUES

```
In [7]: data_num=data.select_dtypes(include=[np.number]) #numerical dataset
```

```
In [8]: data_cat=data.select_dtypes(exclude=[np.number]) #categorical dataset
```

```
In [9]: data_num.head()
```

```
Out[9]:
```

	Id	MSSubClass	LotFrontage	LotArea	OverallQual	OverallCond	YearBuilt	YearRemodAdd	MasVnrArea	Bsr
0	1	60	65.0	8450	7	5	2003	2003	196.0	
1	2	20	80.0	9600	6	8	1976	1976	0.0	
2	3	60	68.0	11250	7	5	2001	2002	162.0	
3	4	70	60.0	9550	7	5	1915	1970	0.0	
4	5	60	84.0	14260	8	5	2000	2000	350.0	

5 rows × 38 columns

```
In [10]: # EDA of numerical dataset
```

```
In [11]: #1. Missing value treatment
```

```
In [12]: # checking the null values in the numerical dataset
```

```
In [13]: data_num.isnull().sum()
```

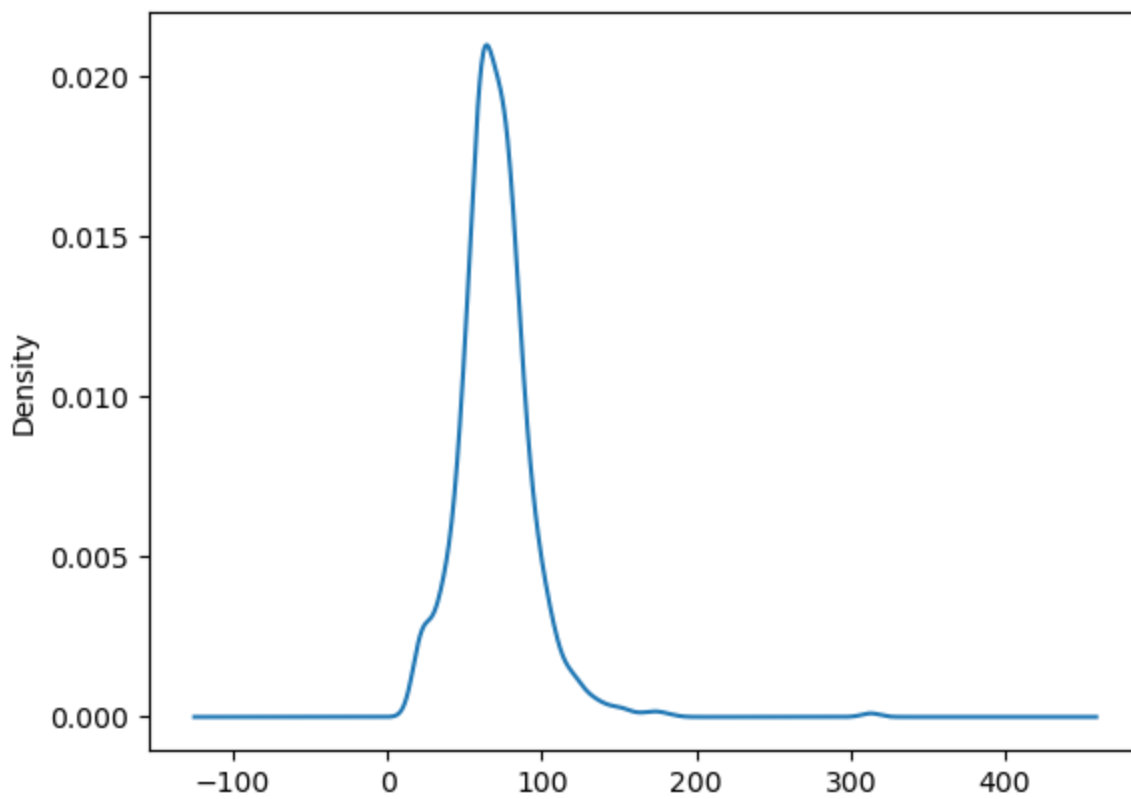
```
Out[13]: Id                0
MSSubClass                0
LotFrontage              259
LotArea                  0
OverallQual               0
OverallCond              0
YearBuilt                0
YearRemodAdd             0
MasVnrArea               8
BsmtFinSF1               0
BsmtFinSF2               0
BsmtUnfSF                0
TotalBsmtSF              0
1stFlrSF                 0
2ndFlrSF                 0
LowQualFinSF             0
GrLivArea                0
BsmtFullBath             0
BsmtHalfBath             0
FullBath                 0
HalfBath                 0
BedroomAbvGr            0
KitchenAbvGr            0
TotRmsAbvGrd            0
Fireplaces               0
GarageYrBlt             81
GarageCars               0
GarageArea               0
WoodDeckSF              0
OpenPorchSF             0
EnclosedPorch            0
3SsnPorch               0
ScreenPorch              0
PoolArea                0
MiscVal                  0
MoSold                  0
YrSold                  0
SalePrice               0
dtype: int64
```

```
In [14]: # LotFrontage is having 259 missing values and GarageYrBlt 81 missing values
```

```
In [15]: # checking the distribution of both
```

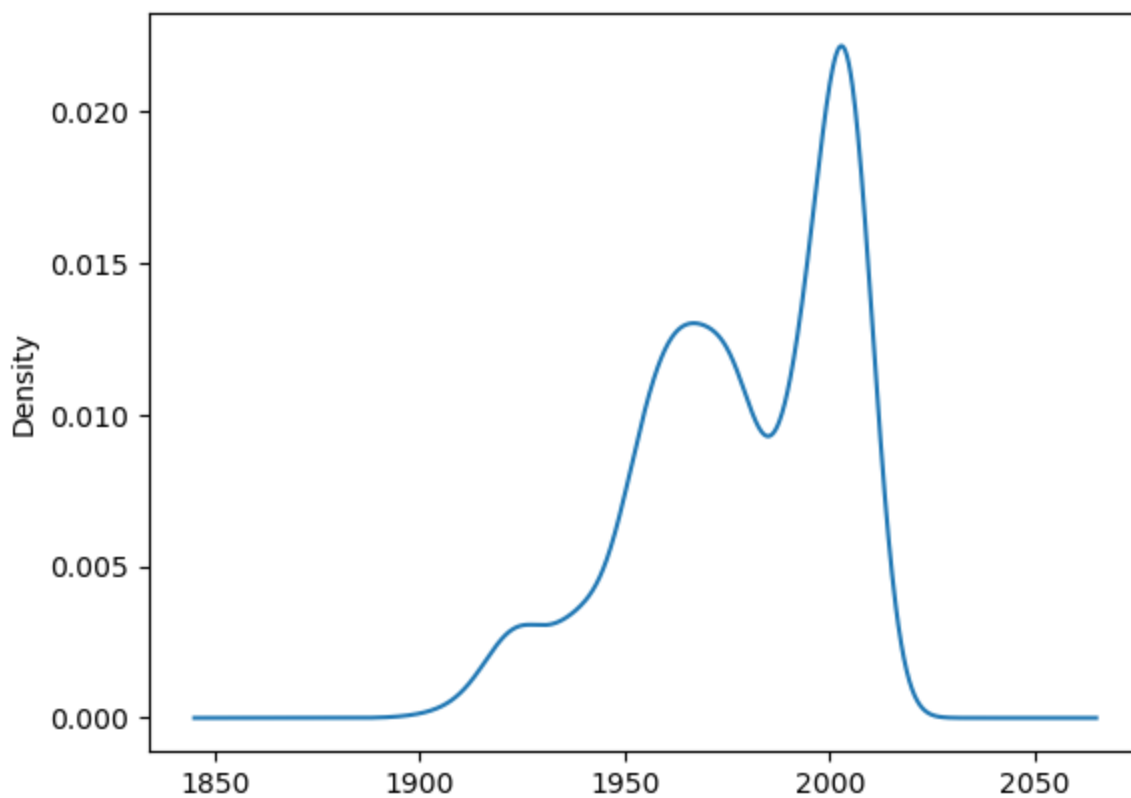
```
In [16]: data_num["LotFrontage"].plot(kind="kde")
```

```
Out[16]: <AxesSubplot:ylabel='Density'>
```



```
In [17]: data_num["GarageYrBlt"].plot(kind="kde")
```

```
Out[17]: <AxesSubplot:ylabel='Density'>
```



```
In [18]: # replacing missing value with mean values
data_num["LotFrontage"].mean()
```

```
Out[18]: 70.04995836802665
```

```
In [19]: data_num["LotFrontage"].fillna(data_num["LotFrontage"].mean(), inplace=True)
```

```
In [20]: data_num["GarageYrBlt"].fillna(data_num["GarageYrBlt"].mean(), inplace=True)
```

```
In [21]: data_num.isnull().sum()
```

```
Out[21]: Id                0
MSSubClass              0
LotFrontage             0
LotArea                0
OverallQual             0
OverallCond             0
YearBuilt               0
YearRemodAdd           0
MasVnrArea              8
BsmtFinSF1              0
BsmtFinSF2              0
BsmtUnfSF               0
TotalBsmtSF            0
1stFlrSF                0
2ndFlrSF                0
LowQualFinSF           0
GrLivArea               0
BsmtFullBath            0
BsmtHalfBath            0
FullBath                0
HalfBath                0
BedroomAbvGr            0
KitchenAbvGr            0
TotRmsAbvGrd            0
Fireplaces              0
GarageYrBlt             0
GarageCars              0
GarageArea              0
WoodDeckSF              0
OpenPorchSF             0
EnclosedPorch           0
3SsnPorch               0
ScreenPorch             0
PoolArea                0
MiscVal                 0
MoSold                  0
YrSold                  0
SalePrice               0
dtype: int64
```

```
In [22]: # missing value treated
```

```
In [23]: # Skewness and Distribution of data
```

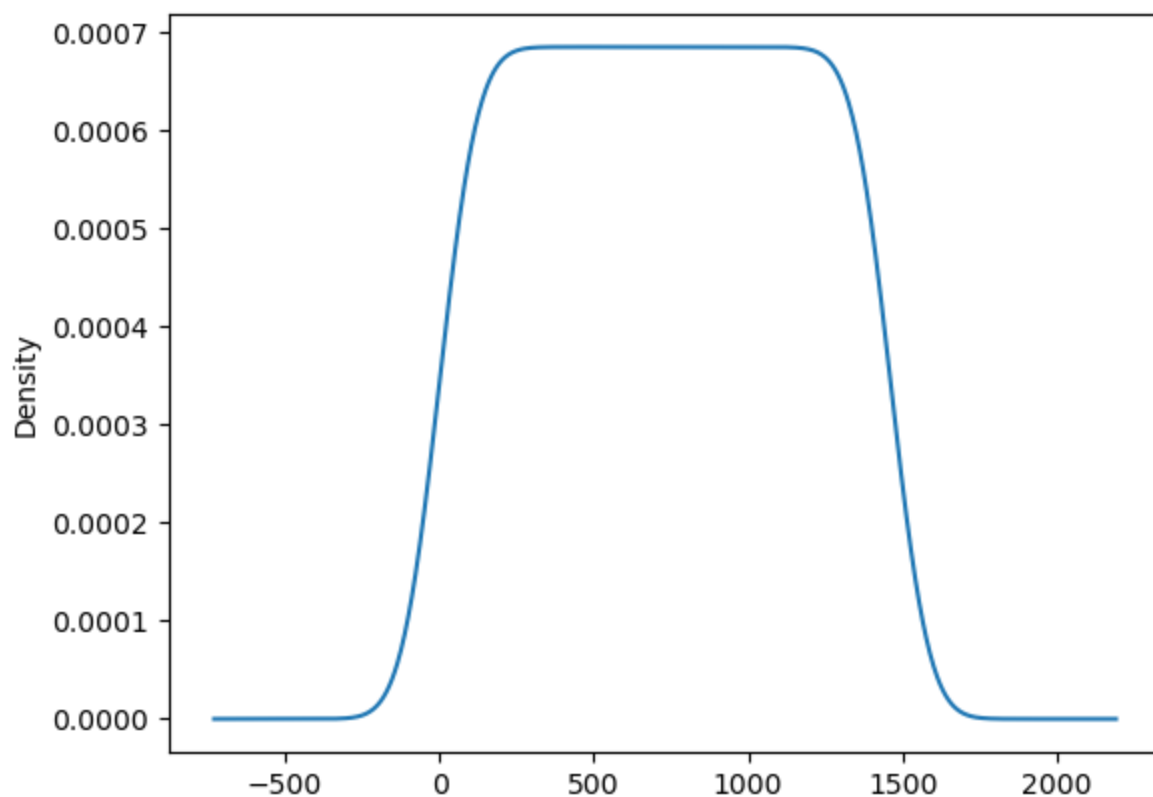
```
In [24]: data_num.skew()
```

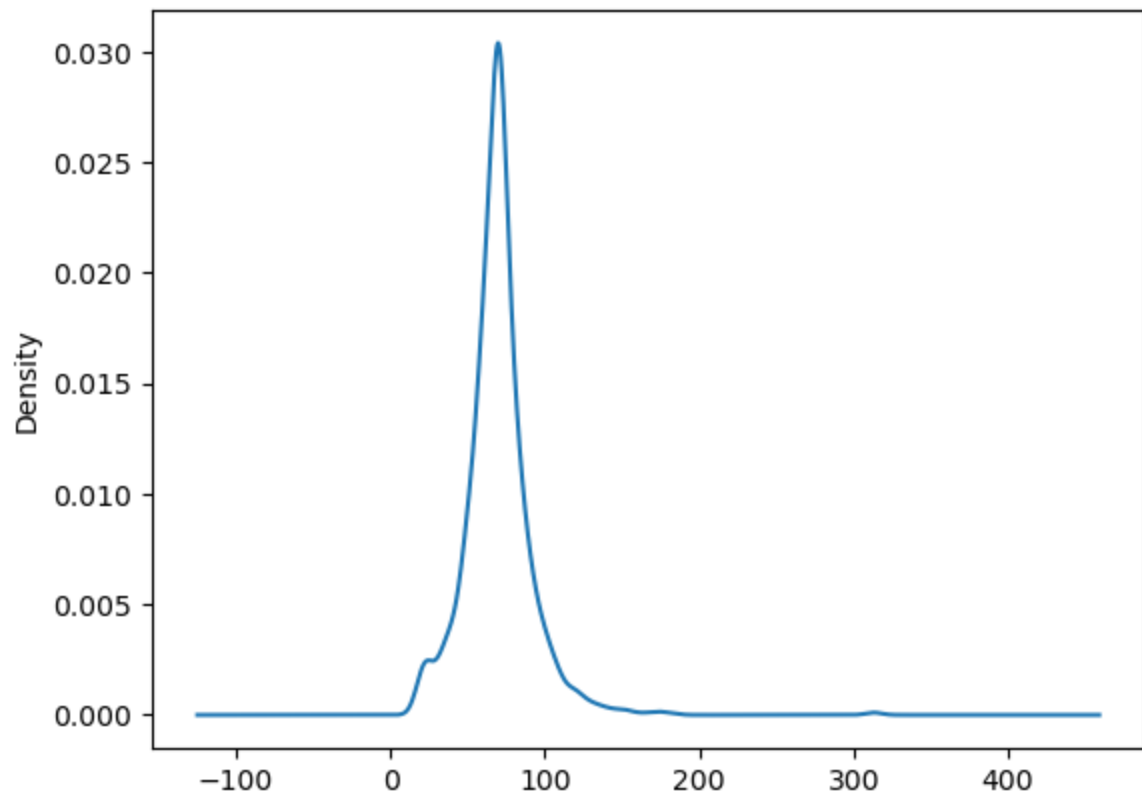
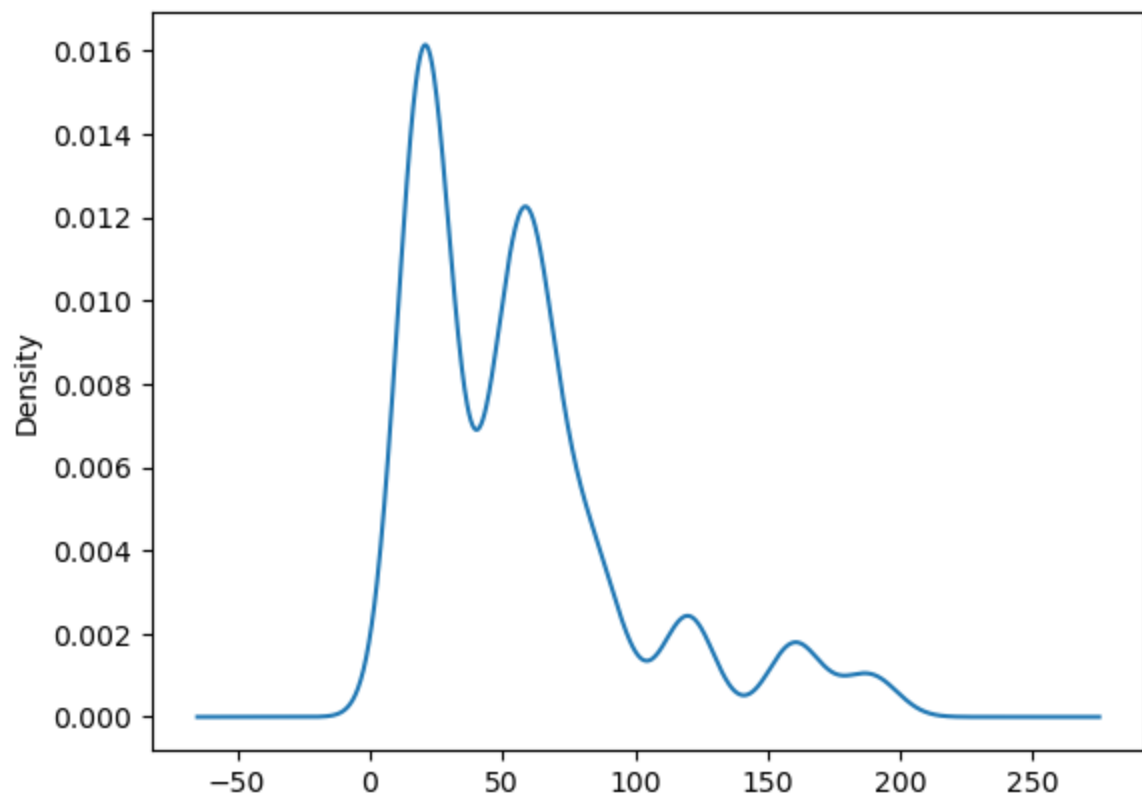
```
Out[24]: Id                0.000000
MSSubClass              1.407657
LotFrontage             2.384950
LotArea                12.207688
OverallQual             0.216944
OverallCond             0.693067
YearBuilt              -0.613461
YearRemodAdd           -0.503562
MasVnrArea              2.669084
BsmtFinSF1              1.685503
BsmtFinSF2              4.255261
BsmtUnfSF               0.920268
TotalBsmtSF            1.524255
1stFlrSF                1.376757
2ndFlrSF                0.813030
```

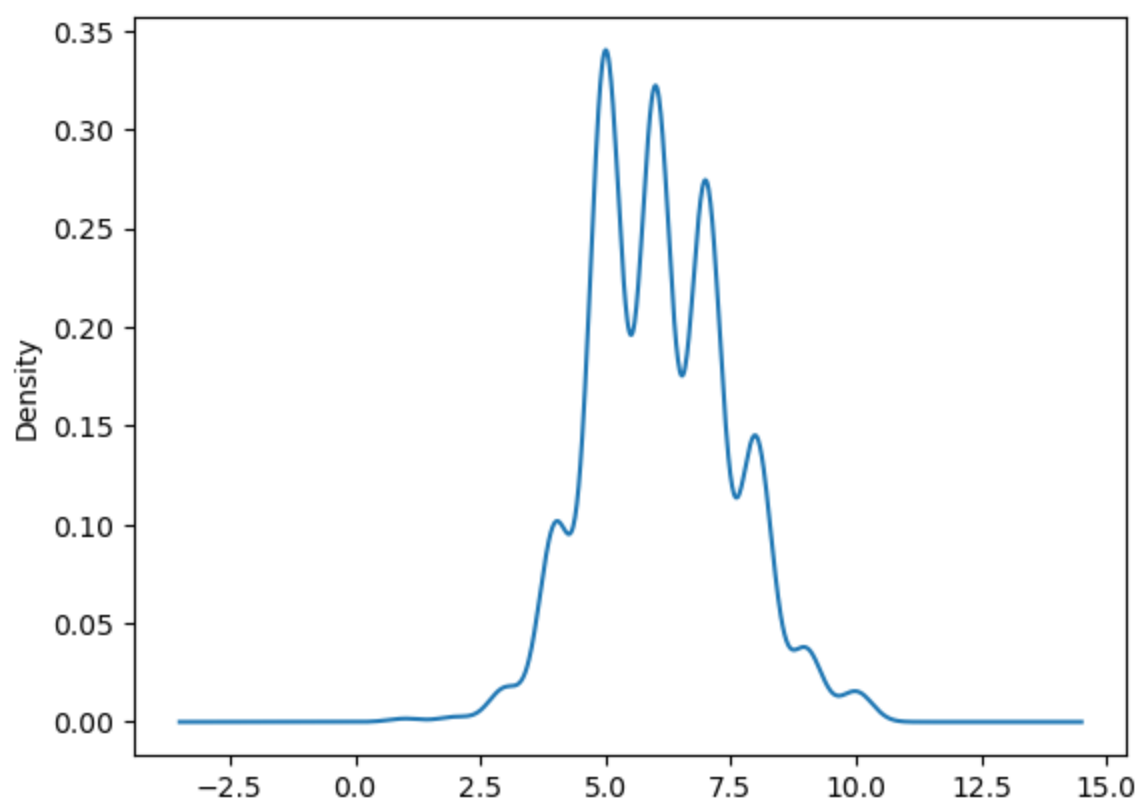
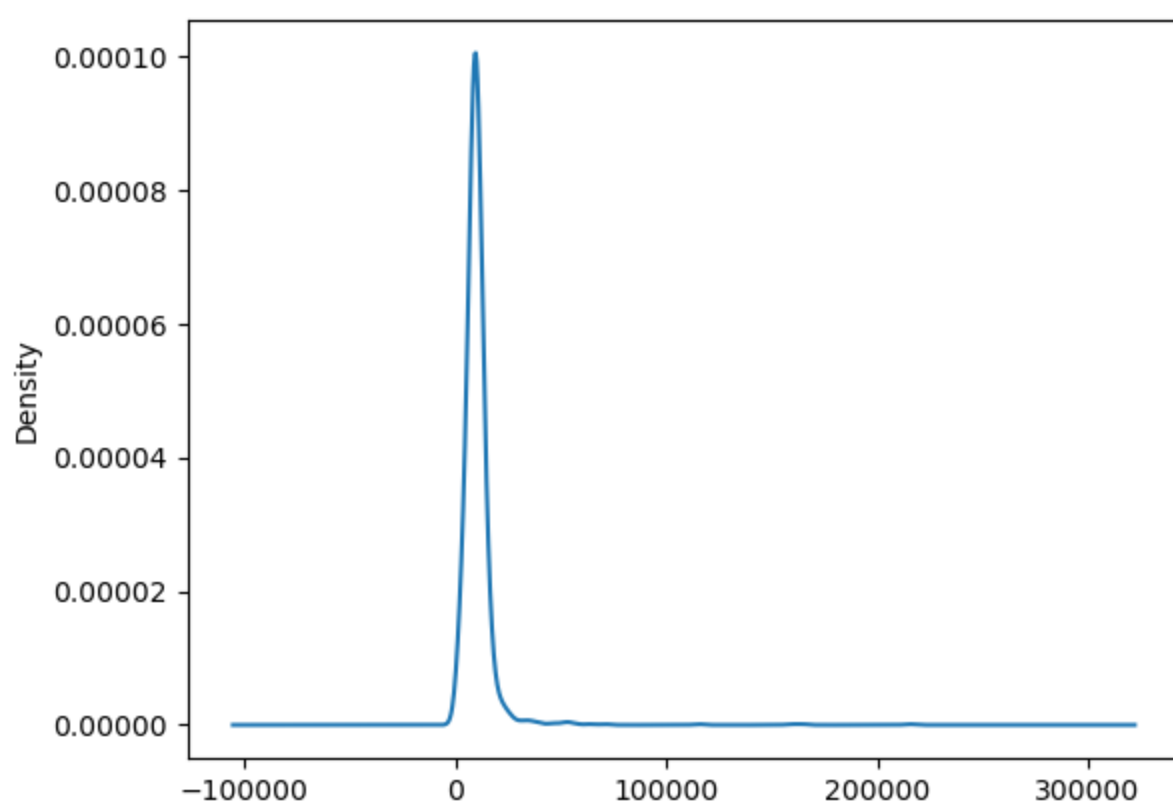
LowQualFinSF	9.011341
GrLivArea	1.366560
BsmtFullBath	0.596067
BsmtHalfBath	4.103403
FullBath	0.036562
HalfBath	0.675897
BedroomAbvGr	0.211790
KitchenAbvGr	4.488397
TotRmsAbvGrd	0.676341
Fireplaces	0.649565
GarageYrBlt	-0.668175
GarageCars	-0.342549
GarageArea	0.179981
WoodDeckSF	1.541376
OpenPorchSF	2.364342
EnclosedPorch	3.089872
3SsnPorch	10.304342
ScreenPorch	4.122214
PoolArea	14.828374
MiscVal	24.476794
MoSold	0.212053
YrSold	0.096269
SalePrice	1.882876

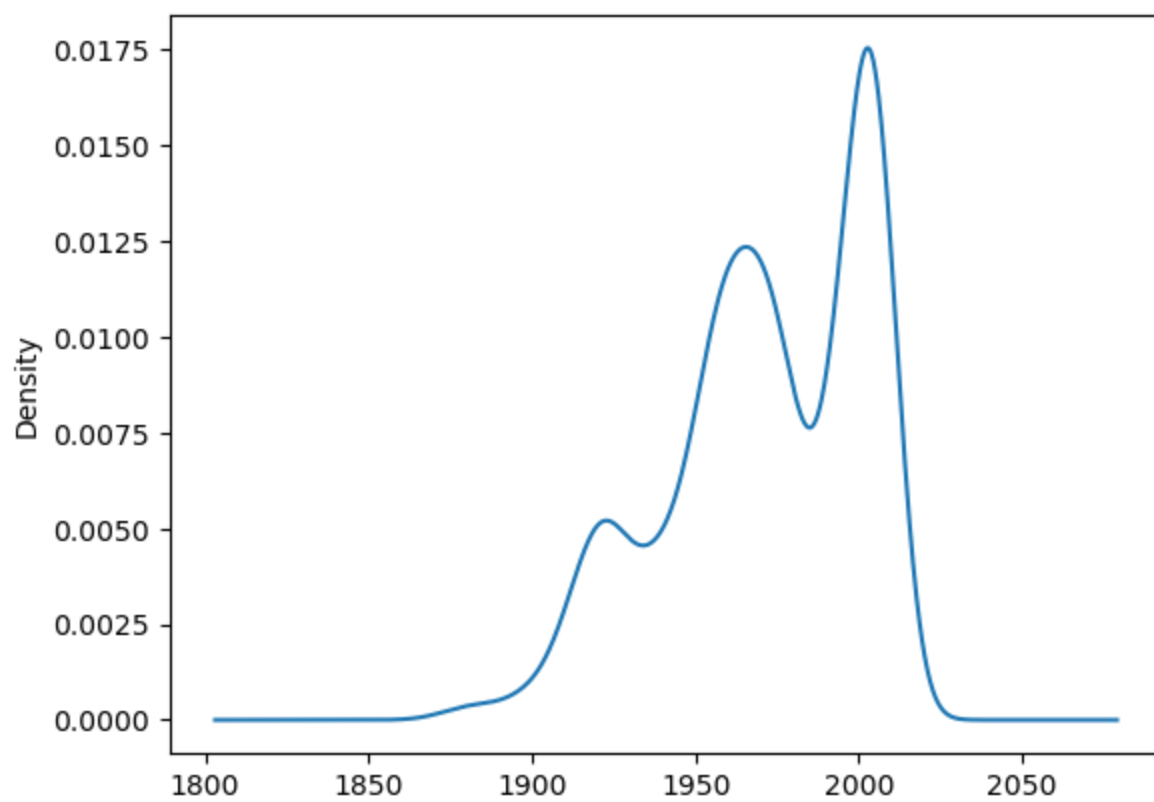
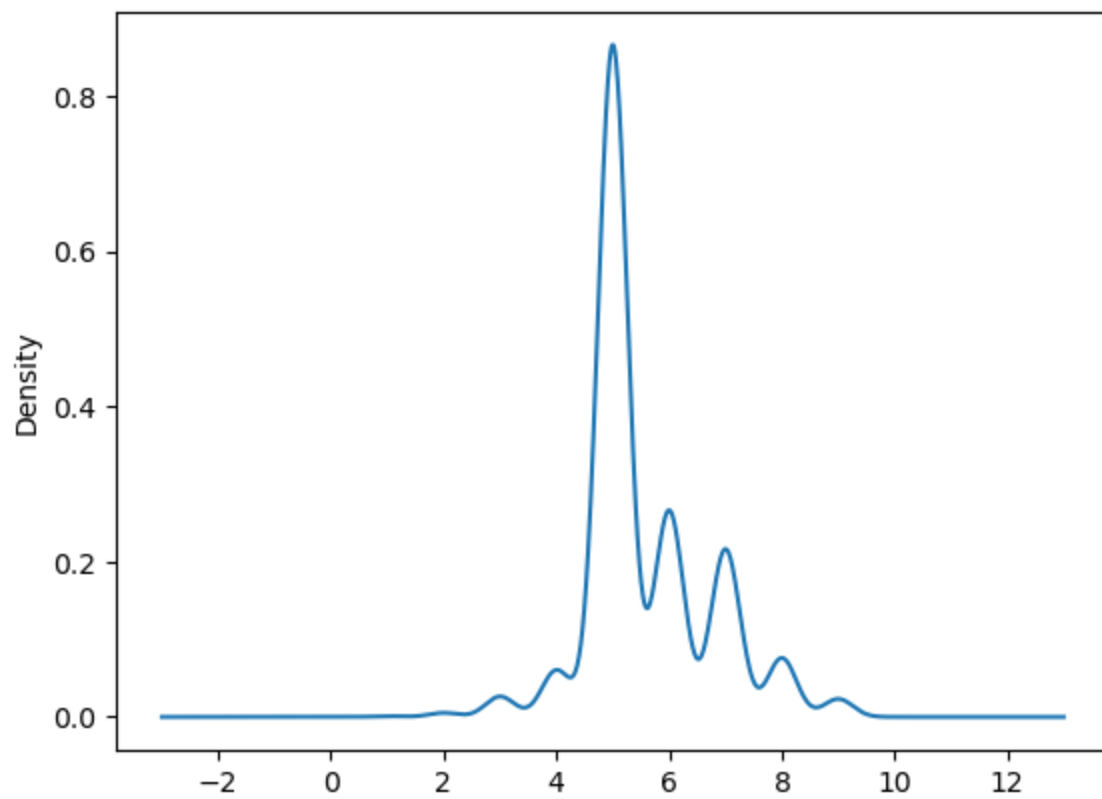
dtype: float64

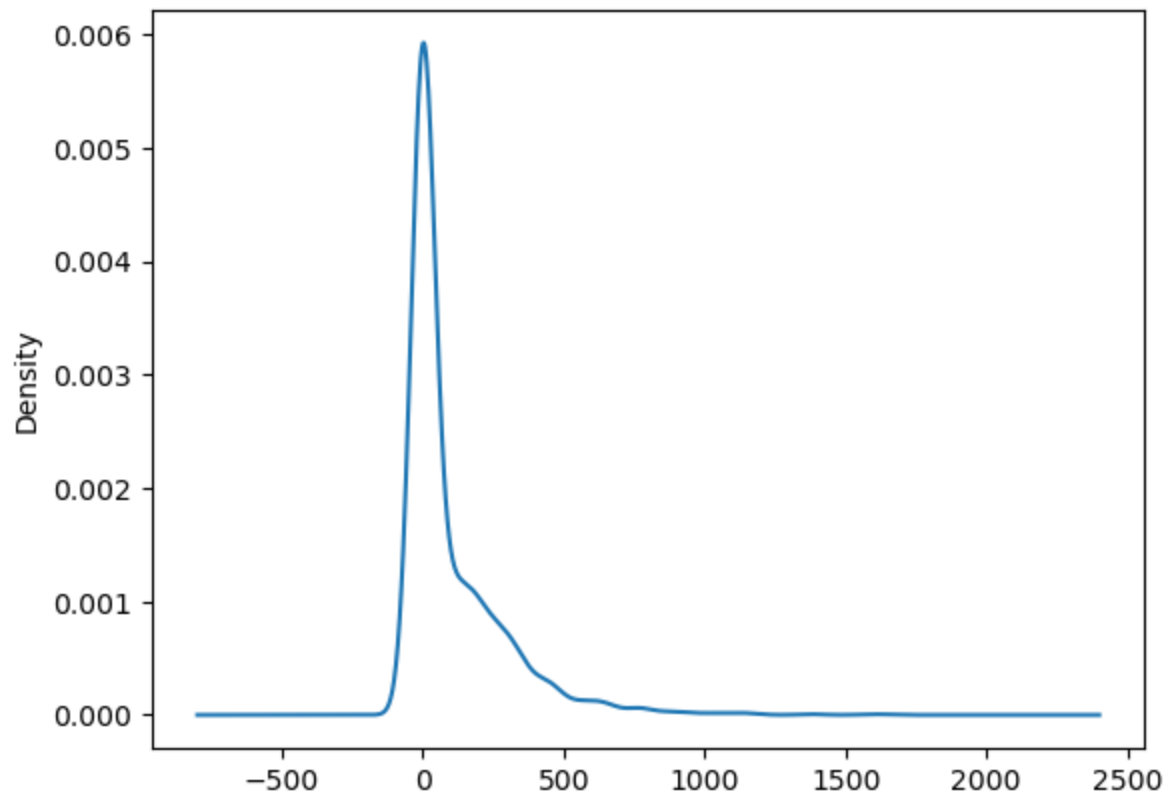
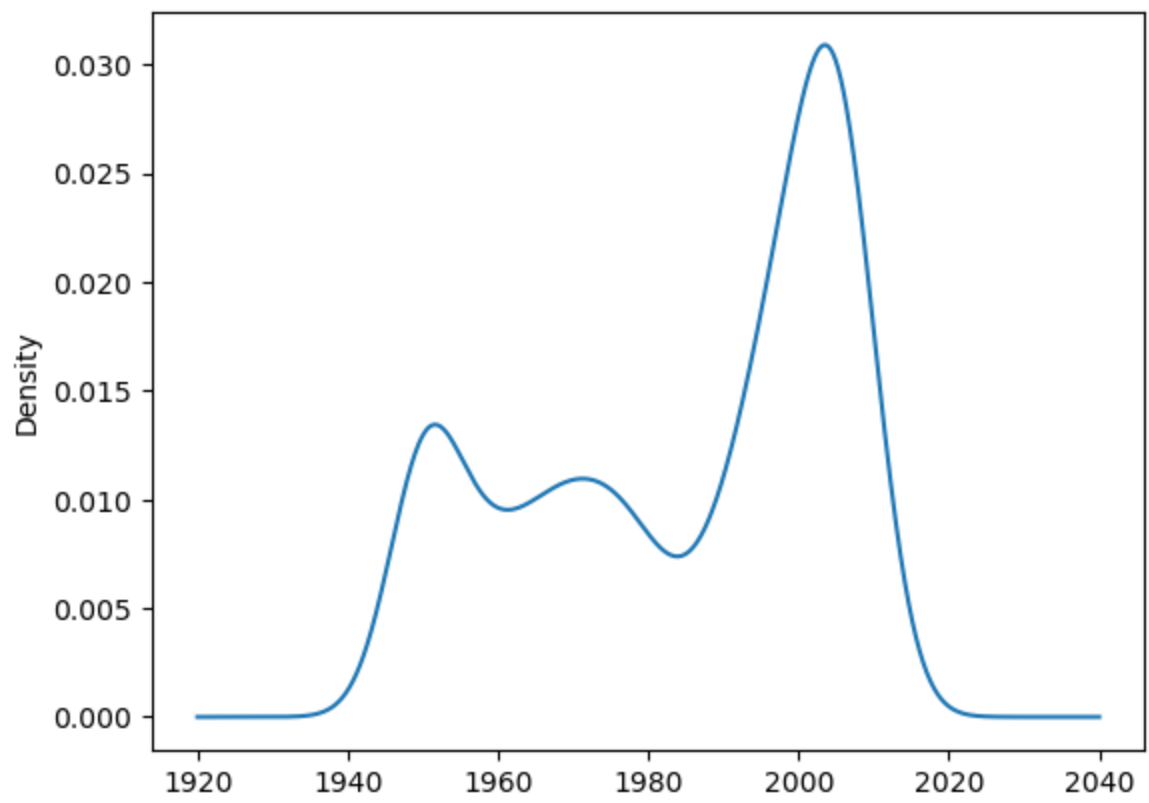
```
In [25]: for k in data_num.columns:
          data_num[k].plot(kind="kde")
          plt.show()
```

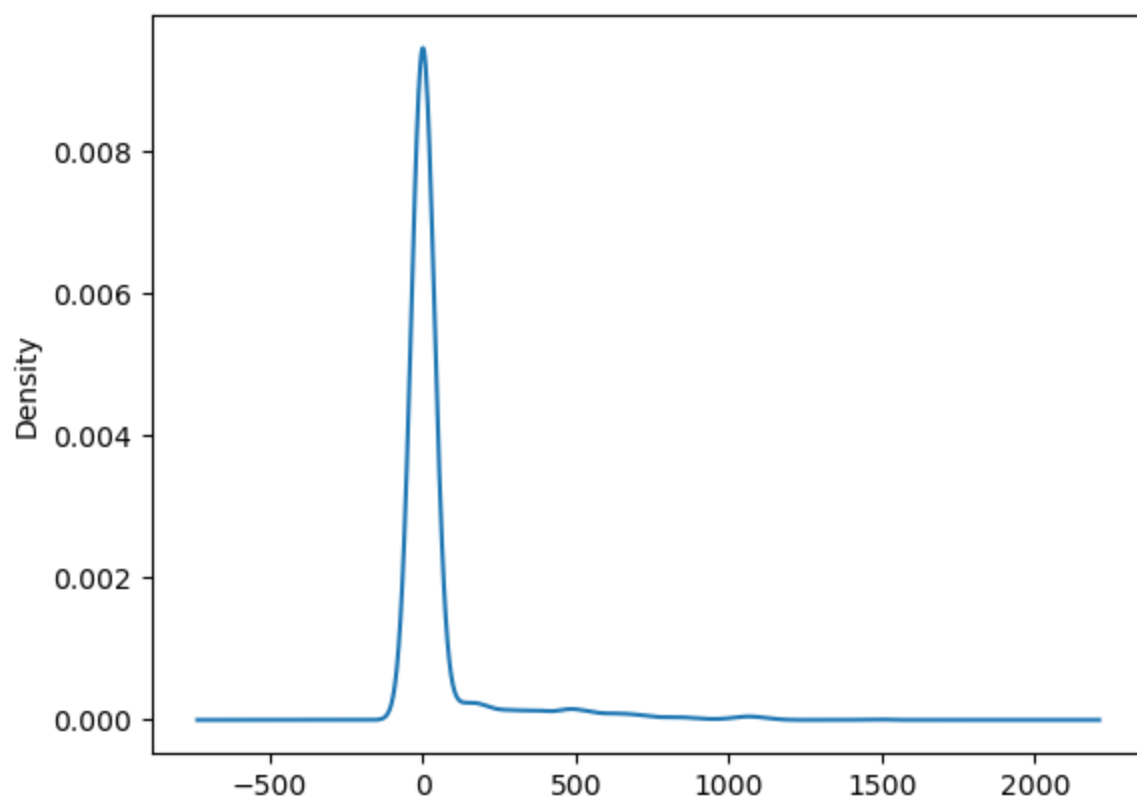
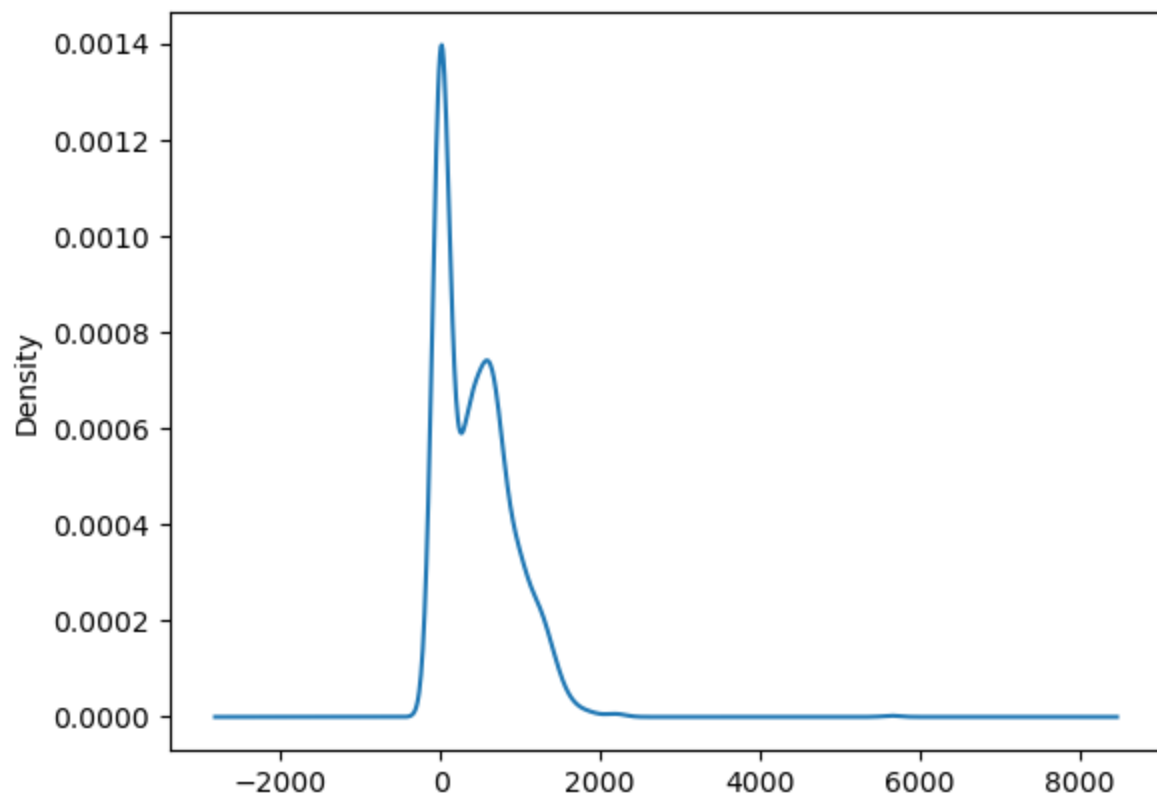


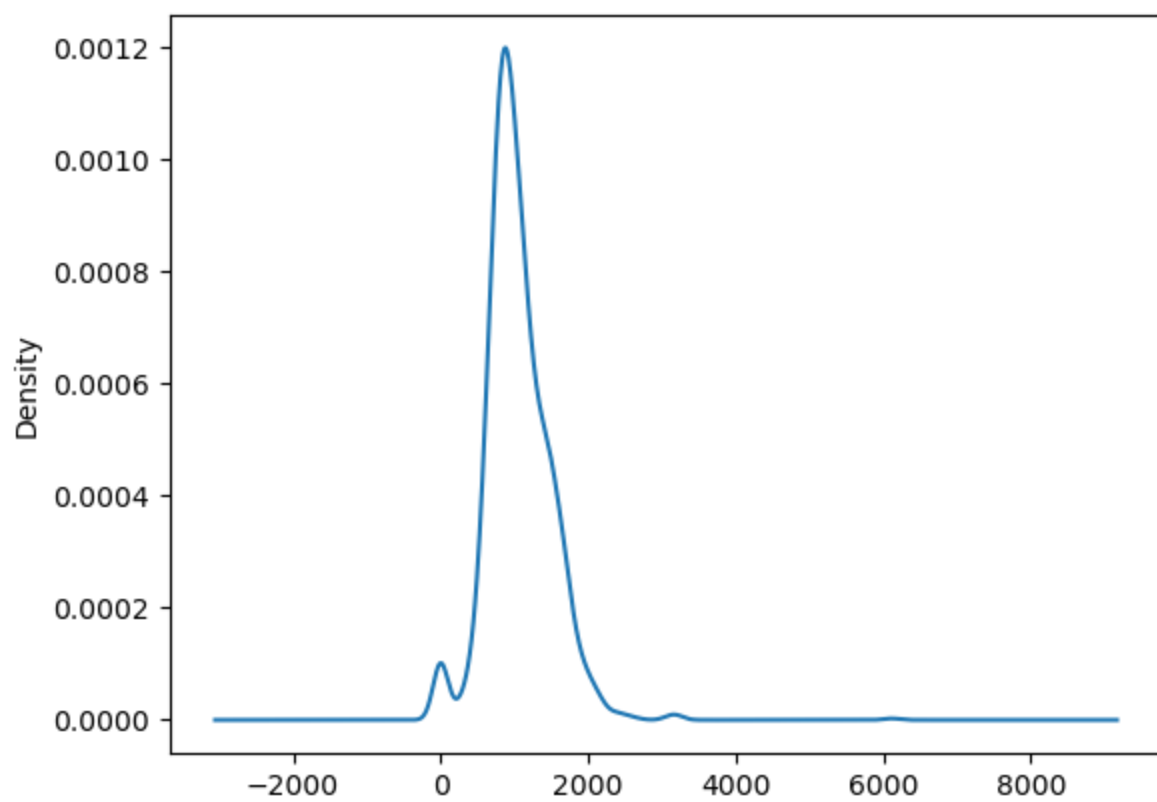
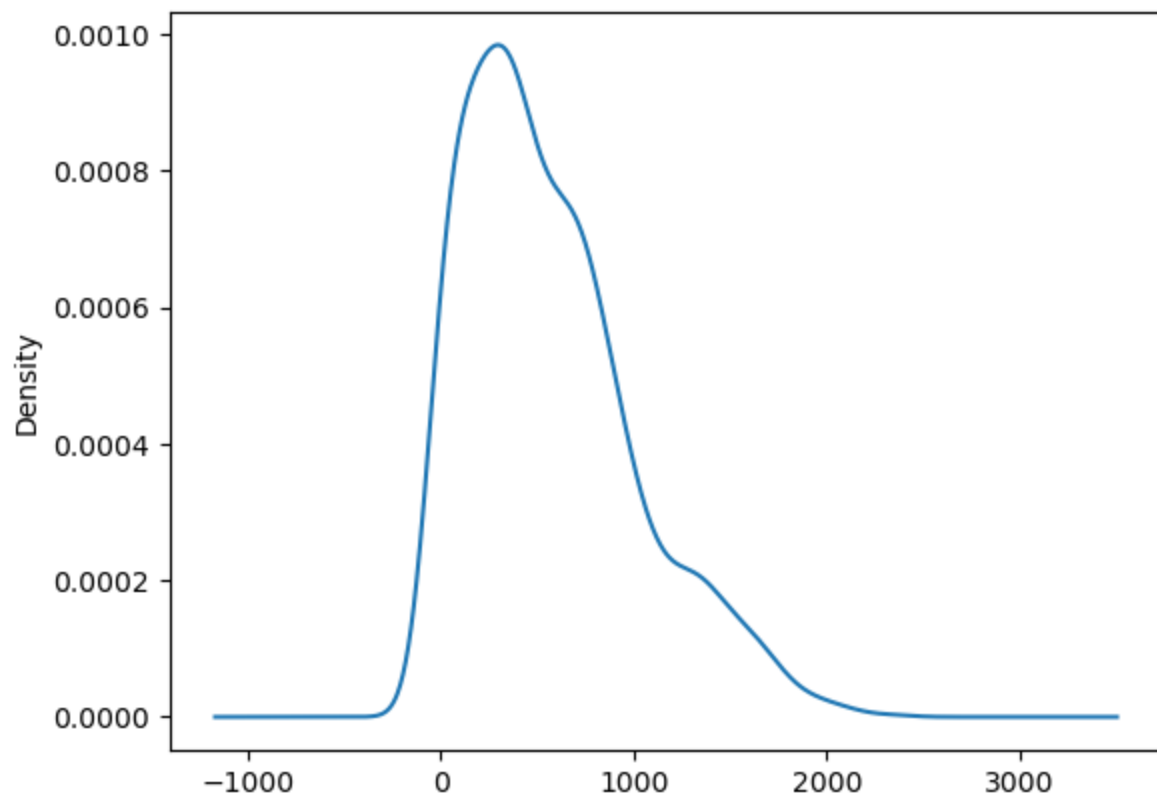


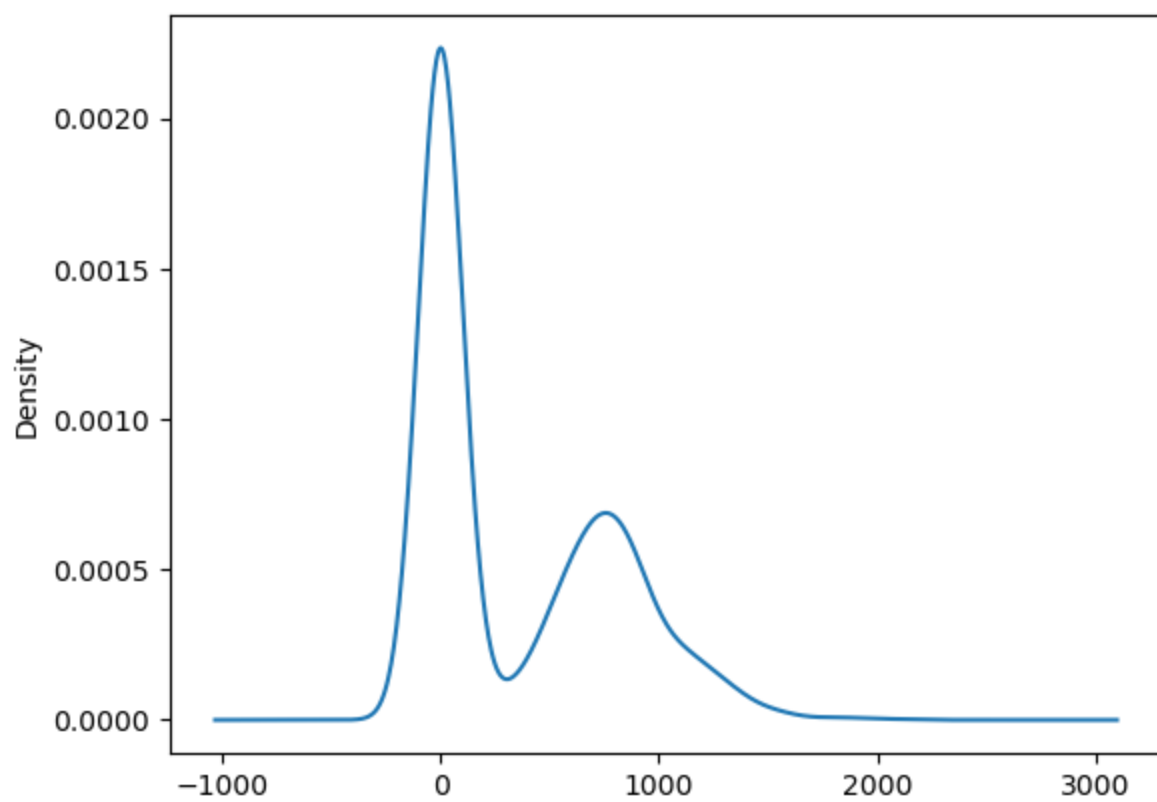
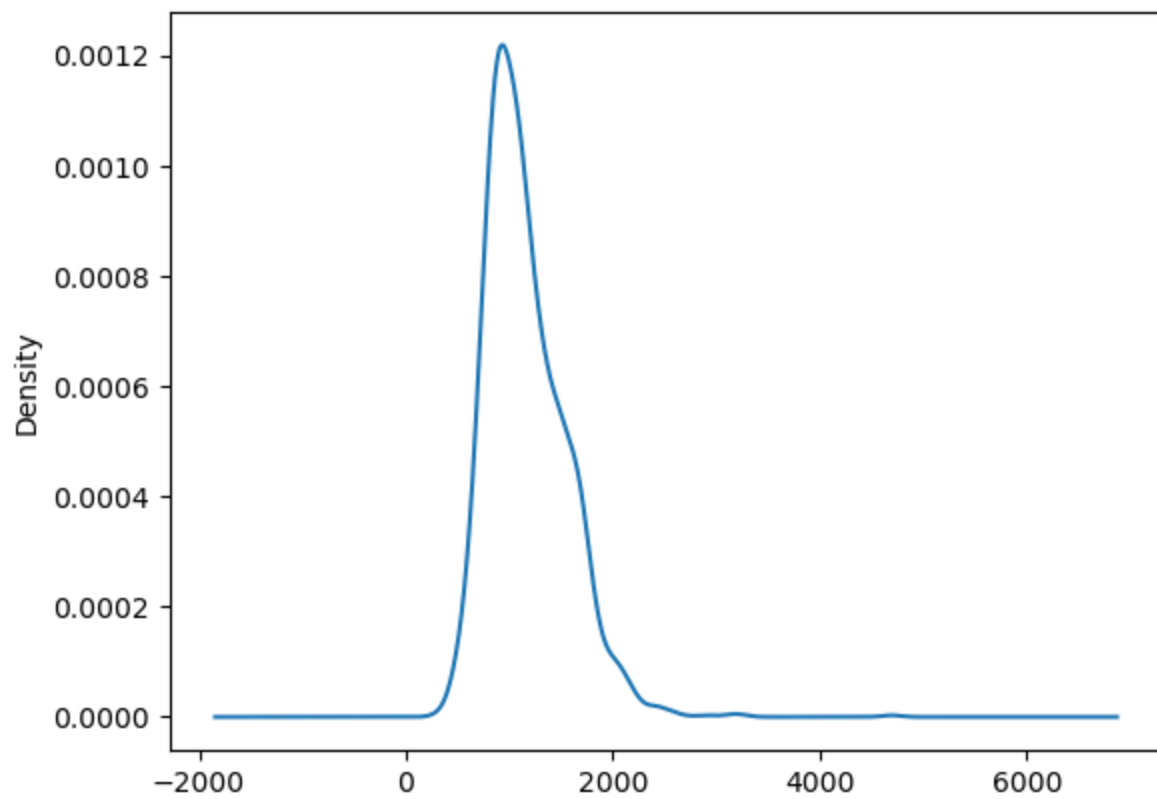


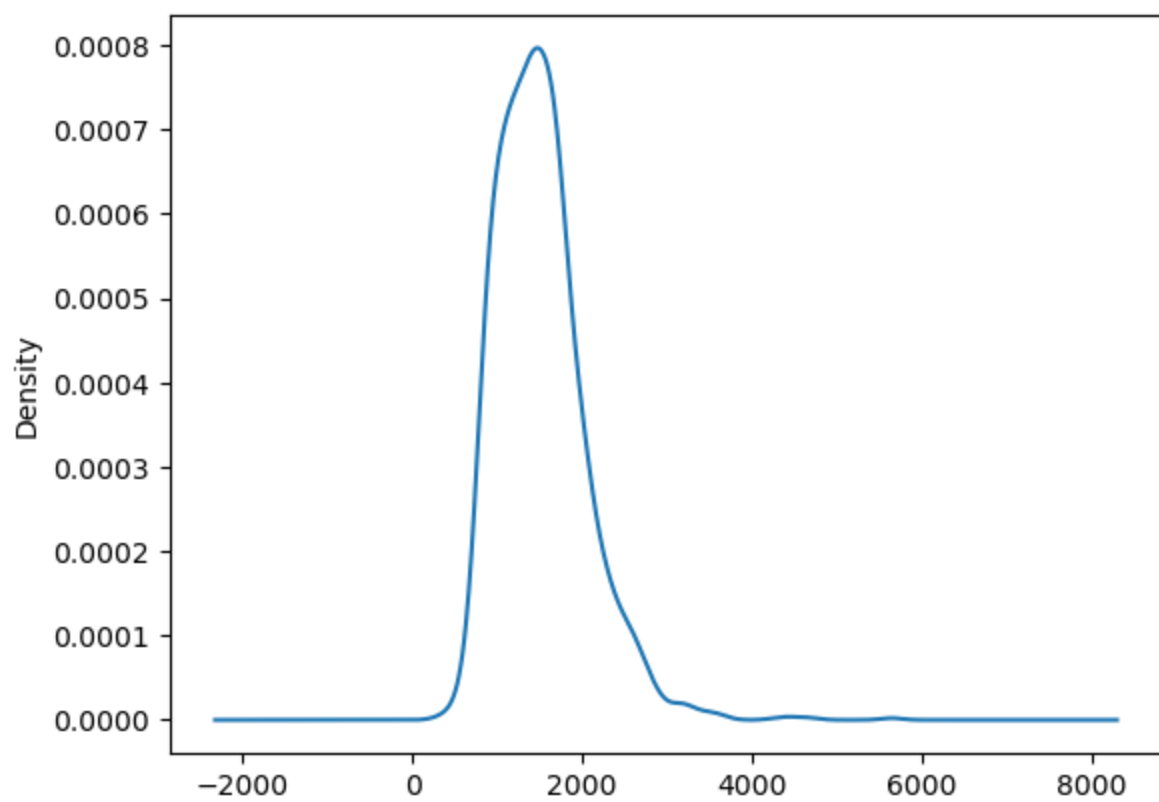
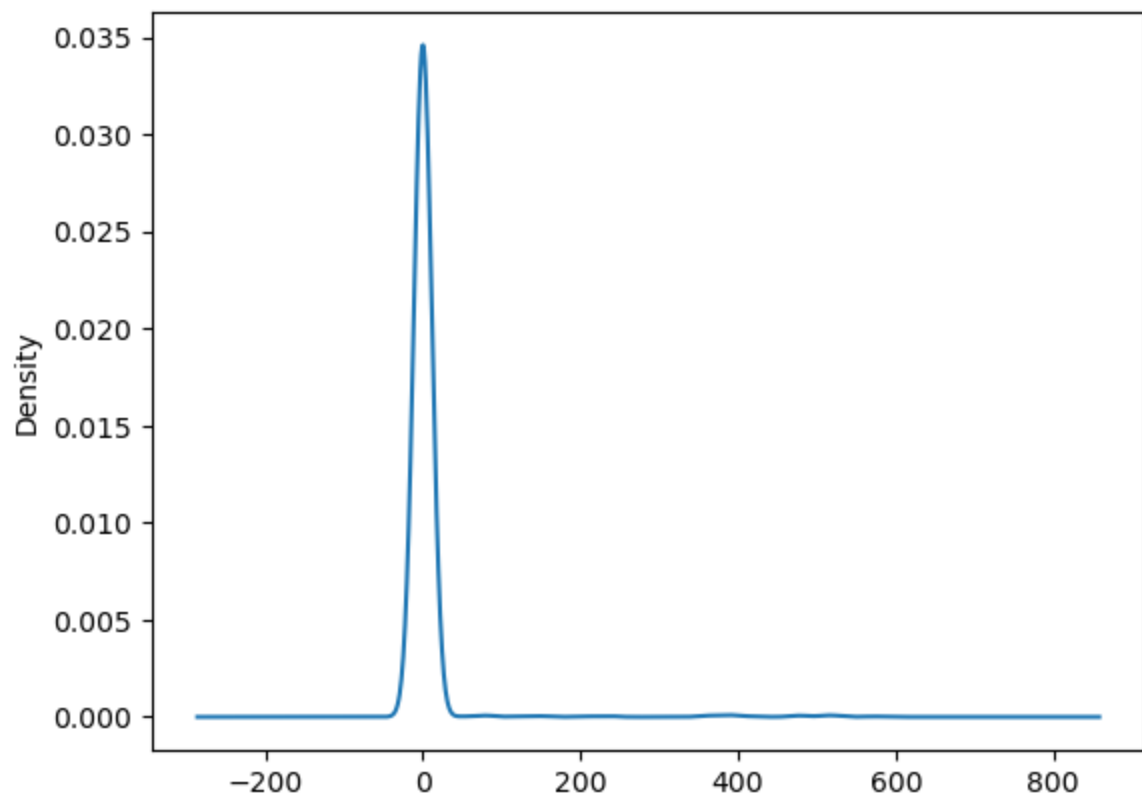


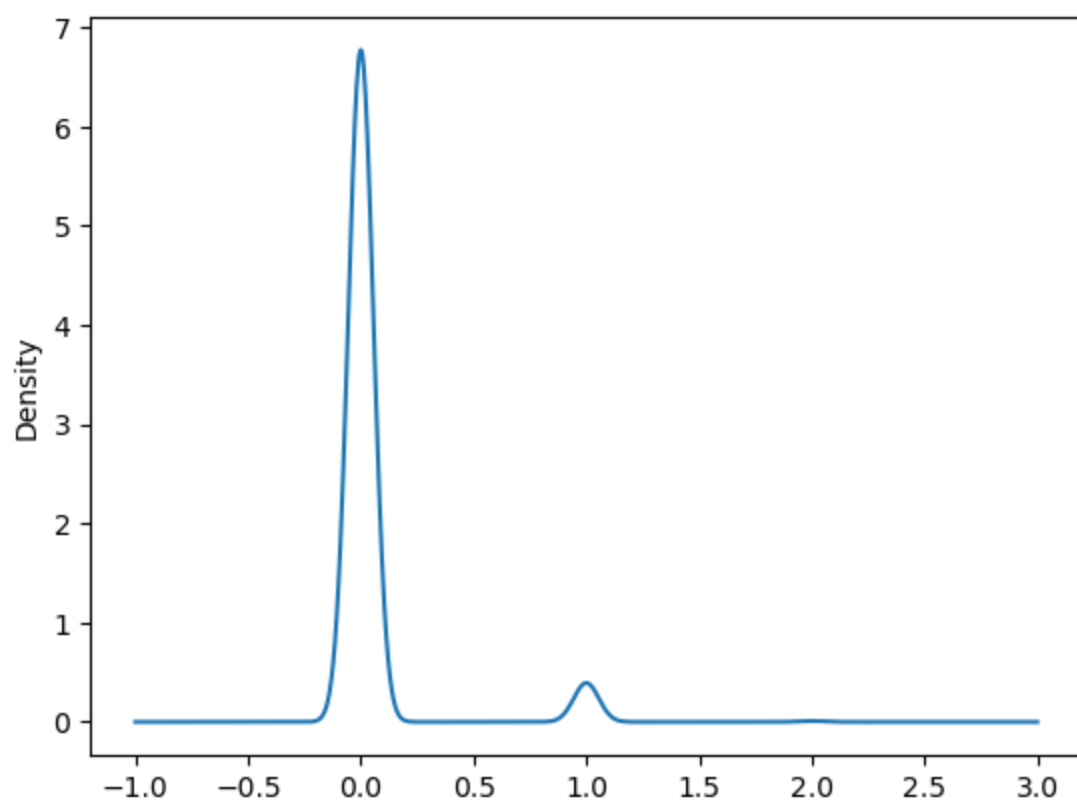
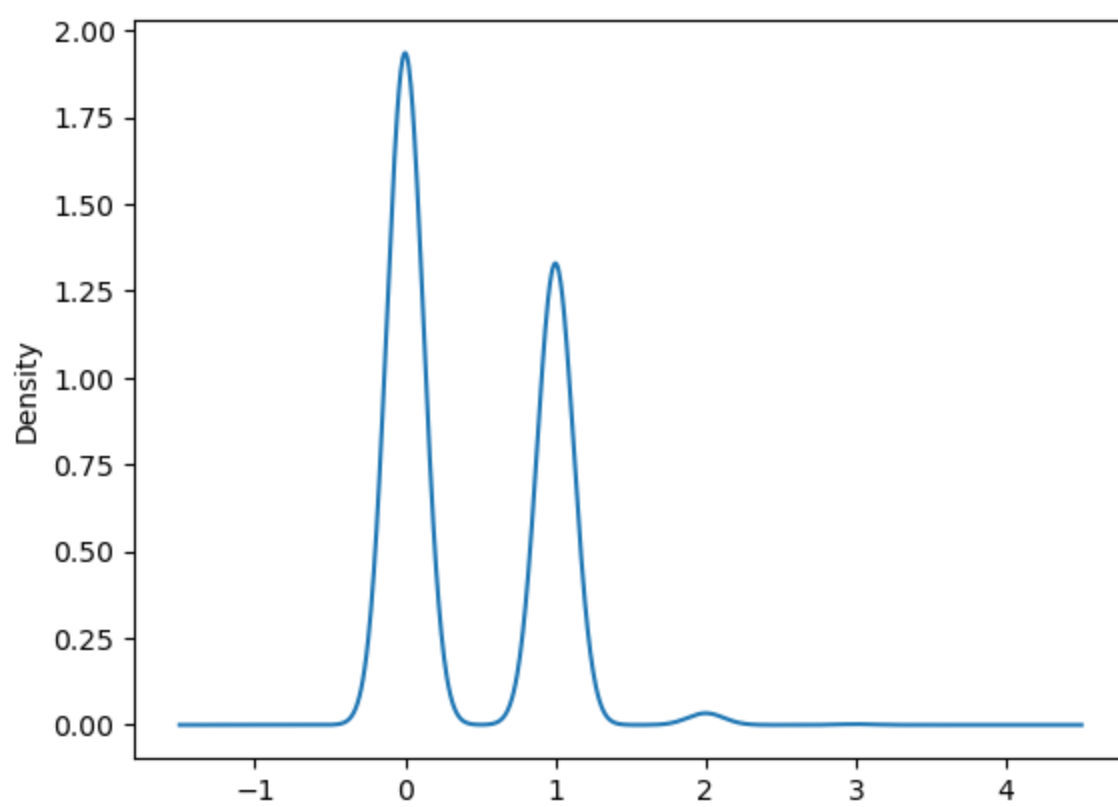


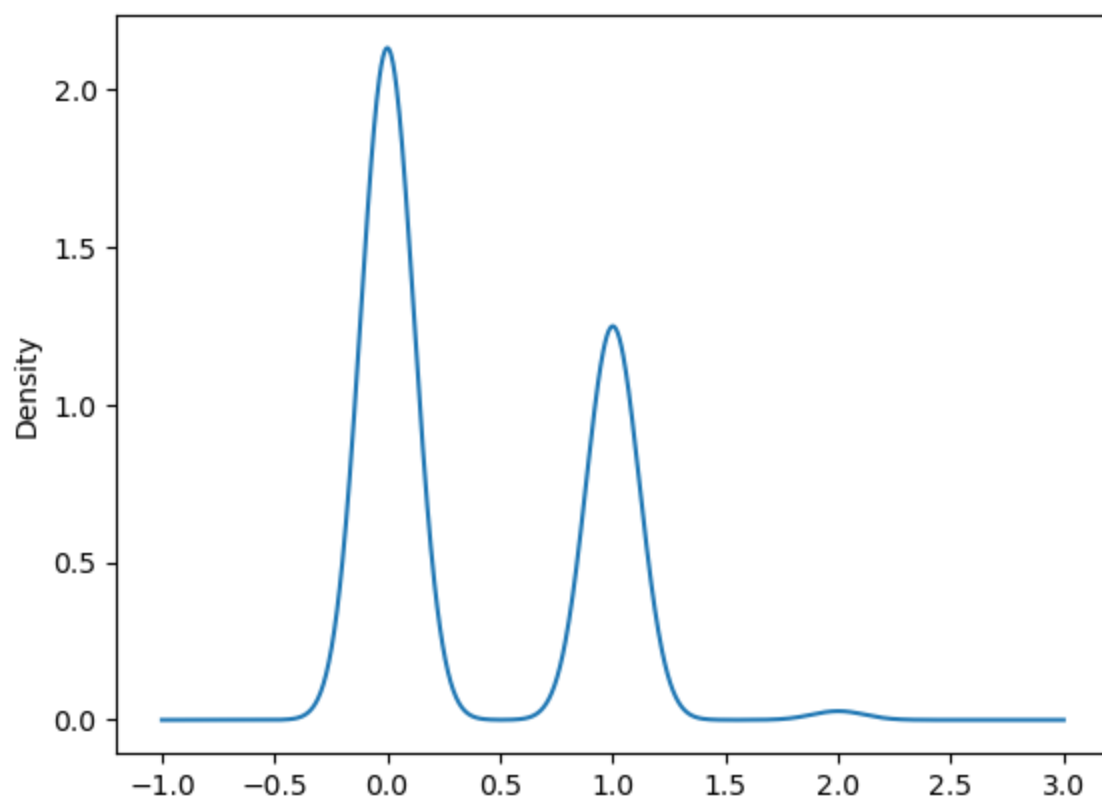
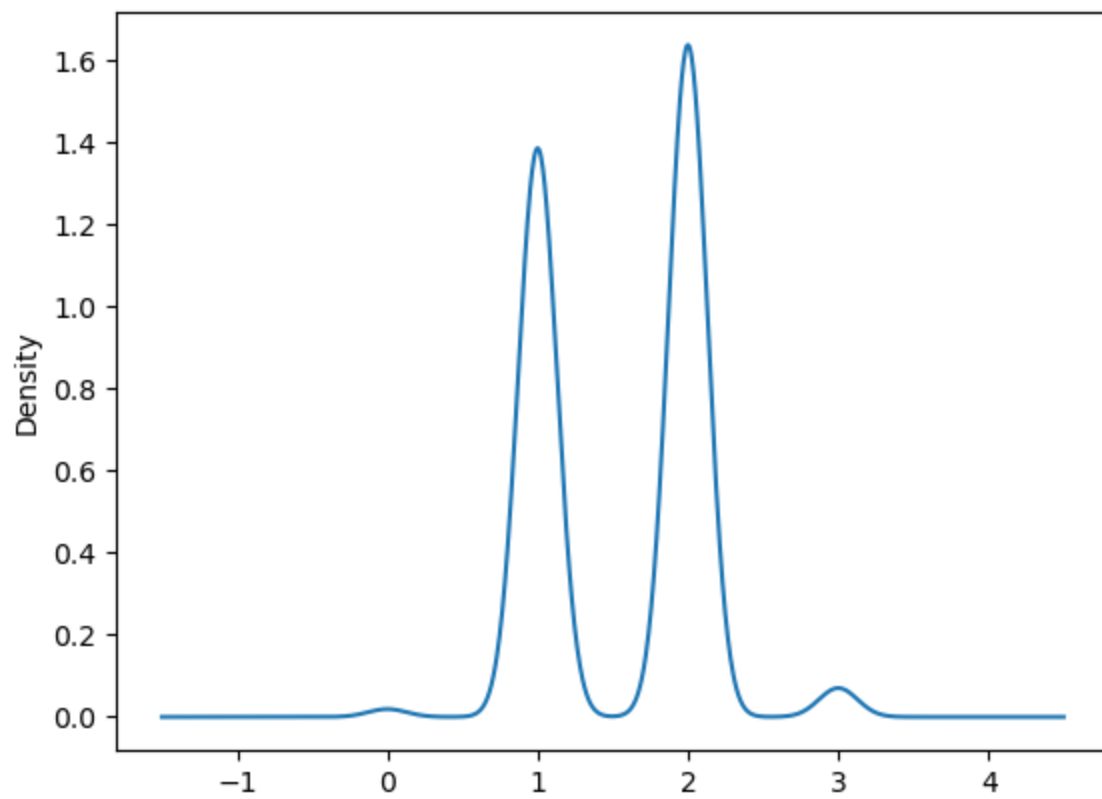


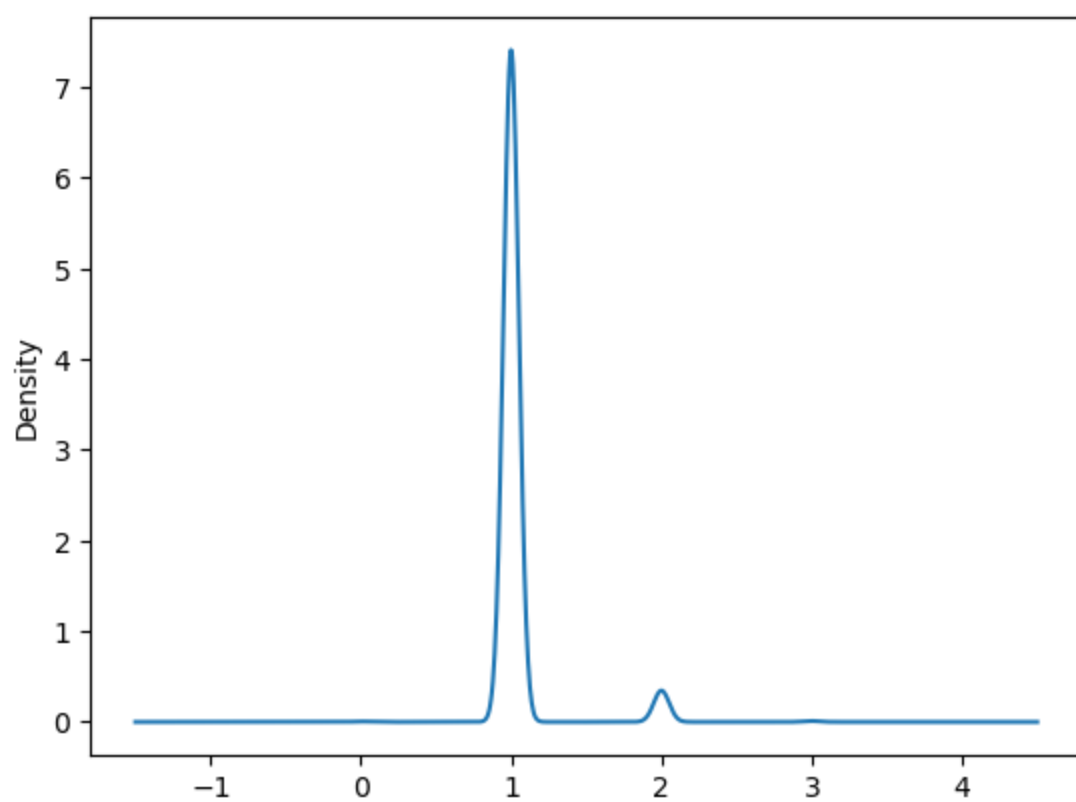
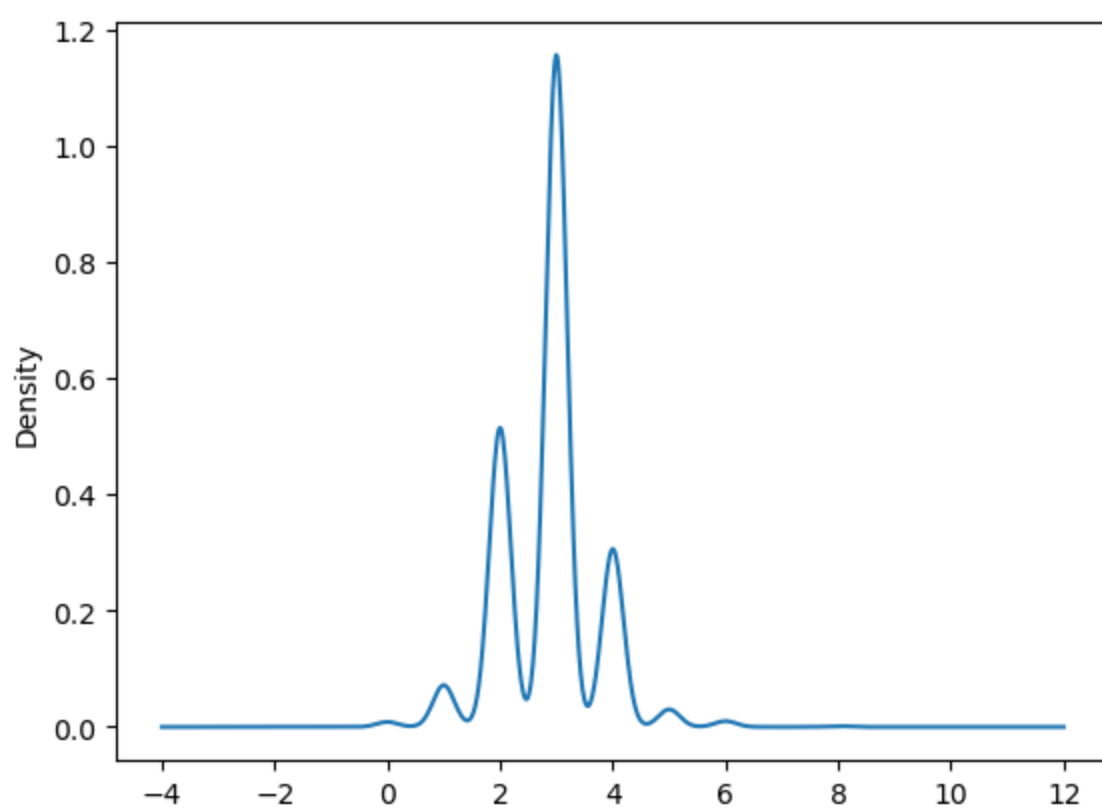


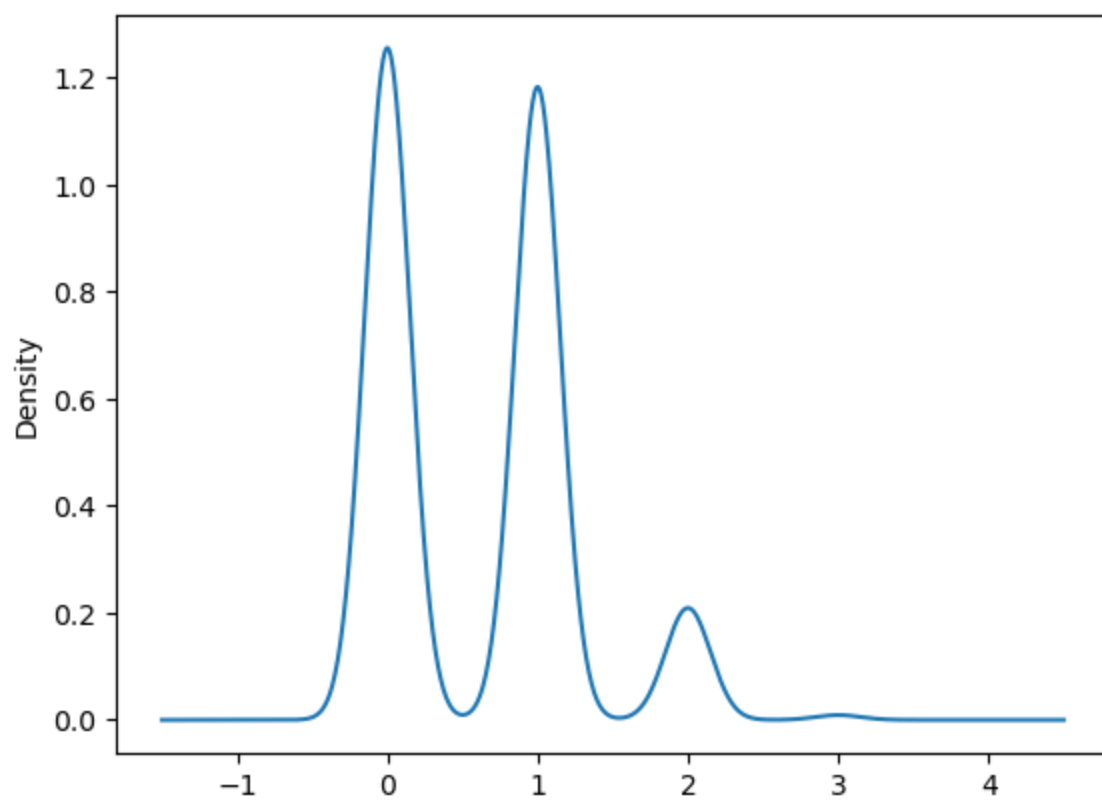
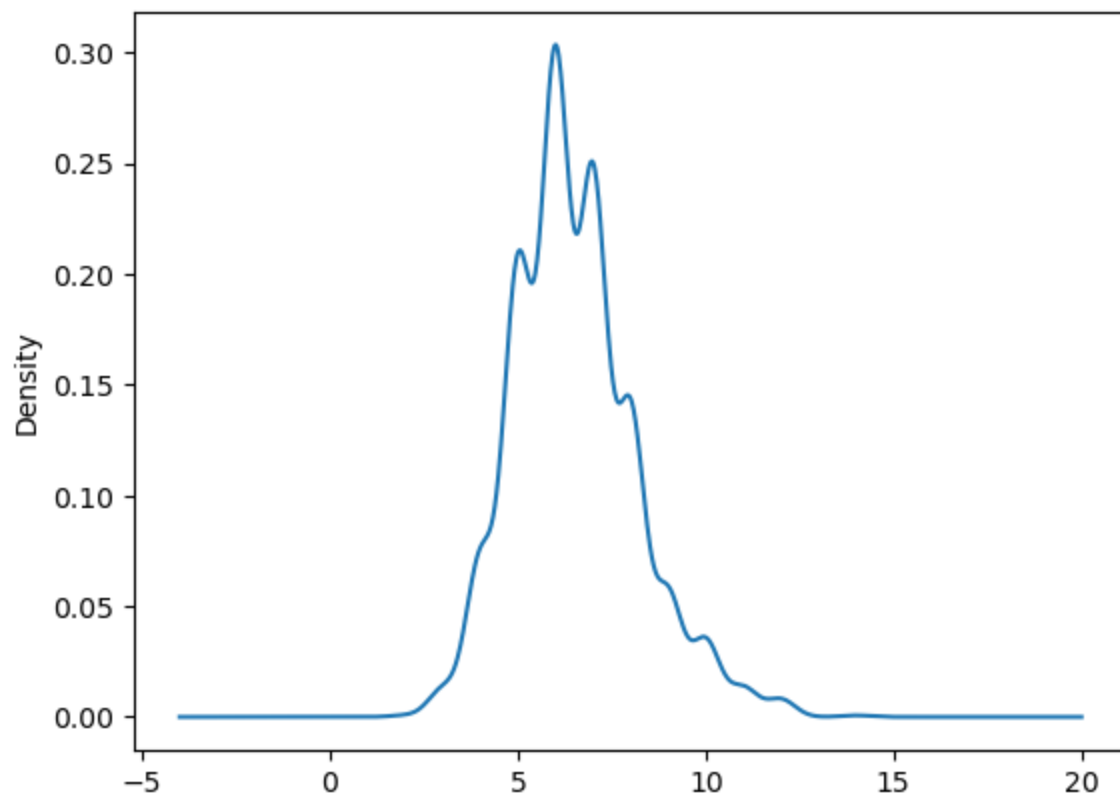


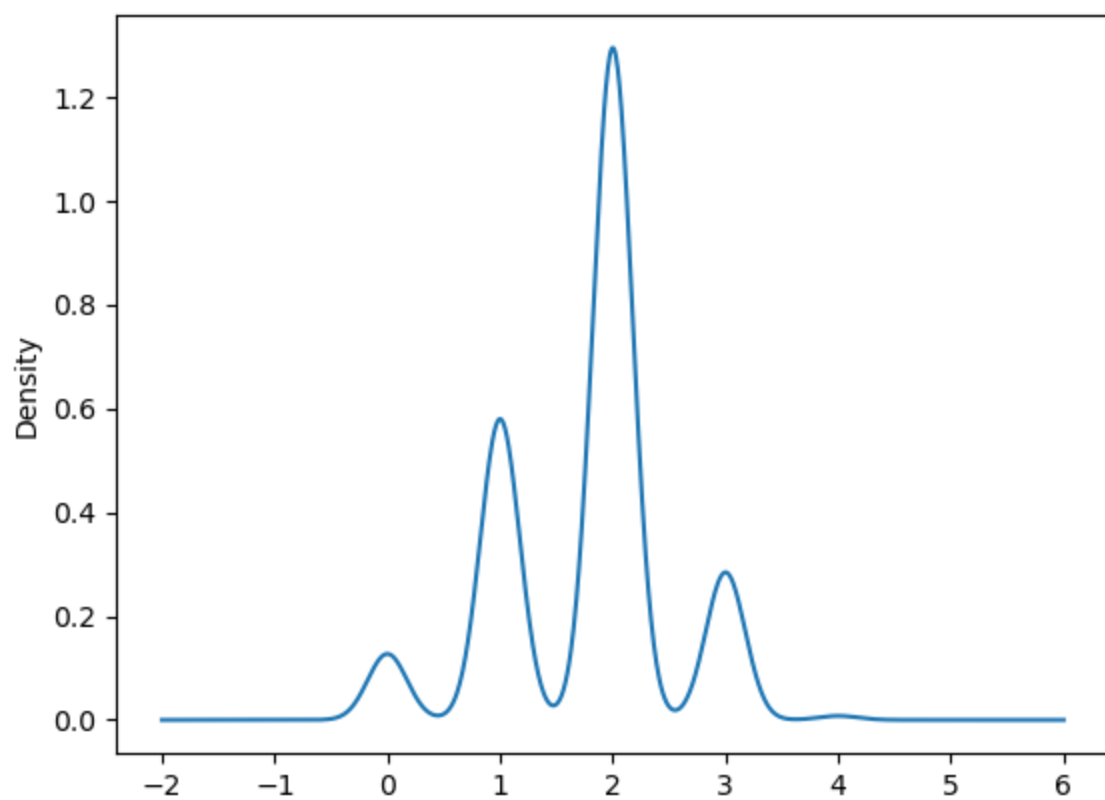
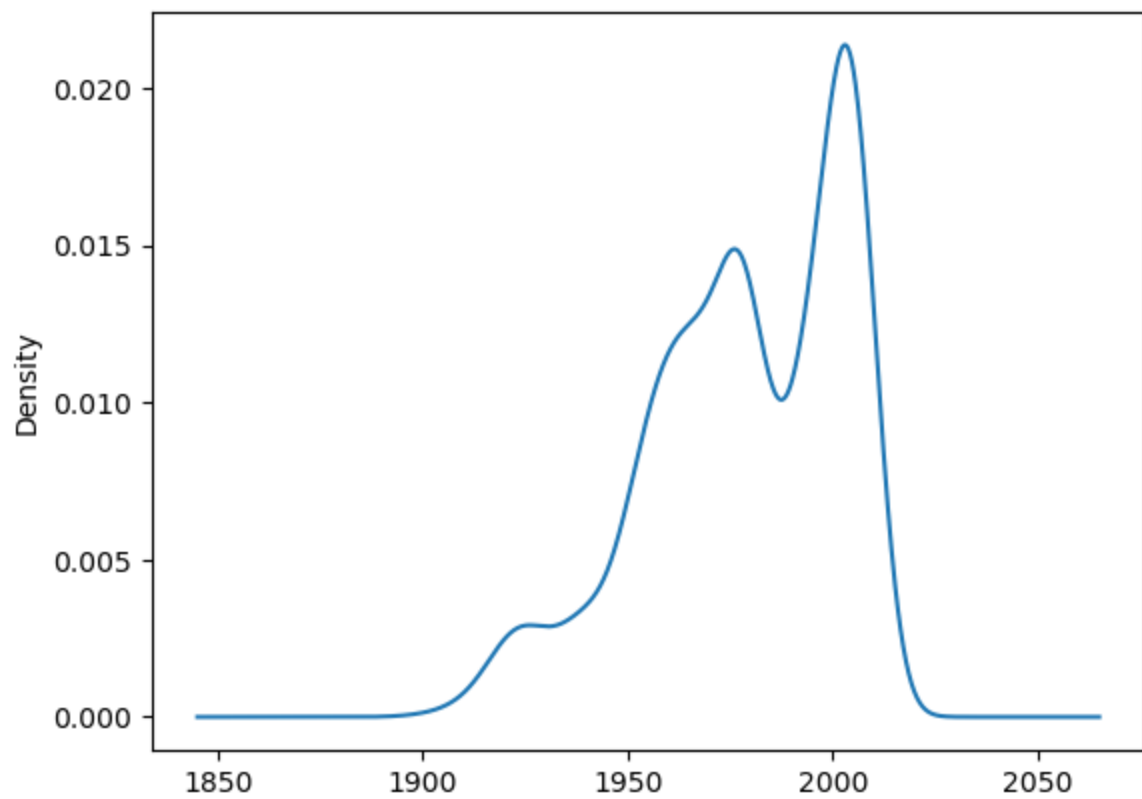


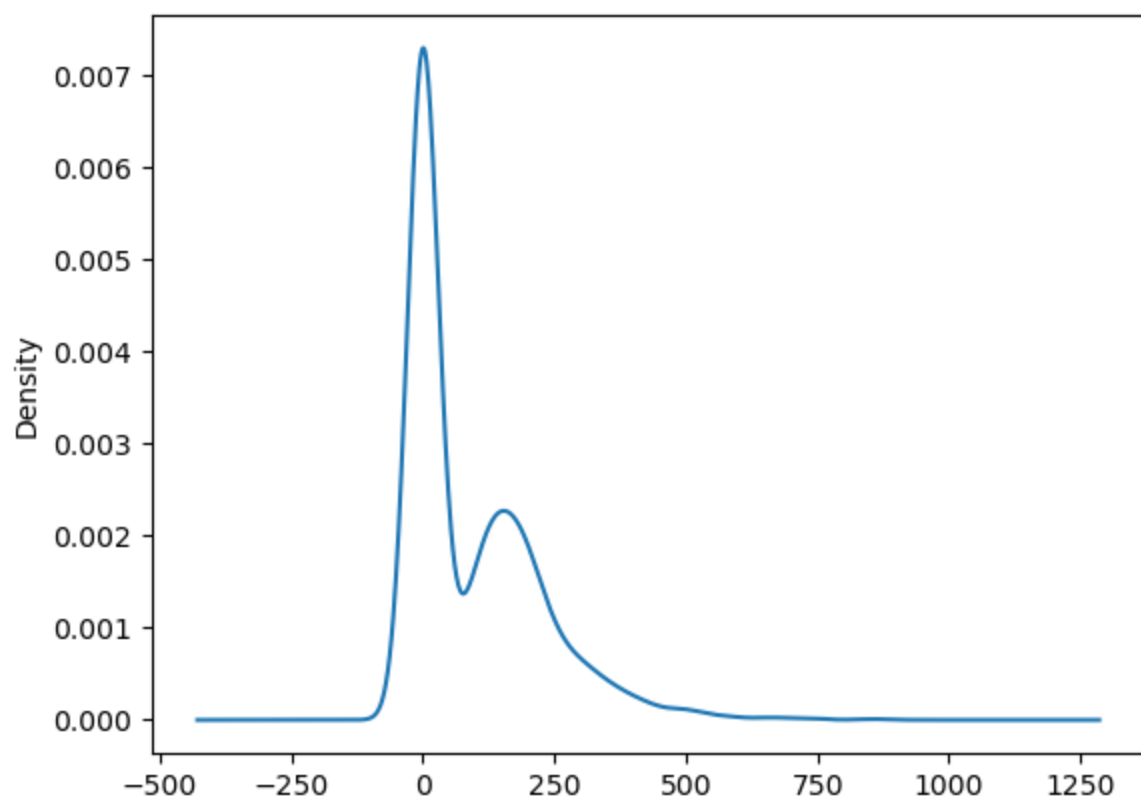
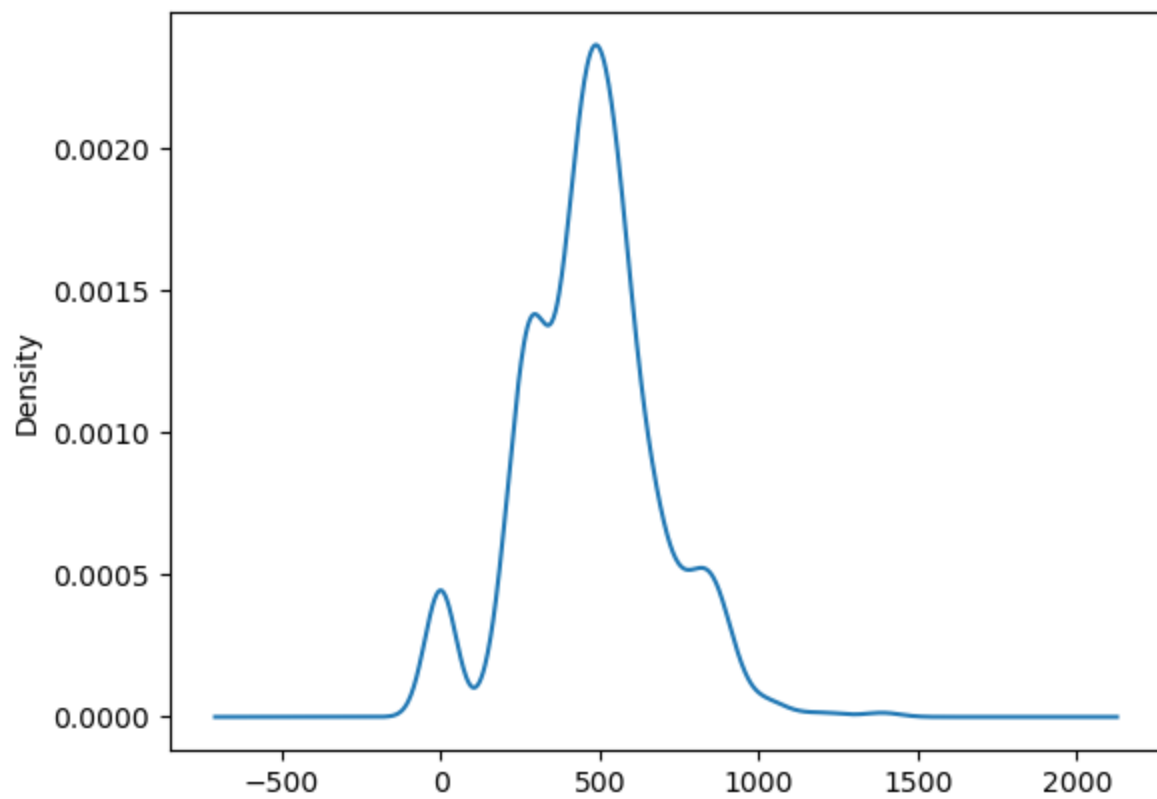


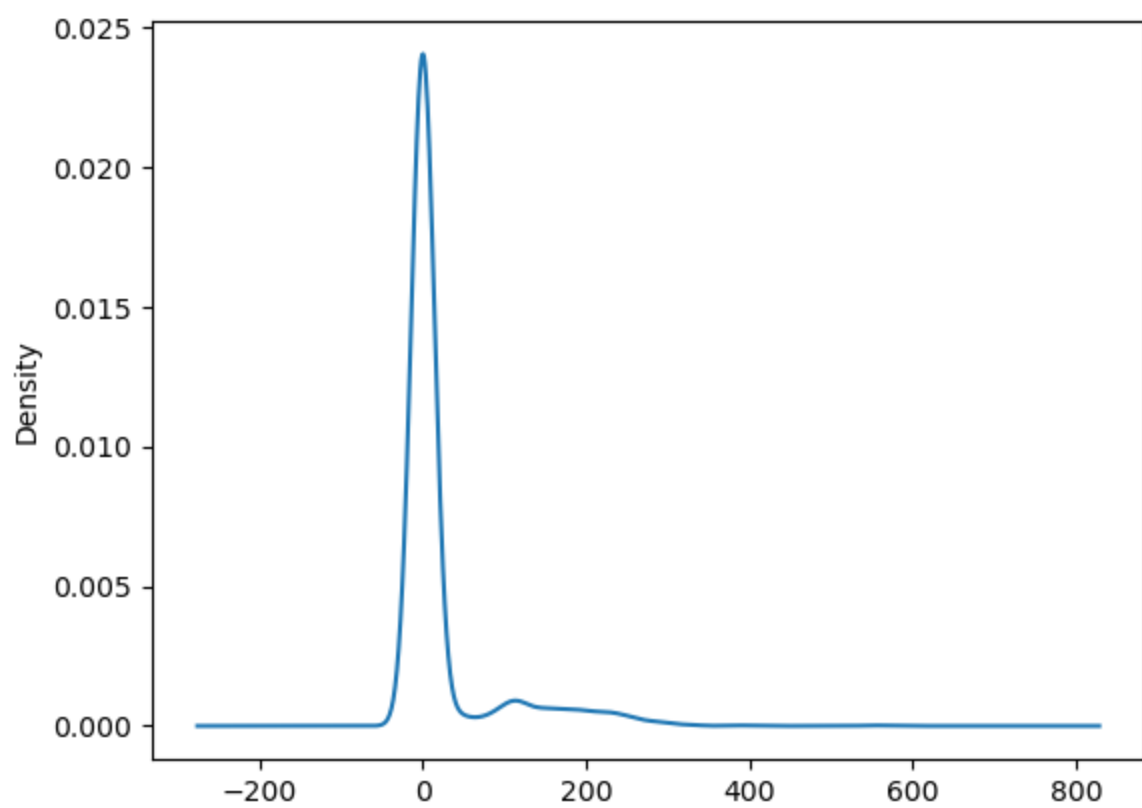
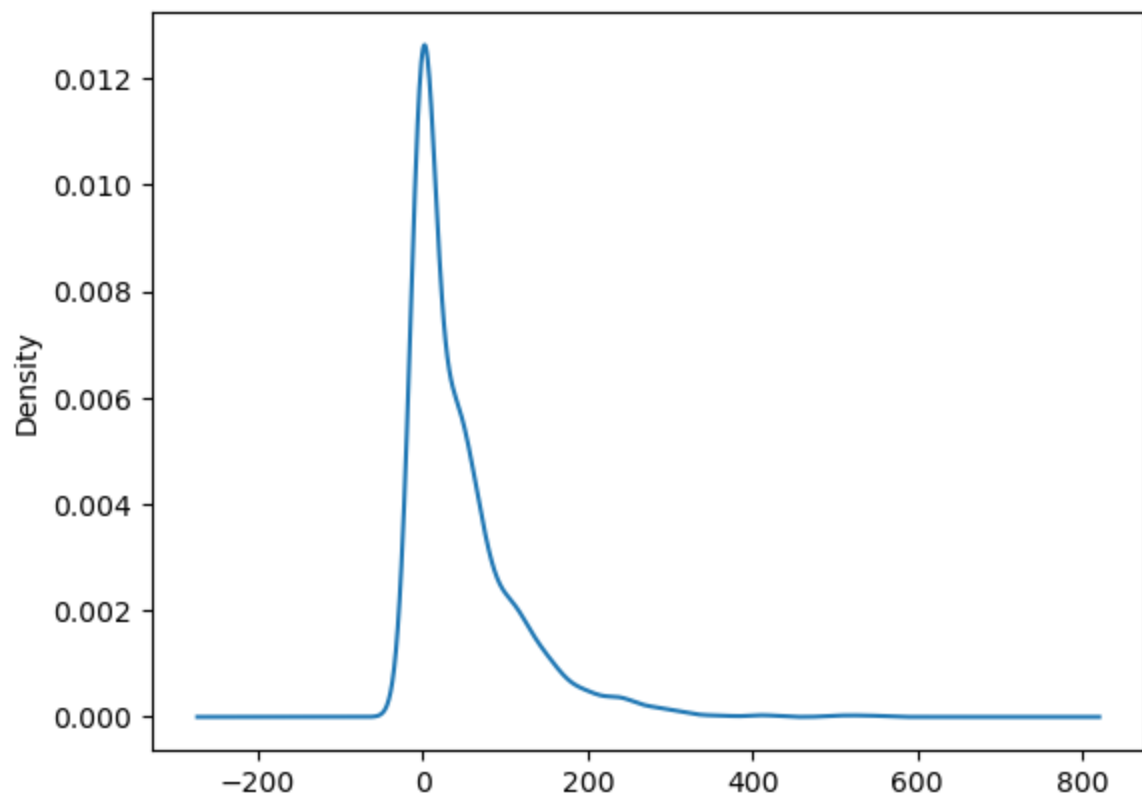


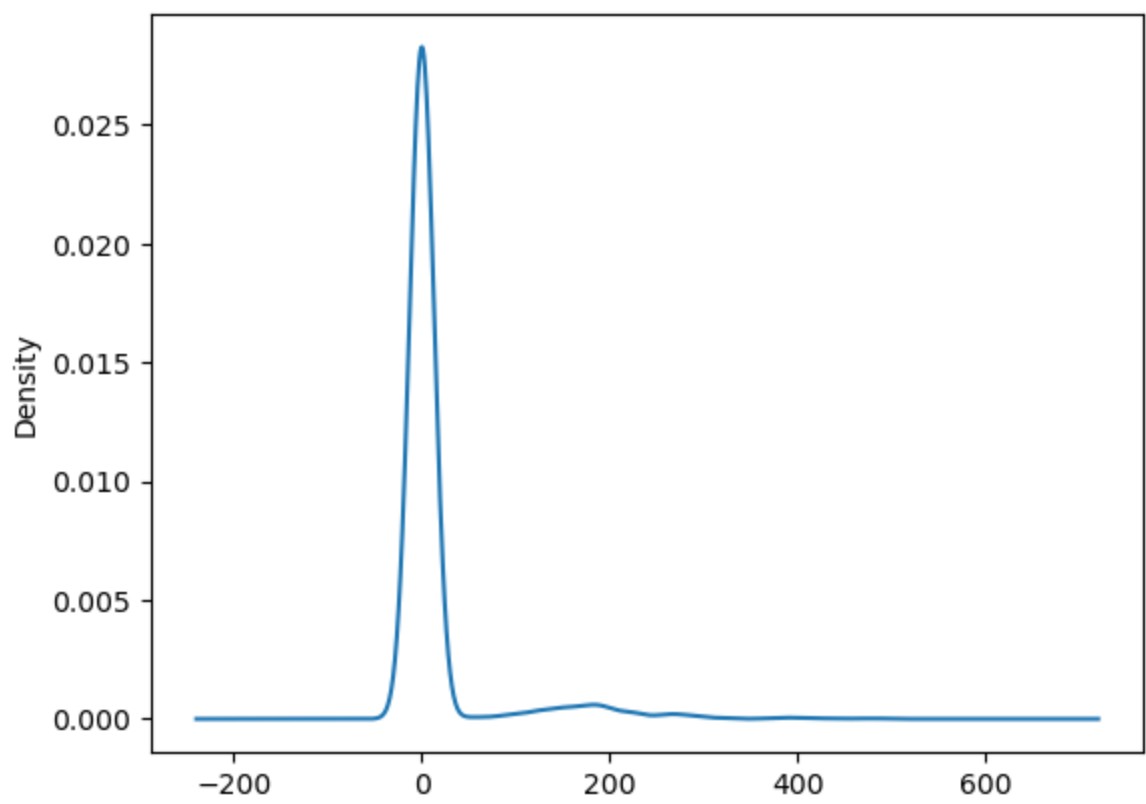
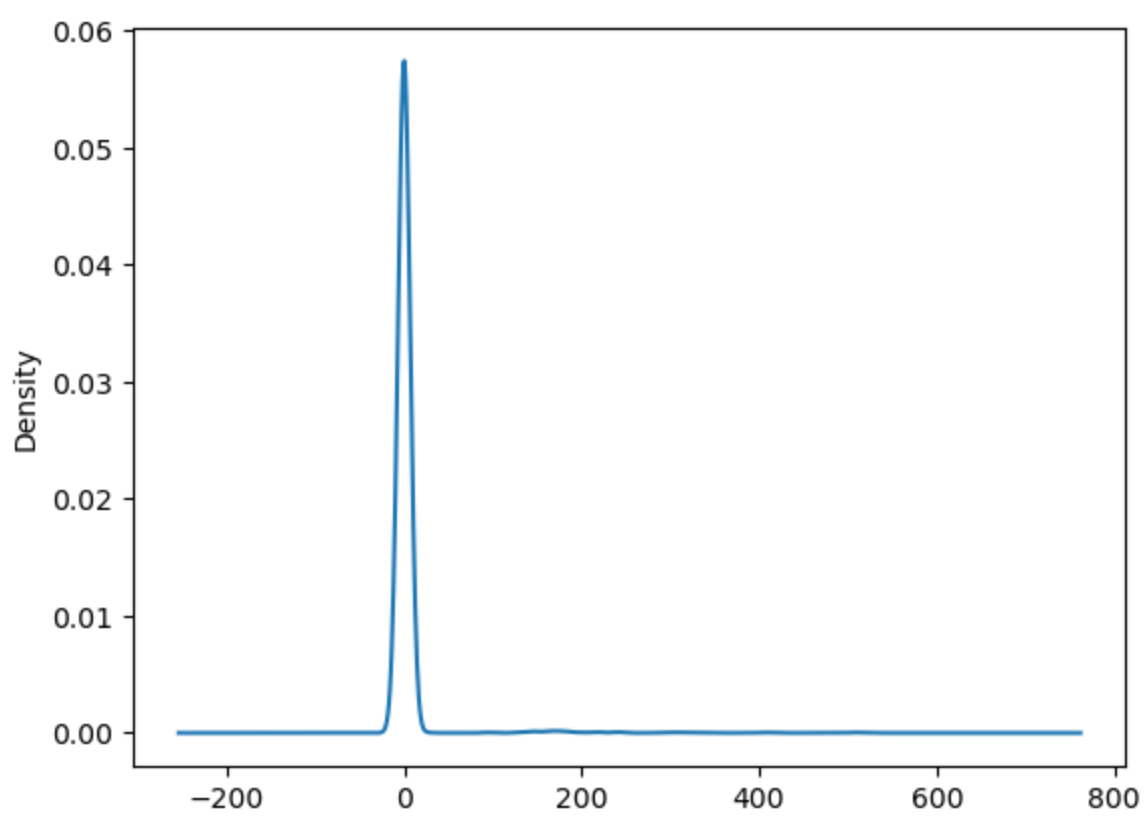


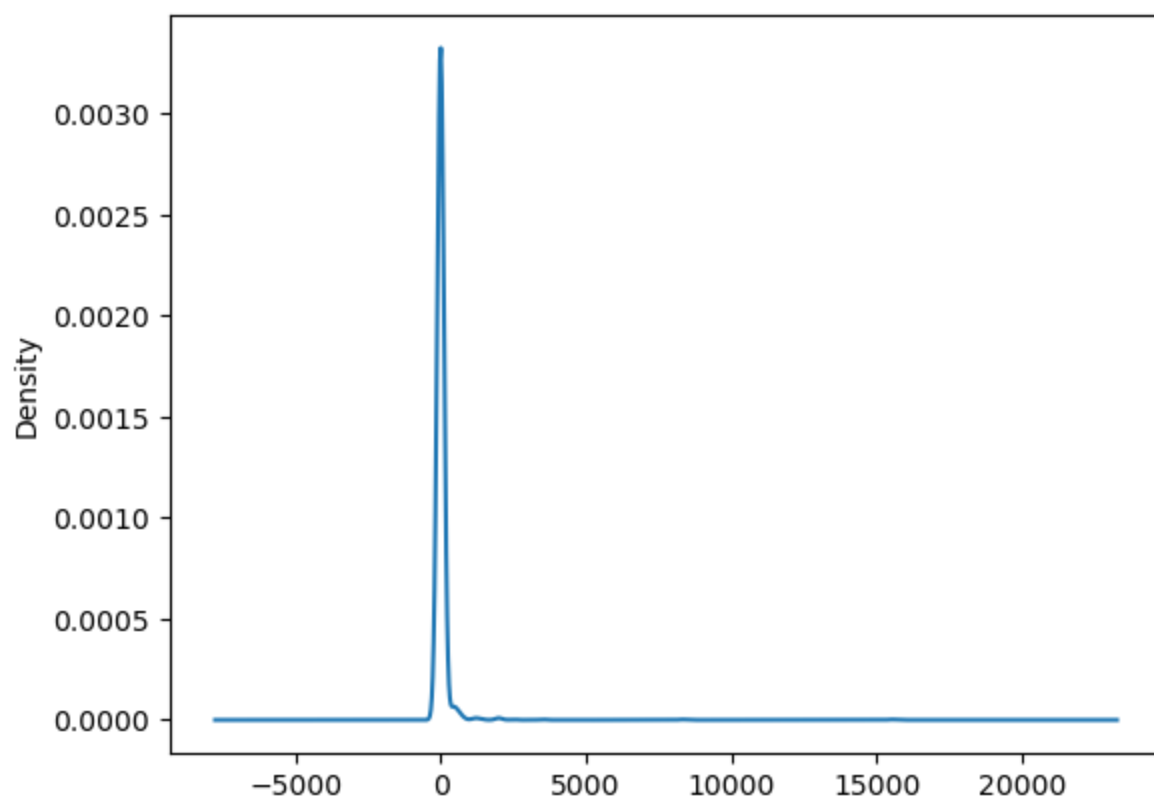
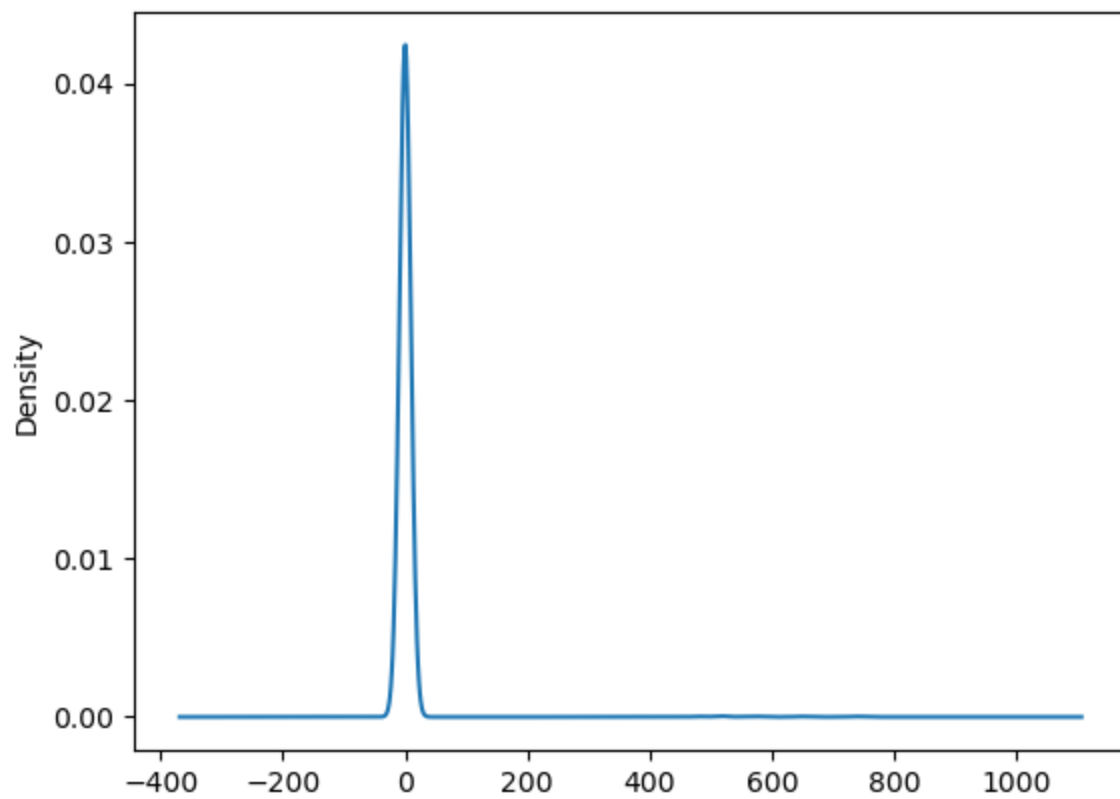


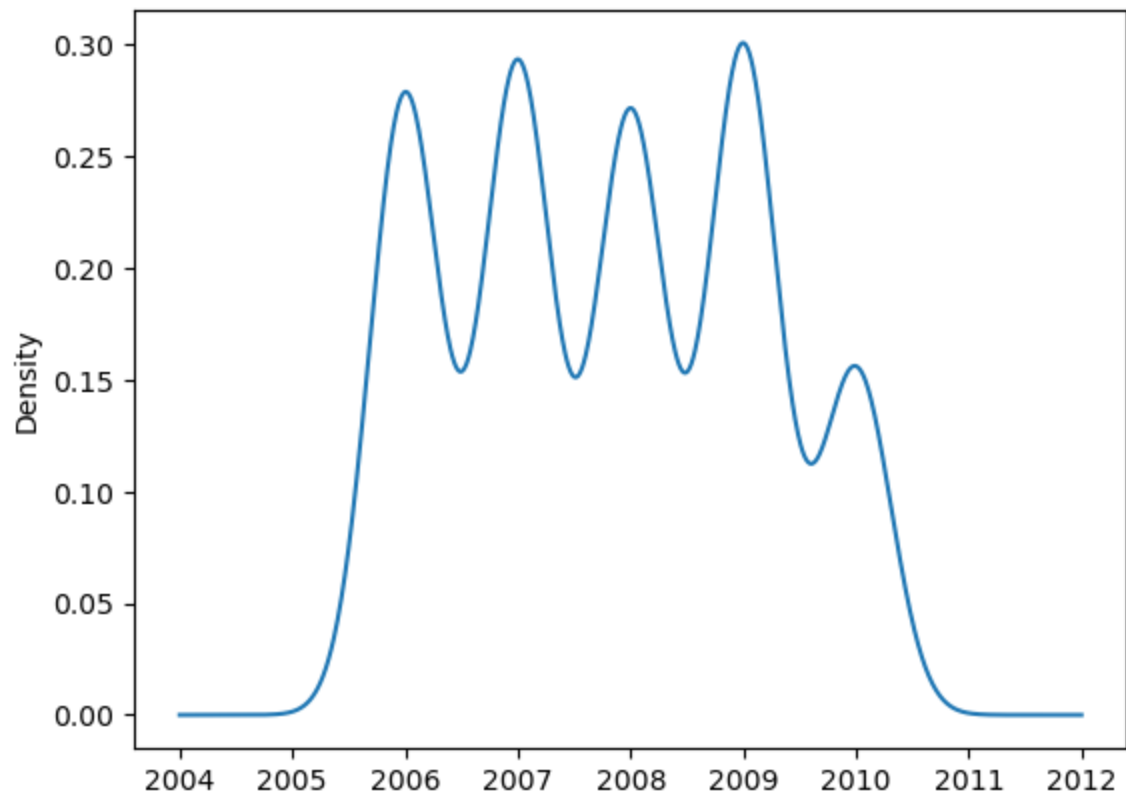
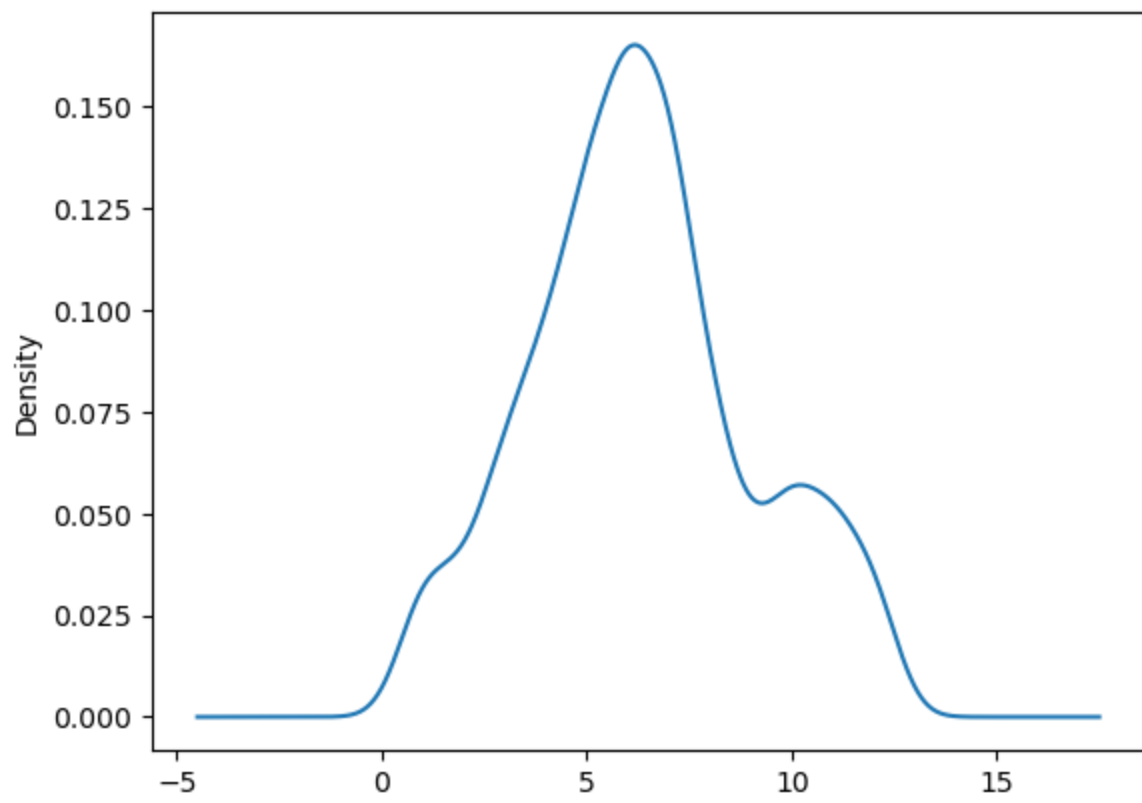


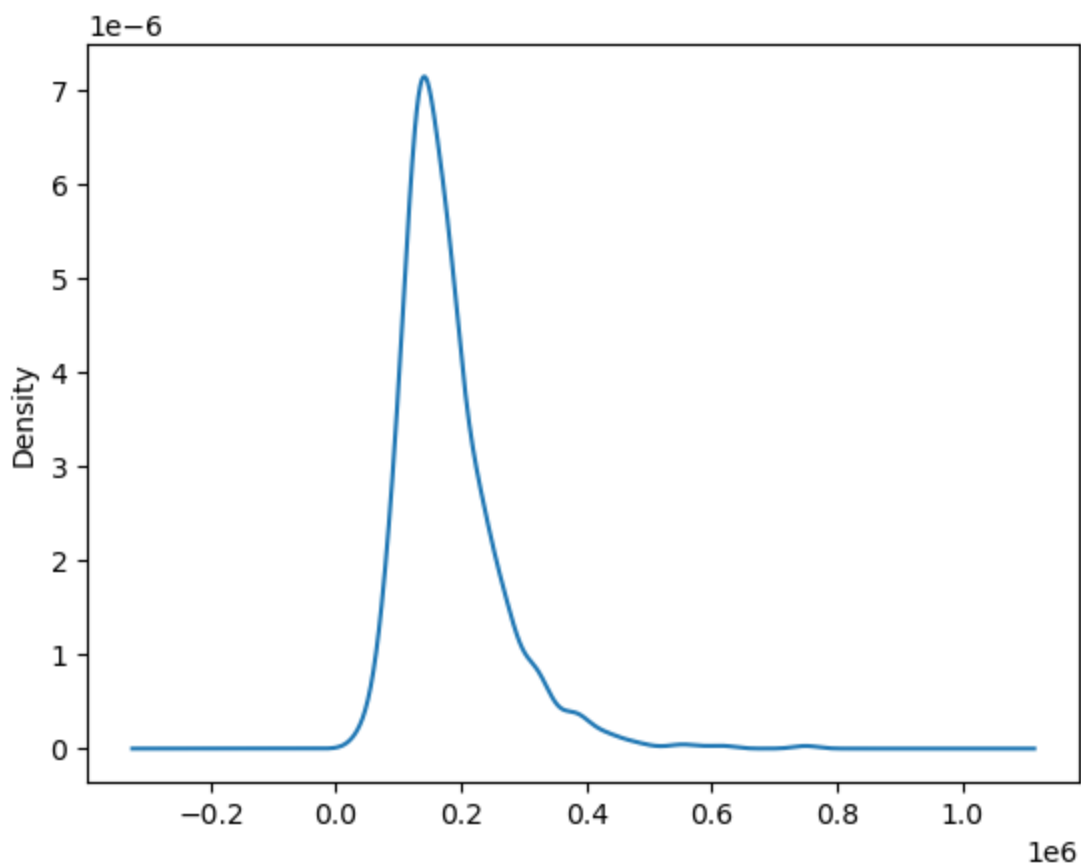












In [26]: `# identifying correlation`

In [27]: `data_num.corr()`

Out[27]:

	Id	MSSubClass	LotFrontage	LotArea	OverallQual	OverallCond	YearBuilt	YearRemodAdd
Id	1.000000	0.011156	-0.009601	-0.033226	-0.028365	0.012609	-0.012713	-0.021998
MSSubClass	0.011156	1.000000	-0.357056	-0.139781	0.032628	-0.059316	0.027850	0.040581
LotFrontage	-0.009601	-0.357056	1.000000	0.306795	0.234196	-0.052820	0.117598	0.082746
LotArea	-0.033226	-0.139781	0.306795	1.000000	0.105806	-0.005636	0.014228	0.013788
OverallQual	-0.028365	0.032628	0.234196	0.105806	1.000000	-0.091932	0.572323	0.550684
OverallCond	0.012609	-0.059316	-0.052820	-0.005636	-0.091932	1.000000	-0.375983	0.073741
YearBuilt	-0.012713	0.027850	0.117598	0.014228	0.572323	-0.375983	1.000000	0.592855
YearRemodAdd	-0.021998	0.040581	0.082746	0.013788	0.550684	0.073741	0.592855	1.000000
MasVnrArea	-0.050298	0.022936	0.179700	0.104160	0.411876	-0.128101	0.315707	0.179700
BsmtFinSF1	-0.005024	-0.069836	0.215828	0.214103	0.239666	-0.046231	0.249503	0.128103
BsmtFinSF2	-0.005968	-0.065649	0.043340	0.111170	-0.059119	0.040229	-0.049107	-0.067711
BsmtUnfSF	-0.007940	-0.140759	0.122156	-0.002618	0.308159	-0.136841	0.149040	0.181103
TotalBsmtSF	-0.015415	-0.238518	0.363358	0.260833	0.537808	-0.171098	0.391452	0.291036
1stFlrSF	0.010496	-0.251758	0.414266	0.299475	0.476224	-0.144203	0.281986	0.240361
2ndFlrSF	0.005590	0.307886	0.072483	0.050986	0.295493	0.028942	0.010308	0.140361
LowQualFinSF	-0.044230	0.046474	0.036849	0.004779	-0.030429	0.025494	-0.183784	-0.062435
GrLivArea	0.008273	0.074853	0.368392	0.263116	0.593007	-0.079686	0.199010	0.287381

	BsmtFullBath	0.002289	0.003491	0.091481	0.158155	0.111098	-0.054942	0.187599	0.1194
	BsmtHalfBath	-0.020155	-0.002333	-0.006419	0.048046	-0.040150	0.117821	-0.038162	-0.0123
	FullBath	0.005587	0.131608	0.180424	0.126031	0.550600	-0.194149	0.468271	0.4390
	HalfBath	0.006784	0.177354	0.048258	0.014259	0.273458	-0.060769	0.242656	0.1833
	BedroomAbvGr	0.037719	-0.023438	0.237023	0.119690	0.101676	0.012980	-0.070651	-0.0409
	KitchenAbvGr	0.002951	0.281721	-0.005805	-0.017784	-0.183882	-0.087001	-0.174800	-0.1499
	TotRmsAbvGrd	0.027239	0.040380	0.320146	0.190015	0.427452	-0.057583	0.095589	0.1917
	Fireplaces	-0.019772	-0.045569	0.235755	0.271364	0.396765	-0.023820	0.147716	0.1129
	GarageYrBlt	0.000070	0.080187	0.064324	-0.024812	0.518018	-0.306169	0.780555	0.6187
	GarageCars	0.016570	-0.040110	0.269729	0.154871	0.600671	-0.185758	0.537850	0.4206
	GarageArea	0.017634	-0.098672	0.323663	0.180403	0.562022	-0.151521	0.478954	0.3716
	WoodDeckSF	-0.029643	-0.012579	0.077106	0.171698	0.238923	-0.003334	0.224880	0.2057
	OpenPorchSF	-0.000477	-0.006100	0.137454	0.084774	0.308819	-0.032589	0.188686	0.2262
	EnclosedPorch	0.002889	-0.012037	0.009790	-0.018340	-0.113937	0.070356	-0.387268	-0.1939
	3SsnPorch	-0.046635	-0.043825	0.062335	0.020423	0.030371	0.025504	0.031355	0.0452
	ScreenPorch	0.001330	-0.026030	0.037684	0.043160	0.064886	0.054811	-0.050364	-0.0387
	PoolArea	0.057044	0.008283	0.180868	0.077672	0.065166	-0.001985	0.004950	0.0058
	MiscVal	-0.006242	-0.007683	0.001168	0.038068	-0.031406	0.068777	-0.034383	-0.0102
	MoSold	0.021172	-0.013585	0.010158	0.001205	0.070815	-0.003511	0.012398	0.0214
	YrSold	0.000712	-0.021407	0.006768	-0.014261	-0.027347	0.043950	-0.013618	0.0357
	SalePrice	-0.021917	-0.084284	0.334901	0.263843	0.790982	-0.077856	0.522897	0.5077

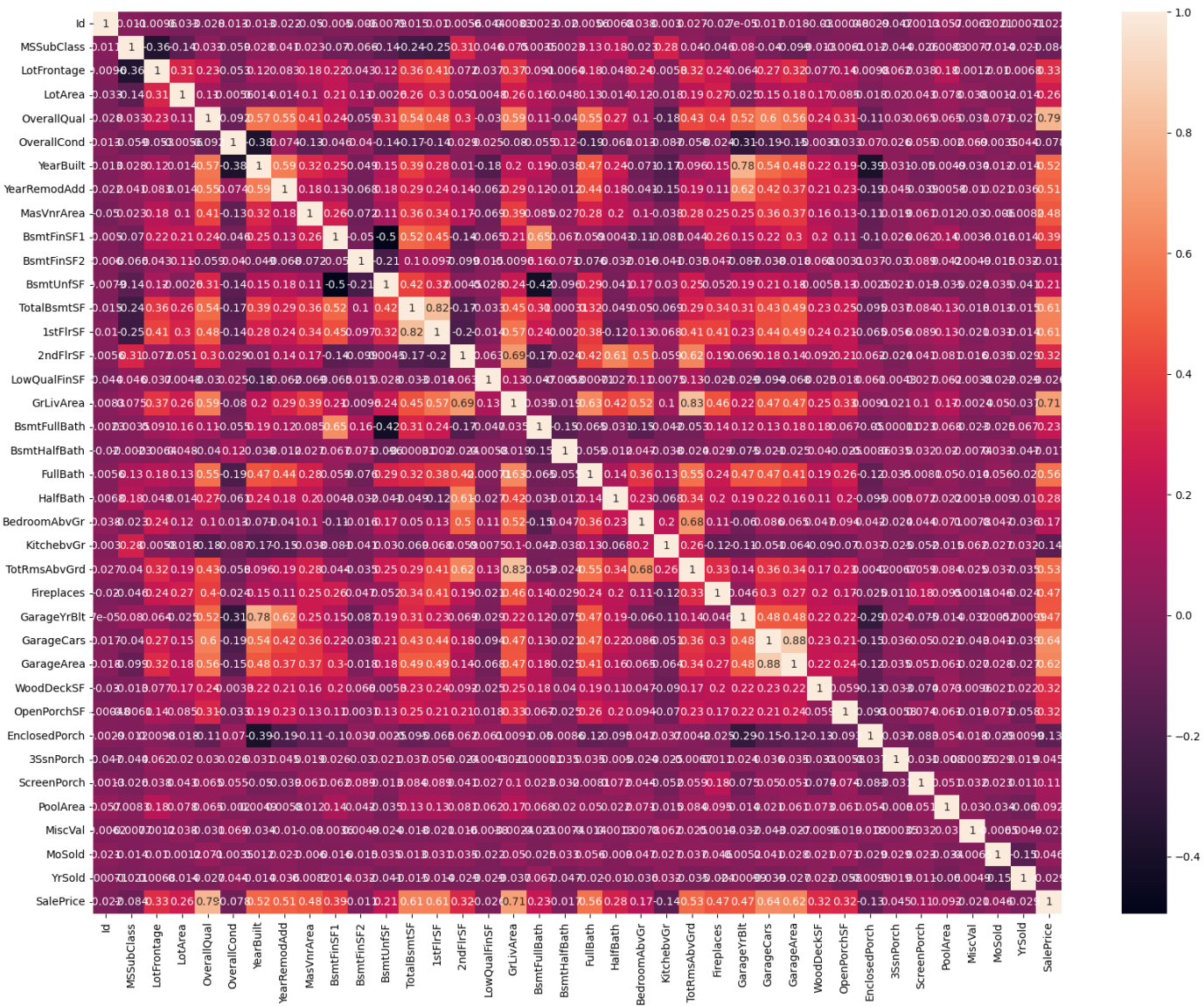
38 rows × 38 columns

```
In [28]: plt.figure(figsize=(20,15))

corr = data_num.corr()
sea.heatmap(corr,annot=True)
corr.style.background_gradient(cmap='coolwarm')
```

	Id	MSSubClass	LotFrontage	LotArea	OverallQual	OverallCond	YearBuilt	YearRemodAdd
	Id	1.000000	0.011156	-0.009601	-0.033226	-0.028365	0.012609	-0.012713
	MSSubClass	0.011156	1.000000	-0.357056	-0.139781	0.032628	-0.059316	0.027850
	LotFrontage	-0.009601	-0.357056	1.000000	0.306795	0.234196	-0.052820	0.117598
	LotArea	-0.033226	-0.139781	0.306795	1.000000	0.105806	-0.005636	0.014228
	OverallQual	-0.028365	0.032628	0.234196	0.105806	1.000000	-0.091932	0.572323
	OverallCond	0.012609	-0.059316	-0.052820	-0.005636	-0.091932	1.000000	-0.375983
	YearBuilt	-0.012713	0.027850	0.117598	0.014228	0.572323	-0.375983	1.000000
	YearRemodAdd	-0.021998	0.040581	0.082746	0.013788	0.550684	0.073741	0.592855
	MasVnrArea	-0.050298	0.022936	0.179700	0.104160	0.411876	-0.128101	0.315707
	BsmtFinSF1	-0.005024	-0.069836	0.215828	0.214103	0.239666	-0.046231	0.249503

BsmtFinSF2	-0.005968	-0.065649	0.043340	0.111170	-0.059119	0.040229	-0.049107	-0.067707
BsmtUnfSF	-0.007940	-0.140759	0.122156	-0.002618	0.308159	-0.136841	0.149040	0.181707
TotalBsmtSF	-0.015415	-0.238518	0.363358	0.260833	0.537808	-0.171098	0.391452	0.291007
1stFlrSF	0.010496	-0.251758	0.414266	0.299475	0.476224	-0.144203	0.281986	0.240307
2ndFlrSF	0.005590	0.307886	0.072483	0.050986	0.295493	0.028942	0.010308	0.140007
LowQualFinSF	-0.044230	0.046474	0.036849	0.004779	-0.030429	0.025494	-0.183784	-0.062407
GrLivArea	0.008273	0.074853	0.368392	0.263116	0.593007	-0.079686	0.199010	0.287307
BsmtFullBath	0.002289	0.003491	0.091481	0.158155	0.111098	-0.054942	0.187599	0.119407
BsmtHalfBath	-0.020155	-0.002333	-0.006419	0.048046	-0.040150	0.117821	-0.038162	-0.012307
FullBath	0.005587	0.131608	0.180424	0.126031	0.550600	-0.194149	0.468271	0.439007
HalfBath	0.006784	0.177354	0.048258	0.014259	0.273458	-0.060769	0.242656	0.183307
BedroomAbvGr	0.037719	-0.023438	0.237023	0.119690	0.101676	0.012980	-0.070651	-0.040307
KitchenAbvGr	0.002951	0.281721	-0.005805	-0.017784	-0.183882	-0.087001	-0.174800	-0.149507
TotRmsAbvGrd	0.027239	0.040380	0.320146	0.190015	0.427452	-0.057583	0.095589	0.191707
Fireplaces	-0.019772	-0.045569	0.235755	0.271364	0.396765	-0.023820	0.147716	0.112507
GarageYrBlt	0.000070	0.080187	0.064324	-0.024812	0.518018	-0.306169	0.780555	0.618707
GarageCars	0.016570	-0.040110	0.269729	0.154871	0.600671	-0.185758	0.537850	0.420607
GarageArea	0.017634	-0.098672	0.323663	0.180403	0.562022	-0.151521	0.478954	0.371607
WoodDeckSF	-0.029643	-0.012579	0.077106	0.171698	0.238923	-0.003334	0.224880	0.205707
OpenPorchSF	-0.000477	-0.006100	0.137454	0.084774	0.308819	-0.032589	0.188686	0.226207
EnclosedPorch	0.002889	-0.012037	0.009790	-0.018340	-0.113937	0.070356	-0.387268	-0.193907
3SsnPorch	-0.046635	-0.043825	0.062335	0.020423	0.030371	0.025504	0.031355	0.045207
ScreenPorch	0.001330	-0.026030	0.037684	0.043160	0.064886	0.054811	-0.050364	-0.038707
PoolArea	0.057044	0.008283	0.180868	0.077672	0.065166	-0.001985	0.004950	0.005807
MiscVal	-0.006242	-0.007683	0.001168	0.038068	-0.031406	0.068777	-0.034383	-0.010207
MoSold	0.021172	-0.013585	0.010158	0.001205	0.070815	-0.003511	0.012398	0.021407
YrSold	0.000712	-0.021407	0.006768	-0.014261	-0.027347	0.043950	-0.013618	0.035707
SalePrice	-0.021917	-0.084284	0.334901	0.263843	0.790982	-0.077856	0.522897	0.507707



THE FOLLOWING INFERENCES CAN BE MADE BY CORRELATION

1. THE LOTFRONTAGE AREA IS HAVING POSITIVE CORRELATION WITH THE LOT AREA.
2. OVERALL QUALITY, PRICE, FULLBATH, YEAR BUILT, YEAR OF REMODELLING ARE POSITIVELY CORRELATED
3. THE PRICING IS SIGNIFICANTLY CORRELATED WITH THE OVERALL QUALITY, YEAR BUILT, REMODELIING YEAR.

PAIRPLOT

```
In [29]: #sea.pairplot(data_num)
#plt.show()
```

Categorical data

```
In [30]: data_cat.head()
```

```
Out[30]:
```

	MSZoning	Street	Alley	LotShape	LandContour	Utilities	LotConfig	LandSlope	Neighborhood	Condition1	
0	RL	Pave	NaN	Reg		Lvl	AllPub	Inside	Gtl	CollgCr	Norm

1	RL	Pave	NaN	Reg	Lvl	AllPub	FR2	Gtl	Veenker	Feedr
2	RL	Pave	NaN	IR1	Lvl	AllPub	Inside	Gtl	CollgCr	Norm
3	RL	Pave	NaN	IR1	Lvl	AllPub	Corner	Gtl	Crawfor	Norm
4	RL	Pave	NaN	IR1	Lvl	AllPub	FR2	Gtl	NoRidge	Norm

5 rows × 43 columns

```
In [31]: # MISSING VALUE TREATMENT
```

```
In [32]: data_cat.isnull().sum()
```

```
Out[32]: MSZoning           0
Street           0
Alley          1369
LotShape         0
LandContour     0
Utilities       0
LotConfig       0
LandSlope       0
Neighborhood    0
Condition1      0
Condition2      0
BldgType        0
HouseStyle      0
RoofStyle       0
RoofMatl        0
Exterior1st     0
Exterior2nd     0
MasVnrType      8
ExterQual       0
ExterCond       0
Foundation      0
BsmtQual        37
BsmtCond        37
BsmtExposure    38
BsmtFinType1    37
BsmtFinType2    38
Heating         0
HeatingQC       0
CentralAir      0
Electrical      1
KitchenQual     0
Function1       0
FireplaceQu     690
GarageType      81
GarageFinish    81
GarageQual      81
GarageCond      81
PavedDrive      0
PoolQC         1453
Fence          1179
MiscFeature     1406
SaleType        0
SaleCondition   0
dtype: int64
```

```
In [33]: # replacing the missing values with mode of respective variable
```

```
In [34]: data_cat["Alley"].mode()
```

```
0      Grv1
```

Out[34]: Name: Alley, dtype: object

```
In [35]: data_cat["Alley"].fillna(("Grv1"), inplace=True)
```

```
In [36]: data_cat["FireplaceQu"].mode()
```

Out[36]: 0 Gd
Name: FireplaceQu, dtype: object

```
In [37]: data_cat["FireplaceQu"].fillna(("Gd"), inplace=True)
```

```
In [38]: data_cat["PoolQC"].mode()
```

Out[38]: 0 Gd
Name: PoolQC, dtype: object

```
In [39]: data_cat["Fence"].mode()
```

Out[39]: 0 MnPrv
Name: Fence, dtype: object

```
In [40]: data_cat["MiscFeature"].mode()
```

Out[40]: 0 Shed
Name: MiscFeature, dtype: object

```
In [41]: data_cat["PoolQC"].fillna(("Gd"), inplace=True)
```

```
In [42]: data_cat["Fence"].fillna(("MnPrv"), inplace=True)
```

```
In [43]: data_cat["MiscFeature"].fillna(("Shed"), inplace=True)
```

```
In [44]: data_filt=[["GarageType"], [""], [""], [""]]
```

```
In [45]: data_cat["GarageType"].mode()
```

Out[45]: 0 Attchd
Name: GarageType, dtype: object

```
In [46]: d1=data_cat["GarageType"].mode()  
d2=data_cat["GarageFinish"].mode()  
d3=data_cat["GarageQual"].mode()  
d4=data_cat["GarageCond"].mode()
```

```
In [47]: print(d1+" "+ d2 +" " + " " +d3+" "+d4)
```

0 Attchd Unf TA TA
dtype: object

```
In [48]: data_cat["GarageType"].fillna(("Attchd"), inplace=True)  
data_cat["GarageFinish"].fillna(("Unf"), inplace=True)  
data_cat["GarageQual"].fillna(("TA"), inplace=True)  
data_cat["GarageCond"].fillna(("TA"), inplace=True)
```

```
In [49]: data_cat["BsmtQual"].fillna(data_cat["BsmtQual"].mode()[0], inplace=True)  
data_cat["BsmtCond"].fillna(data_cat["BsmtCond"].mode()[0], inplace=True)  
data_cat["BsmtExposure"].fillna(data_cat["BsmtExposure"].mode()[0], inplace=True)  
data_cat["BsmtFinType1"].fillna(data_cat["BsmtFinType1"].mode()[0], inplace=True)  
data_cat["BsmtFinType2"].fillna(data_cat["BsmtFinType2"].mode()[0], inplace=True)  
data_cat["Electrical"].fillna(data_cat["Electrical"].mode()[0], inplace=True)
```

```
In [50]: data_cat.isnull().sum()
```

```

Out[50]: MSZoning      0
         Street        0
         Alley        0
         LotShape     0
         LandContour  0
         Utilities    0
         LotConfig    0
         LandSlope    0
         Neighborhood 0
         Condition1   0
         Condition2   0
         BldgType     0
         HouseStyle    0
         RoofStyle    0
         RoofMatl     0
         Exterior1st  0
         Exterior2nd  0
         MasVnrType    8
         ExterQual     0
         ExterCond     0
         Foundation    0
         BsmtQual      0
         BsmtCond      0
         BsmtExposure  0
         BsmtFinType1  0
         BsmtFinType2  0
         Heating       0
         HeatingQC     0
         CentralAir    0
         Electrical    0
         KitchenQual   0
         Functiol      0
         FireplaceQu   0
         GarageType    0
         GarageFinish  0
         GarageQual    0
         GarageCond    0
         PavedDrive    0
         PoolQC        0
         Fence         0
         MiscFeature   0
         SaleType      0
         SaleCondition 0
dtype: int64

```

ALL MISSING VALUE TREATMENT DONE. REPLACED WITH MODE

Count plot and box plot

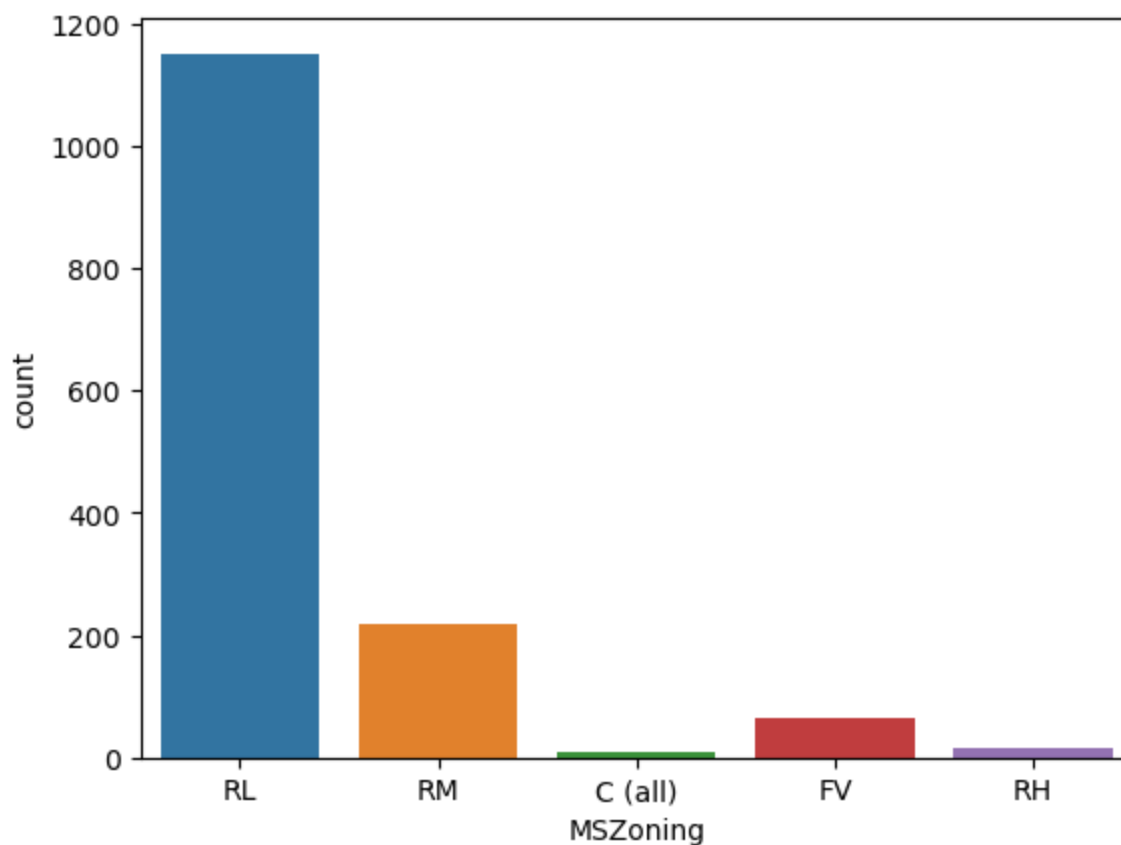
```

In [51]: for y in data_cat.columns:
         sea.countplot(data_cat[y])
         plt.show()

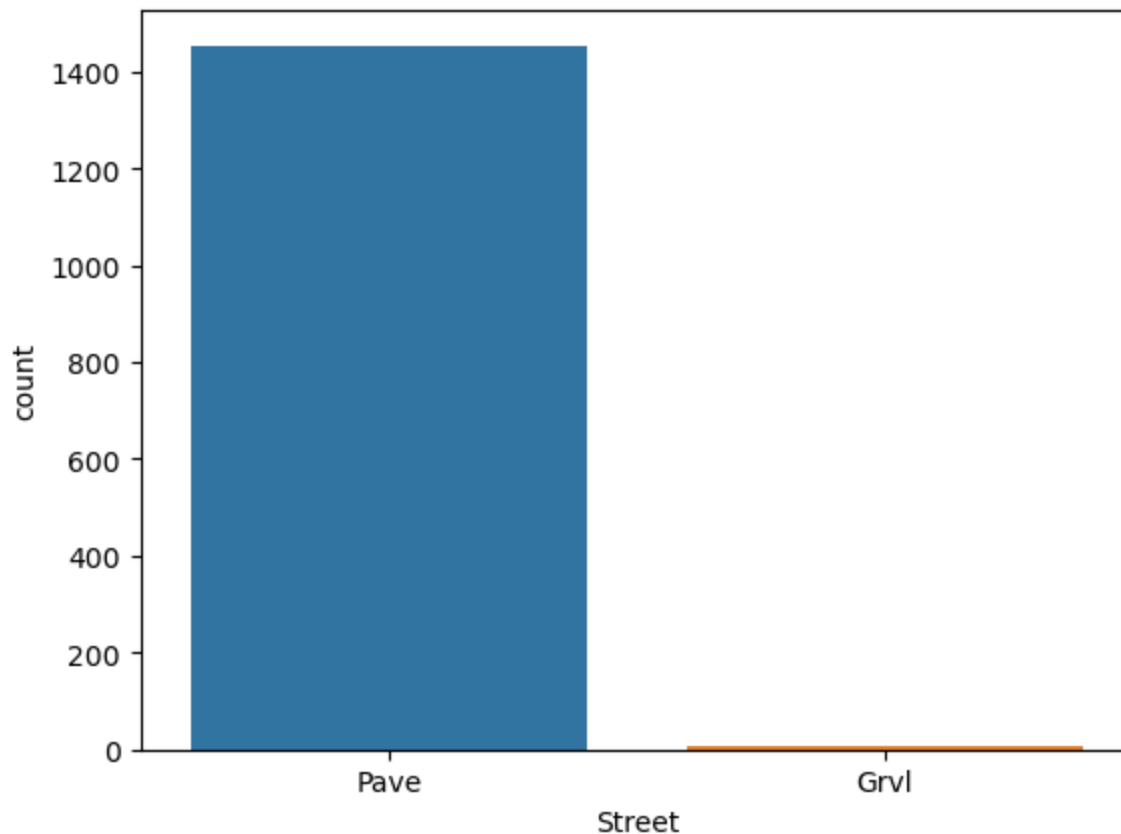
```

C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

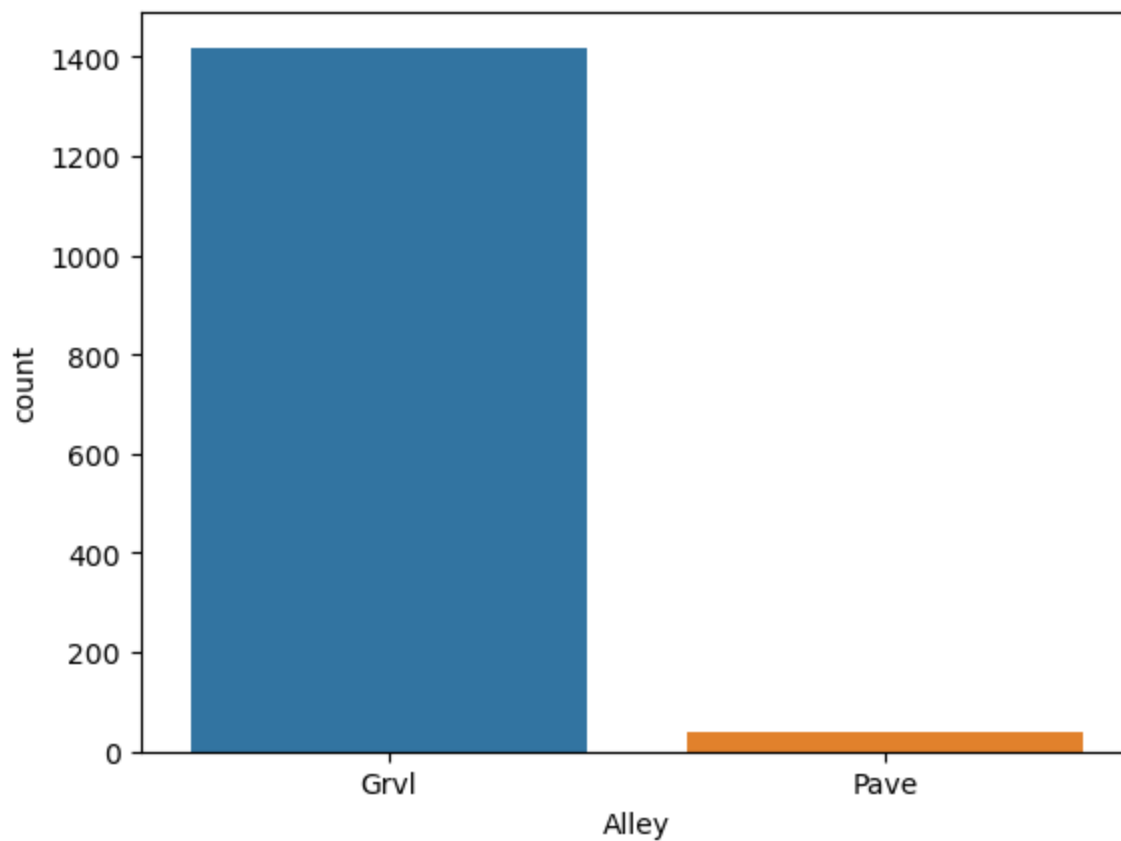
warnings.warn(



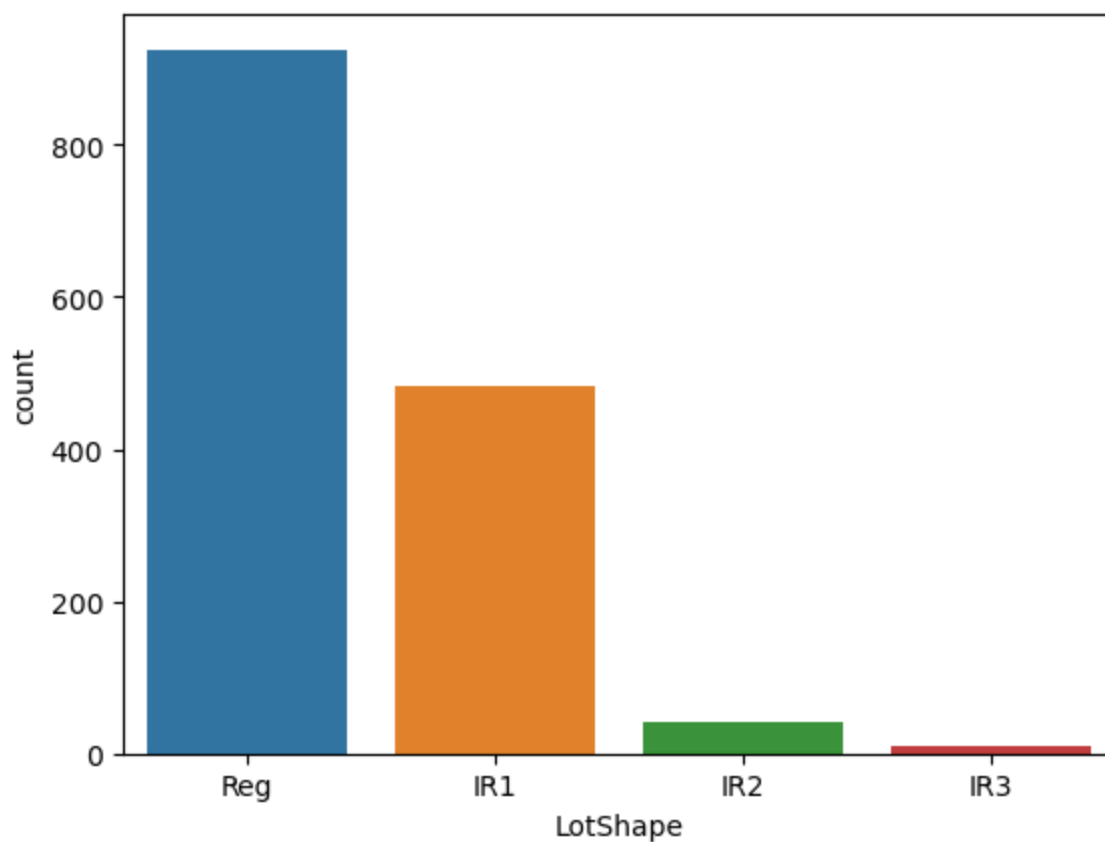
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



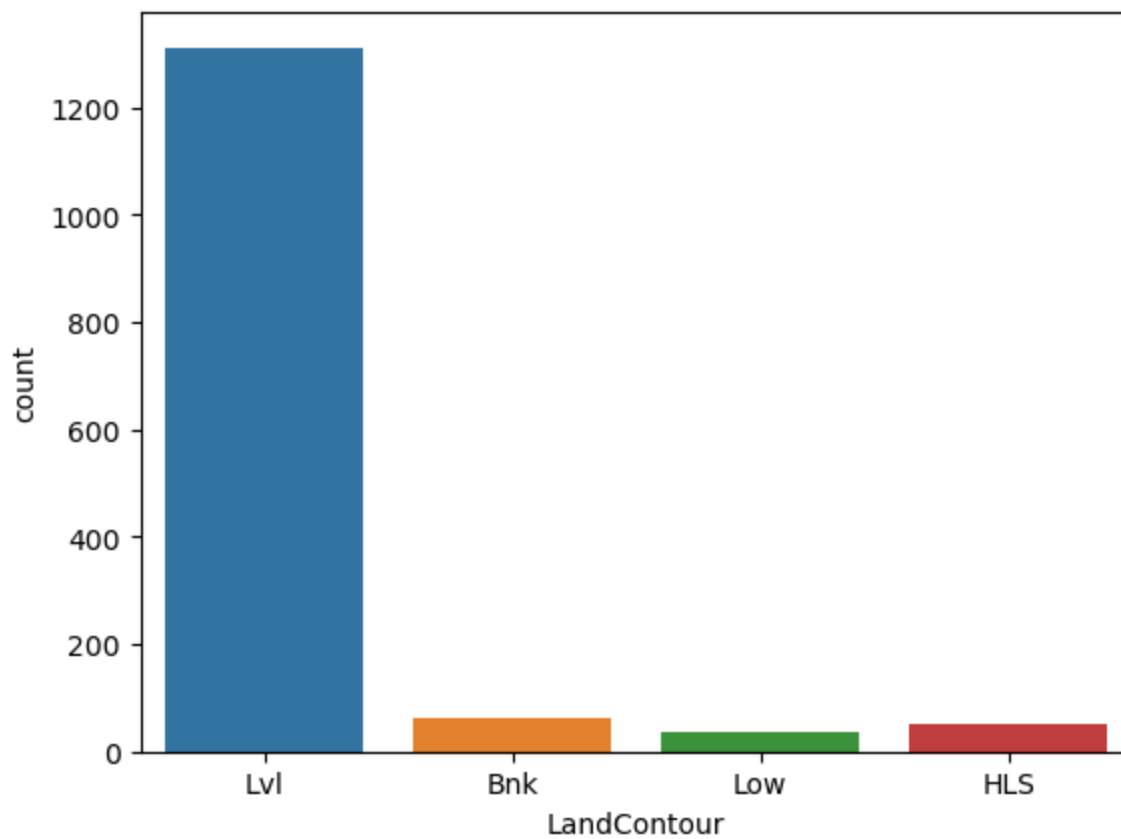
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```

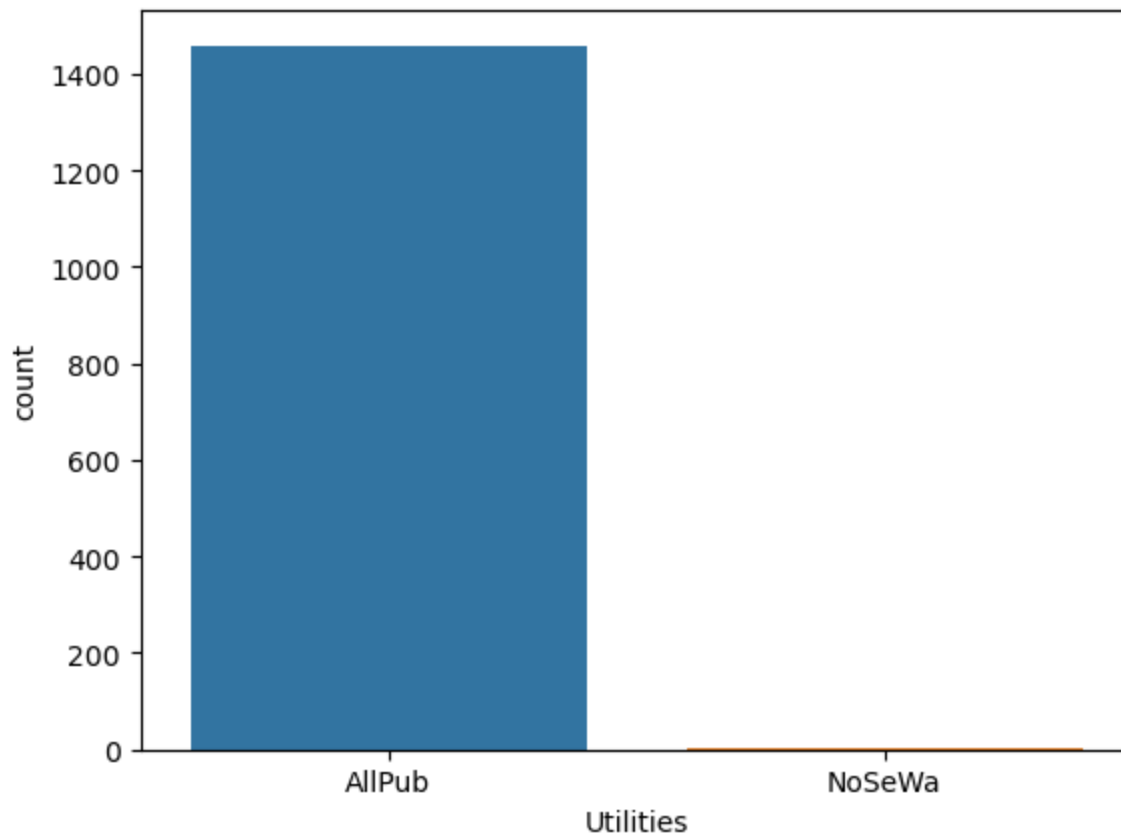
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



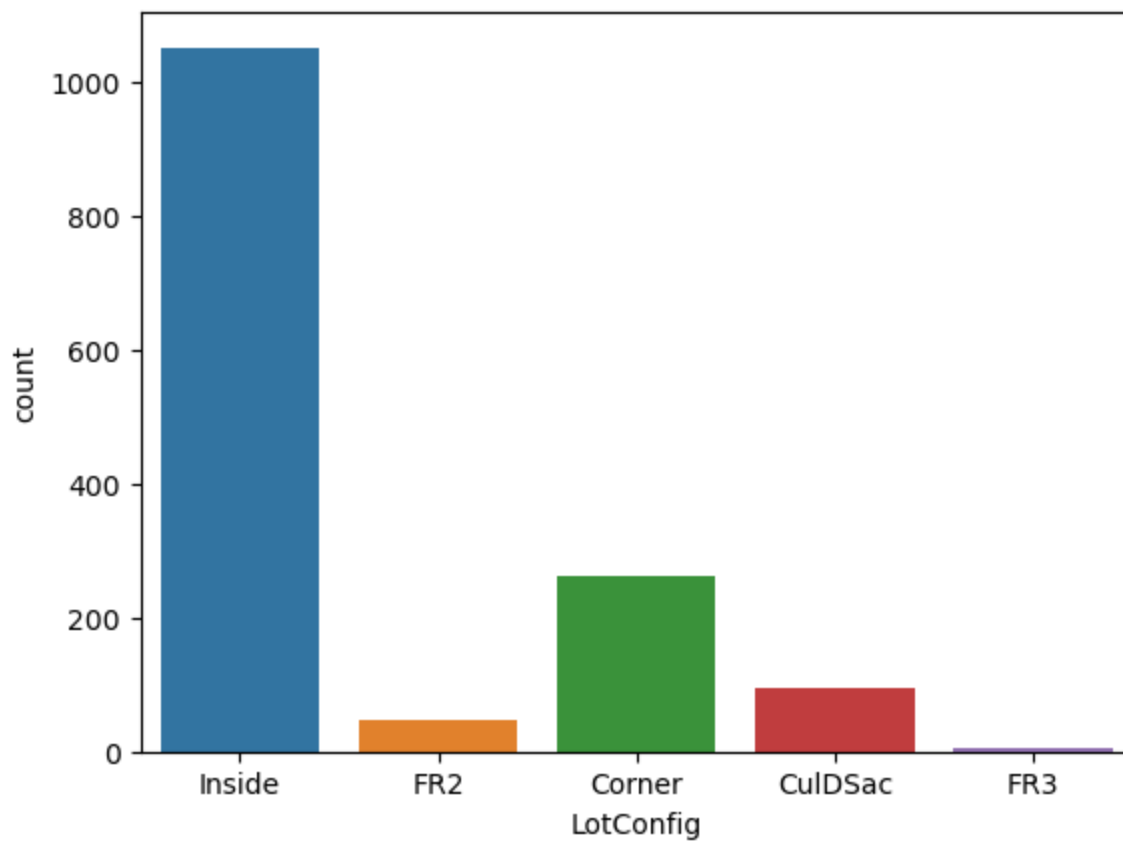
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



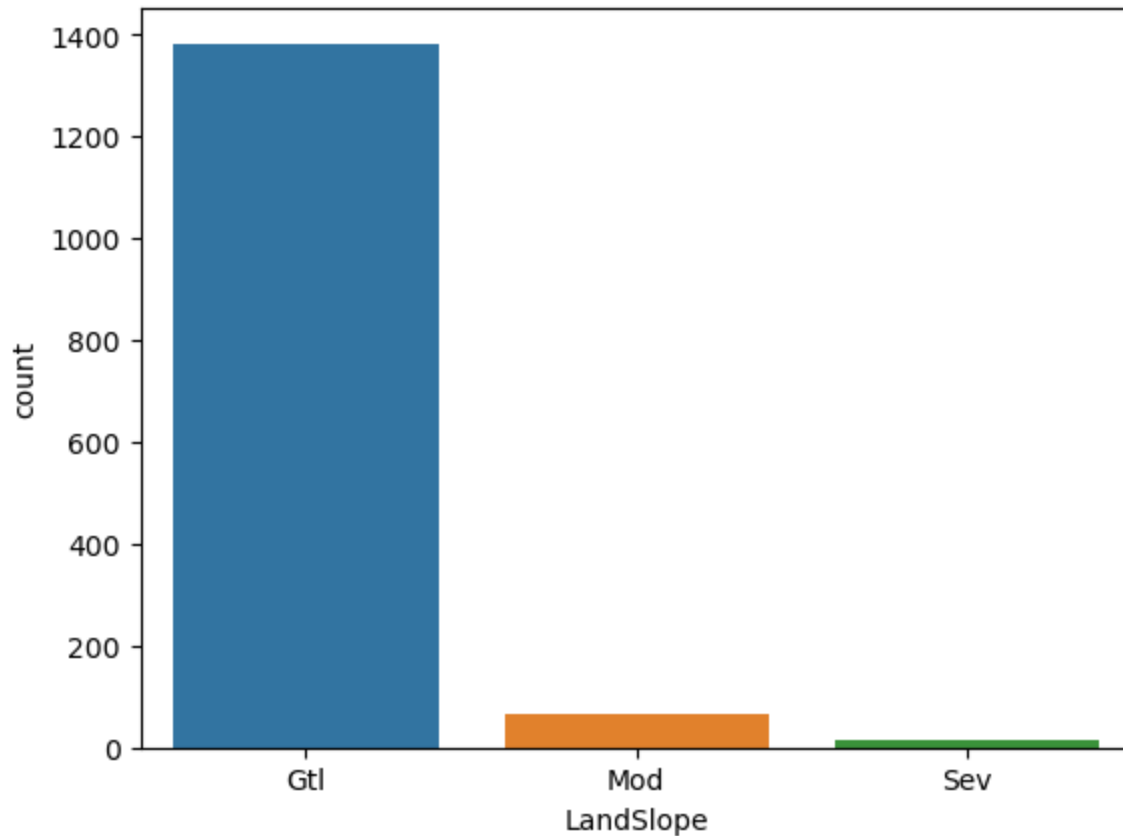
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



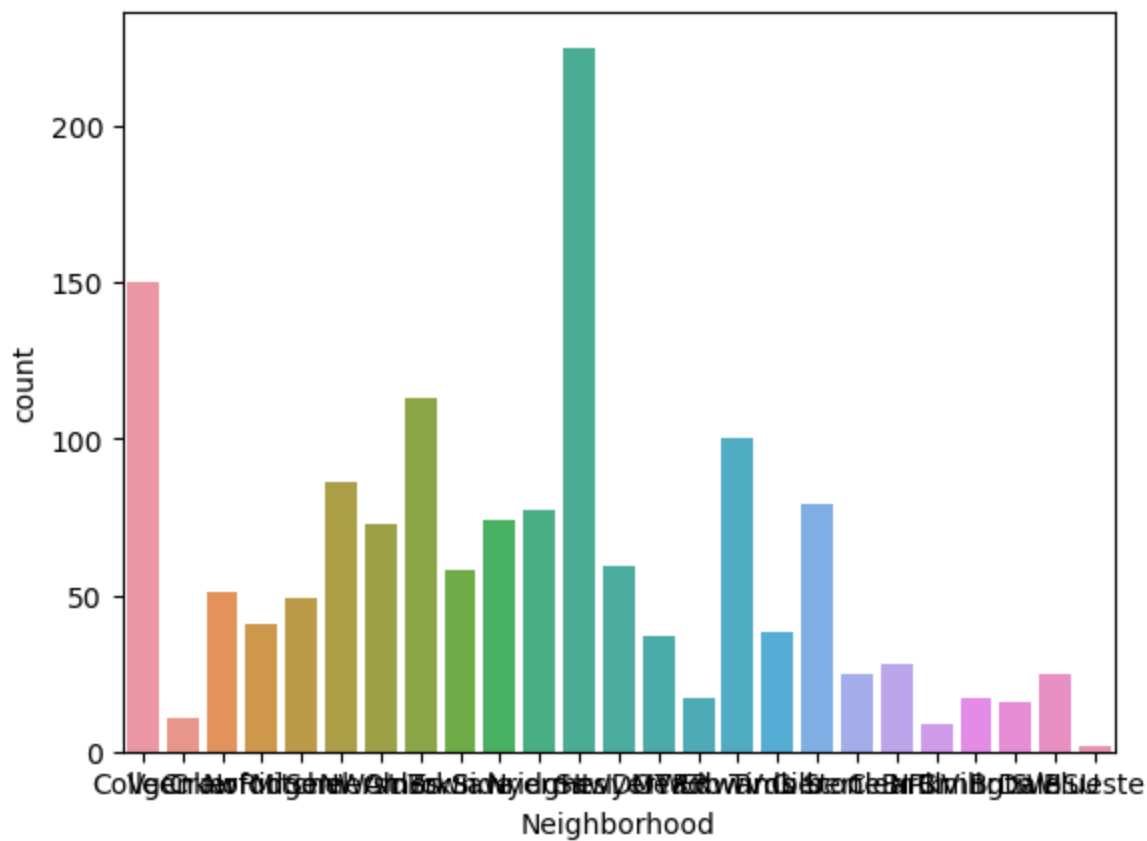
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```

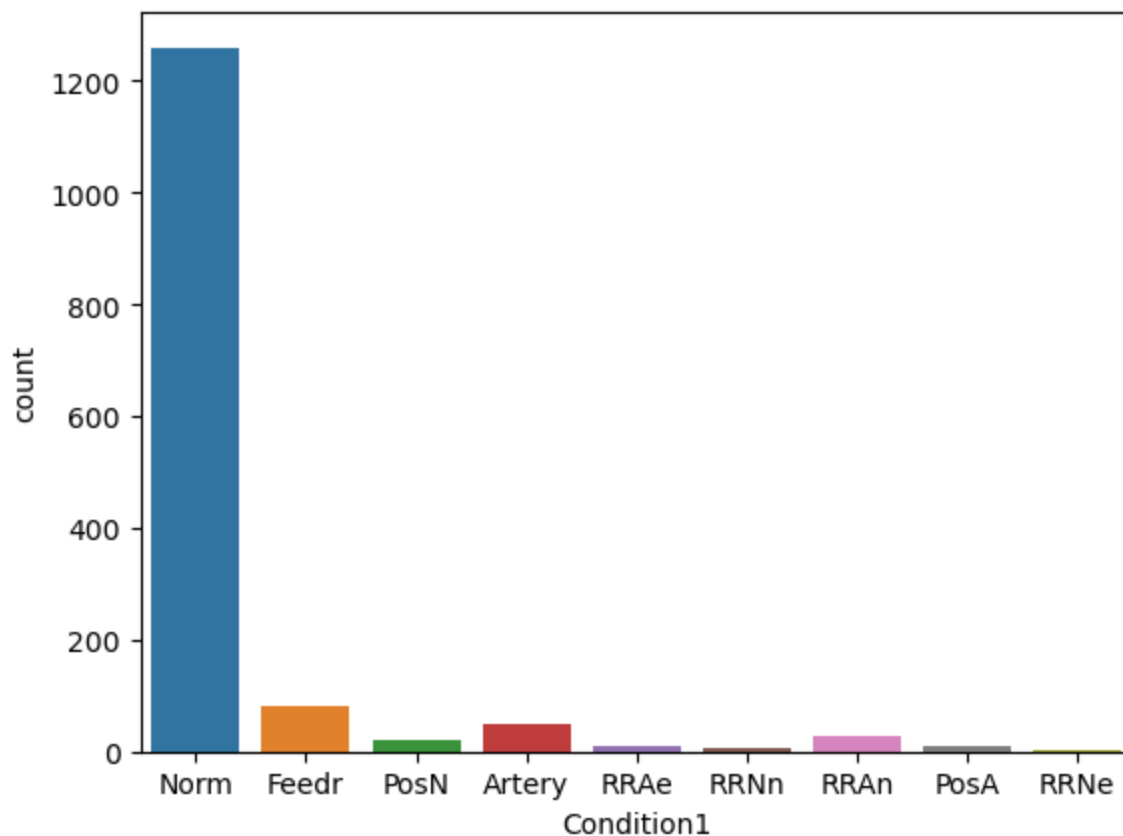


```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



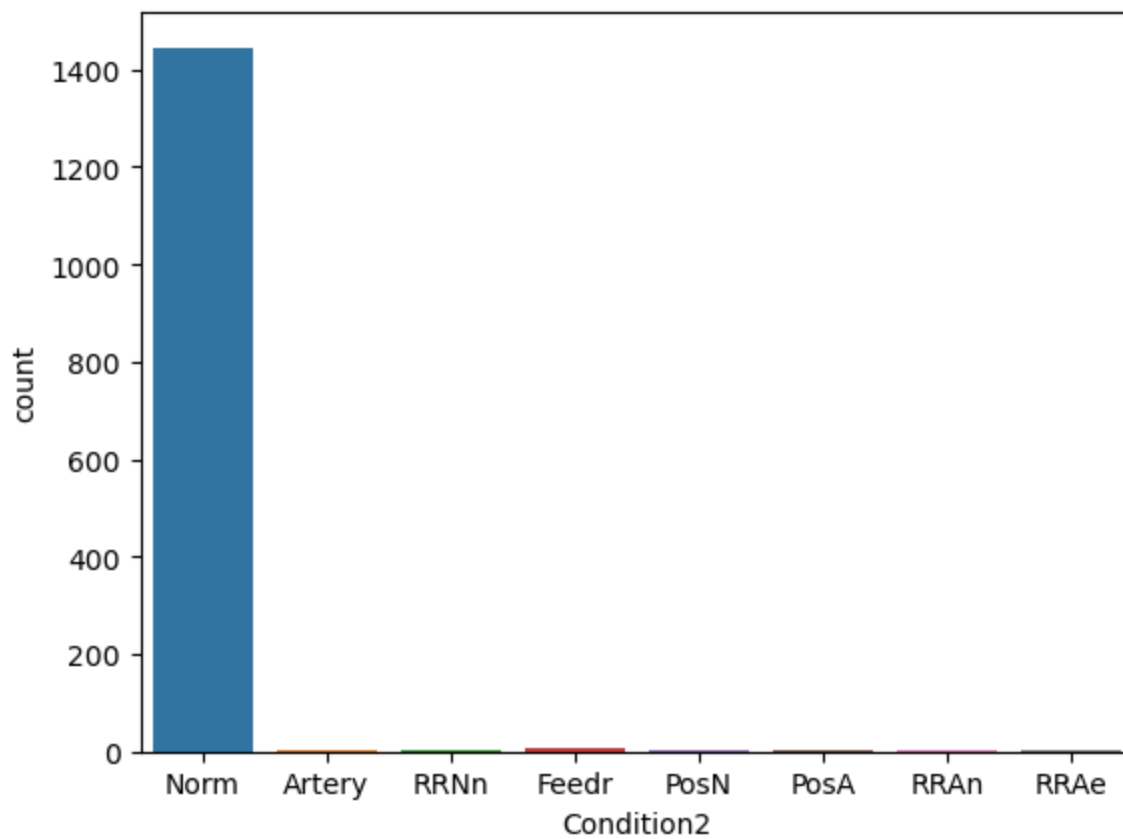
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```

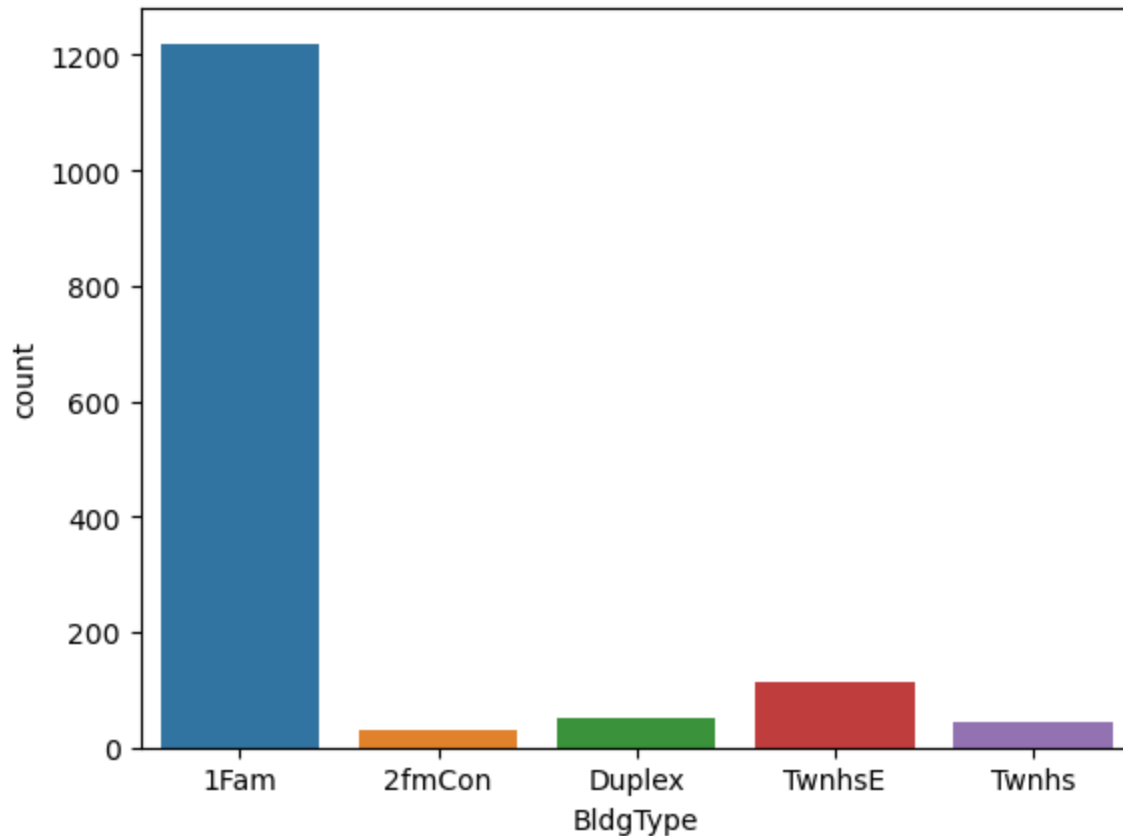


C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

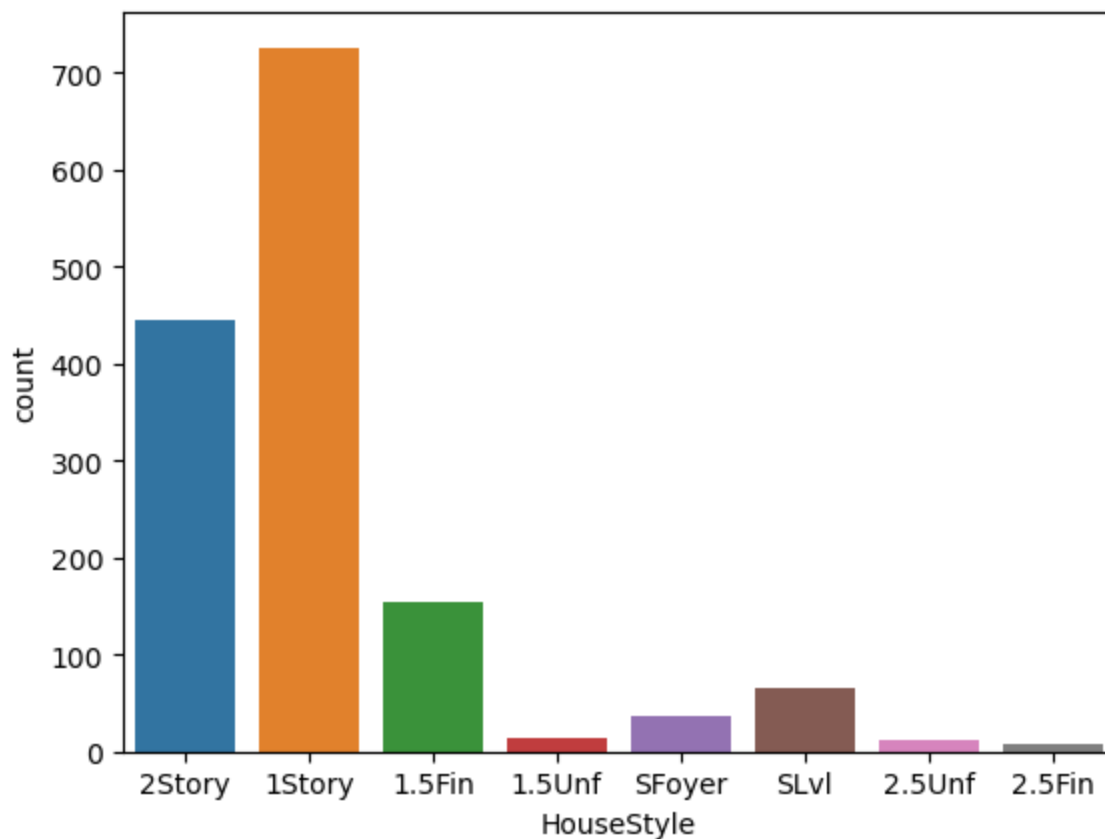
```
warnings.warn(
```



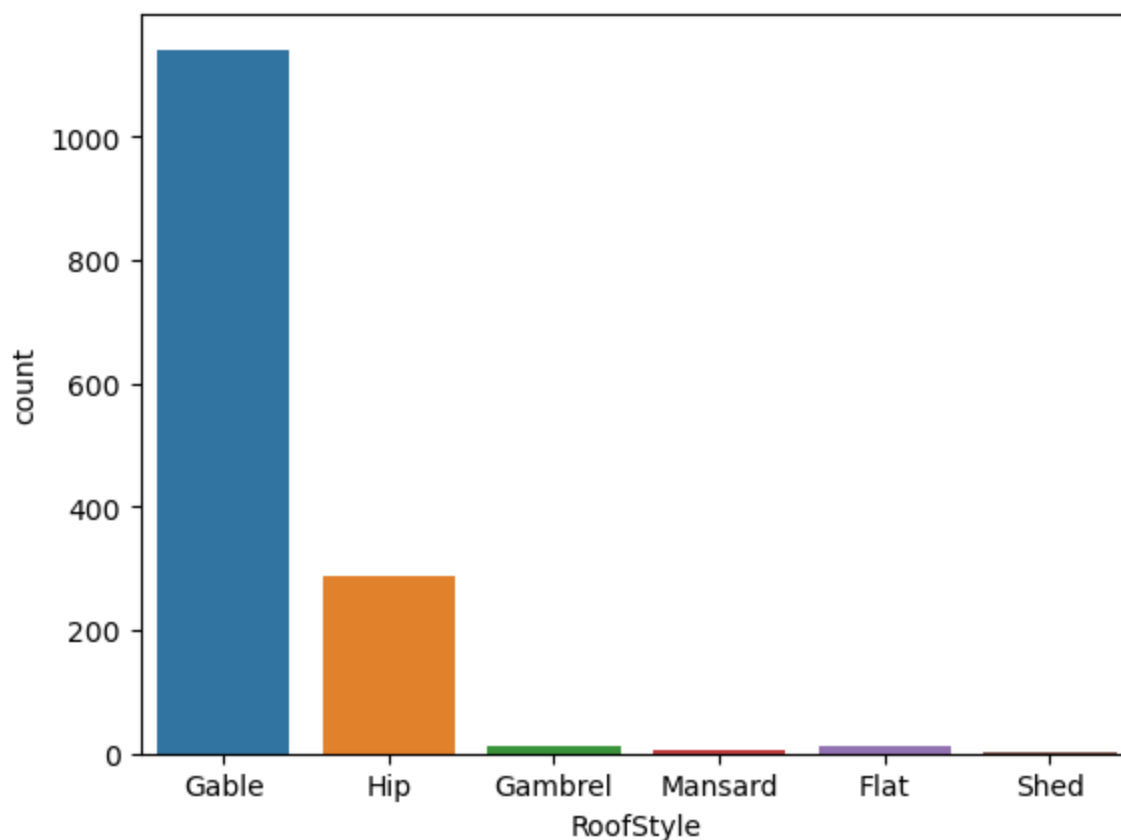
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



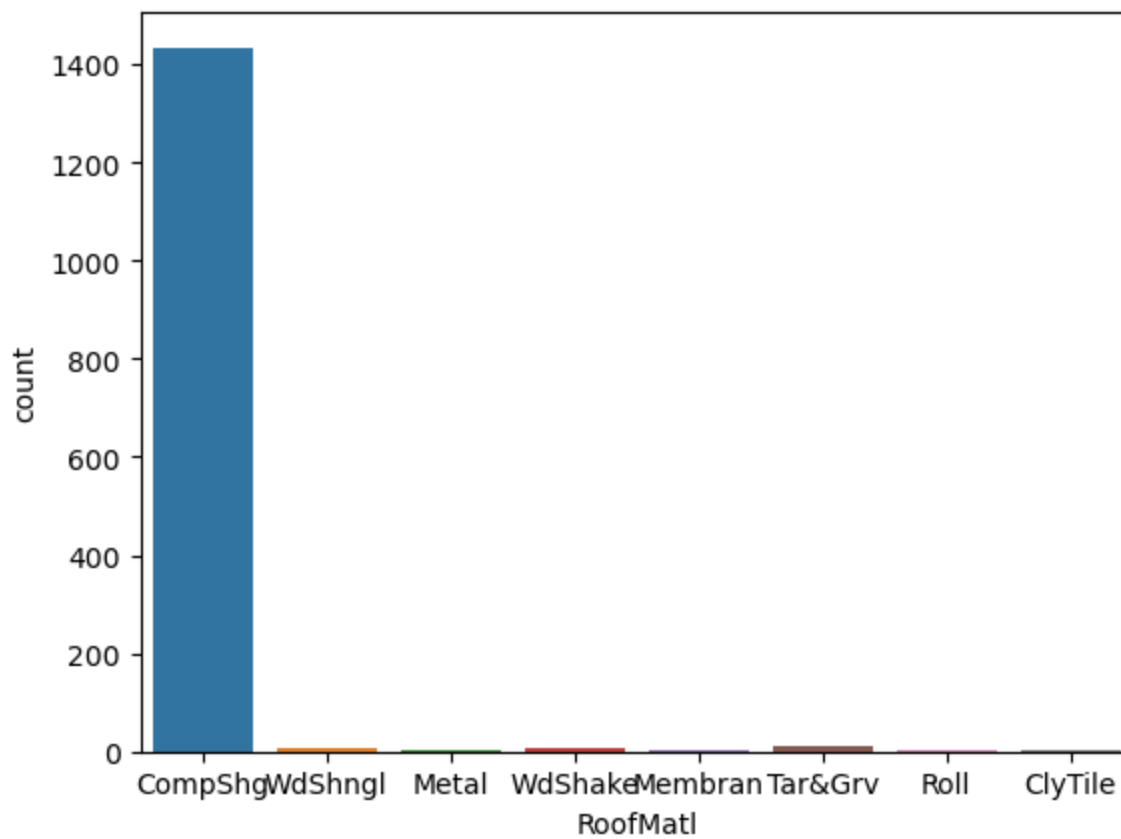
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(

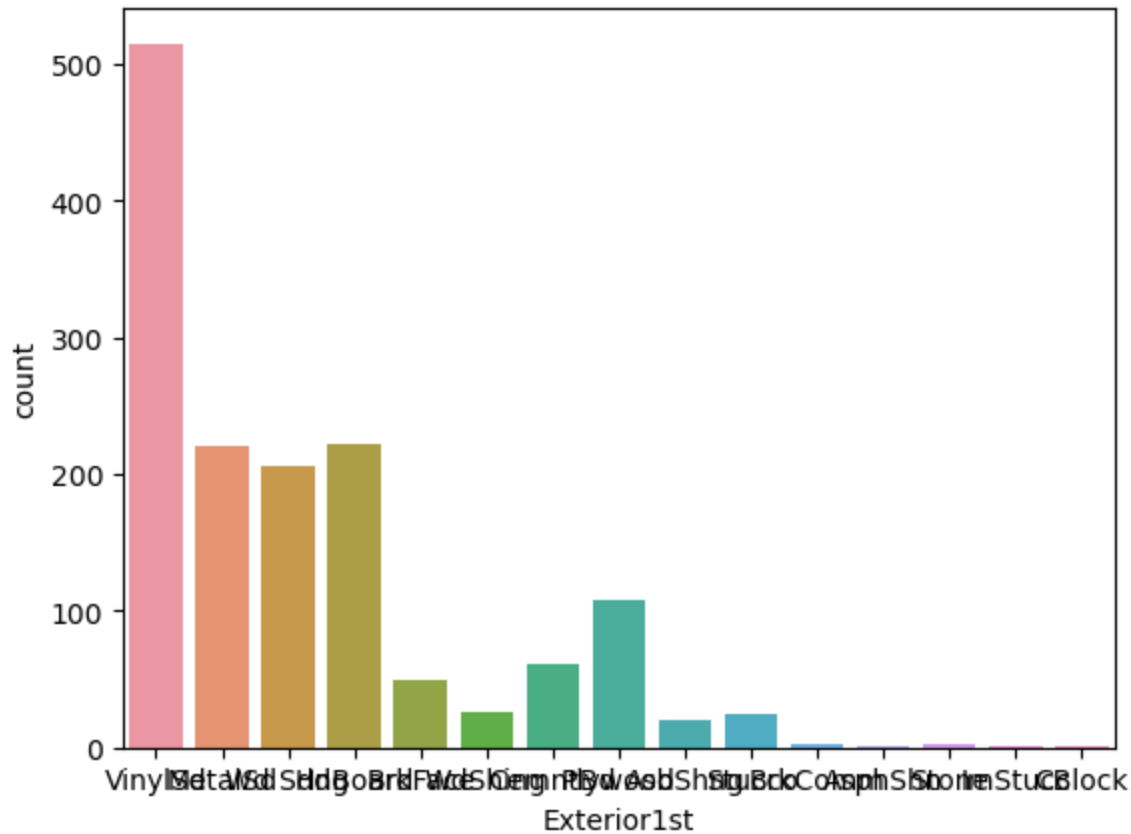


C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(



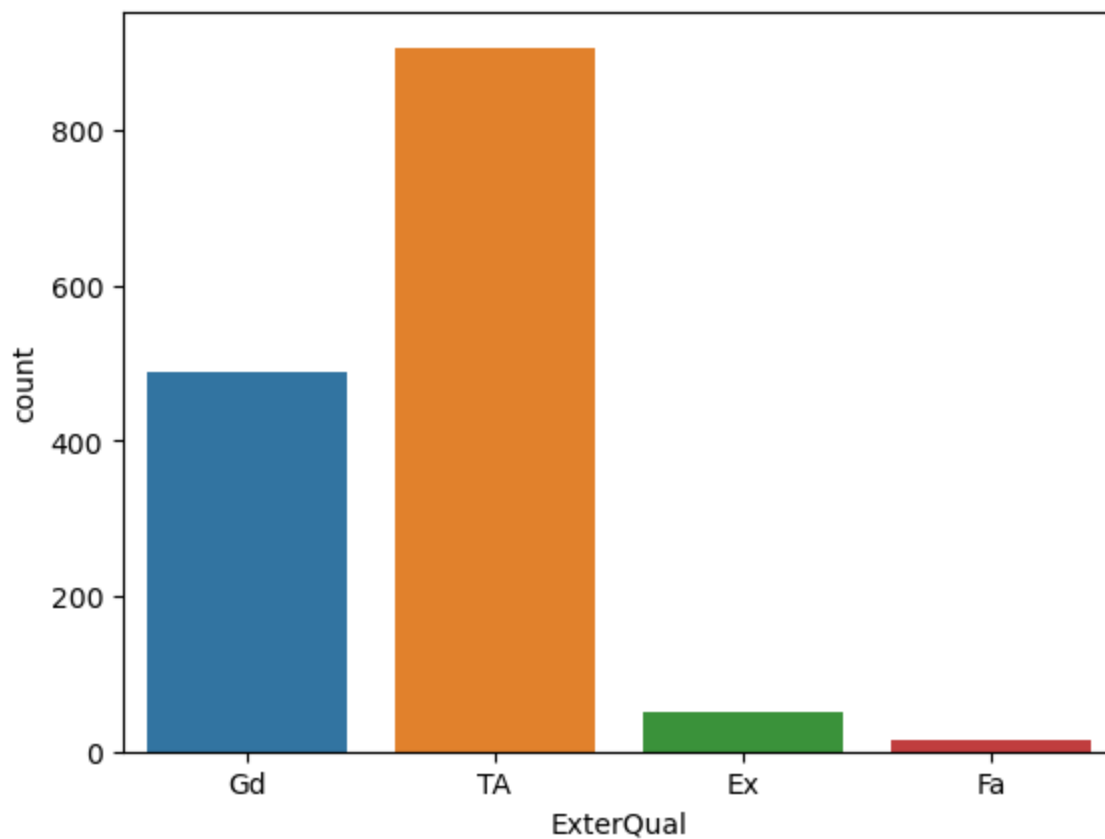
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```

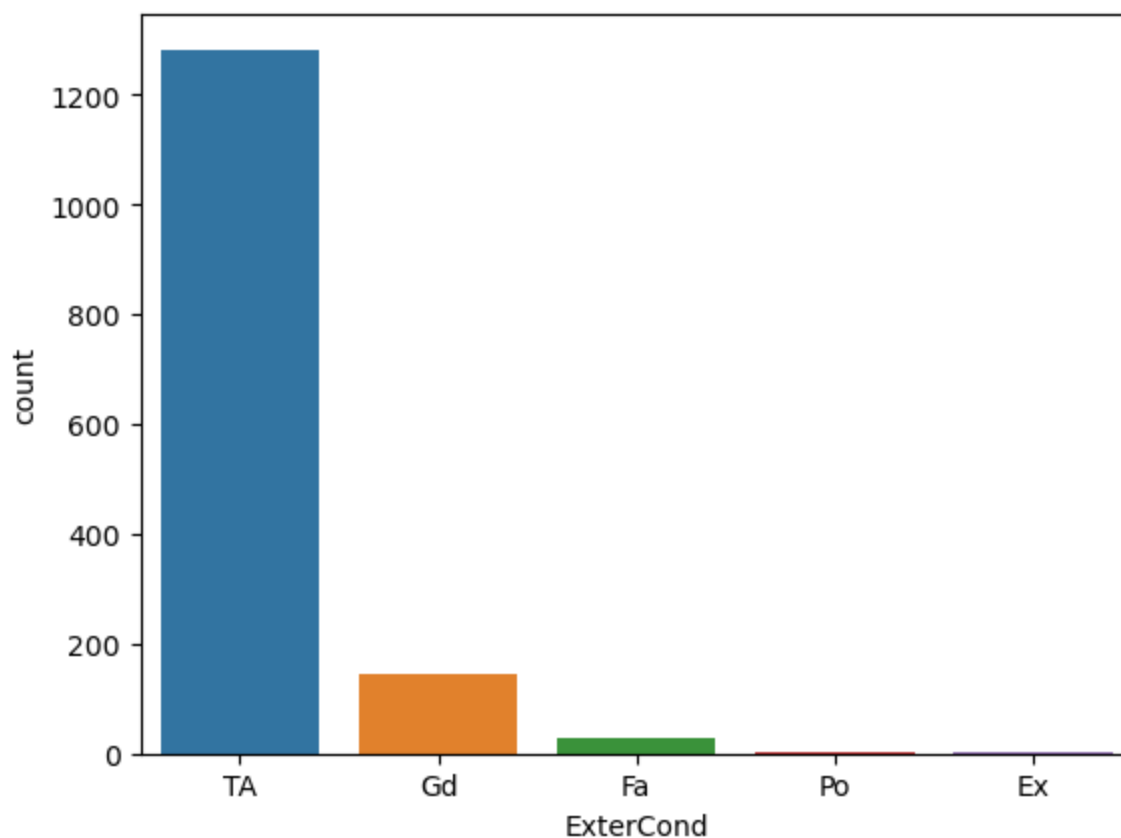


C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

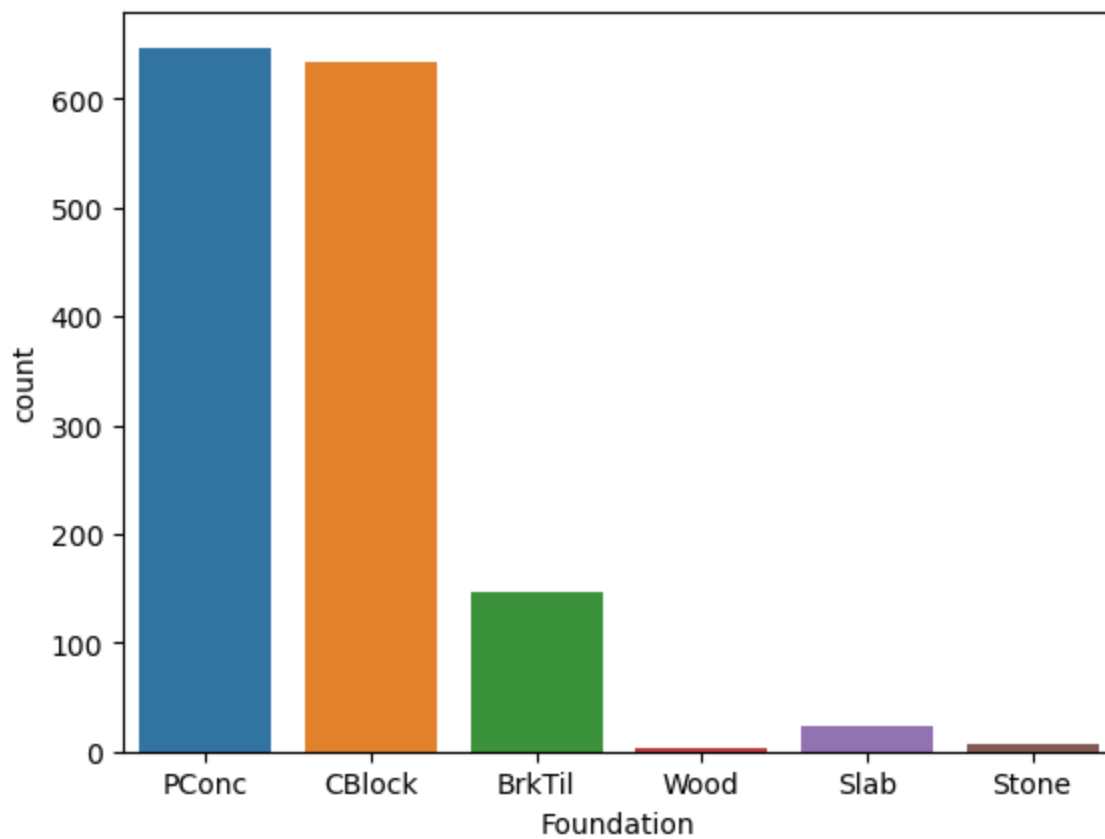
```
warnings.warn(
```

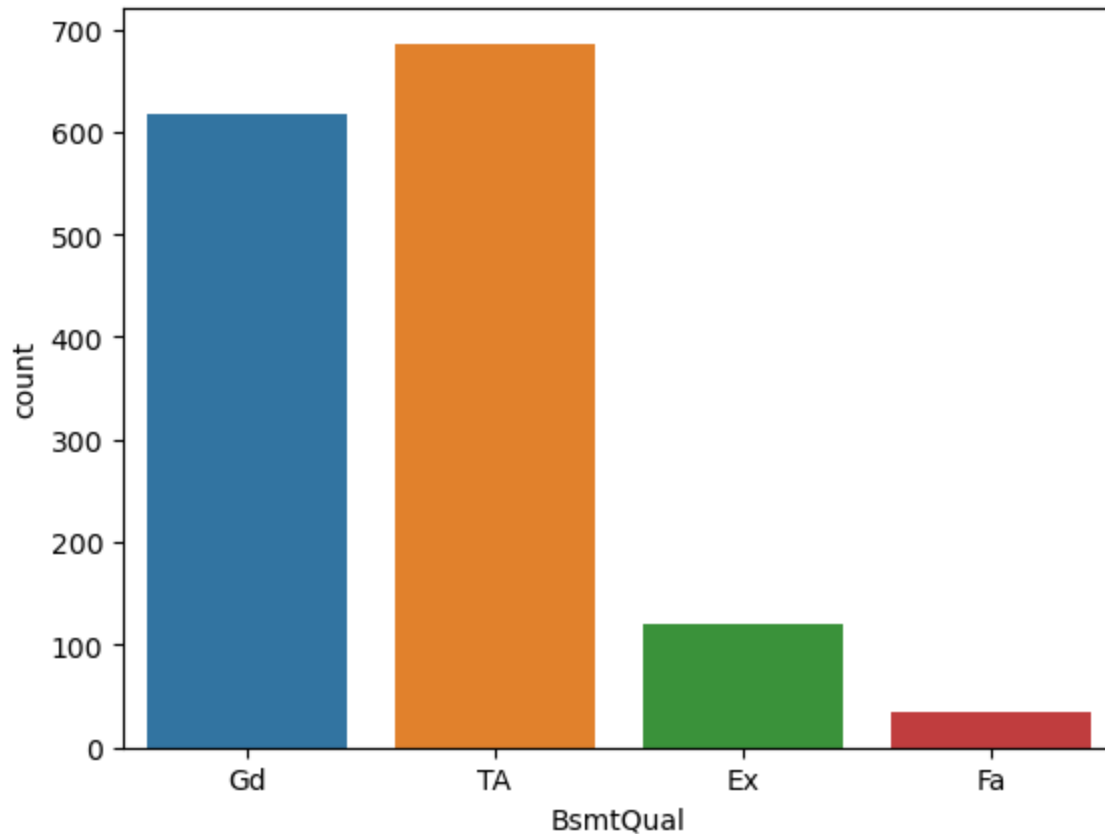
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



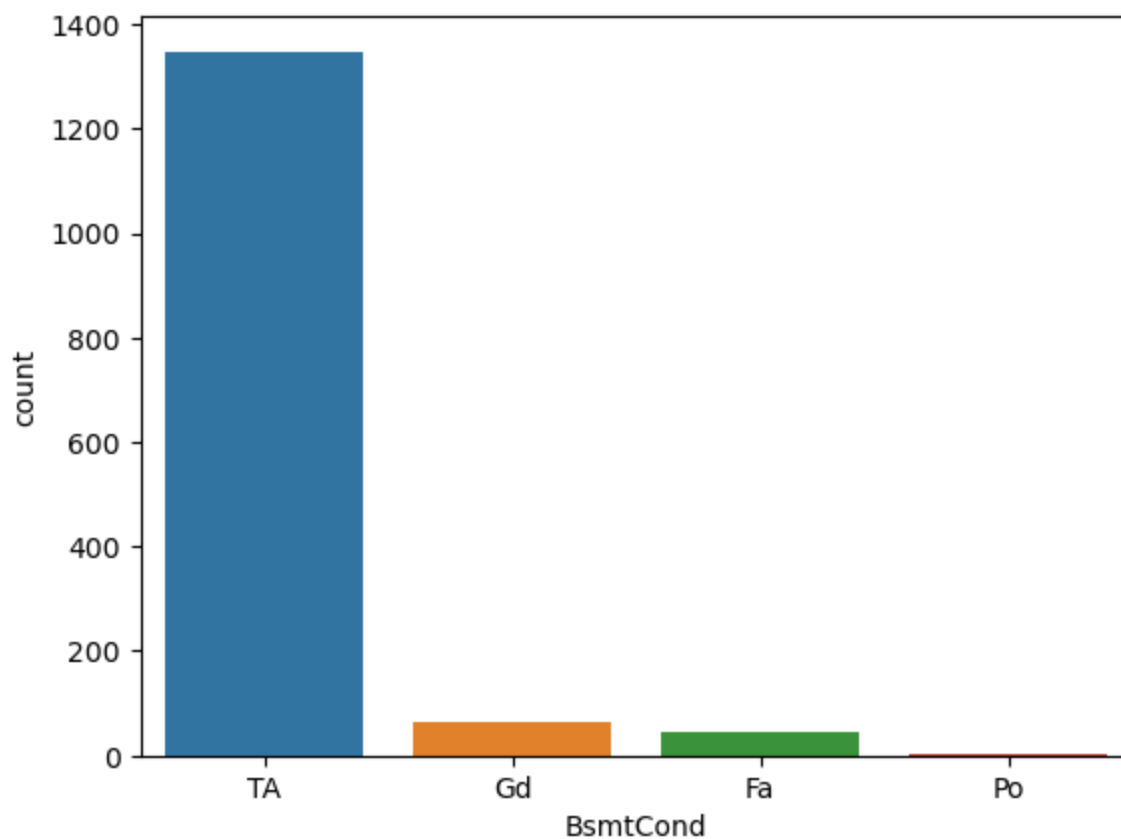
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



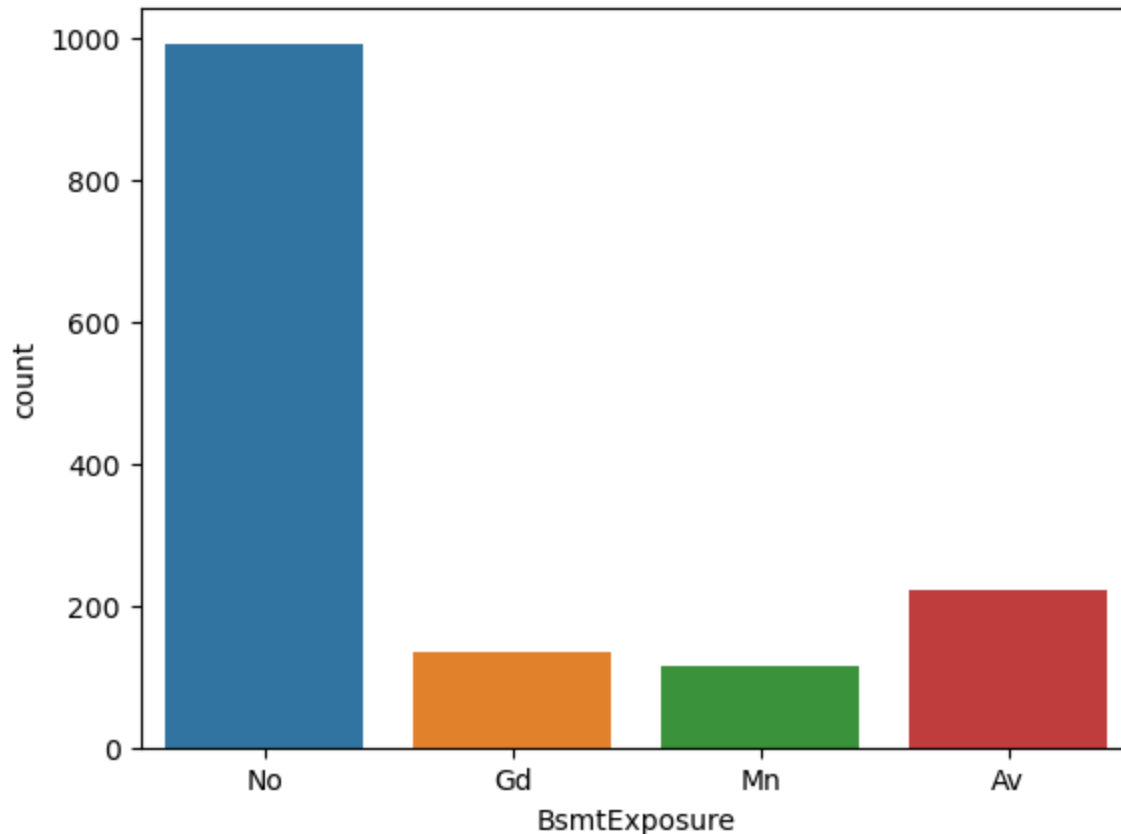
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
warnings.warn()
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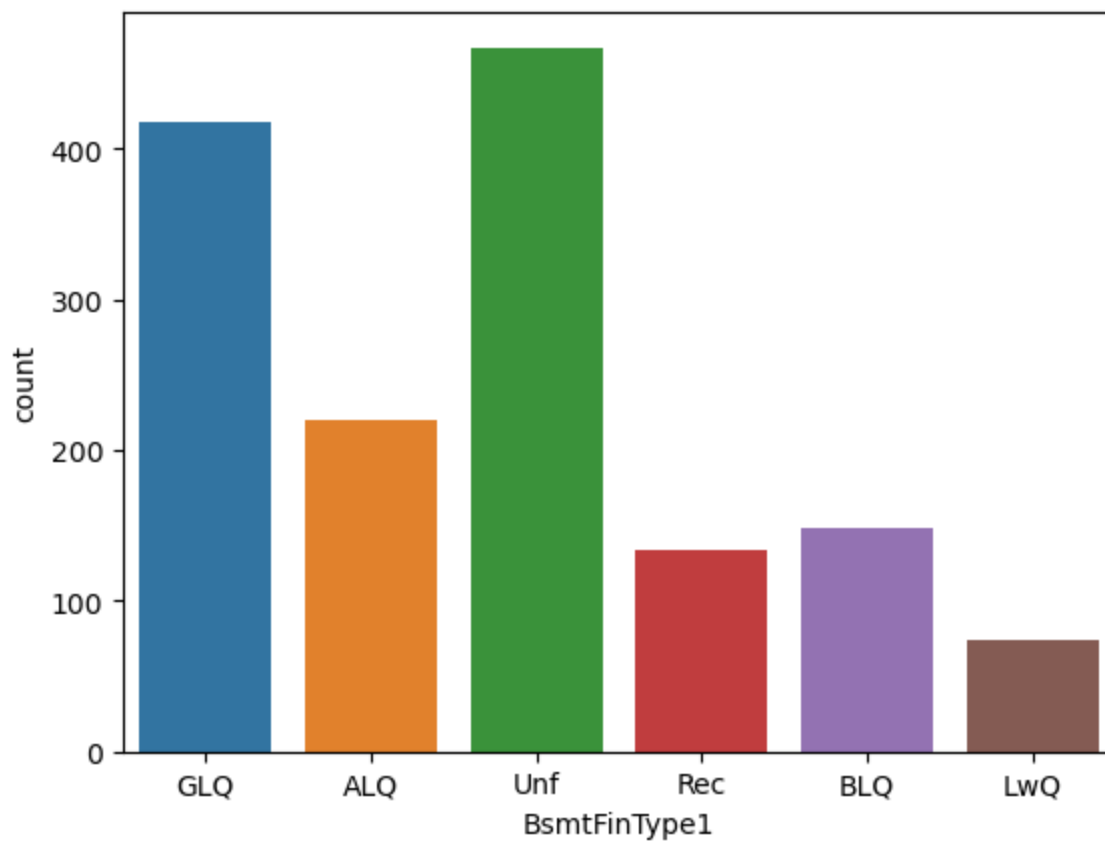
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
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```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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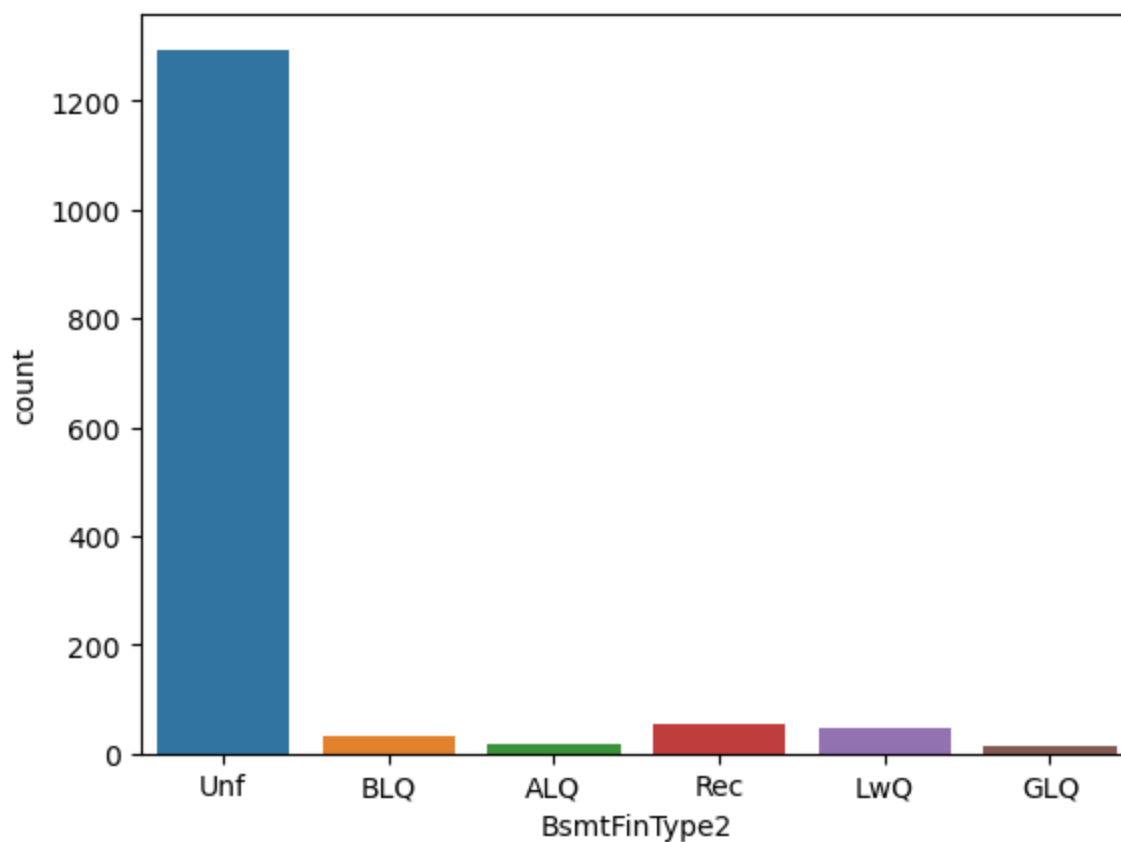


```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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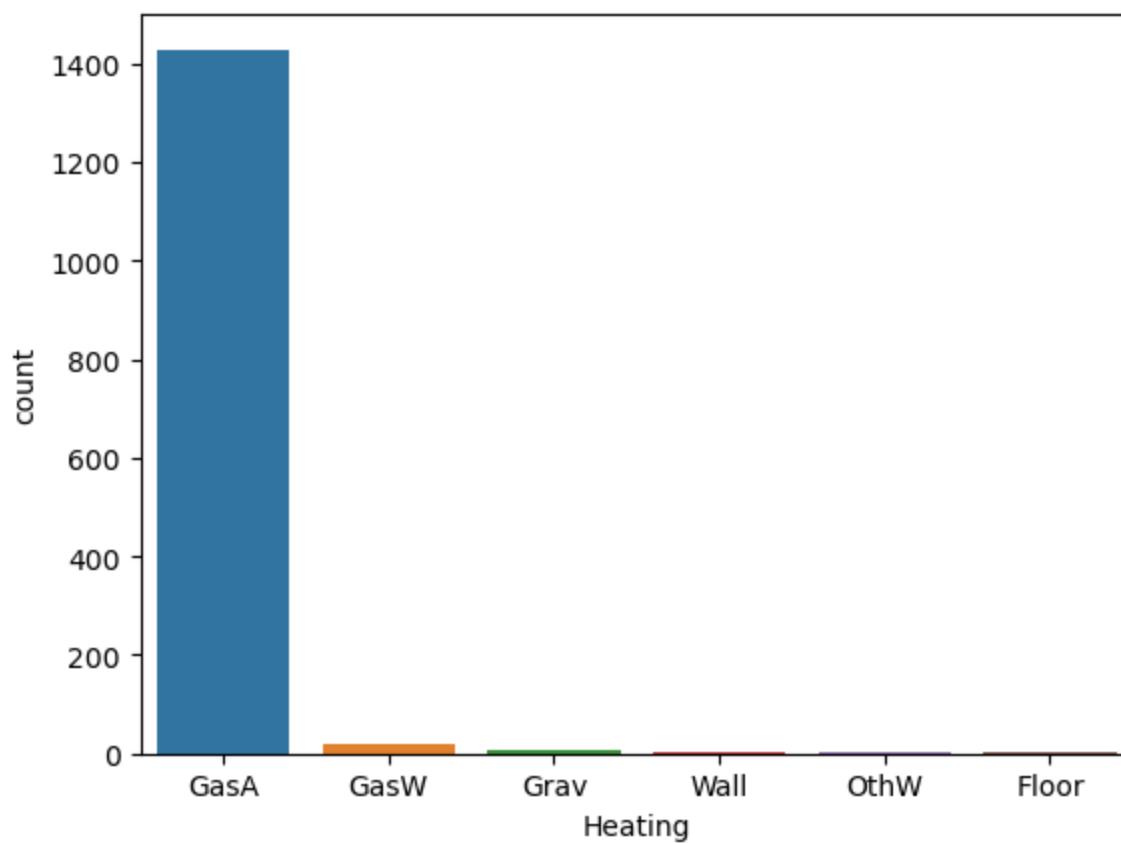
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
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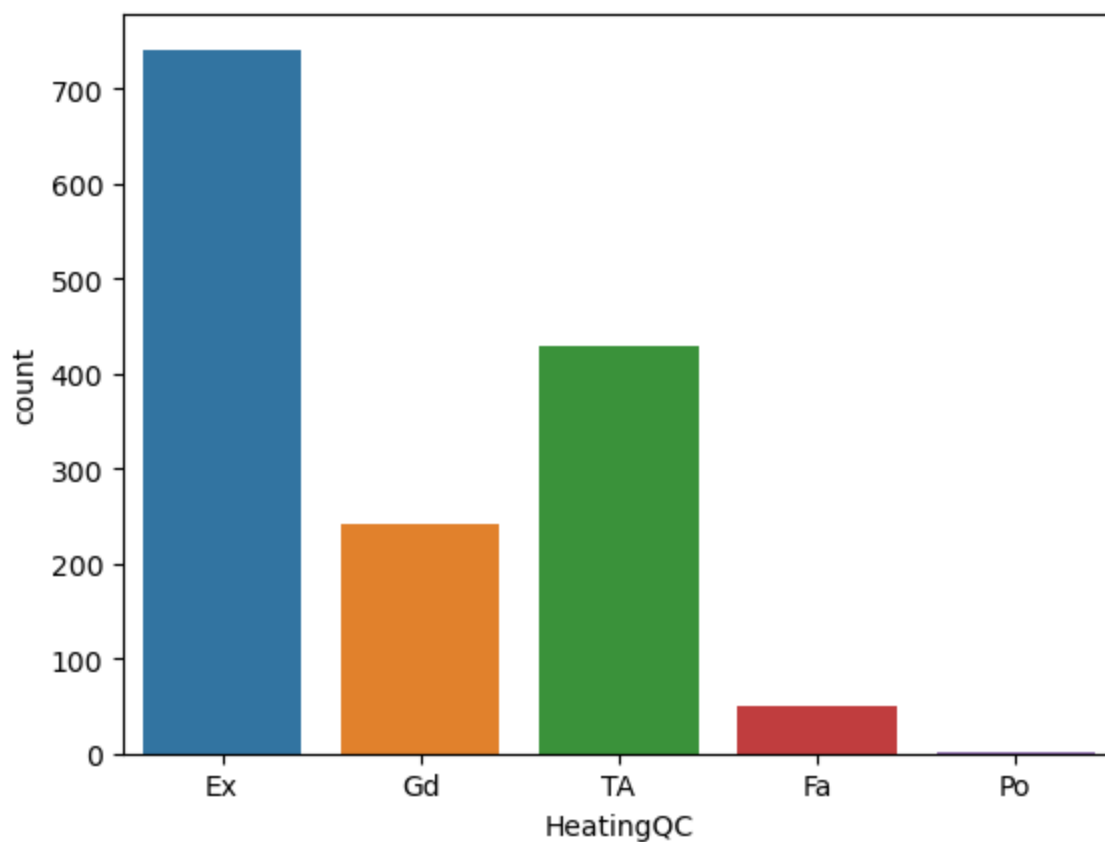


C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

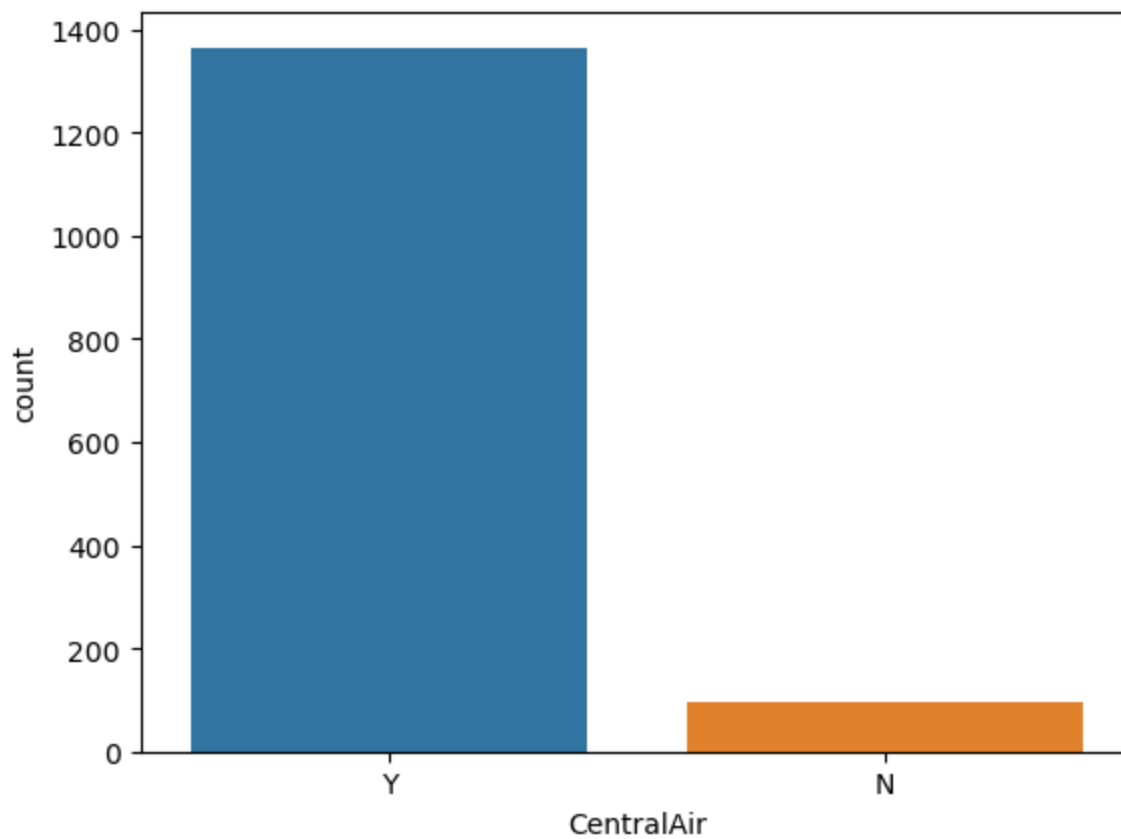
```
warnings.warn(
```



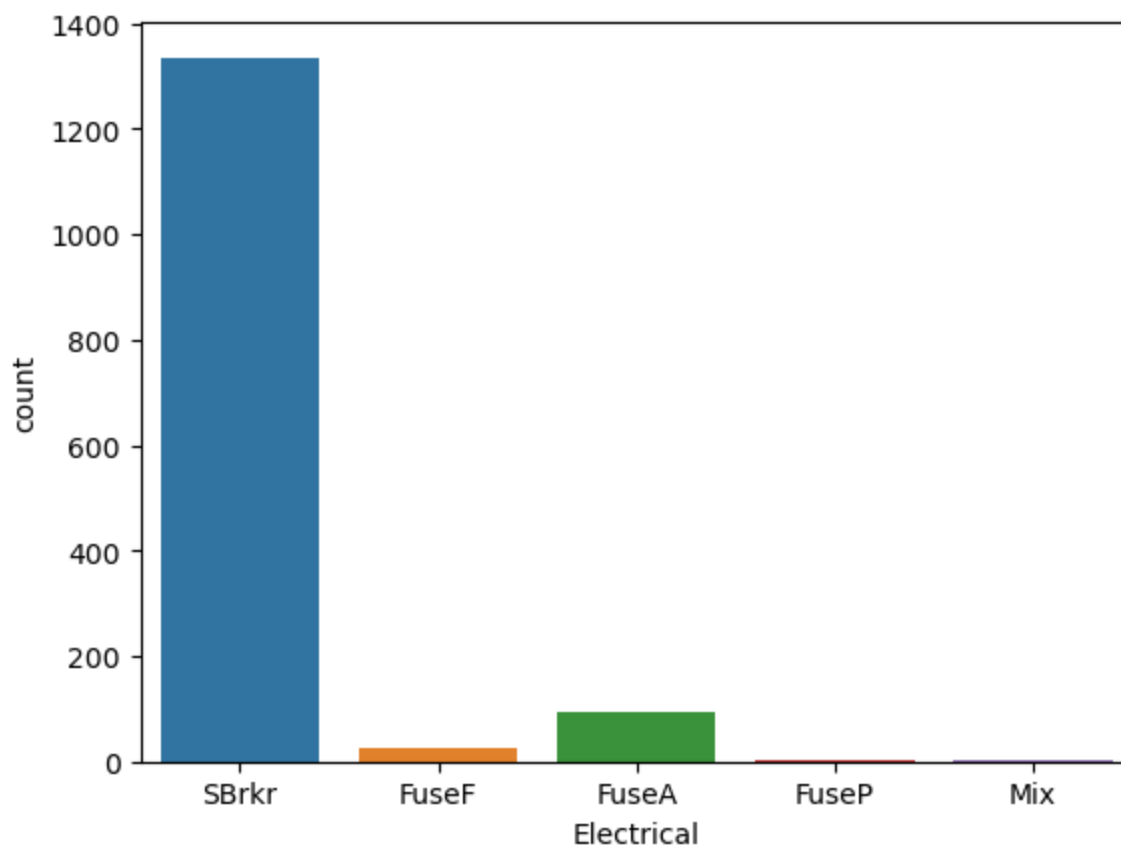
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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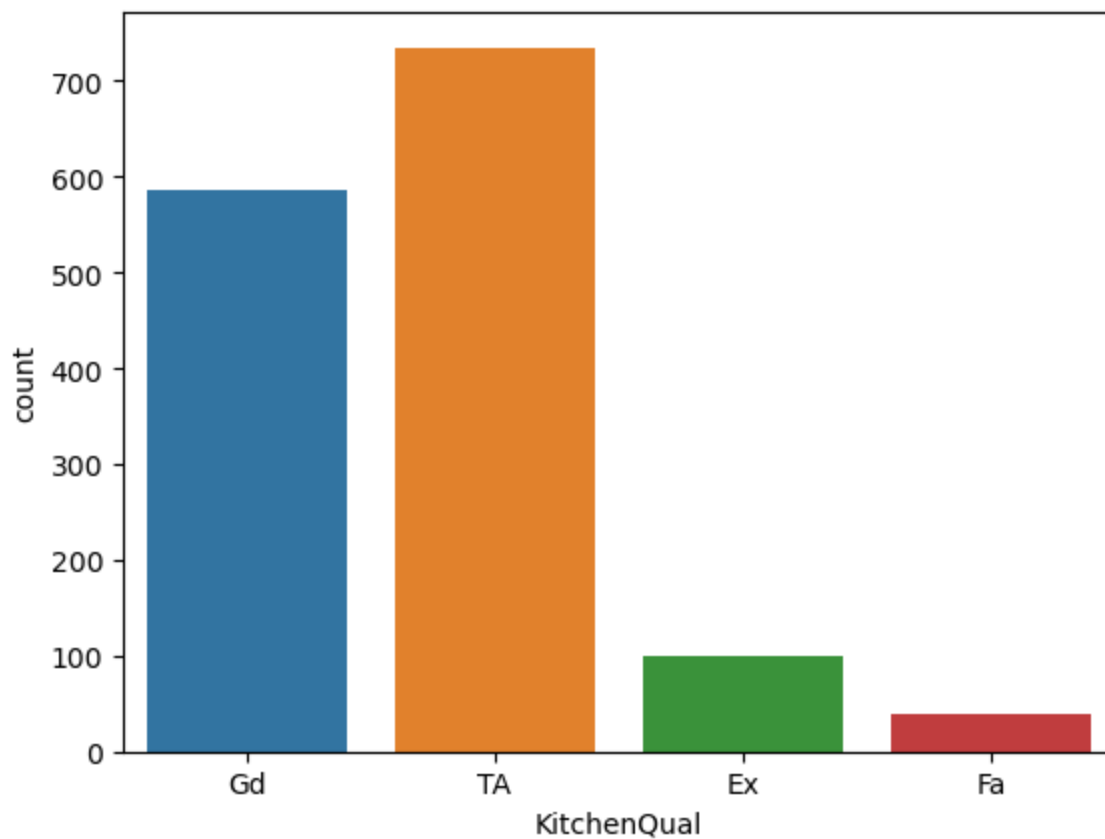
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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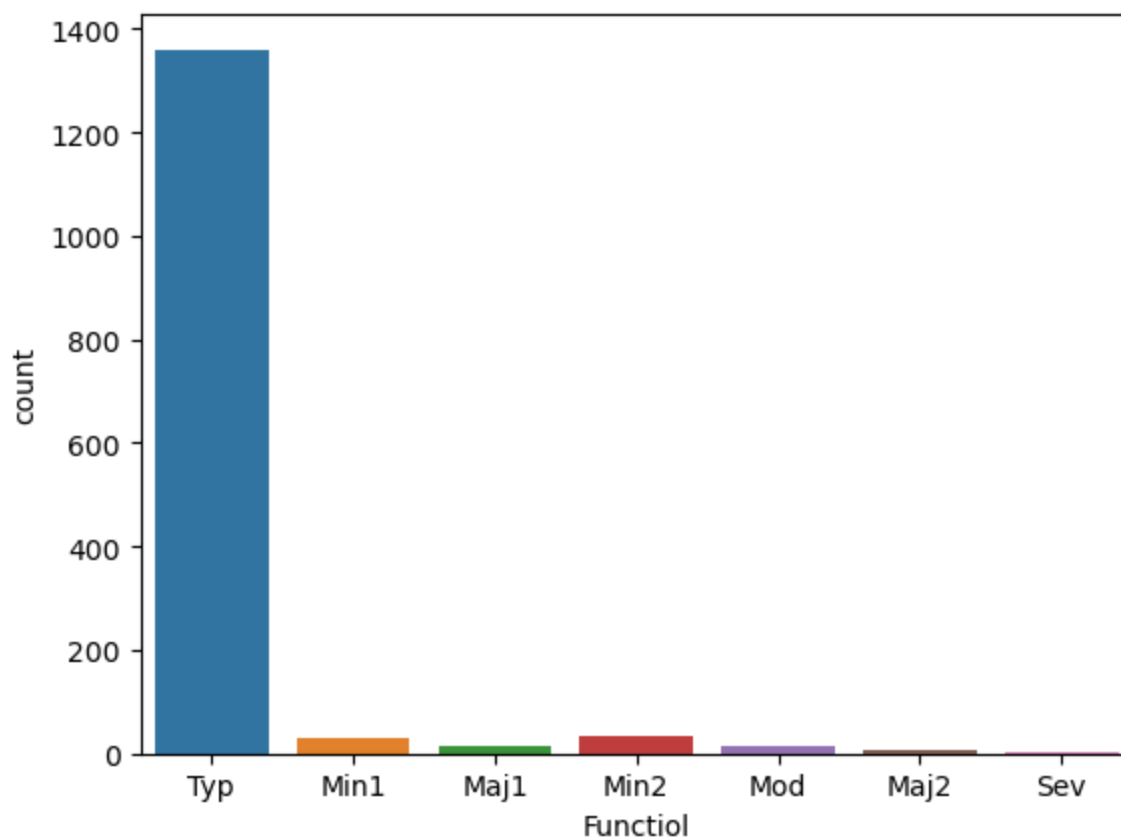


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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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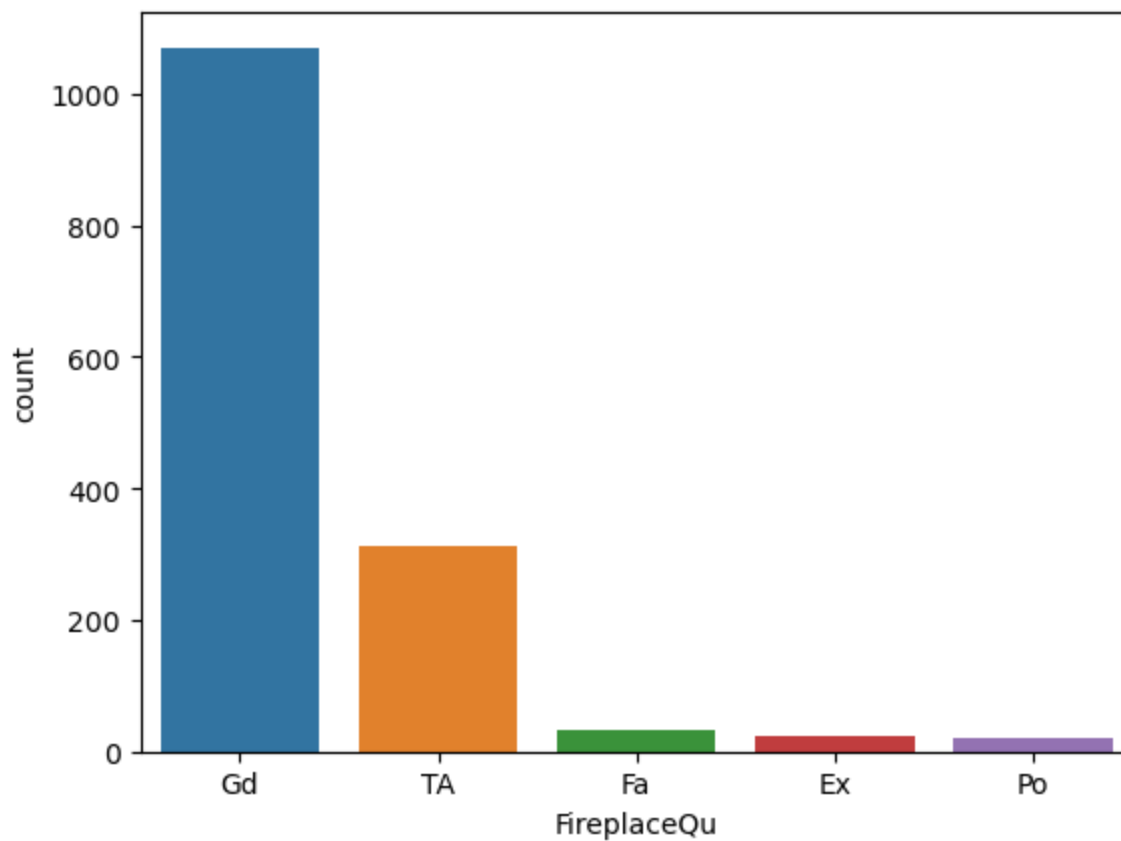
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

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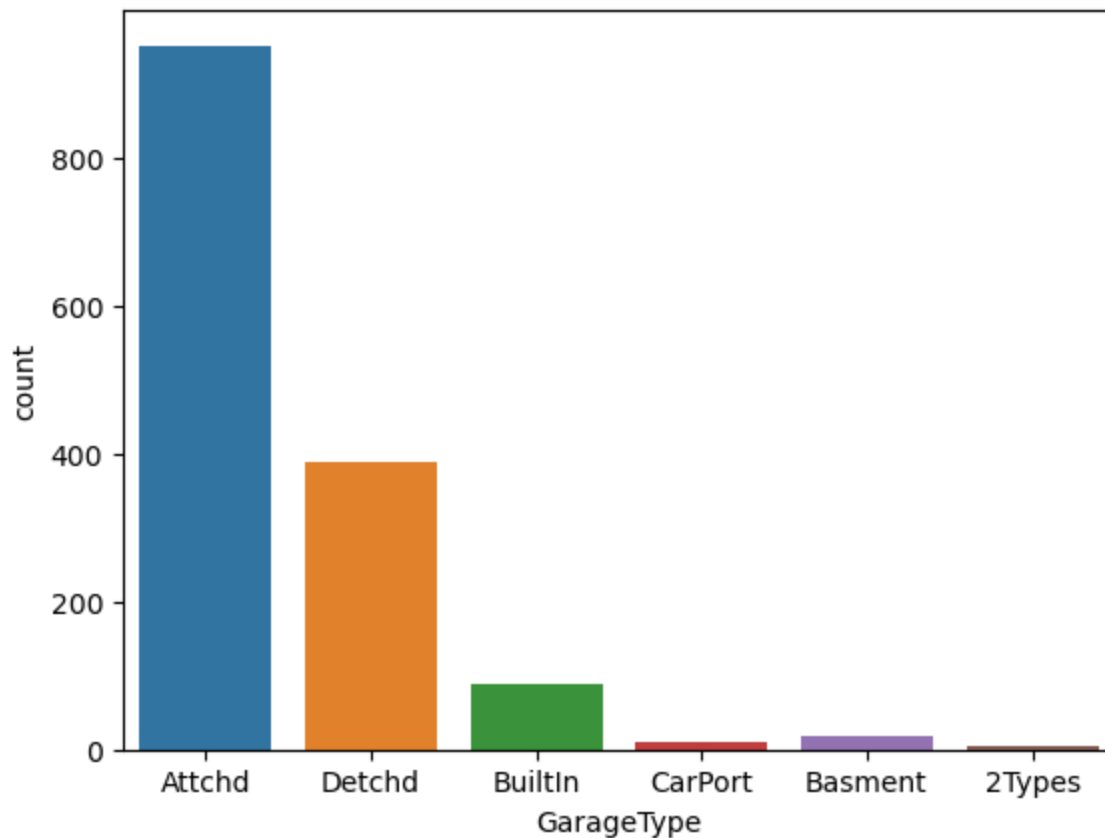


C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

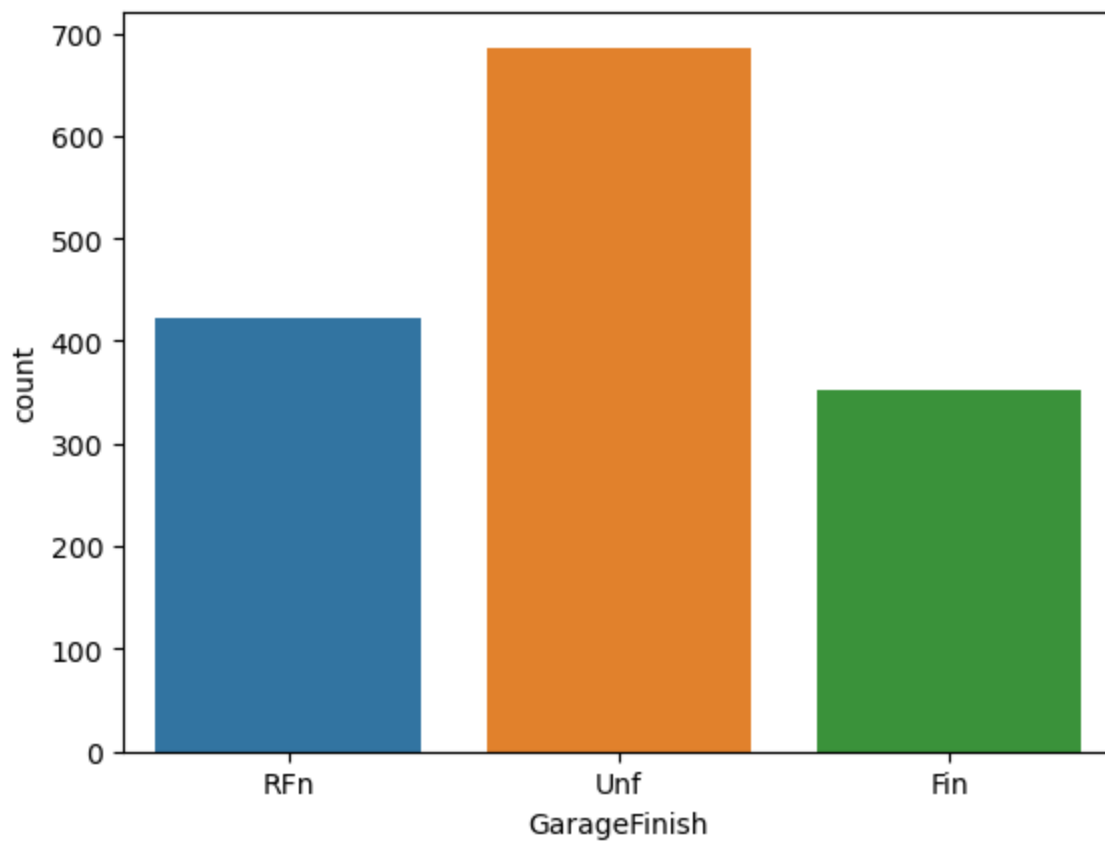
```
warnings.warn(
```



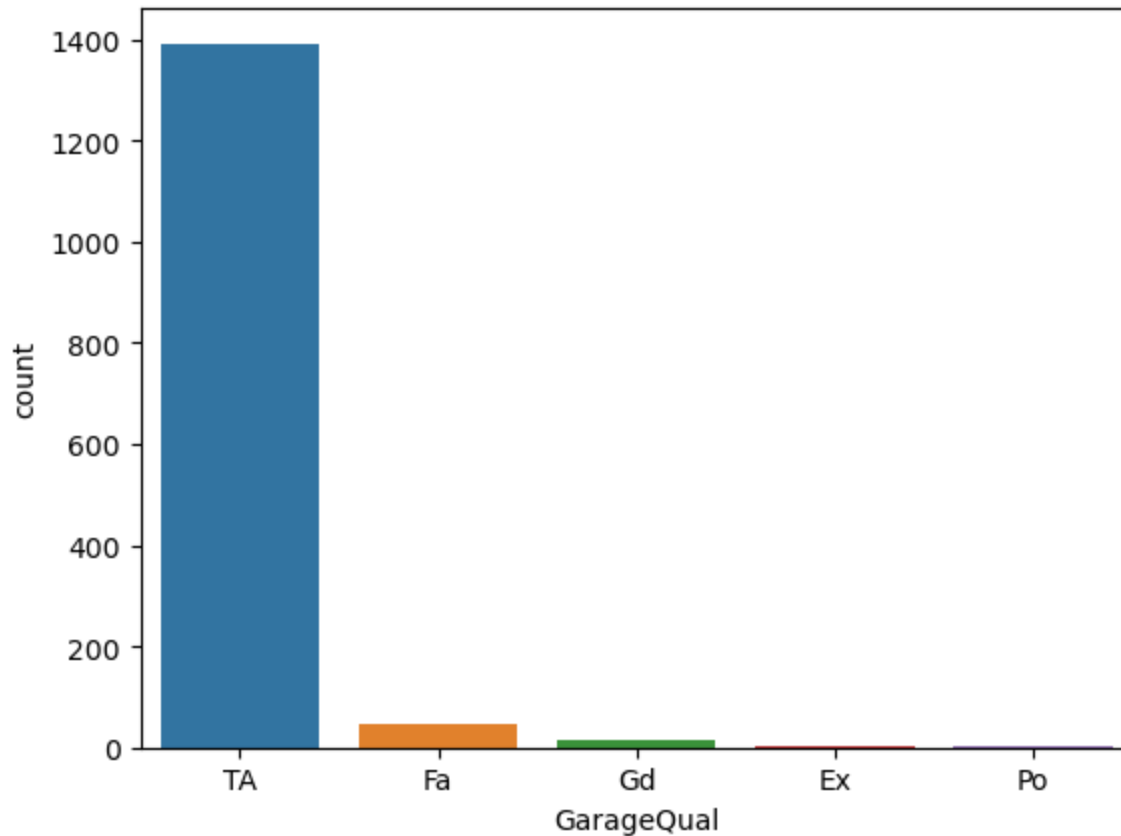
```
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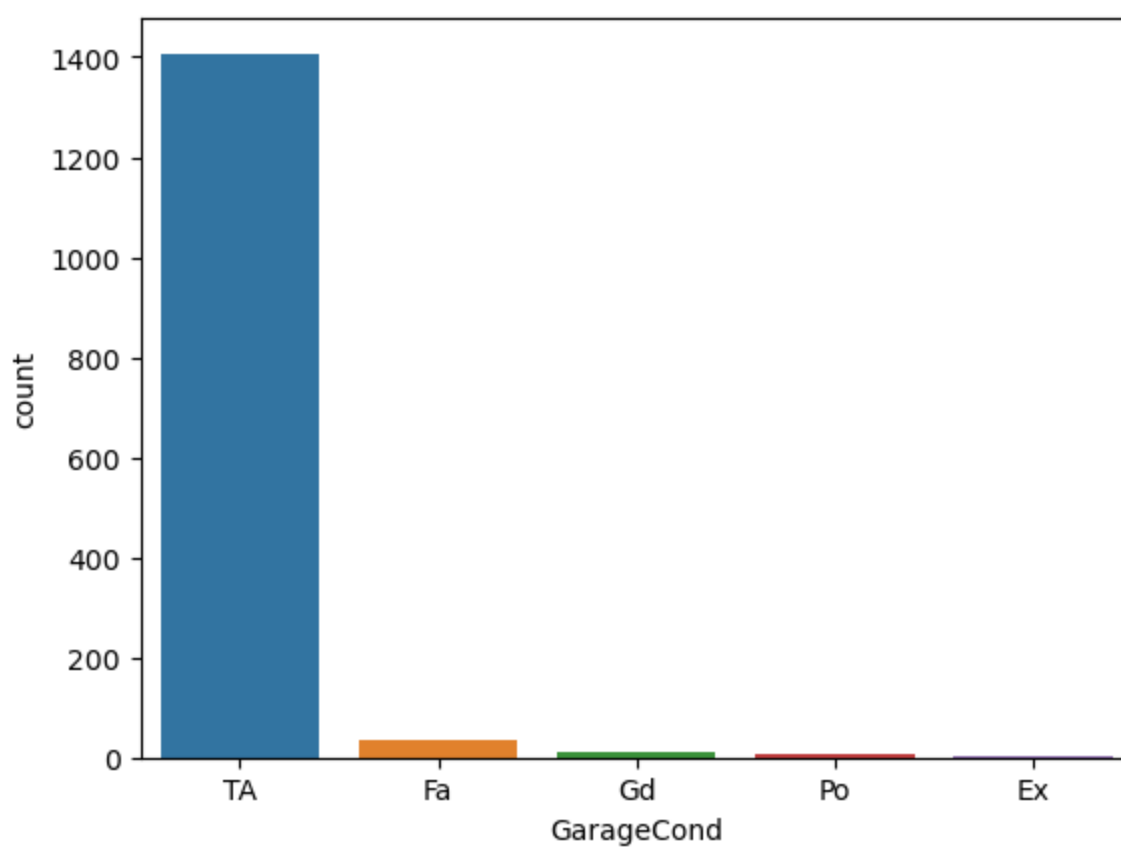
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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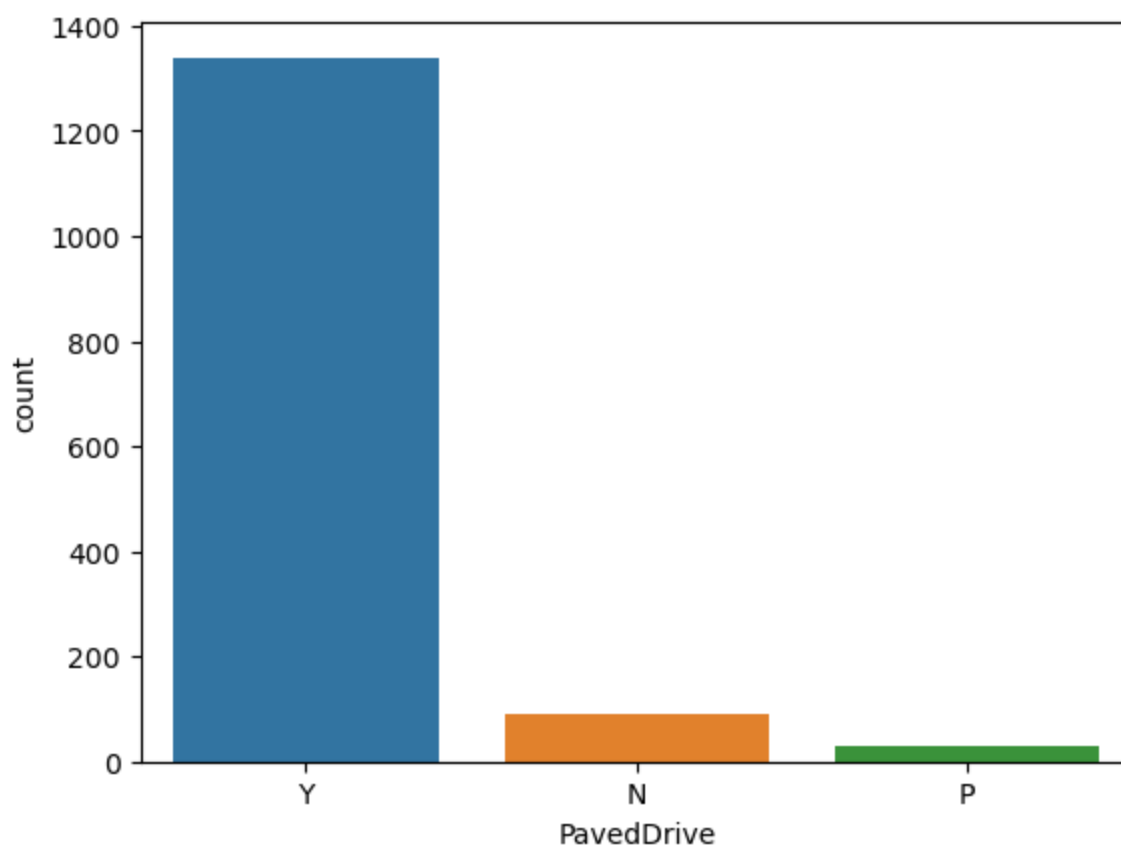
```
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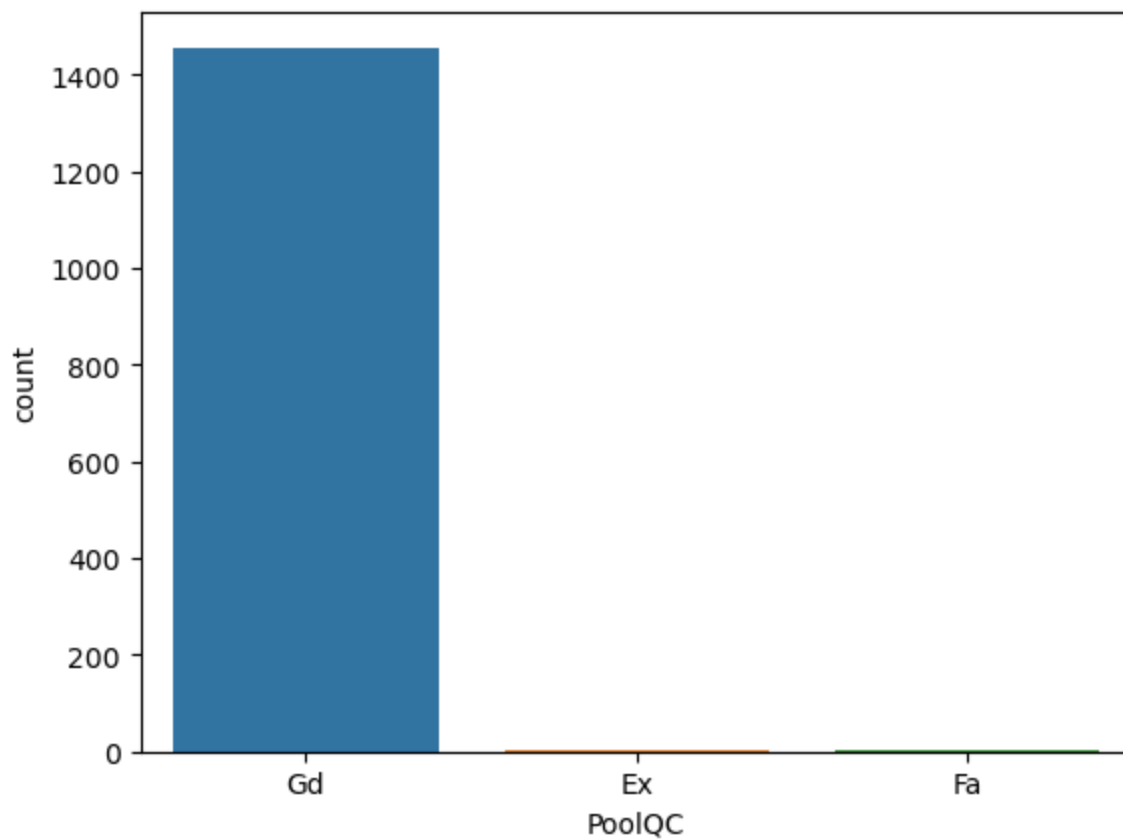
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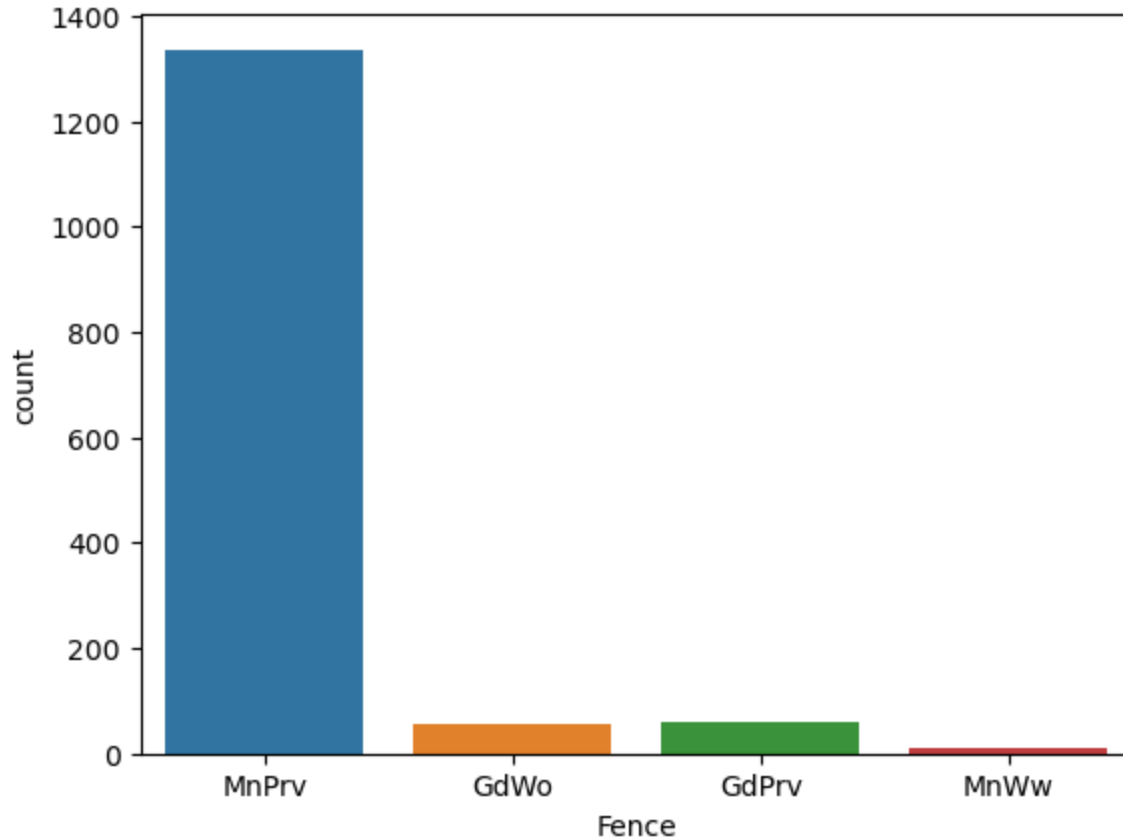
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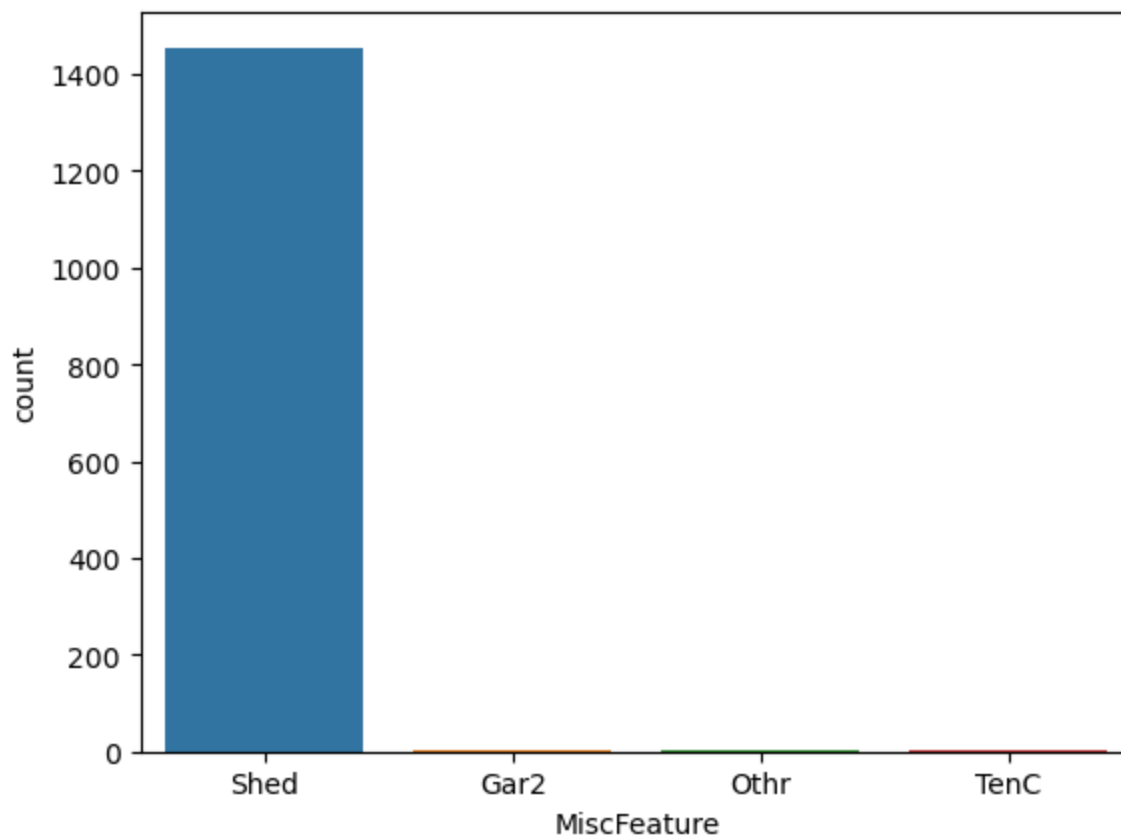
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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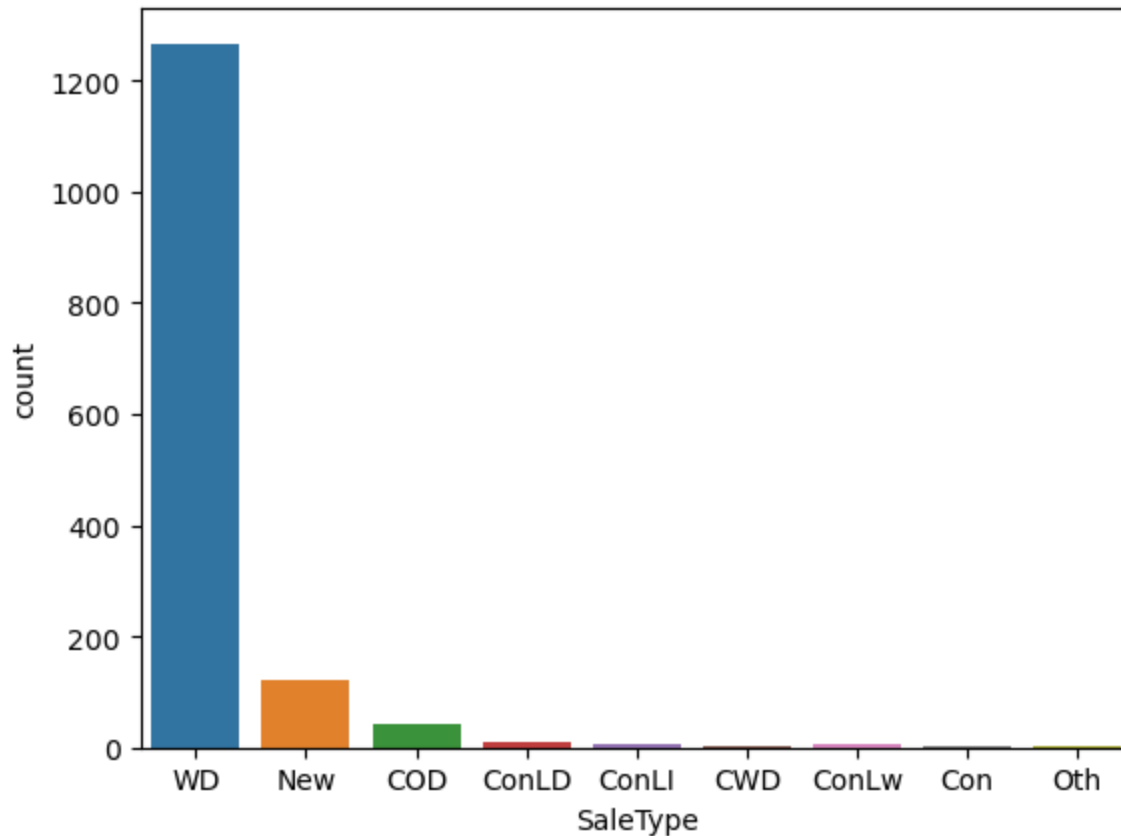
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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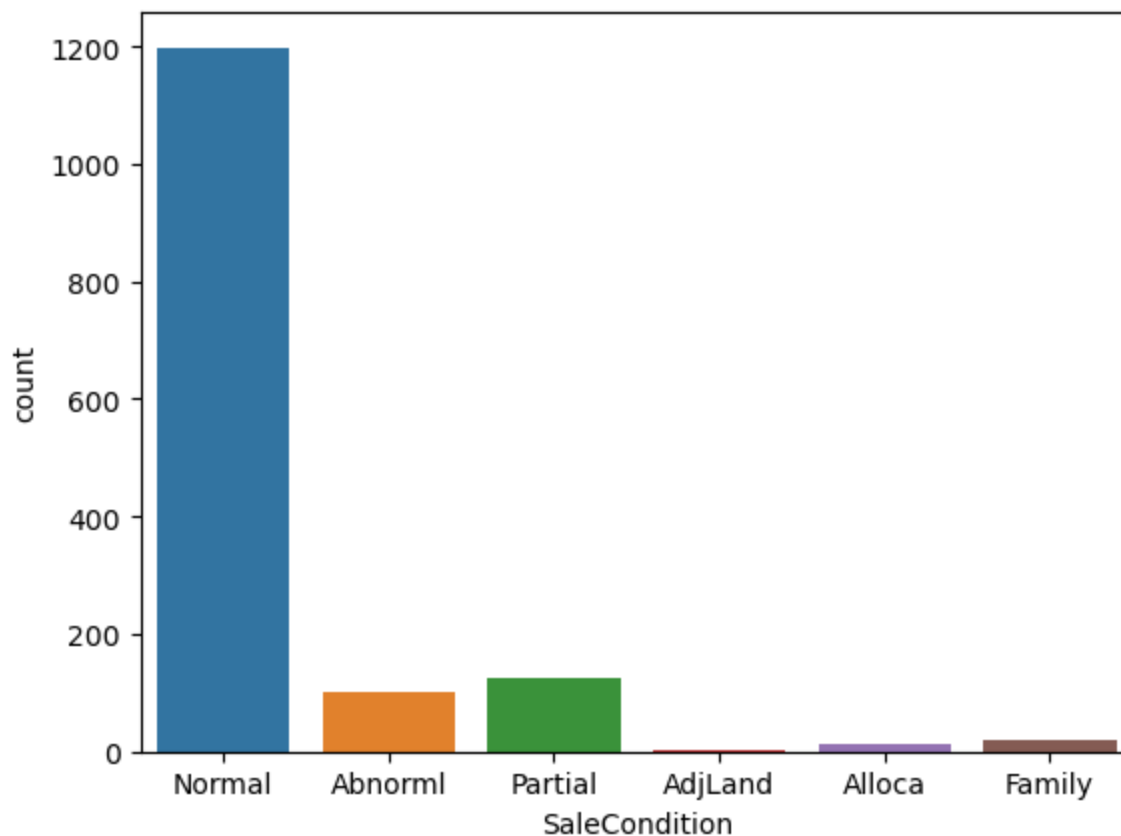
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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warnings.warn(
```



BOXPLOT

THE BOX PLOT IS ONLY FOR NUMERIC DATA HENCE ENCODING IS REQUIRED

Converting all categorical data into numeric data

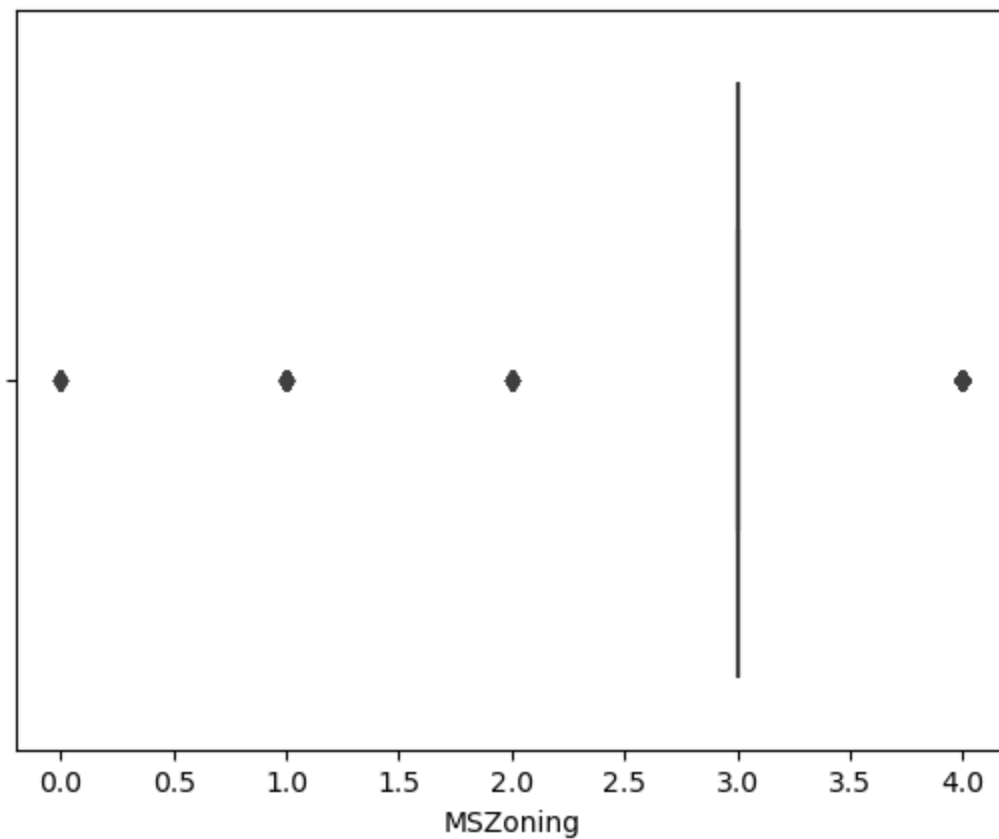
```
In [52]: from sklearn.preprocessing import LabelEncoder
```

```
In [53]: data_cat1=data_cat.copy()
```

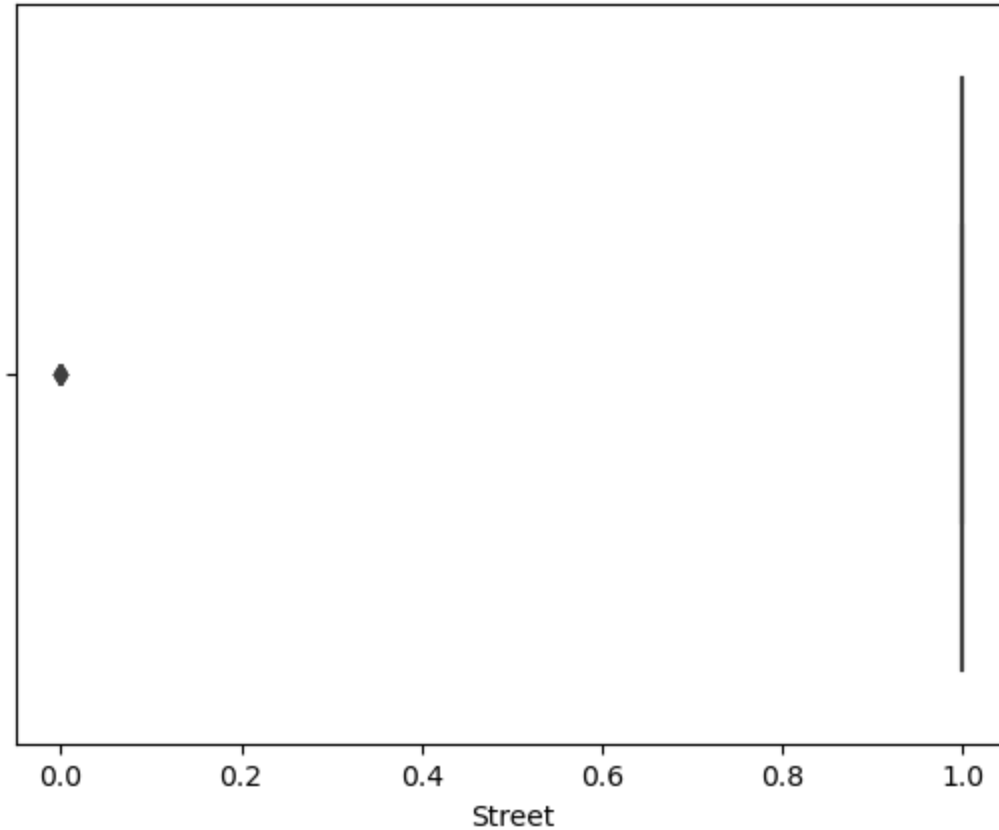
```
In [54]: encoder = LabelEncoder()
for z in data_cat1.columns:
    data_cat1[z] = encoder.fit_transform(data_cat1[z])
```

```
In [55]: for b in data_cat1.columns:
    sea.boxplot(data_cat1[b])
    plt.show()
```

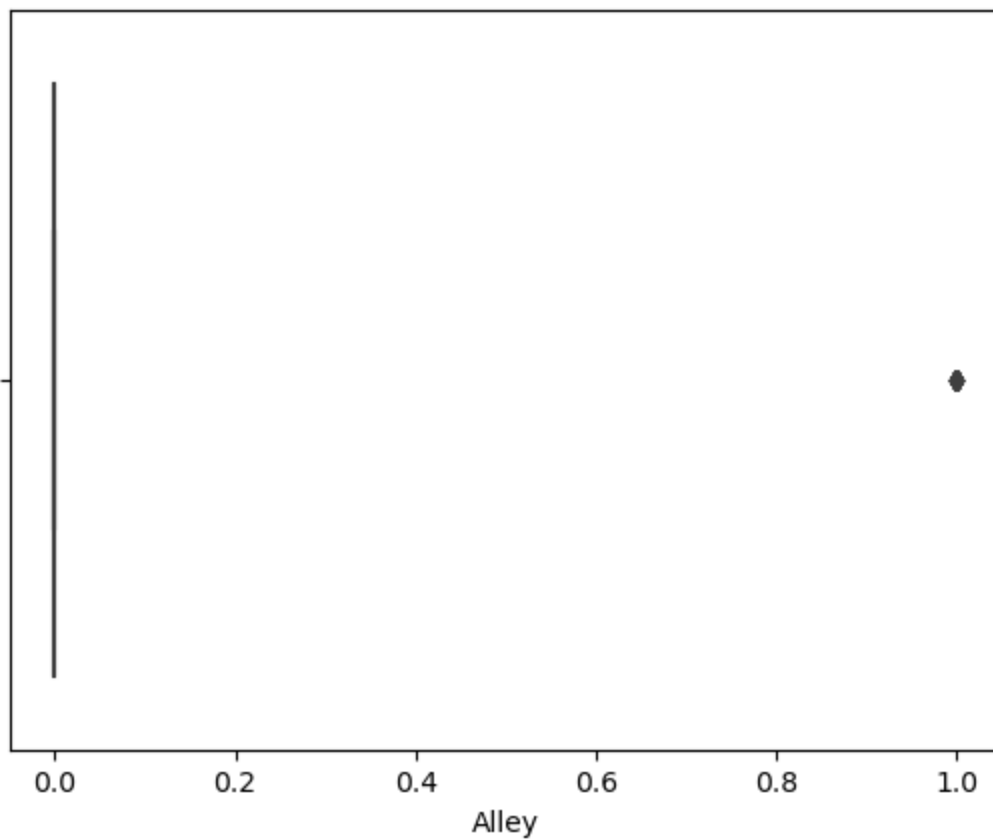
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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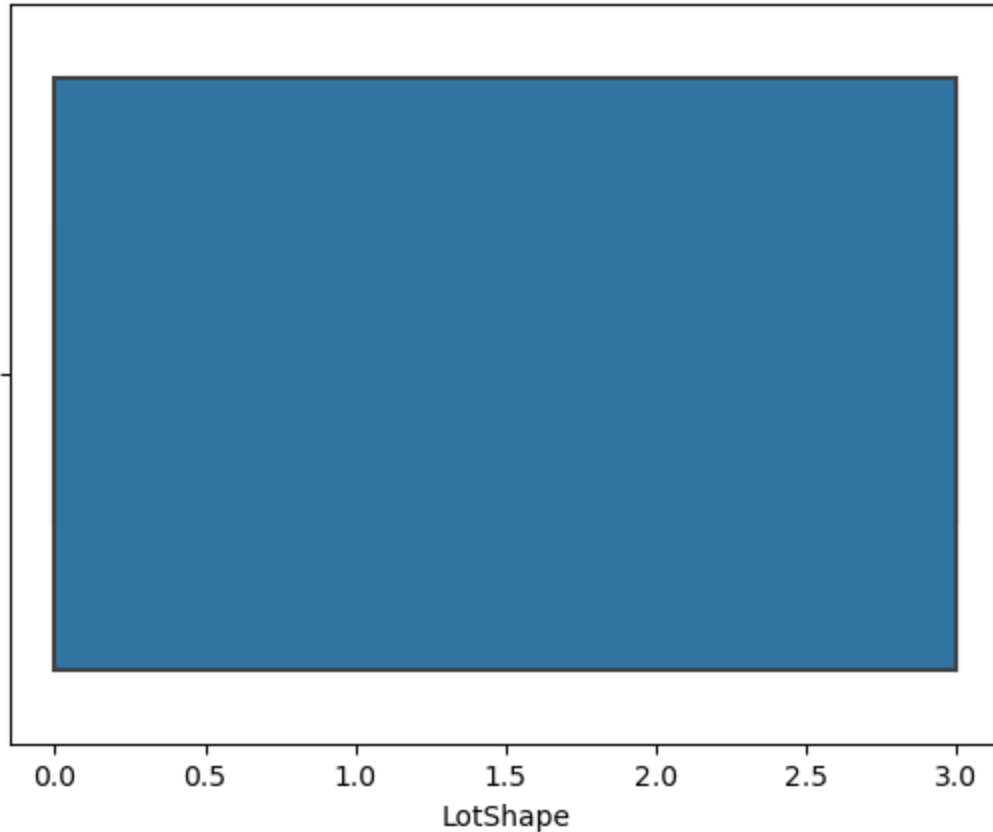
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
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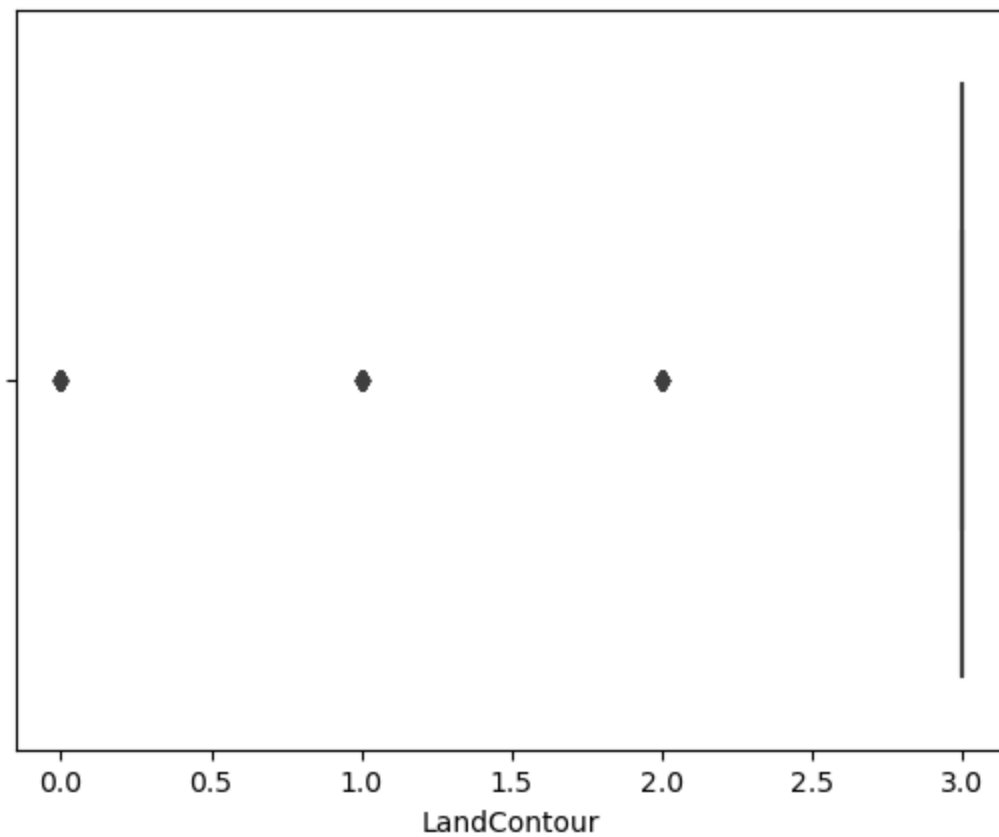
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
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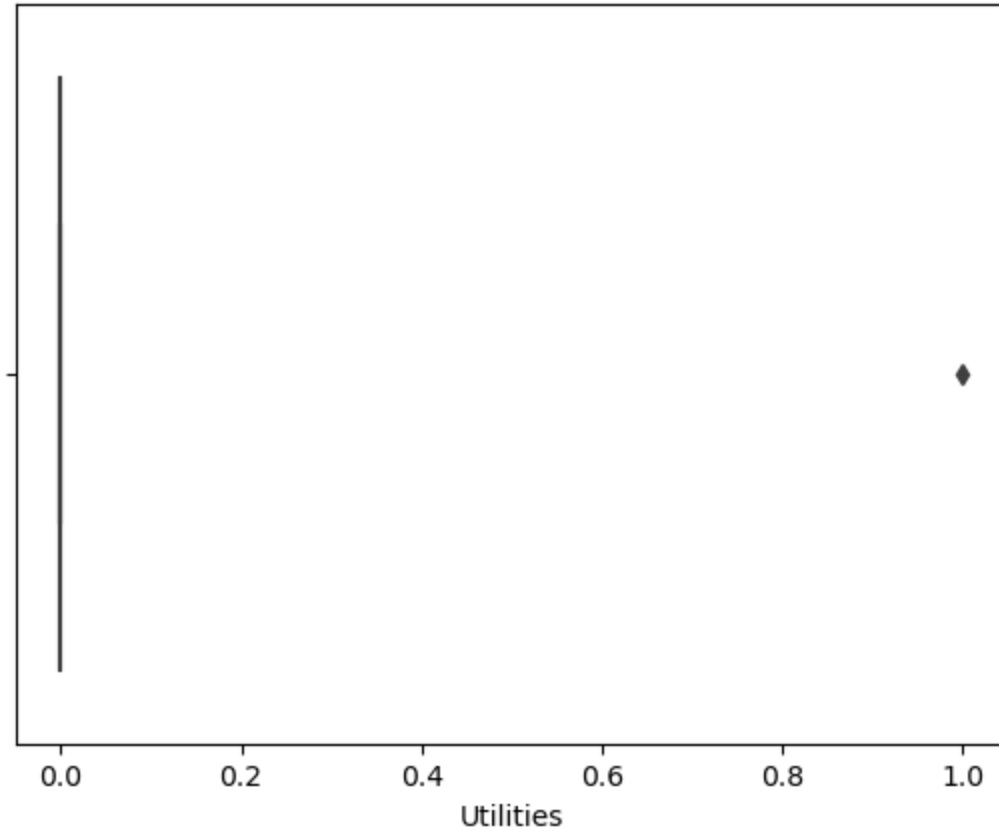
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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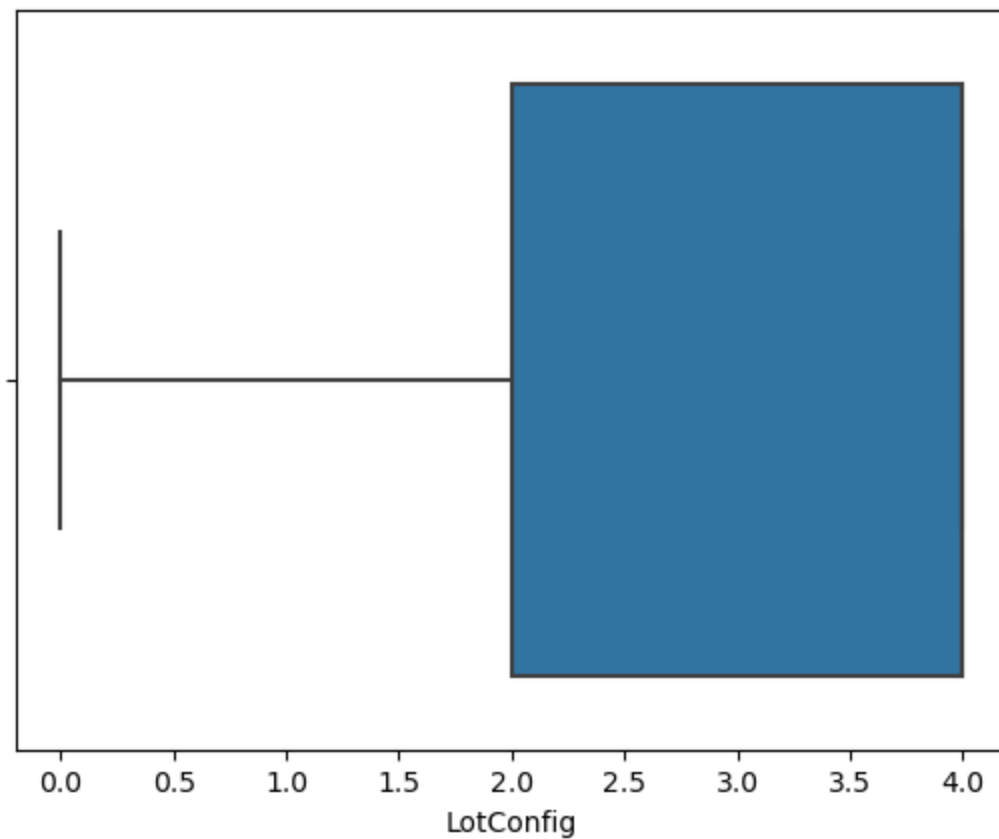
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```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
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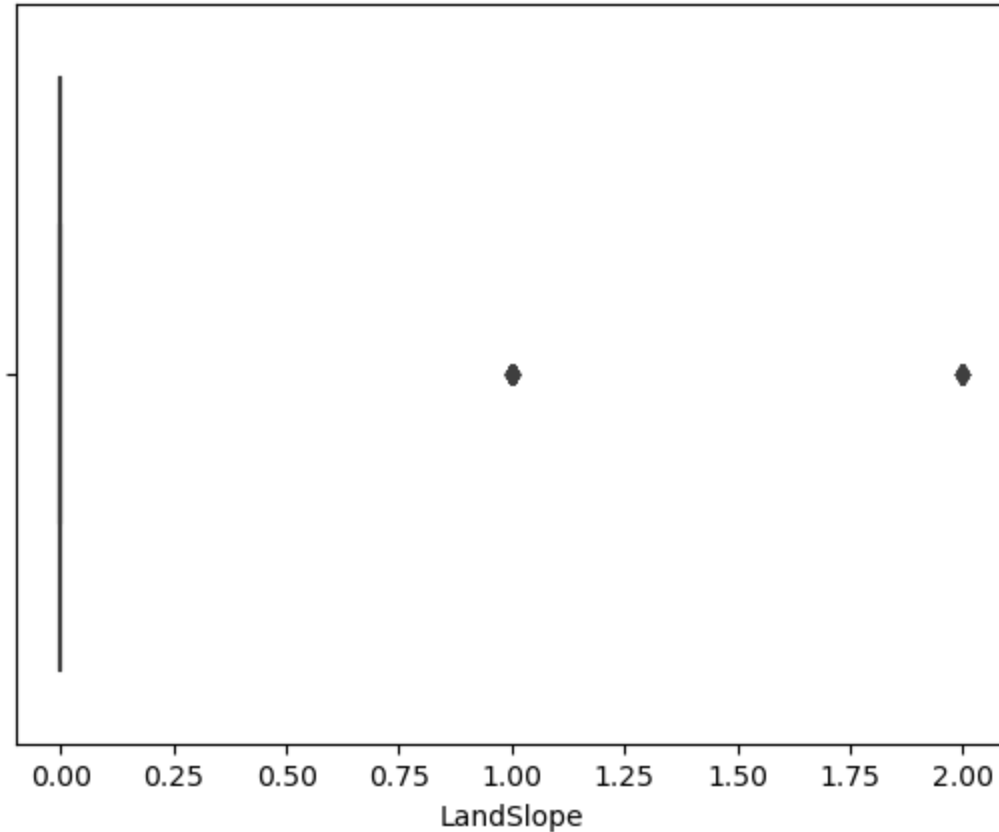


```
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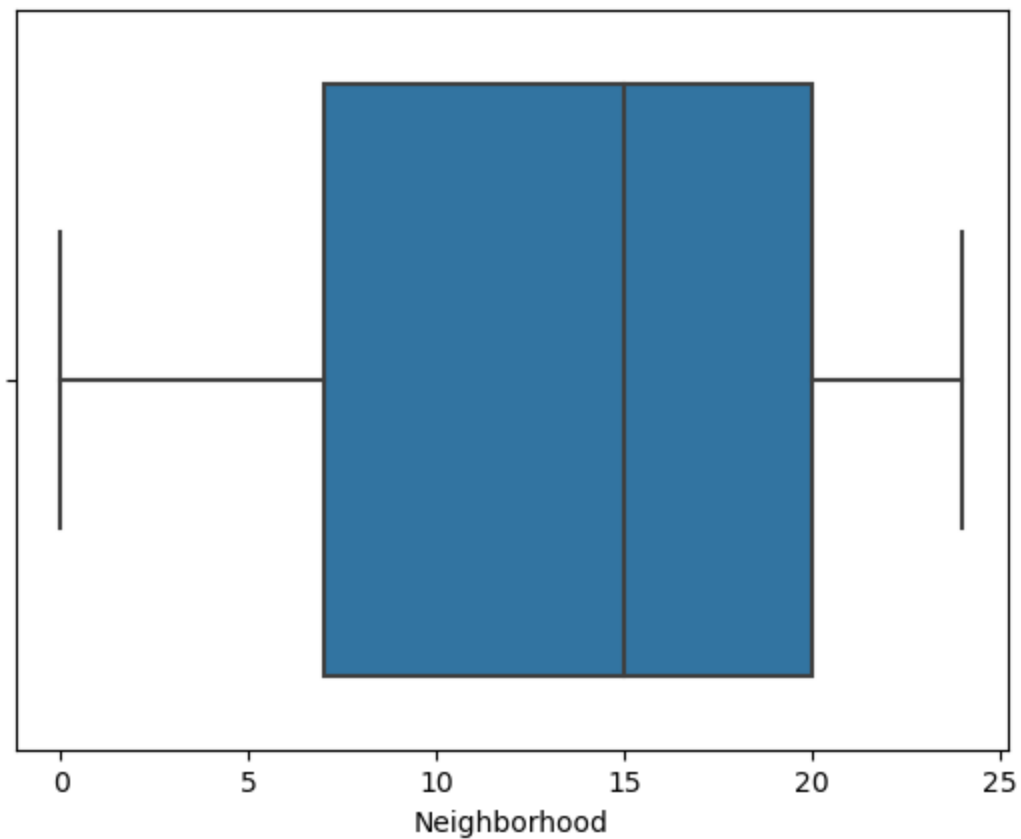
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

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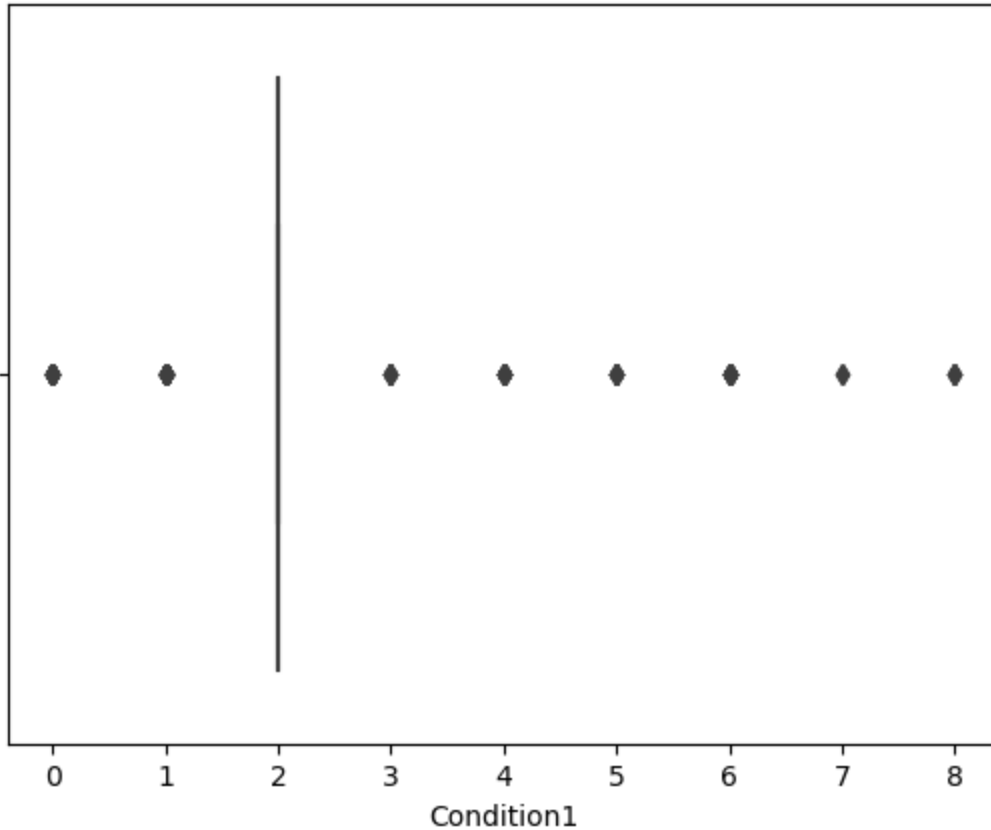
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

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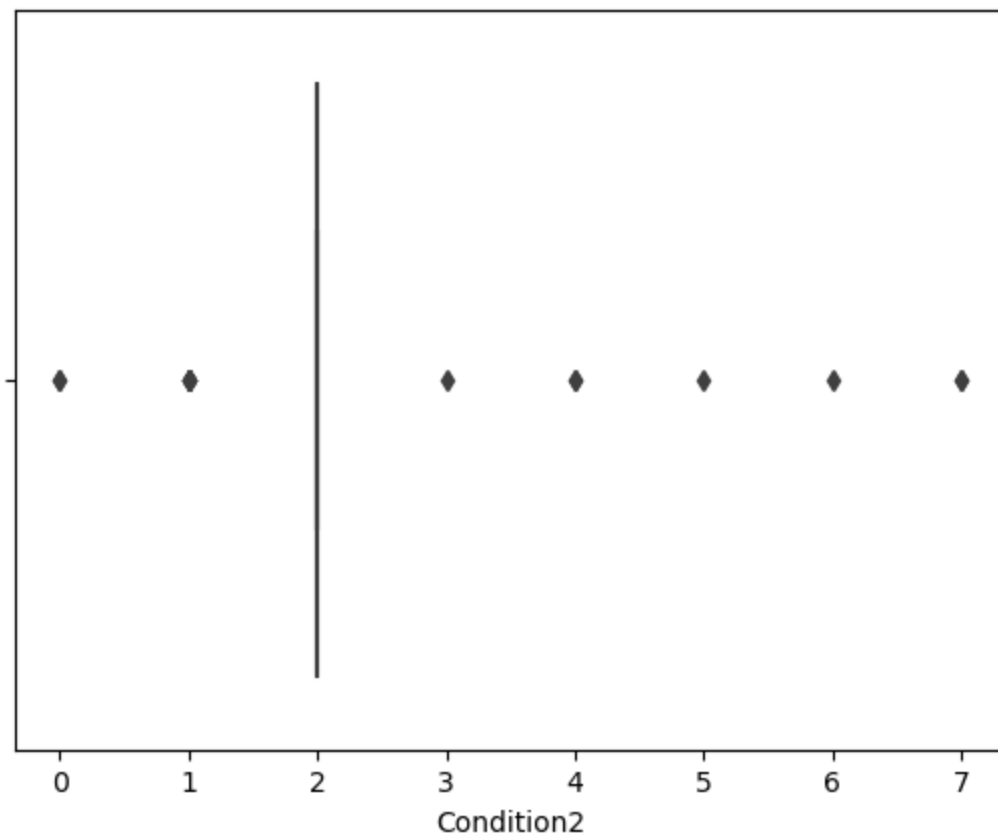
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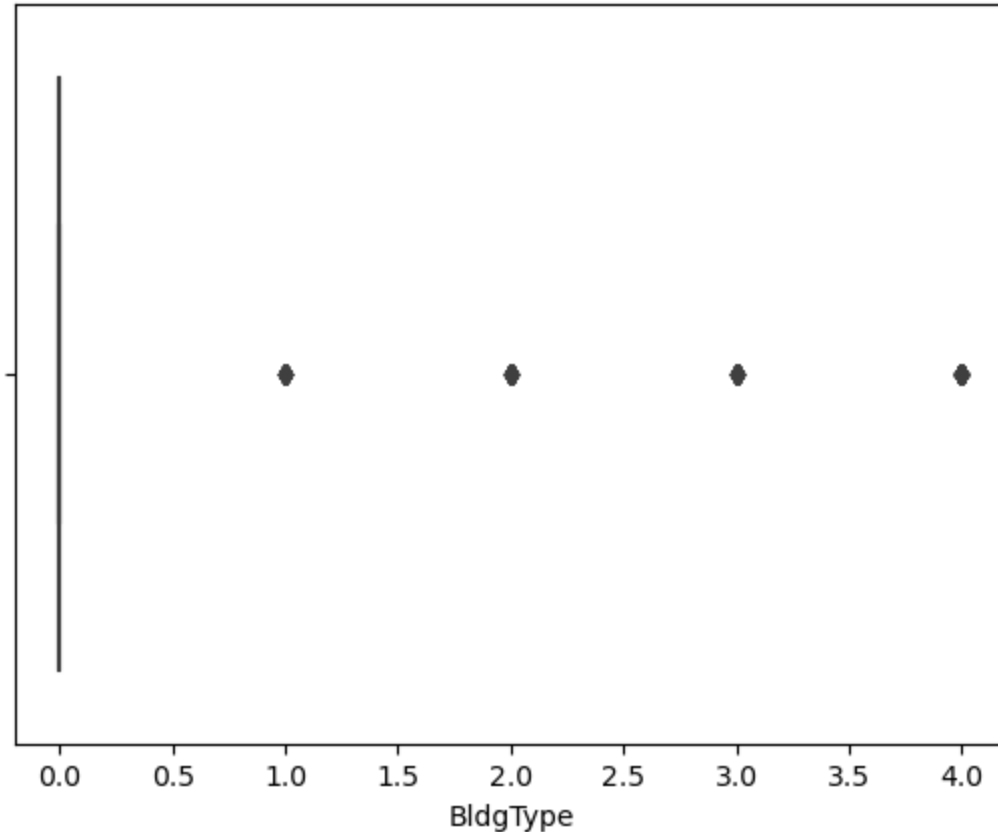


C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

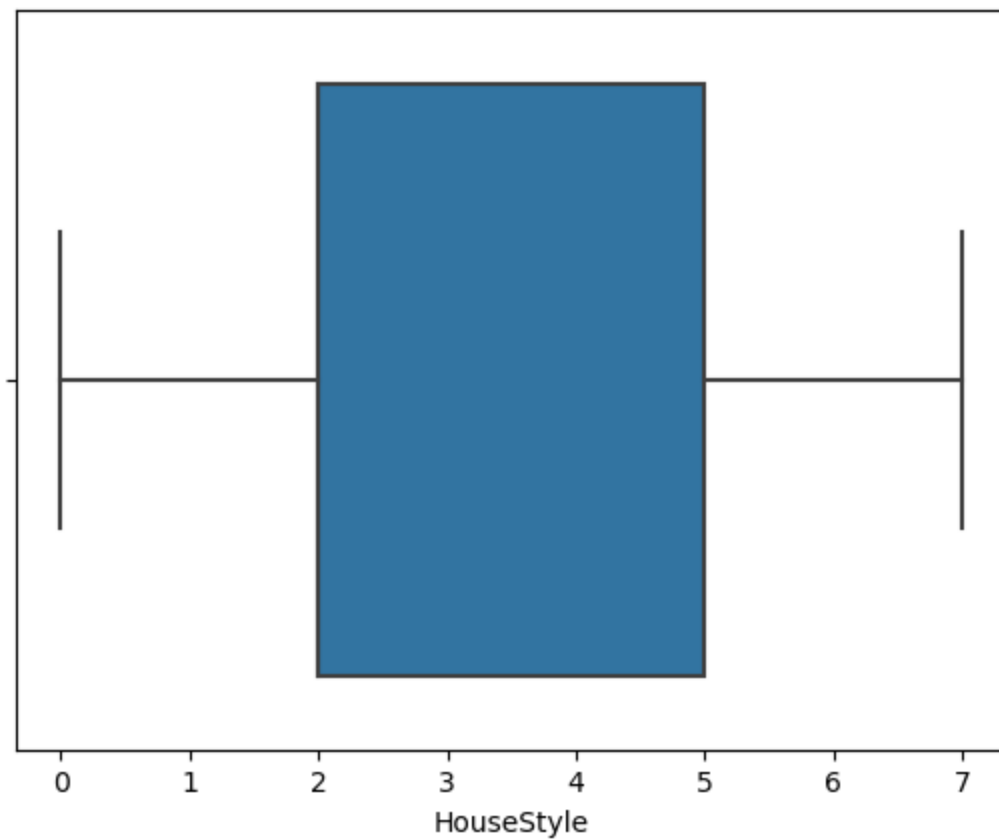
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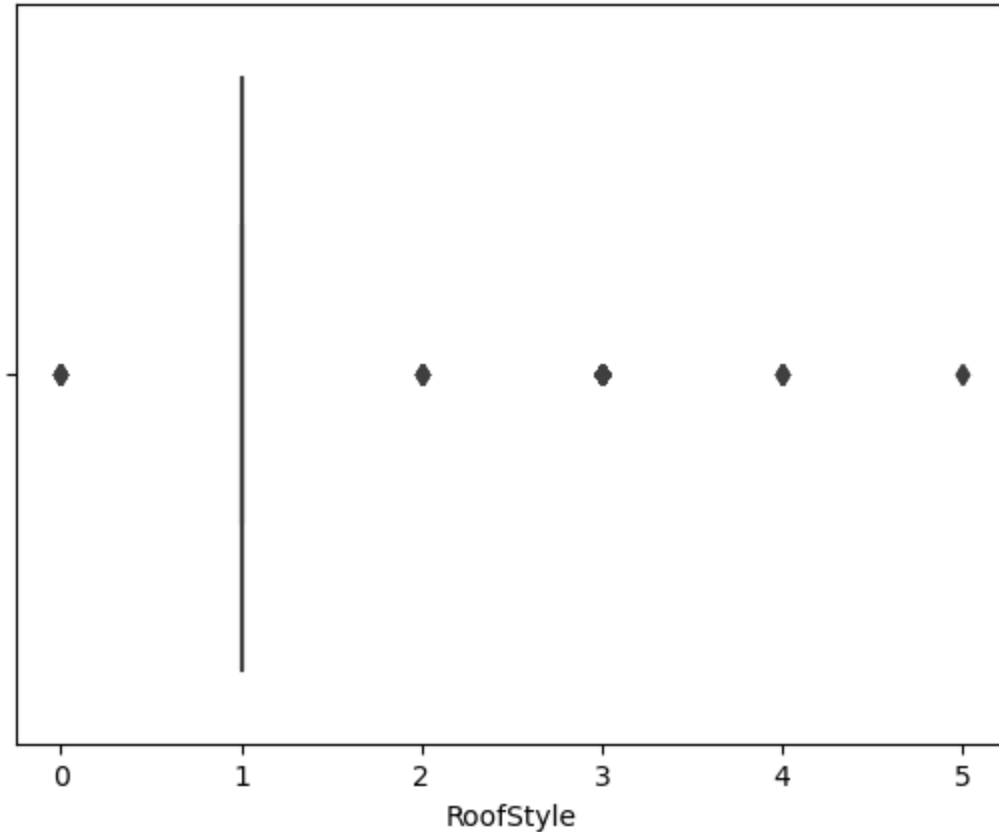
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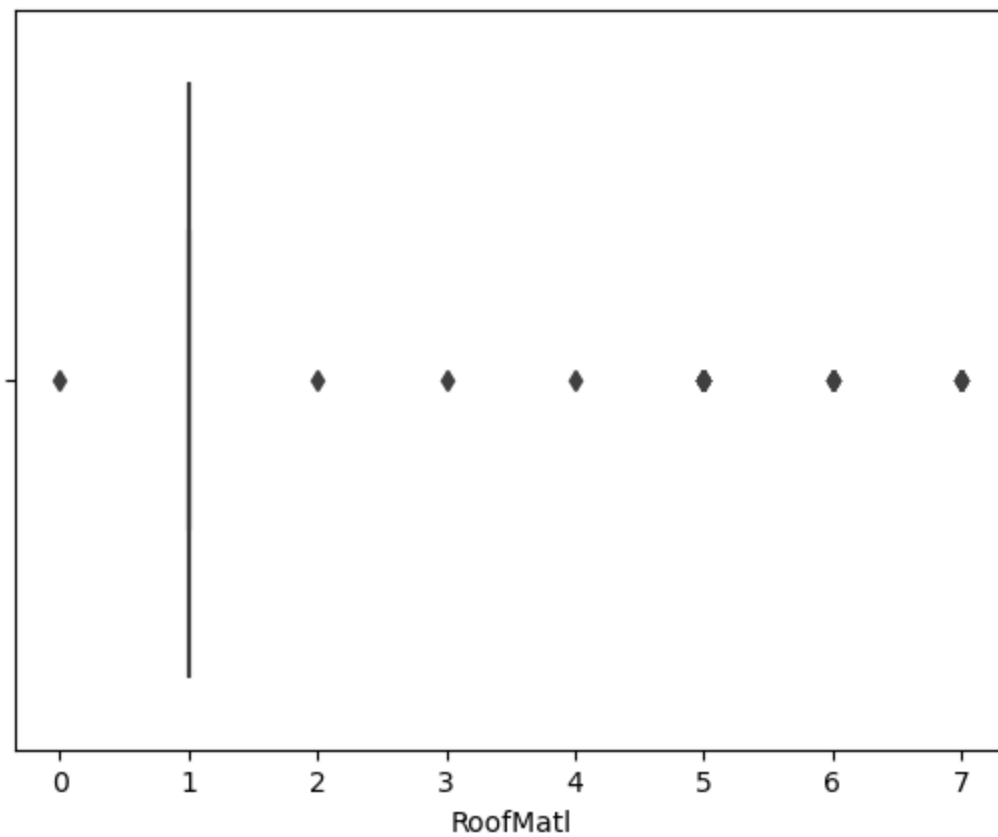
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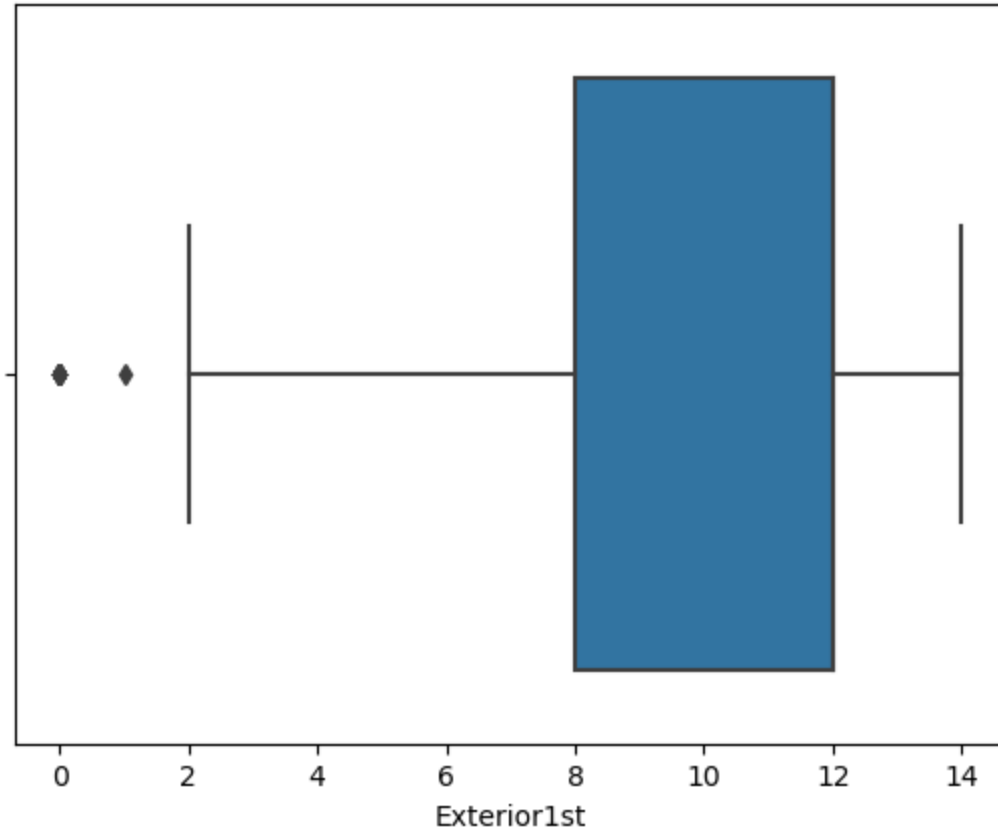
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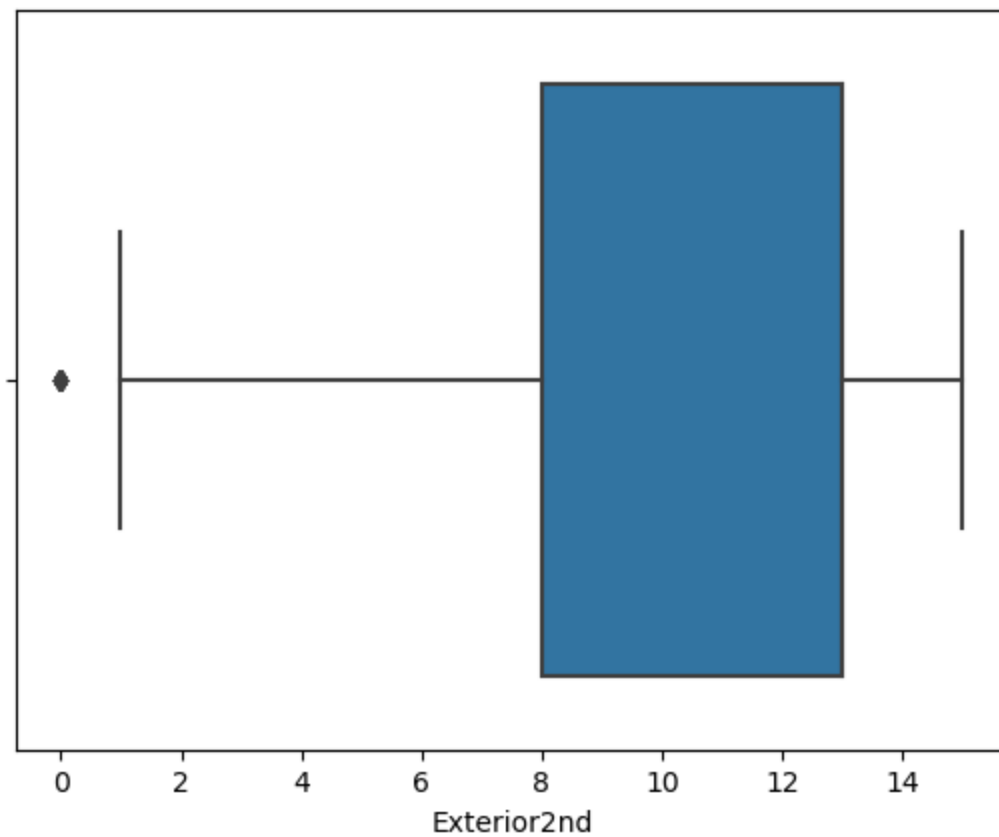
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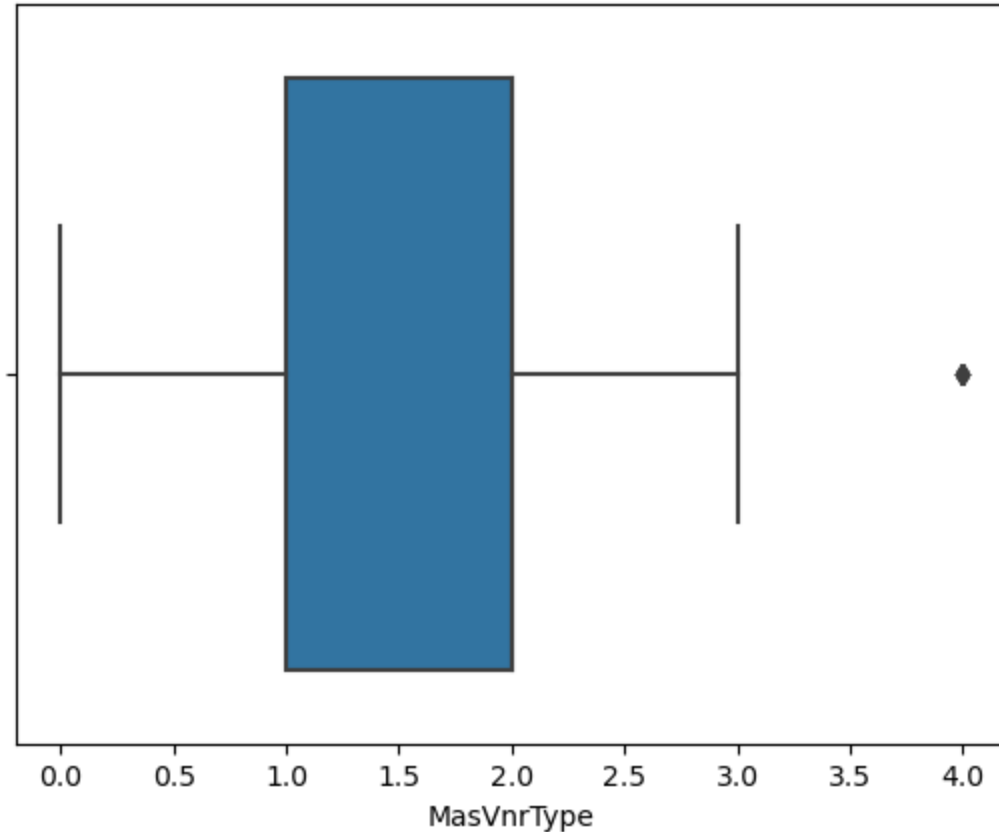


```
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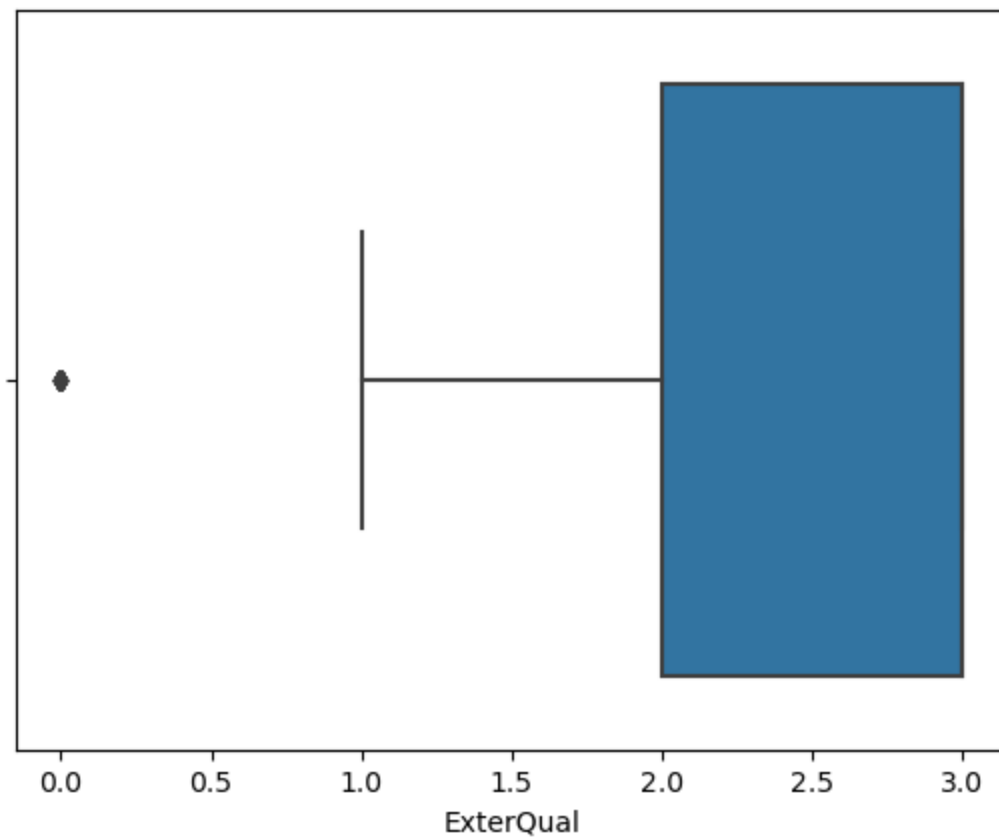
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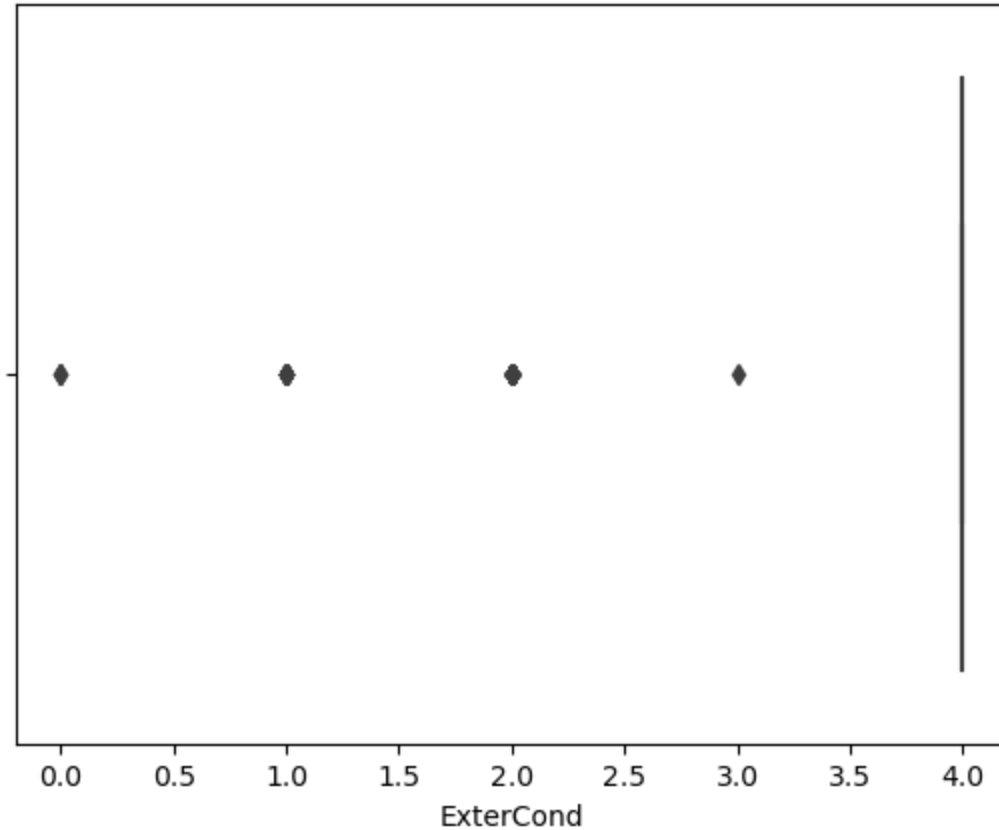


C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

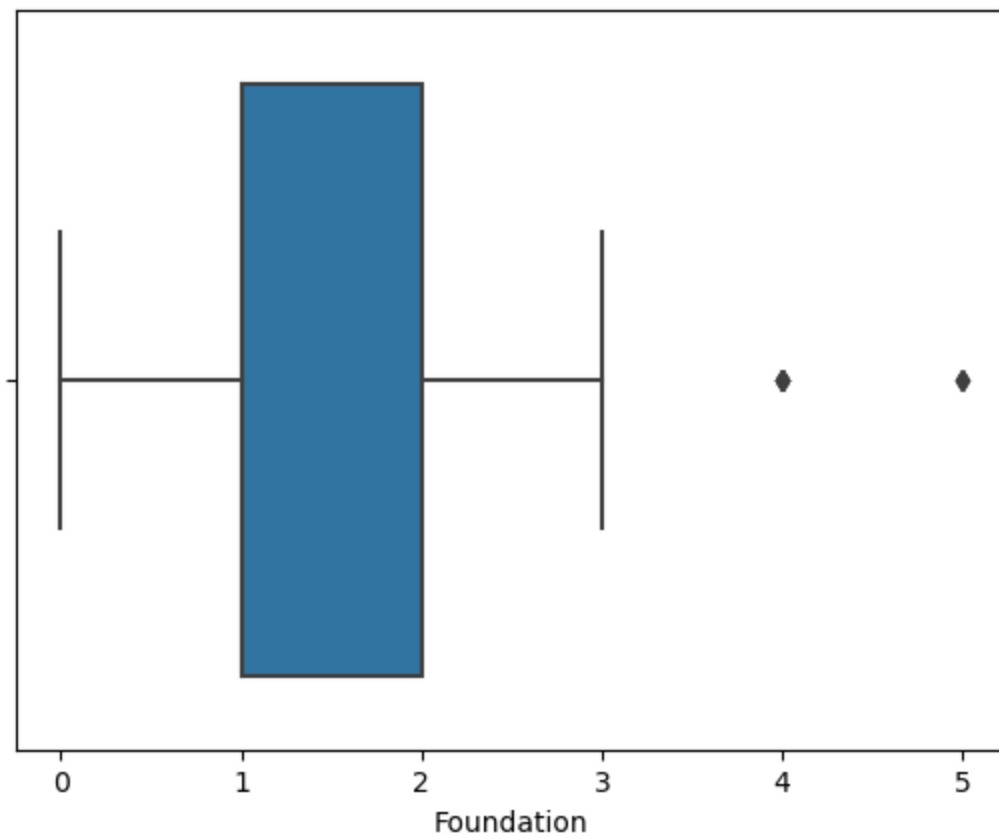
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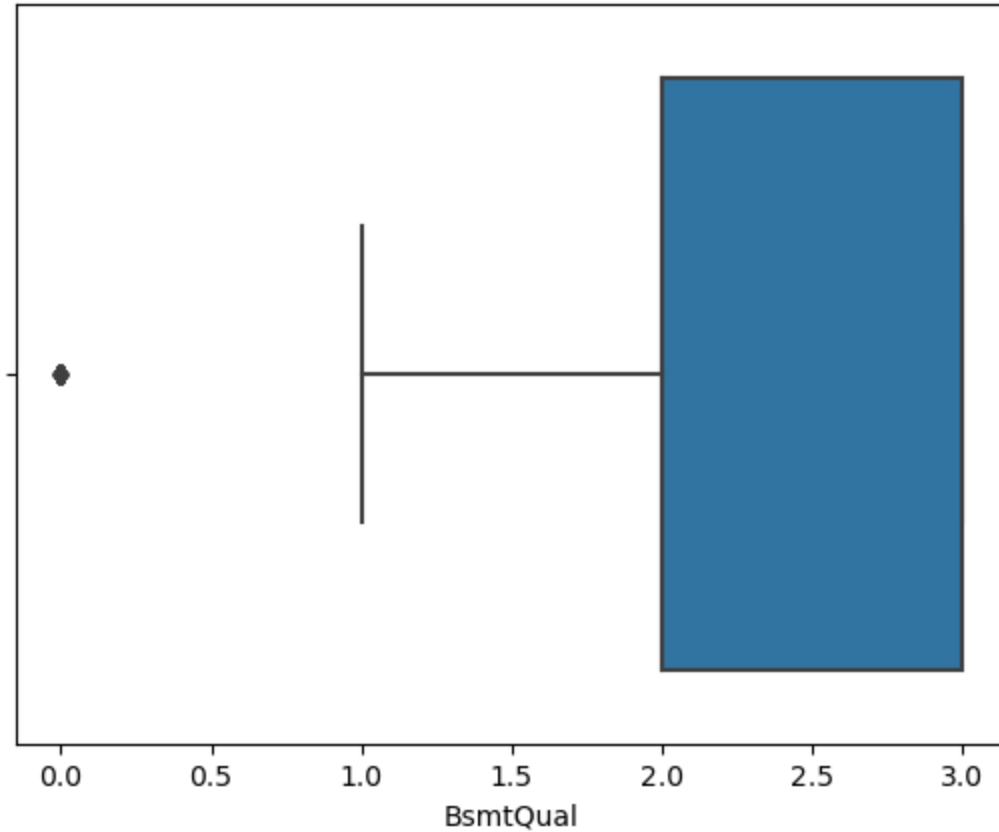
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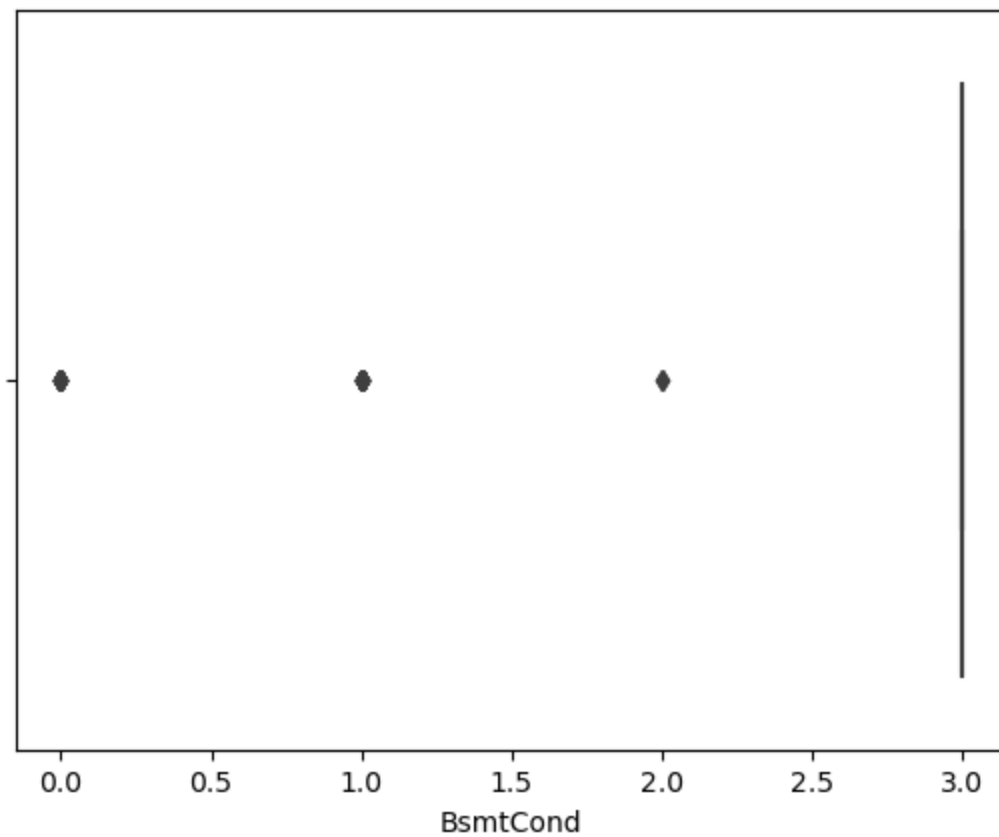
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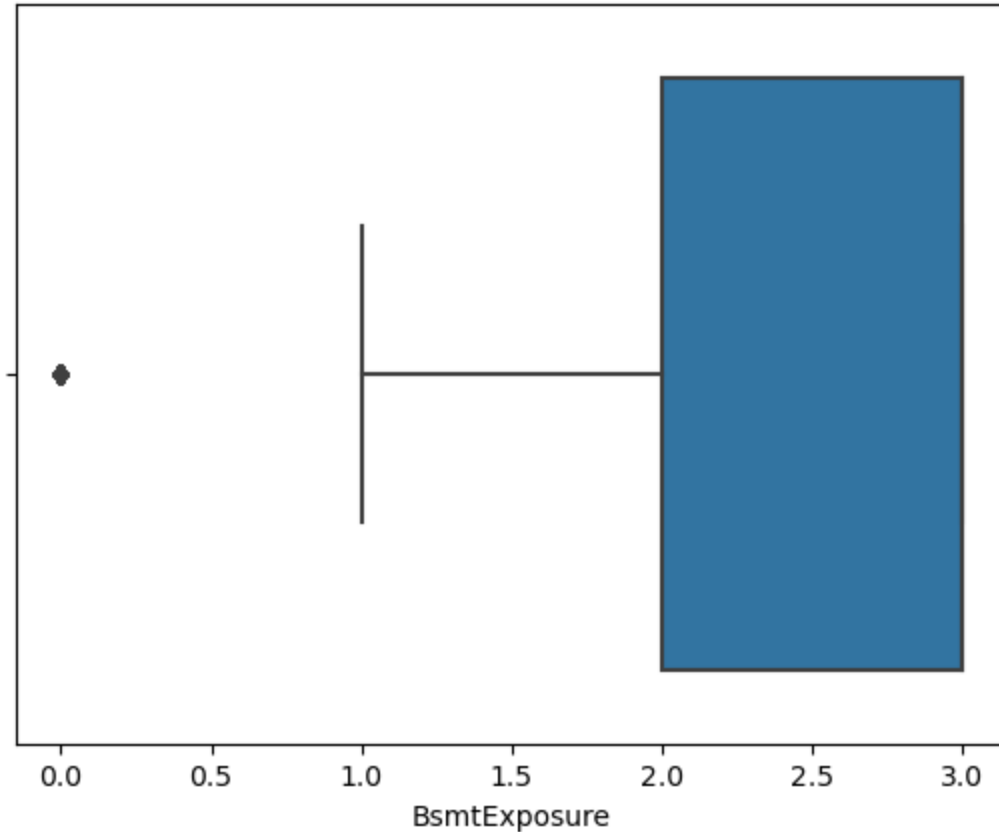
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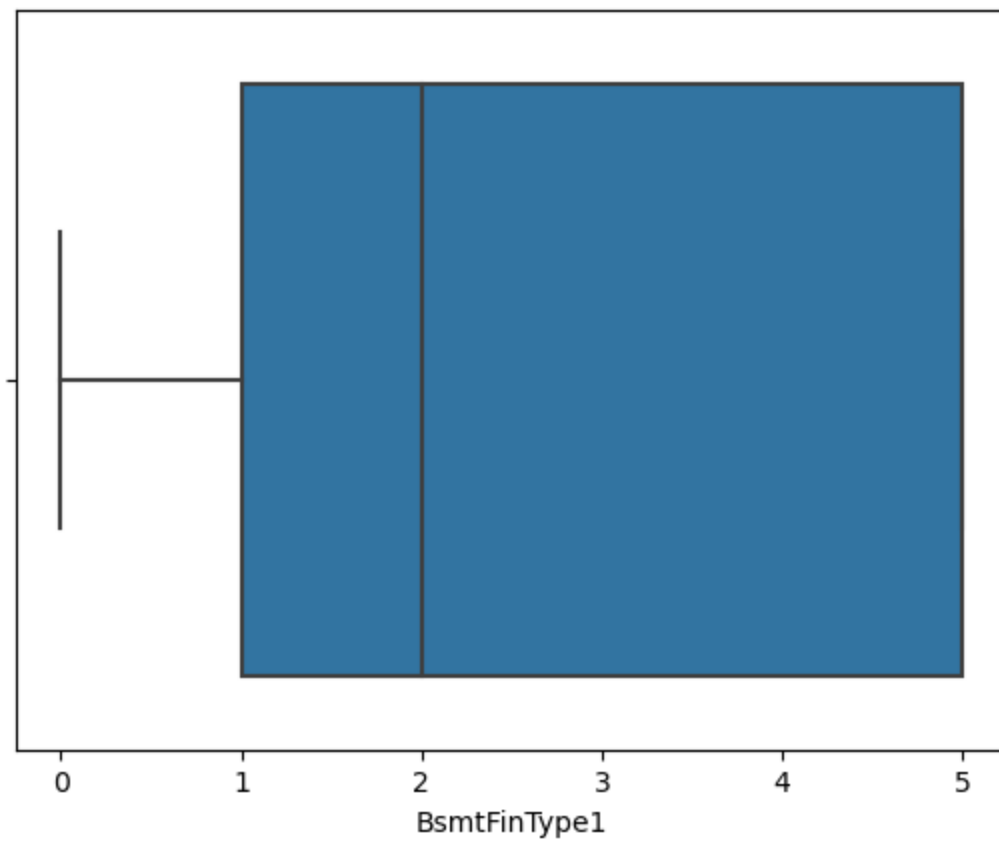
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warnings.warn(
```

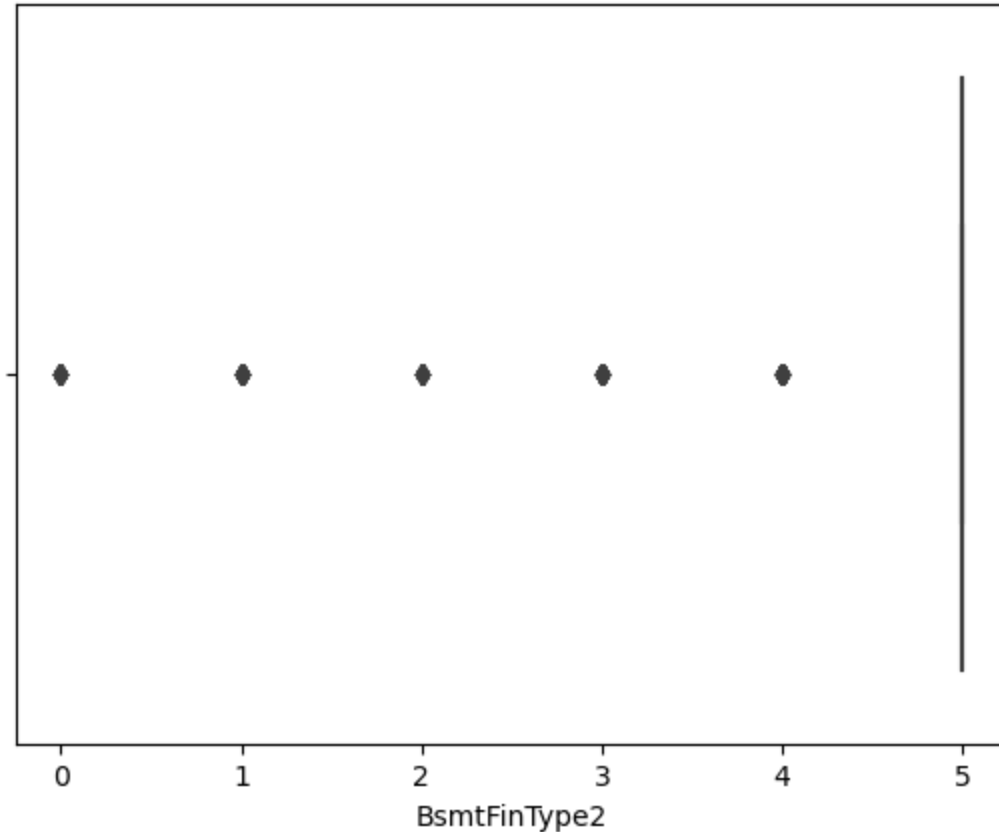
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
warnings.warn(
```



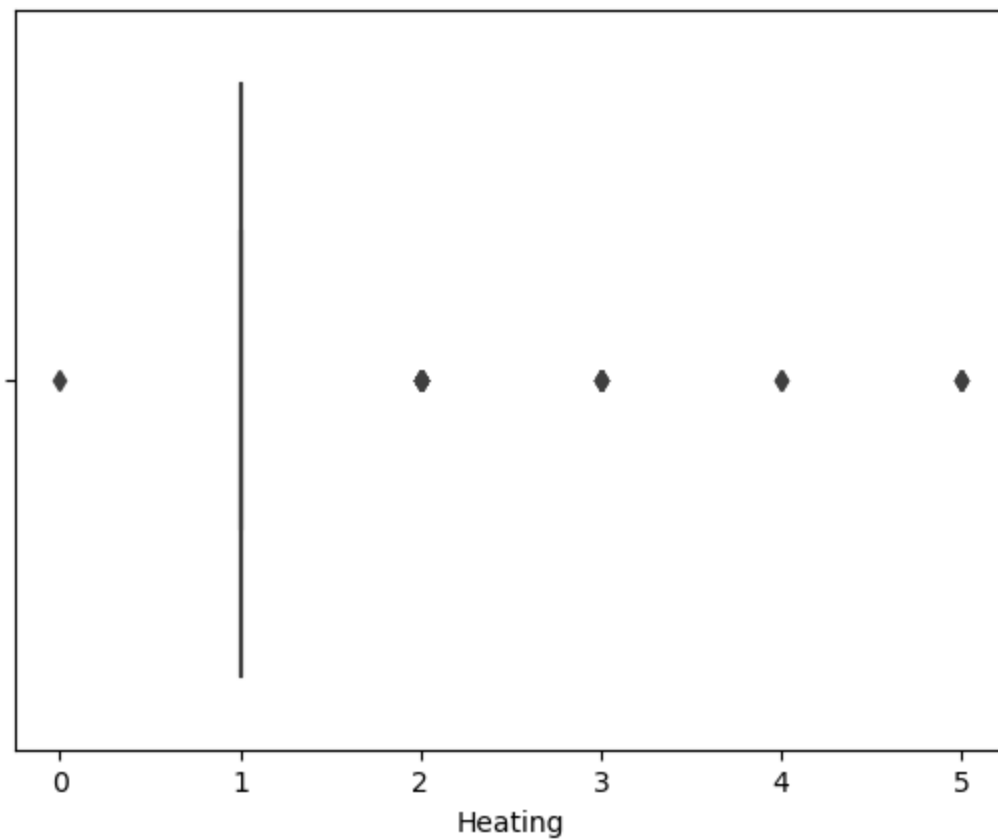
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
warnings.warn(
```



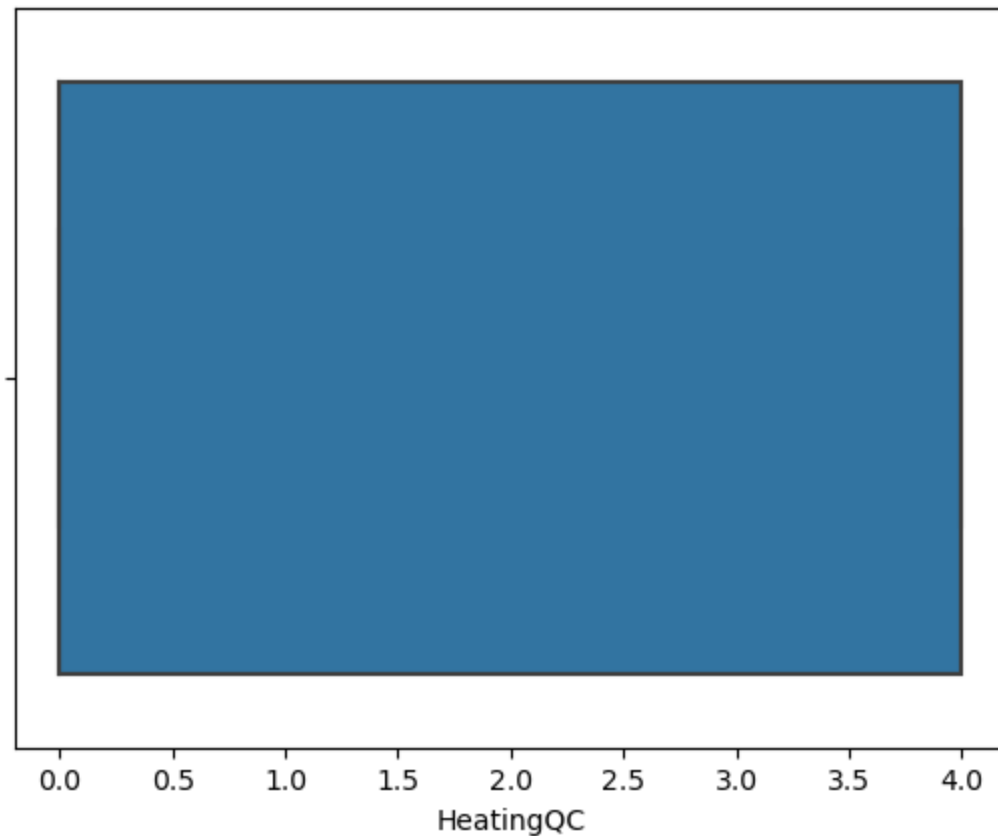
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
warnings.warn(
```



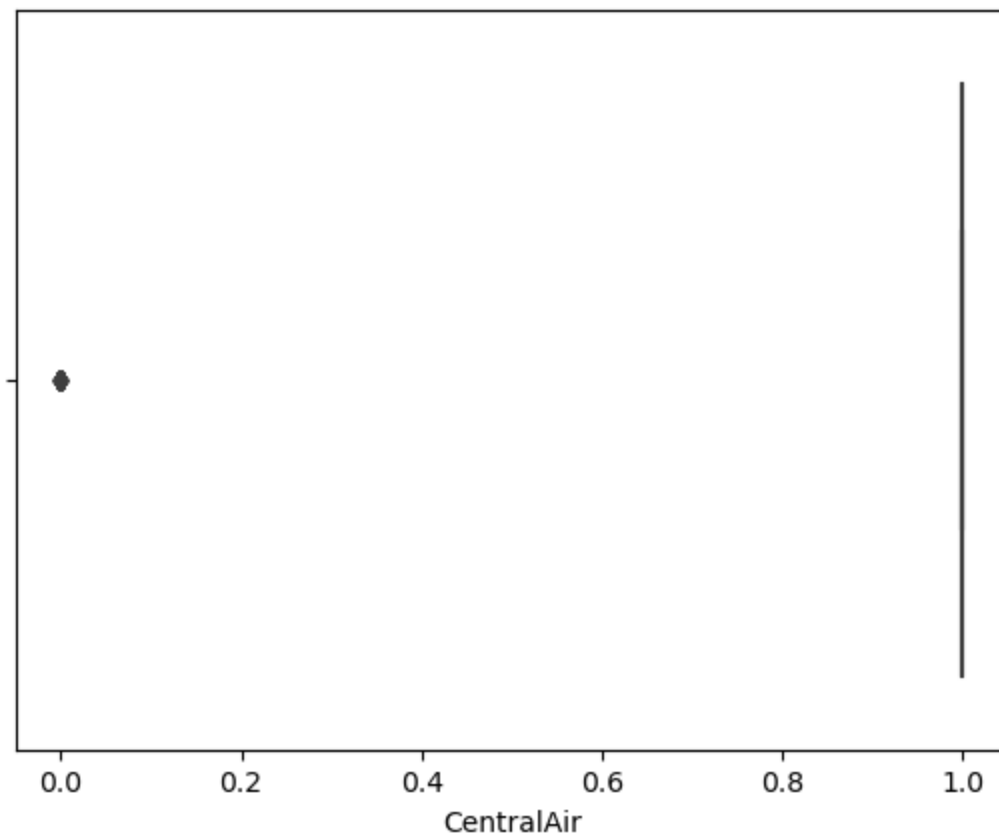
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
warnings.warn(
```



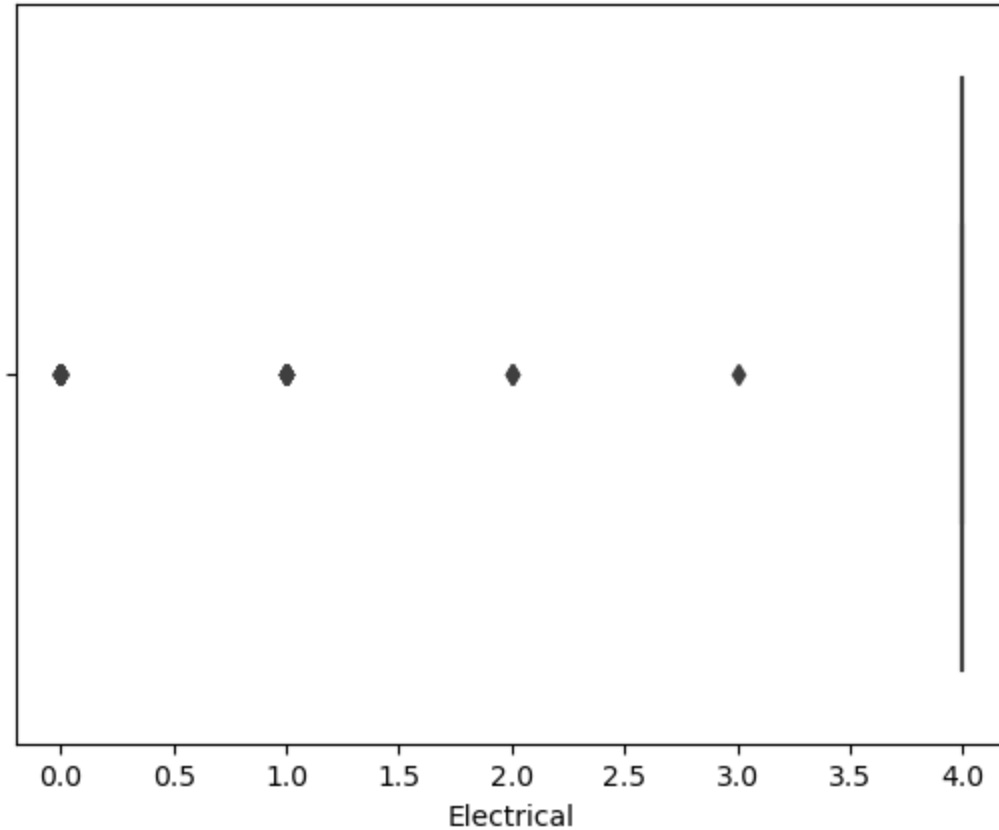
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



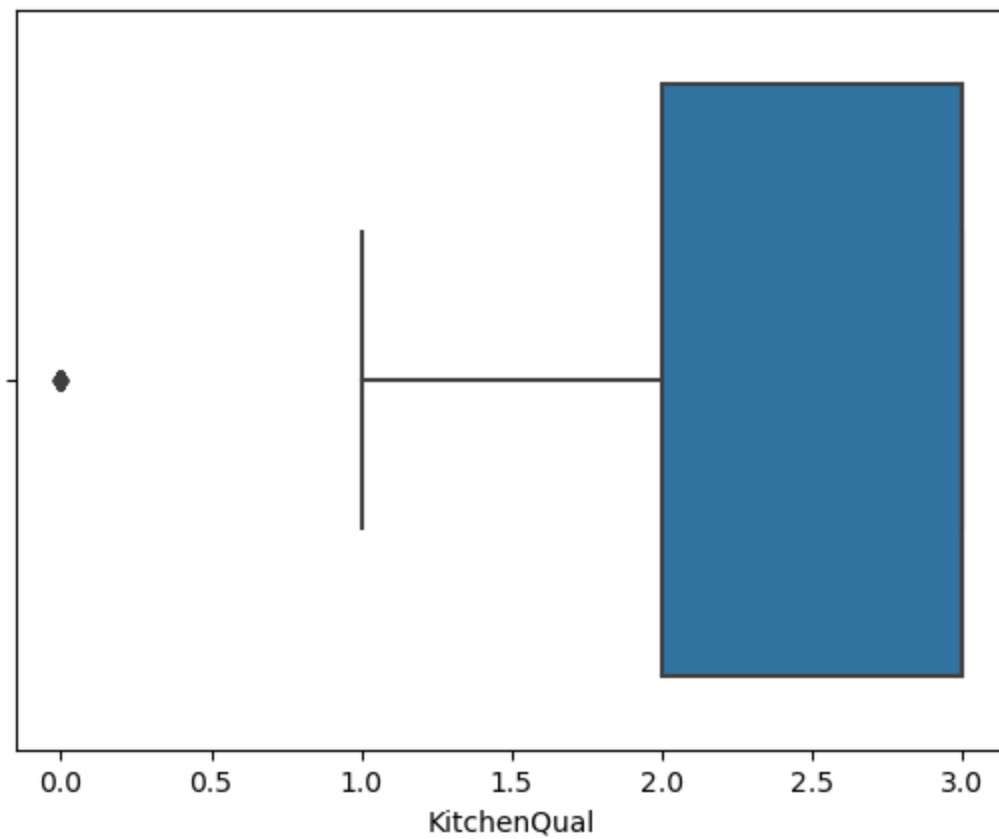
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
warnings.warn(
```

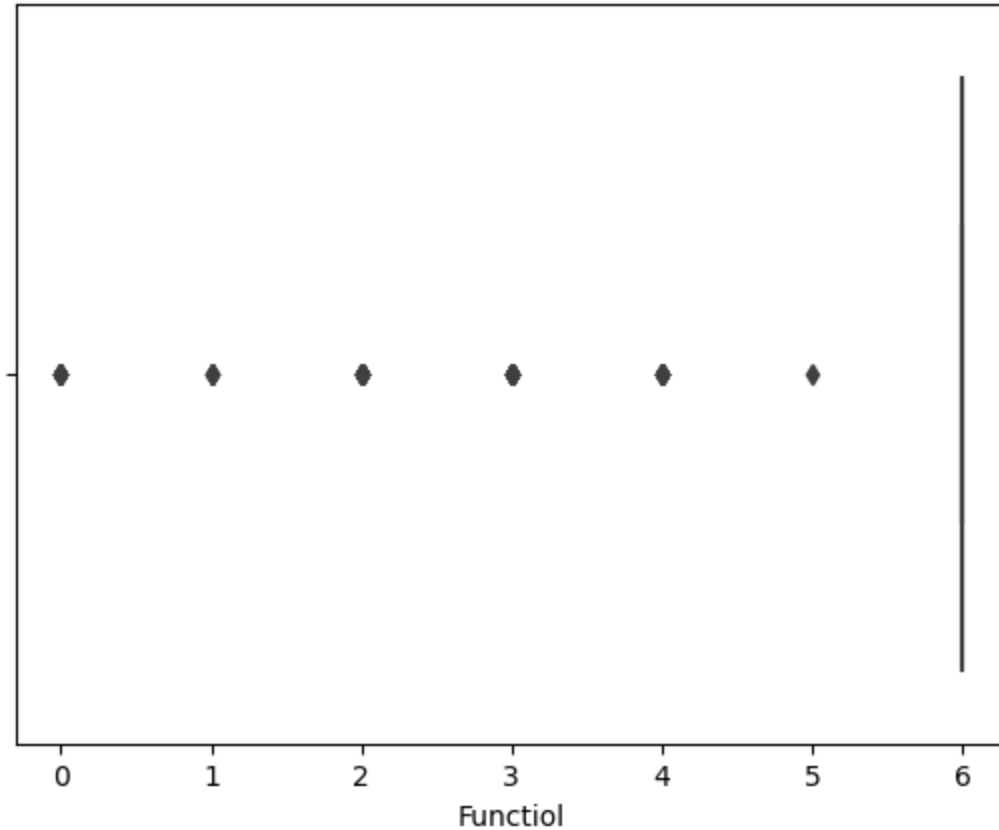


```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
warnings.warn(
```



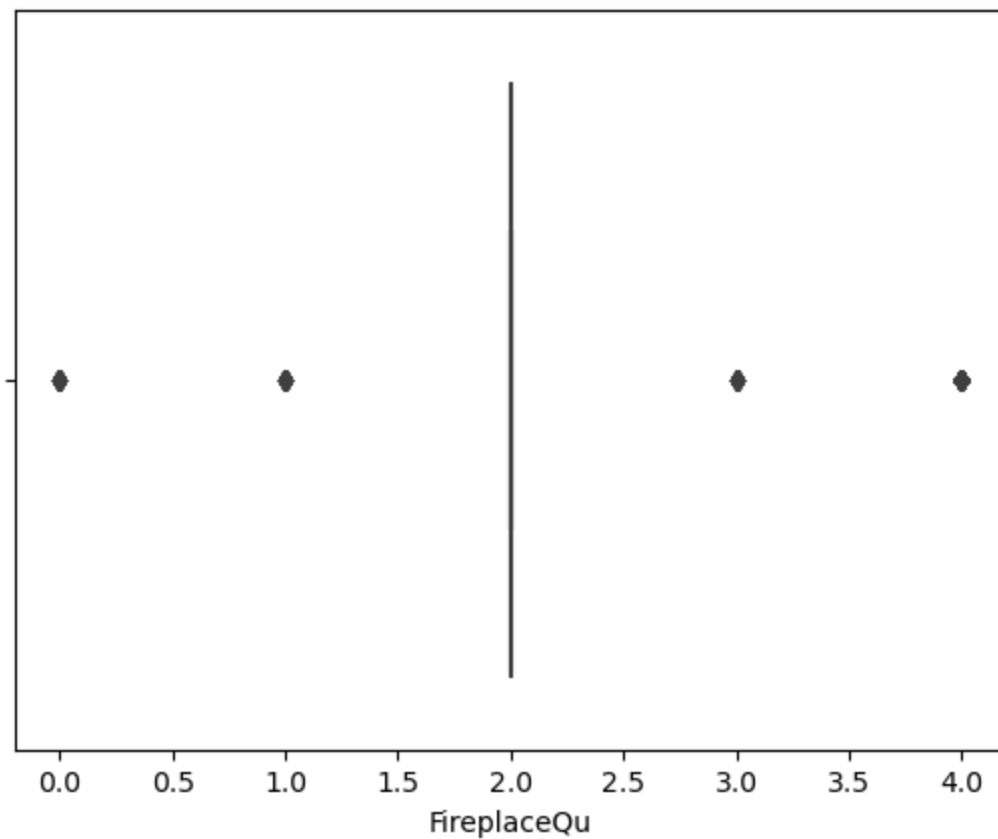
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```

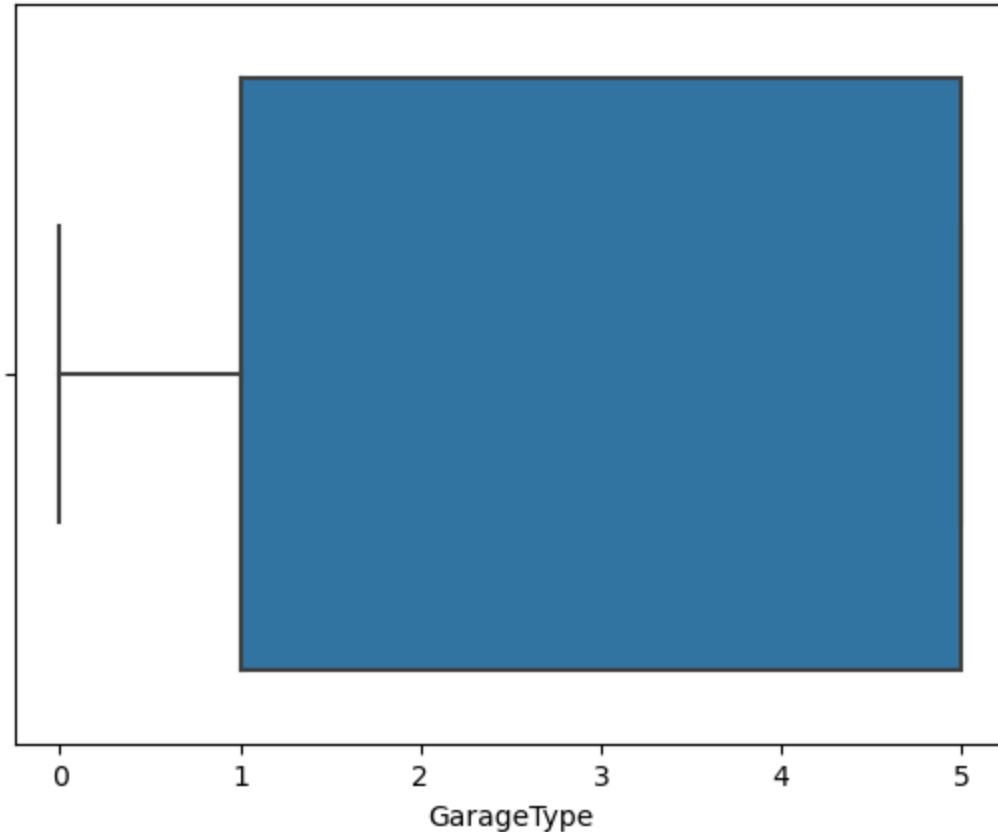


C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

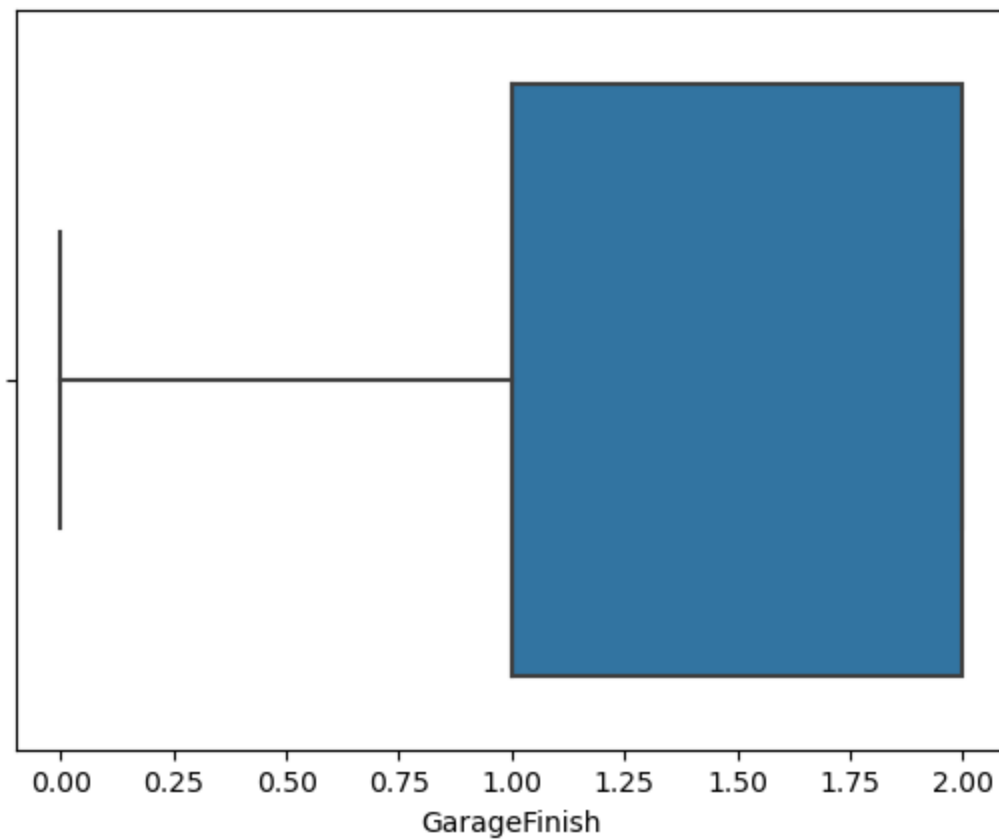
```
warnings.warn(
```



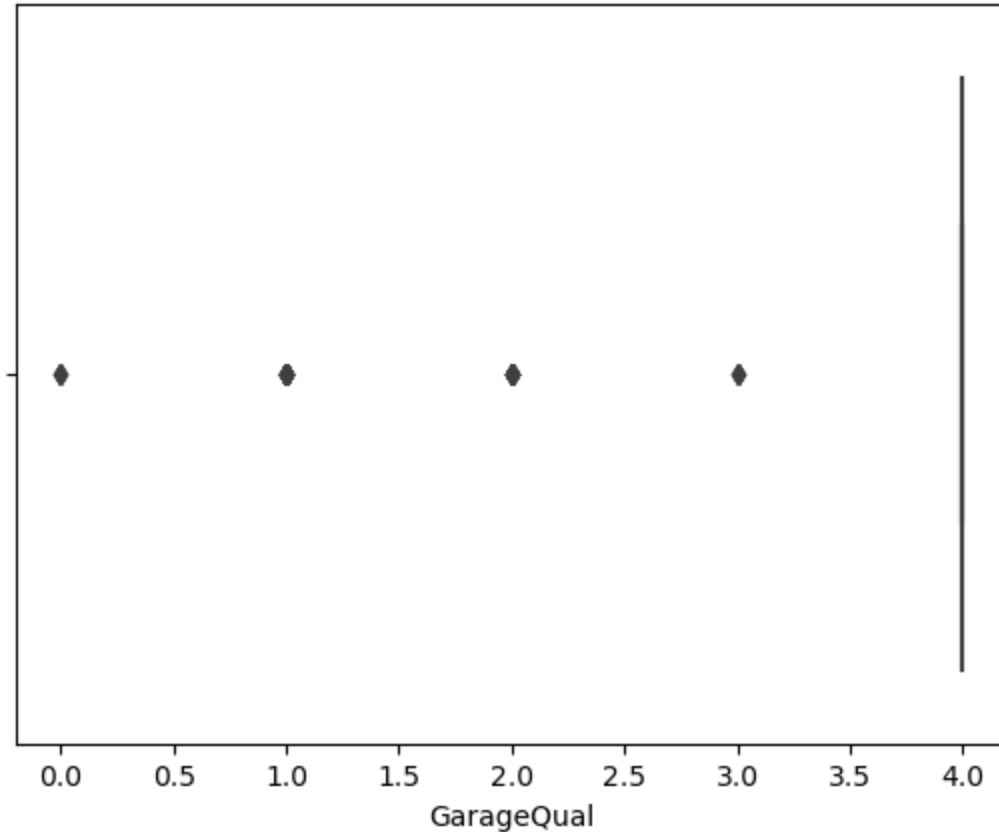
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
warnings.warn(
```



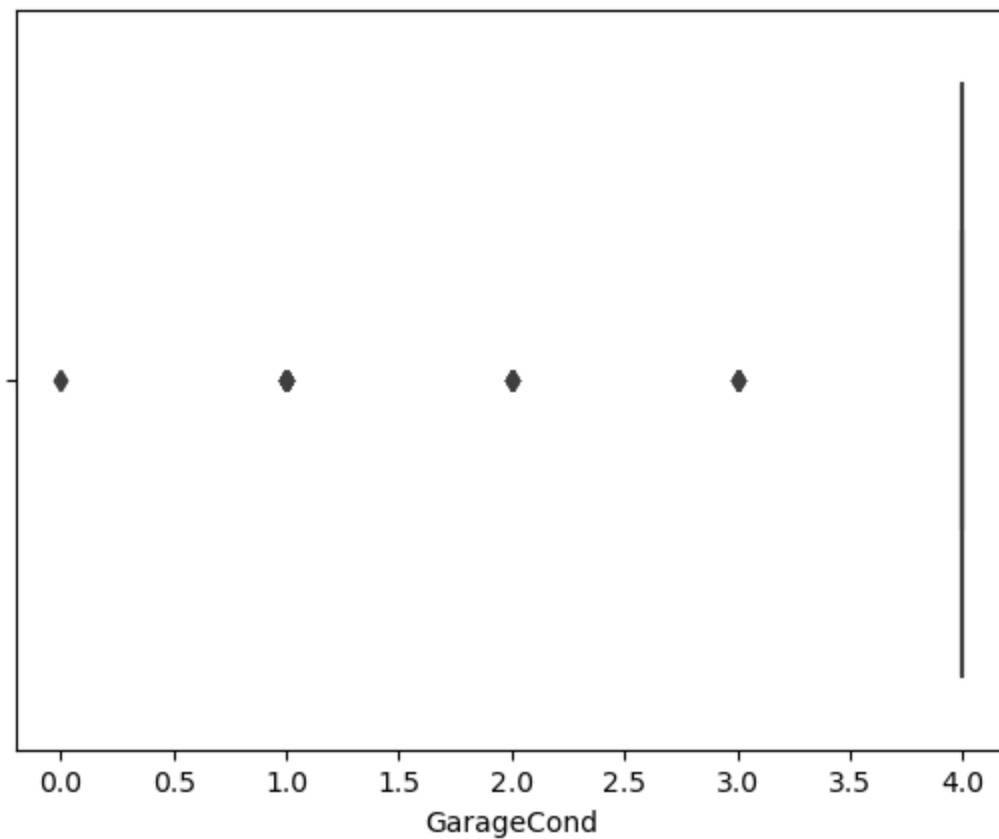
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
warnings.warn(
```



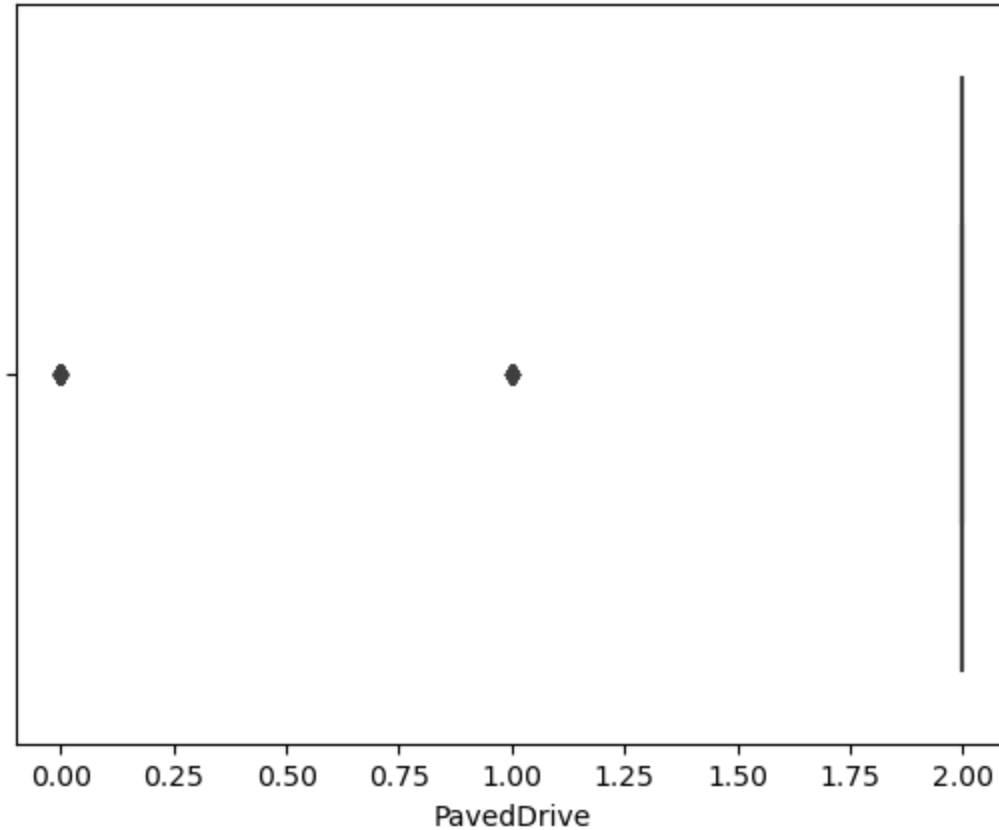
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
warnings.warn(
```



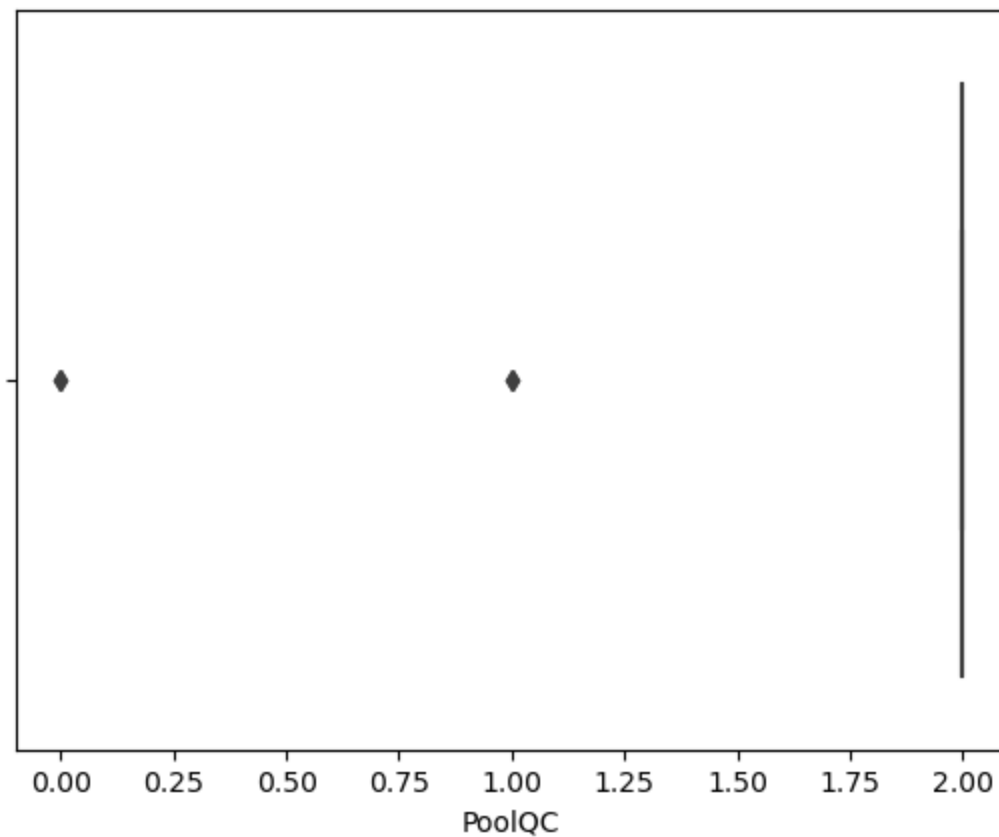
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
warnings.warn(
```



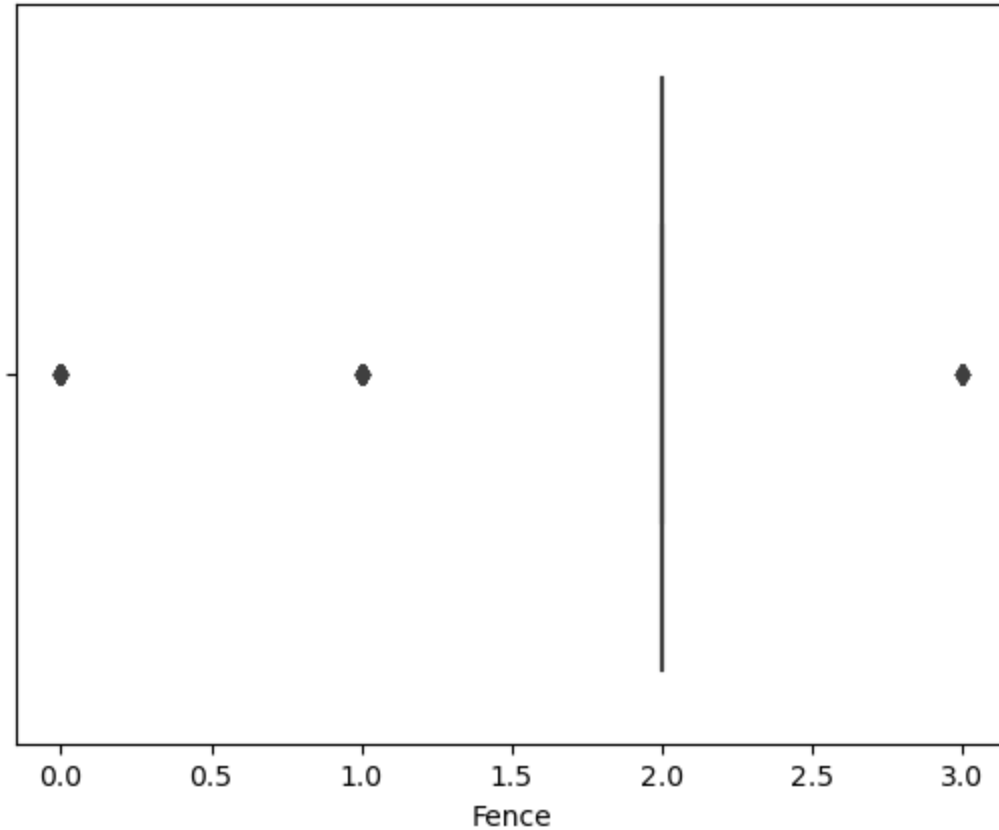
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
warnings.warn(
```



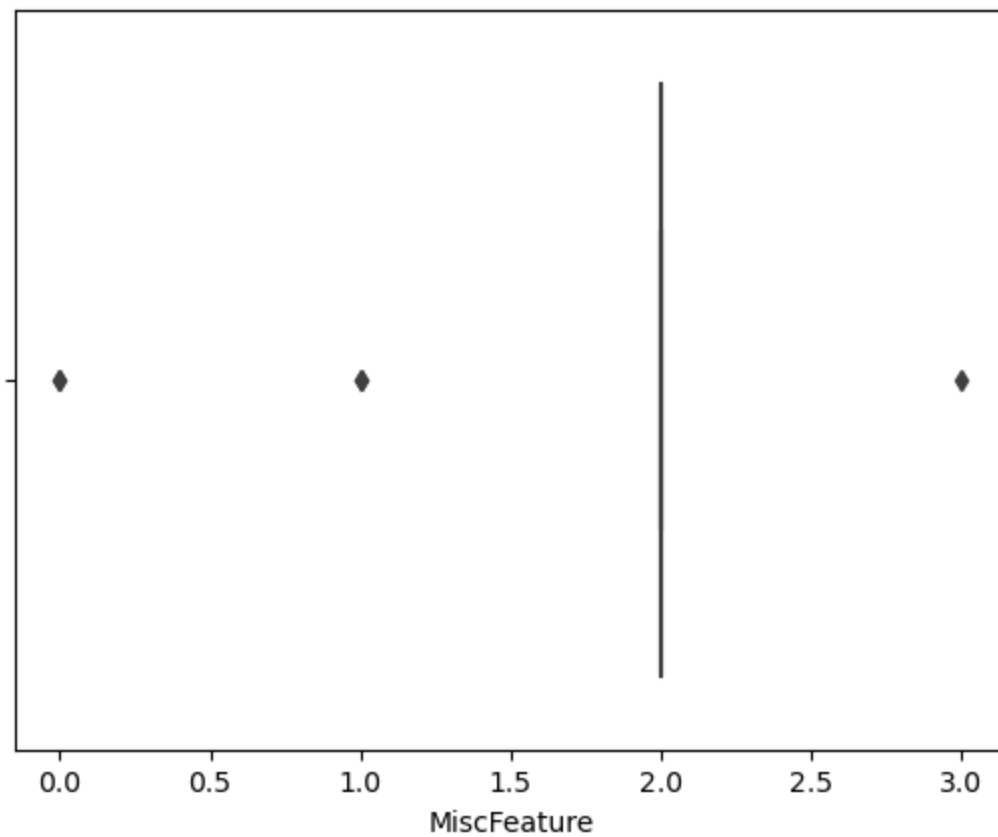
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
warnings.warn(
```

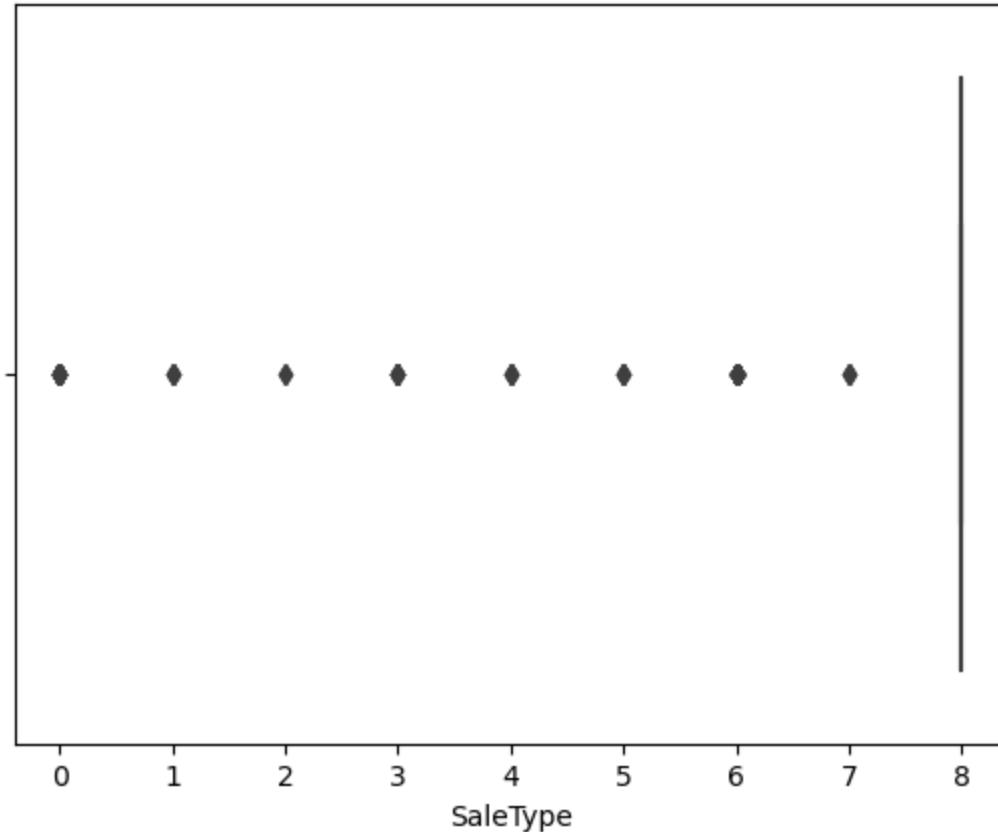
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
warnings.warn(
```



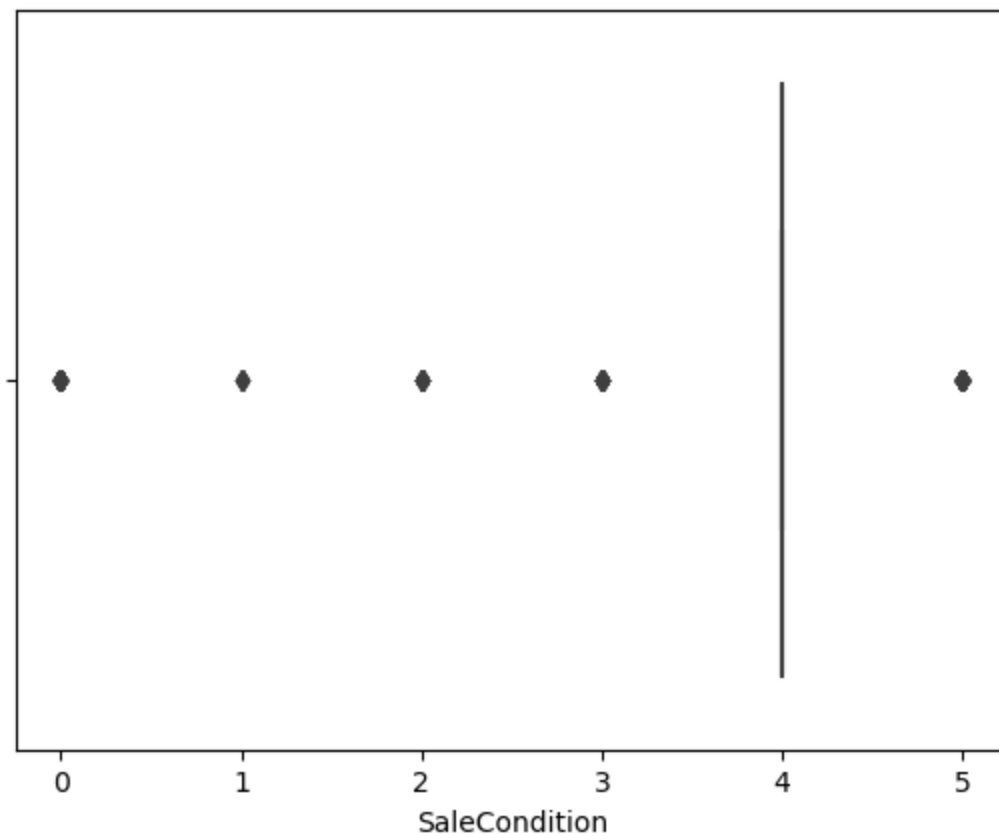
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.  
warnings.warn(
```



```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



significant variables using p-values

```
In [56]: from factor_analyzer import FactorAnalyzer

from factor_analyzer.factor_analyzer import calculate_bartlett_sphericity

x,p_value=calculate_bartlett_sphericity(data_cat1)

x, p_value
```

```
Out[56]: (10548.112276322061, 0.0)
```

```
In [57]: help(calculate_bartlett_sphericity)
```

Help on function calculate_bartlett_sphericity in module factor_analyzer.factor_analyzer:

```
calculate_bartlett_sphericity(x)
    Compute the Bartlett sphericity test.
```

```
H0: The matrix of population correlations is equal to I.
H1: The matrix of population correlations is not equal to I.
```

The formula for Bartlett's Sphericity test is:

```
.. math:: -1 * (n - 1 - ((2p + 5) / 6)) * ln(det(R))
```

Where R $\det(R)$ is the determinant of the correlation matrix,
and p is the number of variables.

```
Parameters
-----
```

```
x : array-like
    The array for which to calculate sphericity.
```

```

Returns
-----
statistic : float
    The chi-square value.
p_value : float
    The associated p-value for the test.

```

Inference:

The p-value is 0, and this indicates that the test is statistically significant and highlights that the correlation matrix is not an identity matrix.

Combine all the significant categorical and numerical variables

```
In [58]: data_num.columns
```

```
Out[58]: Index(['Id', 'MSSubClass', 'LotFrontage', 'LotArea', 'OverallQual',
              'OverallCond', 'YearBuilt', 'YearRemodAdd', 'MasVnrArea', 'BsmtFinSF1',
              'BsmtFinSF2', 'BsmtUnfSF', 'TotalBsmtSF', '1stFlrSF', '2ndFlrSF',
              'LowQualFinSF', 'GrLivArea', 'BsmtFullBath', 'BsmtHalfBath', 'FullBath',
              'HalfBath', 'BedroomAbvGr', 'KitchenAbvGr', 'TotRmsAbvGrd', 'Fireplaces',
              'GarageYrBlt', 'GarageCars', 'GarageArea', 'WoodDeckSF', 'OpenPorchSF',
              'EnclosedPorch', '3SsnPorch', 'ScreenPorch', 'PoolArea', 'MiscVal',
              'MoSold', 'YrSold', 'SalePrice'],
             dtype='object')
```

```
In [59]: data_cat.columns
```

```
Out[59]: Index(['MSZoning', 'Street', 'Alley', 'LotShape', 'LandContour', 'Utilities',
              'LotConfig', 'LandSlope', 'Neighborhood', 'Condition1', 'Condition2',
              'BldgType', 'HouseStyle', 'RoofStyle', 'RoofMatl', 'Exterior1st',
              'Exterior2nd', 'MasVnrType', 'ExterQual', 'ExterCond', 'Foundation',
              'BsmtQual', 'BsmtCond', 'BsmtExposure', 'BsmtFinType1', 'BsmtFinType2',
              'Heating', 'HeatingQC', 'CentralAir', 'Electrical', 'KitchenQual',
              'Function1', 'FireplaceQu', 'GarageType', 'GarageFinish', 'GarageQual',
              'GarageCond', 'PavedDrive', 'PoolQC', 'Fence', 'MiscFeature',
              'SaleType', 'SaleCondition'],
             dtype='object')
```

```
In [60]: # dropping all insignificant values
```

```
In [61]: num_new=data.drop(['Id', 'MSSubClass', 'BsmtFinSF1', 'BsmtFinSF2', 'BsmtUnfSF', 'GarageCars',
```

```
In [62]: cat_new = data.drop(['MSZoning', 'LandContour', 'LandSlope', 'BsmtFinType1', 'BsmtFinType2'
```

```
In [63]: data_catn = data.drop(['MSZoning', 'LandContour', 'LandSlope', 'BsmtFinType1', 'BsmtFinType'
```

Combine all the significant categorical and numerical variables

```
In [64]: new_set=pd.concat([num_new, cat_new], axis=1)
         new_set
```

Out[64]:	MSZoning	LotFrontage	LotArea	Street	Alley	LotShape	LandContour	Utilities	LotConfig	LandSlope	..	
0	RL	65.0	8450	Pave	NaN	Reg		Lvl	AllPub	Inside	Gtl	..
1	RL	80.0	9600	Pave	NaN	Reg		Lvl	AllPub	FR2	Gtl	..
2	RL	68.0	11250	Pave	NaN	IR1		Lvl	AllPub	Inside	Gtl	..
3	RL	60.0	9550	Pave	NaN	IR1		Lvl	AllPub	Corner	Gtl	..
4	RL	84.0	14260	Pave	NaN	IR1		Lvl	AllPub	FR2	Gtl	..
...
1455	RL	62.0	7917	Pave	NaN	Reg		Lvl	AllPub	Inside	Gtl	..
1456	RL	85.0	13175	Pave	NaN	Reg		Lvl	AllPub	Inside	Gtl	..
1457	RL	66.0	9042	Pave	NaN	Reg		Lvl	AllPub	Inside	Gtl	..
1458	RL	68.0	9717	Pave	NaN	Reg		Lvl	AllPub	Inside	Gtl	..
1459	RL	75.0	9937	Pave	NaN	Reg		Lvl	AllPub	Inside	Gtl	..

1460 rows × 150 columns

6. Plot box plot for the new dataset to find the variables with outliers

ENCODING THE CATEGORICAL VALUE TO GET BOXPLOT

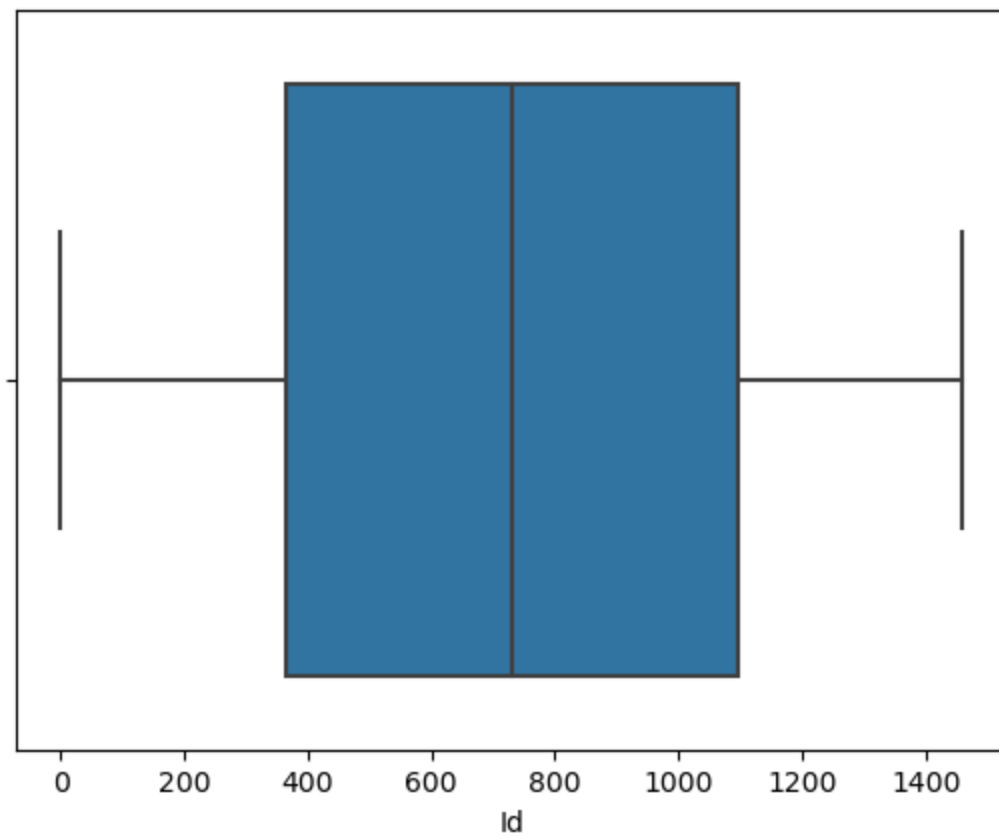
```
In [65]: cat_new1=cat_new.copy()
```

```
In [66]: encoder1 = LabelEncoder()
for r in cat_new1.columns:
    cat_new1[r] = encoder1.fit_transform(cat_new1[r])
```

```
In [67]: for p in data_num.columns:
    sea.boxplot(data_num[p])
    plt.show()
```

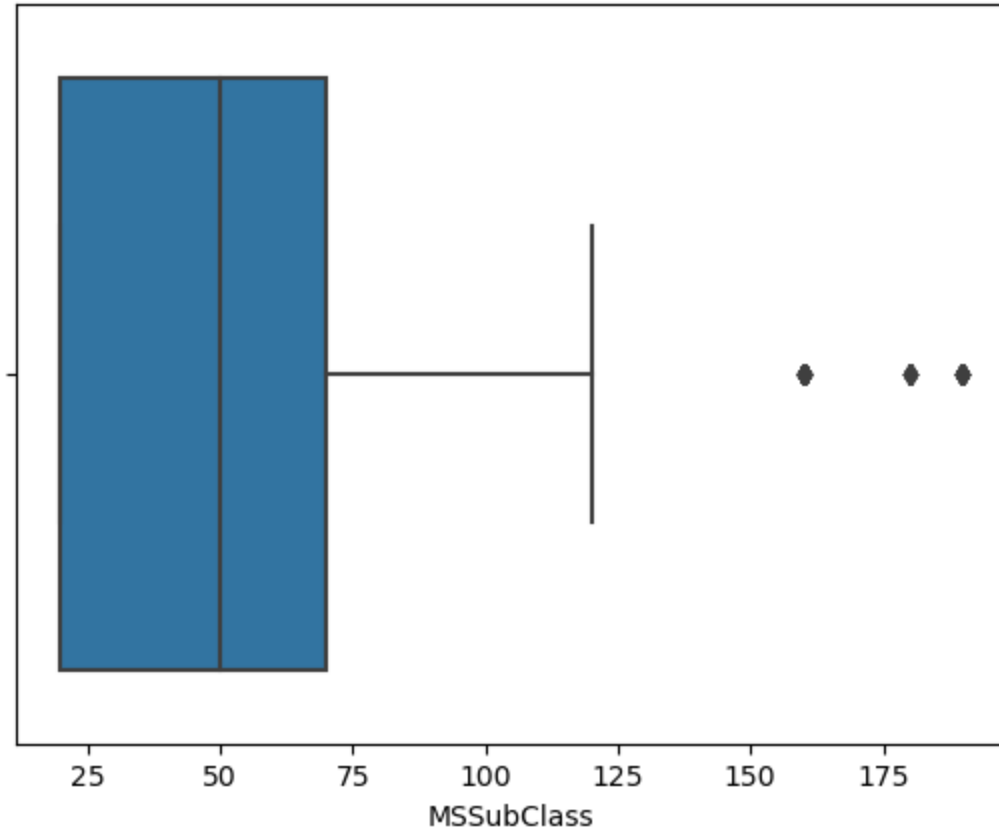
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```



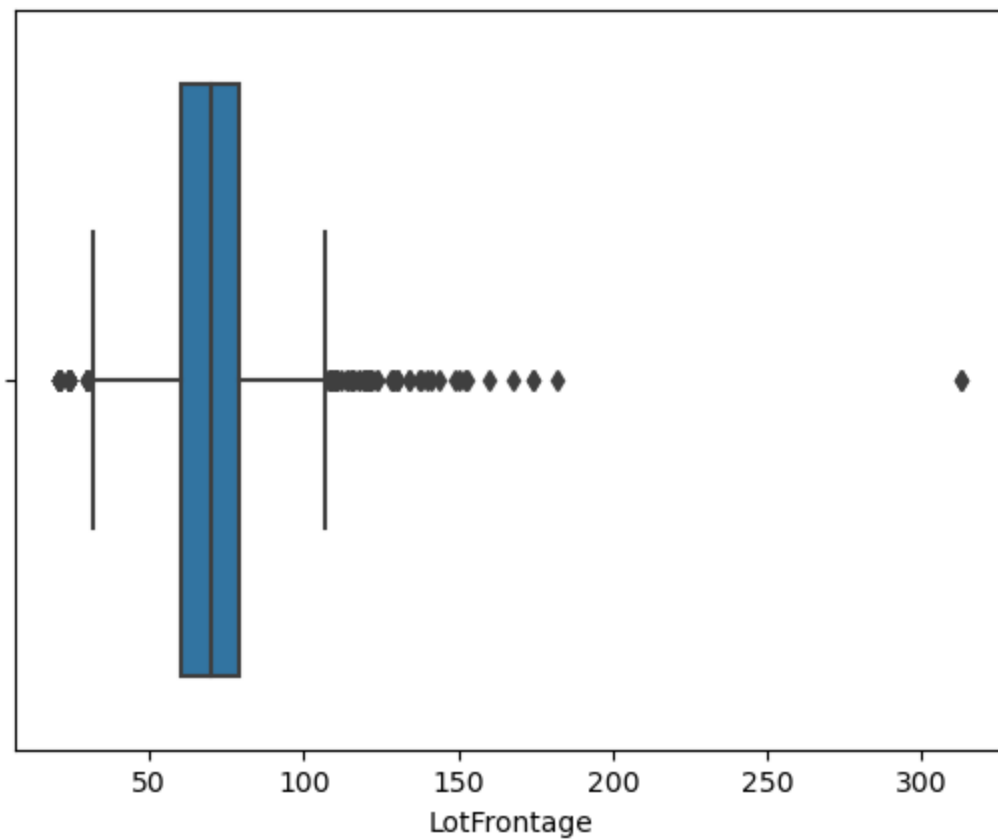
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```



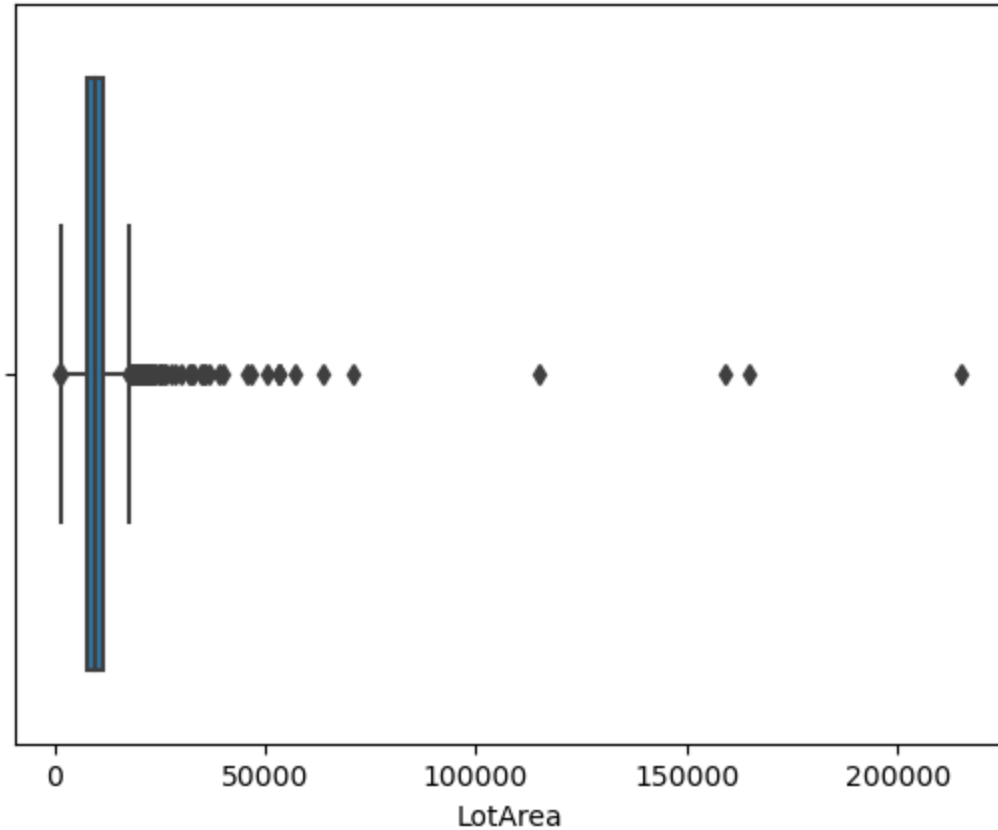
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```



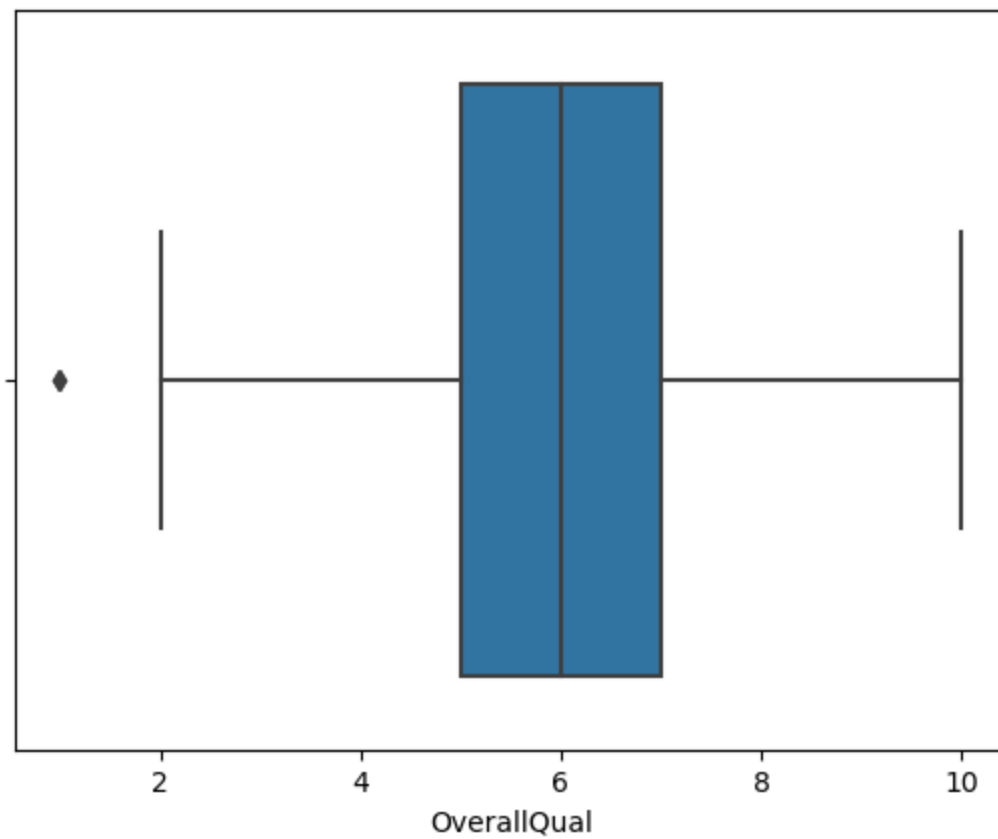
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```

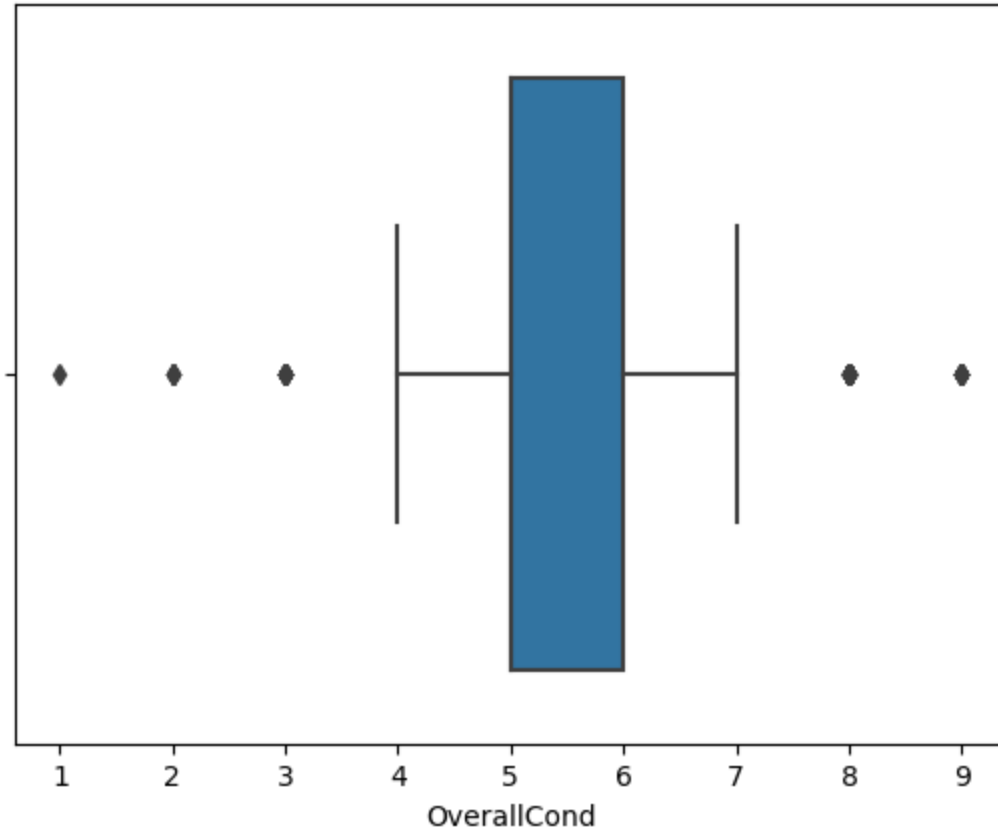


C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

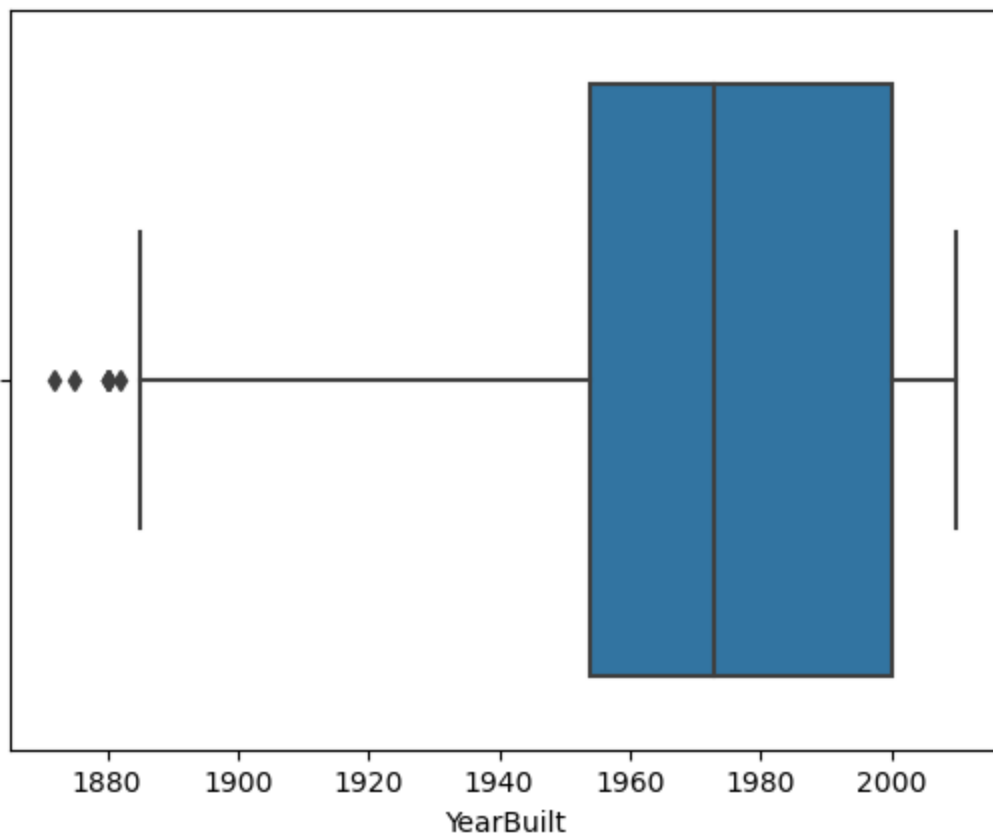
```
warnings.warn(
```



```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

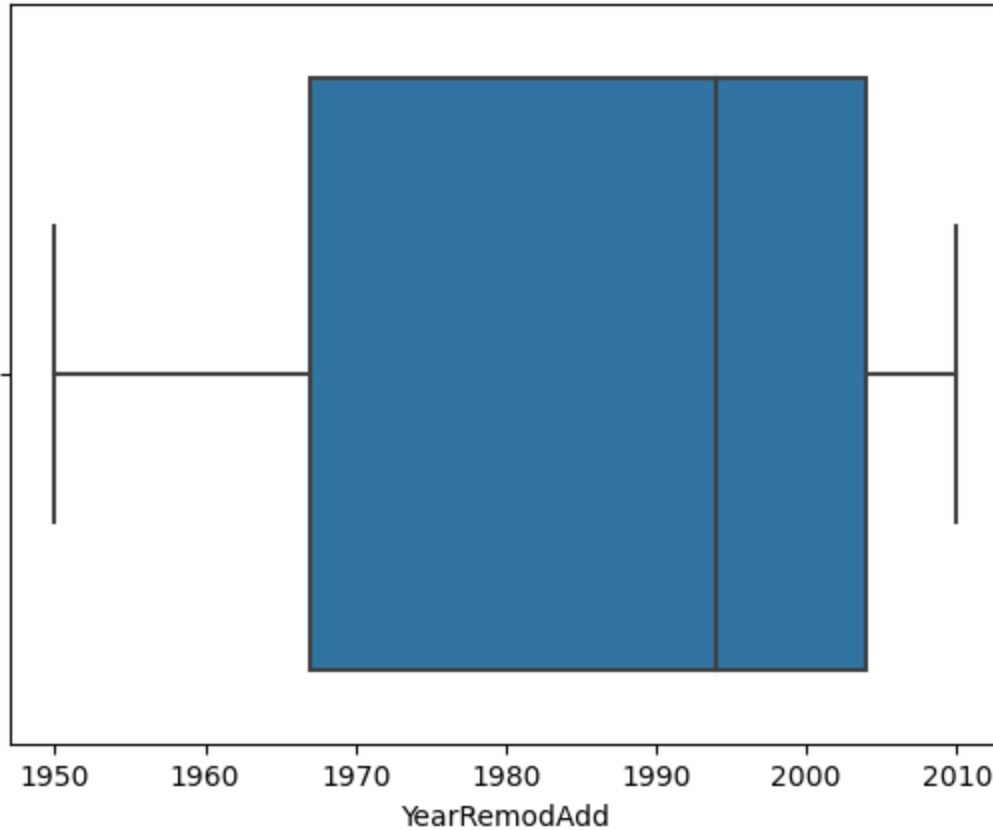


```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

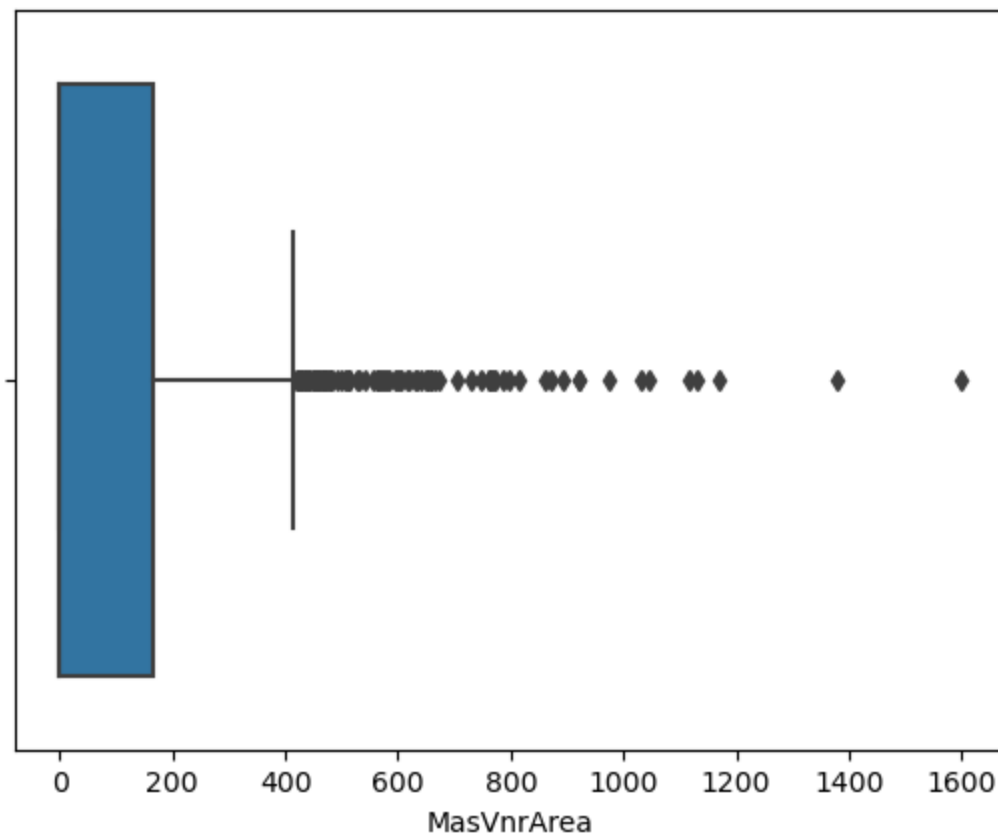
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```



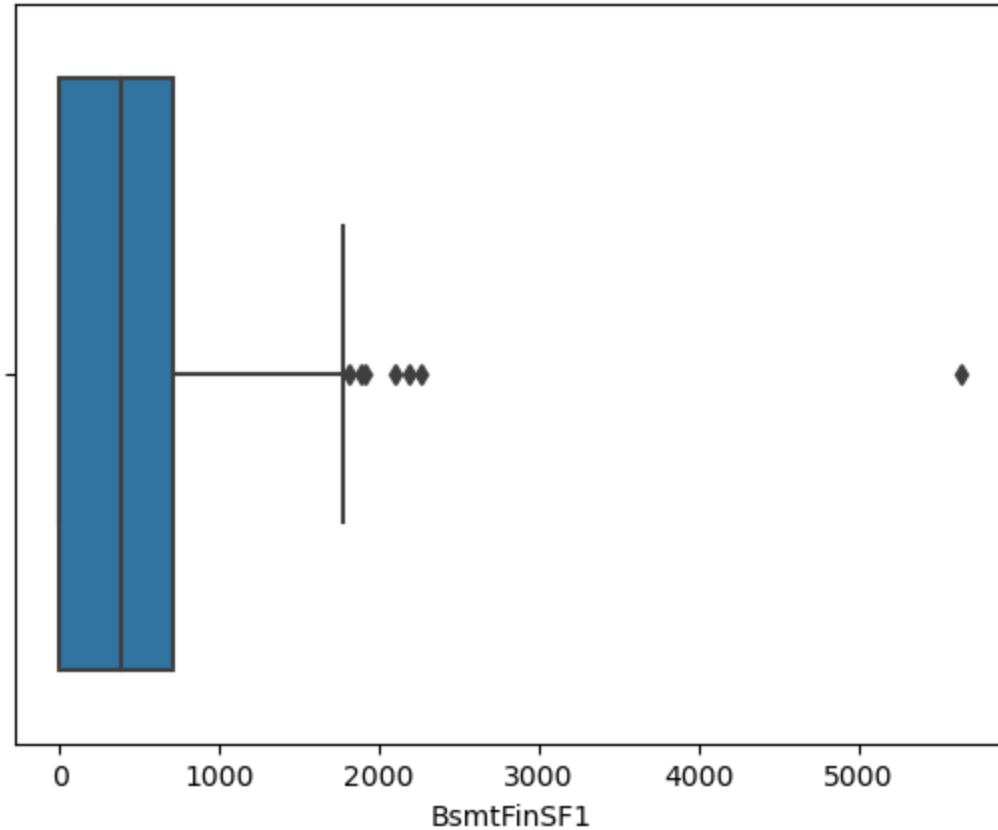
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```



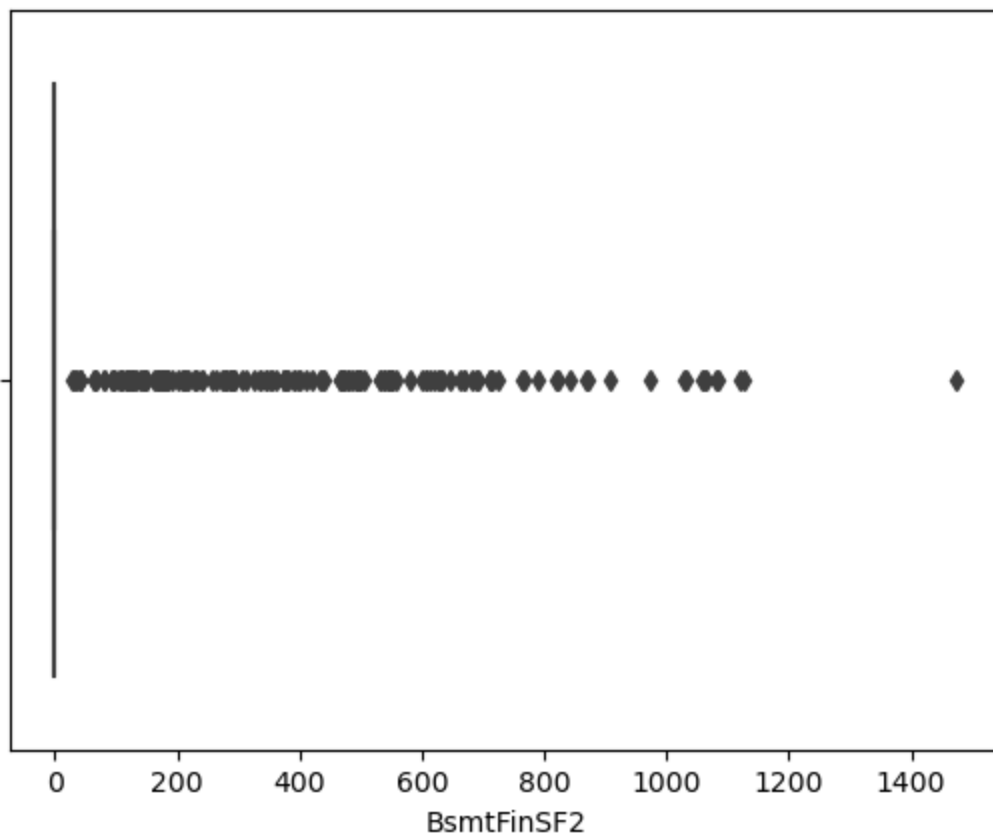
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```



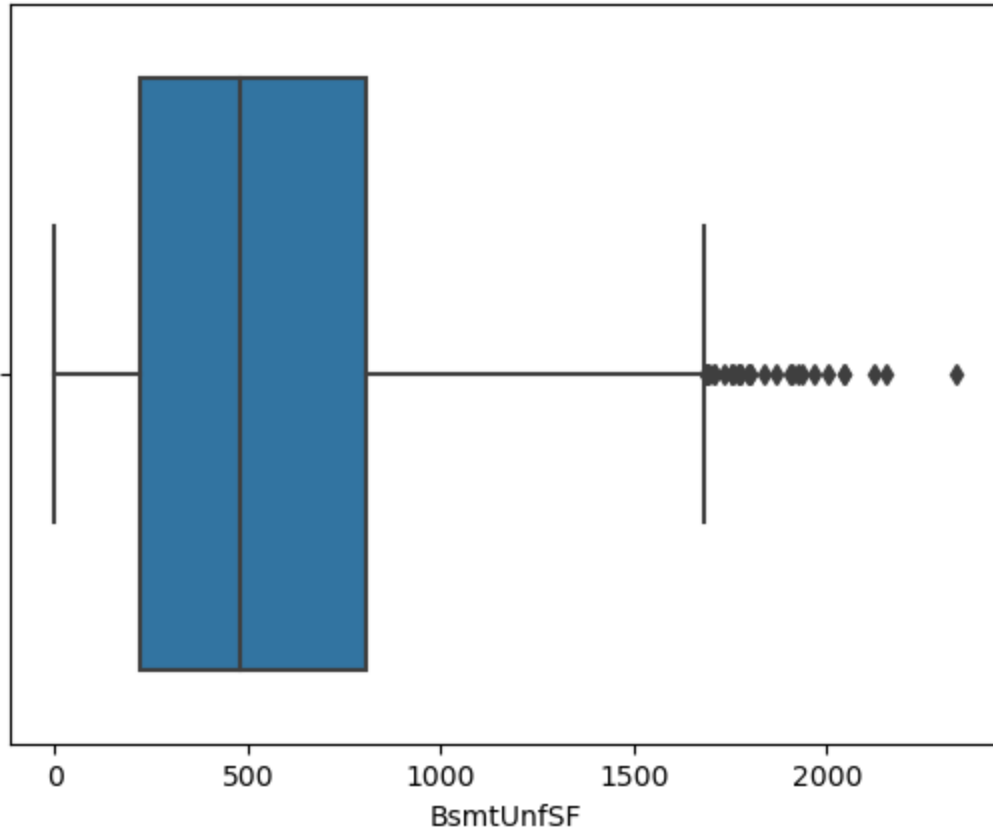
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```



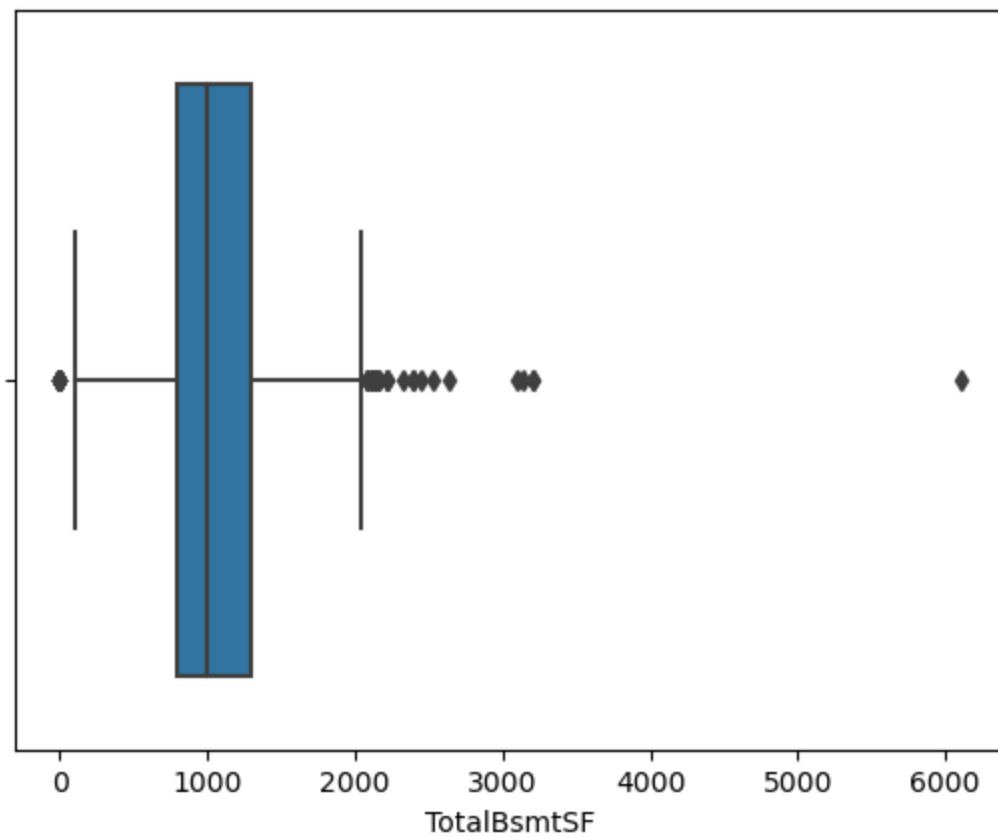
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```



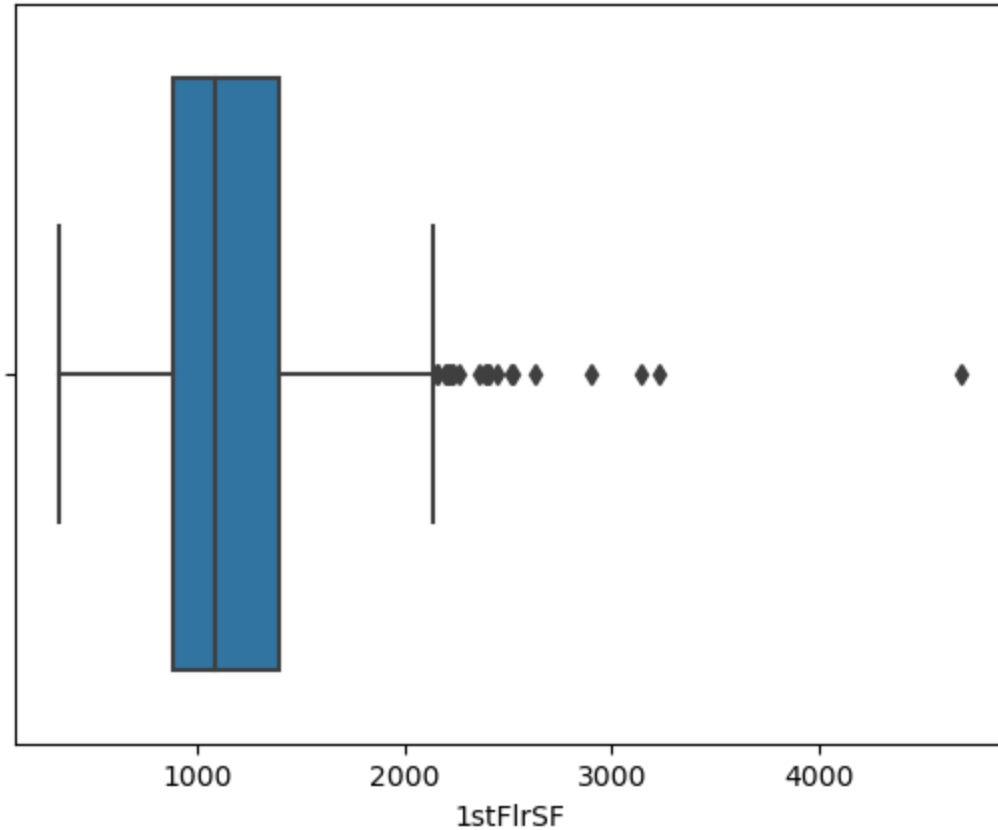
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```



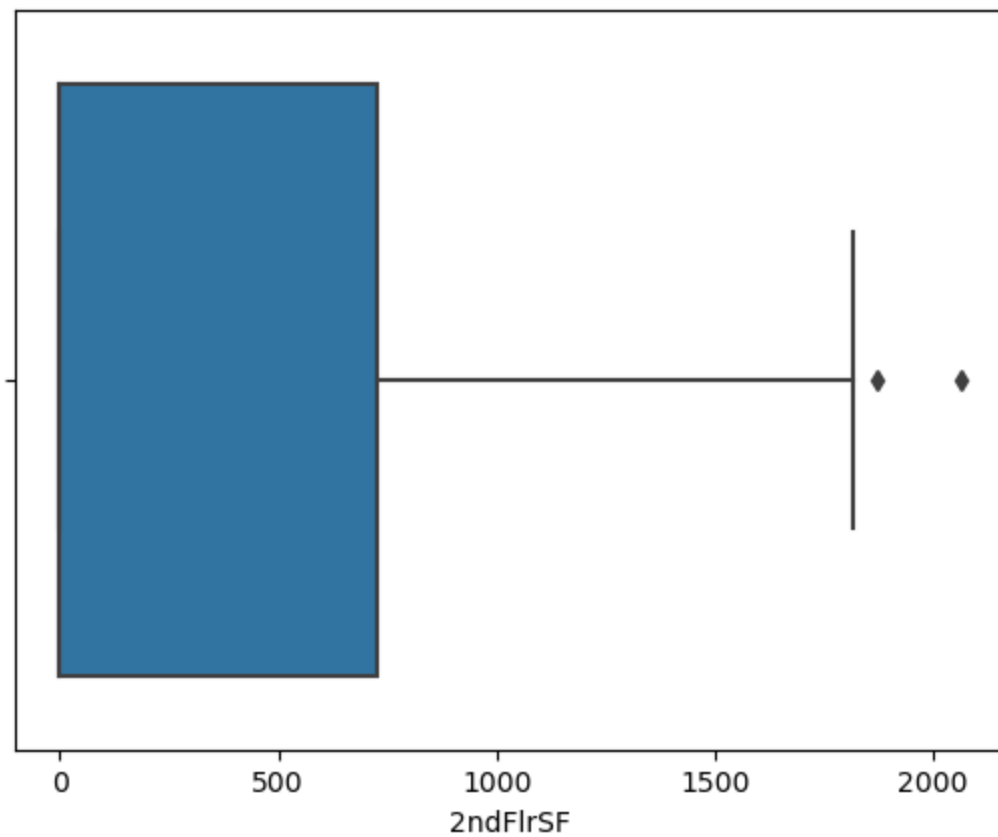
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```



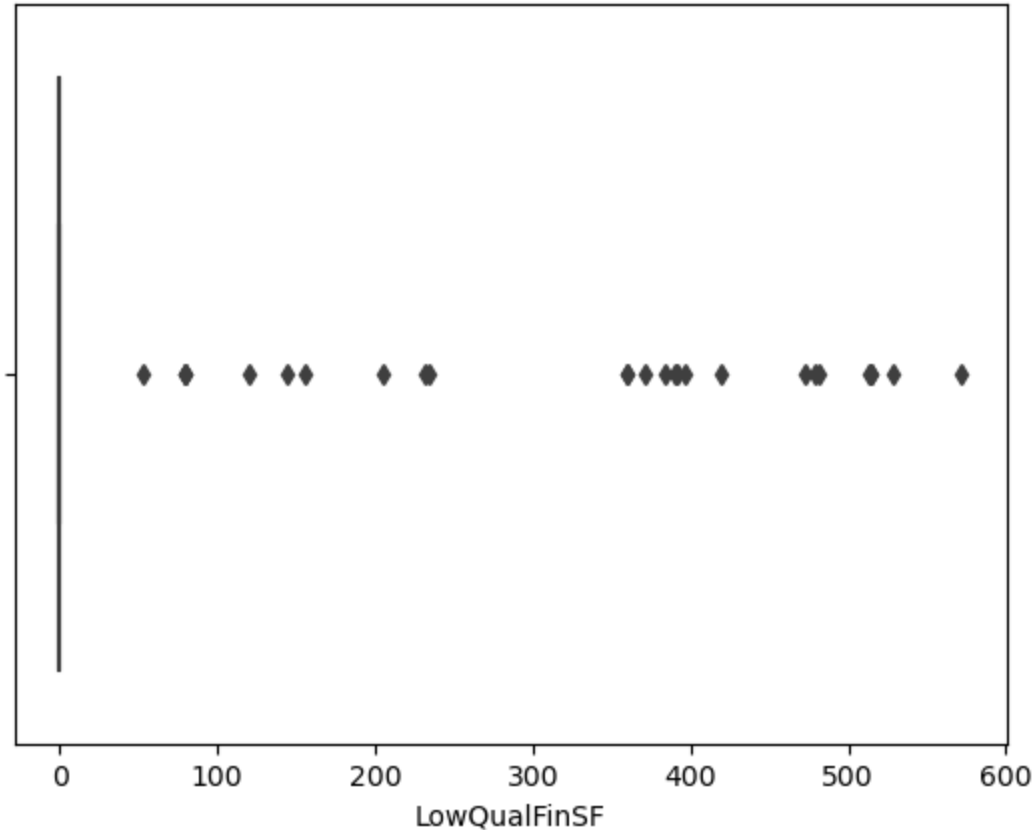
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```



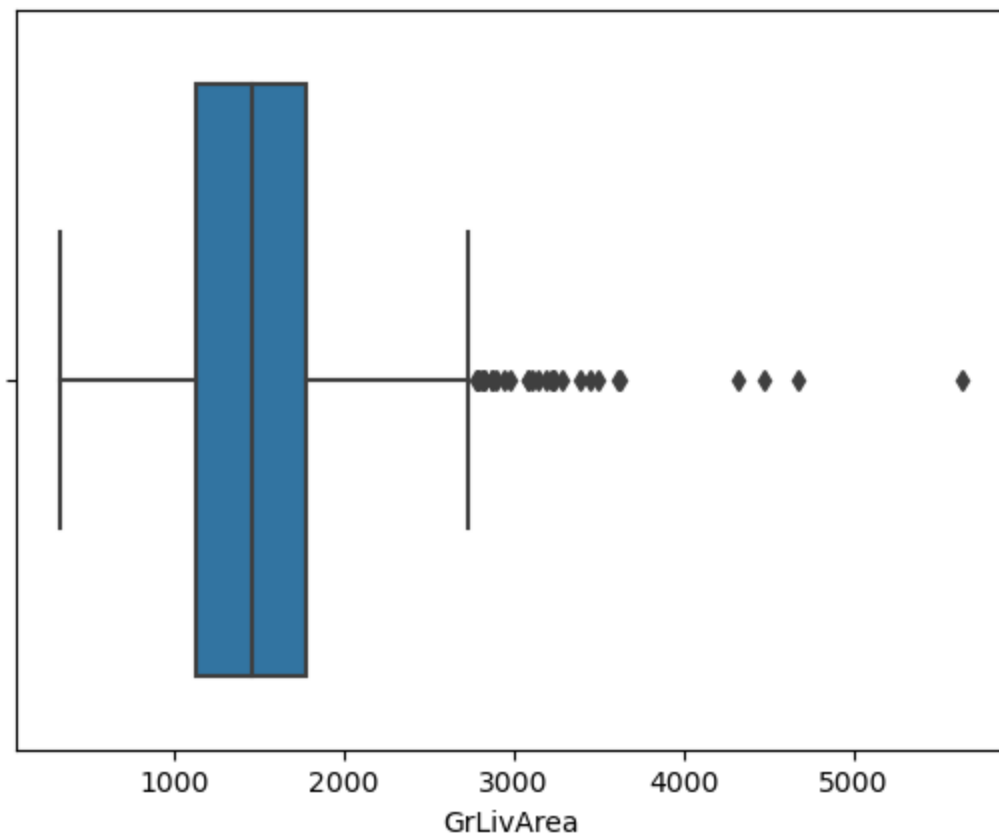
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
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```



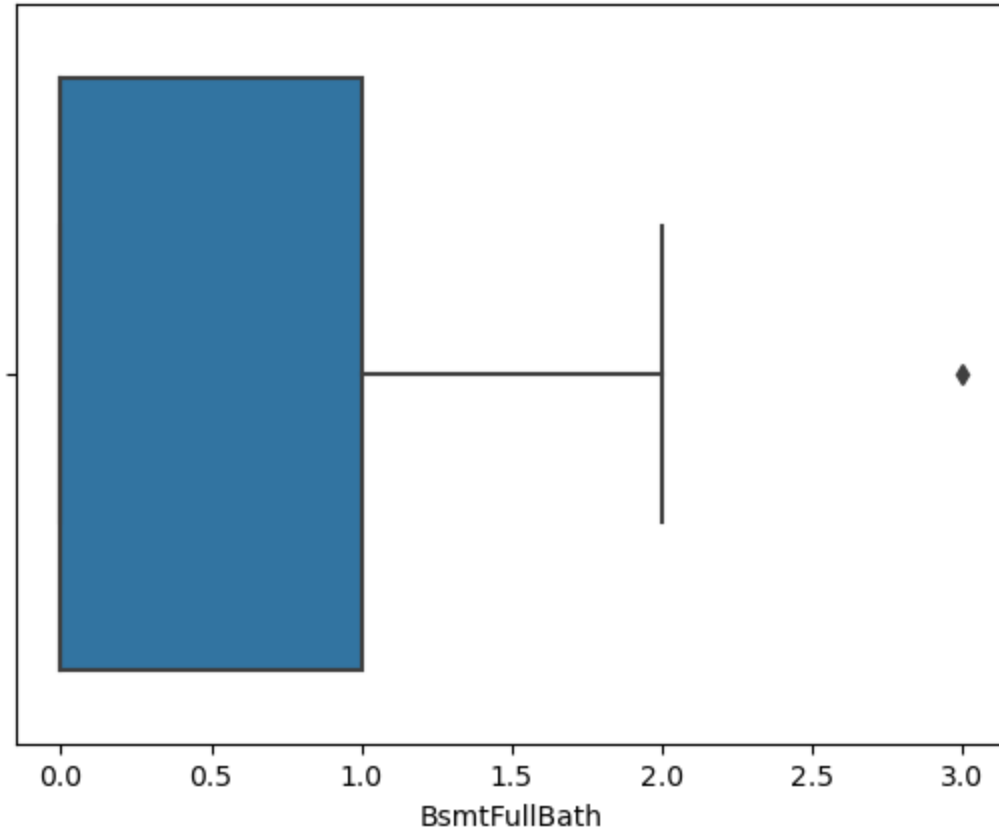
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```



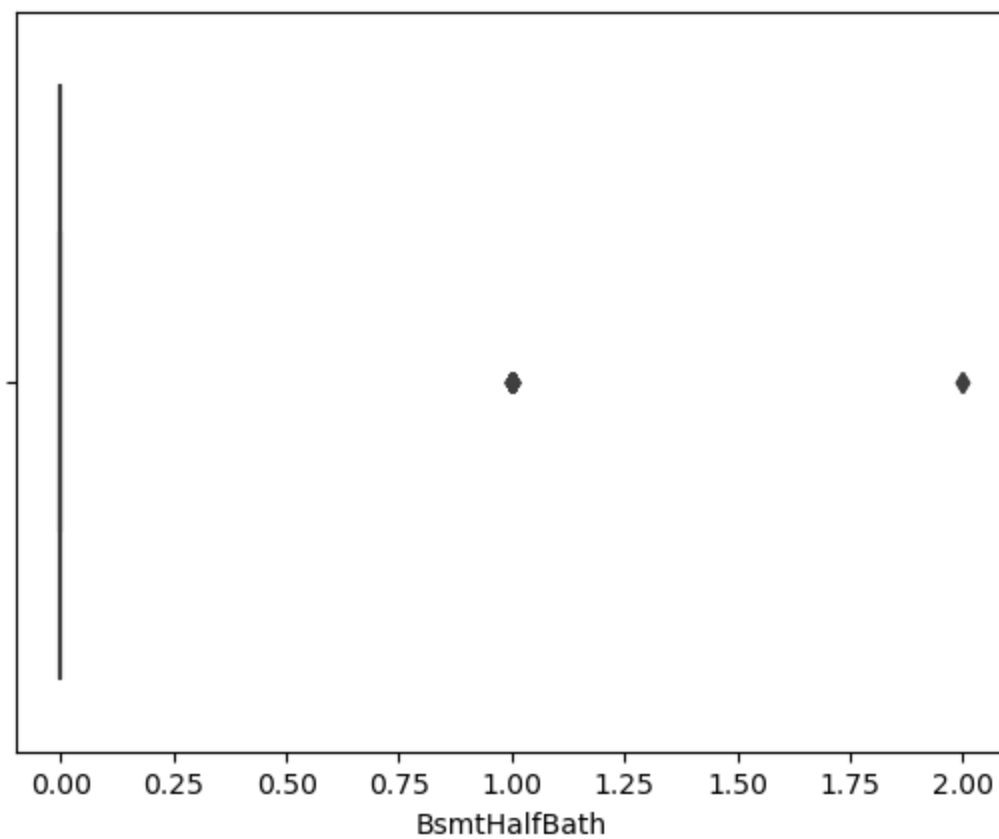
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```

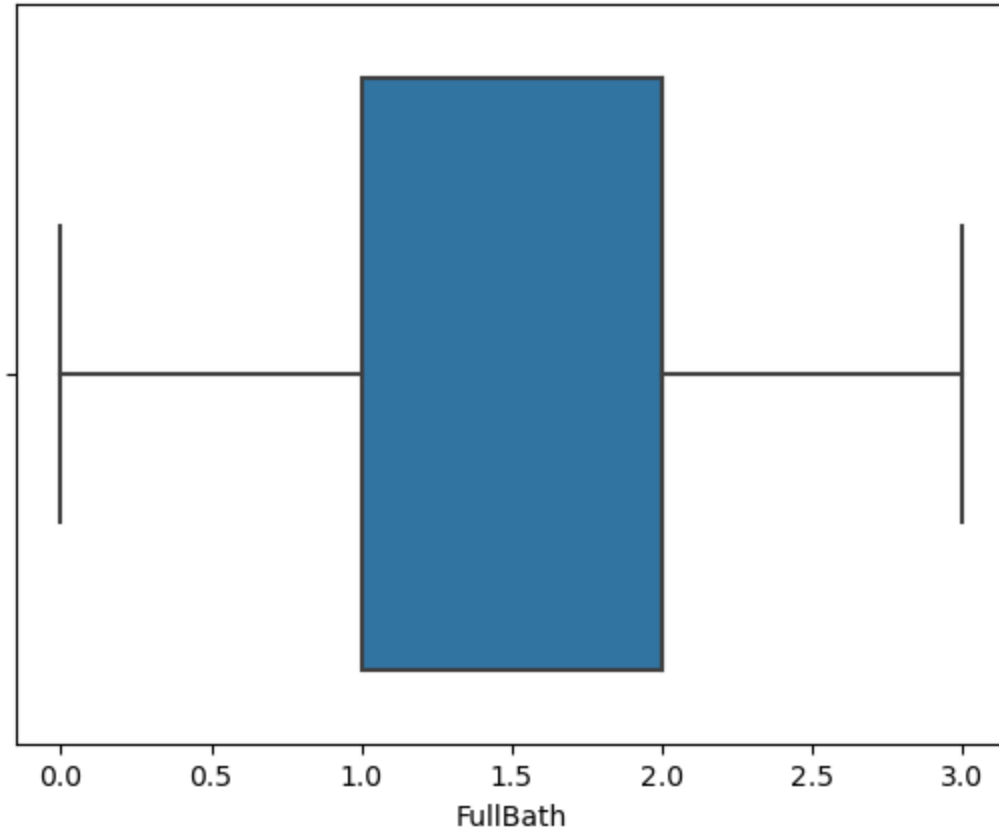


C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

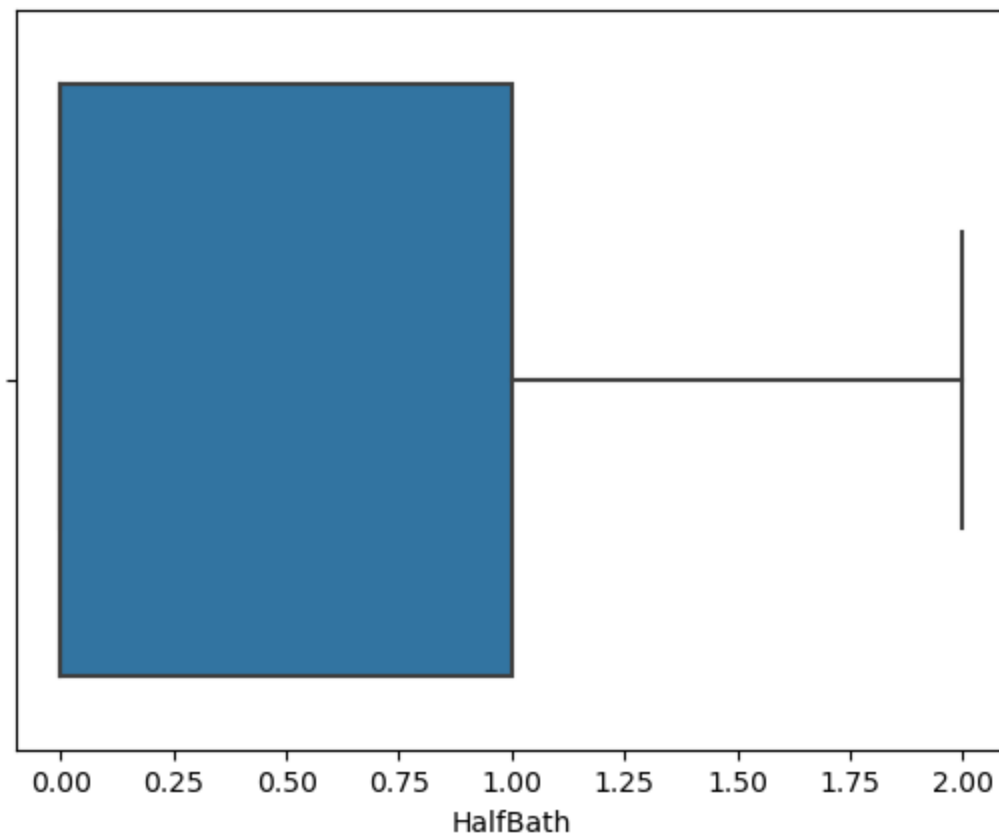
```
warnings.warn(
```



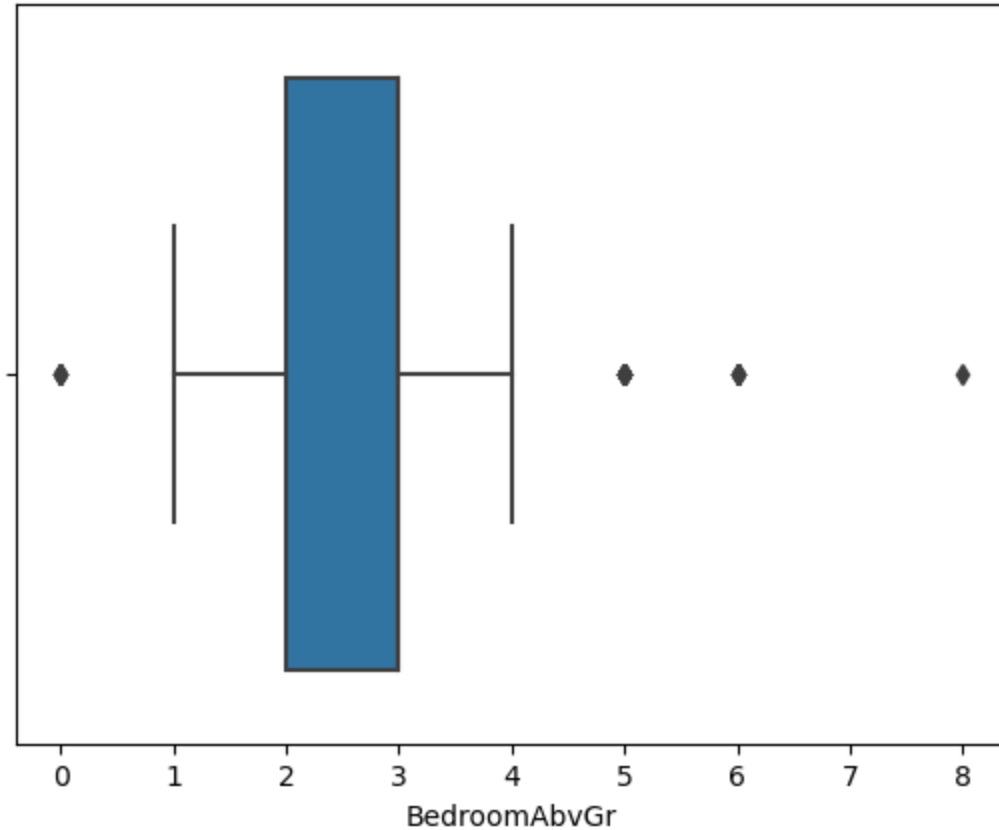
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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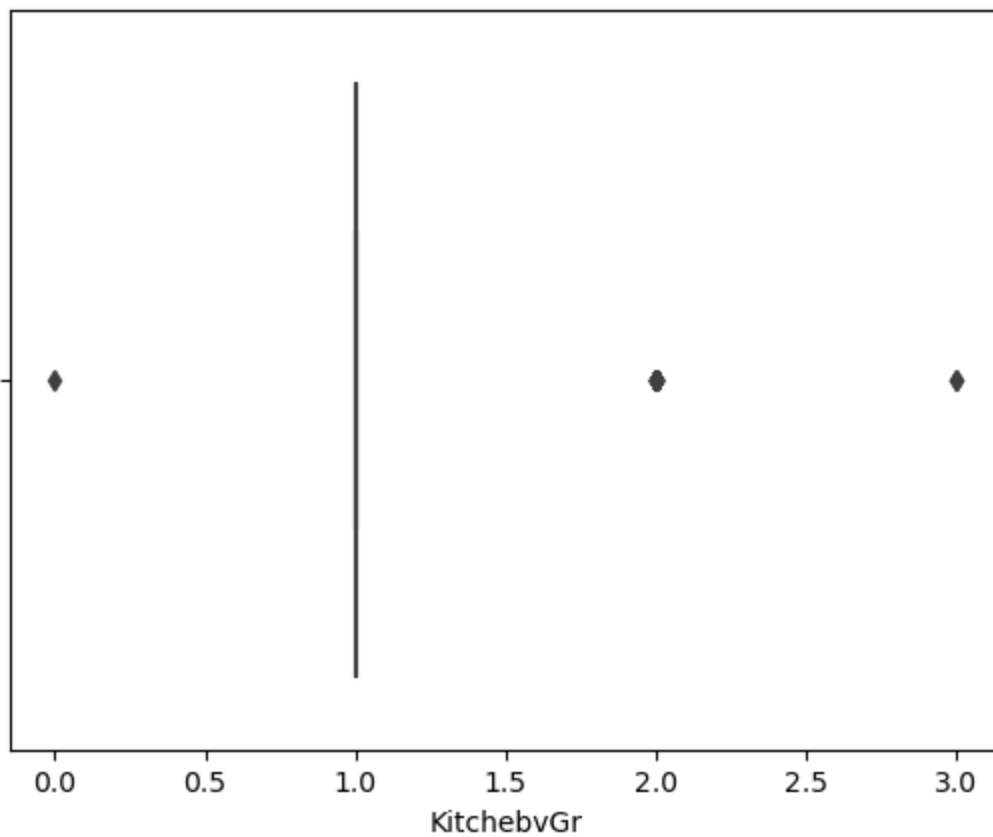
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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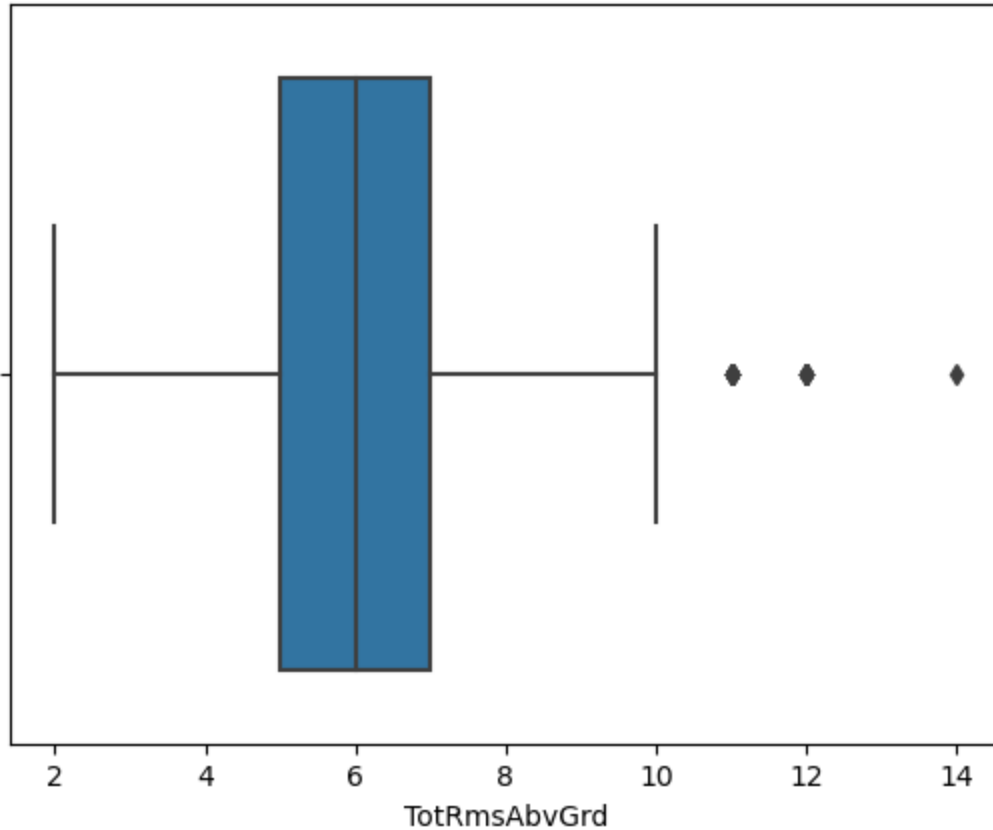
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
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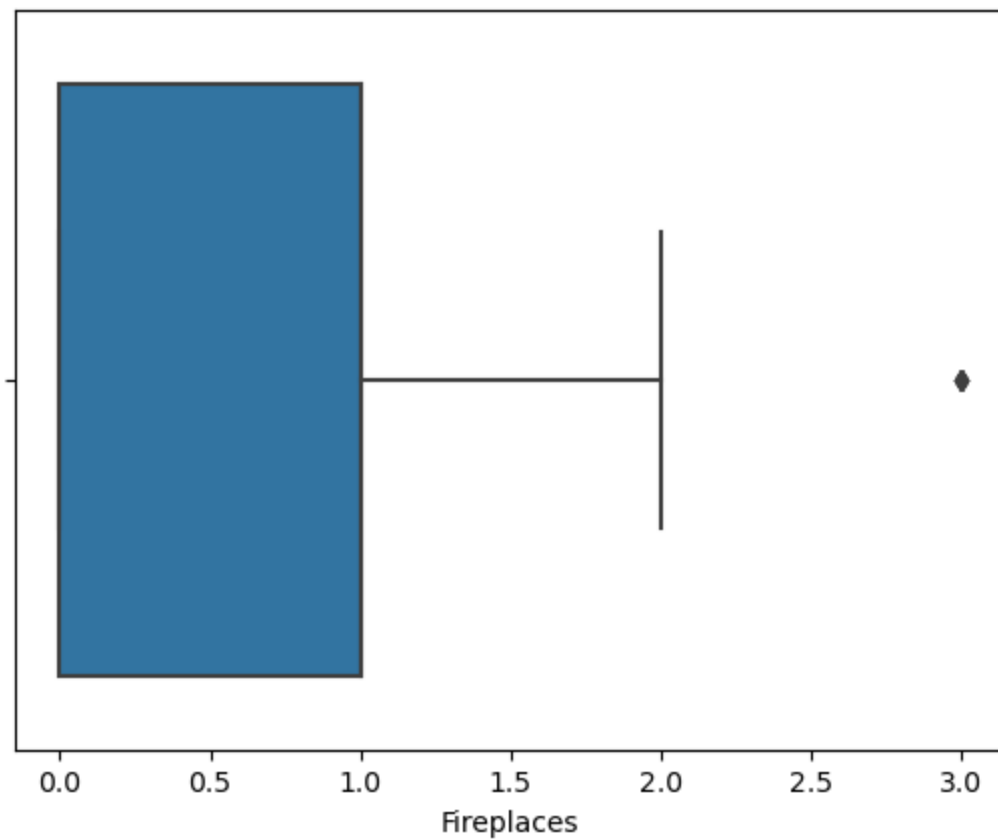
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
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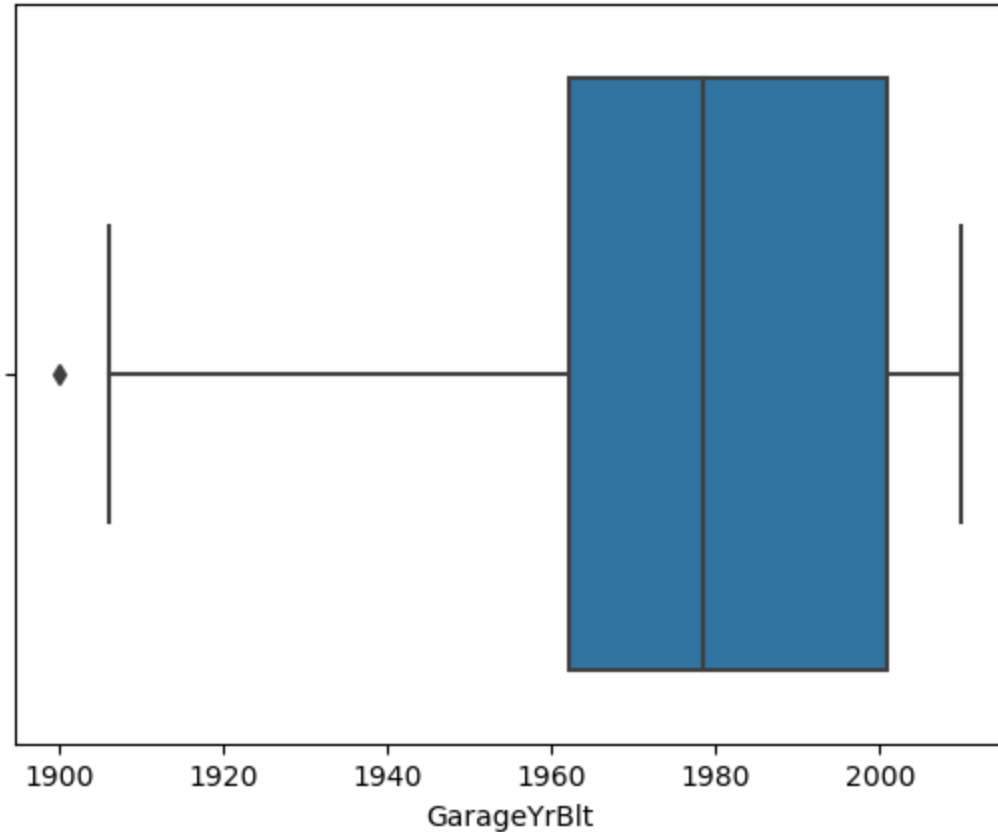


```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
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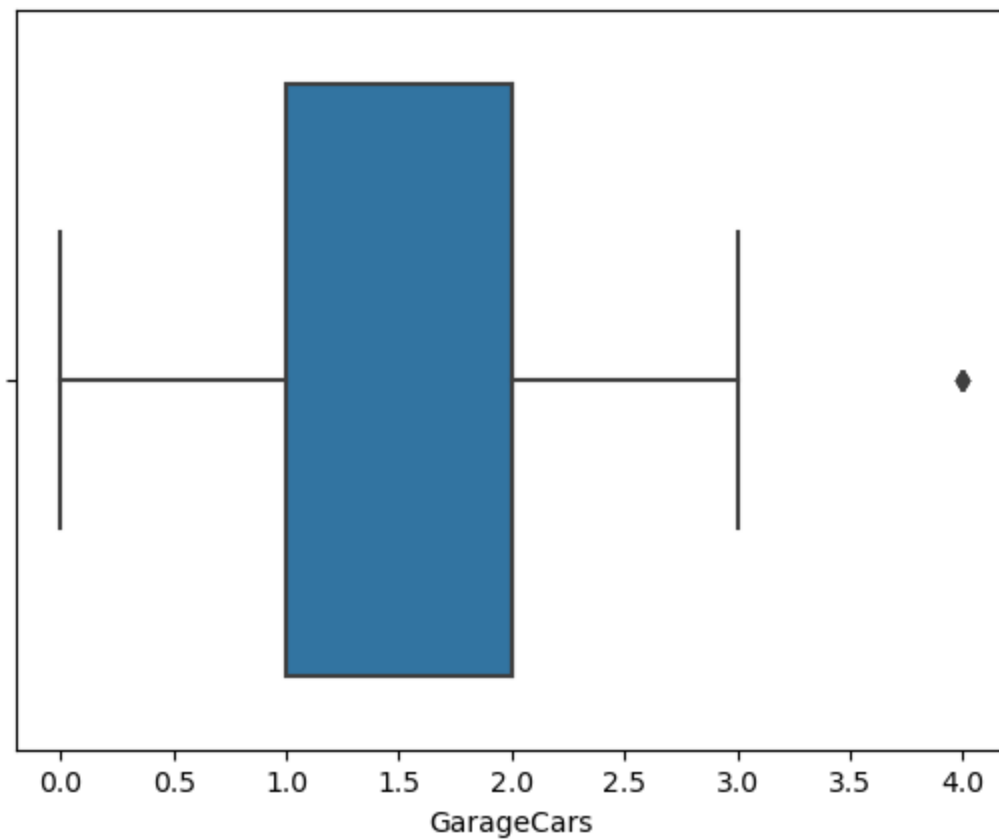
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```



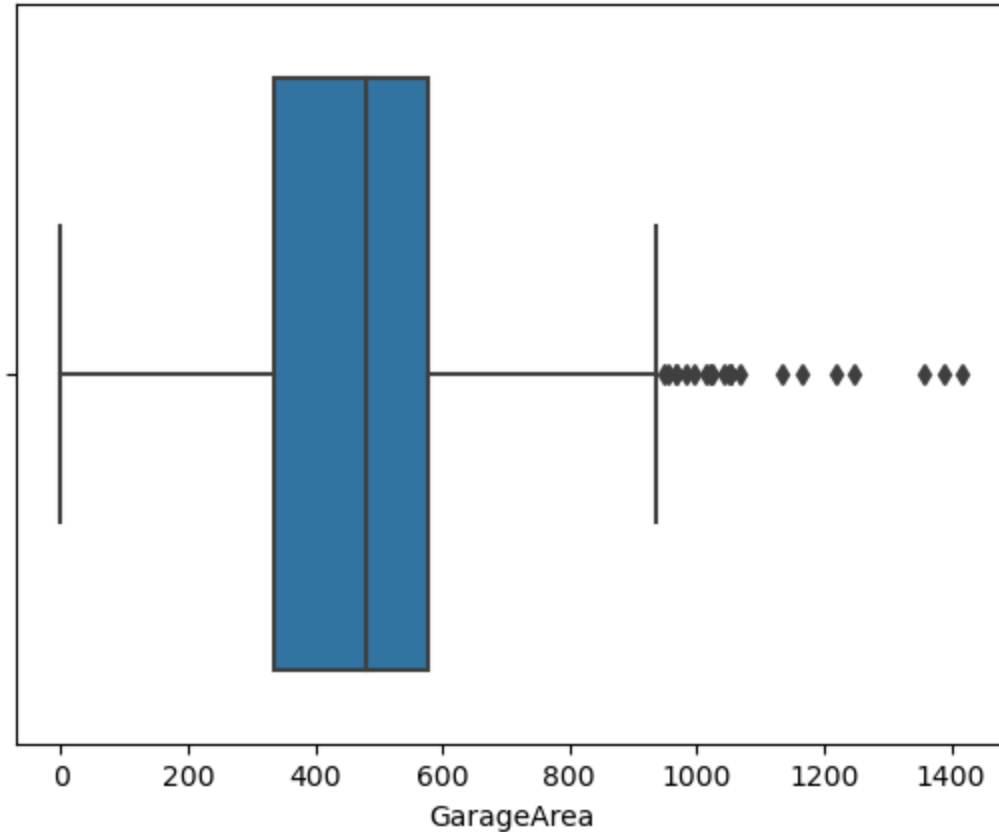
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

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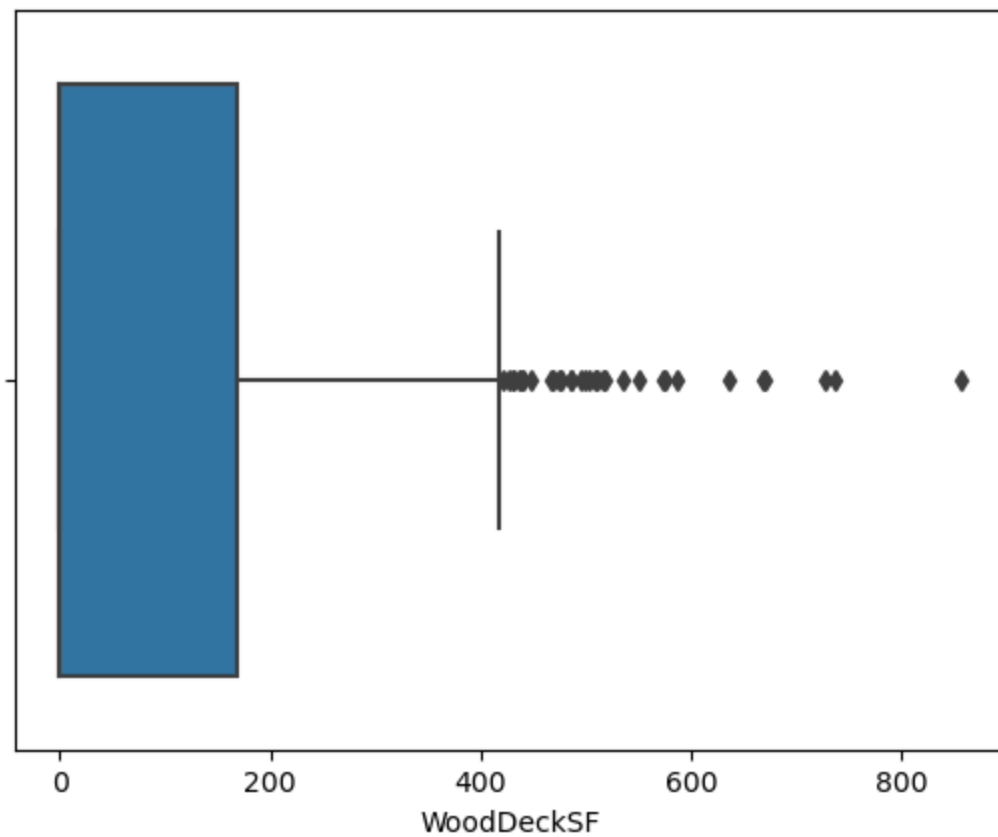
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

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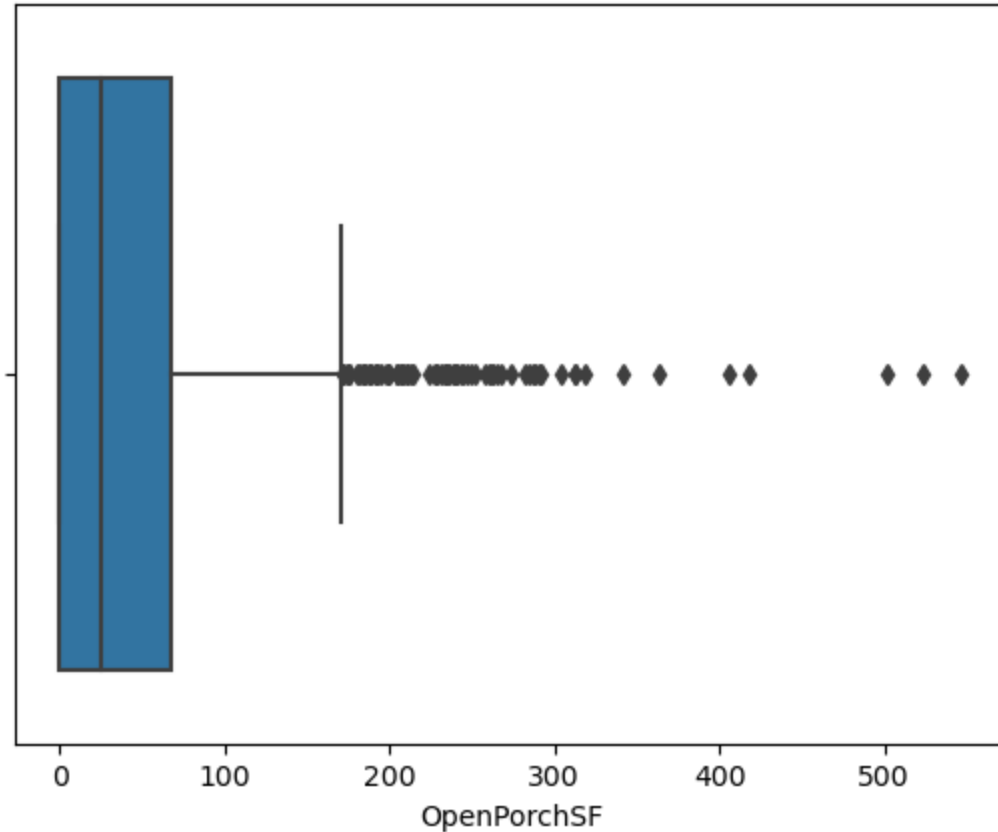
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

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warnings.warn(
```



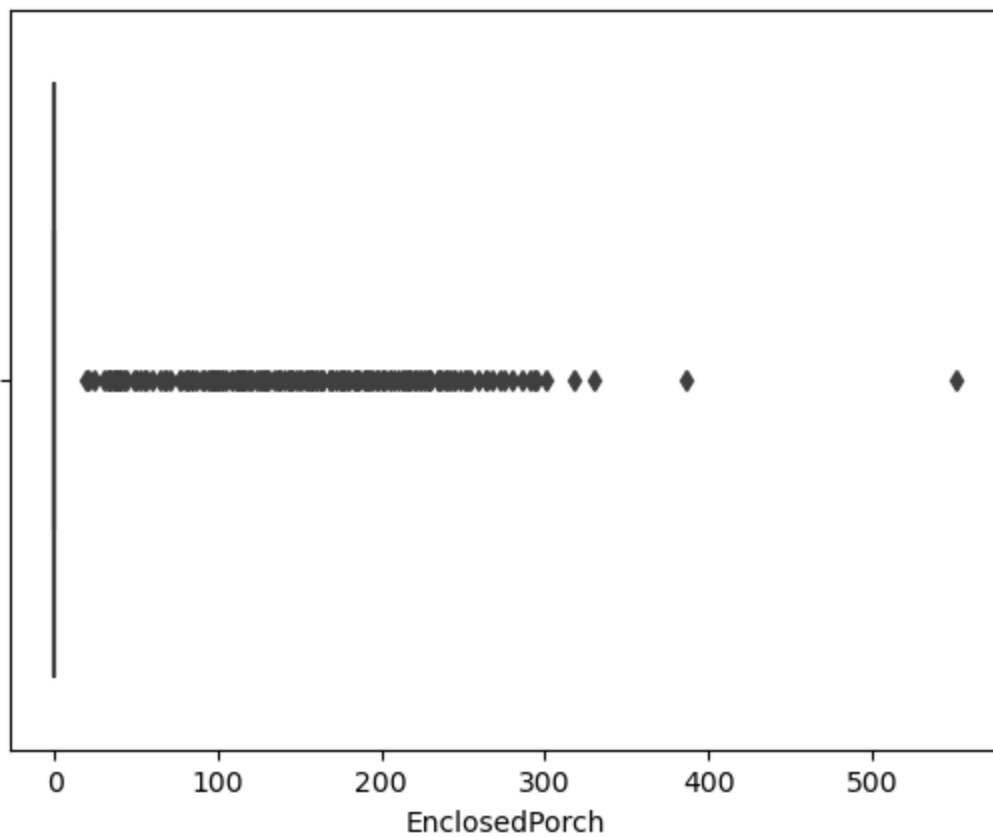
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

```
warnings.warn(
```



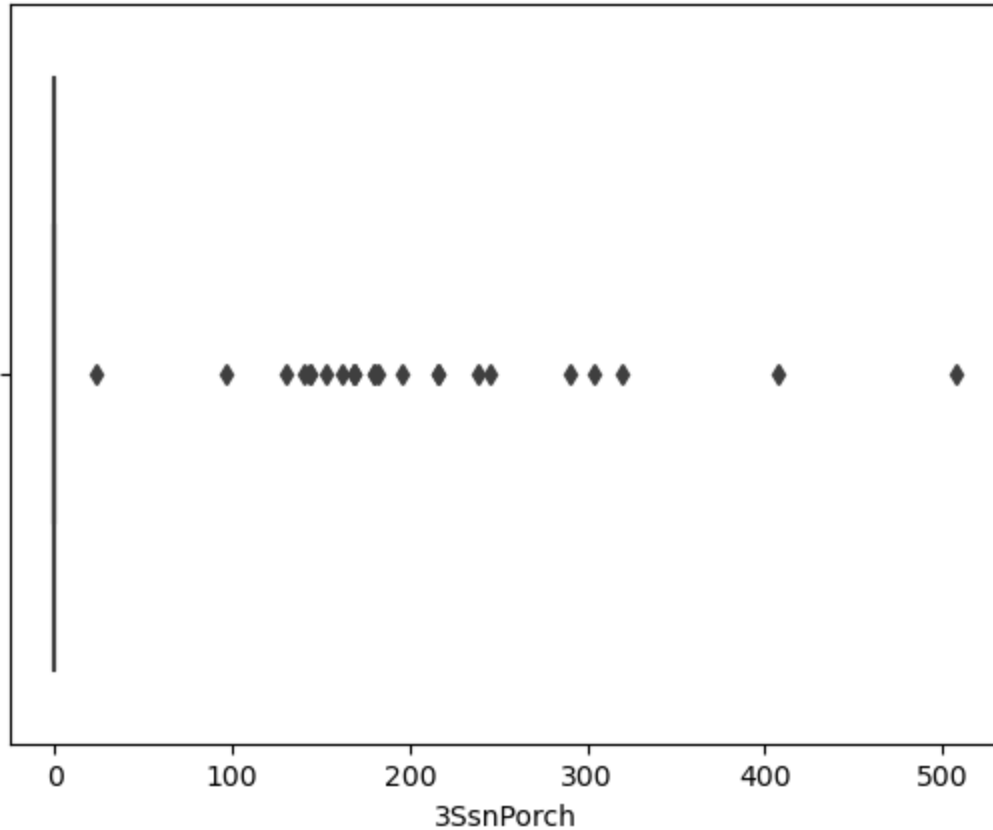
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

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warnings.warn(
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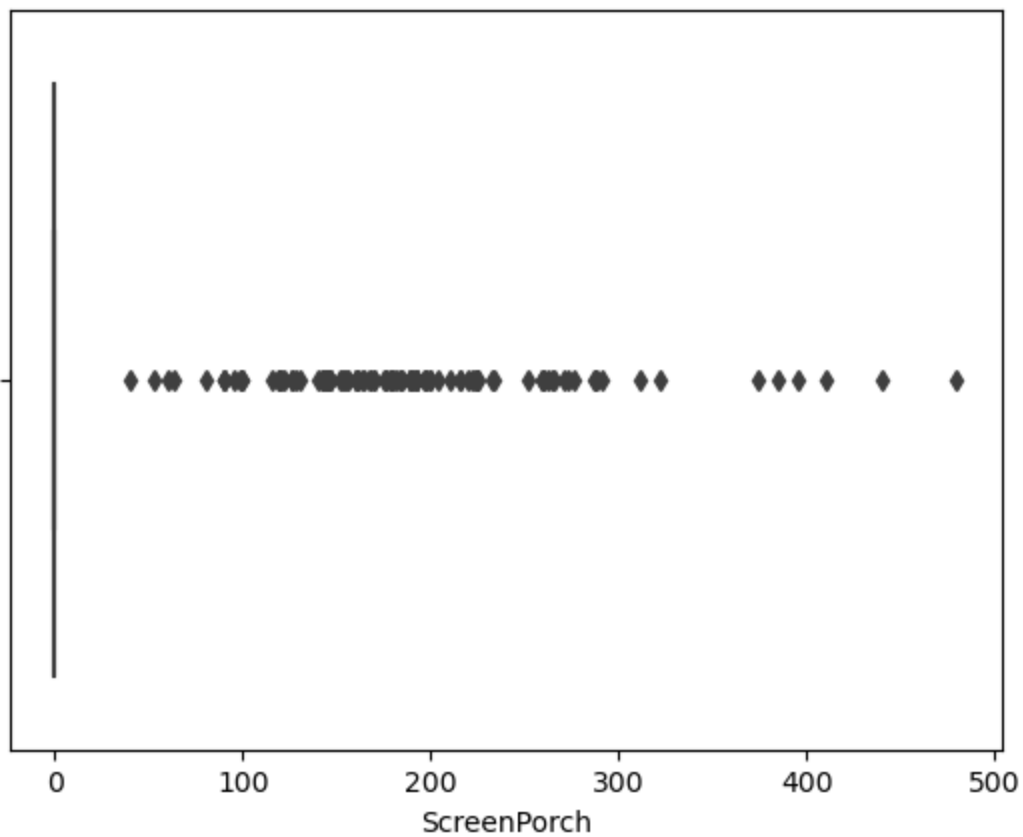
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

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warnings.warn(
```

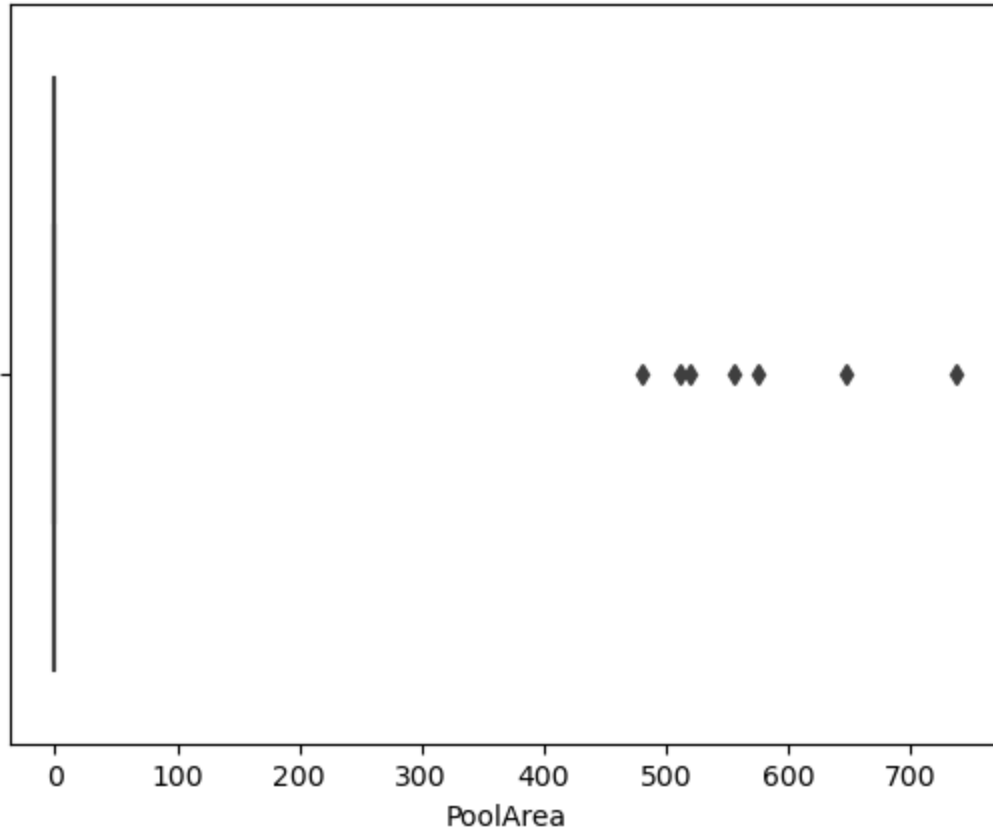


C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

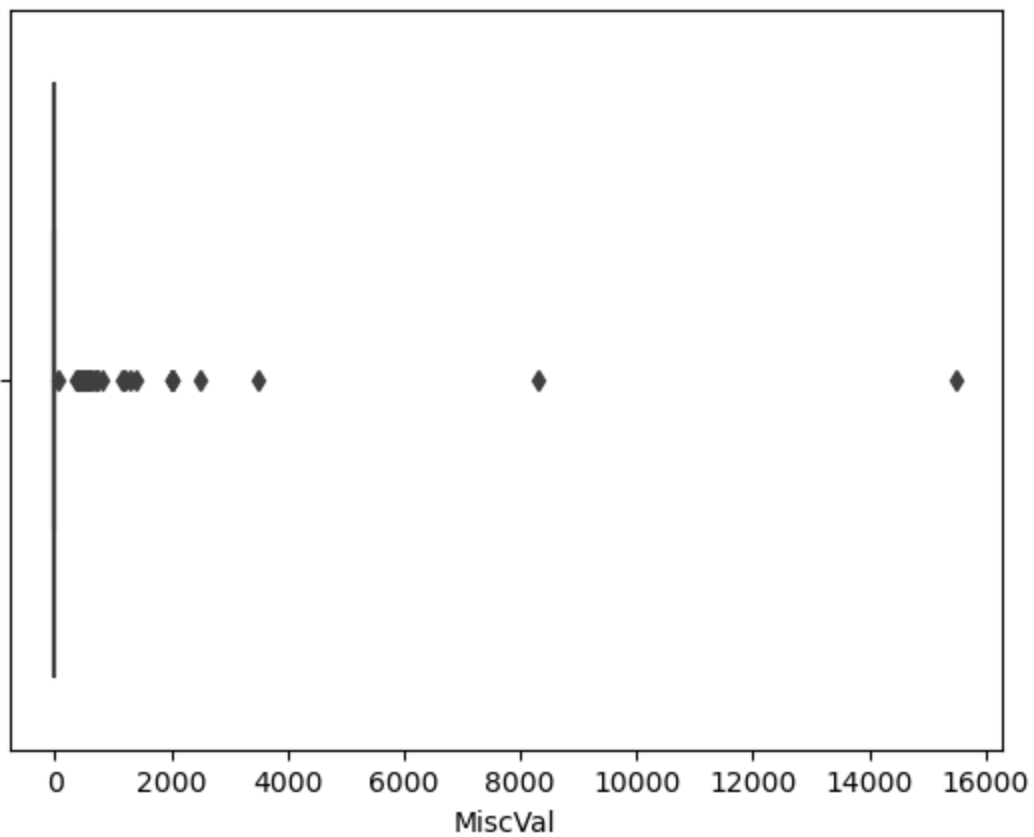
```
warnings.warn(
```



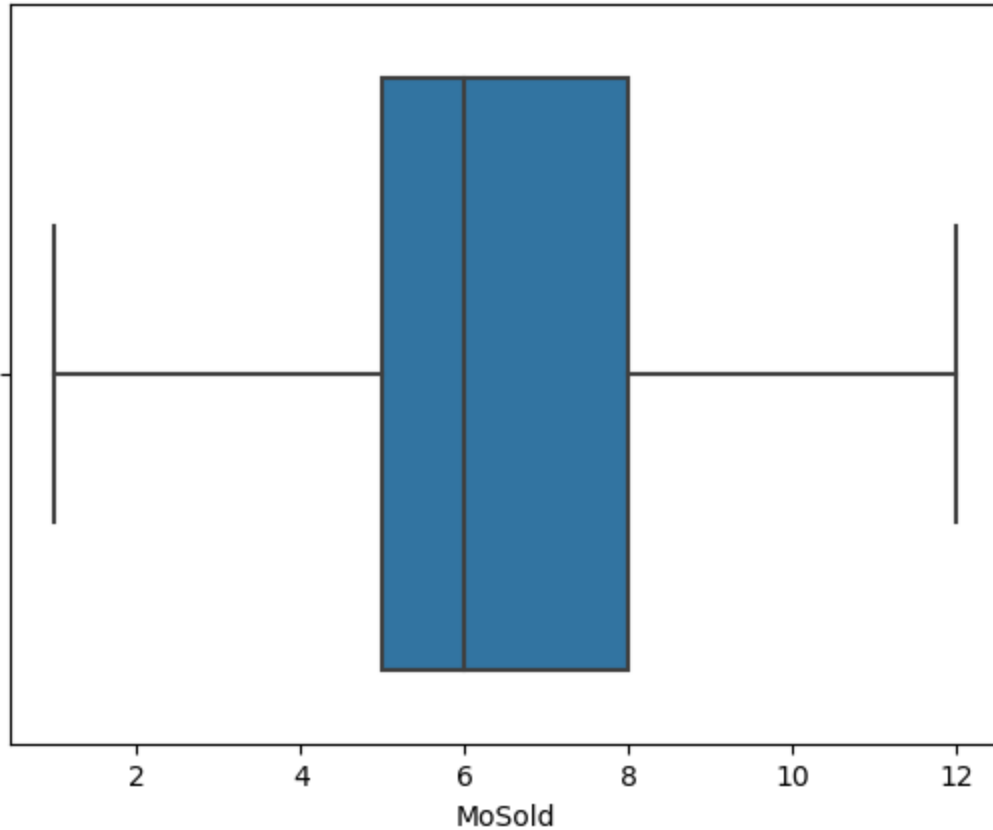
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



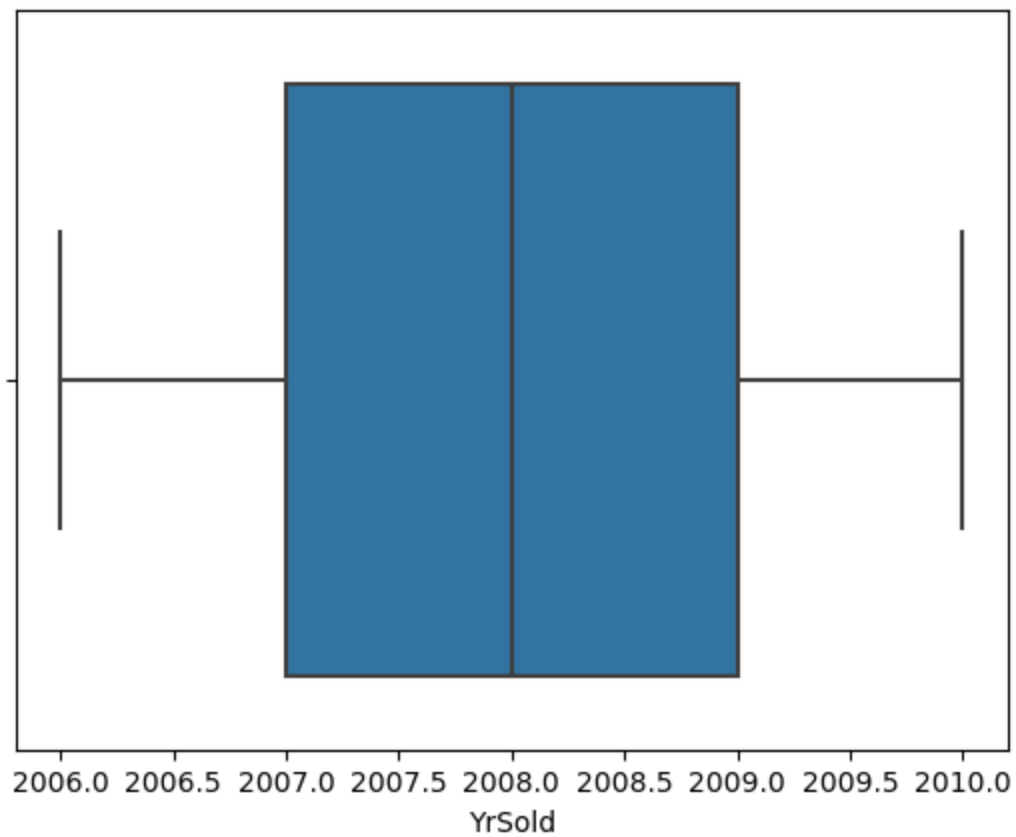
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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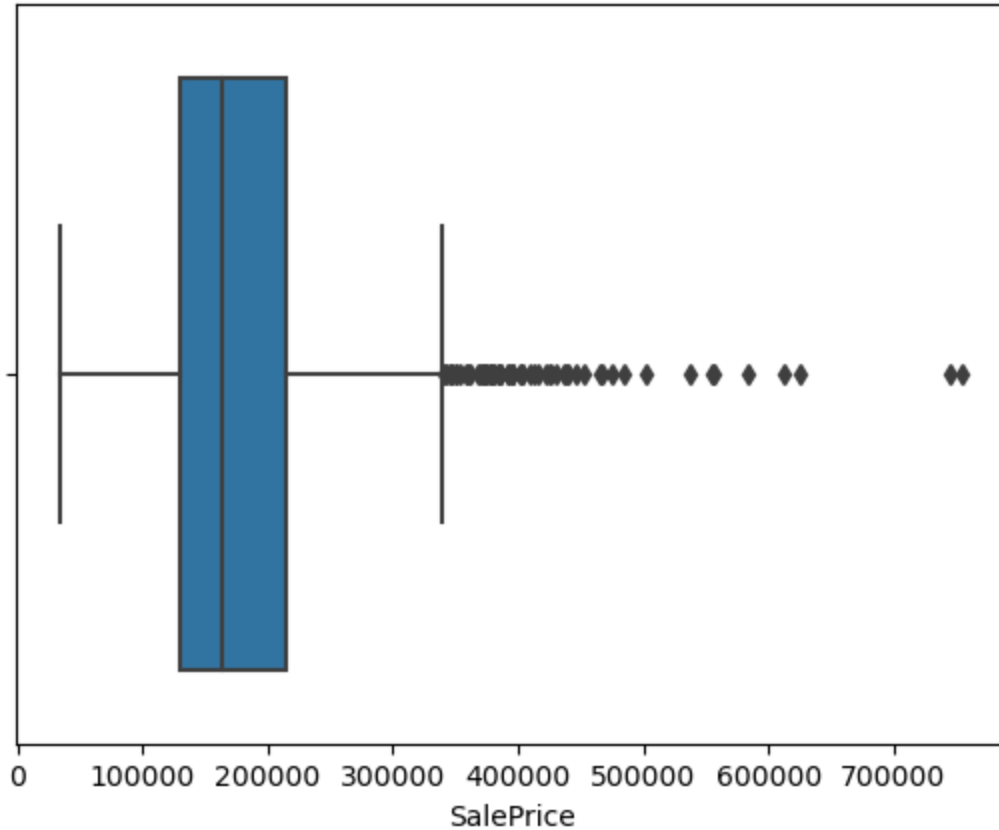


```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.

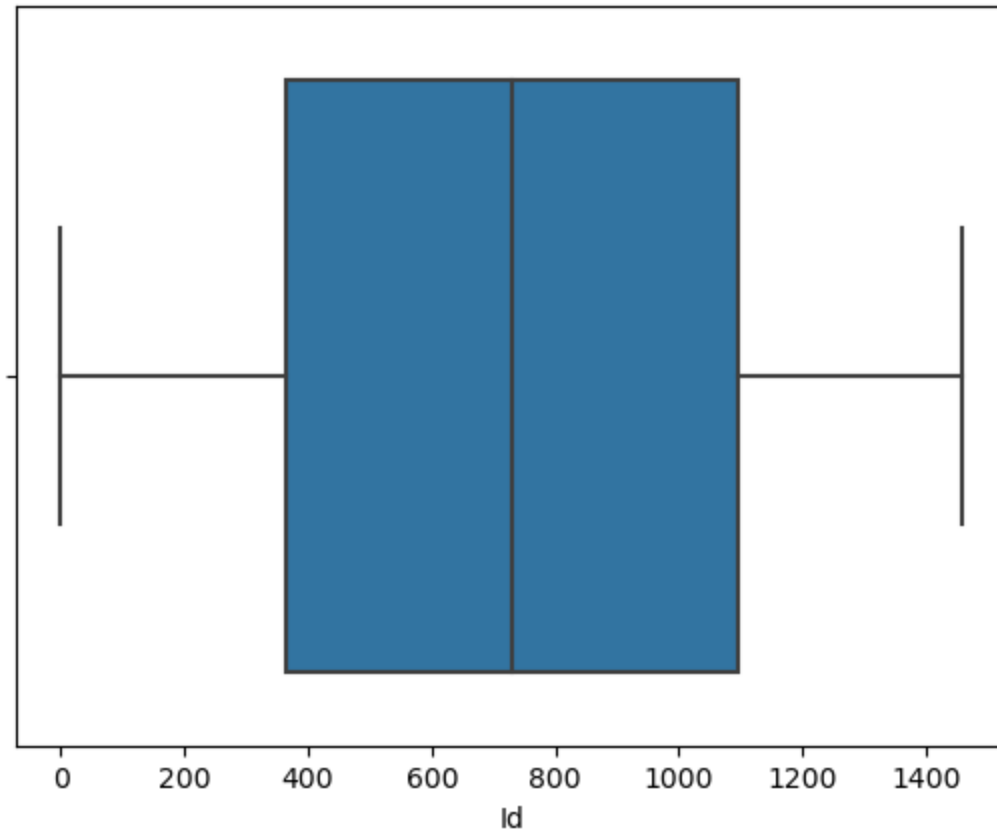
```
warnings.warn(
```



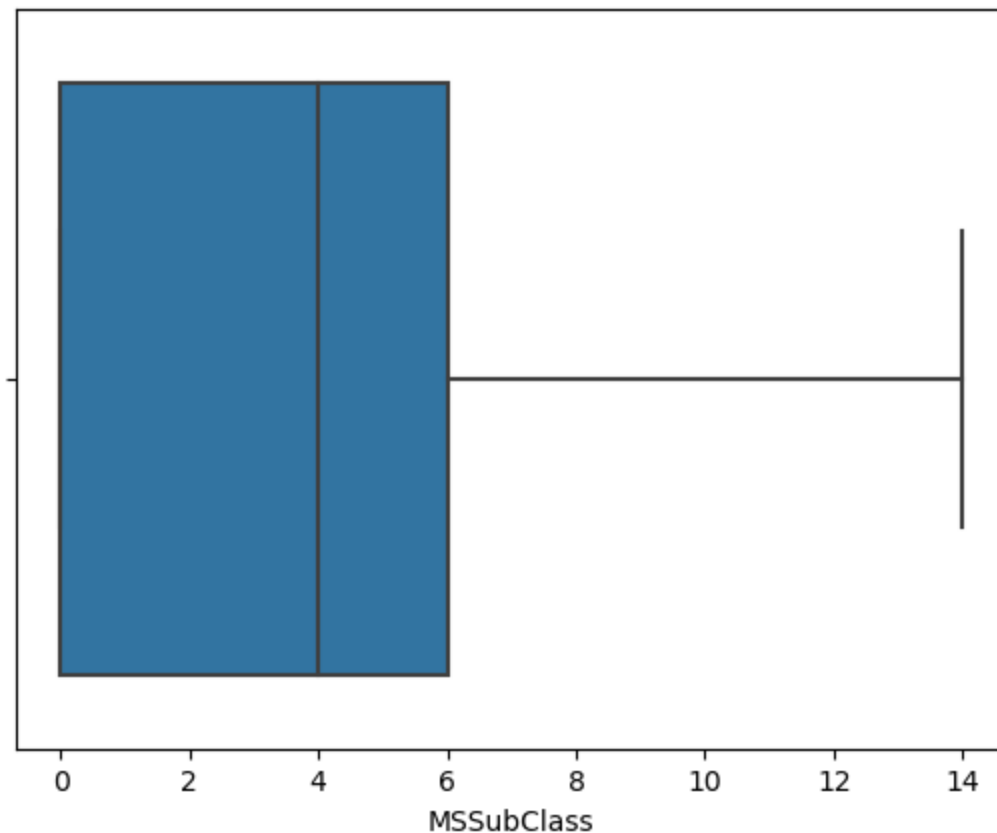
```
In [68]: for u in cat_new1.columns:
          sea.boxplot(cat_new1[u])
          plt.show()
```



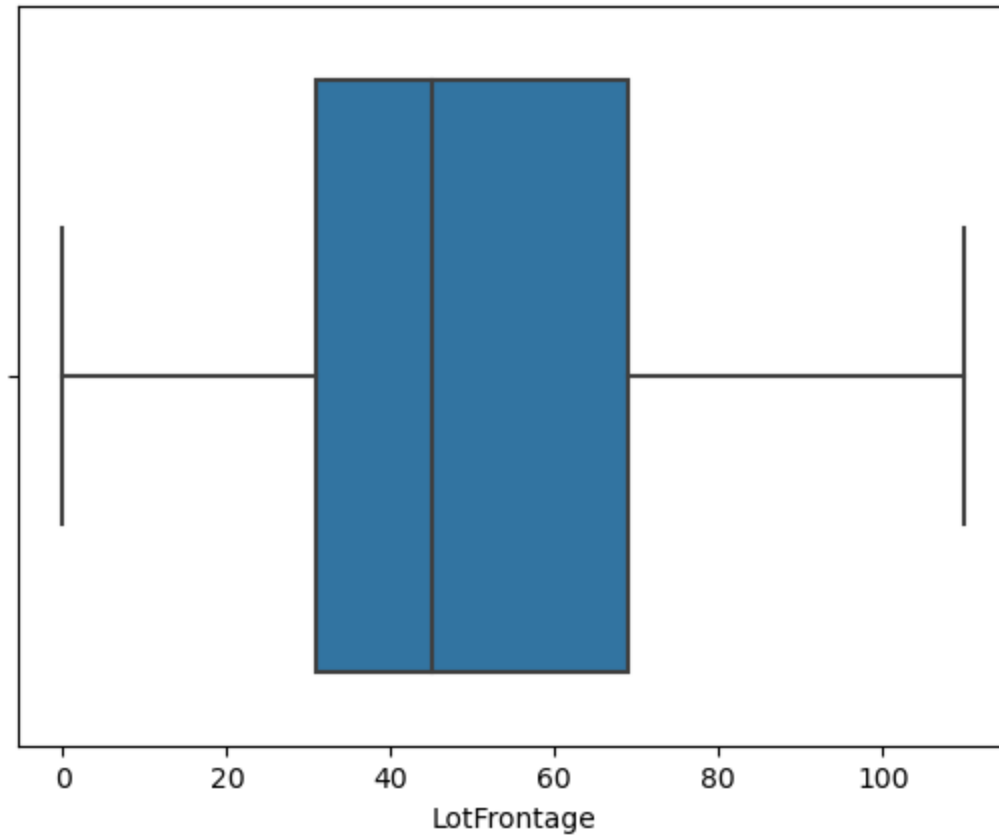
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



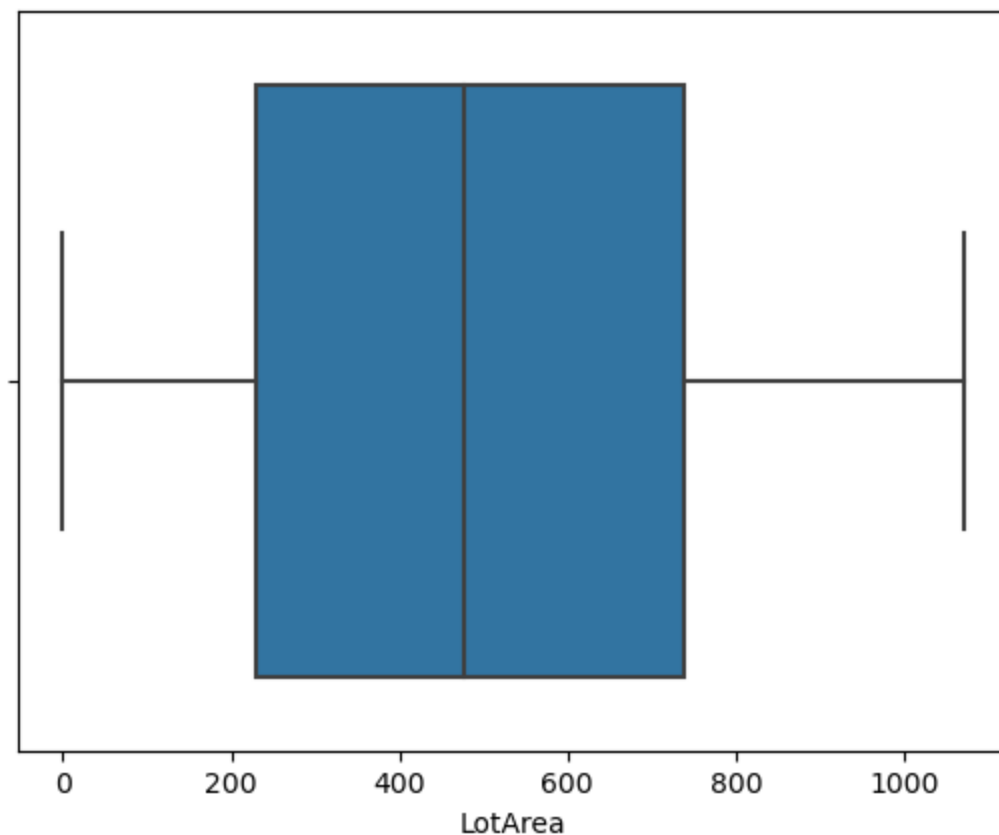
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
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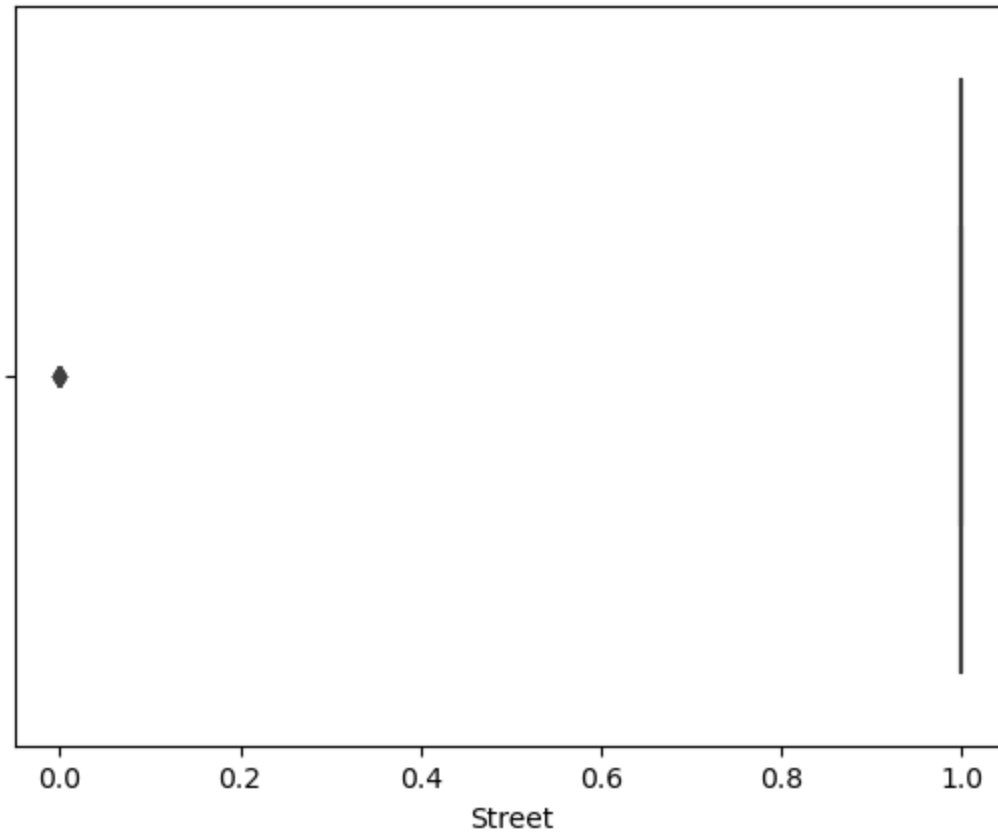


```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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```



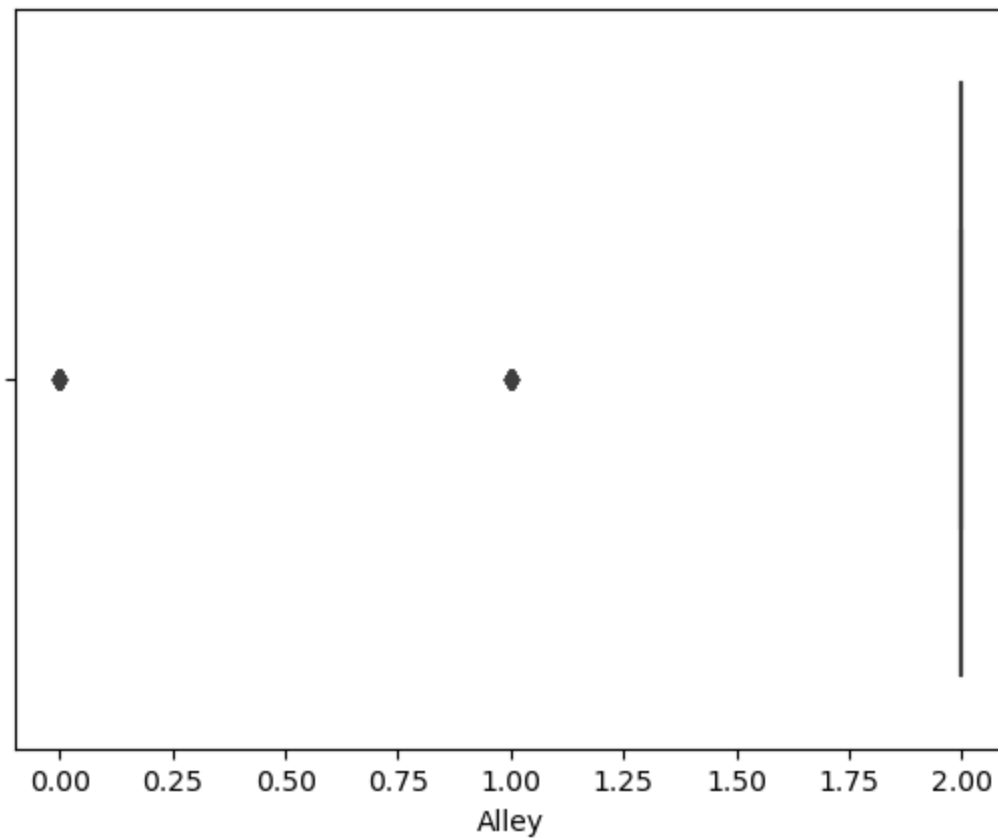
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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```
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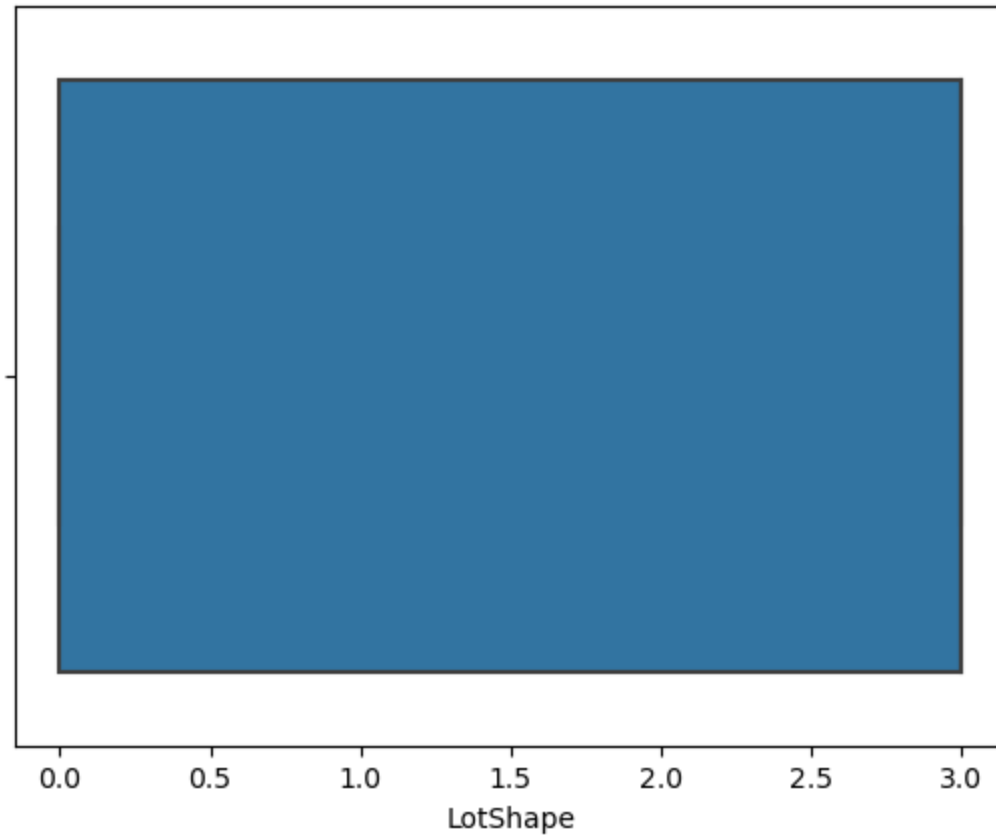
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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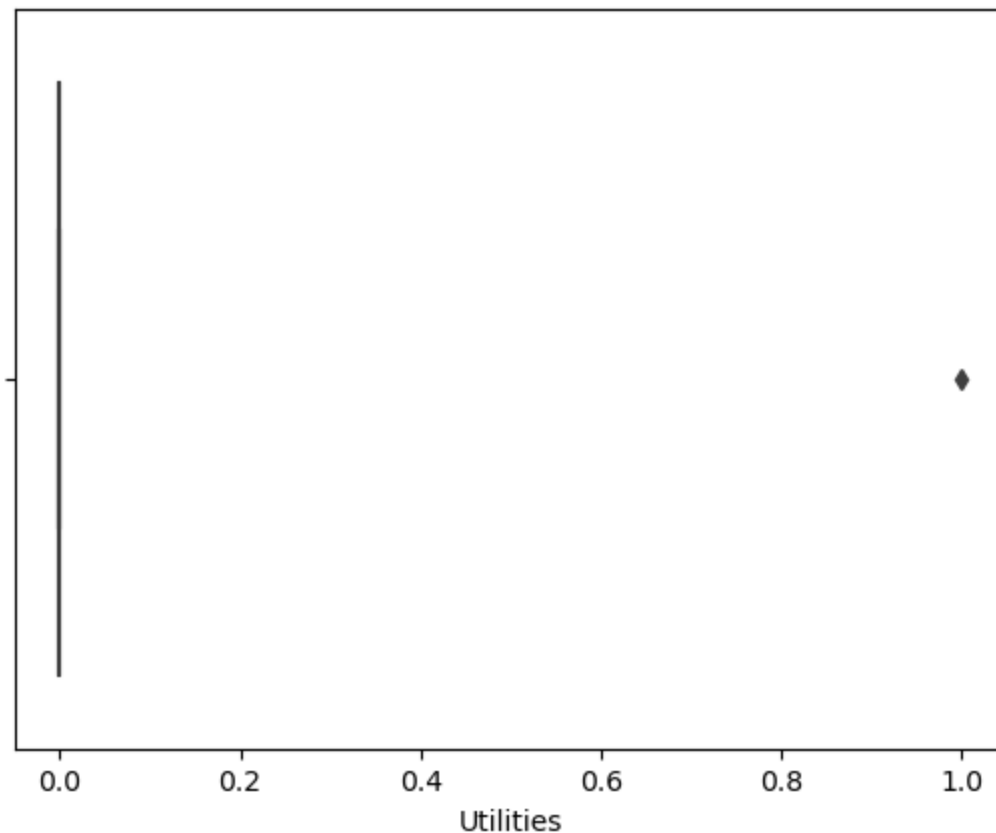
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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```
warnings.warn(
```

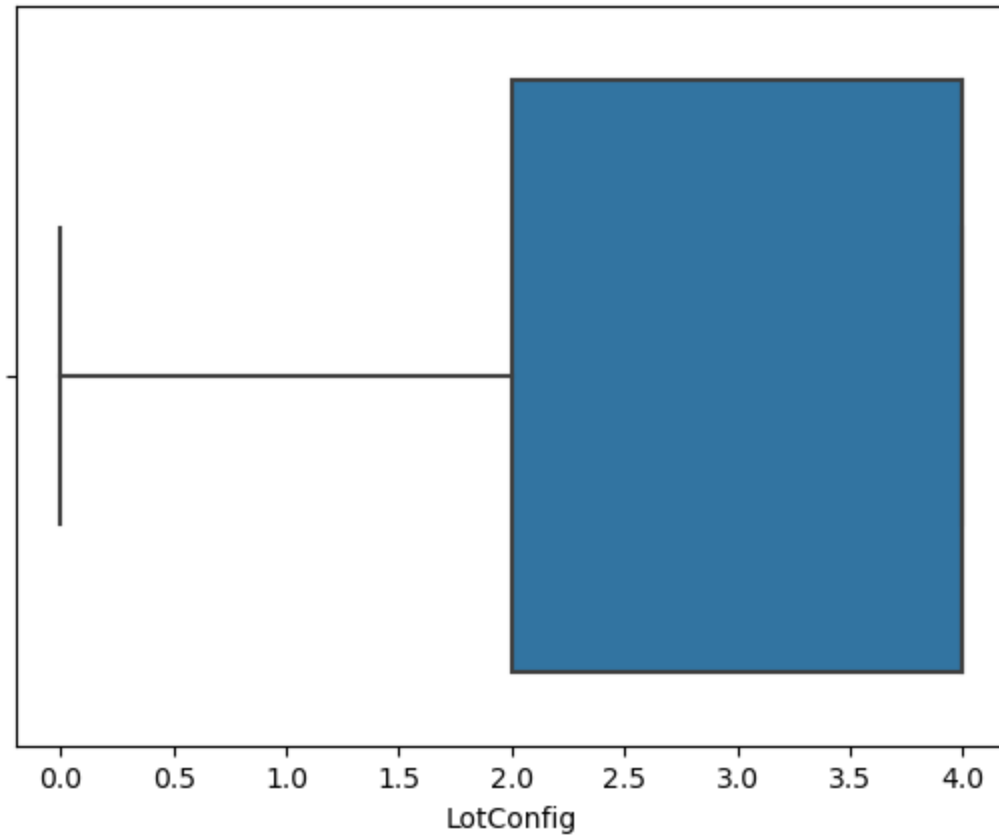


```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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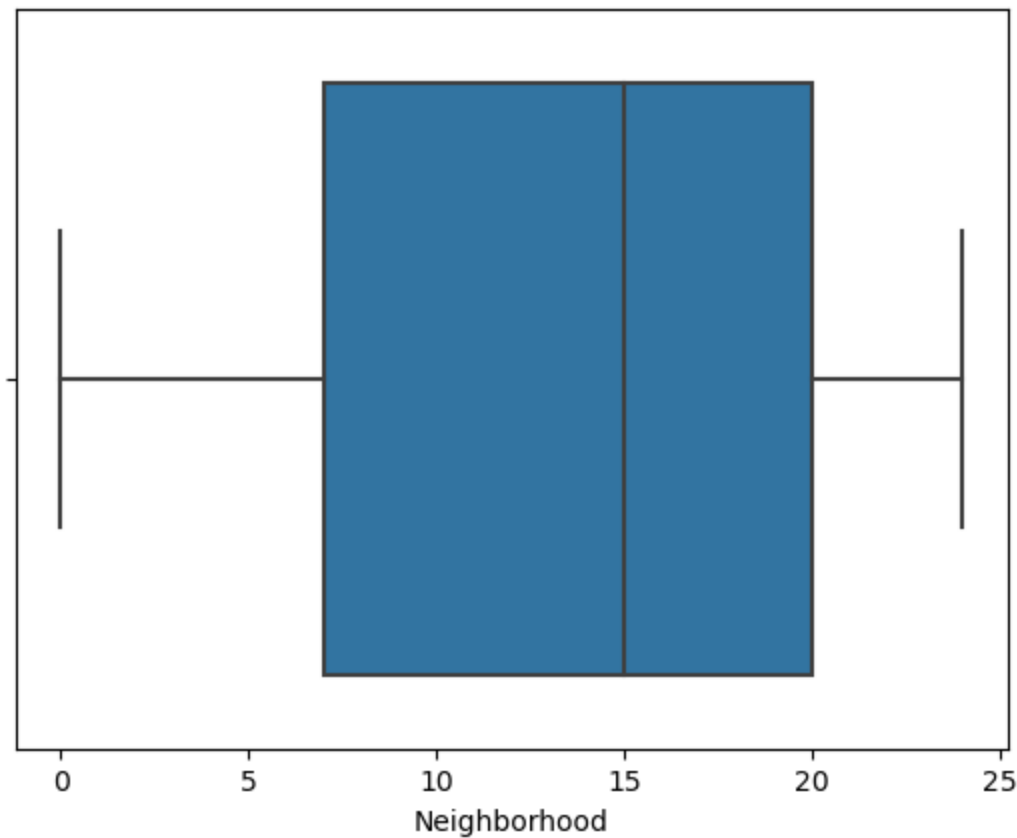
```
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```



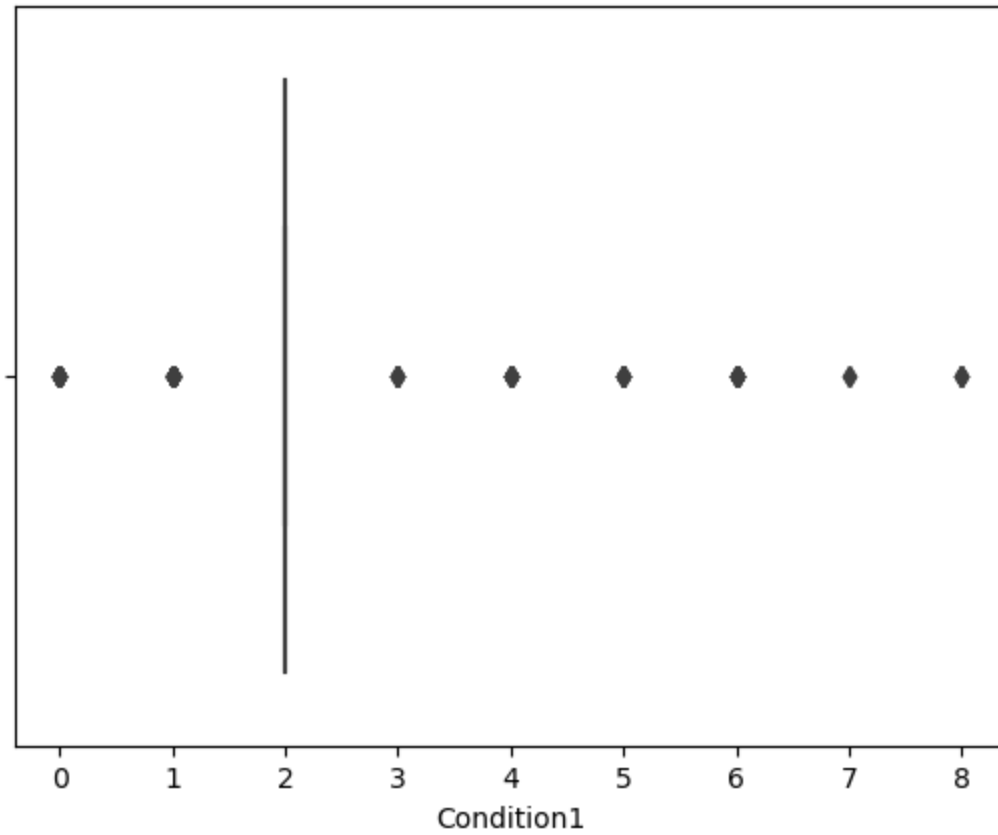
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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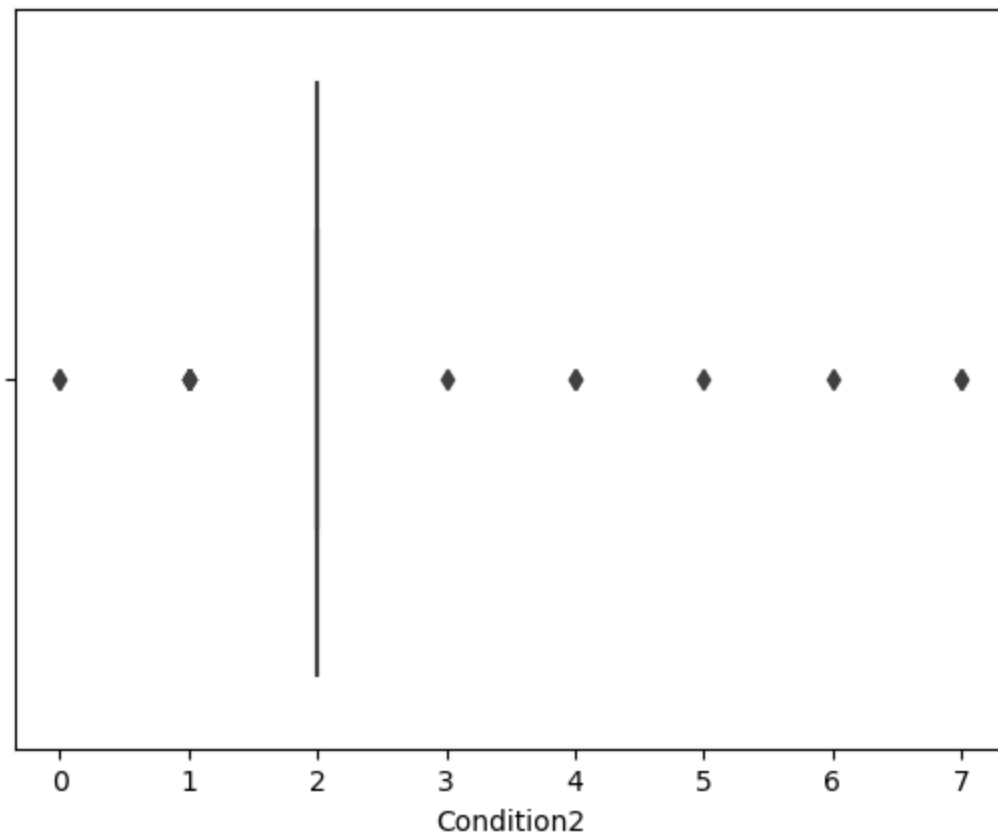
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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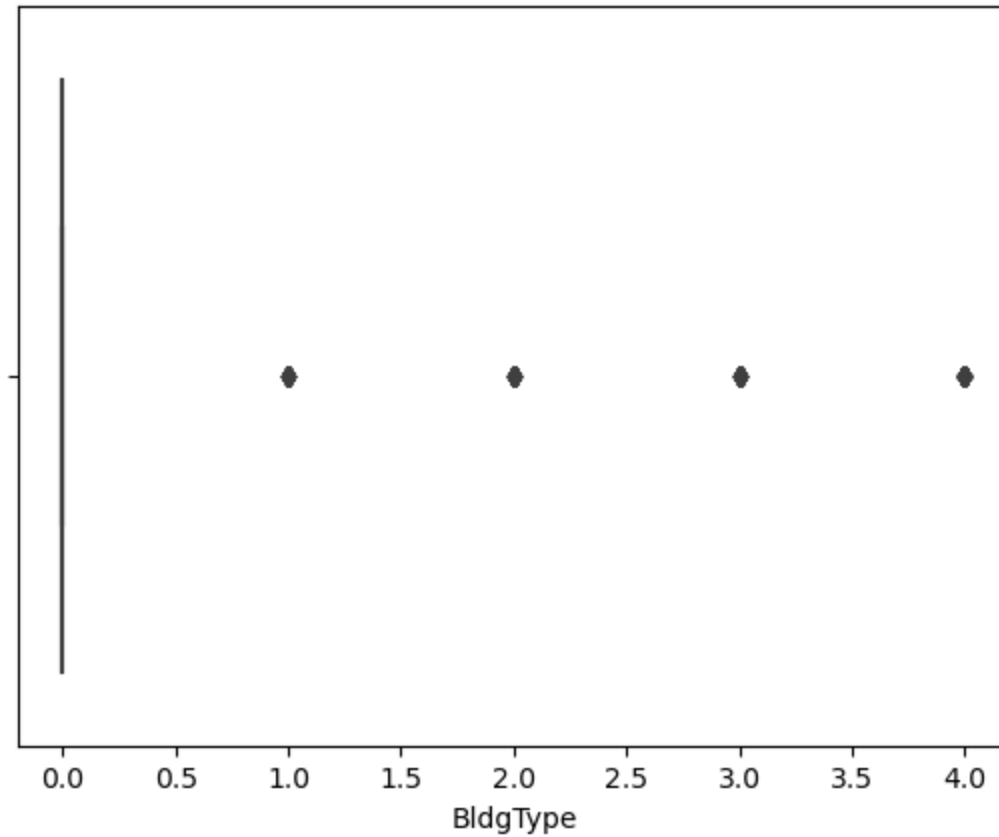
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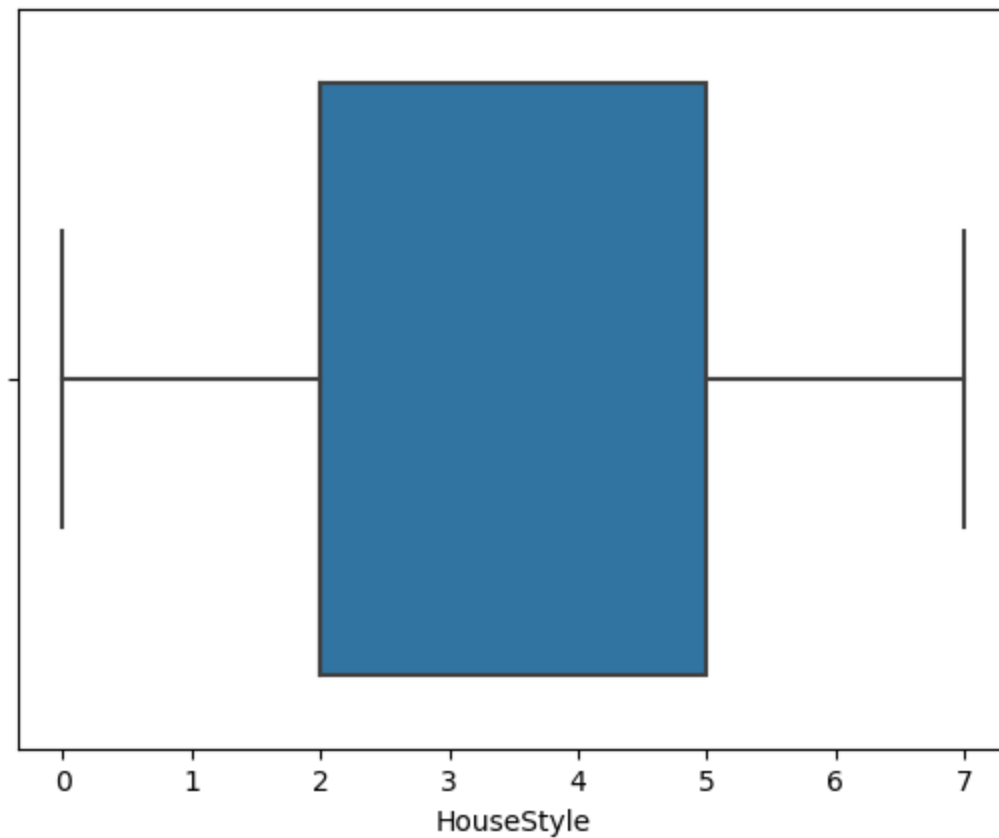
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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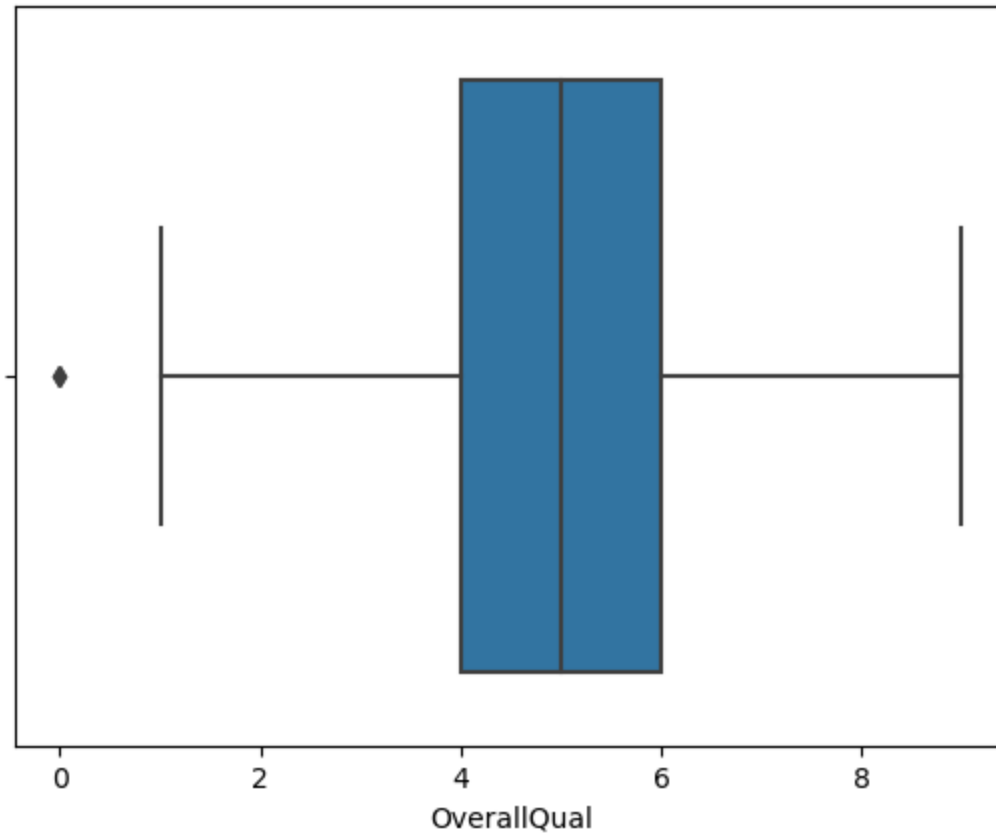
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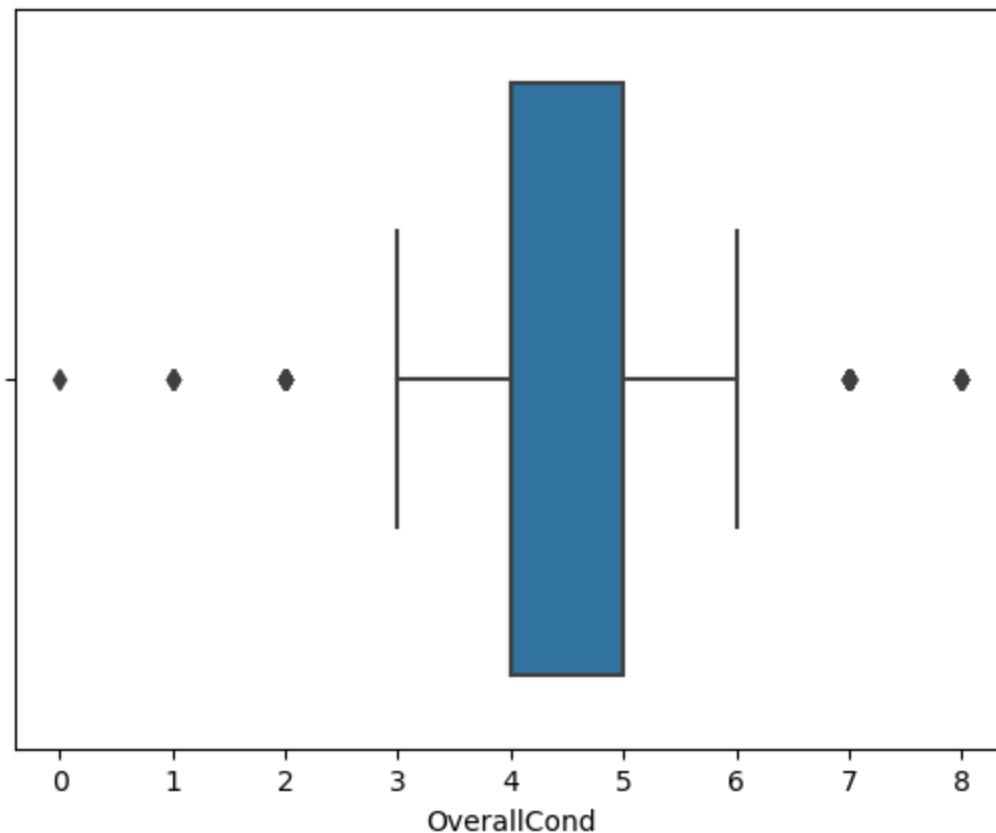
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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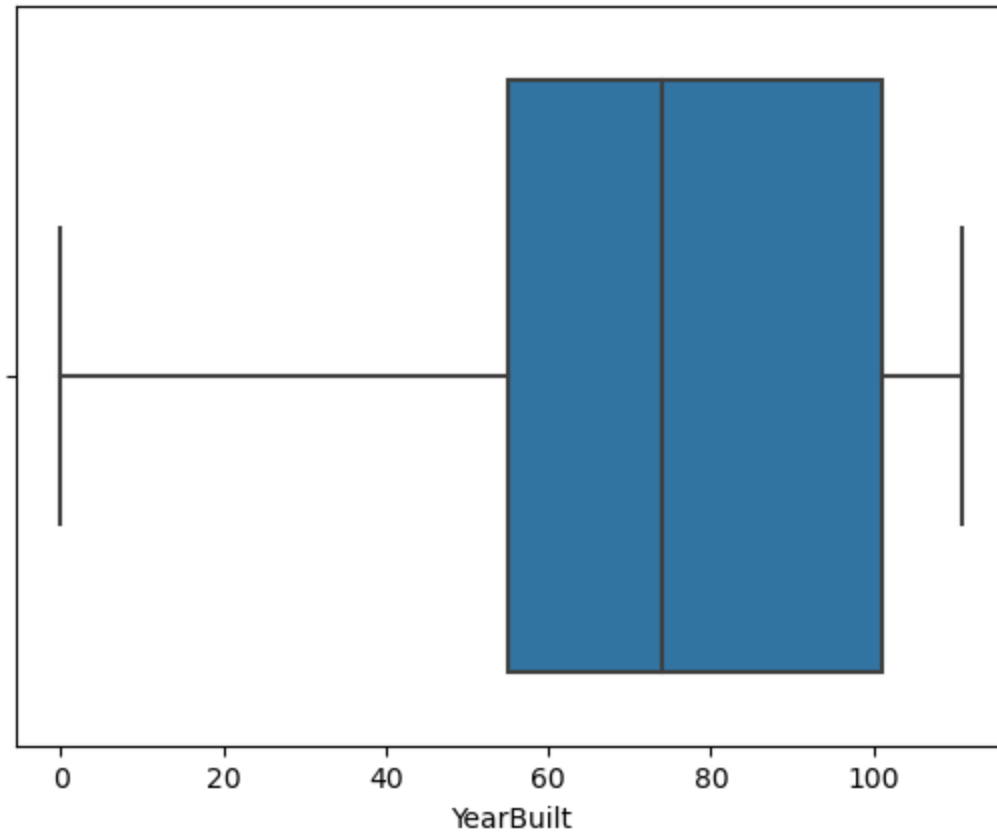
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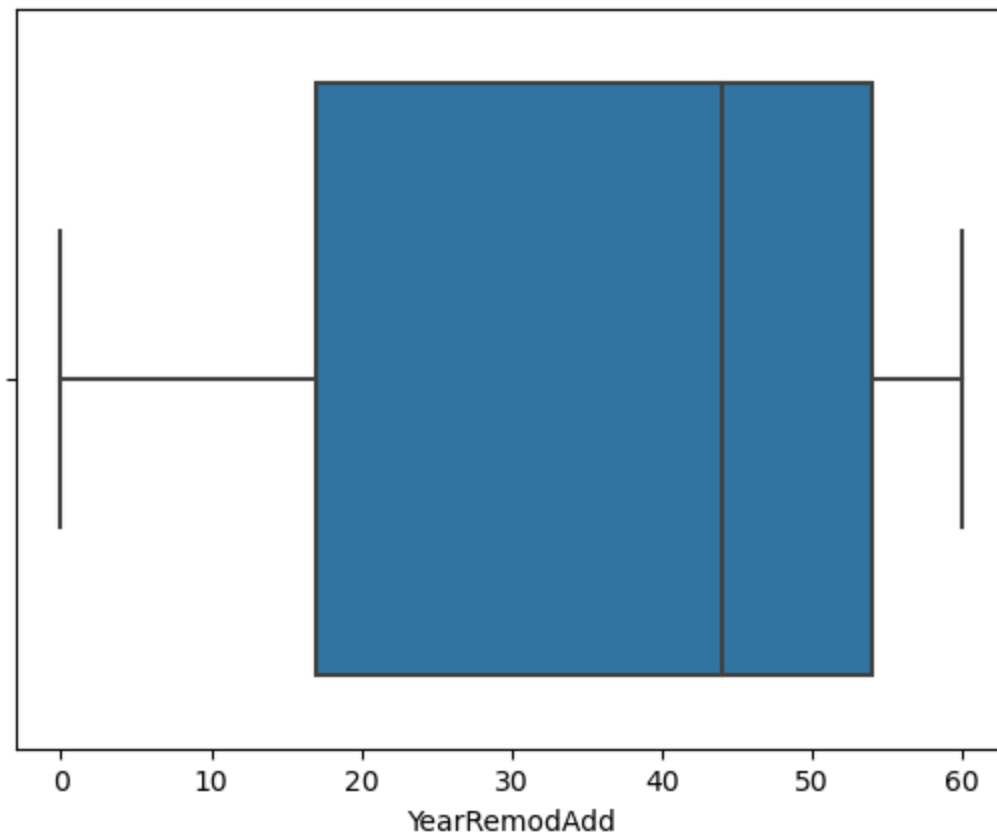
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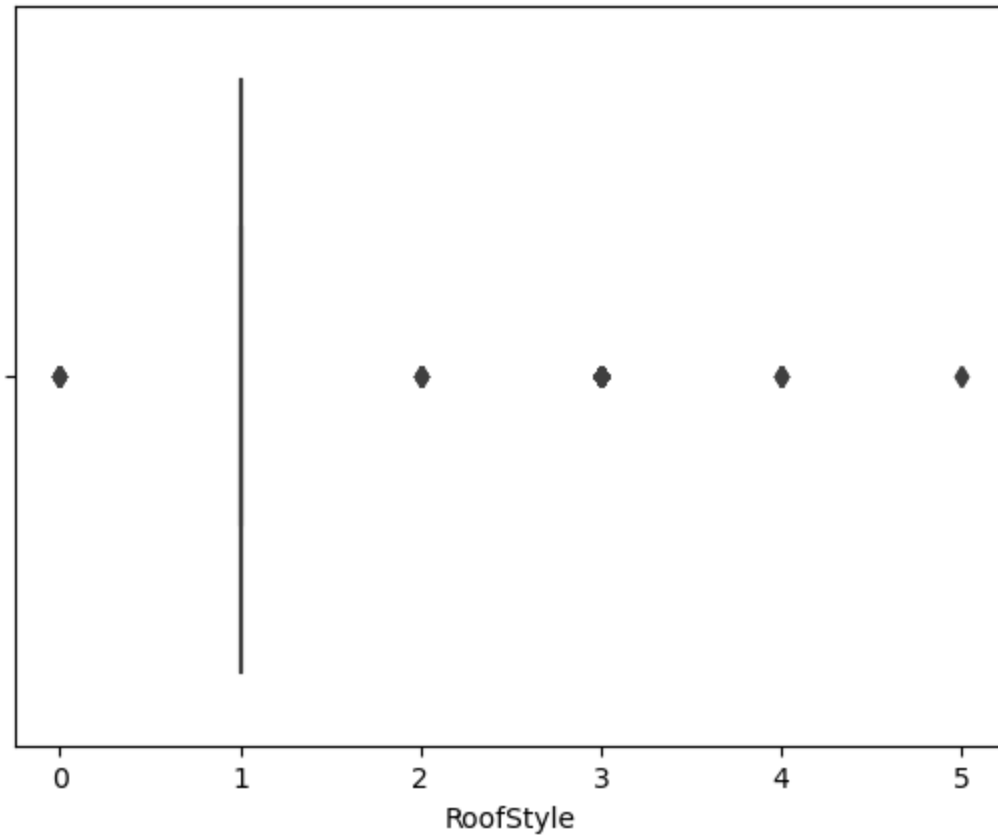

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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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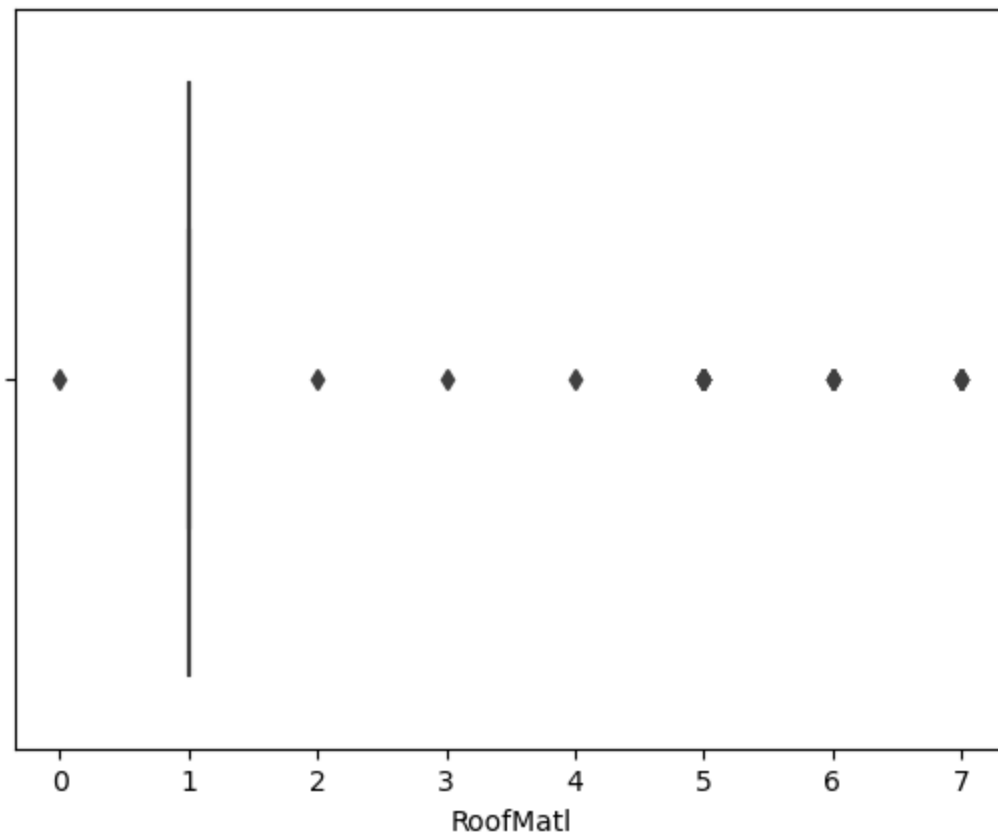
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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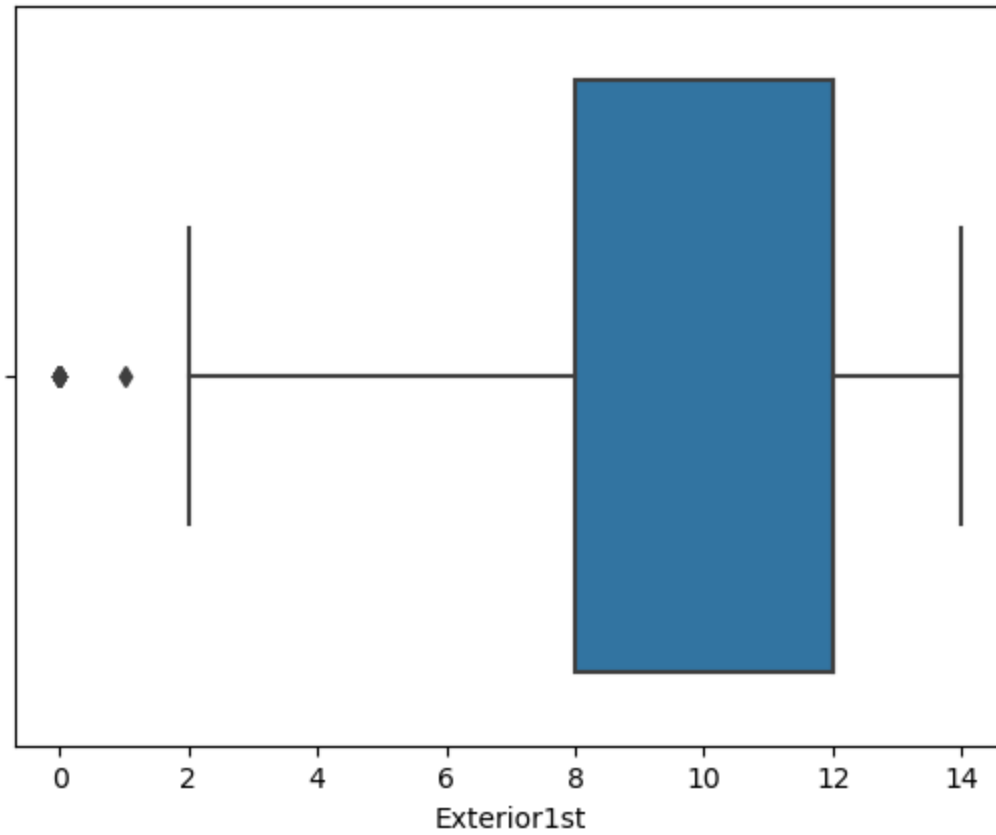
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
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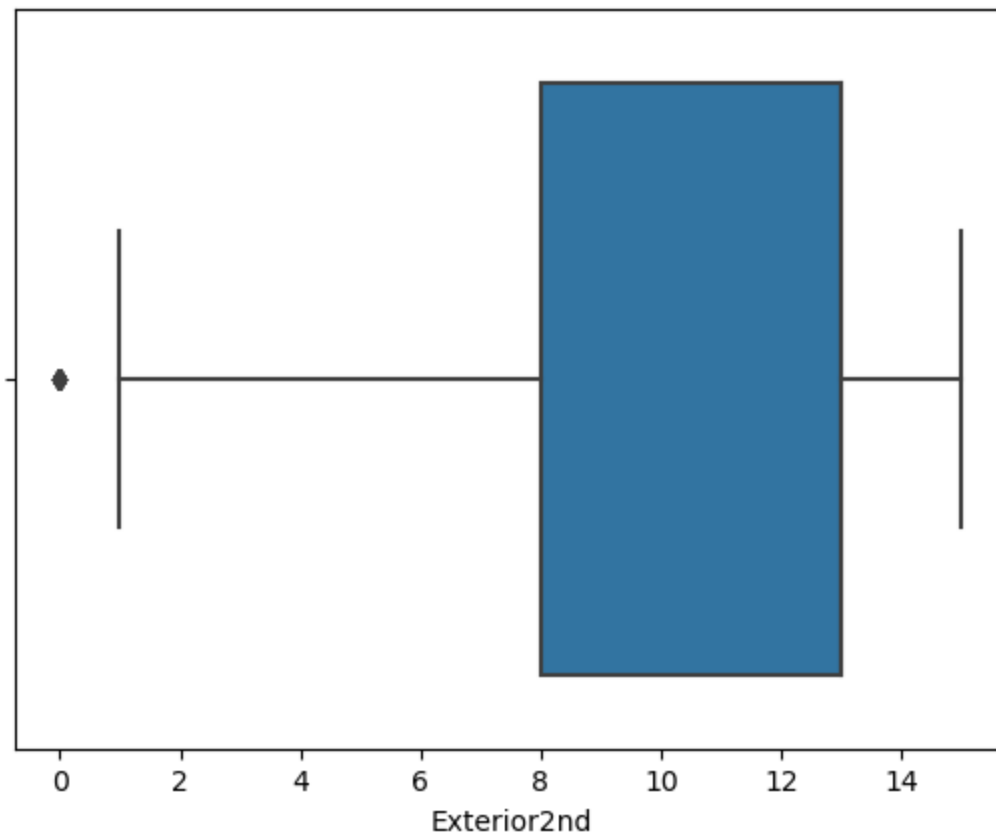
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
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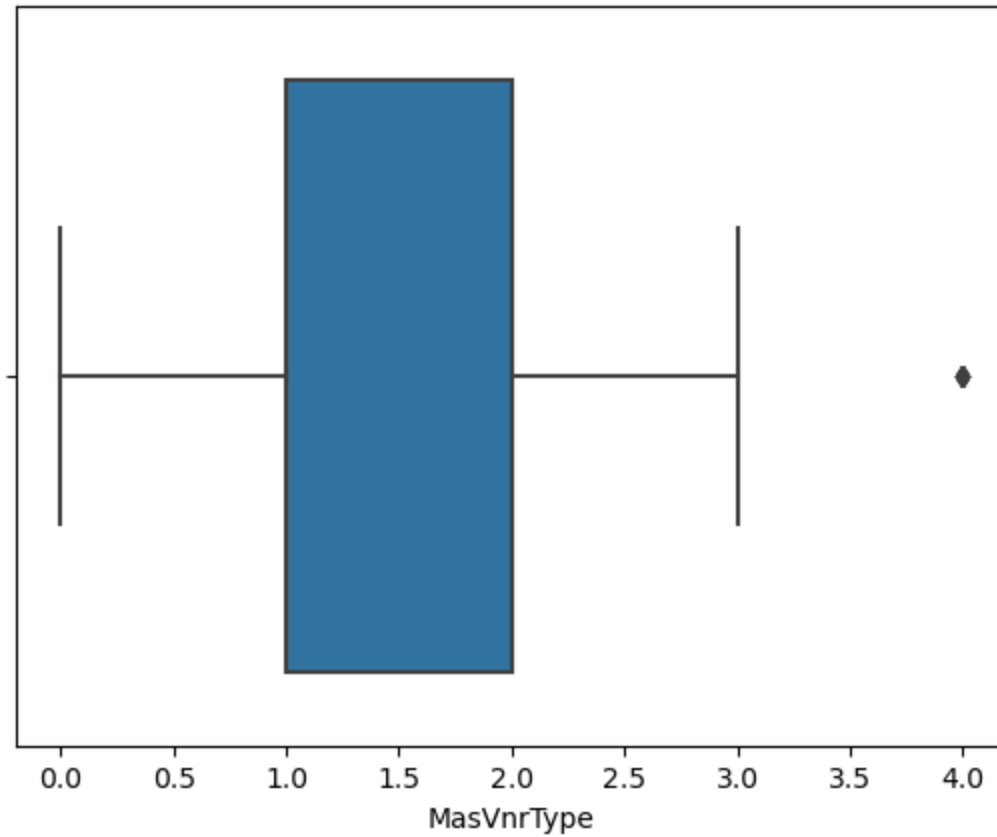
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
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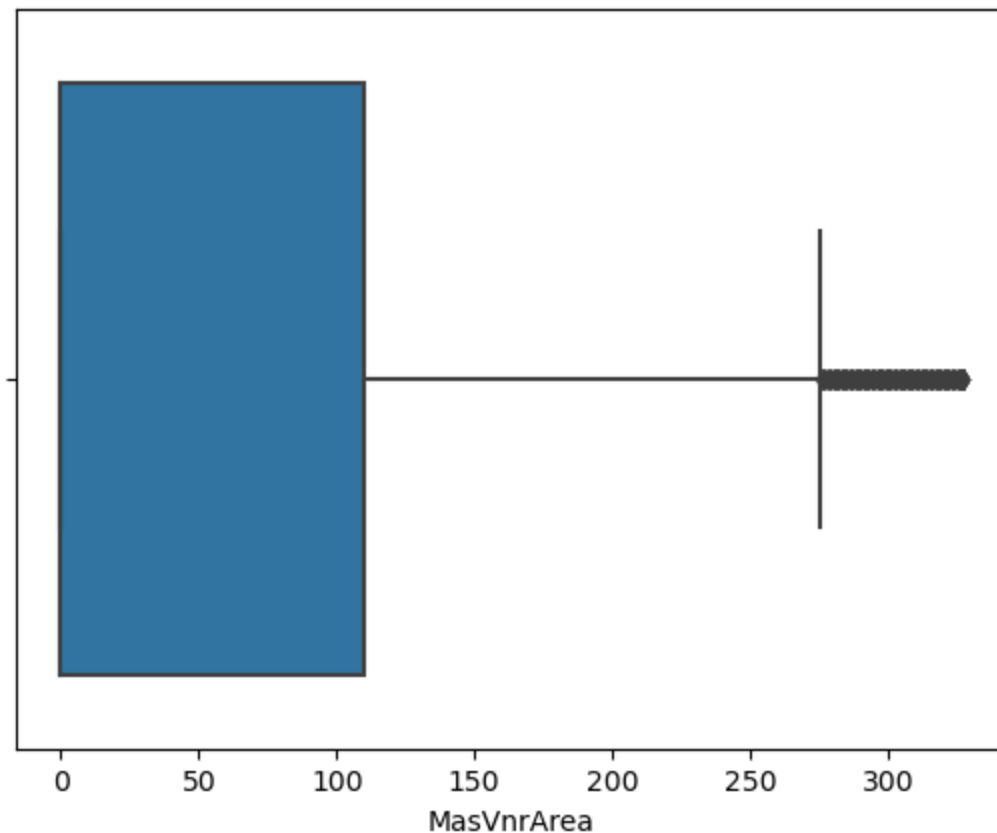
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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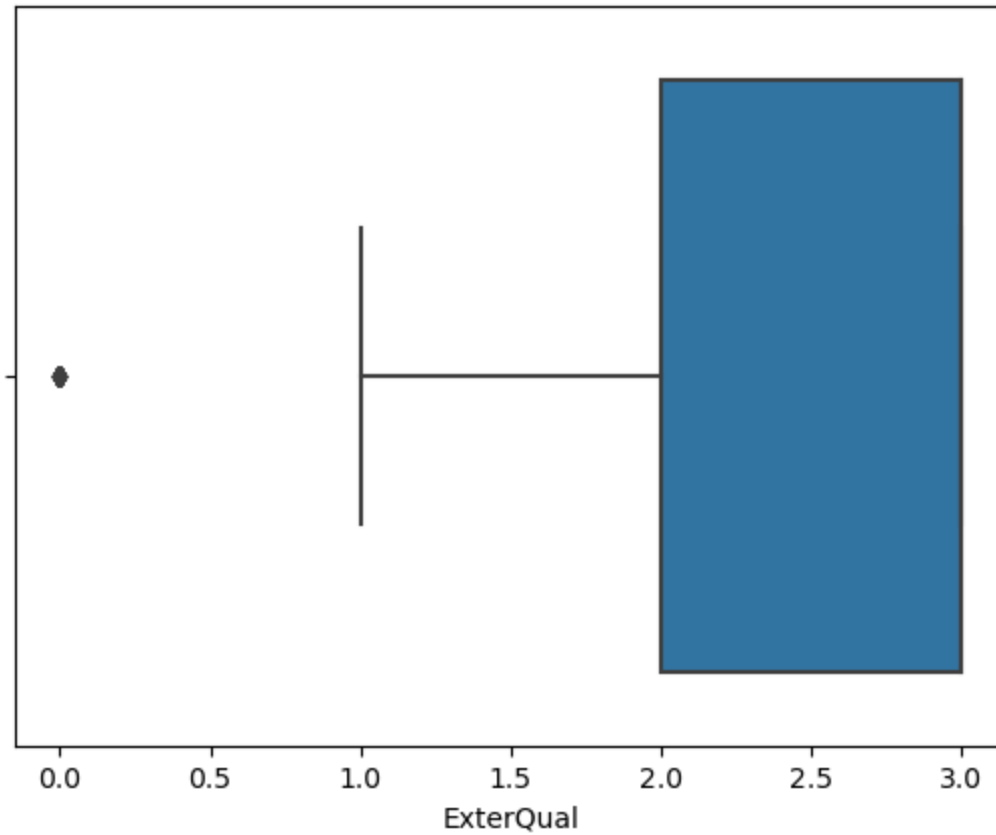
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



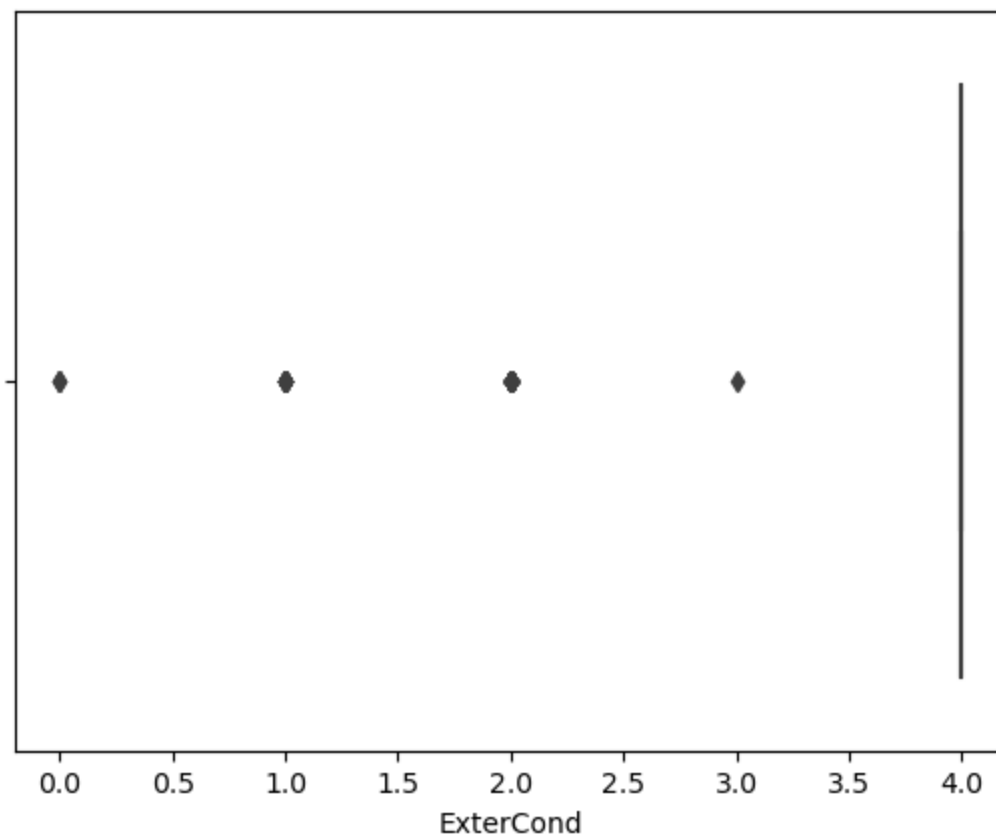
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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```



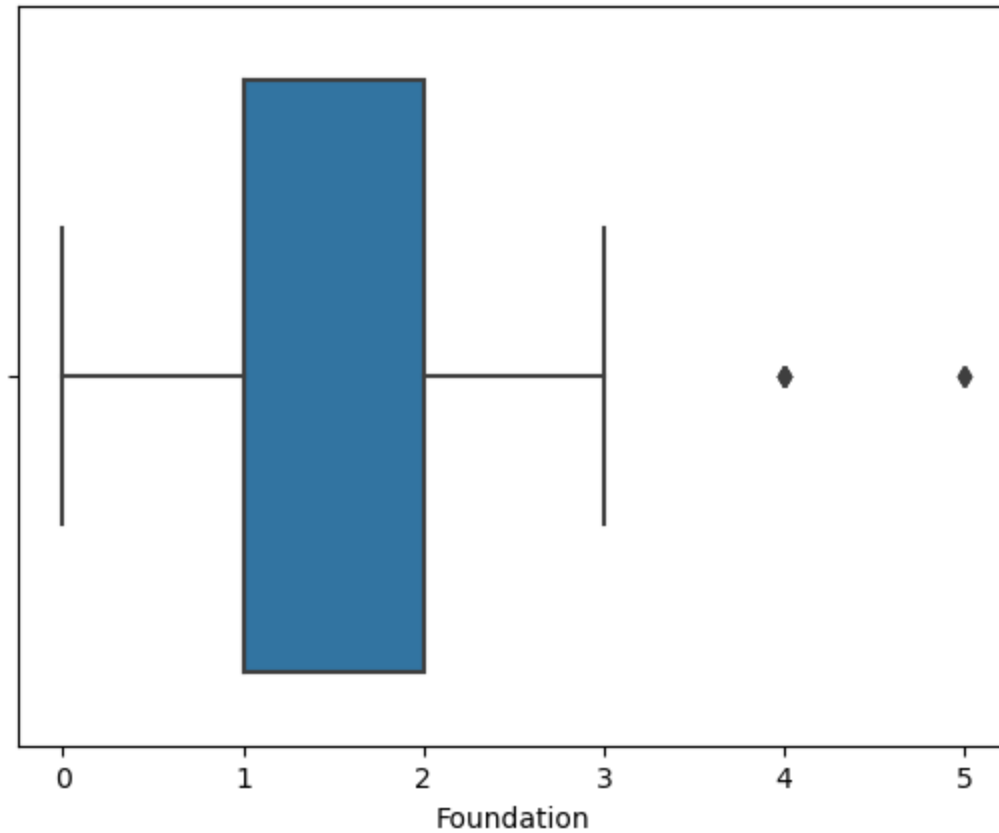
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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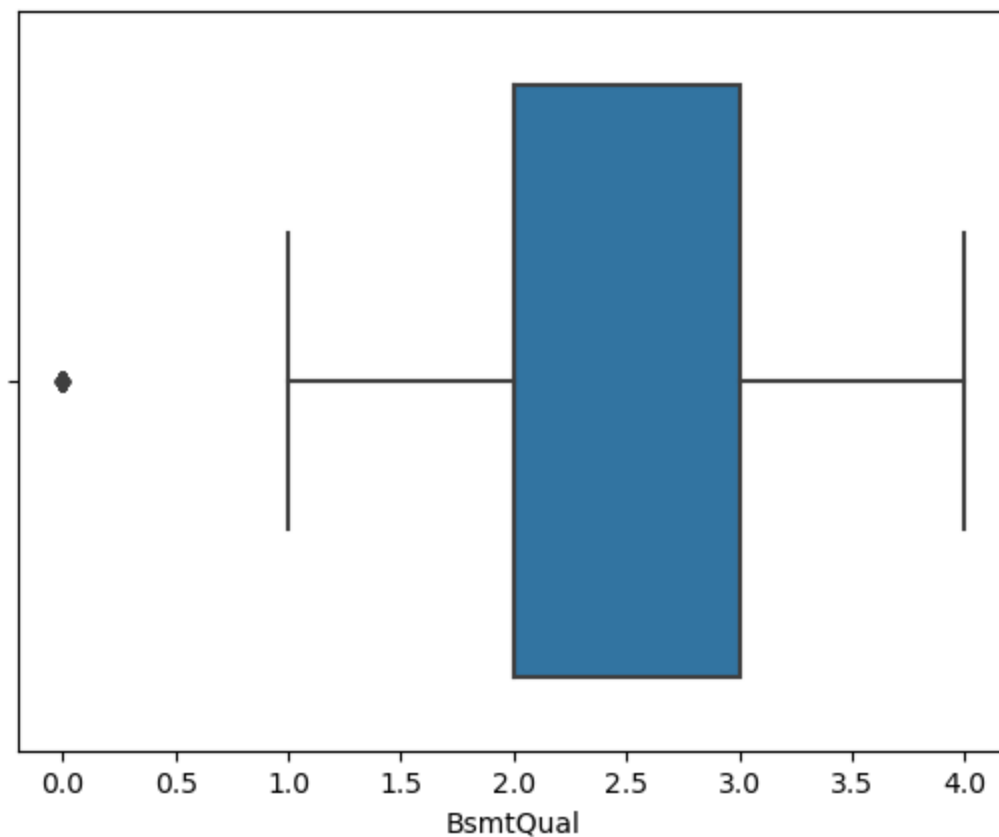
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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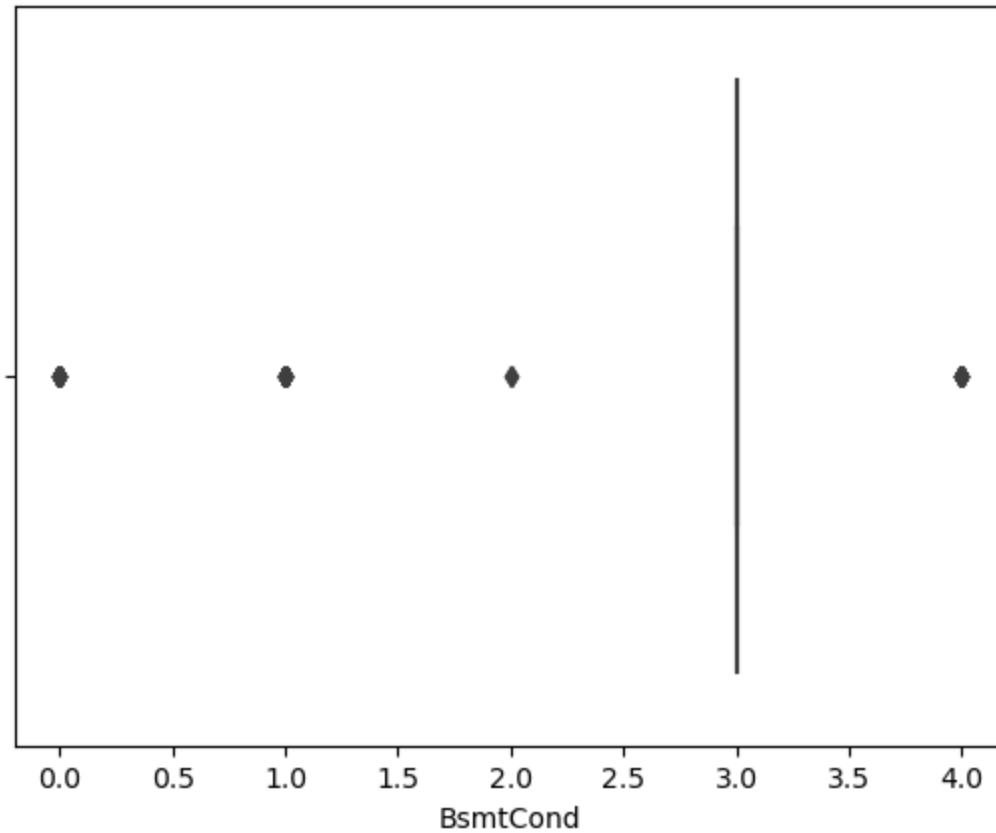
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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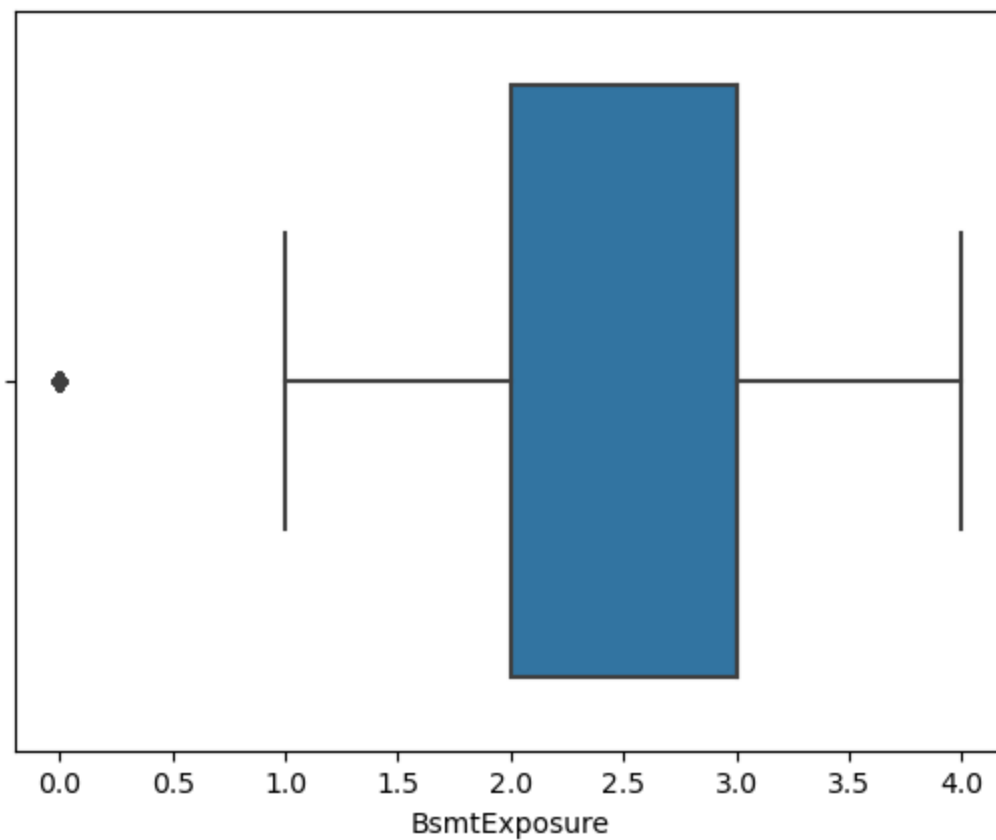
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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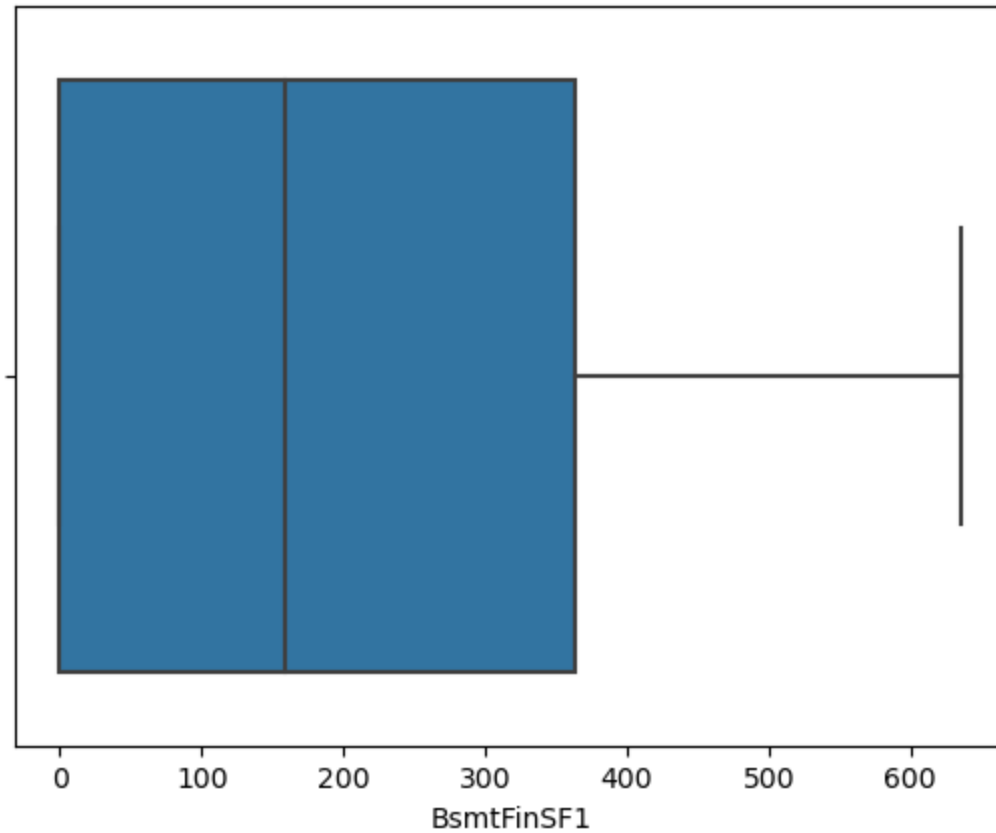
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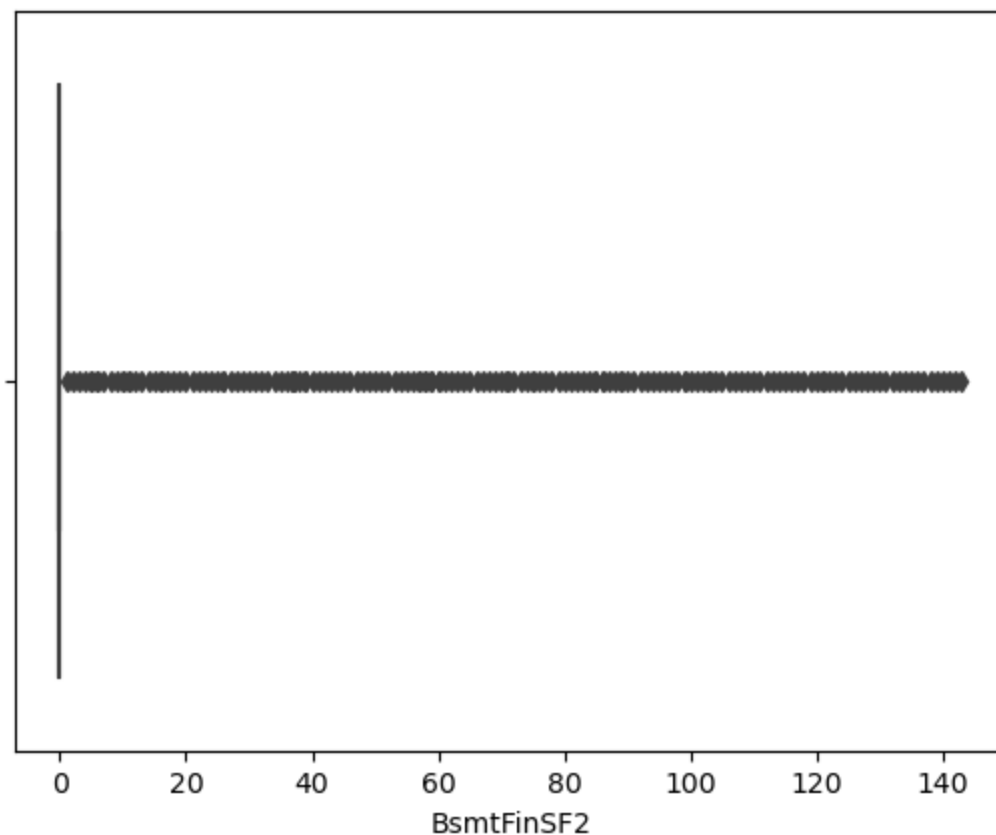
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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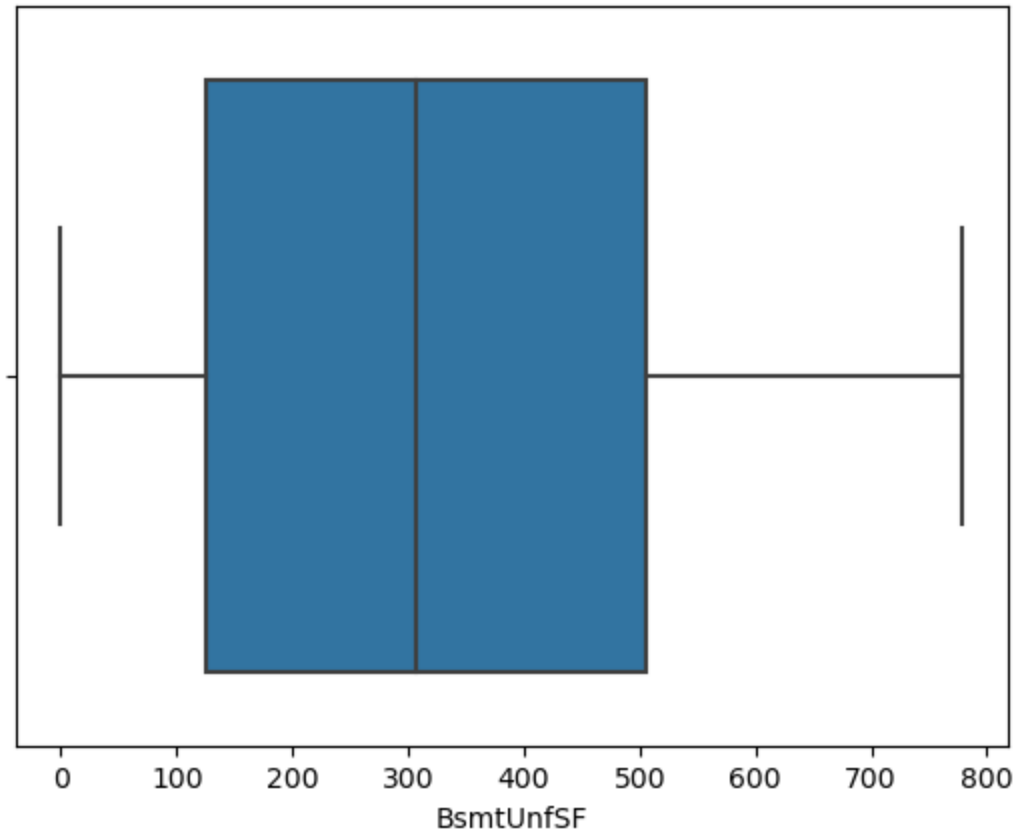
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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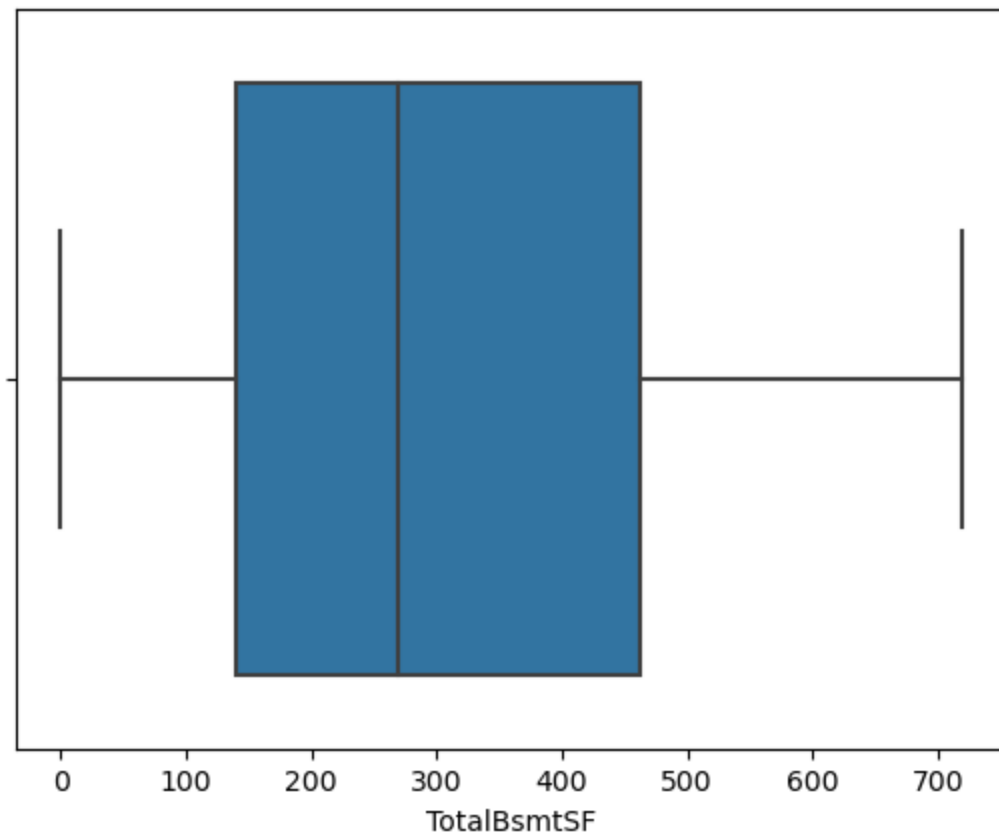
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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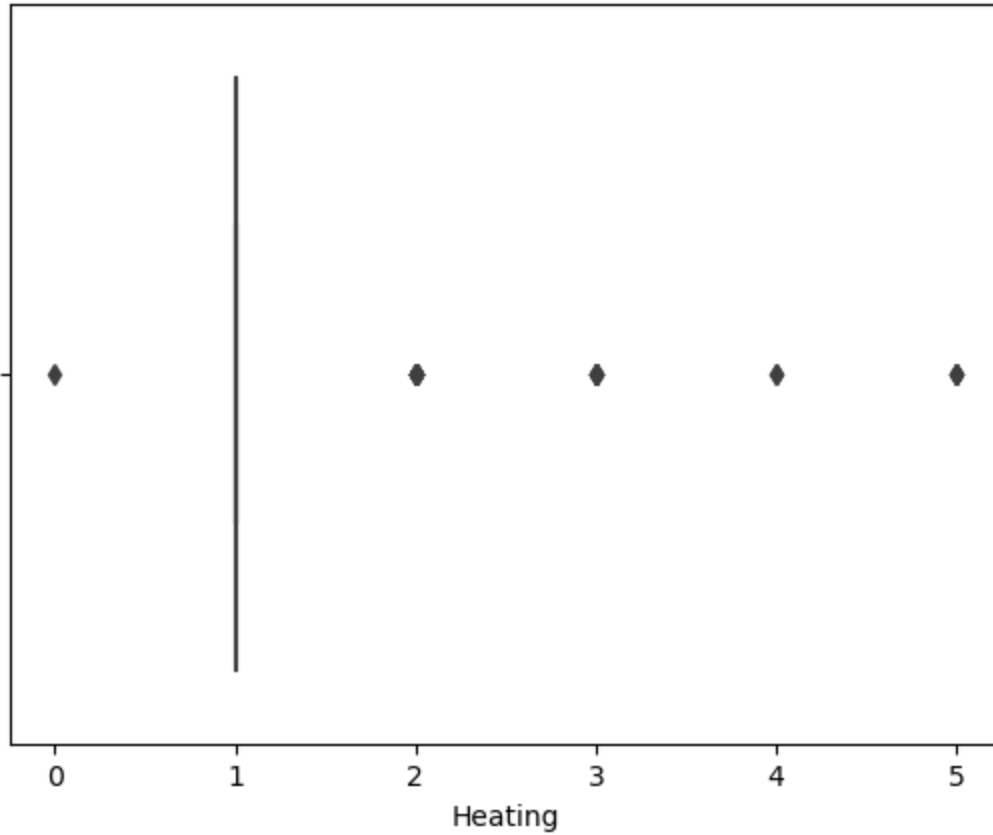

```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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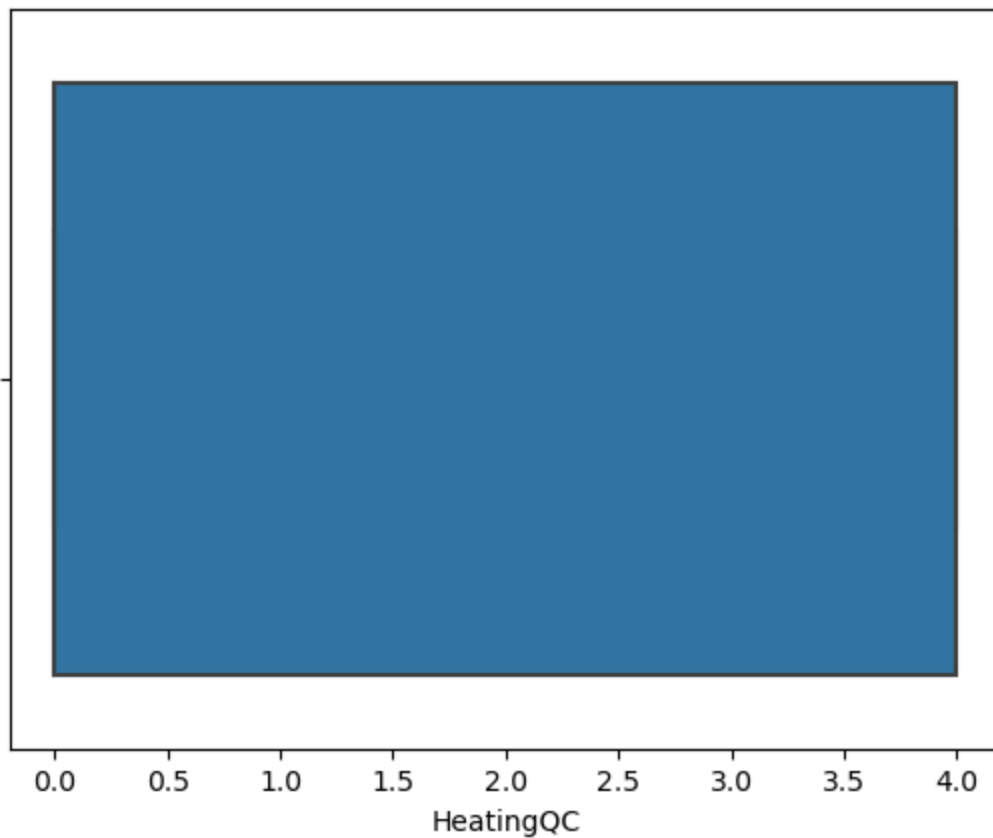
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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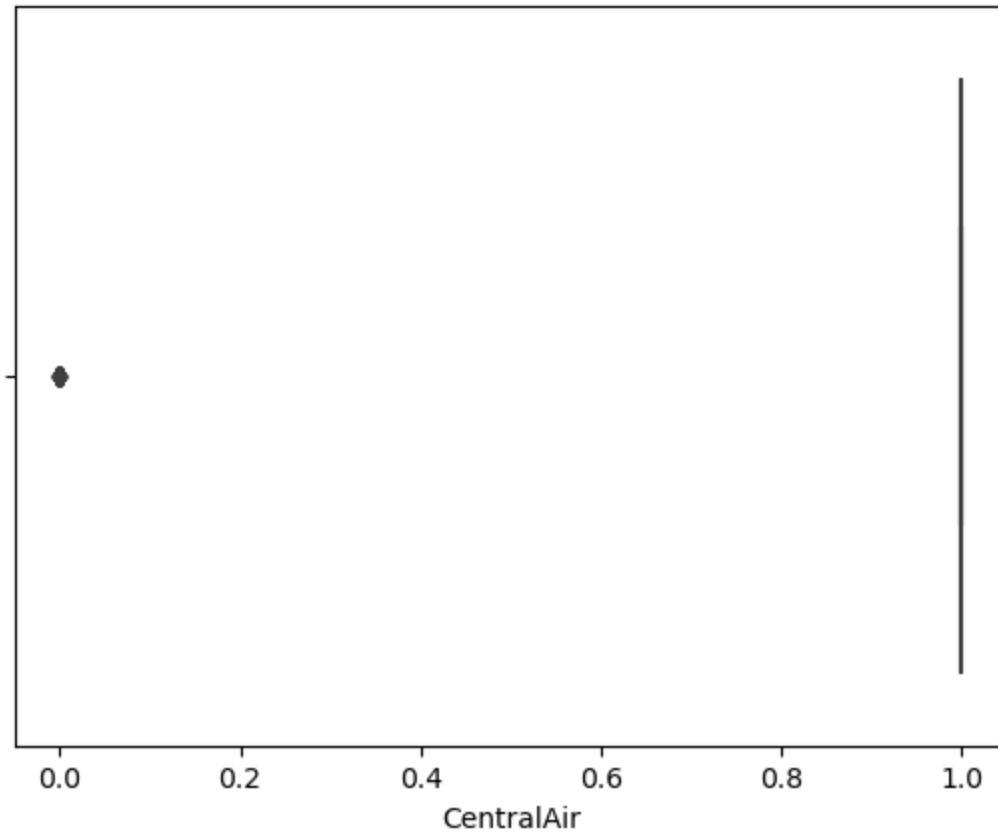
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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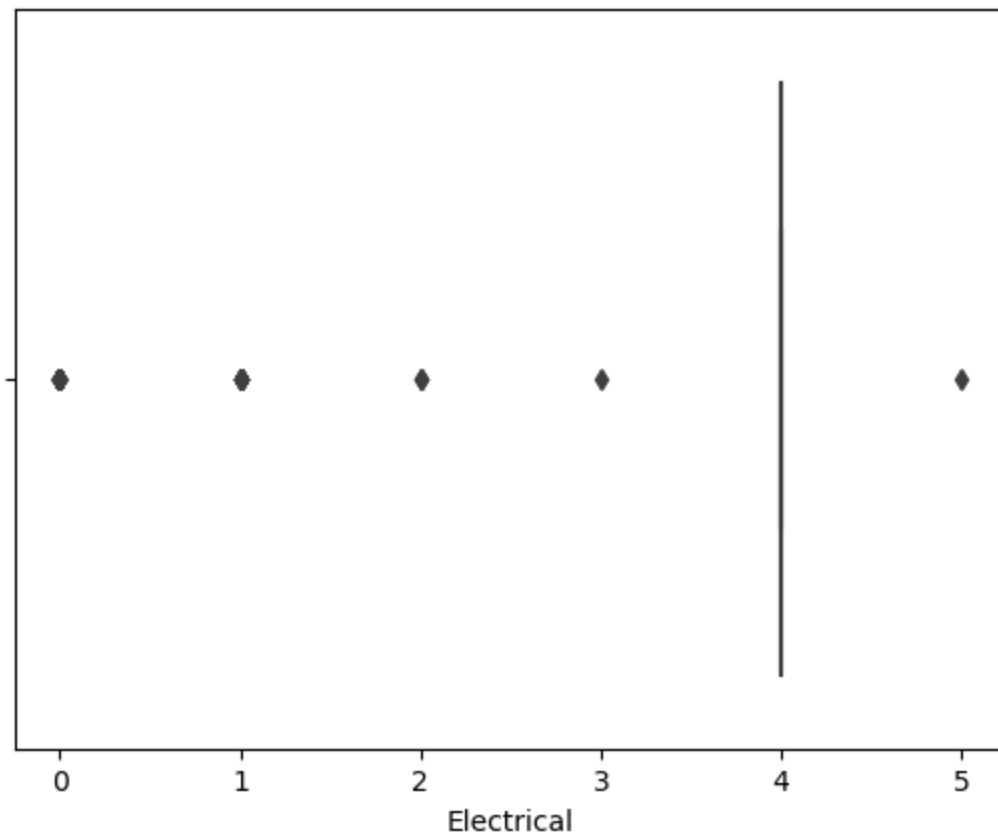
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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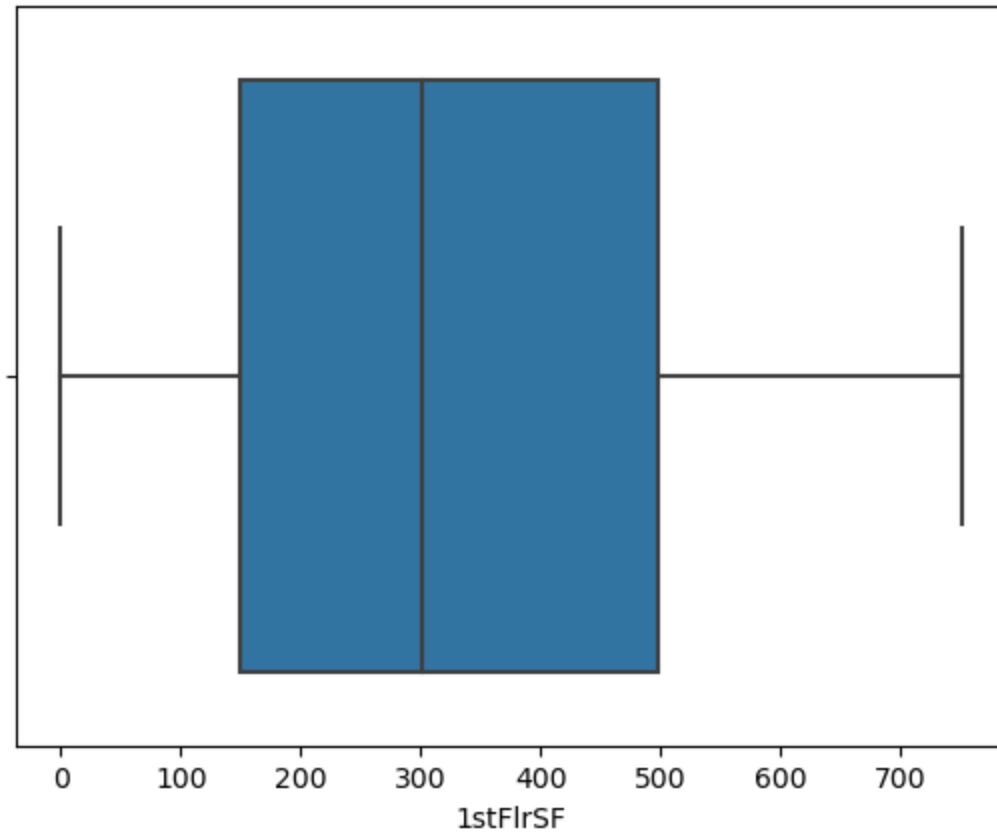
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
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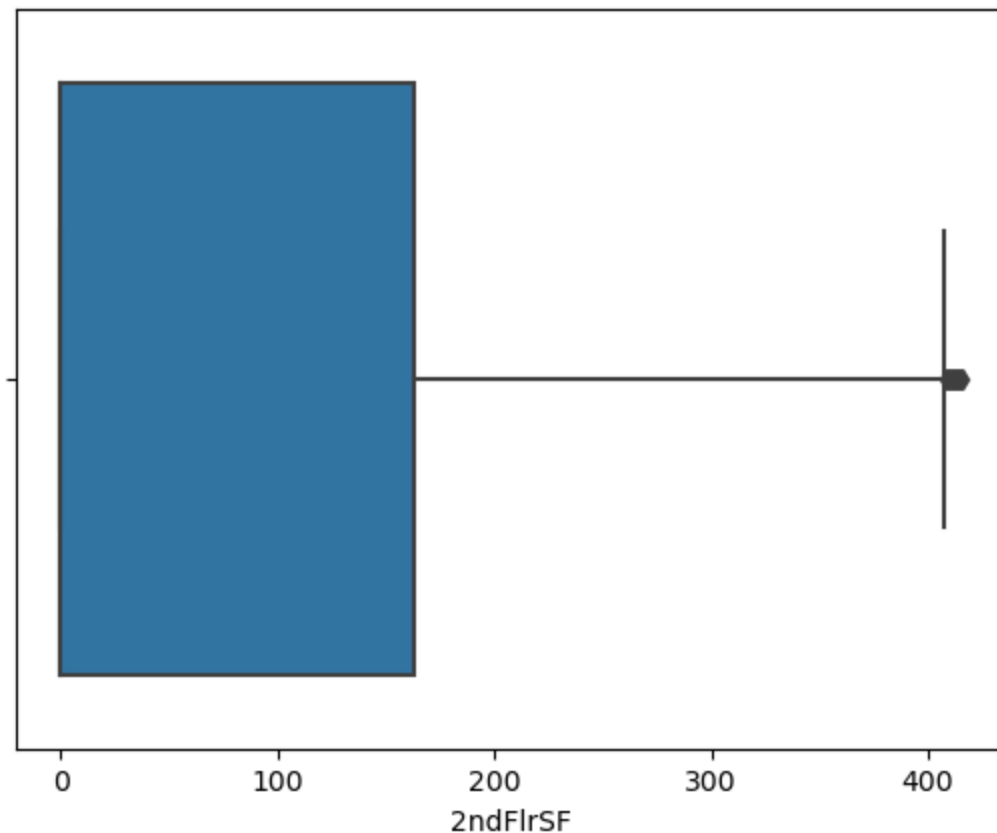
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



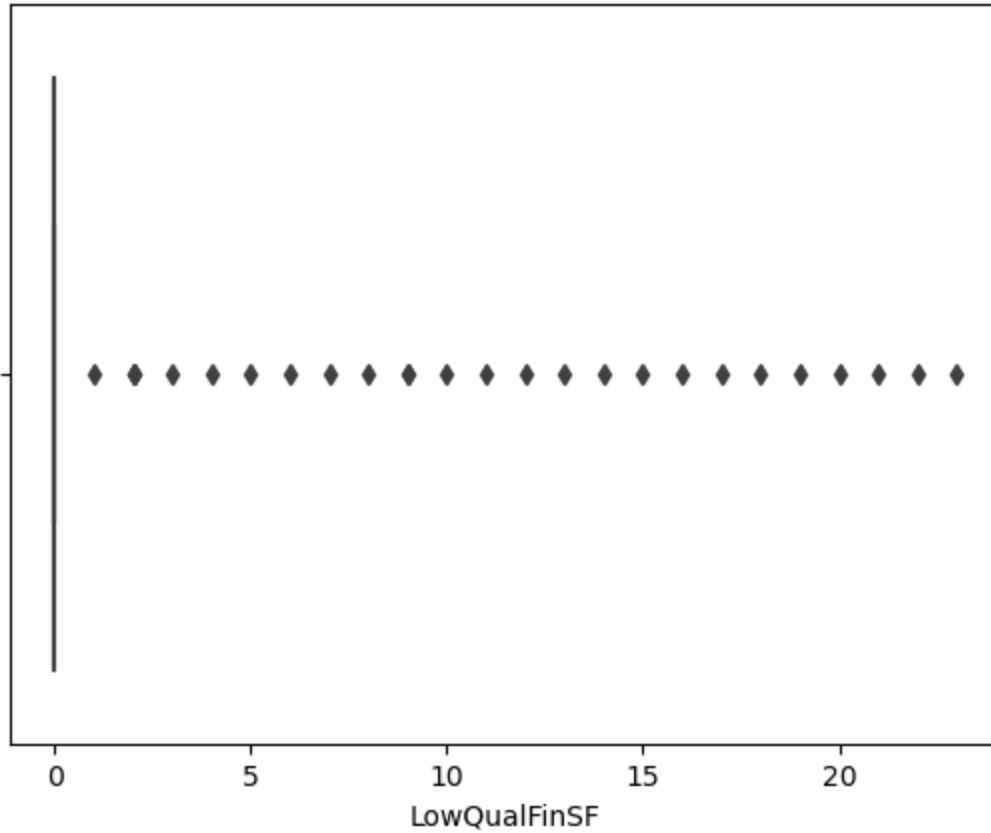
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
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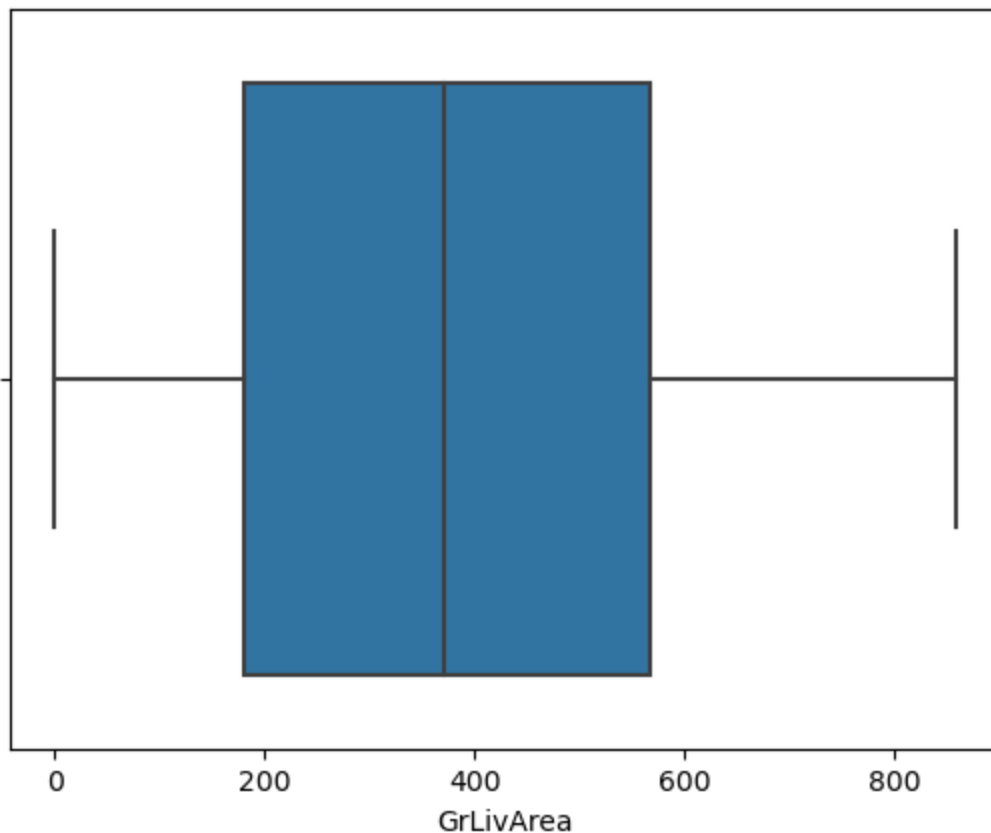
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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```

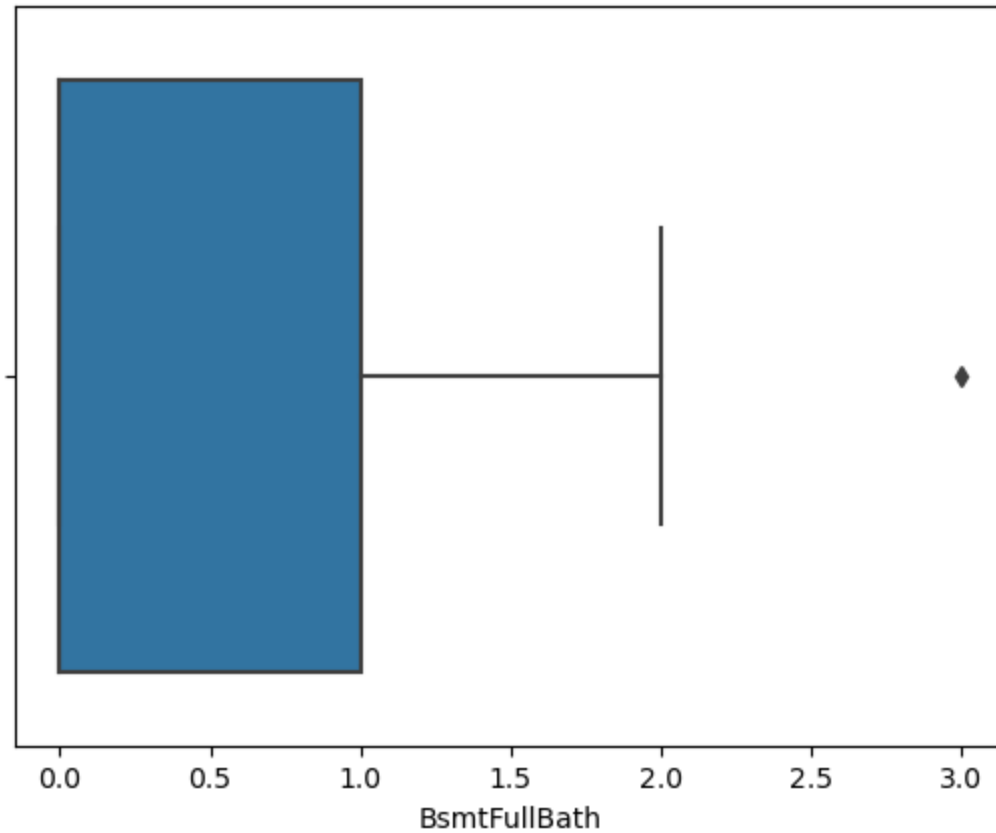


```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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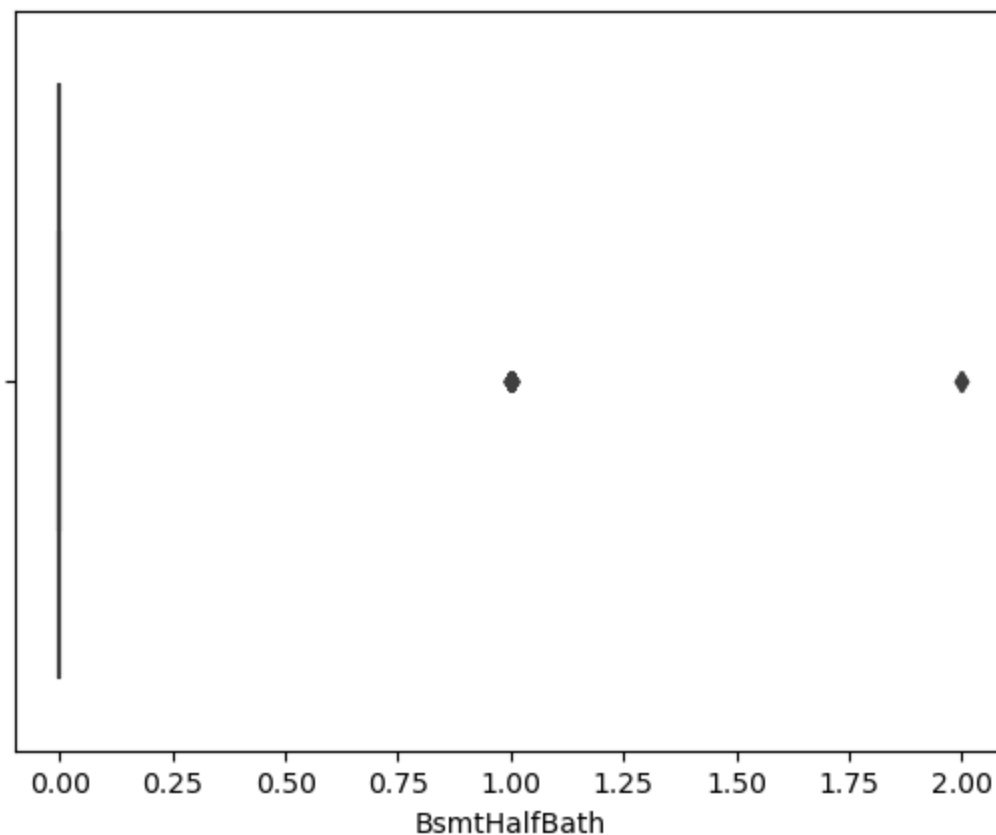
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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```
warnings.warn(
```



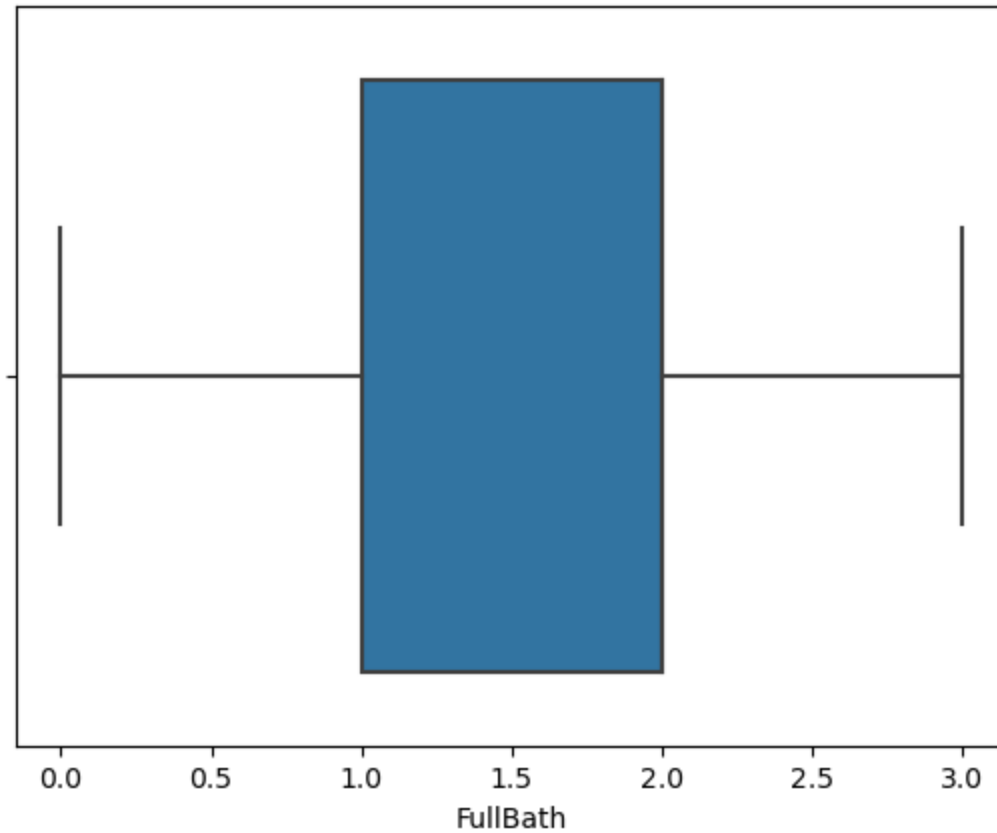
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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```
warnings.warn(
```



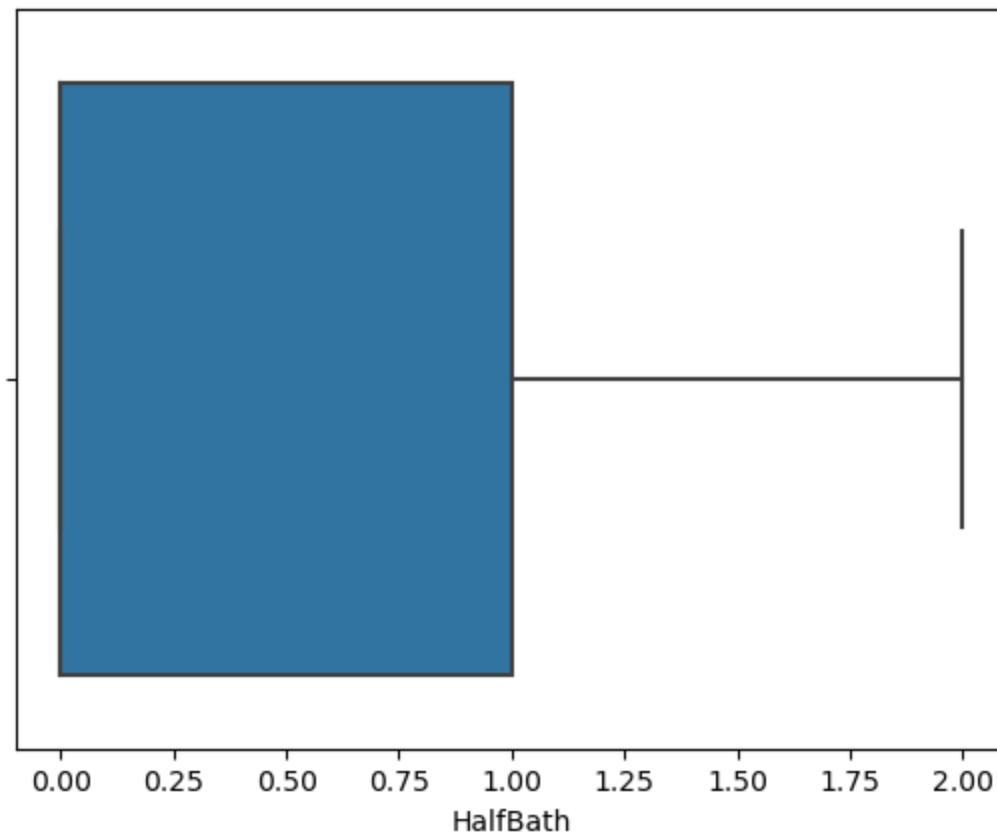
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
```

```
warnings.warn(
```

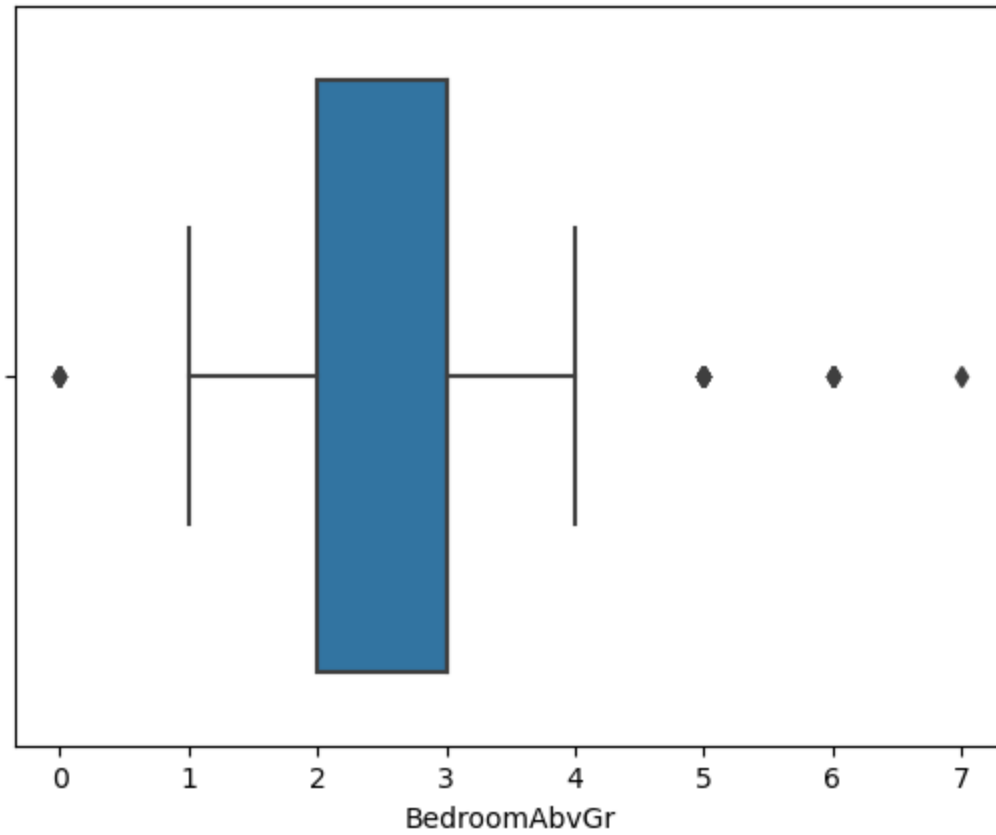


```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
```

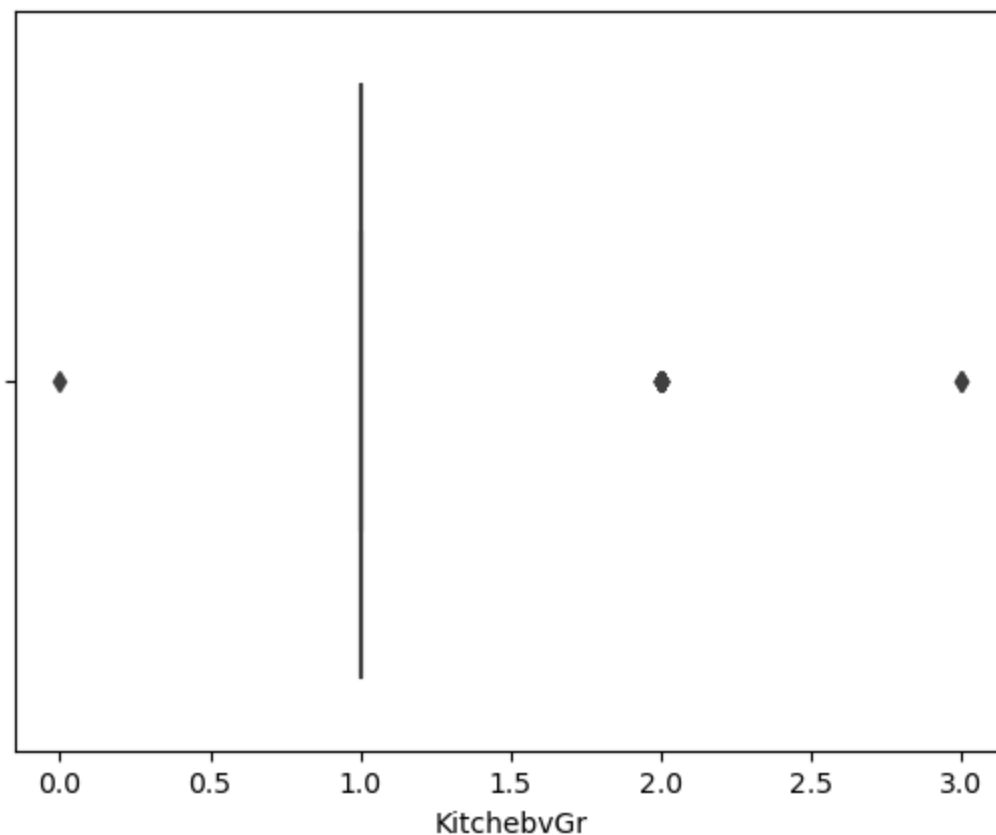
```
warnings.warn(
```



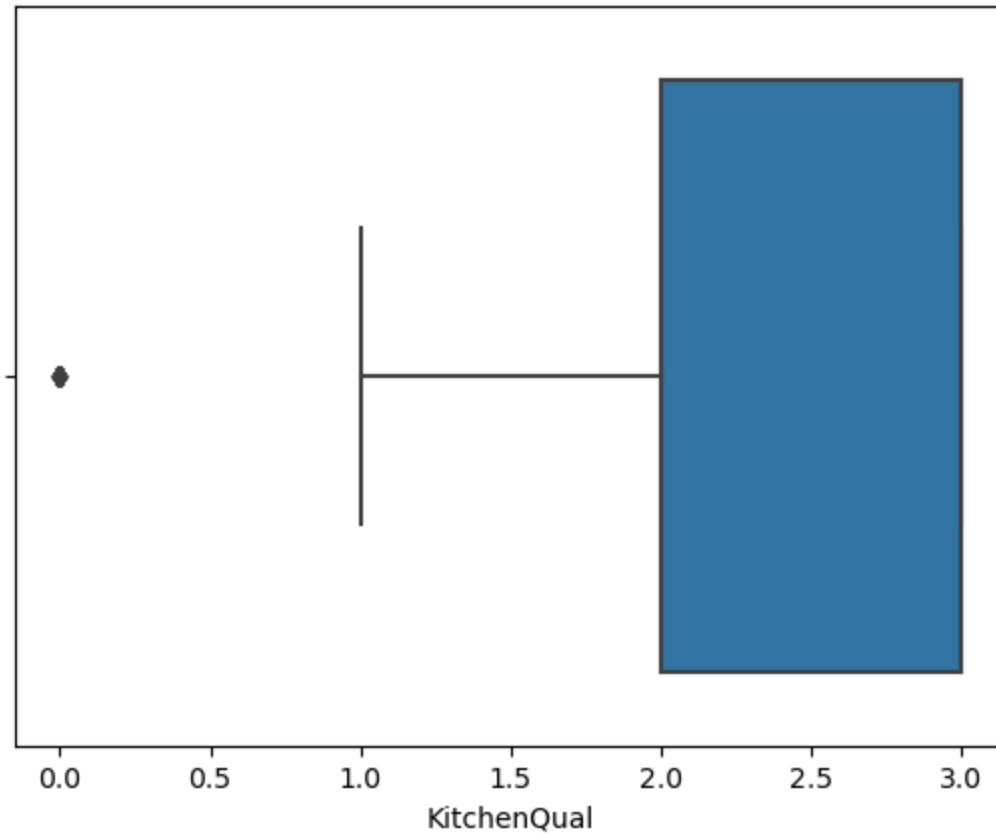
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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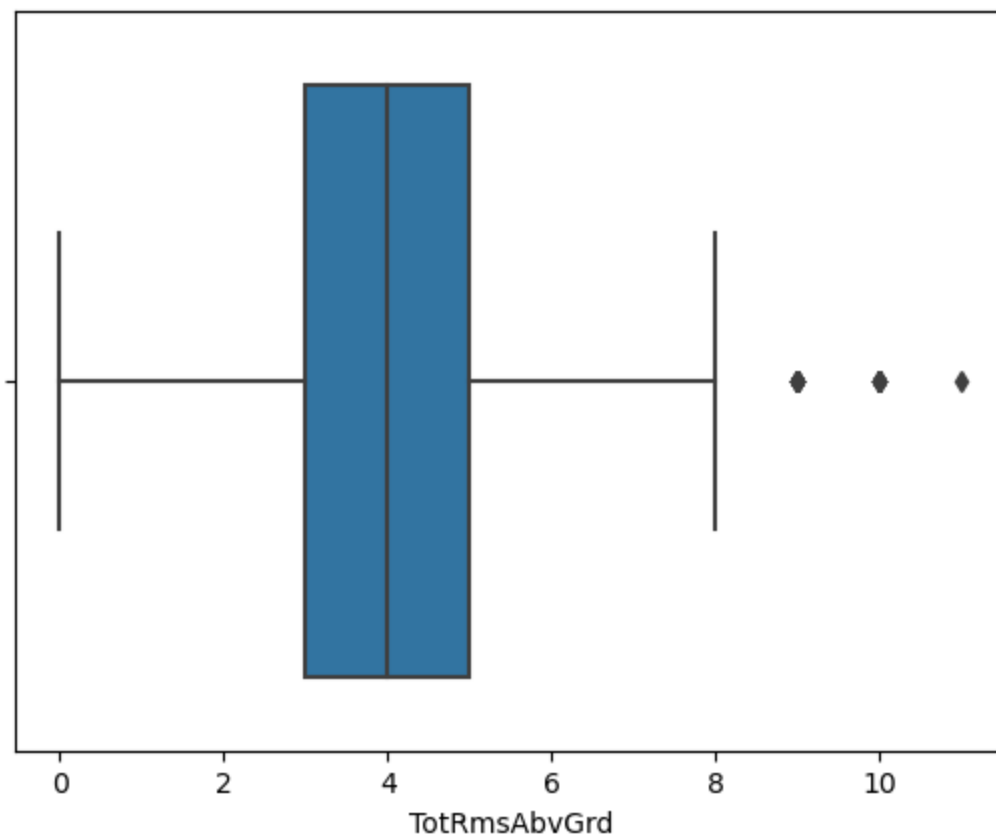
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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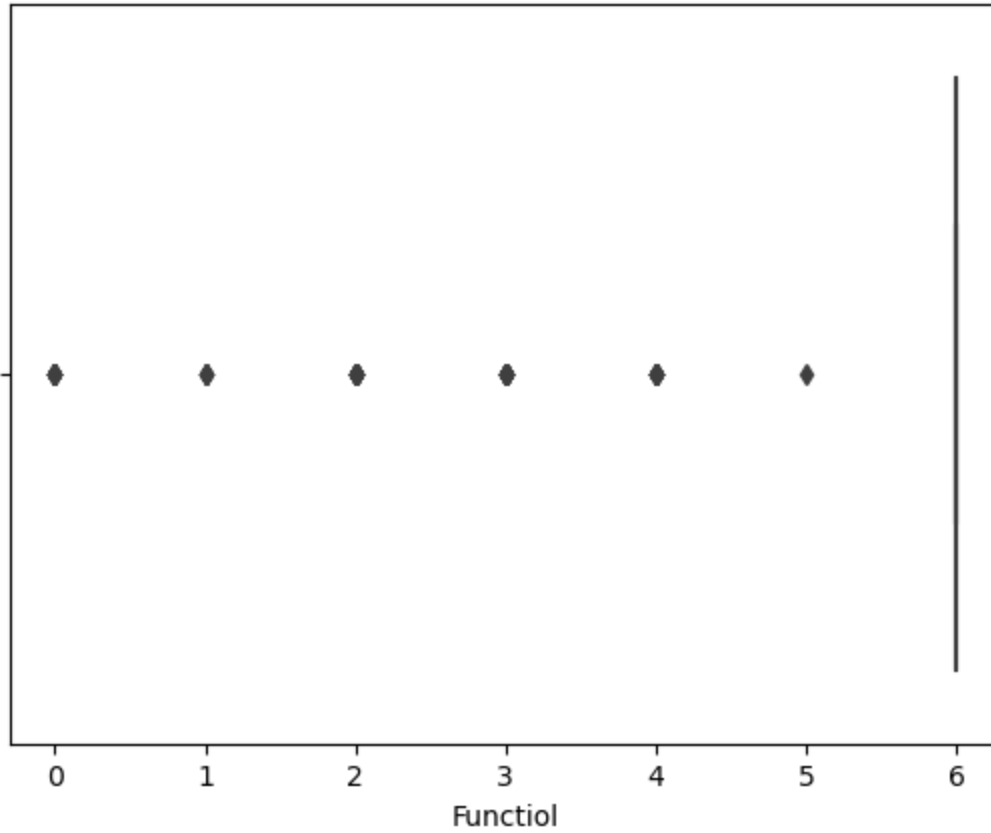

```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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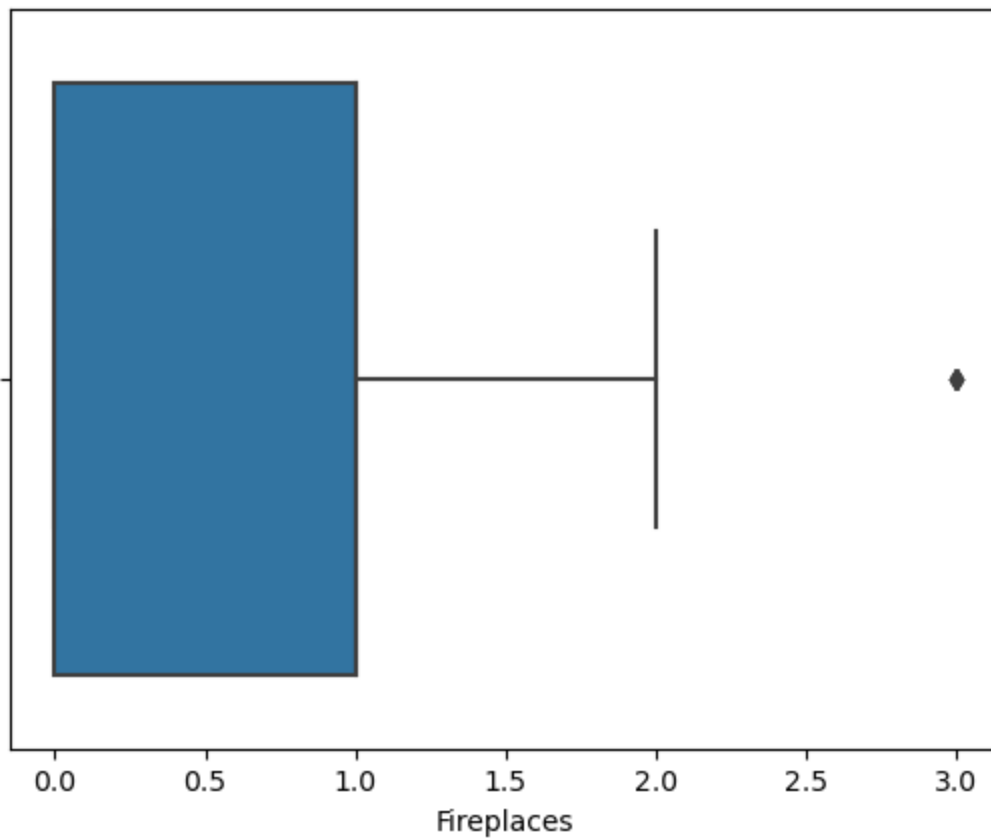
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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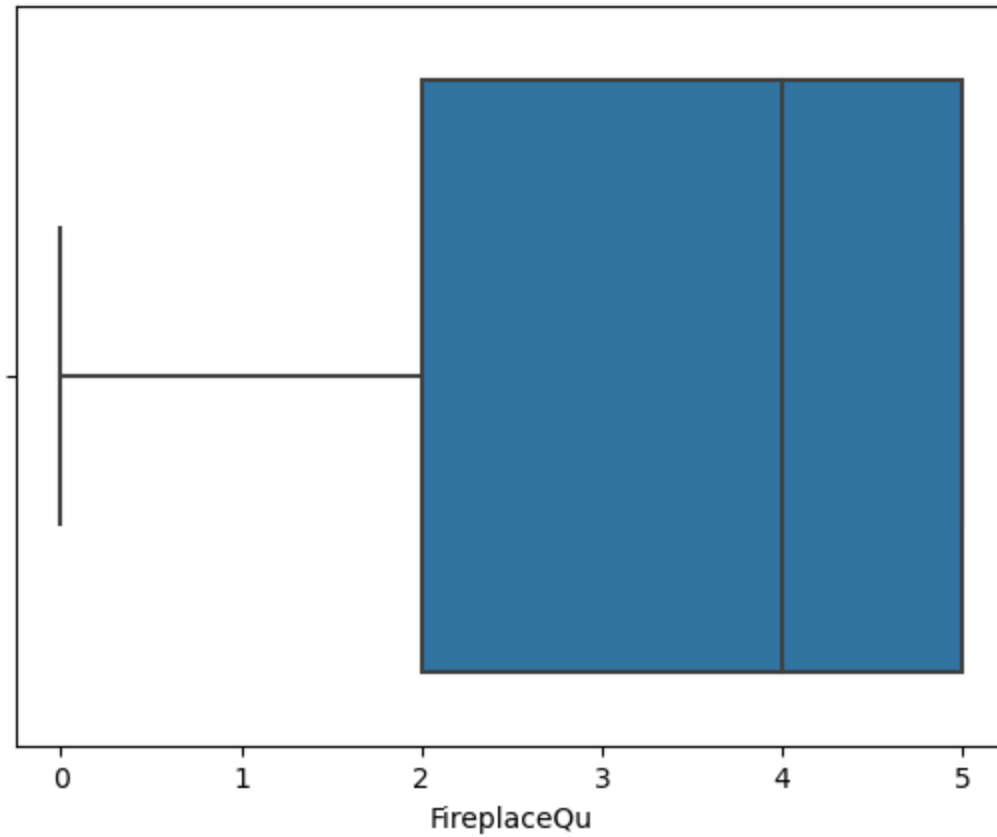
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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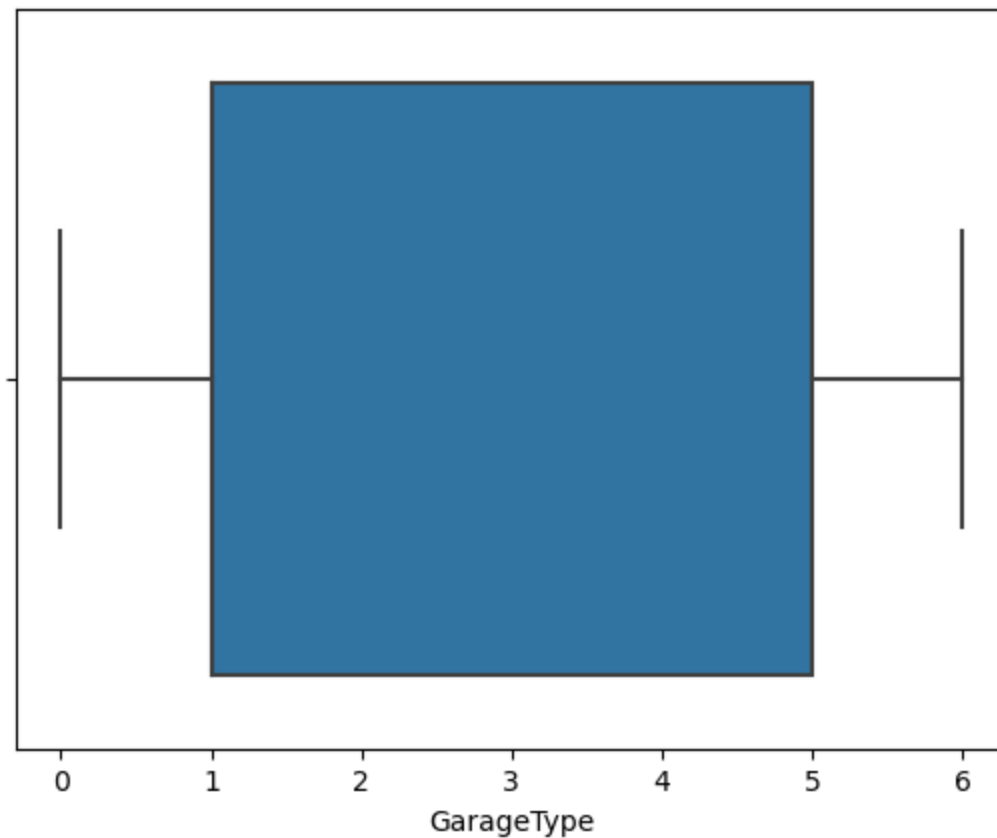
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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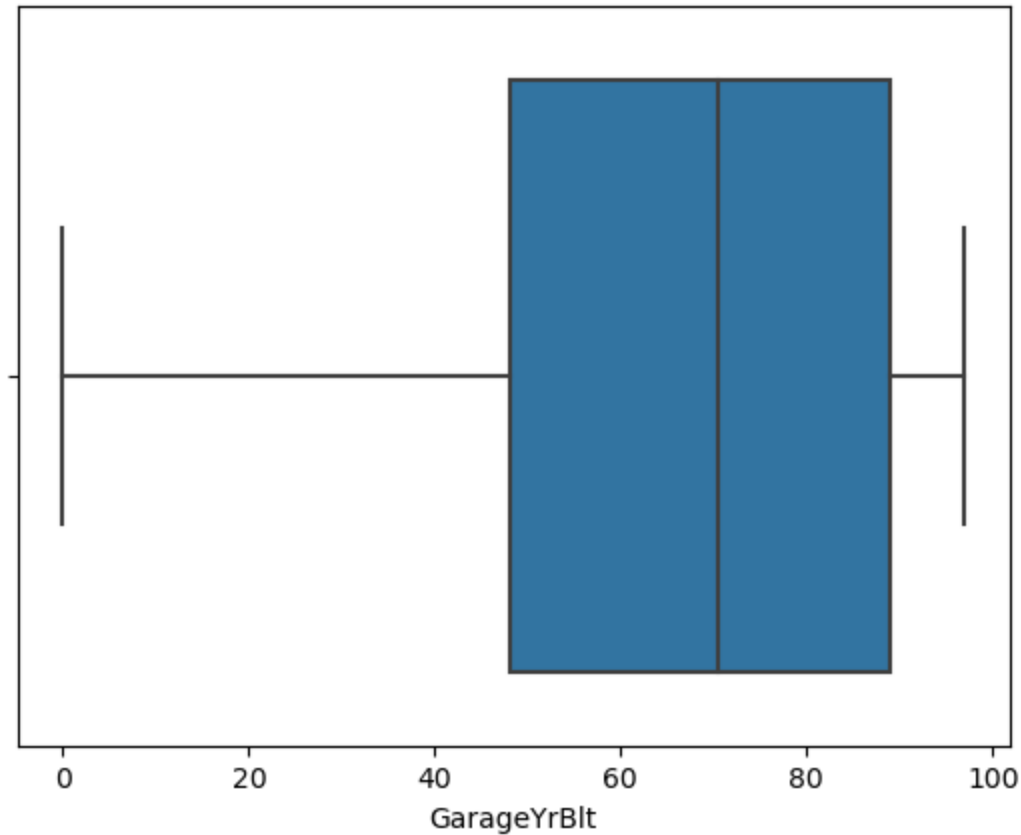
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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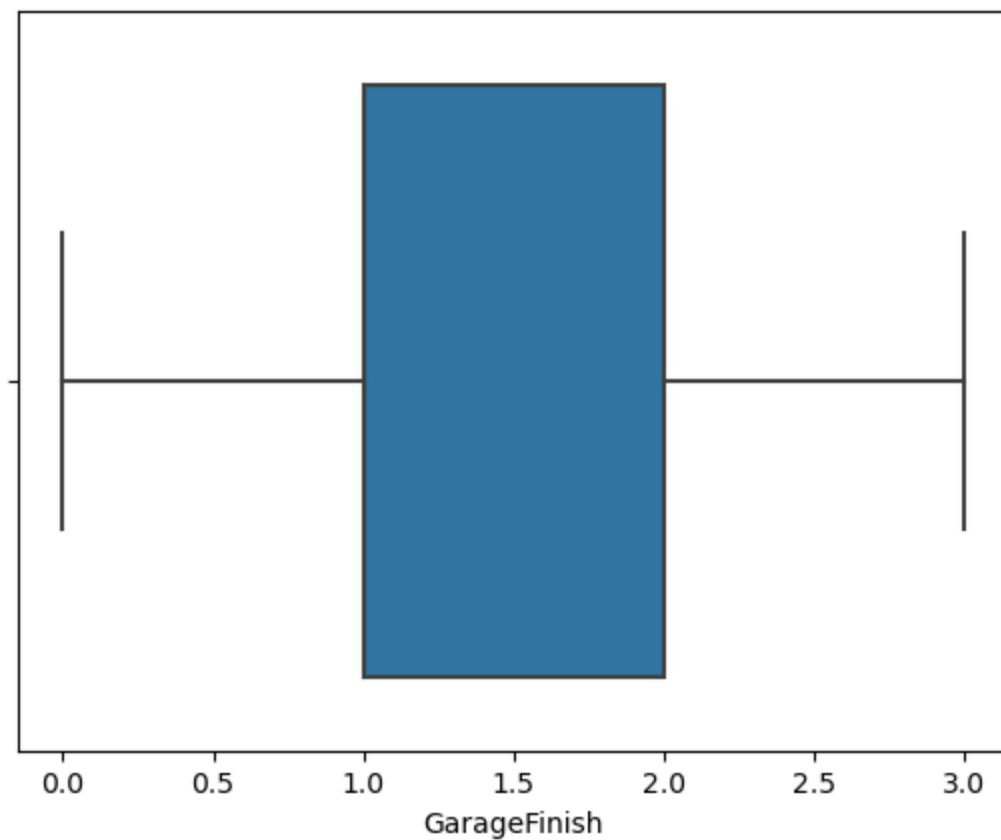
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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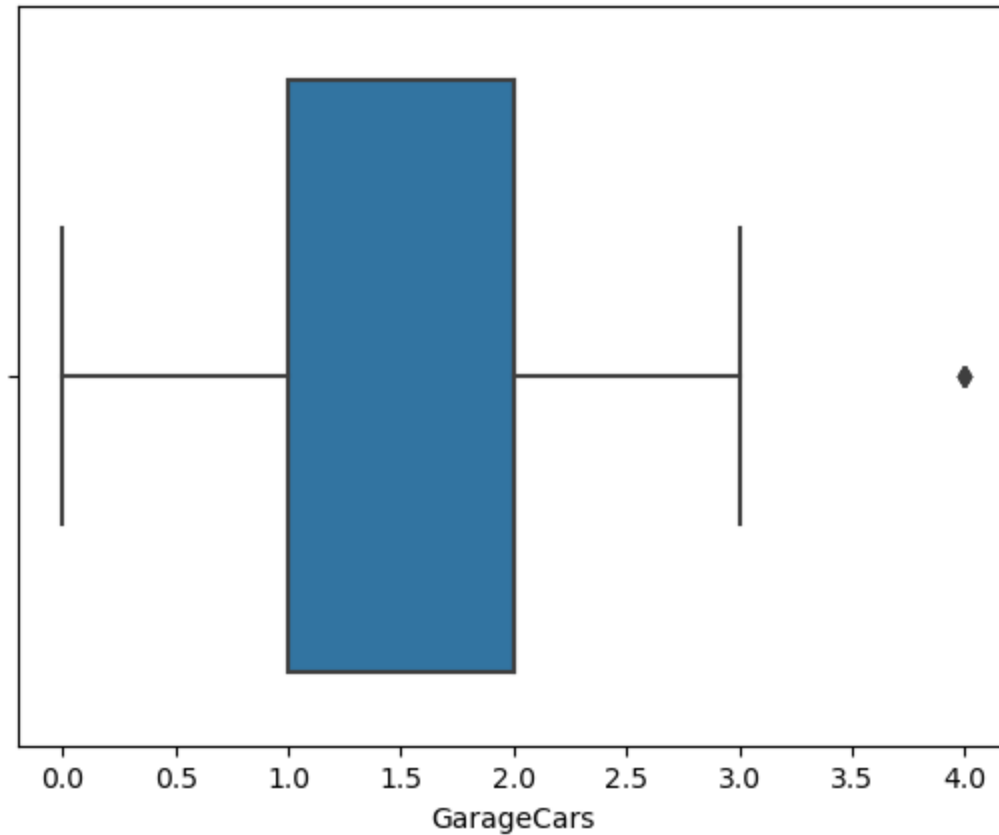
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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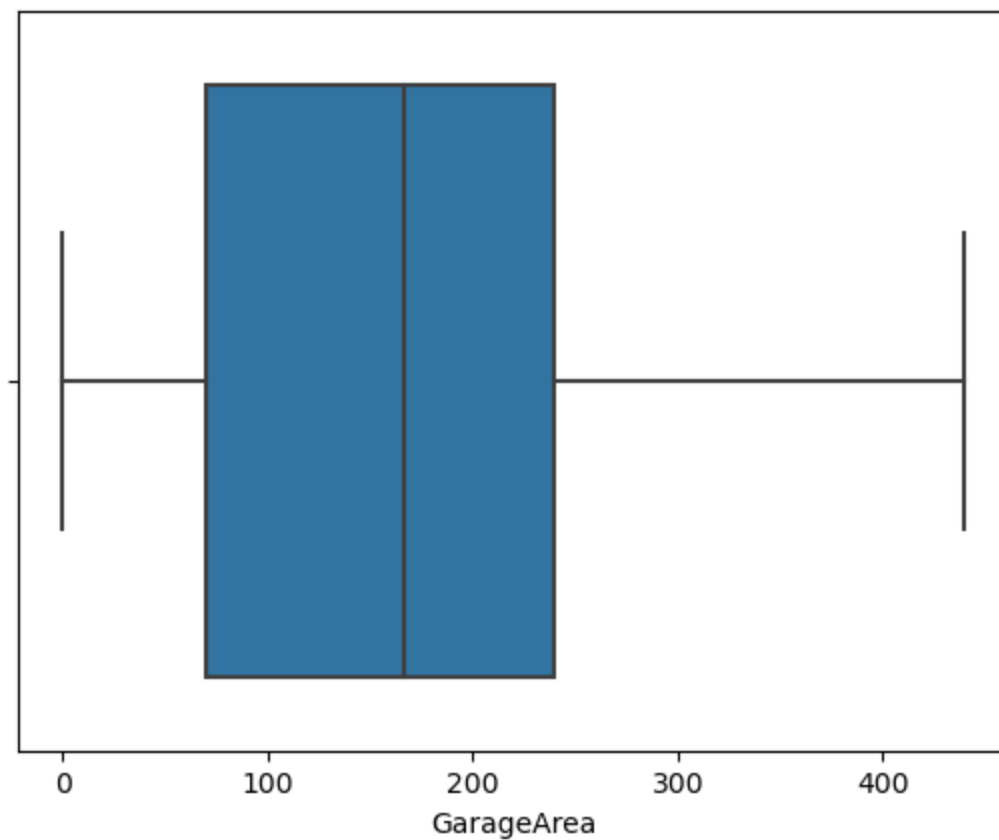
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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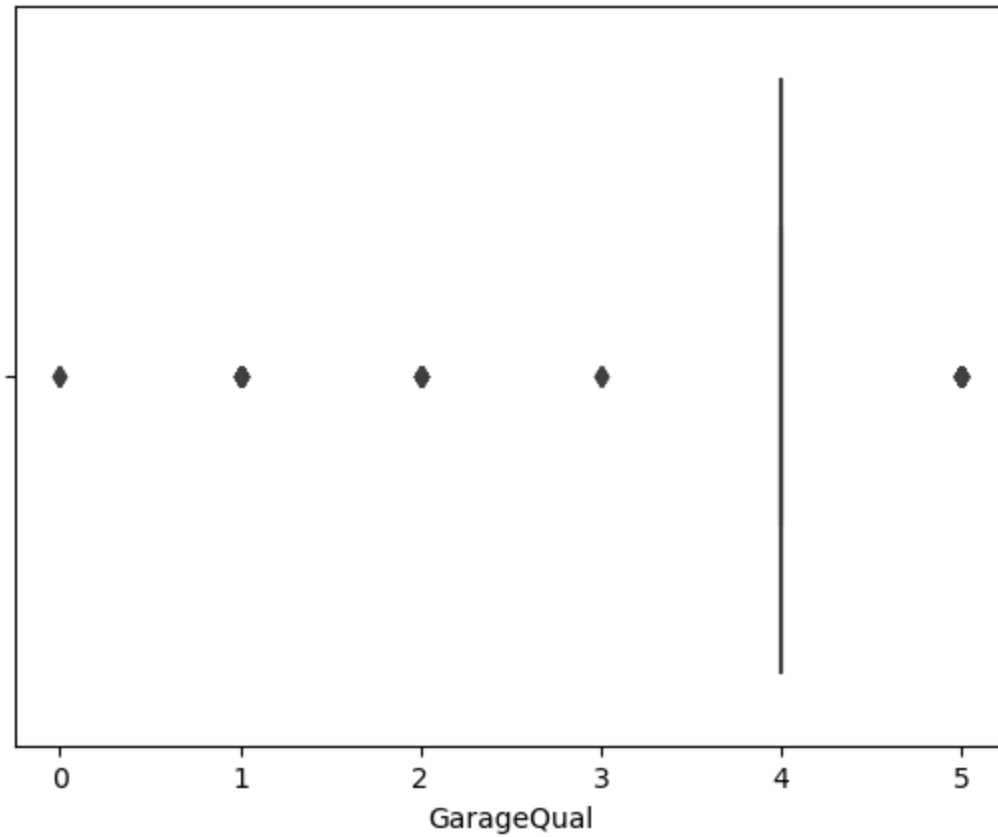


```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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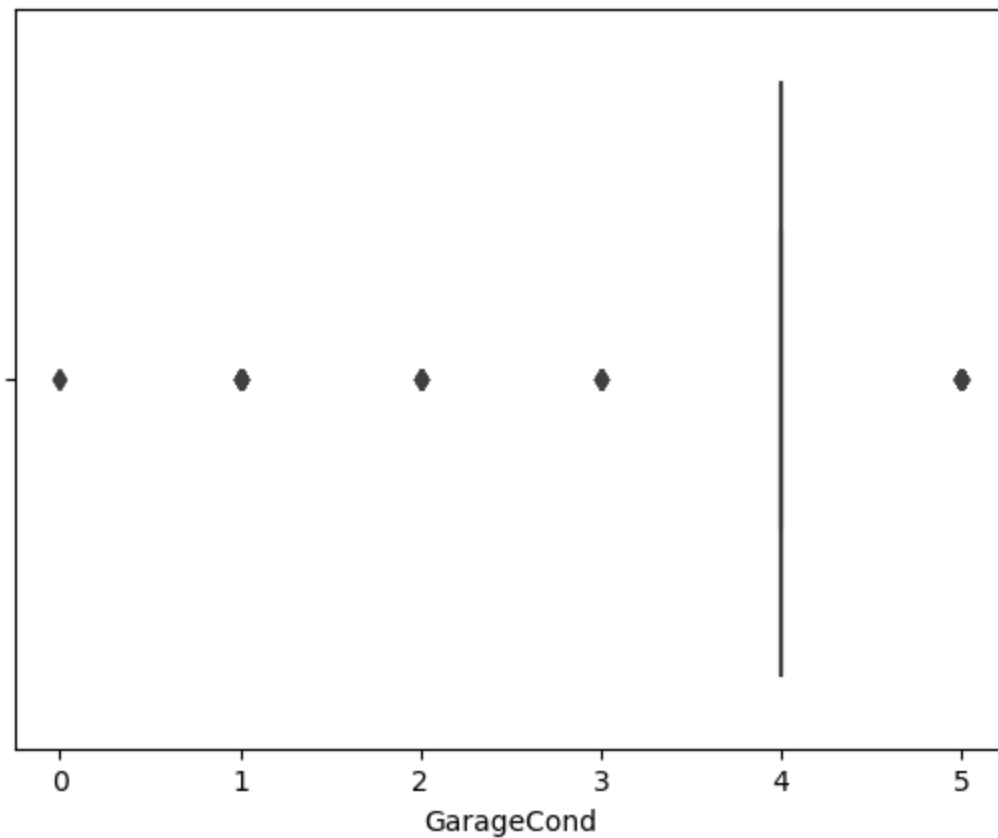
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
```

```
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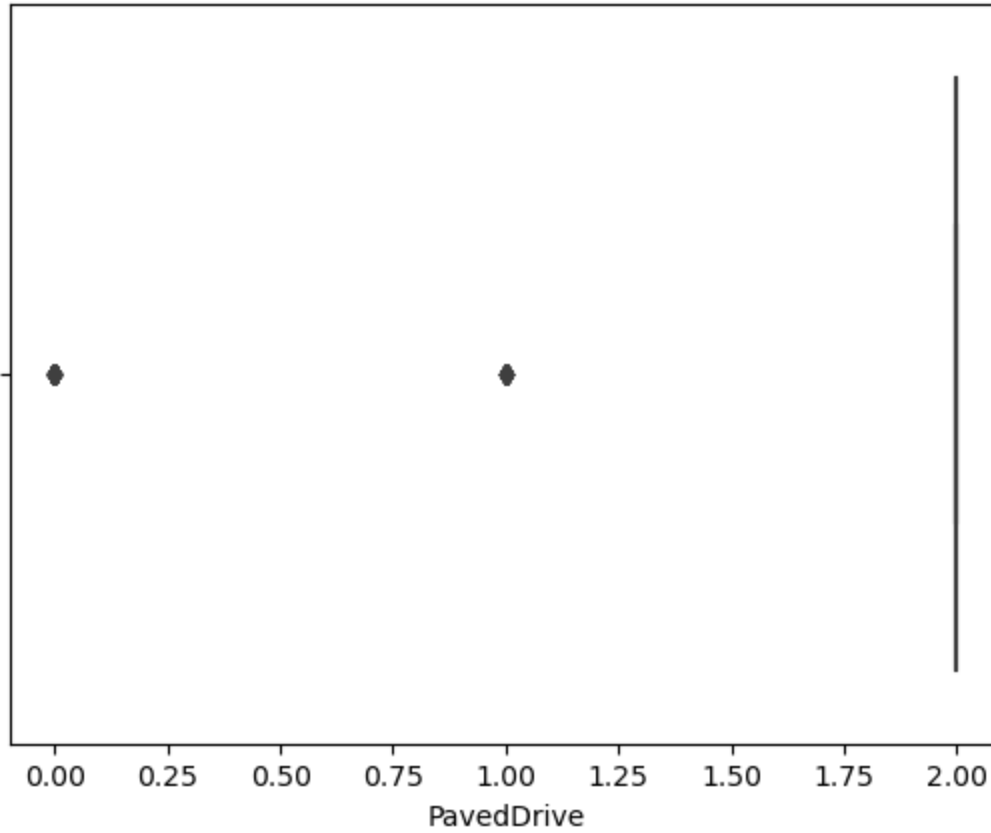


```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
```

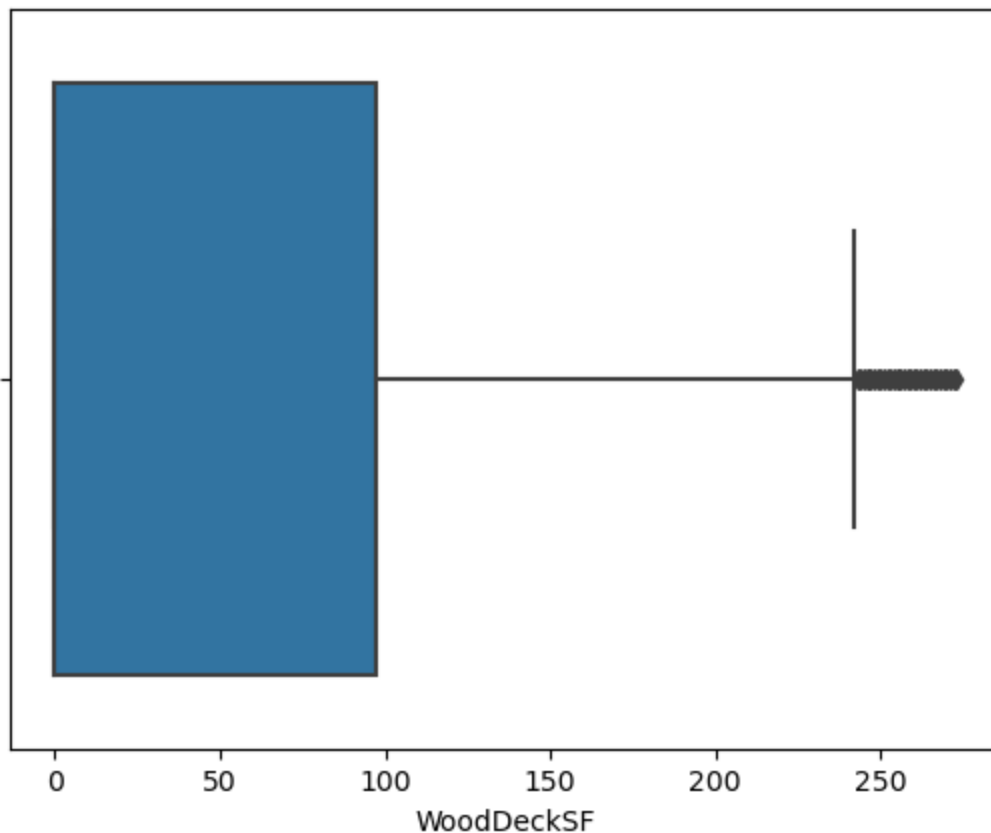
```
warnings.warn(
```



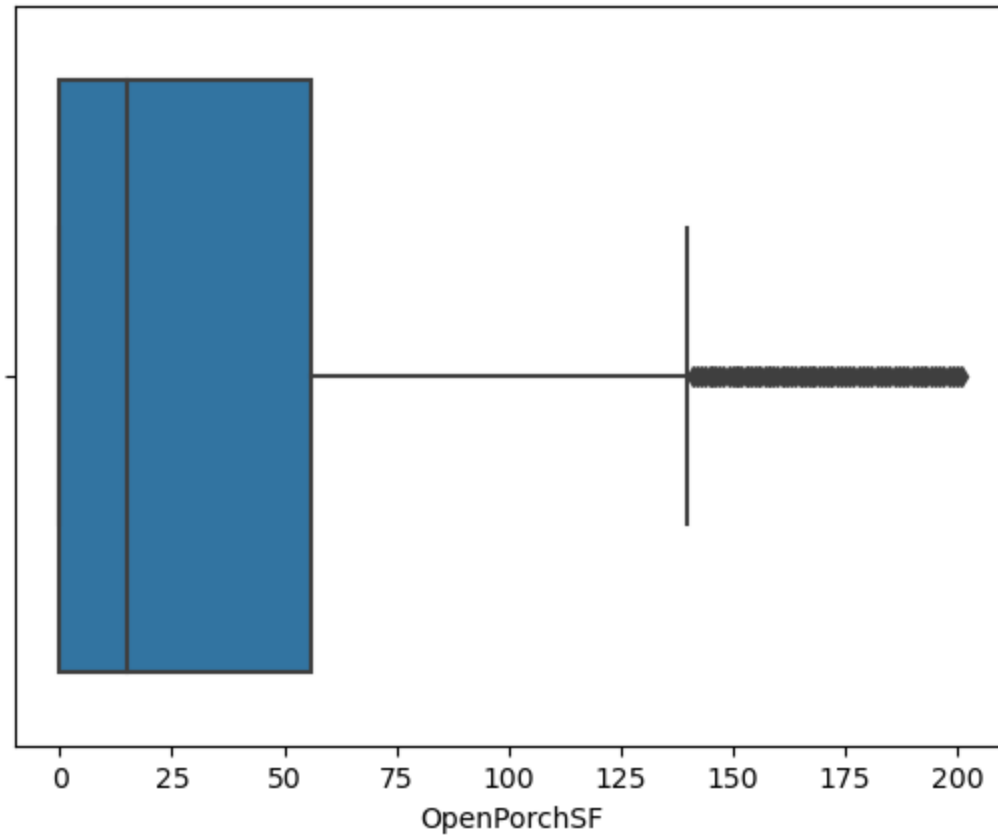
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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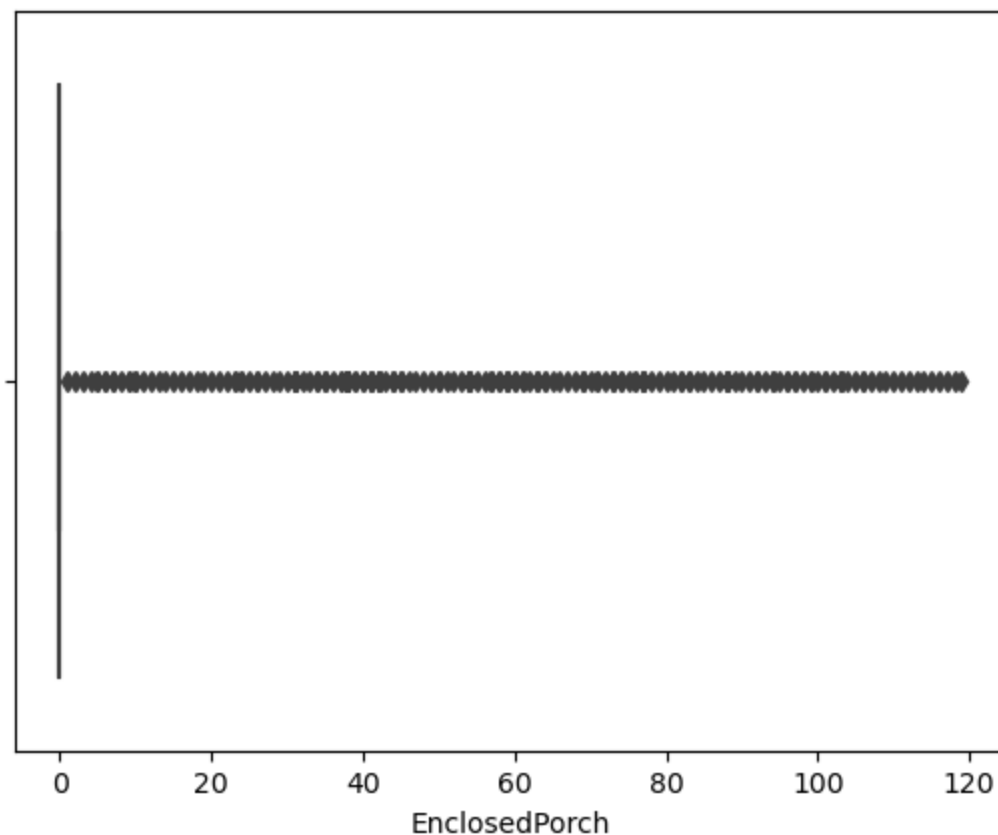
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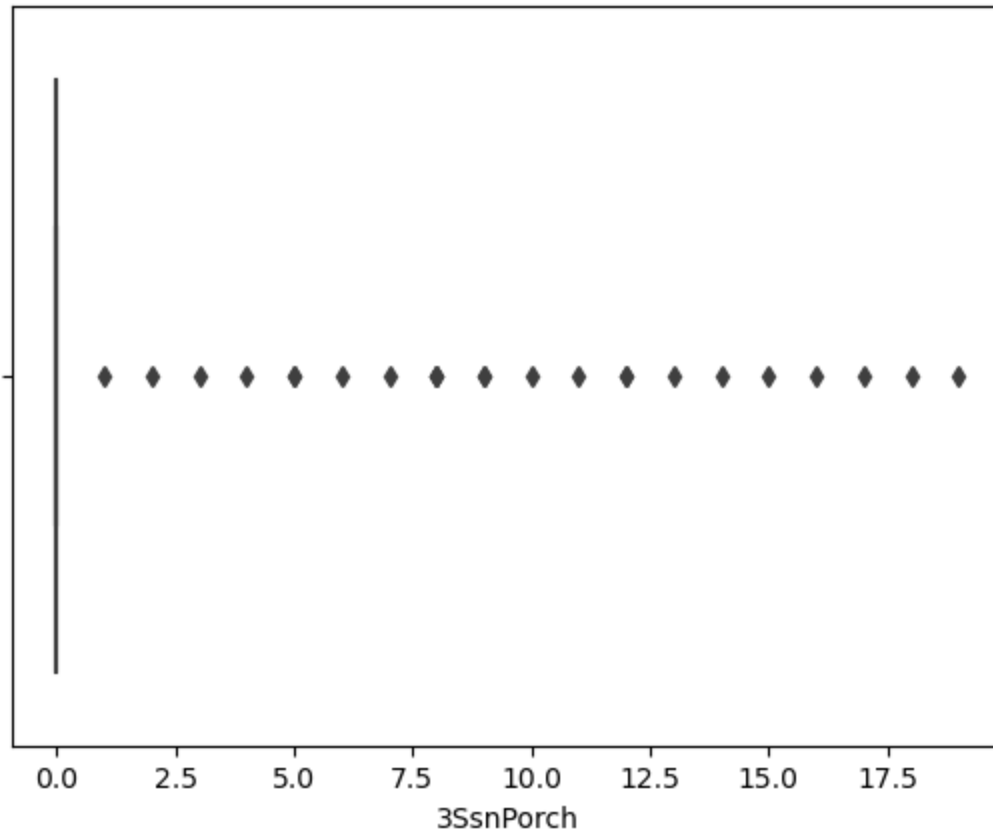
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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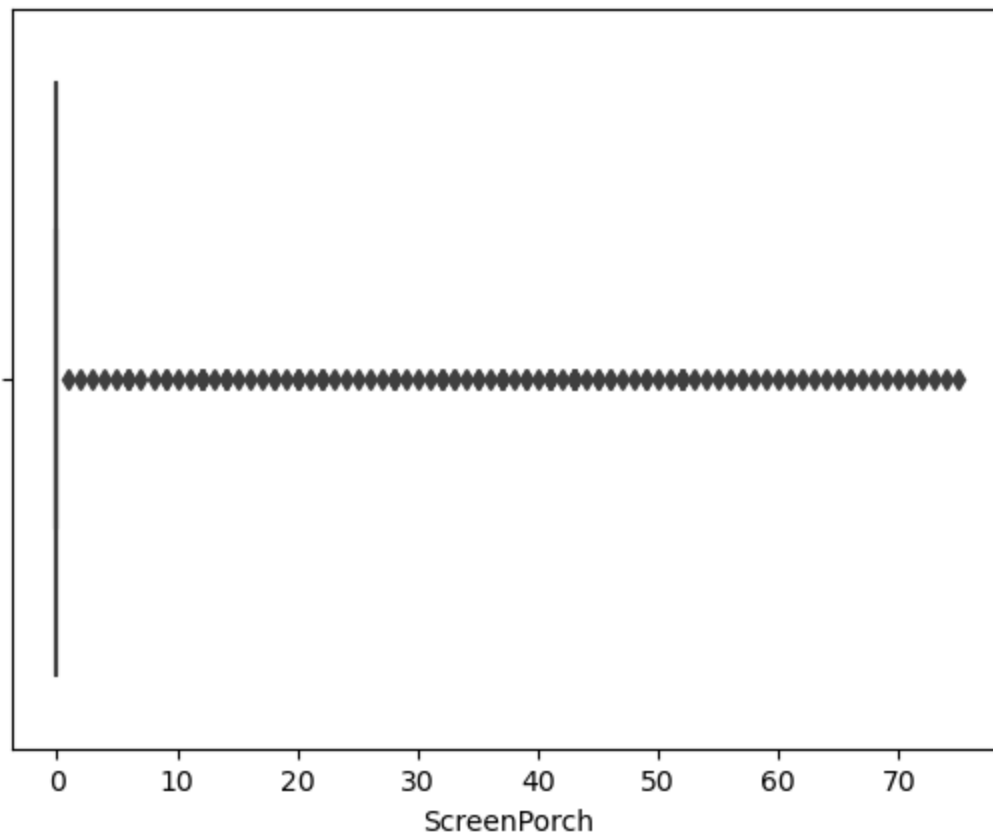
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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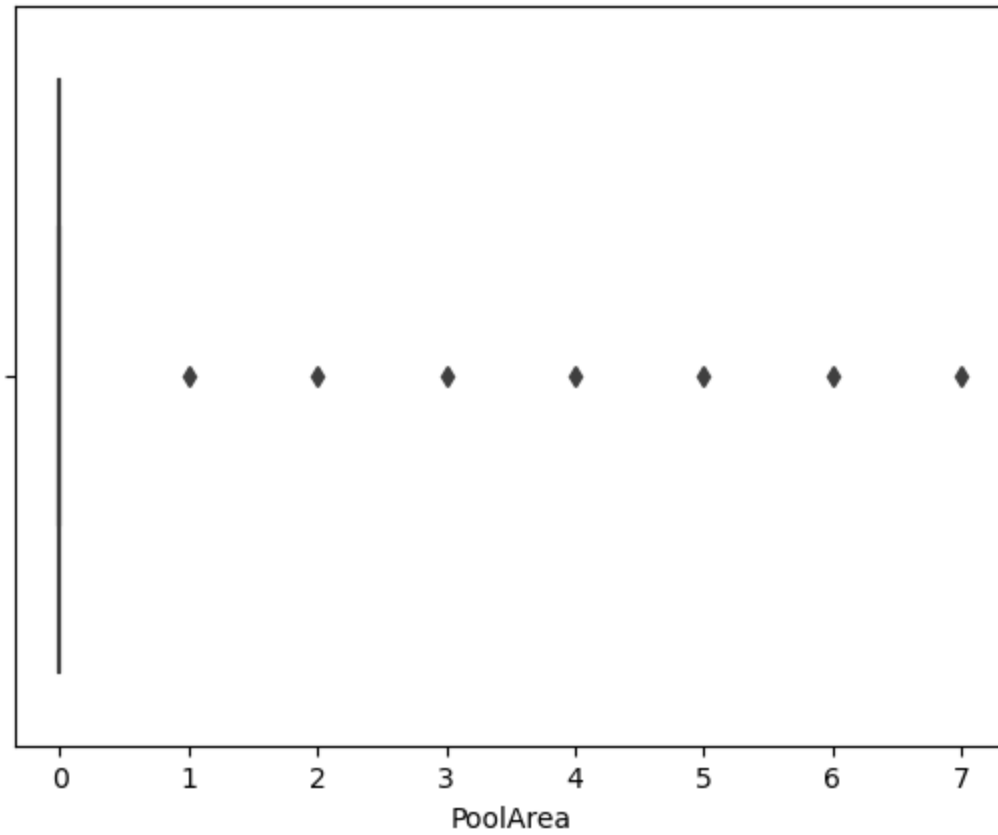

```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
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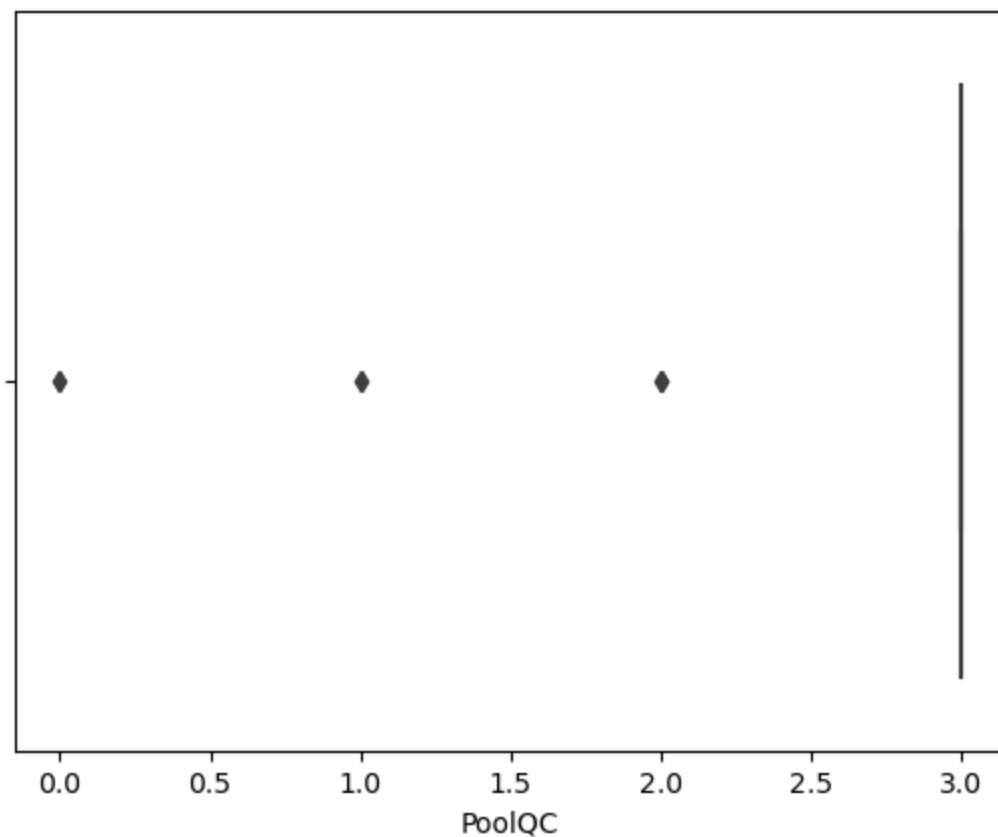
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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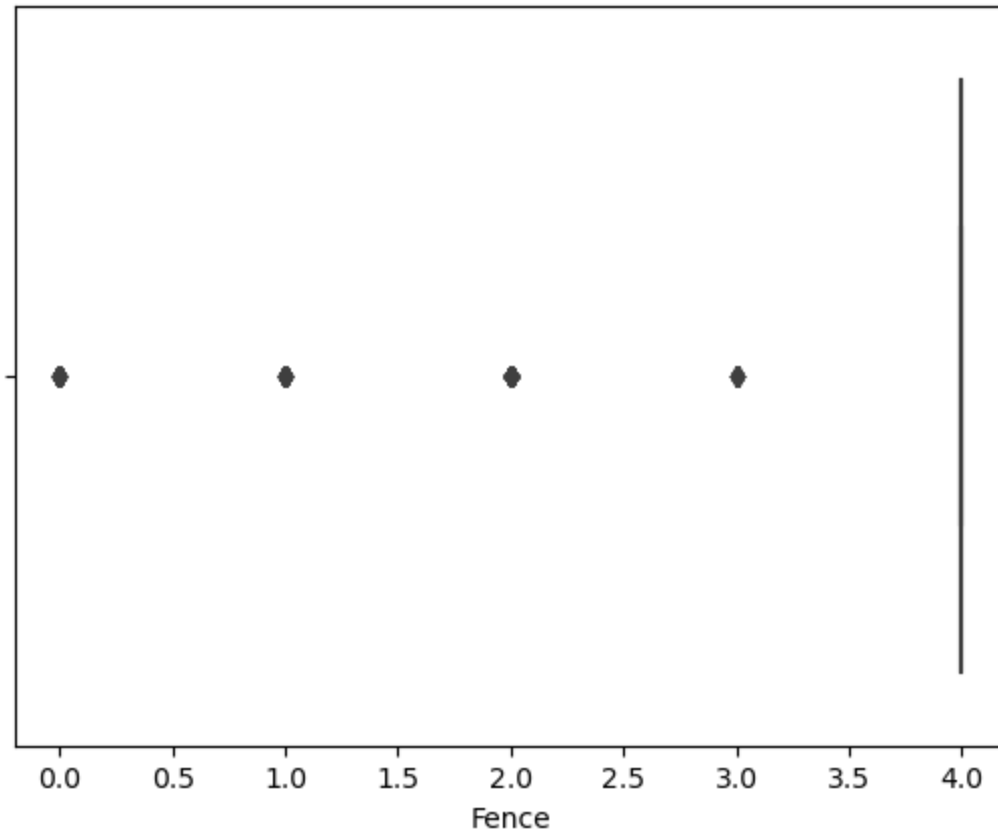


```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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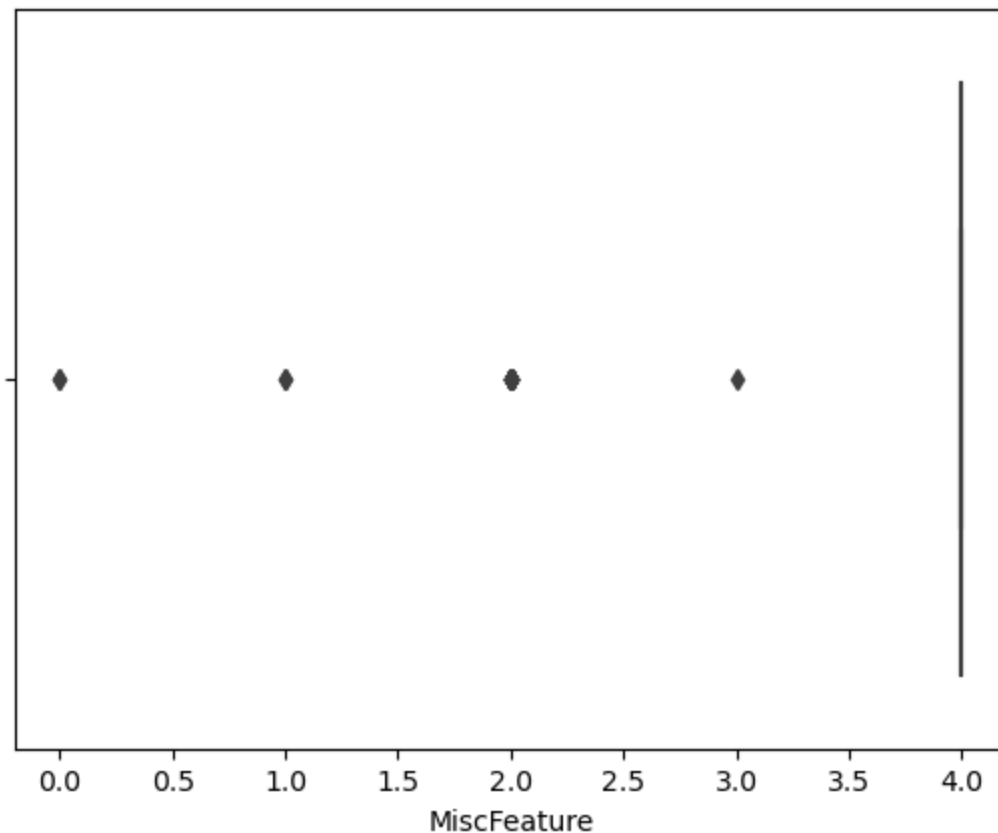
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C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
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```

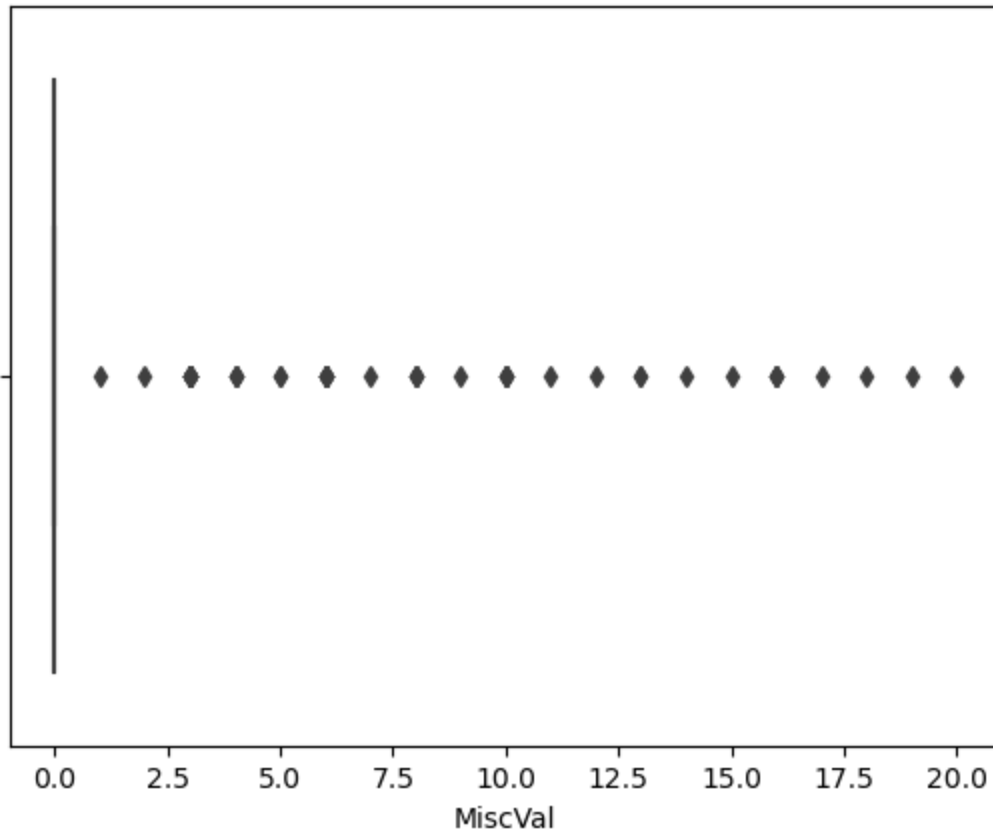


```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
```

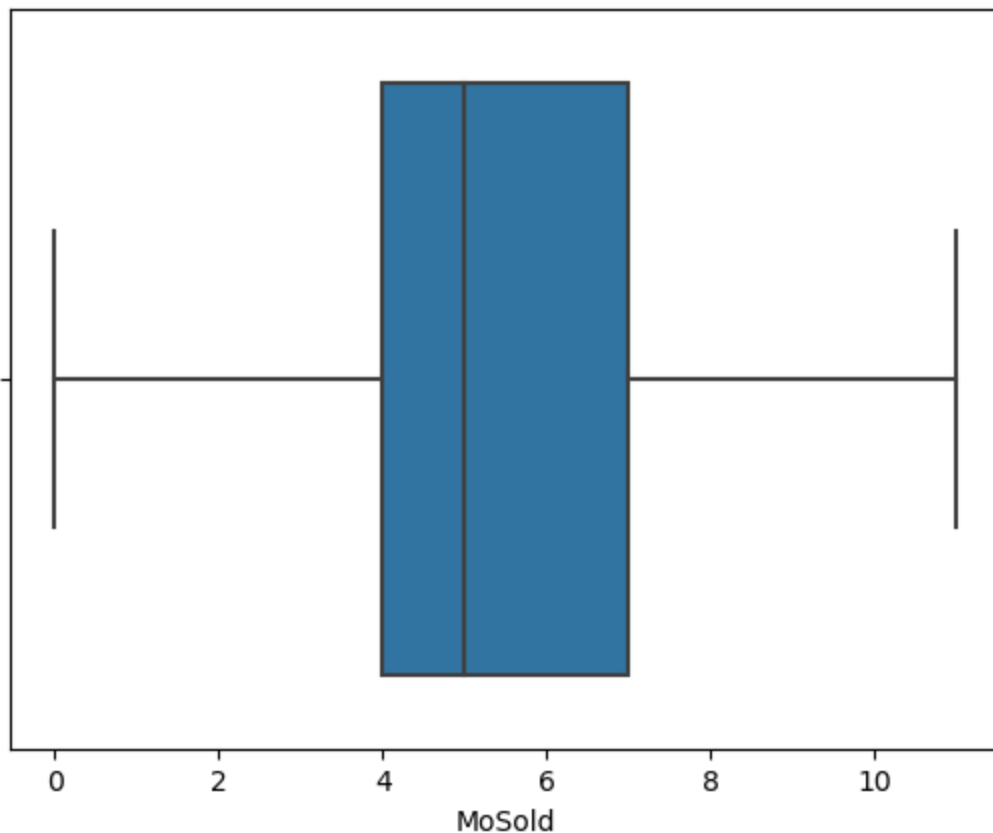
```
warnings.warn(
```



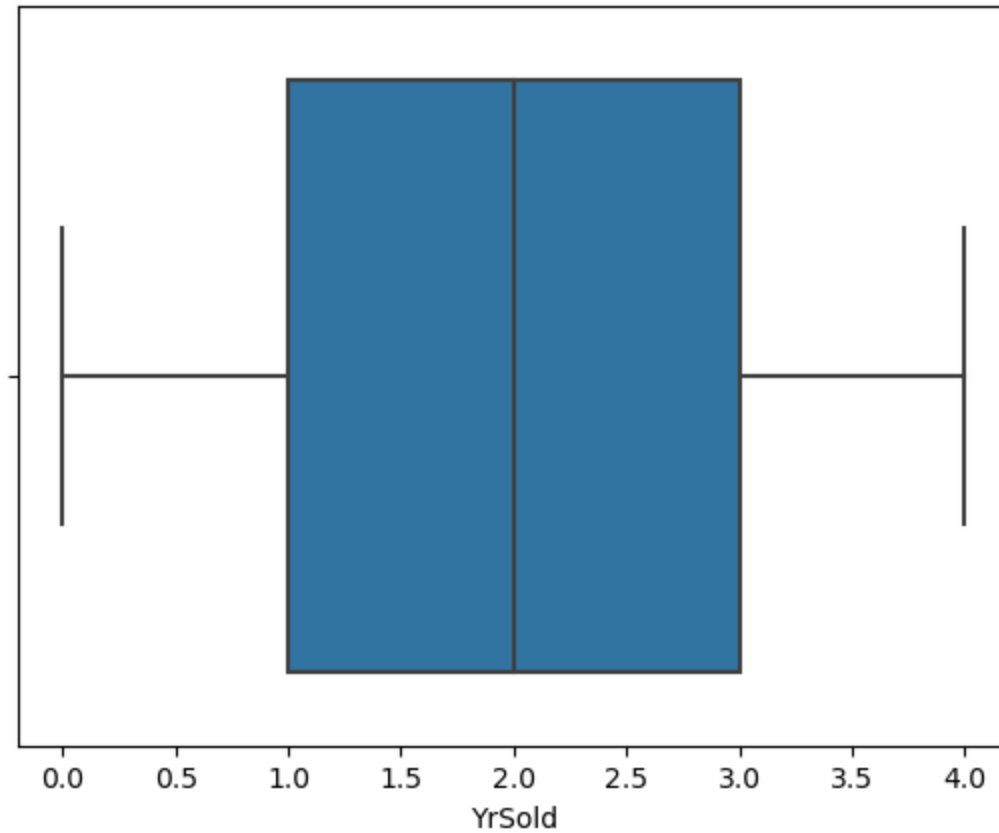
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



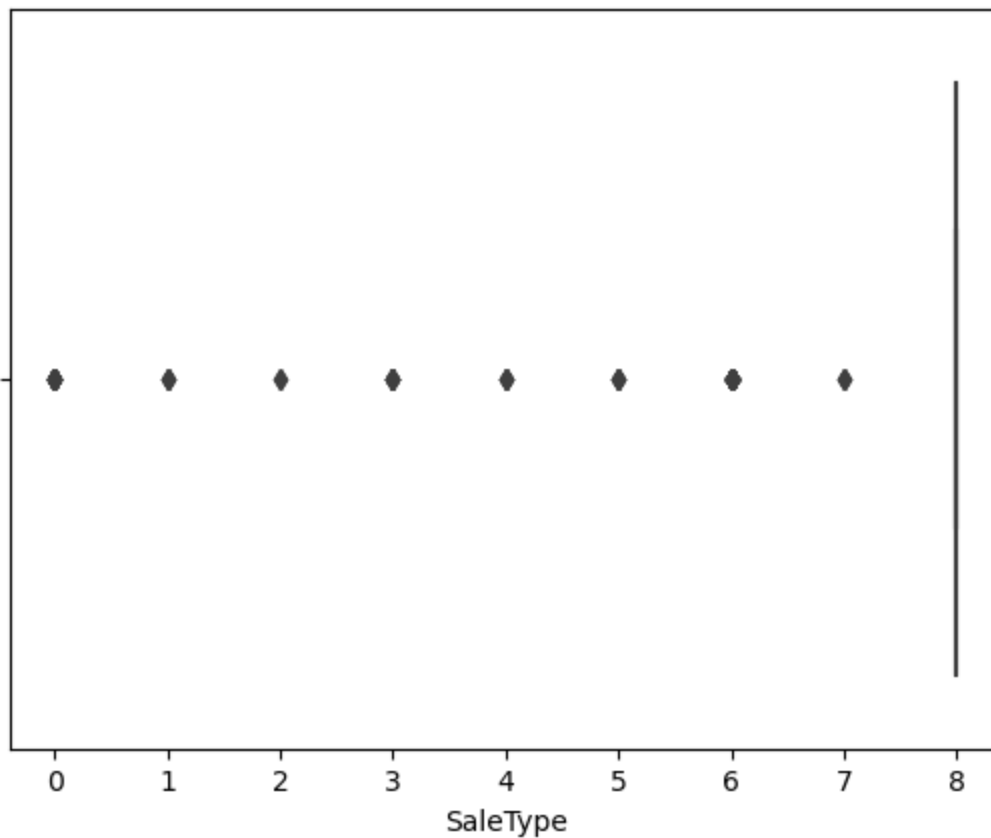
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



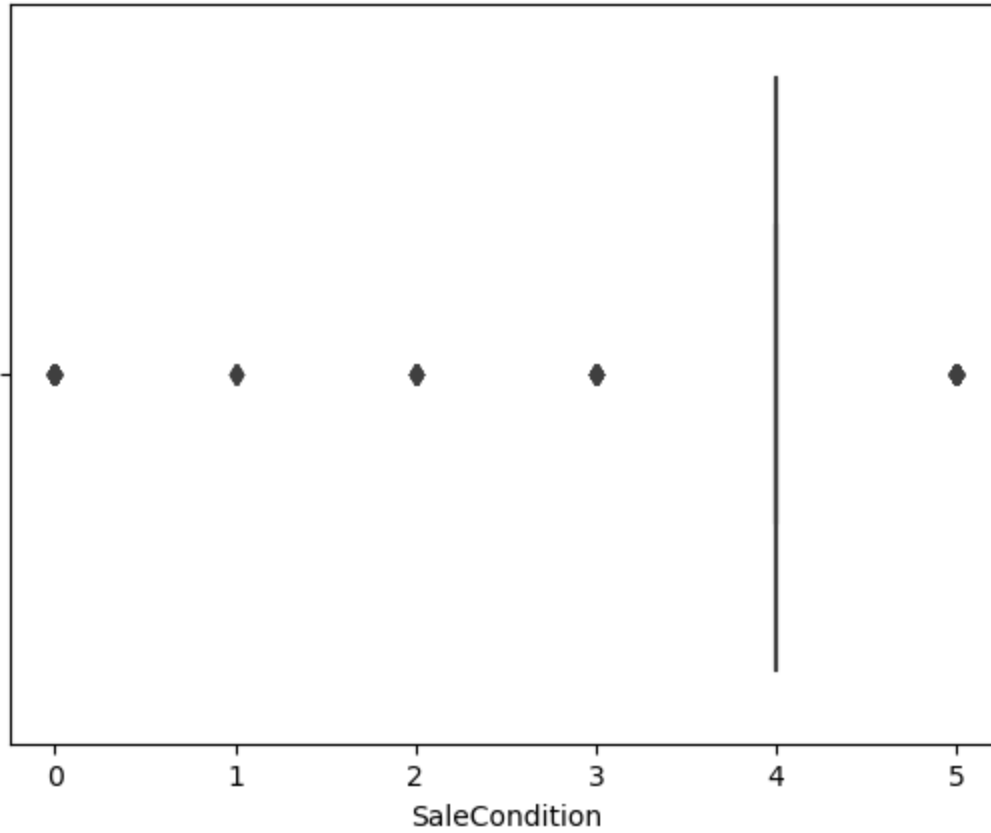
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



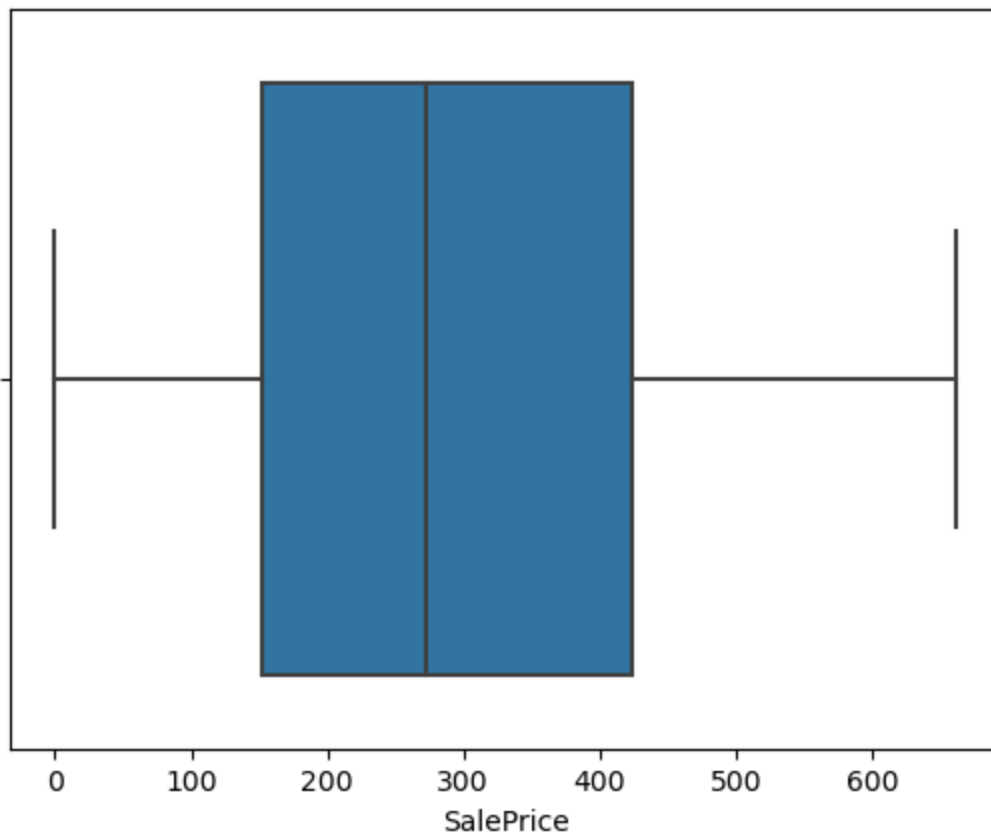
```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



```
C:\Users\rishabh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
warnings.warn(
```



In [69]: `pip install -U notebook-as-pdf`

Requirement already satisfied: notebook-as-pdf in c:\users\rishabh\anaconda3\lib\site-packages (0.5.0)
Requirement already satisfied: pypeteer in c:\users\rishabh\anaconda3\lib\site-packages (from notebook-as-pdf) (1.0.2)
Requirement already satisfied: nbconvert in c:\users\rishabh\anaconda3\lib\site-packages (from notebook-as-pdf) (6.4.4)
Requirement already satisfied: PyPDF2 in c:\users\rishabh\anaconda3\lib\site-packages (from notebook-as-pdf) (2.11.2)
Requirement already satisfied: bleach in c:\users\rishabh\anaconda3\lib\site-packages (from nbconvert->notebook-as-pdf) (4.1.0)
Requirement already satisfied: pandocfilters>=1.4.1 in c:\users\rishabh\anaconda3\lib\site-packages (from nbconvert->notebook-as-pdf) (1.5.0)
Requirement already satisfied: defusedxml in c:\users\rishabh\anaconda3\lib\site-packages (from nbconvert->notebook-as-pdf) (0.7.1)
Requirement already satisfied: traitlets>=5.0 in c:\users\rishabh\anaconda3\lib\site-packages (from nbconvert->notebook-as-pdf) (5.1.1)
Requirement already satisfied: jupyter-core in c:\users\rishabh\anaconda3\lib\site-packages (from nbconvert->notebook-as-pdf) (4.11.1)
Requirement already satisfied: mistune<2,>=0.8.1 in c:\users\rishabh\anaconda3\lib\site-packages (from nbconvert->notebook-as-pdf) (0.8.4)
Requirement already satisfied: beautifulsoup4 in c:\users\rishabh\anaconda3\lib\site-packages (from nbconvert->notebook-as-pdf) (4.11.1)
Requirement already satisfied: nbclient<0.6.0,>=0.5.0 in c:\users\rishabh\anaconda3\lib\site-packages (from nbconvert->notebook-as-pdf) (0.5.13)
Requirement already satisfied: pygments>=2.4.1 in c:\users\rishabh\anaconda3\lib\site-packages (from nbconvert->notebook-as-pdf) (2.11.2)
Requirement already satisfied: jinja2>=2.4 in c:\users\rishabh\anaconda3\lib\site-packages (from nbconvert->notebook-as-pdf) (2.11.3)
Requirement already satisfied: jupyterlab-pygments in c:\users\rishabh\anaconda3\lib\site-packages (from nbconvert->notebook-as-pdf) (0.1.2)
Requirement already satisfied: nbformat>=4.4 in c:\users\rishabh\anaconda3\lib\site-packages (from nbconvert->notebook-as-pdf) (5.5.0)
Requirement already satisfied: testpath in c:\users\rishabh\anaconda3\lib\site-packages (from nbconvert->notebook-as-pdf) (0.6.0)
Requirement already satisfied: entrypoints>=0.2.2 in c:\users\rishabh\anaconda3\lib\site-packages (from nbconvert->notebook-as-pdf) (0.4)
Requirement already satisfied: typing_extensions>=3.10.0.0 in c:\users\rishabh\anaconda3\lib\site-packages (from PyPDF2->notebook-as-pdf) (4.3.0)
Requirement already satisfied: urllib3<2.0.0,>=1.25.8 in c:\users\rishabh\anaconda3\lib\site-packages (from pypeteer->notebook-as-pdf) (1.26.11)
Requirement already satisfied: importlib-metadata>=1.4 in c:\users\rishabh\anaconda3\lib\site-packages (from pypeteer->notebook-as-pdf) (4.11.3)
Requirement already satisfied: appdirs<2.0.0,>=1.4.3 in c:\users\rishabh\anaconda3\lib\site-packages (from pypeteer->notebook-as-pdf) (1.4.4)
Requirement already satisfied: tqdm<5.0.0,>=4.42.1 in c:\users\rishabh\anaconda3\lib\site-packages (from pypeteer->notebook-as-pdf) (4.64.1)
Requirement already satisfied: pyee<9.0.0,>=8.1.0 in c:\users\rishabh\anaconda3\lib\site-packages (from pypeteer->notebook-as-pdf) (8.2.2)
Requirement already satisfied: certifi>=2021 in c:\users\rishabh\anaconda3\lib\site-packages (from pypeteer->notebook-as-pdf) (2022.9.14)
Requirement already satisfied: websockets<11.0,>=10.0 in c:\users\rishabh\anaconda3\lib\site-packages (from pypeteer->notebook-as-pdf) (10.4)
Requirement already satisfied: zipp>=0.5 in c:\users\rishabh\anaconda3\lib\site-packages (from importlib-metadata>=1.4->pypeteer->notebook-as-pdf) (3.8.0)
Requirement already satisfied: MarkupSafe>=0.23 in c:\users\rishabh\anaconda3\lib\site-packages (from jinja2>=2.4->nbconvert->notebook-as-pdf) (2.0.1)
Requirement already satisfied: jupyter-client>=6.1.5 in c:\users\rishabh\anaconda3\lib\site-packages (from nbclient<0.6.0,>=0.5.0->nbconvert->notebook-as-pdf) (7.3.4)
Requirement already satisfied: nest-asyncio in c:\users\rishabh\anaconda3\lib\site-packages (from nbclient<0.6.0,>=0.5.0->nbconvert->notebook-as-pdf) (1.5.5)
Requirement already satisfied: jsonschema>=2.6 in c:\users\rishabh\anaconda3\lib\site-packages (from nbformat>=4.4->nbconvert->notebook-as-pdf) (4.16.0)
Requirement already satisfied: fastjsonschema in c:\users\rishabh\anaconda3\lib\site-packages (from nbformat>=4.4->nbconvert->notebook-as-pdf) (2.16.2)

Requirement already satisfied: colorama in c:\users\rishabh\anaconda3\lib\site-packages (from tqdm<5.0.0,>=4.42.1->pyppeteer->notebook-as-pdf) (0.4.5)

Requirement already satisfied: soupsieve>1.2 in c:\users\rishabh\anaconda3\lib\site-packages (from beautifulsoup4->nbconvert->notebook-as-pdf) (2.3.1)

Requirement already satisfied: packaging in c:\users\rishabh\anaconda3\lib\site-packages (from bleach->nbconvert->notebook-as-pdf) (21.3)

Requirement already satisfied: six>=1.9.0 in c:\users\rishabh\anaconda3\lib\site-packages (from bleach->nbconvert->notebook-as-pdf) (1.16.0)

Requirement already satisfied: webencodings in c:\users\rishabh\anaconda3\lib\site-packages (from bleach->nbconvert->notebook-as-pdf) (0.5.1)

Requirement already satisfied: pywin32>=1.0 in c:\users\rishabh\anaconda3\lib\site-packages (from jupyter-core->nbconvert->notebook-as-pdf) (302)

Requirement already satisfied: pyparsing!=0.17.0,!0.17.1,!0.17.2,>=0.14.0 in c:\users\rishabh\anaconda3\lib\site-packages (from jsonschema>=2.6->nbformat>=4.4->nbconvert->notebook-as-pdf) (0.18.0)

Requirement already satisfied: attrs>=17.4.0 in c:\users\rishabh\anaconda3\lib\site-packages (from jsonschema>=2.6->nbformat>=4.4->nbconvert->notebook-as-pdf) (21.4.0)

Requirement already satisfied: tornado>=6.0 in c:\users\rishabh\anaconda3\lib\site-packages (from jupyter-client>=6.1.5->nbclient<0.6.0,>=0.5.0->nbconvert->notebook-as-pdf) (6.1)

Requirement already satisfied: python-dateutil>=2.8.2 in c:\users\rishabh\anaconda3\lib\site-packages (from jupyter-client>=6.1.5->nbclient<0.6.0,>=0.5.0->nbconvert->notebook-as-pdf) (2.8.2)

Requirement already satisfied: pyzmq>=23.0 in c:\users\rishabh\anaconda3\lib\site-packages (from jupyter-client>=6.1.5->nbclient<0.6.0,>=0.5.0->nbconvert->notebook-as-pdf) (23.2.0)

Requirement already satisfied: pyparsing!=3.0.5,>=2.0.2 in c:\users\rishabh\anaconda3\lib\site-packages (from packaging->bleach->nbconvert->notebook-as-pdf) (3.0.9)

Note: you may need to restart the kernel to use updated packages.

In [76]:

```
File "C:\Users\rishabh\AppData\Local\Temp\ipykernel_10840\3199819252.py", line 1
    jupyter-nbconvert --to pdfviahtml example.ipynb
                        ^
SyntaxError: invalid syntax
```

In []: