1. Read the Data

```
In [30]: import pandas as pd
```

```
In [31]: z=pd.read_csv("C:/Users/admin/Desktop/machine_learning/ml_Regression_project
```

```
In [32]: z.head()
```

Out[32]:

	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

5 rows × 81 columns

```
In [33]: z.isna().sum()
```

```
Out[33]: Id                 0
         MSSubClass         0
         MSZoning           0
         LotFrontage      259
         LotArea            0
                         ...
         MoSold             0
         YrSold             0
         SaleType           0
         SaleCondition      0
         SalePrice          0
         Length: 81, dtype: int64
```

3. Missing Data treatment

```
In [34]: from preprocessing import replacer
         replacer(z)
```

```
In [35]: cat=[]
         con=[]
         for i in z.columns:
             if z[i].dtypes=="object":
                 cat.append(i)
             else:
                 con.append(i)
```

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```
In [36]: cat
```

Out[36]: ['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',
 'Functional',
 'FireplaceQu',
 'GarageType',
 'GarageFinish',
 'GarageQual',
 'GarageCond',
 'PavedDrive',
 'PoolQC',
 'Fence',
 'MiscFeature',
 'SaleType',
 'SaleCondition']

```
In [37]: con
```

```
Out[37]: ['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']
```

Define x and y

```
In [38]: Y=z[["SalePrice"]]
```

```
In [39]: Y
```

Out[39]:

	SalePrice
0	208500
1	181500
2	223500
3	140000
4	250000
...	...
1455	175000
1456	210000
1457	266500
1458	142125
1459	147500

1460 rows × 1 columns

In [40]:
```python
x=z.drop(["SalePrice"],axis=1)
```

In [41]:
```python
x.head()
```

Out[41]:

	Id	MSSubClass	MSZoning	LotFrontage	LotArea	Street	Alley	LotShape
0	1	60	RL	65.0	8450	Pave	Grvl	Reg
1	2	20	RL	80.0	9600	Pave	Grvl	Reg
2	3	60	RL	68.0	11250	Pave	Grvl	IR1
3	4	70	RL	60.0	9550	Pave	Grvl	IR1
4	5	60	RL	84.0	14260	Pave	Grvl	IR1

5 rows × 80 columns

2. Drop unnecessary columns(Columns with no statitical importance)

In [42]:
```python
unnecessory_col=x.drop(["Id","MSSubClass","LotFrontage","LotArea","OverallQu
```

In [43]:
```python
unnecessory_col
```

	MSZoning	Street	Alley	LotShape	LandContour	Utilities	LotConfig	L
0	RL	Pave	Grvl	Reg	Lvl	AllPub	Inside	
1	RL	Pave	Grvl	Reg	Lvl	AllPub	FR2	
2	RL	Pave	Grvl	IR1	Lvl	AllPub	Inside	
3	RL	Pave	Grvl	IR1	Lvl	AllPub	Corner	
4	RL	Pave	Grvl	IR1	Lvl	AllPub	FR2	
...	...	...	...	...	...	...	...	
1455	RL	Pave	Grvl	Reg	Lvl	AllPub	Inside	
1456	RL	Pave	Grvl	Reg	Lvl	AllPub	Inside	
1457	RL	Pave	Grvl	Reg	Lvl	AllPub	Inside	
1458	RL	Pave	Grvl	Reg	Lvl	AllPub	Inside	
1459	RL	Pave	Grvl	Reg	Lvl	AllPub	Inside	

1460 rows × 44 columns

correlation

In [44]:
```
numeric_columns=z.select_dtypes(include=['int','float']).columns
a=z[numeric_columns]
```

In [45]:
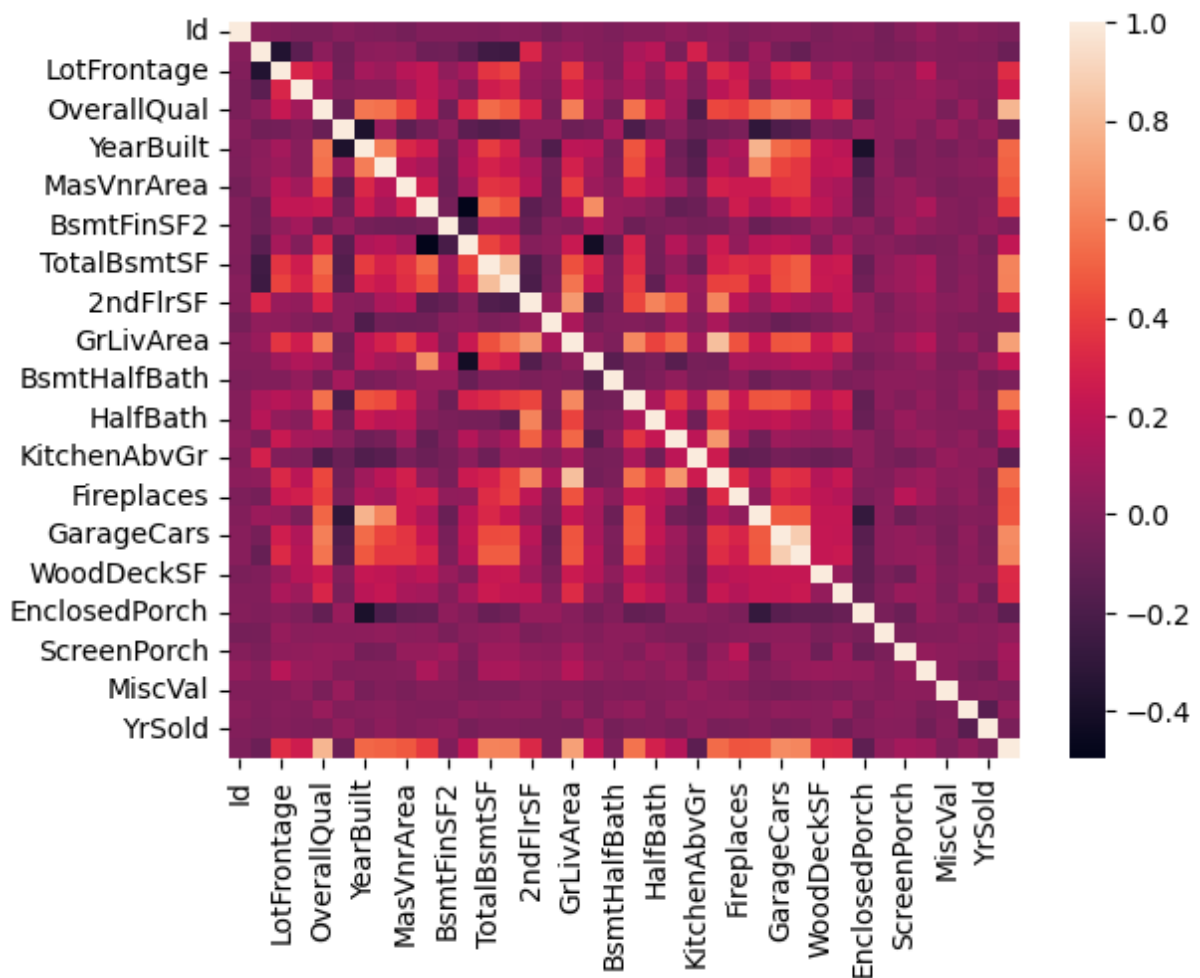```
correlation_matrix=a.corr()
correlation_matrix
```

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Out[45]:

| | Id | MSSubClass | LotFrontage | LotArea | OverallQual |
|---|---|---|---|---|---|
| **Id** | 1.000000 | 0.011156 | -0.009601 | -0.033226 | -0.028365 |
| **MSSubClass** | 0.011156 | 1.000000 | -0.357056 | -0.139781 | 0.032628 |
| **LotFrontage** | -0.009601 | -0.357056 | 1.000000 | 0.306795 | 0.234196 |
| **LotArea** | -0.033226 | -0.139781 | 0.306795 | 1.000000 | 0.105806 |
| **OverallQual** | -0.028365 | 0.032628 | 0.234196 | 0.105806 | 1.000000 |
| **OverallCond** | 0.012609 | -0.059316 | -0.052820 | -0.005636 | -0.091932 |
| **YearBuilt** | -0.012713 | 0.027850 | 0.117598 | 0.014228 | 0.572323 |
| **YearRemodAdd** | -0.021998 | 0.040581 | 0.082746 | 0.013788 | 0.550684 |
| **MasVnrArea** | -0.050199 | 0.022895 | 0.179283 | 0.103960 | 0.410238 |
| **BsmtFinSF1** | -0.005024 | -0.069836 | 0.215828 | 0.214103 | 0.239666 |
| **BsmtFinSF2** | -0.005968 | -0.065649 | 0.043340 | 0.111170 | -0.059119 |
| **BsmtUnfSF** | -0.007940 | -0.140759 | 0.122156 | -0.002618 | 0.308159 |
| **TotalBsmtSF** | -0.015415 | -0.238518 | 0.363358 | 0.260833 | 0.537808 |
| **1stFlrSF** | 0.010496 | -0.251758 | 0.414266 | 0.299475 | 0.476224 |
| **2ndFlrSF** | 0.005590 | 0.307886 | 0.072483 | 0.050986 | 0.295493 |
| **LowQualFinSF** | -0.044230 | 0.046474 | 0.036849 | 0.004779 | -0.030429 |
| **GrLivArea** | 0.008273 | 0.074853 | 0.368392 | 0.263116 | 0.593007 |
| **BsmtFullBath** | 0.002289 | 0.003491 | 0.091481 | 0.158155 | 0.111098 |
| **BsmtHalfBath** | -0.020155 | -0.002333 | -0.006419 | 0.048046 | -0.040150 |
| **FullBath** | 0.005587 | 0.131608 | 0.180424 | 0.126031 | 0.550600 |
| **HalfBath** | 0.006784 | 0.177354 | 0.048258 | 0.014259 | 0.273458 |
| **BedroomAbvGr** | 0.037719 | -0.023438 | 0.237023 | 0.119690 | 0.101676 |
| **KitchenAbvGr** | 0.002951 | 0.281721 | -0.005805 | -0.017784 | -0.183882 |
| **TotRmsAbvGrd** | 0.027239 | 0.040380 | 0.320146 | 0.190015 | 0.427452 |
| **Fireplaces** | -0.019772 | -0.045569 | 0.235755 | 0.271364 | 0.396765 |
| **GarageYrBlt** | 0.000070 | 0.080187 | 0.064324 | -0.024812 | 0.518018 |
| **GarageCars** | 0.016570 | -0.040110 | 0.269729 | 0.154871 | 0.600671 |
| **GarageArea** | 0.017634 | -0.098672 | 0.323663 | 0.180403 | 0.562022 |
| **WoodDeckSF** | -0.029643 | -0.012579 | 0.077106 | 0.171698 | 0.238923 |
| **OpenPorchSF** | -0.000477 | -0.006100 | 0.137454 | 0.084774 | 0.308819 |
| **EnclosedPorch** | 0.002889 | -0.012037 | 0.009790 | -0.018340 | -0.113937 |
| **3SsnPorch** | -0.046635 | -0.043825 | 0.062335 | 0.020423 | 0.030371 |
| **ScreenPorch** | 0.001330 | -0.026030 | 0.037684 | 0.043160 | 0.064886 |

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| | Id | MSSubClass | LotFrontage | LotArea | OverallQual | C |
|---|---|---|---|---|---|---|
| **PoolArea** | 0.057044 | 0.008283 | 0.180868 | 0.077672 | 0.065166 | |
| **MiscVal** | -0.006242 | -0.007683 | 0.001168 | 0.038068 | -0.031406 | |
| **MoSold** | 0.021172 | -0.013585 | 0.010158 | 0.001205 | 0.070815 | |
| **YrSold** | 0.000712 | -0.021407 | 0.006768 | -0.014261 | -0.027347 | |
| **SalePrice** | -0.021917 | -0.084284 | 0.334901 | 0.263843 | 0.790982 | |

38 rows × 38 columns

In [163… ```python
import seaborn as sb
sb.heatmap(a.corr())
```

Out[163… `<Axes: >`

finding skew and drop columns

In [46]: ```python
a.skew().sort_values()>0.7
```

```
Out[46]:  GarageYrBlt      False
          YearBuilt        False
          YearRemodAdd     False
          GarageCars       False
          Id               False
          FullBath         False
          YrSold           False
          GarageArea       False
          BedroomAbvGr     False
          MoSold           False
          OverallQual      False
          BsmtFullBath     False
          Fireplaces       False
          HalfBath         False
          TotRmsAbvGrd     False
          OverallCond      False
          2ndFlrSF          True
          BsmtUnfSF         True
          GrLivArea         True
          1stFlrSF          True
          MSSubClass        True
          TotalBsmtSF       True
          WoodDeckSF        True
          BsmtFinSF1        True
          SalePrice         True
          OpenPorchSF       True
          LotFrontage       True
          MasVnrArea        True
          EnclosedPorch     True
          BsmtHalfBath      True
          ScreenPorch       True
          BsmtFinSF2        True
          KitchenAbvGr      True
          LowQualFinSF      True
          3SsnPorch         True
          LotArea           True
          PoolArea          True
          MiscVal           True
          dtype: bool
```

In [49]: `Skew_new =a.drop(labels=["2ndFlrSF","BsmtUnfSF","GrLivArea","1stFlrSF","MSSu`

In [50]: `Skew_new.head(2)`

Out[50]:

	Id	OverallQual	OverallCond	YearBuilt	YearRemodAdd	BsmtFullBath	Full
0	1	7	5	2003	2003	1	
1	2	6	8	1976	1976	0	

Data Preparation

```python
In [51]: from preprocessing import data_prep
         xnew=data_prep(x)
```

```python
In [52]: xnew
```

Out[52]:

	Id	MSSubClass	LotFrontage	LotArea	OverallQual	OverallCon
0	-1.730865	0.073375	-0.229372	-0.207142	0.651479	-0.51720
1	-1.728492	-0.872563	0.451936	-0.091886	-0.071836	2.17962
2	-1.726120	0.073375	-0.093110	0.073480	0.651479	-0.51720
3	-1.723747	0.309859	-0.456474	-0.096897	0.651479	-0.51720
4	-1.721374	0.073375	0.633618	0.375148	1.374795	-0.51720
...	...	...	...	...	...	.
1455	1.721374	0.073375	-0.365633	-0.260560	-0.071836	-0.51720
1456	1.723747	-0.872563	0.679039	0.266407	-0.071836	0.38174
1457	1.726120	0.309859	-0.183951	-0.147810	0.651479	3.07857
1458	1.728492	-0.872563	-0.093110	-0.080160	-0.795151	0.38174
1459	1.730865	-0.872563	0.224833	-0.058112	-0.795151	0.38174

1460 rows × 288 columns

5. Preprocessing

5.1 Standardization of con columns
5.2 OHE of categorical columns

```python
In [55]: from sklearn.preprocessing import StandardScaler
         ss=StandardScaler()
         ss.fit_transform(xnew)
```

```
Out[55]: array([[-1.73086488,  0.07337496, -0.22937175, ..., -0.11785113,
                   0.4676514 , -0.30599503],
                [-1.7284922 , -0.87256276,  0.4519361 , ..., -0.11785113,
                   0.4676514 , -0.30599503],
                [-1.72611953,  0.07337496, -0.09311018, ..., -0.11785113,
                   0.4676514 , -0.30599503],
                ...,
                [ 1.72611953,  0.30985939, -0.18395123, ..., -0.11785113,
                   0.4676514 , -0.30599503],
                [ 1.7284922 , -0.87256276, -0.09311018, ..., -0.11785113,
                   0.4676514 , -0.30599503],
                [ 1.73086488, -0.87256276,  0.22483348, ..., -0.11785113,
                   0.4676514 , -0.30599503]])
```

```python
In [56]: pd.get_dummies(x,dtype='int')
```

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	Id	MSSubClass	LotFrontage	LotArea	OverallQual	OverallCond	Yea
0	1	60	65.0	8450	7	5	
1	2	20	80.0	9600	6	8	
2	3	60	68.0	11250	7	5	
3	4	70	60.0	9550	7	5	
4	5	60	84.0	14260	8	5	
...	...	...	...	...	...	...	
1455	1456	60	62.0	7917	6	5	
1456	1457	20	85.0	13175	6	6	
1457	1458	70	66.0	9042	7	9	
1458	1459	20	68.0	9717	5	6	
1459	1460	20	75.0	9937	5	6	

1460 rows × 288 columns

6. Divide data in training & testing set(Random state: 31)0.8,0.2

In [57]:
```python
from sklearn.model_selection import train_test_split
xtrain,xtest,ytrain,ytest=train_test_split(xnew,Y,test_size=0.2,random_state
```

In [58]:
```python
xtrain
```

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	Id	MSSubClass	LotFrontage	LotArea	OverallQual	OverallCon
1454	1.719002	-0.872563	$-3.656333e-01$	-0.302353	0.651479	-0.51720
226	-1.194641	0.073375	$5.427771e-01$	-0.056809	0.651479	-0.51720
944	0.508938	-0.872563	$6.454645e-16$	0.386674	-0.071836	0.38174
624	-0.250317	0.073375	$4.519361e-01$	-0.011709	-0.071836	-0.51720
1142	0.978728	0.073375	$3.156745e-01$	-0.055305	1.374795	-0.51720
...	...	...	...	...	...	.
826	0.228963	-0.281352	$-9.106796e-01$	-0.439657	-0.795151	0.38174
610	-0.283534	0.073375	$6.454645e-16$	0.053436	2.098110	-0.51720
894	0.390305	0.782828	$-2.747923e-01$	-0.350660	-0.795151	-0.51720
16	-1.692902	-0.872563	$6.454645e-16$	0.072578	-0.071836	1.28068
722	-0.017795	-0.872563	$-2.269135e-03$	-0.240215	-1.518467	1.28068

1168 rows × 288 columns

Ols model creation

In [59]:
```python
import numpy as np
from statsmodels.api import OLS,add_constant
xconst=add_constant(xtrain)
ol=OLS(ytrain,xconst)
model=ol.fit()
model.summary()
```

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Out[59]:

OLS Regression Results

Dep. Variable:	SalePrice	**R-squared:**	0.946
Model:	OLS	**Adj. R-squared:**	0.932
Method:	Least Squares	**F-statistic:**	68.32
Date:	Tue, 26 Mar 2024	**Prob (F-statistic):**	0.00
Time:	12:51:49	**Log-Likelihood:**	-13098.
No. Observations:	1168	**AIC:**	2.668e+04
Df Residuals:	928	**BIC:**	2.789e+04
Df Model:	239		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.
const	3756.7737	3107.561	1.209	0.227	-2341.889	985!
Id	422.6478	664.565	0.636	0.525	-881.578	1726
MSSubClass	-964.0995	3758.893	-0.256	0.798	-8341.016	6412
LotFrontage	1410.1526	1000.279	1.410	0.159	-552.918	337:
LotArea	8246.5313	1058.676	7.789	0.000	6168.855	1.03
OverallQual	9656.3217	1428.702	6.759	0.000	6852.459	1.25
OverallCond	6319.1962	998.366	6.330	0.000	4359.878	8278
YearBuilt	1.047e+04	2302.613	4.546	0.000	5948.766	1.5
YearRemodAdd	1885.1443	1170.039	1.611	0.107	-411.086	418:
MasVnrArea	3137.6506	872.138	3.598	0.000	1426.060	484!
BsmtFinSF1	9096.9481	1014.604	8.966	0.000	7105.763	1.11
BsmtFinSF2	1066.4035	1175.862	0.907	0.365	-1241.254	337
BsmtUnfSF	-653.8012	821.624	-0.796	0.426	-2266.258	958
TotalBsmtSF	9191.2240	1235.095	7.442	0.000	6767.322	1.16
1stFlrSF	7243.8546	1567.276	4.622	0.000	4168.039	1.03
2ndFlrSF	1.545e+04	1731.107	8.926	0.000	1.21e+04	1.88
LowQualFinSF	-800.2764	896.183	-0.893	0.372	-2559.057	958
GrLivArea	1.809e+04	1298.199	13.936	0.000	1.55e+04	2.06
BsmtFullBath	495.7181	1032.228	0.480	0.631	-1530.054	252:
BsmtHalfBath	-460.8395	700.276	-0.658	0.511	-1835.148	91:
FullBath	1741.9532	1234.391	1.411	0.159	-680.569	4164
HalfBath	957.1881	1066.654	0.897	0.370	-1136.146	305(
BedroomAbvGr	-4678.1654	1170.993	-3.995	0.000	-6976.267	-238(

	coef	std err	t	P>|t|	[0.025	0.975]
KitchenAbvGr	-2592.8439	1346.638	-1.925	0.054	-5235.652	49
TotRmsAbvGrd	2756.6954	1603.767	1.719	0.086	-390.735	5904
Fireplaces	986.6290	989.723	0.997	0.319	-955.727	2928
GarageYrBlt	1184.0424	1393.725	0.850	0.396	-1551.176	3919
GarageCars	3293.8680	1652.604	1.993	0.047	50.595	6537
GarageArea	334.1177	1642.315	0.203	0.839	-2888.964	3557
WoodDeckSF	1797.4707	764.901	2.350	0.019	296.335	3298
OpenPorchSF	900.9795	779.887	1.155	0.248	-629.567	2431
EnclosedPorch	100.1547	776.681	0.129	0.897	-1424.100	1624
3SsnPorch	586.1524	667.788	0.878	0.380	-724.397	1896
ScreenPorch	1595.4764	690.429	2.311	0.021	240.494	2950
PoolArea	3432.6587	1078.030	3.184	0.001	1317.000	5548
MiscVal	1440.1254	2099.961	0.686	0.493	-2681.097	5561
MoSold	-806.7353	669.743	-1.205	0.229	-2121.122	507
YrSold	-503.9567	691.784	-0.728	0.466	-1861.599	853
MSZoning_C (all)	-2.144e+04	9880.422	-2.170	0.030	-4.08e+04	-2049
MSZoning_FV	7256.8894	6267.820	1.158	0.247	-5043.856	1.96
MSZoning_RH	6195.0570	6273.362	0.988	0.324	-6116.564	1.85
MSZoning_RL	9665.3957	3553.457	2.720	0.007	2691.652	1.66
MSZoning_RM	2079.2764	3794.571	0.548	0.584	-5367.659	9526
Street_Grvl	-1.07e+04	7104.798	-1.506	0.132	-2.46e+04	3245
Street_Pave	1.445e+04	6560.033	2.203	0.028	1580.099	2.73
Alley_Grvl	1290.6724	2892.473	0.446	0.656	-4385.874	6967
Alley_Pave	2466.1013	2962.193	0.833	0.405	-3347.272	8279
LotShape_IR1	-354.5338	2968.150	-0.119	0.905	-6179.597	5470
LotShape_IR2	4823.4706	3900.532	1.237	0.217	-2831.416	1.25
LotShape_IR3	-1391.6370	7536.690	-0.185	0.854	-1.62e+04	1.34
LotShape_Reg	679.4740	2993.535	0.227	0.820	-5195.408	6554
LandContour_Bnk	2066.5231	3214.619	0.643	0.520	-4242.243	8375
LandContour_HLS	5004.4838	3344.905	1.496	0.135	-1559.971	1.16
LandContour_Low	-7411.5822	4500.705	-1.647	0.100	-1.62e+04	1421
LandContour_Lvl	4097.3490	2509.559	1.633	0.103	-827.719	9022
Utilities_AllPub	1.527e+04	1.17e+04	1.301	0.194	-7771.020	3.83
Utilities_NoSeWa	-1.152e+04	1.27e+04	-0.910	0.363	-3.63e+04	1.33

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	coef	std err	t	P>|t|	[0.025	0.975
LotConfig_Corner	2591.2548	2884.008	0.898	0.369	-3068.678	825:
LotConfig_CulDSac	1.023e+04	3472.849	2.945	0.003	3410.304	1.7
LotConfig_FR2	-4889.9137	3721.320	-1.314	0.189	-1.22e+04	241:
LotConfig_FR3	-6224.9227	9264.304	-0.672	0.502	-2.44e+04	1.2
LotConfig_Inside	2054.5031	2644.938	0.777	0.437	-3136.251	724:
LandSlope_Gtl	1.964e+04	4382.760	4.482	0.000	1.1e+04	2.82
LandSlope_Mod	2.085e+04	4343.228	4.801	0.000	1.23e+04	2.94
LandSlope_Sev	-3.673e+04	7592.064	-4.839	0.000	-5.16e+04	-2.18
Neighborhood_Blmngtn	-3366.6129	7044.708	-0.478	0.633	-1.72e+04	1.05
Neighborhood_Blueste	1.919e+04	2.26e+04	0.851	0.395	-2.51e+04	6.35
Neighborhood_BrDale	1037.9420	8007.640	0.130	0.897	-1.47e+04	1.68
Neighborhood_BrkSide	1889.6217	4708.239	0.401	0.688	-7350.408	1.11
Neighborhood_ClearCr	-1.112e+04	5760.055	-1.930	0.054	-2.24e+04	18!
Neighborhood_CollgCr	-8238.1404	3137.490	-2.626	0.009	-1.44e+04	-208(
Neighborhood_Crawfor	1.883e+04	4335.104	4.344	0.000	1.03e+04	2.73
Neighborhood_Edwards	-1.39e+04	3357.377	-4.141	0.000	-2.05e+04	-731:
Neighborhood_Gilbert	-1.09e+04	3886.407	-2.805	0.005	-1.85e+04	-327!
Neighborhood_IDOTRR	-2456.0633	6719.275	-0.366	0.715	-1.56e+04	1.07
Neighborhood_MeadowV	5852.2887	8380.398	0.698	0.485	-1.06e+04	2.23
Neighborhood_Mitchel	-1.559e+04	4089.149	-3.812	0.000	-2.36e+04	-756:
Neighborhood_NAmes	-1.267e+04	2819.805	-4.492	0.000	-1.82e+04	-713:
Neighborhood_NPkVill	1.467e+04	1.12e+04	1.312	0.190	-7268.346	3.66
Neighborhood_NWAmes	-1.506e+04	3634.827	-4.143	0.000	-2.22e+04	-792:
Neighborhood_NoRidge	1.988e+04	4969.544	3.999	0.000	1.01e+04	2.96
Neighborhood_NridgHt	1.13e+04	4476.828	2.525	0.012	2516.055	2.01
Neighborhood_OldTown	-4724.2301	4878.940	-0.968	0.333	-1.43e+04	485(
Neighborhood_SWISU	-7055.7390	6060.817	-1.164	0.245	-1.9e+04	483:
Neighborhood_Sawyer	-7737.4461	3646.503	-2.122	0.034	-1.49e+04	-58:
Neighborhood_SawyerW	-3982.2613	3781.426	-1.053	0.293	-1.14e+04	343:
Neighborhood_Somerst	5152.3120	6204.579	0.830	0.407	-7024.322	1.73
Neighborhood_StoneBr	3.236e+04	6345.484	5.100	0.000	1.99e+04	4.48
Neighborhood_Timber	-1.142e+04	4824.498	-2.366	0.018	-2.09e+04	-194:
Neighborhood_Veenker	1808.5600	7989.736	0.226	0.821	-1.39e+04	1.75
Condition1_Artery	-4893.9375	5339.470	-0.917	0.360	-1.54e+04	558!

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	coef	std err	t	P>|t|	[0.025	0.975]
Condition1_Feedr	6288.9707	4507.363	1.395	0.163	-2556.835	1.51
Condition1_Norm	1.429e+04	3683.228	3.879	0.000	7058.317	2.15
Condition1_PosA	-2455.3774	9327.122	-0.263	0.792	-2.08e+04	1.58
Condition1_PosN	1.549e+04	6474.158	2.393	0.017	2786.932	2.82
Condition1_RRAe	-1.751e+04	7354.610	-2.381	0.017	-3.19e+04	-3081
Condition1_RRAn	8581.2496	6017.380	1.426	0.154	-3228.001	2.04
Condition1_RRNe	-1.28e+04	1.95e+04	-0.658	0.511	-5.1e+04	2.54
Condition1_RRNn	-3230.7993	1.55e+04	-0.209	0.835	-3.36e+04	2.72
Condition2_Artery	1.978e+04	1.87e+04	1.055	0.291	-1.7e+04	5.65
Condition2_Feedr	1.315e+04	1.38e+04	0.954	0.340	-1.39e+04	4.02
Condition2_Norm	9173.9174	9464.989	0.969	0.333	-9401.348	2.77
Condition2_PosA	5.385e+04	2.96e+04	1.818	0.069	-4270.386	1.12
Condition2_PosN	-2.461e+04	2.16e+04	-1.138	0.256	-6.71e+04	1.78
Condition2_RRAe	-8.371e+04	4.55e+04	-1.838	0.066	-1.73e+05	5669
Condition2_RRAn	-4521.0642	2.11e+04	-0.214	0.830	-4.59e+04	3.69
Condition2_RRNn	2.065e+04	1.67e+04	1.236	0.217	-1.21e+04	5.34
BldgType_1Fam	1.214e+04	7095.756	1.711	0.087	-1785.597	2.61
BldgType_2fmCon	3830.3569	7144.911	0.536	0.592	-1.02e+04	1.79
BldgType_Duplex	-2321.6442	6111.249	-0.380	0.704	-1.43e+04	9671
BldgType_Twnhs	-7589.9389	5507.654	-1.378	0.169	-1.84e+04	3218
BldgType_TwnhsE	-2301.9923	4294.053	-0.536	0.592	-1.07e+04	6125
HouseStyle_1.5Fin	673.0776	3058.151	0.220	0.826	-5328.615	6674
HouseStyle_1.5Unf	1.887e+04	6740.767	2.799	0.005	5639.099	3.21
HouseStyle_1Story	9722.4423	4750.143	2.047	0.041	400.175	1.9
HouseStyle_2.5Fin	-2.621e+04	1.26e+04	-2.074	0.038	-5.1e+04	-1404
HouseStyle_2.5Unf	-1.051e+04	7864.904	-1.336	0.182	-2.59e+04	4925
HouseStyle_2Story	-4297.5534	3196.931	-1.344	0.179	-1.06e+04	1976
HouseStyle_SFoyer	8372.0451	5418.269	1.545	0.123	-2261.436	1.9
HouseStyle_SLvl	7136.3104	4594.060	1.553	0.121	-1879.640	1.62
RoofStyle_Flat	-2.038e+04	1.51e+04	-1.352	0.177	-5e+04	9212
RoofStyle_Gable	-1.548e+04	6741.380	-2.296	0.022	-2.87e+04	-2246
RoofStyle_Gambrel	-1.039e+04	9813.197	-1.059	0.290	-2.96e+04	8867
RoofStyle_Hip	-1.783e+04	6857.086	-2.600	0.009	-3.13e+04	-4373
RoofStyle_Mansard	-467.3989	1.12e+04	-0.042	0.967	-2.24e+04	2.15

	coef	std err	t	P>|t|	[0.025	0.975
RoofStyle_Shed	6.83e+04	2.43e+04	2.805	0.005	2.05e+04	1.16
RoofMatl_ClyTile	-6.406e+05	3.22e+04	-19.916	0.000	-7.04e+05	-5.77
RoofMatl_CompShg	6.297e+04	9393.466	6.703	0.000	4.45e+04	8.14
RoofMatl_Membran	1.728e+05	2.53e+04	6.824	0.000	1.23e+05	2.23
RoofMatl_Metal	1.352e+05	2.42e+04	5.580	0.000	8.77e+04	1.83
RoofMatl_Roll	5.102e+04	2.26e+04	2.253	0.024	6575.927	9.55
RoofMatl_Tar&Grv	6.913e+04	1.32e+04	5.251	0.000	4.33e+04	9.5
RoofMatl_WdShake	6.319e+04	1.77e+04	3.561	0.000	2.84e+04	9.8
RoofMatl_WdShngl	8.997e+04	1.5e+04	5.980	0.000	6.04e+04	1.19
Exterior1st_AsbShng	1.094e+04	1.32e+04	0.830	0.407	-1.49e+04	3.68
Exterior1st_AsphShn	2.119e+04	3.09e+04	0.686	0.493	-3.94e+04	8.18
Exterior1st_BrkComm	-2561.6279	2.25e+04	-0.114	0.909	-4.67e+04	4.16
Exterior1st_BrkFace	1.95e+04	6818.299	2.860	0.004	6119.616	3.29
Exterior1st_CBlock	2.051e-11	4.85e-11	0.423	0.673	-7.47e-11	1.16
Exterior1st_CemntBd	-1.014e+04	2.13e+04	-0.476	0.634	-5.19e+04	3.16
Exterior1st_HdBoard	-4191.2032	5753.229	-0.728	0.466	-1.55e+04	7099
Exterior1st_ImStucc	-8.785e-11	3.34e-11	-2.632	0.009	-1.53e-10	-2.23
Exterior1st_MetalSd	891.0154	8572.957	0.104	0.917	-1.59e+04	1.77
Exterior1st_Plywood	-5416.1764	5865.502	-0.923	0.356	-1.69e+04	6095
Exterior1st_Stone	-6647.7940	2.62e+04	-0.253	0.800	-5.81e+04	4.48
Exterior1st_Stucco	-1.08e+04	1.02e+04	-1.056	0.291	-3.09e+04	9268
Exterior1st_VinylSd	-4795.0160	8308.889	-0.577	0.564	-2.11e+04	1.15
Exterior1st_Wd Sdng	-3999.7012	5622.631	-0.711	0.477	-1.5e+04	7034
Exterior1st_WdShing	-213.8069	7115.413	-0.030	0.976	-1.42e+04	1.38
Exterior2nd_AsbShng	-7745.6325	1.31e+04	-0.593	0.554	-3.34e+04	1.79
Exterior2nd_AsphShn	-1.257e+04	2.33e+04	-0.538	0.590	-5.84e+04	3.33
Exterior2nd_Brk Cmn	1332.3287	1.57e+04	0.085	0.932	-2.95e+04	3.22
Exterior2nd_BrkFace	-1030.5510	7916.722	-0.130	0.896	-1.66e+04	1.45
Exterior2nd_CBlock	-9.491e-11	3.88e-11	-2.443	0.015	-1.71e-10	-1.87
Exterior2nd_CmentBd	7648.5599	2.15e+04	0.356	0.722	-3.45e+04	4.98
Exterior2nd_HdBoard	2398.2646	5037.207	0.476	0.634	-7487.372	1.23
Exterior2nd_ImStucc	1.863e+04	9535.676	1.954	0.051	-85.342	3.73
Exterior2nd_MetalSd	2207.5174	8137.327	0.271	0.786	-1.38e+04	1.82
Exterior2nd_Other	-1.285e-10	3.28e-11	-3.913	0.000	-1.93e-10	-6.41

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Exterior2nd_Plywood	-1169.3255	4596.719	-0.254	0.799	-1.02e+04	785
Exterior2nd_Stone	-2.729e+04	1.61e+04	-1.699	0.090	-5.88e+04	424
Exterior2nd_Stucco	1.035e+04	9767.264	1.060	0.290	-8817.764	2.95
Exterior2nd_VinylSd	7886.5457	7683.954	1.026	0.305	-7193.396	2.3
Exterior2nd_Wd Sdng	3725.1654	4702.124	0.792	0.428	-5502.864	1.3
Exterior2nd_Wd Shng	-617.2862	5753.897	-0.107	0.915	-1.19e+04	1.07
MasVnrType_BrkCmn	-2940.6037	4868.473	-0.604	0.546	-1.25e+04	661
MasVnrType_BrkFace	744.4972	2675.392	0.278	0.781	-4506.022	599
MasVnrType_Stone	5952.8802	3052.364	1.950	0.051	-37.456	1.19
ExterQual_Ex	9305.4214	4793.551	1.941	0.053	-102.035	1.87
ExterQual_Fa	3779.8584	8058.090	0.469	0.639	-1.2e+04	1.96
ExterQual_Gd	-5048.9232	3279.427	-1.540	0.124	-1.15e+04	138
ExterQual_TA	-4279.5829	3230.570	-1.325	0.186	-1.06e+04	206
ExterCond_Ex	5769.6909	1.76e+04	0.327	0.744	-2.88e+04	4.04
ExterCond_Fa	539.0085	7746.062	0.070	0.945	-1.47e+04	1.57
ExterCond_Gd	-8378.7738	6713.247	-1.248	0.212	-2.16e+04	479
ExterCond_Po	1.069e+04	1.97e+04	0.543	0.587	-2.8e+04	4.93
ExterCond_TA	-4865.6808	6526.270	-0.746	0.456	-1.77e+04	794
Foundation_BrkTil	188.4657	4087.344	0.046	0.963	-7833.044	820
Foundation_CBlock	999.4007	3650.566	0.274	0.784	-6164.922	816
Foundation_PConc	1103.2573	3773.396	0.292	0.770	-6302.122	850
Foundation_Slab	1.042e+04	6829.942	1.526	0.127	-2979.574	2.38
Foundation_Stone	1.594e+04	1.15e+04	1.389	0.165	-6576.032	3.84
Foundation_Wood	-2.489e+04	1.13e+04	-2.202	0.028	-4.71e+04	-270
BsmtQual_Ex	1.307e+04	3226.388	4.050	0.000	6735.330	1.94
BsmtQual_Fa	1138.0407	4019.704	0.283	0.777	-6750.722	902
BsmtQual_Gd	-7418.3288	2122.172	-3.496	0.000	-1.16e+04	-325
BsmtQual_TA	-3030.1305	2143.264	-1.414	0.158	-7236.336	117
BsmtCond_Fa	-1.963e+04	7449.693	-2.635	0.009	-3.42e+04	-500
BsmtCond_Gd	-1.93e+04	7727.379	-2.497	0.013	-3.45e+04	-413
BsmtCond_Po	5.786e+04	2.13e+04	2.720	0.007	1.61e+04	9.96
BsmtCond_TA	-1.518e+04	7335.637	-2.070	0.039	-2.96e+04	-784
BsmtExposure_Av	-2966.0516	1777.194	-1.669	0.095	-6453.837	52
BsmtExposure_Gd	1.328e+04	2253.944	5.890	0.000	8851.688	1.77

BsmtExposure_Mn	-1935.2550	2211.463	-0.875	0.382	-6275.303	240∠
BsmtExposure_No	-4617.0253	1547.217	-2.984	0.003	-7653.476	-158(
BsmtFinType1_ALQ	-764.8003	1891.397	-0.404	0.686	-4476.712	2947
BsmtFinType1_BLQ	1548.0731	2101.946	0.736	0.462	-2577.046	567:
BsmtFinType1_GLQ	4610.6075	1907.897	2.417	0.016	866.314	835∠
BsmtFinType1_LwQ	-5465.4310	2763.799	-1.978	0.048	-1.09e+04	-4:
BsmtFinType1_Rec	-304.8277	2275.384	-0.134	0.893	-4770.323	416(
BsmtFinType1_Unf	4133.1520	2028.786	2.037	0.042	151.612	811∠
BsmtFinType2_ALQ	1.103e+04	5216.531	2.114	0.035	792.580	2.13
BsmtFinType2_BLQ	-1214.4689	4454.457	-0.273	0.785	-9956.446	752:
BsmtFinType2_GLQ	9134.2295	7022.759	1.301	0.194	-4648.102	2.29
BsmtFinType2_LwQ	-7957.7995	3704.209	-2.148	0.032	-1.52e+04	-68∠
BsmtFinType2_Rec	-3603.2893	3469.525	-1.039	0.299	-1.04e+04	320:
BsmtFinType2_Unf	-3632.0441	3554.832	-1.022	0.307	-1.06e+04	334∠
Heating_Floor	5818.6579	1.95e+04	0.298	0.766	-3.25e+04	4.41
Heating_GasA	2506.5613	6631.136	0.378	0.706	-1.05e+04	1.55
Heating_GasW	-1598.1685	8095.301	-0.197	0.844	-1.75e+04	1.43
Heating_Grav	2735.4478	1.18e+04	0.232	0.817	-2.05e+04	2.59
Heating_OthW	-2.513e+04	2.04e+04	-1.232	0.218	-6.52e+04	1.49
Heating_Wall	1.942e+04	1.27e+04	1.531	0.126	-5481.428	4.43
HeatingQC_Ex	591.7949	5066.828	0.117	0.907	-9351.974	1.05
HeatingQC_Fa	705.8274	6095.302	0.116	0.908	-1.13e+04	1.27
HeatingQC_Gd	-3191.6217	5118.626	-0.624	0.533	-1.32e+04	685:
HeatingQC_Po	6748.3899	1.94e+04	0.347	0.728	-3.14e+04	4.49
HeatingQC_TA	-1097.6169	5019.439	-0.219	0.827	-1.09e+04	875:
CentralAir_N	1784.4501	2477.928	0.720	0.472	-3078.543	6647
CentralAir_Y	1972.3236	2571.706	0.767	0.443	-3074.710	7019
Electrical_FuseA	8484.5496	9464.338	0.896	0.370	-1.01e+04	2.71
Electrical_FuseF	8627.9805	1.06e+04	0.812	0.417	-1.22e+04	2.95
Electrical_FuseP	1.168e+04	1.54e+04	0.757	0.449	-1.86e+04	4.2
Electrical_Mix	-3.26e+04	3.29e+04	-0.990	0.323	-9.72e+04	3.2
Electrical_SBrkr	7556.1942	9494.802	0.796	0.426	-1.11e+04	2.62
KitchenQual_Ex	1.764e+04	3268.335	5.397	0.000	1.12e+04	2.41
KitchenQual_Fa	-1539.4569	3933.710	-0.391	0.696	-9259.455	618(

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	coef	std err	t	P>|t|	[0.025	0.975]
KitchenQual_Gd	-6562.4468	2082.607	-3.151	0.002	-1.06e+04	-247!
KitchenQual_TA	-5780.4645	2050.018	-2.820	0.005	-9803.673	-175
Functional_Maj1	4614.8541	8170.575	0.565	0.572	-1.14e+04	2.06
Functional_Maj2	975.3035	1.07e+04	0.091	0.928	-2.01e+04	2.2
Functional_Min1	1.134e+04	6244.356	1.816	0.070	-913.855	2.36
Functional_Min2	1.641e+04	6245.851	2.627	0.009	4149.710	2.87
Functional_Mod	-5361.3949	7909.545	-0.678	0.498	-2.09e+04	1.02
Functional_Sev	-4.881e+04	2.39e+04	-2.039	0.042	-9.58e+04	-183
Functional_Typ	2.459e+04	4857.939	5.062	0.000	1.51e+04	3.41
FireplaceQu_Ex	-2859.1686	4557.974	-0.627	0.531	-1.18e+04	608!
FireplaceQu_Fa	-6950.3614	3865.218	-1.798	0.072	-1.45e+04	63!
FireplaceQu_Gd	1275.4346	2114.591	0.603	0.547	-2874.501	542!
FireplaceQu_Po	1.074e+04	4794.868	2.240	0.025	1329.870	2.01
FireplaceQu_TA	1550.9582	2282.552	0.679	0.497	-2928.603	603(
GarageType_2Types	-1.204e+04	9501.844	-1.267	0.206	-3.07e+04	661
GarageType_Attchd	3145.2280	3201.386	0.982	0.326	-3137.568	9428
GarageType_Basment	4642.2608	6286.230	0.738	0.460	-7694.614	1.7
GarageType_BuiltIn	2685.4887	4268.781	0.629	0.529	-5692.095	1.11
GarageType_CarPort	-915.5819	1.07e+04	-0.086	0.932	-2.19e+04	2.01
GarageType_Detchd	6235.7807	3322.427	1.877	0.061	-284.561	1.28
GarageFinish_Fin	1550.1342	1689.055	0.918	0.359	-1764.675	4864
GarageFinish_RFn	-606.4645	1533.156	-0.396	0.693	-3615.320	240:
GarageFinish_Unf	2813.1041	1680.382	1.674	0.094	-484.685	611(
GarageQual_Ex	1.233e+05	2.43e+04	5.078	0.000	7.56e+04	1.71
GarageQual_Fa	-2.881e+04	8102.873	-3.556	0.000	-4.47e+04	-1.29
GarageQual_Gd	-2.21e+04	9683.288	-2.282	0.023	-4.11e+04	-309(
GarageQual_Po	-4.796e+04	1.94e+04	-2.478	0.013	-8.59e+04	-998:
GarageQual_TA	-2.064e+04	7803.814	-2.645	0.008	-3.6e+04	-532(
GarageCond_Ex	-1.067e+05	2.73e+04	-3.910	0.000	-1.6e+05	-5.31
GarageCond_Fa	2.925e+04	8222.766	3.557	0.000	1.31e+04	4.54
GarageCond_Gd	3.046e+04	1.07e+04	2.840	0.005	9413.408	5.15
GarageCond_Po	2.068e+04	1.36e+04	1.517	0.130	-6067.051	4.74
GarageCond_TA	3.007e+04	7564.910	3.975	0.000	1.52e+04	4.49
PavedDrive_N	4724.1373	2741.203	1.723	0.085	-655.538	1.01

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	coef	std err	t	P>|t|	[0.025	0.975]
PavedDrive_P	-3828.7727	3461.855	-1.106	0.269	-1.06e+04	296!
PavedDrive_Y	2861.4091	2318.234	1.234	0.217	-1688.180	741(
PoolQC_Ex	4.151e+04	1.54e+04	2.687	0.007	1.12e+04	7.18
PoolQC_Fa	-2.683e+04	1.75e+04	-1.530	0.126	-6.12e+04	7578
PoolQC_Gd	-1.092e+04	1.4e+04	-0.781	0.435	-3.84e+04	1.65
Fence_GdPrv	-6649.8358	3520.277	-1.889	0.059	-1.36e+04	258
Fence_GdWo	5438.7509	3396.668	1.601	0.110	-1227.290	1.21
Fence_MnPrv	5659.1521	2440.834	2.319	0.021	868.958	1.04
Fence_MnWw	-691.2934	5787.568	-0.119	0.905	-1.2e+04	1.07
MiscFeature_Gar2	-2.102e+04	4.91e+04	-0.428	0.669	-1.17e+05	7.54
MiscFeature_Othr	3.344e+04	2.13e+04	1.567	0.117	-8442.540	7.53
MiscFeature_Shed	2.369e+04	2.19e+04	1.084	0.279	-1.92e+04	6.66
MiscFeature_TenC	-3.236e+04	2.69e+04	-1.202	0.230	-8.52e+04	2.05
SaleType_COD	-1.189e+04	5506.661	-2.159	0.031	-2.27e+04	-107!
SaleType_CWD	9397.3102	1.2e+04	0.780	0.435	-1.42e+04	3.3
SaleType_Con	4246.8339	1.9e+04	0.223	0.823	-3.31e+04	4.16
SaleType_ConLD	701.4571	9640.610	0.073	0.942	-1.82e+04	1.96
SaleType_ConLI	-3792.3323	9574.775	-0.396	0.692	-2.26e+04	1.5
SaleType_ConLw	-1.139e+04	1.01e+04	-1.124	0.261	-3.13e+04	8492
SaleType_New	2.357e+04	1.54e+04	1.528	0.127	-6696.692	5.38
SaleType_Oth	3674.1493	1.41e+04	0.261	0.794	-2.39e+04	3.13
SaleType_WD	-1.076e+04	4277.415	-2.516	0.012	-1.92e+04	-2366
SaleCondition_Abnorml	894.1953	4905.394	0.182	0.855	-8732.756	1.05
SaleCondition_AdjLand	4748.3996	1.43e+04	0.332	0.740	-2.33e+04	3.28
SaleCondition_Alloca	1.184e+04	7995.762	1.481	0.139	-3854.005	2.75
SaleCondition_Family	-3864.9326	6041.541	-0.640	0.523	-1.57e+04	799:
SaleCondition_Normal	4615.1635	4404.226	1.048	0.295	-4028.234	1.33
SaleCondition_Partial	-1.447e+04	1.41e+04	-1.026	0.305	-4.22e+04	1.32

Omnibus:	255.567	Durbin-Watson:	1.995
Prob(Omnibus):	0.000	Jarque-Bera (JB):	3381.712
Skew:	0.613	Prob(JB):	0.00
Kurtosis:	11.245	Cond. No.	1.02e+16

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Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

[2] The smallest eigenvalue is 3.4e-28. This might indicate that there are strong multicollinearity problems or that the design matrix is singular.

```
In [60]: W = pd.DataFrame(model.pvalues,columns=["pval"])
         column_to_drop = W.sort_values(by="pval",ascending=False)[0:1].index[0]
         Xnew = xnew.drop(labels=[column_to_drop],axis=1)
```

```
In [61]: Xnew
```

Out[61]:

	Id	MSSubClass	LotFrontage	LotArea	OverallQual	OverallCon
0	-1.730865	0.073375	-0.229372	-0.207142	0.651479	-0.51720
1	-1.728492	-0.872563	0.451936	-0.091886	-0.071836	2.17962
2	-1.726120	0.073375	-0.093110	0.073480	0.651479	-0.51720
3	-1.723747	0.309859	-0.456474	-0.096897	0.651479	-0.51720
4	-1.721374	0.073375	0.633618	0.375148	1.374795	-0.51720
...	...	...	...	...	...	.
1455	1.721374	0.073375	-0.365633	-0.260560	-0.071836	-0.51720
1456	1.723747	-0.872563	0.679039	0.266407	-0.071836	0.38174
1457	1.726120	0.309859	-0.183951	-0.147810	0.651479	3.07857
1458	1.728492	-0.872563	-0.093110	-0.080160	-0.795151	0.38174
1459	1.730865	-0.872563	0.224833	-0.058112	-0.795151	0.38174

1460 rows × 287 columns

create Linear_Regression Model

```
In [62]: from sklearn.linear_model import LinearRegression
         lm=LinearRegression()
         model=lm.fit(xtrain,ytrain)
```

```
In [63]: pred=model.predict(xtest)
         from sklearn.metrics import mean_absolute_error
         mean_absolute_error(ytest,pred)
```

Out[63]: 9519259412603.926

```
In [165… from sklearn.metrics import mean_squared_error
         odel.predict(xtrain)
```

```
tr_err=round(mean_squared_error(ytrain,pred_tr),3)

pred_ts=model.predict(xtest)
ts_err=round(mean_squared_error(ytest,pred_ts),3)
print("training error:",tr_err)
print("testing error:",ts_err)
if(tr_err>ts_err):
    print("overfitting")
else:
    print("underfitting")
```

```
training error: 323223308.285
testing error: 1275976688.951
underfitting
```

tunning Grid Ridge and lasso

Ridge

In [66]:
```
Q=[]
x=20.5
for i in range(0,200,1):
    x=x+0.01
    x=round(x,4)
    Q.append(x)
```

In [67]:
```
from sklearn.linear_model import Ridge
for i in Q:
    rr=Ridge(alpha=i)
    model=rr.fit(xtrain,ytrain)
    tr_pred=model.predict(xtrain)
    ts_pred=model.predict(xtest)
    from sklearn.metrics import mean_absolute_error
    ts_err=mean_absolute_error(ytest,ts_pred)
    tr_err=mean_absolute_error(ytrain,tr_pred)
    print("alpha",i,"\ttr_Err",round(tr_err,4),"tss_Err",round(ts_err,4))
```

```
alpha 20.51    tr_Err 14732.046 tss_Err 18674.2222
alpha 20.52    tr_Err 14732.2866 tss_Err 18674.3127
alpha 20.53    tr_Err 14732.527 tss_Err 18674.403
alpha 20.54    tr_Err 14732.7672 tss_Err 18674.4933
alpha 20.55    tr_Err 14733.0073 tss_Err 18674.5834
alpha 20.56    tr_Err 14733.2472 tss_Err 18674.6735
alpha 20.57    tr_Err 14733.4869 tss_Err 18674.7634
alpha 20.58    tr_Err 14733.7265 tss_Err 18674.8533
alpha 20.59    tr_Err 14733.9658 tss_Err 18674.9431
alpha 20.6     tr_Err 14734.205 tss_Err 18675.0327
alpha 20.61    tr_Err 14734.4441 tss_Err 18675.1251
alpha 20.62    tr_Err 14734.6829 tss_Err 18675.2448
alpha 20.63    tr_Err 14734.9216 tss_Err 18675.3644
alpha 20.64    tr_Err 14735.1601 tss_Err 18675.4838
alpha 20.65    tr_Err 14735.3985 tss_Err 18675.6032
alpha 20.66    tr_Err 14735.6366 tss_Err 18675.7224
alpha 20.67    tr_Err 14735.8746 tss_Err 18675.8416
alpha 20.68    tr_Err 14736.1125 tss_Err 18675.9606
alpha 20.69    tr_Err 14736.3501 tss_Err 18676.0795
alpha 20.7     tr_Err 14736.5922 tss_Err 18676.1983
alpha 20.71    tr_Err 14736.8341 tss_Err 18676.317
alpha 20.72    tr_Err 14737.0758 tss_Err 18676.4356
alpha 20.73    tr_Err 14737.3174 tss_Err 18676.5541
alpha 20.74    tr_Err 14737.5588 tss_Err 18676.6725
alpha 20.75    tr_Err 14737.8 tss_Err 18676.7908
alpha 20.76    tr_Err 14738.041 tss_Err 18676.9089
alpha 20.77    tr_Err 14738.2819 tss_Err 18677.027
alpha 20.78    tr_Err 14738.5226 tss_Err 18677.1449
alpha 20.79    tr_Err 14738.7631 tss_Err 18677.2628
alpha 20.8     tr_Err 14739.0035 tss_Err 18677.3805
alpha 20.81    tr_Err 14739.2437 tss_Err 18677.4981
alpha 20.82    tr_Err 14739.4837 tss_Err 18677.6156
alpha 20.83    tr_Err 14739.7235 tss_Err 18677.733
alpha 20.84    tr_Err 14739.9632 tss_Err 18677.8503
alpha 20.85    tr_Err 14740.2027 tss_Err 18677.9675
alpha 20.86    tr_Err 14740.442 tss_Err 18678.0846
alpha 20.87    tr_Err 14740.6812 tss_Err 18678.2016
alpha 20.88    tr_Err 14740.9202 tss_Err 18678.3185
alpha 20.89    tr_Err 14741.159 tss_Err 18678.4352
alpha 20.9     tr_Err 14741.3977 tss_Err 18678.5519
alpha 20.91    tr_Err 14741.6362 tss_Err 18678.6685
alpha 20.92    tr_Err 14741.8745 tss_Err 18678.7849
alpha 20.93    tr_Err 14742.1126 tss_Err 18678.9012
alpha 20.94    tr_Err 14742.3506 tss_Err 18679.0175
alpha 20.95    tr_Err 14742.5884 tss_Err 18679.1336
alpha 20.96    tr_Err 14742.826 tss_Err 18679.2496
alpha 20.97    tr_Err 14743.0635 tss_Err 18679.3655
alpha 20.98    tr_Err 14743.3008 tss_Err 18679.4814
alpha 20.99    tr_Err 14743.538 tss_Err 18679.5971
alpha 21.0     tr_Err 14743.7749 tss_Err 18679.7127
alpha 21.01    tr_Err 14744.0117 tss_Err 18679.8281
alpha 21.02    tr_Err 14744.2484 tss_Err 18679.9435
alpha 21.03    tr_Err 14744.4848 tss_Err 18680.0588
alpha 21.04    tr_Err 14744.7211 tss_Err 18680.174
alpha 21.05    tr_Err 14744.9573 tss_Err 18680.2891
alpha 21.06    tr_Err 14745.1932 tss_Err 18680.404
```

```
alpha 21.07     tr_Err 14745.429 tss_Err 18680.5189
alpha 21.08     tr_Err 14745.6679 tss_Err 18680.6337
alpha 21.09     tr_Err 14745.9088 tss_Err 18680.7483
alpha 21.1      tr_Err 14746.1495 tss_Err 18680.8629
alpha 21.11     tr_Err 14746.39 tss_Err 18680.9773
alpha 21.12     tr_Err 14746.6307 tss_Err 18681.0917
alpha 21.13     tr_Err 14746.8728 tss_Err 18681.2059
alpha 21.14     tr_Err 14747.1147 tss_Err 18681.32
alpha 21.15     tr_Err 14747.3565 tss_Err 18681.4341
alpha 21.16     tr_Err 14747.5981 tss_Err 18681.548
alpha 21.17     tr_Err 14747.8395 tss_Err 18681.6618
alpha 21.18     tr_Err 14748.0807 tss_Err 18681.7755
alpha 21.19     tr_Err 14748.3218 tss_Err 18681.8891
alpha 21.2      tr_Err 14748.5628 tss_Err 18682.0027
alpha 21.21     tr_Err 14748.8035 tss_Err 18682.1161
alpha 21.22     tr_Err 14749.0441 tss_Err 18682.2294
alpha 21.23     tr_Err 14749.2845 tss_Err 18682.3426
alpha 21.24     tr_Err 14749.5248 tss_Err 18682.4557
alpha 21.25     tr_Err 14749.7649 tss_Err 18682.5687
alpha 21.26     tr_Err 14750.0048 tss_Err 18682.6816
alpha 21.27     tr_Err 14750.2446 tss_Err 18682.7944
alpha 21.28     tr_Err 14750.4842 tss_Err 18682.907
alpha 21.29     tr_Err 14750.7236 tss_Err 18683.0196
alpha 21.3      tr_Err 14750.9629 tss_Err 18683.1321
alpha 21.31     tr_Err 14751.202 tss_Err 18683.2445
alpha 21.32     tr_Err 14751.441 tss_Err 18683.3568
alpha 21.33     tr_Err 14751.6797 tss_Err 18683.469
alpha 21.34     tr_Err 14751.9184 tss_Err 18683.581
alpha 21.35     tr_Err 14752.1568 tss_Err 18683.693
alpha 21.36     tr_Err 14752.3951 tss_Err 18683.8049
alpha 21.37     tr_Err 14752.6332 tss_Err 18683.9167
alpha 21.38     tr_Err 14752.8712 tss_Err 18684.0283
alpha 21.39     tr_Err 14753.109 tss_Err 18684.1399
alpha 21.4      tr_Err 14753.3466 tss_Err 18684.2514
alpha 21.41     tr_Err 14753.5841 tss_Err 18684.3627
alpha 21.42     tr_Err 14753.8214 tss_Err 18684.474
alpha 21.43     tr_Err 14754.0585 tss_Err 18684.5852
alpha 21.44     tr_Err 14754.2955 tss_Err 18684.6962
alpha 21.45     tr_Err 14754.5323 tss_Err 18684.8072
alpha 21.46     tr_Err 14754.769 tss_Err 18684.9181
alpha 21.47     tr_Err 14755.0055 tss_Err 18685.0288
alpha 21.48     tr_Err 14755.2418 tss_Err 18685.1395
alpha 21.49     tr_Err 14755.478 tss_Err 18685.2501
alpha 21.5      tr_Err 14755.714 tss_Err 18685.3605
alpha 21.51     tr_Err 14755.9499 tss_Err 18685.4709
alpha 21.52     tr_Err 14756.1873 tss_Err 18685.5812
alpha 21.53     tr_Err 14756.4257 tss_Err 18685.6913
alpha 21.54     tr_Err 14756.6639 tss_Err 18685.8014
alpha 21.55     tr_Err 14756.902 tss_Err 18685.9113
alpha 21.56     tr_Err 14757.14 tss_Err 18686.0212
alpha 21.57     tr_Err 14757.3777 tss_Err 18686.131
alpha 21.58     tr_Err 14757.6153 tss_Err 18686.2406
alpha 21.59     tr_Err 14757.8528 tss_Err 18686.3502
alpha 21.6      tr_Err 14758.0901 tss_Err 18686.4597
alpha 21.61     tr_Err 14758.3272 tss_Err 18686.569
alpha 21.62     tr_Err 14758.5641 tss_Err 18686.6783
```

```
alpha 21.63     tr_Err 14758.8009 tss_Err 18686.7875
alpha 21.64     tr_Err 14759.0376 tss_Err 18686.8966
alpha 21.65     tr_Err 14759.2741 tss_Err 18687.0055
alpha 21.66     tr_Err 14759.5104 tss_Err 18687.1144
alpha 21.67     tr_Err 14759.7465 tss_Err 18687.2232
alpha 21.68     tr_Err 14759.9825 tss_Err 18687.3319
alpha 21.69     tr_Err 14760.2184 tss_Err 18687.4405
alpha 21.7      tr_Err 14760.454 tss_Err 18687.5489
alpha 21.71     tr_Err 14760.6895 tss_Err 18687.6573
alpha 21.72     tr_Err 14760.9249 tss_Err 18687.7656
alpha 21.73     tr_Err 14761.1601 tss_Err 18687.8738
alpha 21.74     tr_Err 14761.3951 tss_Err 18687.9819
alpha 21.75     tr_Err 14761.63 tss_Err 18688.0899
alpha 21.76     tr_Err 14761.8647 tss_Err 18688.1978
alpha 21.77     tr_Err 14762.0993 tss_Err 18688.3056
alpha 21.78     tr_Err 14762.3336 tss_Err 18688.4133
alpha 21.79     tr_Err 14762.5679 tss_Err 18688.5209
alpha 21.8      tr_Err 14762.802 tss_Err 18688.6284
alpha 21.81     tr_Err 14763.0359 tss_Err 18688.7358
alpha 21.82     tr_Err 14763.2696 tss_Err 18688.8431
alpha 21.83     tr_Err 14763.5032 tss_Err 18688.9503
alpha 21.84     tr_Err 14763.7367 tss_Err 18689.0575
alpha 21.85     tr_Err 14763.97 tss_Err 18689.1645
alpha 21.86     tr_Err 14764.2031 tss_Err 18689.2714
alpha 21.87     tr_Err 14764.4361 tss_Err 18689.3782
alpha 21.88     tr_Err 14764.6689 tss_Err 18689.485
alpha 21.89     tr_Err 14764.9015 tss_Err 18689.5916
alpha 21.9      tr_Err 14765.134 tss_Err 18689.6982
alpha 21.91     tr_Err 14765.3664 tss_Err 18689.8046
alpha 21.92     tr_Err 14765.5986 tss_Err 18689.911
alpha 21.93     tr_Err 14765.8306 tss_Err 18690.0172
alpha 21.94     tr_Err 14766.0625 tss_Err 18690.1234
alpha 21.95     tr_Err 14766.2942 tss_Err 18690.2294
alpha 21.96     tr_Err 14766.5257 tss_Err 18690.3354
alpha 21.97     tr_Err 14766.7571 tss_Err 18690.4413
alpha 21.98     tr_Err 14766.9884 tss_Err 18690.547
alpha 21.99     tr_Err 14767.2195 tss_Err 18690.6527
alpha 22.0      tr_Err 14767.4504 tss_Err 18690.7583
alpha 22.01     tr_Err 14767.6812 tss_Err 18690.8638
alpha 22.02     tr_Err 14767.9118 tss_Err 18690.9692
alpha 22.03     tr_Err 14768.1423 tss_Err 18691.0745
alpha 22.04     tr_Err 14768.3726 tss_Err 18691.1797
alpha 22.05     tr_Err 14768.6027 tss_Err 18691.2848
alpha 22.06     tr_Err 14768.8327 tss_Err 18691.3898
alpha 22.07     tr_Err 14769.0626 tss_Err 18691.4948
alpha 22.08     tr_Err 14769.2923 tss_Err 18691.5996
alpha 22.09     tr_Err 14769.5218 tss_Err 18691.7043
alpha 22.1      tr_Err 14769.7512 tss_Err 18691.809
alpha 22.11     tr_Err 14769.9823 tss_Err 18691.9135
alpha 22.12     tr_Err 14770.2136 tss_Err 18692.018
alpha 22.13     tr_Err 14770.4449 tss_Err 18692.1223
alpha 22.14     tr_Err 14770.6759 tss_Err 18692.2266
alpha 22.15     tr_Err 14770.9068 tss_Err 18692.3308
alpha 22.16     tr_Err 14771.1376 tss_Err 18692.4349
alpha 22.17     tr_Err 14771.3682 tss_Err 18692.5388
alpha 22.18     tr_Err 14771.5987 tss_Err 18692.646
```

```
alpha 22.19    tr_Err 14771.829 tss_Err 18692.7583
alpha 22.2     tr_Err 14772.0591 tss_Err 18692.8705
alpha 22.21    tr_Err 14772.2891 tss_Err 18692.9826
alpha 22.22    tr_Err 14772.5189 tss_Err 18693.0946
alpha 22.23    tr_Err 14772.7486 tss_Err 18693.2064
alpha 22.24    tr_Err 14772.9781 tss_Err 18693.3182
alpha 22.25    tr_Err 14773.2075 tss_Err 18693.4299
alpha 22.26    tr_Err 14773.4367 tss_Err 18693.5415
alpha 22.27    tr_Err 14773.6658 tss_Err 18693.653
alpha 22.28    tr_Err 14773.8947 tss_Err 18693.7644
alpha 22.29    tr_Err 14774.1235 tss_Err 18693.8758
alpha 22.3     tr_Err 14774.3521 tss_Err 18693.987
alpha 22.31    tr_Err 14774.5806 tss_Err 18694.0981
alpha 22.32    tr_Err 14774.8089 tss_Err 18694.2091
alpha 22.33    tr_Err 14775.0371 tss_Err 18694.32
alpha 22.34    tr_Err 14775.2651 tss_Err 18694.4309
alpha 22.35    tr_Err 14775.4929 tss_Err 18694.5416
alpha 22.36    tr_Err 14775.7206 tss_Err 18694.6523
alpha 22.37    tr_Err 14775.9482 tss_Err 18694.7628
alpha 22.38    tr_Err 14776.1756 tss_Err 18694.8733
alpha 22.39    tr_Err 14776.4028 tss_Err 18694.9836
alpha 22.4     tr_Err 14776.6299 tss_Err 18695.0939
alpha 22.41    tr_Err 14776.8569 tss_Err 18695.2041
alpha 22.42    tr_Err 14777.0837 tss_Err 18695.3142
alpha 22.43    tr_Err 14777.3103 tss_Err 18695.4242
alpha 22.44    tr_Err 14777.5368 tss_Err 18695.534
alpha 22.45    tr_Err 14777.7632 tss_Err 18695.6438
alpha 22.46    tr_Err 14777.9894 tss_Err 18695.7535
alpha 22.47    tr_Err 14778.2154 tss_Err 18695.8632
alpha 22.48    tr_Err 14778.4413 tss_Err 18695.9727
alpha 22.49    tr_Err 14778.6671 tss_Err 18696.0821
alpha 22.5     tr_Err 14778.8927 tss_Err 18696.1914
```

Lasso

In [71]:
```python
Q=[]
x=3.03
for i in range(0,10,1):
    x=x+0.001
    x=round(x,4)
    Q.append(x)
```

In [72]:
```python
from warnings import filterwarnings
filterwarnings("ignore")
```

In [73]:
```python
from sklearn.linear_model import Lasso
trerrs=[]
tserrs=[]
for i in Q:
    ls=Lasso(alpha=i)
    model=ls.fit(xtrain,ytrain)
    tr_pred=model.predict(xtrain)
    ts_pred=model.predict(xtest)
    from sklearn.metrics import mean_absolute_error
    ts_err=mean_absolute_error(ytest,ts_pred)
```

```
        tr_err=mean_absolute_error(ytrain,tr_pred)
        print("alpha",i,"\ttr_Err",round(tr_err,4),"tss_Err",round(ts_err,4))
```
```
alpha 3.031      tr_Err 12490.9447 tss_Err 17851.8278
alpha 3.032      tr_Err 12490.9557 tss_Err 17851.7694
alpha 3.033      tr_Err 12490.9667 tss_Err 17851.7108
alpha 3.034      tr_Err 12490.9777 tss_Err 17851.6523
alpha 3.035      tr_Err 12490.9887 tss_Err 17851.5938
alpha 3.036      tr_Err 12490.9961 tss_Err 17851.5182
alpha 3.037      tr_Err 12491.0071 tss_Err 17851.4598
alpha 3.038      tr_Err 12491.0181 tss_Err 17851.4014
alpha 3.039      tr_Err 12491.0291 tss_Err 17851.3429
alpha 3.04       tr_Err 12491.04 tss_Err 17851.2844
```

GrisearchCv model to find best penalty value for Ridge | Lasso

In [75]:
```python
tunning_grid={"alpha":Q}
ls=Lasso()
from sklearn.model_selection import GridSearchCV
cv=GridSearchCV(ls,tunning_grid,scoring="neg_mean_squared_error",cv=4)
cvmodel=cv.fit(xnew,Y)
cvmodel.best_params_
```

Out[75]: {'alpha': 3.04}

Testing

In [130…
```python
test=pd.read_csv("C:/Users/admin/Desktop/machine_learning/ml_Regression_proj
```

In [131…
```python
test.head()
```

Out[131…

	Id	MSSubClass	MSZoning	LotFrontage	LotArea	Street	Alley	LotShap
0	1461	20	RH	80.0	11622	Pave	NaN	Re
1	1462	20	RL	81.0	14267	Pave	NaN	IF
2	1463	60	RL	74.0	13830	Pave	NaN	IF
3	1464	60	RL	78.0	9978	Pave	NaN	IF
4	1465	120	RL	43.0	5005	Pave	NaN	IF

5 rows × 80 columns

In [132…
```python
test.shape
```

Out[132… (1459, 80)

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```
In [ ]:
```

```
In [133…  replacer(test)
```

```
In [134…  cols_keeps=list(xtrain.columns)
```

```
In [135…  cols_keeps
```

```
Out[135…  ['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',
           'MSZoning_C (all)',
           'MSZoning_FV',
           'MSZoning_RH',
           'MSZoning_RL',
           'MSZoning_RM',
           'Street_Grvl',
           'Street_Pave',
           'Alley_Grvl',
           'Alley_Pave',
           'LotShape_IR1',
           'LotShape_IR2',
           'LotShape_IR3',
           'LotShape_Reg',
           'LandContour_Bnk',
           'LandContour_HLS',
           'LandContour_Low',
           'LandContour_Lvl',
           'Utilities_AllPub',
           es_NoSeWa',
```

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```
        'LotConfig_Corner',
        'LotConfig_CulDSac',
        'LotConfig_FR2',
        'LotConfig_FR3',
        'LotConfig_Inside',
        'LandSlope_Gtl',
        'LandSlope_Mod',
        'LandSlope_Sev',
        'Neighborhood_Blmngtn',
        'Neighborhood_Blueste',
        'Neighborhood_BrDale',
        'Neighborhood_BrkSide',
        'Neighborhood_ClearCr',
        'Neighborhood_CollgCr',
        'Neighborhood_Crawfor',
        'Neighborhood_Edwards',
        'Neighborhood_Gilbert',
        'Neighborhood_IDOTRR',
        'Neighborhood_MeadowV',
        'Neighborhood_Mitchel',
        'Neighborhood_NAmes',
        'Neighborhood_NPkVill',
        'Neighborhood_NWAmes',
        'Neighborhood_NoRidge',
        'Neighborhood_NridgHt',
        'Neighborhood_OldTown',
        'Neighborhood_SWISU',
        'Neighborhood_Sawyer',
        'Neighborhood_SawyerW',
        'Neighborhood_Somerst',
        'Neighborhood_StoneBr',
        'Neighborhood_Timber',
        'Neighborhood_Veenker',
        'Condition1_Artery',
        'Condition1_Feedr',
        'Condition1_Norm',
        'Condition1_PosA',
        'Condition1_PosN',
        'Condition1_RRAe',
        'Condition1_RRAn',
        'Condition1_RRNe',
        'Condition1_RRNn',
        'Condition2_Artery',
        'Condition2_Feedr',
        'Condition2_Norm',
        'Condition2_PosA',
        'Condition2_PosN',
        'Condition2_RRAe',
        'Condition2_RRAn',
        'Condition2_RRNn',
        'BldgType_1Fam',
        'BldgType_2fmCon',
        'BldgType_Duplex',
        'BldgType_Twnhs',
        'BldgType_TwnhsE',
        'HouseStyle_1.5Fin',
```

```
'HouseStyle_1.5Unf',
'HouseStyle_1Story',
'HouseStyle_2.5Fin',
'HouseStyle_2.5Unf',
'HouseStyle_2Story',
'HouseStyle_SFoyer',
'HouseStyle_SLvl',
'RoofStyle_Flat',
'RoofStyle_Gable',
'RoofStyle_Gambrel',
'RoofStyle_Hip',
'RoofStyle_Mansard',
'RoofStyle_Shed',
'RoofMatl_ClyTile',
'RoofMatl_CompShg',
'RoofMatl_Membran',
'RoofMatl_Metal',
'RoofMatl_Roll',
'RoofMatl_Tar&Grv',
'RoofMatl_WdShake',
'RoofMatl_WdShngl',
'Exterior1st_AsbShng',
'Exterior1st_AsphShn',
'Exterior1st_BrkComm',
'Exterior1st_BrkFace',
'Exterior1st_CBlock',
'Exterior1st_CemntBd',
'Exterior1st_HdBoard',
'Exterior1st_ImStucc',
'Exterior1st_MetalSd',
'Exterior1st_Plywood',
'Exterior1st_Stone',
'Exterior1st_Stucco',
'Exterior1st_VinylSd',
'Exterior1st_Wd Sdng',
'Exterior1st_WdShing',
'Exterior2nd_AsbShng',
'Exterior2nd_AsphShn',
'Exterior2nd_Brk Cmn',
'Exterior2nd_BrkFace',
'Exterior2nd_CBlock',
'Exterior2nd_CmentBd',
'Exterior2nd_HdBoard',
'Exterior2nd_ImStucc',
'Exterior2nd_MetalSd',
'Exterior2nd_Other',
'Exterior2nd_Plywood',
'Exterior2nd_Stone',
'Exterior2nd_Stucco',
'Exterior2nd_VinylSd',
'Exterior2nd_Wd Sdng',
'Exterior2nd_Wd Shng',
'MasVnrType_BrkCmn',
'MasVnrType_BrkFace',
'MasVnrType_Stone',
'ExterQual_Ex',
```

```
'ExterQual_Fa',
'ExterQual_Gd',
'ExterQual_TA',
'ExterCond_Ex',
'ExterCond_Fa',
'ExterCond_Gd',
'ExterCond_Po',
'ExterCond_TA',
'Foundation_BrkTil',
'Foundation_CBlock',
'Foundation_PConc',
'Foundation_Slab',
'Foundation_Stone',
'Foundation_Wood',
'BsmtQual_Ex',
'BsmtQual_Fa',
'BsmtQual_Gd',
'BsmtQual_TA',
'BsmtCond_Fa',
'BsmtCond_Gd',
'BsmtCond_Po',
'BsmtCond_TA',
'BsmtExposure_Av',
'BsmtExposure_Gd',
'BsmtExposure_Mn',
'BsmtExposure_No',
'BsmtFinType1_ALQ',
'BsmtFinType1_BLQ',
'BsmtFinType1_GLQ',
'BsmtFinType1_LwQ',
'BsmtFinType1_Rec',
'BsmtFinType1_Unf',
'BsmtFinType2_ALQ',
'BsmtFinType2_BLQ',
'BsmtFinType2_GLQ',
'BsmtFinType2_LwQ',
'BsmtFinType2_Rec',
'BsmtFinType2_Unf',
'Heating_Floor',
'Heating_GasA',
'Heating_GasW',
'Heating_Grav',
'Heating_OthW',
'Heating_Wall',
'HeatingQC_Ex',
'HeatingQC_Fa',
'HeatingQC_Gd',
'HeatingQC_Po',
'HeatingQC_TA',
'CentralAir_N',
'CentralAir_Y',
'Electrical_FuseA',
'Electrical_FuseF',
'Electrical_FuseP',
'Electrical_Mix',
'Electrical_SBrkr',
```

```
'KitchenQual_Ex',
'KitchenQual_Fa',
'KitchenQual_Gd',
'KitchenQual_TA',
'Functional_Maj1',
'Functional_Maj2',
'Functional_Min1',
'Functional_Min2',
'Functional_Mod',
'Functional_Sev',
'Functional_Typ',
'FireplaceQu_Ex',
'FireplaceQu_Fa',
'FireplaceQu_Gd',
'FireplaceQu_Po',
'FireplaceQu_TA',
'GarageType_2Types',
'GarageType_Attchd',
'GarageType_Basment',
'GarageType_BuiltIn',
'GarageType_CarPort',
'GarageType_Detchd',
'GarageFinish_Fin',
'GarageFinish_RFn',
'GarageFinish_Unf',
'GarageQual_Ex',
'GarageQual_Fa',
'GarageQual_Gd',
'GarageQual_Po',
'GarageQual_TA',
'GarageCond_Ex',
'GarageCond_Fa',
'GarageCond_Gd',
'GarageCond_Po',
'GarageCond_TA',
'PavedDrive_N',
'PavedDrive_P',
'PavedDrive_Y',
'PoolQC_Ex',
'PoolQC_Fa',
'PoolQC_Gd',
'Fence_GdPrv',
'Fence_GdWo',
'Fence_MnPrv',
'Fence_MnWw',
'MiscFeature_Gar2',
'MiscFeature_Othr',
'MiscFeature_Shed',
'MiscFeature_TenC',
'SaleType_COD',
'SaleType_CWD',
'SaleType_Con',
'SaleType_ConLD',
'SaleType_ConLI',
'SaleType_ConLw',
'SaleType_New',
```

```
          'SaleType_Oth',
          'SaleType_WD',
          'SaleCondition_Abnorml',
          'SaleCondition_AdjLand',
          'SaleCondition_Alloca',
          'SaleCondition_Family',
          'SaleCondition_Normal',
          'SaleCondition_Partial']
```

In [136…
```python
cat=[]
con=[]
for i in test.columns:
    if(test[i].dtypes=="object"):
        cat.append(i)
    else:
        con.append(i)
```

In [137…
```python
cat
```

```
Out[137…   ['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',
           'Functional',
           'FireplaceQu',
           'GarageType',
           'GarageFinish',
           'GarageQual',
           'GarageCond',
           'PavedDrive',
           'PoolQC',
           'Fence',
           'MiscFeature',
           'SaleType',
           'SaleCondition']

In [138…   con
```

```
Out[138…  ['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']
```

```
In [139…  x1=pd.DataFrame(ss.fit_transform(test[con]),columns=con)
```

```
In [140…  x1
```

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Out[140…

	Id	MSSubClass	LotFrontage	LotArea	OverallQual	OverallCon…
0	-1.730864	-0.874711	0.555587	0.363929	-0.751101	0.40076
1	-1.728490	-0.874711	0.604239	0.897861	-0.054877	0.40076
2	-1.726115	0.061351	0.263676	0.809646	-0.751101	-0.49741
3	-1.723741	0.061351	0.458284	0.032064	-0.054877	0.40076
4	-1.721367	1.465443	-1.244533	-0.971808	1.337571	-0.49741
...	...	...	...	...	...	.
1454	1.721367	2.401505	-2.314875	-1.591330	-1.447325	1.29895
1455	1.723741	2.401505	-2.314875	-1.599808	-1.447325	-0.49741
1456	1.726115	-0.874711	4.447740	2.055150	-0.751101	1.29895
1457	1.728490	0.646389	-0.320147	0.125527	-0.751101	-0.49741
1458	1.730864	0.061351	0.263676	-0.038790	0.641347	-0.49741

1459 rows × 37 columns

In [141… `x2=pd.get_dummies(test[cat],dtype='int')`

In [142… `x2`

Out[142…

	MSZoning_C (all)	MSZoning_FV	MSZoning_RH	MSZoning_RL	MSZoning_RM
0	0	0	1	0	0
1	0	0	0	1	0
2	0	0	0	1	0
3	0	0	0	1	0
4	0	0	0	1	0
...	...	...	...	...	...
1454	0	0	0	0	1
1455	0	0	0	0	1
1456	0	0	0	1	0
1457	0	0	0	1	0
1458	0	0	0	1	0

1459 rows × 233 columns

In [143… `x3=x1.join(x2)`

In [144… `x3`

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	Id	MSSubClass	LotFrontage	LotArea	OverallQual	OverallCon
0	-1.730864	-0.874711	0.555587	0.363929	-0.751101	0.40076
1	-1.728490	-0.874711	0.604239	0.897861	-0.054877	0.40076
2	-1.726115	0.061351	0.263676	0.809646	-0.751101	-0.49741
3	-1.723741	0.061351	0.458284	0.032064	-0.054877	0.40076
4	-1.721367	1.465443	-1.244533	-0.971808	1.337571	-0.49741
...	...	...	...	...	...	.
1454	1.721367	2.401505	-2.314875	-1.591330	-1.447325	1.29895
1455	1.723741	2.401505	-2.314875	-1.599808	-1.447325	-0.49741
1456	1.726115	-0.874711	4.447740	2.055150	-0.751101	1.29895
1457	1.728490	0.646389	-0.320147	0.125527	-0.751101	-0.49741
1458	1.730864	0.061351	0.263676	-0.038790	0.641347	-0.49741

1459 rows × 270 columns

In [145... `#cols_to_add=["HouseStyle_2.5Fin","RoofMalt_Membran","Condition2_RRAe","Pool`

In [149... `cols_to_add=['Utilities_NoSeWa', 'Condition2_RRAe', 'Condition2_RRAn', 'Cond`

In [150... `cols_to_add`

Out[150...
```
['Utilities_NoSeWa',
 'Condition2_RRAe',
 'Condition2_RRAn',
 'Condition2_RRNn',
 'HouseStyle_2.5Fin',
 'RoofMatl_ClyTile',
 'RoofMatl_Membran',
 'RoofMatl_Metal',
 'RoofMatl_Roll',
 'Exterior1st_ImStucc',
 'Exterior1st_Stone',
 'Exterior2nd_Other',
 'Heating_Floor',
 'Heating_OthW',
 'Electrical_Mix',
 'GarageQual_Ex',
 'PoolQC_Fa',
 'MiscFeature_TenC']
```

In [157...
```
for i in cols_to_add:
    x3[i]=0
```

In [158... `final_pred=model.predict(x3[cols_keeps])`

In [159... `test["Predicted_sale_Price"]=final_pred`

```
In [160…   test.head()
```

Out[160…

	Id	MSSubClass	MSZoning	LotFrontage	LotArea	Street	Alley	LotShap
0	1461	20	RH	80.0	11622	Pave	Grvl	Re
1	1462	20	RL	81.0	14267	Pave	Grvl	IF
2	1463	60	RL	74.0	13830	Pave	Grvl	IF
3	1464	60	RL	78.0	9978	Pave	Grvl	IF
4	1465	120	RL	43.0	5005	Pave	Grvl	IF

5 rows × 81 columns

```
In [161…   test[["Id","Predicted_sale_Price"]].to_csv("Desktop/submission.csv")
```

```
In [162…   pd.set_option("display.max_rows",5000)
```

```
In [ ]:
```