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February 4, 2022

1 Multicollinearity of Features - Lab

1.1 Introduction

In this lab, you'll identify multicollinearity in the Ames Housing dataset.

1.2 Objectives

You will be able to: * Create a scatter matrix and correlation matrix * Assess Intpret the output of a correlation matrix * Identify if variables are exhibiting collinearity * Decide how to address the collinearity in the data set

1.3 Correlation matrix for the Ames Housing data

1.3.1 Import data

Let's reimport the Ames Housing data assign the numeric variables we want to keep to `numeric_vars`.

```
[2]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline

pd.options.display.max_columns = 999
pd.options.display.max_rows = 999

ames = pd.read_csv('ames.csv')

numeric_vars = ['LotFrontage', 'LotArea', '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']
```

1.3.2 Create processed

Create a new dataframe named `ames_preprocessed` that contains only the features in `numeric_vars`.

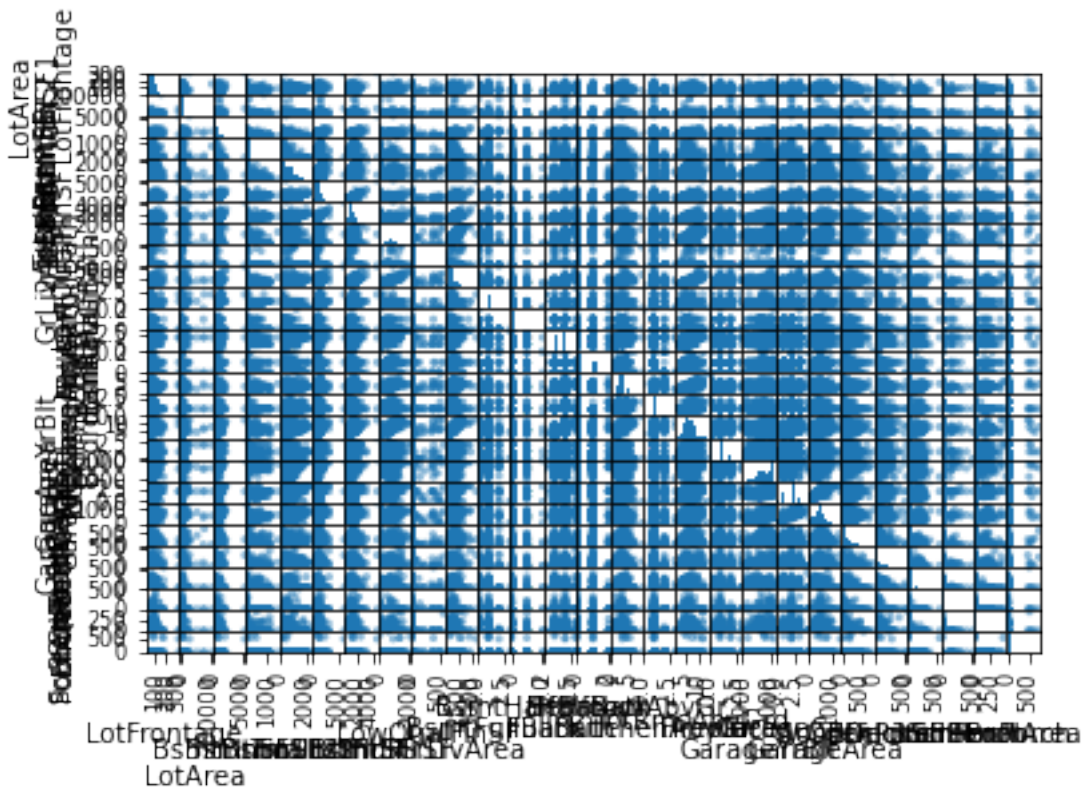
```
[3]: # create single dataframe called ames_preprocessed

ames_preprocessed = ames[numeric_vars]
```

1.4 Scatter matrix

Create the scatter matrix for the Ames Housing data. This takes a few minutes to load!

```
[6]: # use pd.plotting.scatter_matrix
pd.plotting.scatter_matrix(ames_preprocessed);
```



The scatter matrix took a while to load and is hard to read. Run the code below to see if adjusting some of the visualization settings helps.

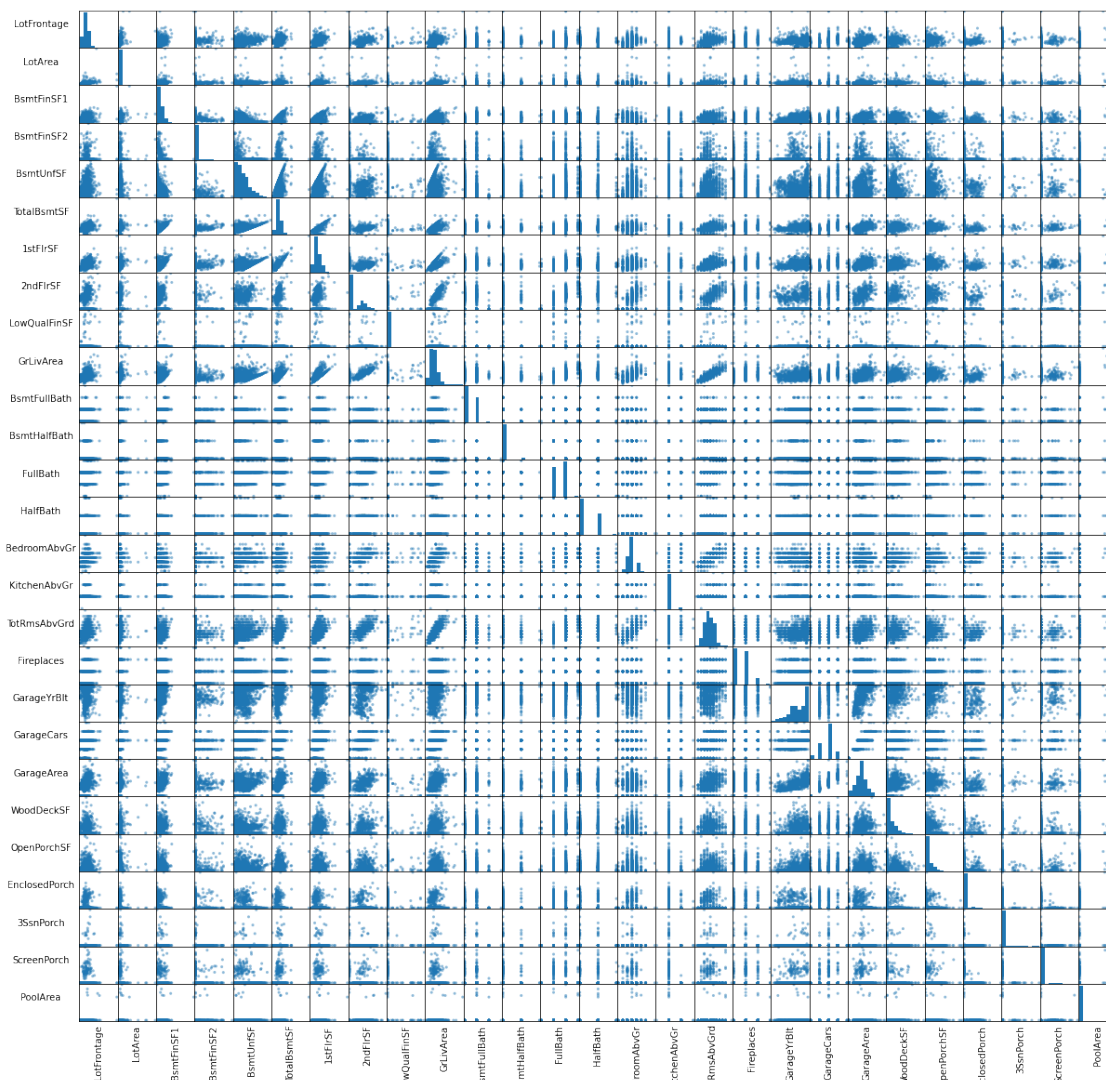
```
[7]: sm = pd.plotting.scatter_matrix(ames_preprocessed, figsize=[20, 20]);

# Rotates the text
[s.xaxis.label.set_rotation(90) for s in sm.reshape(-1)]
[s.yaxis.label.set_rotation(0) for s in sm.reshape(-1)]

#May need to offset label when rotating to prevent overlap of figure
[s.get_yaxis().set_label_coords(-1,0.5) for s in sm.reshape(-1)]

#Hide all ticks
[s.set_xticks(()) for s in sm.reshape(-1)]
[s.set_yticks(()) for s in sm.reshape(-1)]

plt.show()
```



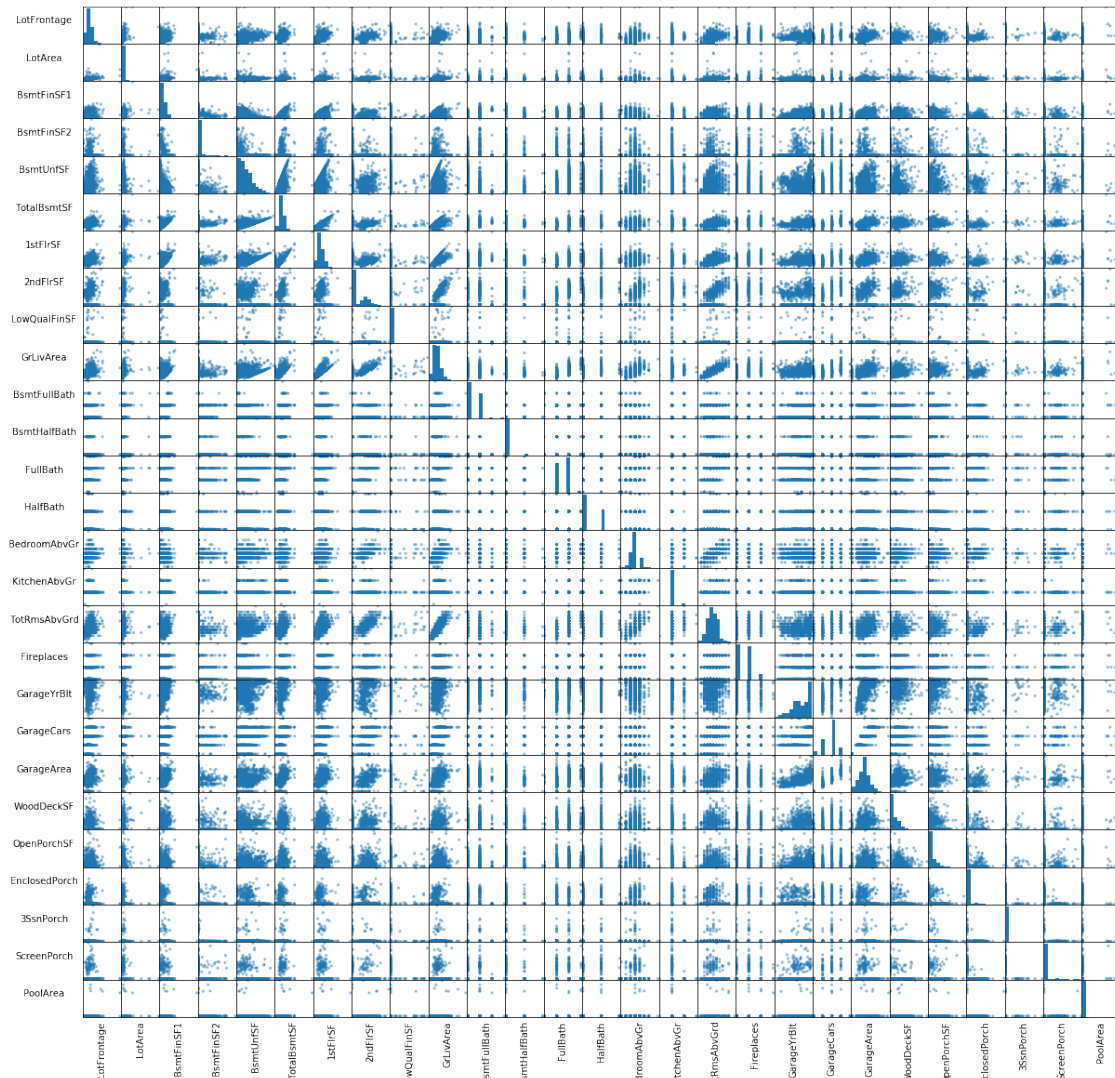
```
[8]: #__Solution__
sm = pd.plotting.scatter_matrix(ames_preprocessed, figsize=[20, 20]);

# Rotates the text
[s.xaxis.label.set_rotation(90) for s in sm.reshape(-1)]
[s.yaxis.label.set_rotation(0) for s in sm.reshape(-1)]

#May need to offset label when rotating to prevent overlap of figure
[s.get_yaxis().set_label_coords(-1,0.5) for s in sm.reshape(-1)]

#Hide all ticks
[s.set_xticks(()) for s in sm.reshape(-1)]
[s.set_yticks(()) for s in sm.reshape(-1)]

plt.show()
```



The enhanced plot demonstrates that with larger datasets, scatter matrices become less useful. Through careful examination of the matrix it's clear that `TotRmsAbvGrd` seems correlated with `GrLivArea`, but how easy to use would this matrix if a dataset has hundreds or thousands of variables? Also visual approach to finding correlation cannot be automated, so a numeric approach is a good next step.

1.5 Correlation matrix

Next, create and look at the correlation matrix:

```
[4]: ames_preprocessed.corr()
```

```
[4]:
```

	LotFrontage	LotArea	BsmtFinSF1	BsmtFinSF2	BsmtUnfSF	\
LotFrontage	1.000000	0.426095	0.233633	0.049900	0.132644	
LotArea	0.426095	1.000000	0.214103	0.111170	-0.002618	
BsmtFinSF1	0.233633	0.214103	1.000000	-0.050117	-0.495251	
BsmtFinSF2	0.049900	0.111170	-0.050117	1.000000	-0.209294	
BsmtUnfSF	0.132644	-0.002618	-0.495251	-0.209294	1.000000	
TotalBsmtSF	0.392075	0.260833	0.522396	0.104810	0.415360	
1stFlrSF	0.457181	0.299475	0.445863	0.097117	0.317987	
2ndFlrSF	0.080177	0.050986	-0.137079	-0.099260	0.004469	
LowQualFinSF	0.038469	0.004779	-0.064503	0.014807	0.028167	
GrLivArea	0.402797	0.263116	0.208171	-0.009640	0.240257	
BsmtFullBath	0.100949	0.158155	0.649212	0.158678	-0.422900	
BsmtHalfBath	-0.007234	0.048046	0.067418	0.070948	-0.095804	
FullBath	0.198769	0.126031	0.058543	-0.076444	0.288886	
HalfBath	0.053532	0.014259	0.004262	-0.032148	-0.041118	
BedroomAbvGr	0.263170	0.119690	-0.107355	-0.015728	0.166643	
KitchenAbvGr	-0.006069	-0.017784	-0.081007	-0.040751	0.030086	
TotRmsAbvGrd	0.352096	0.190015	0.044316	-0.035227	0.250647	
Fireplaces	0.266639	0.271364	0.260011	0.046921	0.051575	
GarageYrBlt	0.070250	-0.024947	0.153484	-0.088011	0.190708	
GarageCars	0.285691	0.154871	0.224054	-0.038264	0.214175	
GarageArea	0.344997	0.180403	0.296970	-0.018227	0.183303	
WoodDeckSF	0.088521	0.171698	0.204306	0.067898	-0.005316	
OpenPorchSF	0.151972	0.084774	0.111761	0.003093	0.129005	
EnclosedPorch	0.010700	-0.018340	-0.102303	0.036543	-0.002538	
3SsnPorch	0.070029	0.020423	0.026451	-0.029993	0.020764	
ScreenPorch	0.041383	0.043160	0.062021	0.088871	-0.012579	
PoolArea	0.206167	0.077672	0.140491	0.041709	-0.035092	
	TotalBsmtSF	1stFlrSF	2ndFlrSF	LowQualFinSF	GrLivArea	\
LotFrontage	0.392075	0.457181	0.080177	0.038469	0.402797	
LotArea	0.260833	0.299475	0.050986	0.004779	0.263116	
BsmtFinSF1	0.522396	0.445863	-0.137079	-0.064503	0.208171	

BsmtFinSF2	0.104810	0.097117	-0.099260	0.014807	-0.009640
BsmtUnfSF	0.415360	0.317987	0.004469	0.028167	0.240257
TotalBsmtSF	1.000000	0.819530	-0.174512	-0.033245	0.454868
1stFlrSF	0.819530	1.000000	-0.202646	-0.014241	0.566024
2ndFlrSF	-0.174512	-0.202646	1.000000	0.063353	0.687501
LowQualFinSF	-0.033245	-0.014241	0.063353	1.000000	0.134683
GrLivArea	0.454868	0.566024	0.687501	0.134683	1.000000
BsmtFullBath	0.307351	0.244671	-0.169494	-0.047143	0.034836
BsmtHalfBath	-0.000315	0.001956	-0.023855	-0.005842	-0.018918
FullBath	0.323722	0.380637	0.421378	-0.000710	0.630012
HalfBath	-0.048804	-0.119916	0.609707	-0.027080	0.415772
BedroomAbvGr	0.050450	0.127401	0.502901	0.105607	0.521270
KitchenAbvGr	-0.068901	0.068101	0.059306	0.007522	0.100063
TotRmsAbvGrd	0.285573	0.409516	0.616423	0.131185	0.825489
Fireplaces	0.339519	0.410531	0.194561	-0.021272	0.461679
GarageYrBlt	0.322445	0.233449	0.070832	-0.036363	0.231197
GarageCars	0.434585	0.439317	0.183926	-0.094480	0.467247
GarageArea	0.486665	0.489782	0.138347	-0.067601	0.468997
WoodDeckSF	0.232019	0.235459	0.092165	-0.025444	0.247433
OpenPorchSF	0.247264	0.211671	0.208026	0.018251	0.330224
EnclosedPorch	-0.095478	-0.065292	0.061989	0.061081	0.009113
3SsnPorch	0.037384	0.056104	-0.024358	-0.004296	0.020643
ScreenPorch	0.084489	0.088758	0.040606	0.026799	0.101510
PoolArea	0.126053	0.131525	0.081487	0.062157	0.170205

	BsmtFullBath	BsmtHalfBath	FullBath	HalfBath	BedroomAbvGr	\
LotFrontage	0.100949	-0.007234	0.198769	0.053532	0.263170	
LotArea	0.158155	0.048046	0.126031	0.014259	0.119690	
BsmtFinSF1	0.649212	0.067418	0.058543	0.004262	-0.107355	
BsmtFinSF2	0.158678	0.070948	-0.076444	-0.032148	-0.015728	
BsmtUnfSF	-0.422900	-0.095804	0.288886	-0.041118	0.166643	
TotalBsmtSF	0.307351	-0.000315	0.323722	-0.048804	0.050450	
1stFlrSF	0.244671	0.001956	0.380637	-0.119916	0.127401	
2ndFlrSF	-0.169494	-0.023855	0.421378	0.609707	0.502901	
LowQualFinSF	-0.047143	-0.005842	-0.000710	-0.027080	0.105607	
GrLivArea	0.034836	-0.018918	0.630012	0.415772	0.521270	
BsmtFullBath	1.000000	-0.147871	-0.064512	-0.030905	-0.150673	
BsmtHalfBath	-0.147871	1.000000	-0.054536	-0.012340	0.046519	
FullBath	-0.064512	-0.054536	1.000000	0.136381	0.363252	
HalfBath	-0.030905	-0.012340	0.136381	1.000000	0.226651	
BedroomAbvGr	-0.150673	0.046519	0.363252	0.226651	1.000000	
KitchenAbvGr	-0.041503	-0.037944	0.133115	-0.068263	0.198597	
TotRmsAbvGrd	-0.053275	-0.023836	0.554784	0.343415	0.676620	
Fireplaces	0.137928	0.028976	0.243671	0.203649	0.107570	
GarageYrBlt	0.124553	-0.077464	0.484557	0.196785	-0.064518	
GarageCars	0.131881	-0.020891	0.469672	0.219178	0.086106	
GarageArea	0.179189	-0.024536	0.405656	0.163549	0.065253	

WoodDeckSF	0.175315	0.040161	0.187703	0.108080	0.046854
OpenPorchSF	0.067341	-0.025324	0.259977	0.199740	0.093810
EnclosedPorch	-0.049911	-0.008555	-0.115093	-0.095317	0.041570
3SsnPorch	-0.000106	0.035114	0.035353	-0.004972	-0.024478
ScreenPorch	0.023148	0.032121	-0.008106	0.072426	0.044300
PoolArea	0.067616	0.020025	0.049604	0.022381	0.070703

	KitchenAbvGr	TotRmsAbvGrd	Fireplaces	GarageYrBlt	\
LotFrontage	-0.006069	0.352096	0.266639	0.070250	
LotArea	-0.017784	0.190015	0.271364	-0.024947	
BsmtFinSF1	-0.081007	0.044316	0.260011	0.153484	
BsmtFinSF2	-0.040751	-0.035227	0.046921	-0.088011	
BsmtUnfSF	0.030086	0.250647	0.051575	0.190708	
TotalBsmtSF	-0.068901	0.285573	0.339519	0.322445	
1stFlrSF	0.068101	0.409516	0.410531	0.233449	
2ndFlrSF	0.059306	0.616423	0.194561	0.070832	
LowQualFinSF	0.007522	0.131185	-0.021272	-0.036363	
GrLivArea	0.100063	0.825489	0.461679	0.231197	
BsmtFullBath	-0.041503	-0.053275	0.137928	0.124553	
BsmtHalfBath	-0.037944	-0.023836	0.028976	-0.077464	
FullBath	0.133115	0.554784	0.243671	0.484557	
HalfBath	-0.068263	0.343415	0.203649	0.196785	
BedroomAbvGr	0.198597	0.676620	0.107570	-0.064518	
KitchenAbvGr	1.000000	0.256045	-0.123936	-0.124411	
TotRmsAbvGrd	0.256045	1.000000	0.326114	0.148112	
Fireplaces	-0.123936	0.326114	1.000000	0.046822	
GarageYrBlt	-0.124411	0.148112	0.046822	1.000000	
GarageCars	-0.050634	0.362289	0.300789	0.588920	
GarageArea	-0.064433	0.337822	0.269141	0.564567	
WoodDeckSF	-0.090130	0.165984	0.200019	0.224577	
OpenPorchSF	-0.070091	0.234192	0.169405	0.228425	
EnclosedPorch	0.037312	0.004151	-0.024822	-0.297003	
3SsnPorch	-0.024600	-0.006683	0.011257	0.023544	
ScreenPorch	-0.051613	0.059383	0.184530	-0.075418	
PoolArea	-0.014525	0.083757	0.095074	-0.014501	

	GarageCars	GarageArea	WoodDeckSF	OpenPorchSF	EnclosedPorch	\
LotFrontage	0.285691	0.344997	0.088521	0.151972	0.010700	
LotArea	0.154871	0.180403	0.171698	0.084774	-0.018340	
BsmtFinSF1	0.224054	0.296970	0.204306	0.111761	-0.102303	
BsmtFinSF2	-0.038264	-0.018227	0.067898	0.003093	0.036543	
BsmtUnfSF	0.214175	0.183303	-0.005316	0.129005	-0.002538	
TotalBsmtSF	0.434585	0.486665	0.232019	0.247264	-0.095478	
1stFlrSF	0.439317	0.489782	0.235459	0.211671	-0.065292	
2ndFlrSF	0.183926	0.138347	0.092165	0.208026	0.061989	
LowQualFinSF	-0.094480	-0.067601	-0.025444	0.018251	0.061081	
GrLivArea	0.467247	0.468997	0.247433	0.330224	0.009113	

BsmtFullBath	0.131881	0.179189	0.175315	0.067341	-0.049911
BsmtHalfBath	-0.020891	-0.024536	0.040161	-0.025324	-0.008555
FullBath	0.469672	0.405656	0.187703	0.259977	-0.115093
HalfBath	0.219178	0.163549	0.108080	0.199740	-0.095317
BedroomAbvGr	0.086106	0.065253	0.046854	0.093810	0.041570
KitchenAbvGr	-0.050634	-0.064433	-0.090130	-0.070091	0.037312
TotRmsAbvGrd	0.362289	0.337822	0.165984	0.234192	0.004151
Fireplaces	0.300789	0.269141	0.200019	0.169405	-0.024822
GarageYrBlt	0.588920	0.564567	0.224577	0.228425	-0.297003
GarageCars	1.000000	0.882475	0.226342	0.213569	-0.151434
GarageArea	0.882475	1.000000	0.224666	0.241435	-0.121777
WoodDeckSF	0.226342	0.224666	1.000000	0.058661	-0.125989
OpenPorchSF	0.213569	0.241435	0.058661	1.000000	-0.093079
EnclosedPorch	-0.151434	-0.121777	-0.125989	-0.093079	1.000000
3SsnPorch	0.035765	0.035087	-0.032771	-0.005842	-0.037305
ScreenPorch	0.050494	0.051412	-0.074181	0.074304	-0.082864
PoolArea	0.020934	0.061047	0.073378	0.060762	0.054203

	3SsnPorch	ScreenPorch	PoolArea
LotFrontage	0.070029	0.041383	0.206167
LotArea	0.020423	0.043160	0.077672
BsmtFinSF1	0.026451	0.062021	0.140491
BsmtFinSF2	-0.029993	0.088871	0.041709
BsmtUnfSF	0.020764	-0.012579	-0.035092
TotalBsmtSF	0.037384	0.084489	0.126053
1stFlrSF	0.056104	0.088758	0.131525
2ndFlrSF	-0.024358	0.040606	0.081487
LowQualFinSF	-0.004296	0.026799	0.062157
GrLivArea	0.020643	0.101510	0.170205
BsmtFullBath	-0.000106	0.023148	0.067616
BsmtHalfBath	0.035114	0.032121	0.020025
FullBath	0.035353	-0.008106	0.049604
HalfBath	-0.004972	0.072426	0.022381
BedroomAbvGr	-0.024478	0.044300	0.070703
KitchenAbvGr	-0.024600	-0.051613	-0.014525
TotRmsAbvGrd	-0.006683	0.059383	0.083757
Fireplaces	0.011257	0.184530	0.095074
GarageYrBlt	0.023544	-0.075418	-0.014501
GarageCars	0.035765	0.050494	0.020934
GarageArea	0.035087	0.051412	0.061047
WoodDeckSF	-0.032771	-0.074181	0.073378
OpenPorchSF	-0.005842	0.074304	0.060762
EnclosedPorch	-0.037305	-0.082864	0.054203
3SsnPorch	1.000000	-0.031436	-0.007992
ScreenPorch	-0.031436	1.000000	0.051307
PoolArea	-0.007992	0.051307	1.000000

Return True for positive or negative correlations that are bigger than 0.75 in the correlation matrix:

```
[5]: abs(ames_preprocessed.corr())>0.75
```

```
[5]:
```

	LotFrontage	LotArea	BsmtFinSF1	BsmtFinSF2	BsmtUnfSF	\
LotFrontage	True	False	False	False	False	
LotArea	False	True	False	False	False	
BsmtFinSF1	False	False	True	False	False	
BsmtFinSF2	False	False	False	True	False	
BsmtUnfSF	False	False	False	False	True	
TotalBsmtSF	False	False	False	False	False	
1stFlrSF	False	False	False	False	False	
2ndFlrSF	False	False	False	False	False	
LowQualFinSF	False	False	False	False	False	
GrLivArea	False	False	False	False	False	
BsmtFullBath	False	False	False	False	False	
BsmtHalfBath	False	False	False	False	False	
FullBath	False	False	False	False	False	
HalfBath	False	False	False	False	False	
BedroomAbvGr	False	False	False	False	False	
KitchenAbvGr	False	False	False	False	False	
TotRmsAbvGrd	False	False	False	False	False	
Fireplaces	False	False	False	False	False	
GarageYrBlt	False	False	False	False	False	
GarageCars	False	False	False	False	False	
GarageArea	False	False	False	False	False	
WoodDeckSF	False	False	False	False	False	
OpenPorchSF	False	False	False	False	False	
EnclosedPorch	False	False	False	False	False	
3SsnPorch	False	False	False	False	False	
ScreenPorch	False	False	False	False	False	
PoolArea	False	False	False	False	False	

	TotalBsmtSF	1stFlrSF	2ndFlrSF	LowQualFinSF	GrLivArea	\
LotFrontage	False	False	False	False	False	
LotArea	False	False	False	False	False	
BsmtFinSF1	False	False	False	False	False	
BsmtFinSF2	False	False	False	False	False	
BsmtUnfSF	False	False	False	False	False	
TotalBsmtSF	True	True	False	False	False	
1stFlrSF	True	True	False	False	False	
2ndFlrSF	False	False	True	False	False	
LowQualFinSF	False	False	False	True	False	
GrLivArea	False	False	False	False	True	
BsmtFullBath	False	False	False	False	False	
BsmtHalfBath	False	False	False	False	False	
FullBath	False	False	False	False	False	

HalfBath	False	False	False	False	False
BedroomAbvGr	False	False	False	False	False
KitchenAbvGr	False	False	False	False	False
TotRmsAbvGrd	False	False	False	False	True
Fireplaces	False	False	False	False	False
GarageYrBlt	False	False	False	False	False
GarageCars	False	False	False	False	False
GarageArea	False	False	False	False	False
WoodDeckSF	False	False	False	False	False
OpenPorchSF	False	False	False	False	False
EnclosedPorch	False	False	False	False	False
3SsnPorch	False	False	False	False	False
ScreenPorch	False	False	False	False	False
PoolArea	False	False	False	False	False

	BsmtFullBath	BsmtHalfBath	FullBath	HalfBath	BedroomAbvGr \
LotFrontage	False	False	False	False	False
LotArea	False	False	False	False	False
BsmtFinSF1	False	False	False	False	False
BsmtFinSF2	False	False	False	False	False
BsmtUnfSF	False	False	False	False	False
TotalBsmtSF	False	False	False	False	False
1stFlrSF	False	False	False	False	False
2ndFlrSF	False	False	False	False	False
LowQualFinSF	False	False	False	False	False
GrLivArea	False	False	False	False	False
BsmtFullBath	True	False	False	False	False
BsmtHalfBath	False	True	False	False	False
FullBath	False	False	True	False	False
HalfBath	False	False	False	True	False
BedroomAbvGr	False	False	False	False	True
KitchenAbvGr	False	False	False	False	False
TotRmsAbvGrd	False	False	False	False	False
Fireplaces	False	False	False	False	False
GarageYrBlt	False	False	False	False	False
GarageCars	False	False	False	False	False
GarageArea	False	False	False	False	False
WoodDeckSF	False	False	False	False	False
OpenPorchSF	False	False	False	False	False
EnclosedPorch	False	False	False	False	False
3SsnPorch	False	False	False	False	False
ScreenPorch	False	False	False	False	False
PoolArea	False	False	False	False	False

	KitchenAbvGr	TotRmsAbvGrd	Fireplaces	GarageYrBlt \
LotFrontage	False	False	False	False
LotArea	False	False	False	False

BsmtFinSF1	False	False	False	False
BsmtFinSF2	False	False	False	False
BsmtUnfSF	False	False	False	False
TotalBsmtSF	False	False	False	False
1stFlrSF	False	False	False	False
2ndFlrSF	False	False	False	False
LowQualFinSF	False	False	False	False
GrLivArea	False	True	False	False
BsmtFullBath	False	False	False	False
BsmtHalfBath	False	False	False	False
FullBath	False	False	False	False
HalfBath	False	False	False	False
BedroomAbvGr	False	False	False	False
KitchenAbvGr	True	False	False	False
TotRmsAbvGrd	False	True	False	False
Fireplaces	False	False	True	False
GarageYrBlt	False	False	False	True
GarageCars	False	False	False	False
GarageArea	False	False	False	False
WoodDeckSF	False	False	False	False
OpenPorchSF	False	False	False	False
EnclosedPorch	False	False	False	False
3SsnPorch	False	False	False	False
ScreenPorch	False	False	False	False
PoolArea	False	False	False	False

	GarageCars	GarageArea	WoodDeckSF	OpenPorchSF	EnclosedPorch	\
LotFrontage	False	False	False	False	False	
LotArea	False	False	False	False	False	
BsmtFinSF1	False	False	False	False	False	
BsmtFinSF2	False	False	False	False	False	
BsmtUnfSF	False	False	False	False	False	
TotalBsmtSF	False	False	False	False	False	
1stFlrSF	False	False	False	False	False	
2ndFlrSF	False	False	False	False	False	
LowQualFinSF	False	False	False	False	False	
GrLivArea	False	False	False	False	False	
BsmtFullBath	False	False	False	False	False	
BsmtHalfBath	False	False	False	False	False	
FullBath	False	False	False	False	False	
HalfBath	False	False	False	False	False	
BedroomAbvGr	False	False	False	False	False	
KitchenAbvGr	False	False	False	False	False	
TotRmsAbvGrd	False	False	False	False	False	
Fireplaces	False	False	False	False	False	
GarageYrBlt	False	False	False	False	False	
GarageCars	True	True	False	False	False	

GarageArea	True	True	False	False	False
WoodDeckSF	False	False	True	False	False
OpenPorchSF	False	False	False	True	False
EnclosedPorch	False	False	False	False	True
3SsnPorch	False	False	False	False	False
ScreenPorch	False	False	False	False	False
PoolArea	False	False	False	False	False

	3SsnPorch	ScreenPorch	PoolArea
LotFrontage	False	False	False
LotArea	False	False	False
BsmtFinSF1	False	False	False
BsmtFinSF2	False	False	False
BsmtUnfSF	False	False	False
TotalBsmtSF	False	False	False
1stFlrSF	False	False	False
2ndFlrSF	False	False	False
LowQualFinSF	False	False	False
GrLivArea	False	False	False
BsmtFullBath	False	False	False
BsmtHalfBath	False	False	False
FullBath	False	False	False
HalfBath	False	False	False
BedroomAbvGr	False	False	False
KitchenAbvGr	False	False	False
TotRmsAbvGrd	False	False	False
Fireplaces	False	False	False
GarageYrBlt	False	False	False
GarageCars	False	False	False
GarageArea	False	False	False
WoodDeckSF	False	False	False
OpenPorchSF	False	False	False
EnclosedPorch	False	False	False
3SsnPorch	True	False	False
ScreenPorch	False	True	False
PoolArea	False	False	True

Now, include `stack` and `zip` to create a more robust solution that will return the variable pairs from the correlation matrix that have correlations over .75, but less than 1.

```
[7]: df = ames_preprocessed.corr().abs().stack().reset_index().sort_values(0,
                                                                    ascending=False)
df["pairs"] = list(zip(df.level_0, df.level_1))
df.head(15)
df.set_index("pairs")
df.drop(columns = ["level_1", "level_0"], inplace = True)
# ind = df.loc[df[0] == float(1)].index
```

```
# df.drop(index = ind, inplace = True)

corr_1 = df.iloc[0:len(ames_preprocessed.columns)].index
df.drop(index = corr_1, inplace = True)
df.reset_index(inplace = True)
df.head(15)
df.index
df
```

```
[7]:
```

	index	0	pairs
0	559	0.882475	(GarageArea, GarageCars)
1	533	0.882475	(GarageCars, GarageArea)
2	441	0.825489	(TotRmsAbvGrd, GrLivArea)
3	259	0.825489	(GrLivArea, TotRmsAbvGrd)
4	167	0.819530	(1stFlrSF, TotalBsmtSF)
5	141	0.819530	(TotalBsmtSF, 1stFlrSF)
6	250	0.687501	(GrLivArea, 2ndFlrSF)
7	198	0.687501	(2ndFlrSF, GrLivArea)
8	394	0.676620	(BedroomAbvGr, TotRmsAbvGrd)
9	446	0.676620	(TotRmsAbvGrd, BedroomAbvGr)
10	64	0.649212	(BsmtFinSF1, BsmtFullBath)
11	272	0.649212	(BsmtFullBath, BsmtFinSF1)
12	333	0.630012	(FullBath, GrLivArea)
13	255	0.630012	(GrLivArea, FullBath)
14	205	0.616423	(2ndFlrSF, TotRmsAbvGrd)
15	439	0.616423	(TotRmsAbvGrd, 2ndFlrSF)
16	202	0.609707	(2ndFlrSF, HalfBath)
17	358	0.609707	(HalfBath, 2ndFlrSF)
18	505	0.588920	(GarageYrBlt, GarageCars)
19	531	0.588920	(GarageCars, GarageYrBlt)
20	171	0.566024	(1stFlrSF, GrLivArea)
21	249	0.566024	(GrLivArea, 1stFlrSF)
22	558	0.564567	(GarageArea, GarageYrBlt)
23	506	0.564567	(GarageYrBlt, GarageArea)
24	340	0.554784	(FullBath, TotRmsAbvGrd)
25	444	0.554784	(TotRmsAbvGrd, FullBath)
26	59	0.522396	(BsmtFinSF1, TotalBsmtSF)
27	137	0.522396	(TotalBsmtSF, BsmtFinSF1)
28	387	0.521270	(BedroomAbvGr, GrLivArea)
29	257	0.521270	(GrLivArea, BedroomAbvGr)
30	385	0.502901	(BedroomAbvGr, 2ndFlrSF)
31	203	0.502901	(2ndFlrSF, BedroomAbvGr)
32	110	0.495251	(BsmtUnfSF, BsmtFinSF1)
33	58	0.495251	(BsmtFinSF1, BsmtUnfSF)
34	546	0.489782	(GarageArea, 1stFlrSF)
35	182	0.489782	(1stFlrSF, GarageArea)

36	155	0.486665	(TotalBsmtSF, GarageArea)
37	545	0.486665	(GarageArea, TotalBsmtSF)
38	498	0.484557	(GarageYrBlt, FullBath)
39	342	0.484557	(FullBath, GarageYrBlt)
40	343	0.469672	(FullBath, GarageCars)
41	525	0.469672	(GarageCars, FullBath)
42	549	0.468997	(GarageArea, GrLivArea)
43	263	0.468997	(GrLivArea, GarageArea)
44	262	0.467247	(GrLivArea, GarageCars)
45	522	0.467247	(GarageCars, GrLivArea)
46	260	0.461679	(GrLivArea, Fireplaces)
47	468	0.461679	(Fireplaces, GrLivArea)
48	6	0.457181	(LotFrontage, 1stFlrSF)
49	162	0.457181	(1stFlrSF, LotFrontage)
50	144	0.454868	(TotalBsmtSF, GrLivArea)
51	248	0.454868	(GrLivArea, TotalBsmtSF)
52	164	0.445863	(1stFlrSF, BsmtFinSF1)
53	60	0.445863	(BsmtFinSF1, 1stFlrSF)
54	519	0.439317	(GarageCars, 1stFlrSF)
55	181	0.439317	(1stFlrSF, GarageCars)
56	154	0.434585	(TotalBsmtSF, GarageCars)
57	518	0.434585	(GarageCars, TotalBsmtSF)
58	27	0.426095	(LotArea, LotFrontage)
59	1	0.426095	(LotFrontage, LotArea)
60	118	0.422900	(BsmtUnfSF, BsmtFullBath)
61	274	0.422900	(BsmtFullBath, BsmtUnfSF)
62	201	0.421378	(2ndFlrSF, FullBath)
63	331	0.421378	(FullBath, 2ndFlrSF)
64	360	0.415772	(HalfBath, GrLivArea)
65	256	0.415772	(GrLivArea, HalfBath)
66	139	0.415360	(TotalBsmtSF, BsmtUnfSF)
67	113	0.415360	(BsmtUnfSF, TotalBsmtSF)
68	465	0.410531	(Fireplaces, 1stFlrSF)
69	179	0.410531	(1stFlrSF, Fireplaces)
70	438	0.409516	(TotRmsAbvGrd, 1stFlrSF)
71	178	0.409516	(1stFlrSF, TotRmsAbvGrd)
72	344	0.405656	(FullBath, GarageArea)
73	552	0.405656	(GarageArea, FullBath)
74	9	0.402797	(LotFrontage, GrLivArea)
75	243	0.402797	(GrLivArea, LotFrontage)
76	5	0.392075	(LotFrontage, TotalBsmtSF)
77	135	0.392075	(TotalBsmtSF, LotFrontage)
78	174	0.380637	(1stFlrSF, FullBath)
79	330	0.380637	(FullBath, 1stFlrSF)
80	390	0.363252	(BedroomAbvGr, FullBath)
81	338	0.363252	(FullBath, BedroomAbvGr)
82	451	0.362289	(TotRmsAbvGrd, GarageCars)

83	529	0.362289	(GarageCars, TotRmsAbvGrd)
84	432	0.352096	(TotRmsAbvGrd, LotFrontage)
85	16	0.352096	(LotFrontage, TotRmsAbvGrd)
86	540	0.344997	(GarageArea, LotFrontage)
87	20	0.344997	(LotFrontage, GarageArea)
88	367	0.343415	(HalfBath, TotRmsAbvGrd)
89	445	0.343415	(TotRmsAbvGrd, HalfBath)
90	152	0.339519	(TotalBsmtSF, Fireplaces)
91	464	0.339519	(Fireplaces, TotalBsmtSF)
92	556	0.337822	(GarageArea, TotRmsAbvGrd)
93	452	0.337822	(TotRmsAbvGrd, GarageArea)
94	603	0.330224	(OpenPorchSF, GrLivArea)
95	265	0.330224	(GrLivArea, OpenPorchSF)
96	475	0.326114	(Fireplaces, TotRmsAbvGrd)
97	449	0.326114	(TotRmsAbvGrd, Fireplaces)
98	329	0.323722	(FullBath, TotalBsmtSF)
99	147	0.323722	(TotalBsmtSF, FullBath)
100	491	0.322445	(GarageYrBlt, TotalBsmtSF)
101	153	0.322445	(TotalBsmtSF, GarageYrBlt)
102	114	0.317987	(BsmtUnfSF, 1stFlrSF)
103	166	0.317987	(1stFlrSF, BsmtUnfSF)
104	145	0.307351	(TotalBsmtSF, BsmtFullBath)
105	275	0.307351	(BsmtFullBath, TotalBsmtSF)
106	478	0.300789	(Fireplaces, GarageCars)
107	530	0.300789	(GarageCars, Fireplaces)
108	33	0.299475	(LotArea, 1stFlrSF)
109	163	0.299475	(1stFlrSF, LotArea)
110	509	0.297003	(GarageYrBlt, EnclosedPorch)
111	639	0.297003	(EnclosedPorch, GarageYrBlt)
112	74	0.296970	(BsmtFinSF1, GarageArea)
113	542	0.296970	(GarageArea, BsmtFinSF1)
114	328	0.288886	(FullBath, BsmtUnfSF)
115	120	0.288886	(BsmtUnfSF, FullBath)
116	19	0.285691	(LotFrontage, GarageCars)
117	513	0.285691	(GarageCars, LotFrontage)
118	437	0.285573	(TotRmsAbvGrd, TotalBsmtSF)
119	151	0.285573	(TotalBsmtSF, TotRmsAbvGrd)
120	460	0.271364	(Fireplaces, LotArea)
121	44	0.271364	(LotArea, Fireplaces)
122	479	0.269141	(Fireplaces, GarageArea)
123	557	0.269141	(GarageArea, Fireplaces)
124	17	0.266639	(LotFrontage, Fireplaces)
125	459	0.266639	(Fireplaces, LotFrontage)
126	14	0.263170	(LotFrontage, BedroomAbvGr)
127	378	0.263170	(BedroomAbvGr, LotFrontage)
128	244	0.263116	(GrLivArea, LotArea)
129	36	0.263116	(LotArea, GrLivArea)

130	32	0.260833	(LotArea, TotalBsmtSF)
131	136	0.260833	(TotalBsmtSF, LotArea)
132	461	0.260011	(Fireplaces, BsmtFinSF1)
133	71	0.260011	(BsmtFinSF1, Fireplaces)
134	606	0.259977	(OpenPorchSF, FullBath)
135	346	0.259977	(FullBath, OpenPorchSF)
136	447	0.256045	(TotRmsAbvGrd, KitchenAbvGr)
137	421	0.256045	(KitchenAbvGr, TotRmsAbvGrd)
138	436	0.250647	(TotRmsAbvGrd, BsmtUnfSF)
139	124	0.250647	(BsmtUnfSF, TotRmsAbvGrd)
140	576	0.247433	(WoodDeckSF, GrLivArea)
141	264	0.247433	(GrLivArea, WoodDeckSF)
142	599	0.247264	(OpenPorchSF, TotalBsmtSF)
143	157	0.247264	(TotalBsmtSF, OpenPorchSF)
144	276	0.244671	(BsmtFullBath, 1stFlrSF)
145	172	0.244671	(1stFlrSF, BsmtFullBath)
146	341	0.243671	(FullBath, Fireplaces)
147	471	0.243671	(Fireplaces, FullBath)
148	562	0.241435	(GarageArea, OpenPorchSF)
149	614	0.241435	(OpenPorchSF, GarageArea)
150	247	0.240257	(GrLivArea, BsmtUnfSF)
151	117	0.240257	(BsmtUnfSF, GrLivArea)
152	573	0.235459	(WoodDeckSF, 1stFlrSF)
153	183	0.235459	(1stFlrSF, WoodDeckSF)
154	610	0.234192	(OpenPorchSF, TotRmsAbvGrd)
155	454	0.234192	(TotRmsAbvGrd, OpenPorchSF)
156	2	0.233633	(LotFrontage, BsmtFinSF1)
157	54	0.233633	(BsmtFinSF1, LotFrontage)
158	180	0.233449	(1stFlrSF, GarageYrBlt)
159	492	0.233449	(GarageYrBlt, 1stFlrSF)
160	572	0.232019	(WoodDeckSF, TotalBsmtSF)
161	156	0.232019	(TotalBsmtSF, WoodDeckSF)
162	495	0.231197	(GarageYrBlt, GrLivArea)
163	261	0.231197	(GrLivArea, GarageYrBlt)
164	508	0.228425	(GarageYrBlt, OpenPorchSF)
165	612	0.228425	(OpenPorchSF, GarageYrBlt)
166	391	0.226651	(BedroomAbvGr, HalfBath)
167	365	0.226651	(HalfBath, BedroomAbvGr)
168	586	0.226342	(WoodDeckSF, GarageCars)
169	534	0.226342	(GarageCars, WoodDeckSF)
170	561	0.224666	(GarageArea, WoodDeckSF)
171	587	0.224666	(WoodDeckSF, GarageArea)
172	585	0.224577	(WoodDeckSF, GarageYrBlt)
173	507	0.224577	(GarageYrBlt, WoodDeckSF)
174	515	0.224054	(GarageCars, BsmtFinSF1)
175	73	0.224054	(BsmtFinSF1, GarageCars)
176	526	0.219178	(GarageCars, HalfBath)

177	370	0.219178	(HalfBath, GarageCars)
178	517	0.214175	(GarageCars, BsmtUnfSF)
179	127	0.214175	(BsmtUnfSF, GarageCars)
180	55	0.214103	(BsmtFinSF1, LotArea)
181	29	0.214103	(LotArea, BsmtFinSF1)
182	613	0.213569	(OpenPorchSF, GarageCars)
183	535	0.213569	(GarageCars, OpenPorchSF)
184	600	0.211671	(OpenPorchSF, 1stFlrSF)
185	184	0.211671	(1stFlrSF, OpenPorchSF)
186	85	0.209294	(BsmtFinSF2, BsmtUnfSF)
187	111	0.209294	(BsmtUnfSF, BsmtFinSF2)
188	63	0.208171	(BsmtFinSF1, GrLivArea)
189	245	0.208171	(GrLivArea, BsmtFinSF1)
190	601	0.208026	(OpenPorchSF, 2ndFlrSF)
191	211	0.208026	(2ndFlrSF, OpenPorchSF)
192	702	0.206167	(PoolArea, LotFrontage)
193	26	0.206167	(LotFrontage, PoolArea)
194	569	0.204306	(WoodDeckSF, BsmtFinSF1)
195	75	0.204306	(BsmtFinSF1, WoodDeckSF)
196	472	0.203649	(Fireplaces, HalfBath)
197	368	0.203649	(HalfBath, Fireplaces)
198	195	0.202646	(2ndFlrSF, 1stFlrSF)
199	169	0.202646	(1stFlrSF, 2ndFlrSF)
200	480	0.200019	(Fireplaces, WoodDeckSF)
201	584	0.200019	(WoodDeckSF, Fireplaces)
202	373	0.199740	(HalfBath, OpenPorchSF)
203	607	0.199740	(OpenPorchSF, HalfBath)
204	12	0.198769	(LotFrontage, FullBath)
205	324	0.198769	(FullBath, LotFrontage)
206	419	0.198597	(KitchenAbvGr, BedroomAbvGr)
207	393	0.198597	(BedroomAbvGr, KitchenAbvGr)
208	499	0.196785	(GarageYrBlt, HalfBath)
209	369	0.196785	(HalfBath, GarageYrBlt)
210	466	0.194561	(Fireplaces, 2ndFlrSF)
211	206	0.194561	(2ndFlrSF, Fireplaces)
212	490	0.190708	(GarageYrBlt, BsmtUnfSF)
213	126	0.190708	(BsmtUnfSF, GarageYrBlt)
214	433	0.190015	(TotRmsAbvGrd, LotArea)
215	43	0.190015	(LotArea, TotRmsAbvGrd)
216	345	0.187703	(FullBath, WoodDeckSF)
217	579	0.187703	(WoodDeckSF, FullBath)
218	484	0.184530	(Fireplaces, ScreenPorch)
219	692	0.184530	(ScreenPorch, Fireplaces)
220	520	0.183926	(GarageCars, 2ndFlrSF)
221	208	0.183926	(2ndFlrSF, GarageCars)
222	544	0.183303	(GarageArea, BsmtUnfSF)
223	128	0.183303	(BsmtUnfSF, GarageArea)

224	541	0.180403	(GarageArea, LotArea)
225	47	0.180403	(LotArea, GarageArea)
226	290	0.179189	(BsmtFullBath, GarageArea)
227	550	0.179189	(GarageArea, BsmtFullBath)
228	291	0.175315	(BsmtFullBath, WoodDeckSF)
229	577	0.175315	(WoodDeckSF, BsmtFullBath)
230	194	0.174512	(2ndFlrSF, TotalBsmtSF)
231	142	0.174512	(TotalBsmtSF, 2ndFlrSF)
232	568	0.171698	(WoodDeckSF, LotArea)
233	48	0.171698	(LotArea, WoodDeckSF)
234	711	0.170205	(PoolArea, GrLivArea)
235	269	0.170205	(GrLivArea, PoolArea)
236	199	0.169494	(2ndFlrSF, BsmtFullBath)
237	277	0.169494	(BsmtFullBath, 2ndFlrSF)
238	611	0.169405	(OpenPorchSF, Fireplaces)
239	481	0.169405	(Fireplaces, OpenPorchSF)
240	382	0.166643	(BedroomAbvGr, BsmtUnfSF)
241	122	0.166643	(BsmtUnfSF, BedroomAbvGr)
242	453	0.165984	(TotRmsAbvGrd, WoodDeckSF)
243	583	0.165984	(WoodDeckSF, TotRmsAbvGrd)
244	371	0.163549	(HalfBath, GarageArea)
245	553	0.163549	(GarageArea, HalfBath)
246	273	0.158678	(BsmtFullBath, BsmtFinSF2)
247	91	0.158678	(BsmtFinSF2, BsmtFullBath)
248	271	0.158155	(BsmtFullBath, LotArea)
249	37	0.158155	(LotArea, BsmtFullBath)
250	514	0.154871	(GarageCars, LotArea)
251	46	0.154871	(LotArea, GarageCars)
252	72	0.153484	(BsmtFinSF1, GarageYrBlt)
253	488	0.153484	(GarageYrBlt, BsmtFinSF1)
254	22	0.151972	(LotFrontage, OpenPorchSF)
255	594	0.151972	(OpenPorchSF, LotFrontage)
256	536	0.151434	(GarageCars, EnclosedPorch)
257	640	0.151434	(EnclosedPorch, GarageCars)
258	284	0.150673	(BsmtFullBath, BedroomAbvGr)
259	388	0.150673	(BedroomAbvGr, BsmtFullBath)
260	450	0.148112	(TotRmsAbvGrd, GarageYrBlt)
261	502	0.148112	(GarageYrBlt, TotRmsAbvGrd)
262	307	0.147871	(BsmtHalfBath, BsmtFullBath)
263	281	0.147871	(BsmtFullBath, BsmtHalfBath)
264	80	0.140491	(BsmtFinSF1, PoolArea)
265	704	0.140491	(PoolArea, BsmtFinSF1)
266	547	0.138347	(GarageArea, 2ndFlrSF)
267	209	0.138347	(2ndFlrSF, GarageArea)
268	287	0.137928	(BsmtFullBath, Fireplaces)
269	469	0.137928	(Fireplaces, BsmtFullBath)
270	191	0.137079	(2ndFlrSF, BsmtFinSF1)

271	61	0.137079	(BsmtFinSF1, 2ndFlrSF)
272	337	0.136381	(FullBath, HalfBath)
273	363	0.136381	(HalfBath, FullBath)
274	225	0.134683	(LowQualFinSF, GrLivArea)
275	251	0.134683	(GrLivArea, LowQualFinSF)
276	339	0.133115	(FullBath, KitchenAbvGr)
277	417	0.133115	(KitchenAbvGr, FullBath)
278	108	0.132644	(BsmtUnfSF, LotFrontage)
279	4	0.132644	(LotFrontage, BsmtUnfSF)
280	289	0.131881	(BsmtFullBath, GarageCars)
281	523	0.131881	(GarageCars, BsmtFullBath)
282	188	0.131525	(1stFlrSF, PoolArea)
283	708	0.131525	(PoolArea, 1stFlrSF)
284	232	0.131185	(LowQualFinSF, TotRmsAbvGrd)
285	440	0.131185	(TotRmsAbvGrd, LowQualFinSF)
286	130	0.129005	(BsmtUnfSF, OpenPorchSF)
287	598	0.129005	(OpenPorchSF, BsmtUnfSF)
288	384	0.127401	(BedroomAbvGr, 1stFlrSF)
289	176	0.127401	(1stFlrSF, BedroomAbvGr)
290	707	0.126053	(PoolArea, TotalBsmtSF)
291	161	0.126053	(TotalBsmtSF, PoolArea)
292	39	0.126031	(LotArea, FullBath)
293	325	0.126031	(FullBath, LotArea)
294	642	0.125989	(EnclosedPorch, WoodDeckSF)
295	590	0.125989	(WoodDeckSF, EnclosedPorch)
296	288	0.124553	(BsmtFullBath, GarageYrBlt)
297	496	0.124553	(GarageYrBlt, BsmtFullBath)
298	501	0.124411	(GarageYrBlt, KitchenAbvGr)
299	423	0.124411	(KitchenAbvGr, GarageYrBlt)
300	422	0.123936	(KitchenAbvGr, Fireplaces)
301	474	0.123936	(Fireplaces, KitchenAbvGr)
302	641	0.121777	(EnclosedPorch, GarageArea)
303	563	0.121777	(GarageArea, EnclosedPorch)
304	175	0.119916	(1stFlrSF, HalfBath)
305	357	0.119916	(HalfBath, 1stFlrSF)
306	379	0.119690	(BedroomAbvGr, LotArea)
307	41	0.119690	(LotArea, BedroomAbvGr)
308	633	0.115093	(EnclosedPorch, FullBath)
309	347	0.115093	(FullBath, EnclosedPorch)
310	76	0.111761	(BsmtFinSF1, OpenPorchSF)
311	596	0.111761	(OpenPorchSF, BsmtFinSF1)
312	82	0.111170	(BsmtFinSF2, LotArea)
313	30	0.111170	(LotArea, BsmtFinSF2)
314	580	0.108080	(WoodDeckSF, HalfBath)
315	372	0.108080	(HalfBath, WoodDeckSF)
316	473	0.107570	(Fireplaces, BedroomAbvGr)
317	395	0.107570	(BedroomAbvGr, Fireplaces)

318	68	0.107355	(BsmtFinSF1, BedroomAbvGr)
319	380	0.107355	(BedroomAbvGr, BsmtFinSF1)
320	386	0.105607	(BedroomAbvGr, LowQualFinSF)
321	230	0.105607	(LowQualFinSF, BedroomAbvGr)
322	138	0.104810	(TotalBsmtSF, BsmtFinSF2)
323	86	0.104810	(BsmtFinSF2, TotalBsmtSF)
324	623	0.102303	(EnclosedPorch, BsmtFinSF1)
325	77	0.102303	(BsmtFinSF1, EnclosedPorch)
326	268	0.101510	(GrLivArea, ScreenPorch)
327	684	0.101510	(ScreenPorch, GrLivArea)
328	270	0.100949	(BsmtFullBath, LotFrontage)
329	10	0.100949	(LotFrontage, BsmtFullBath)
330	414	0.100063	(KitchenAbvGr, GrLivArea)
331	258	0.100063	(GrLivArea, KitchenAbvGr)
332	88	0.099260	(BsmtFinSF2, 2ndFlrSF)
333	192	0.099260	(2ndFlrSF, BsmtFinSF2)
334	87	0.097117	(BsmtFinSF2, 1stFlrSF)
335	165	0.097117	(1stFlrSF, BsmtFinSF2)
336	119	0.095804	(BsmtUnfSF, BsmtHalfBath)
337	301	0.095804	(BsmtHalfBath, BsmtUnfSF)
338	158	0.095478	(TotalBsmtSF, EnclosedPorch)
339	626	0.095478	(EnclosedPorch, TotalBsmtSF)
340	634	0.095317	(EnclosedPorch, HalfBath)
341	374	0.095317	(HalfBath, EnclosedPorch)
342	485	0.095074	(Fireplaces, PoolArea)
343	719	0.095074	(PoolArea, Fireplaces)
344	521	0.094480	(GarageCars, LowQualFinSF)
345	235	0.094480	(LowQualFinSF, GarageCars)
346	400	0.093810	(BedroomAbvGr, OpenPorchSF)
347	608	0.093810	(OpenPorchSF, BedroomAbvGr)
348	643	0.093079	(EnclosedPorch, OpenPorchSF)
349	617	0.093079	(OpenPorchSF, EnclosedPorch)
350	210	0.092165	(2ndFlrSF, WoodDeckSF)
351	574	0.092165	(WoodDeckSF, 2ndFlrSF)
352	582	0.090130	(WoodDeckSF, KitchenAbvGr)
353	426	0.090130	(KitchenAbvGr, WoodDeckSF)
354	106	0.088871	(BsmtFinSF2, ScreenPorch)
355	678	0.088871	(ScreenPorch, BsmtFinSF2)
356	187	0.088758	(1stFlrSF, ScreenPorch)
357	681	0.088758	(ScreenPorch, 1stFlrSF)
358	567	0.088521	(WoodDeckSF, LotFrontage)
359	21	0.088521	(LotFrontage, WoodDeckSF)
360	489	0.088011	(GarageYrBlt, BsmtFinSF2)
361	99	0.088011	(BsmtFinSF2, GarageYrBlt)
362	527	0.086106	(GarageCars, BedroomAbvGr)
363	397	0.086106	(BedroomAbvGr, GarageCars)
364	49	0.084774	(LotArea, OpenPorchSF)

365	595	0.084774	(OpenPorchSF, LotArea)
366	680	0.084489	(ScreenPorch, TotalBsmtSF)
367	160	0.084489	(TotalBsmtSF, ScreenPorch)
368	458	0.083757	(TotRmsAbvGrd, PoolArea)
369	718	0.083757	(PoolArea, TotRmsAbvGrd)
370	698	0.082864	(ScreenPorch, EnclosedPorch)
371	646	0.082864	(EnclosedPorch, ScreenPorch)
372	215	0.081487	(2ndFlrSF, PoolArea)
373	709	0.081487	(PoolArea, 2ndFlrSF)
374	407	0.081007	(KitchenAbvGr, BsmtFinSF1)
375	69	0.081007	(BsmtFinSF1, KitchenAbvGr)
376	189	0.080177	(2ndFlrSF, LotFrontage)
377	7	0.080177	(LotFrontage, 2ndFlrSF)
378	53	0.077672	(LotArea, PoolArea)
379	703	0.077672	(PoolArea, LotArea)
380	497	0.077464	(GarageYrBlt, BsmtHalfBath)
381	315	0.077464	(BsmtHalfBath, GarageYrBlt)
382	327	0.076444	(FullBath, BsmtFinSF2)
383	93	0.076444	(BsmtFinSF2, FullBath)
384	693	0.075418	(ScreenPorch, GarageYrBlt)
385	511	0.075418	(GarageYrBlt, ScreenPorch)
386	697	0.074304	(ScreenPorch, OpenPorchSF)
387	619	0.074304	(OpenPorchSF, ScreenPorch)
388	592	0.074181	(WoodDeckSF, ScreenPorch)
389	696	0.074181	(ScreenPorch, WoodDeckSF)
390	593	0.073378	(WoodDeckSF, PoolArea)
391	723	0.073378	(PoolArea, WoodDeckSF)
392	688	0.072426	(ScreenPorch, HalfBath)
393	376	0.072426	(HalfBath, ScreenPorch)
394	300	0.070948	(BsmtHalfBath, BsmtFinSF2)
395	92	0.070948	(BsmtFinSF2, BsmtHalfBath)
396	207	0.070832	(2ndFlrSF, GarageYrBlt)
397	493	0.070832	(GarageYrBlt, 2ndFlrSF)
398	404	0.070703	(BedroomAbvGr, PoolArea)
399	716	0.070703	(PoolArea, BedroomAbvGr)
400	18	0.070250	(LotFrontage, GarageYrBlt)
401	486	0.070250	(GarageYrBlt, LotFrontage)
402	609	0.070091	(OpenPorchSF, KitchenAbvGr)
403	427	0.070091	(KitchenAbvGr, OpenPorchSF)
404	648	0.070029	(3SsnPorch, LotFrontage)
405	24	0.070029	(LotFrontage, 3SsnPorch)
406	410	0.068901	(KitchenAbvGr, TotalBsmtSF)
407	150	0.068901	(TotalBsmtSF, KitchenAbvGr)
408	366	0.068263	(HalfBath, KitchenAbvGr)
409	418	0.068263	(KitchenAbvGr, HalfBath)
410	177	0.068101	(1stFlrSF, KitchenAbvGr)
411	411	0.068101	(KitchenAbvGr, 1stFlrSF)

412	570	0.067898	(WoodDeckSF, BsmtFinSF2)
413	102	0.067898	(BsmtFinSF2, WoodDeckSF)
414	296	0.067616	(BsmtFullBath, PoolArea)
415	712	0.067616	(PoolArea, BsmtFullBath)
416	548	0.067601	(GarageArea, LowQualFinSF)
417	236	0.067601	(LowQualFinSF, GarageArea)
418	299	0.067418	(BsmtHalfBath, BsmtFinSF1)
419	65	0.067418	(BsmtFinSF1, BsmtHalfBath)
420	292	0.067341	(BsmtFullBath, OpenPorchSF)
421	604	0.067341	(OpenPorchSF, BsmtFullBath)
422	627	0.065292	(EnclosedPorch, 1stFlrSF)
423	185	0.065292	(1stFlrSF, EnclosedPorch)
424	398	0.065253	(BedroomAbvGr, GarageArea)
425	554	0.065253	(GarageArea, BedroomAbvGr)
426	500	0.064518	(GarageYrBlt, BedroomAbvGr)
427	396	0.064518	(BedroomAbvGr, GarageYrBlt)
428	282	0.064512	(BsmtFullBath, FullBath)
429	334	0.064512	(FullBath, BsmtFullBath)
430	62	0.064503	(BsmtFinSF1, LowQualFinSF)
431	218	0.064503	(LowQualFinSF, BsmtFinSF1)
432	555	0.064433	(GarageArea, KitchenAbvGr)
433	425	0.064433	(KitchenAbvGr, GarageArea)
434	197	0.063353	(2ndFlrSF, LowQualFinSF)
435	223	0.063353	(LowQualFinSF, 2ndFlrSF)
436	710	0.062157	(PoolArea, LowQualFinSF)
437	242	0.062157	(LowQualFinSF, PoolArea)
438	677	0.062021	(ScreenPorch, BsmtFinSF1)
439	79	0.062021	(BsmtFinSF1, ScreenPorch)
440	628	0.061989	(EnclosedPorch, 2ndFlrSF)
441	212	0.061989	(2ndFlrSF, EnclosedPorch)
442	239	0.061081	(LowQualFinSF, EnclosedPorch)
443	629	0.061081	(EnclosedPorch, LowQualFinSF)
444	722	0.061047	(PoolArea, GarageArea)
445	566	0.061047	(GarageArea, PoolArea)
446	620	0.060762	(OpenPorchSF, PoolArea)
447	724	0.060762	(PoolArea, OpenPorchSF)
448	691	0.059383	(ScreenPorch, TotRmsAbvGrd)
449	457	0.059383	(TotRmsAbvGrd, ScreenPorch)
450	204	0.059306	(2ndFlrSF, KitchenAbvGr)
451	412	0.059306	(KitchenAbvGr, 2ndFlrSF)
452	615	0.058661	(OpenPorchSF, WoodDeckSF)
453	589	0.058661	(WoodDeckSF, OpenPorchSF)
454	66	0.058543	(BsmtFinSF1, FullBath)
455	326	0.058543	(FullBath, BsmtFinSF1)
456	186	0.056104	(1stFlrSF, 3SsnPorch)
457	654	0.056104	(3SsnPorch, 1stFlrSF)
458	309	0.054536	(BsmtHalfBath, FullBath)

459	335	0.054536	(FullBath, BsmtHalfBath)
460	647	0.054203	(EnclosedPorch, PoolArea)
461	725	0.054203	(PoolArea, EnclosedPorch)
462	351	0.053532	(HalfBath, LotFrontage)
463	13	0.053532	(LotFrontage, HalfBath)
464	442	0.053275	(TotRmsAbvGrd, BsmtFullBath)
465	286	0.053275	(BsmtFullBath, TotRmsAbvGrd)
466	690	0.051613	(ScreenPorch, KitchenAbvGr)
467	430	0.051613	(KitchenAbvGr, ScreenPorch)
468	125	0.051575	(BsmtUnfSF, Fireplaces)
469	463	0.051575	(Fireplaces, BsmtUnfSF)
470	695	0.051412	(ScreenPorch, GarageArea)
471	565	0.051412	(GarageArea, ScreenPorch)
472	727	0.051307	(PoolArea, ScreenPorch)
473	701	0.051307	(ScreenPorch, PoolArea)
474	34	0.050986	(LotArea, 2ndFlrSF)
475	190	0.050986	(2ndFlrSF, LotArea)
476	528	0.050634	(GarageCars, KitchenAbvGr)
477	424	0.050634	(KitchenAbvGr, GarageCars)
478	694	0.050494	(ScreenPorch, GarageCars)
479	538	0.050494	(GarageCars, ScreenPorch)
480	149	0.050450	(TotalBsmtSF, BedroomAbvGr)
481	383	0.050450	(BedroomAbvGr, TotalBsmtSF)
482	57	0.050117	(BsmtFinSF1, BsmtFinSF2)
483	83	0.050117	(BsmtFinSF2, BsmtFinSF1)
484	293	0.049911	(BsmtFullBath, EnclosedPorch)
485	631	0.049911	(EnclosedPorch, BsmtFullBath)
486	3	0.049900	(LotFrontage, BsmtFinSF2)
487	81	0.049900	(BsmtFinSF2, LotFrontage)
488	714	0.049604	(PoolArea, FullBath)
489	350	0.049604	(FullBath, PoolArea)
490	148	0.048804	(TotalBsmtSF, HalfBath)
491	356	0.048804	(HalfBath, TotalBsmtSF)
492	298	0.048046	(BsmtHalfBath, LotArea)
493	38	0.048046	(LotArea, BsmtHalfBath)
494	278	0.047143	(BsmtFullBath, LowQualFinSF)
495	226	0.047143	(LowQualFinSF, BsmtFullBath)
496	98	0.046921	(BsmtFinSF2, Fireplaces)
497	462	0.046921	(Fireplaces, BsmtFinSF2)
498	581	0.046854	(WoodDeckSF, BedroomAbvGr)
499	399	0.046854	(BedroomAbvGr, WoodDeckSF)
500	477	0.046822	(Fireplaces, GarageYrBlt)
501	503	0.046822	(GarageYrBlt, Fireplaces)
502	389	0.046519	(BedroomAbvGr, BsmtHalfBath)
503	311	0.046519	(BsmtHalfBath, BedroomAbvGr)
504	70	0.044316	(BsmtFinSF1, TotRmsAbvGrd)
505	434	0.044316	(TotRmsAbvGrd, BsmtFinSF1)

506	403	0.044300	(BedroomAbvGr, ScreenPorch)
507	689	0.044300	(ScreenPorch, BedroomAbvGr)
508	52	0.043160	(LotArea, ScreenPorch)
509	676	0.043160	(ScreenPorch, LotArea)
510	107	0.041709	(BsmtFinSF2, PoolArea)
511	705	0.041709	(PoolArea, BsmtFinSF2)
512	635	0.041570	(EnclosedPorch, BedroomAbvGr)
513	401	0.041570	(BedroomAbvGr, EnclosedPorch)
514	285	0.041503	(BsmtFullBath, KitchenAbvGr)
515	415	0.041503	(KitchenAbvGr, BsmtFullBath)
516	675	0.041383	(ScreenPorch, LotFrontage)
517	25	0.041383	(LotFrontage, ScreenPorch)
518	355	0.041118	(HalfBath, BsmtUnfSF)
519	121	0.041118	(BsmtUnfSF, HalfBath)
520	408	0.040751	(KitchenAbvGr, BsmtFinSF2)
521	96	0.040751	(BsmtFinSF2, KitchenAbvGr)
522	214	0.040606	(2ndFlrSF, ScreenPorch)
523	682	0.040606	(ScreenPorch, 2ndFlrSF)
524	578	0.040161	(WoodDeckSF, BsmtHalfBath)
525	318	0.040161	(BsmtHalfBath, WoodDeckSF)
526	8	0.038469	(LotFrontage, LowQualFinSF)
527	216	0.038469	(LowQualFinSF, LotFrontage)
528	100	0.038264	(BsmtFinSF2, GarageCars)
529	516	0.038264	(GarageCars, BsmtFinSF2)
530	416	0.037944	(KitchenAbvGr, BsmtHalfBath)
531	312	0.037944	(BsmtHalfBath, KitchenAbvGr)
532	653	0.037384	(3SsnPorch, TotalBsmtSF)
533	159	0.037384	(TotalBsmtSF, 3SsnPorch)
534	636	0.037312	(EnclosedPorch, KitchenAbvGr)
535	428	0.037312	(KitchenAbvGr, EnclosedPorch)
536	671	0.037305	(3SsnPorch, EnclosedPorch)
537	645	0.037305	(EnclosedPorch, 3SsnPorch)
538	624	0.036543	(EnclosedPorch, BsmtFinSF2)
539	104	0.036543	(BsmtFinSF2, EnclosedPorch)
540	234	0.036363	(LowQualFinSF, GarageYrBlt)
541	494	0.036363	(GarageYrBlt, LowQualFinSF)
542	537	0.035765	(GarageCars, 3SsnPorch)
543	667	0.035765	(3SsnPorch, GarageCars)
544	660	0.035353	(3SsnPorch, FullBath)
545	348	0.035353	(FullBath, 3SsnPorch)
546	97	0.035227	(BsmtFinSF2, TotRmsAbvGrd)
547	435	0.035227	(TotRmsAbvGrd, BsmtFinSF2)
548	659	0.035114	(3SsnPorch, BsmtHalfBath)
549	321	0.035114	(BsmtHalfBath, 3SsnPorch)
550	706	0.035092	(PoolArea, BsmtUnfSF)
551	134	0.035092	(BsmtUnfSF, PoolArea)
552	564	0.035087	(GarageArea, 3SsnPorch)

553	668	0.035087	(3SsnPorch, GarageArea)
554	279	0.034836	(BsmtFullBath, GrLivArea)
555	253	0.034836	(GrLivArea, BsmtFullBath)
556	221	0.033245	(LowQualFinSF, TotalBsmtSF)
557	143	0.033245	(TotalBsmtSF, LowQualFinSF)
558	591	0.032771	(WoodDeckSF, 3SsnPorch)
559	669	0.032771	(3SsnPorch, WoodDeckSF)
560	94	0.032148	(BsmtFinSF2, HalfBath)
561	354	0.032148	(HalfBath, BsmtFinSF2)
562	686	0.032121	(ScreenPorch, BsmtHalfBath)
563	322	0.032121	(BsmtHalfBath, ScreenPorch)
564	699	0.031436	(ScreenPorch, 3SsnPorch)
565	673	0.031436	(3SsnPorch, ScreenPorch)
566	283	0.030905	(BsmtFullBath, HalfBath)
567	361	0.030905	(HalfBath, BsmtFullBath)
568	123	0.030086	(BsmtUnfSF, KitchenAbvGr)
569	409	0.030086	(KitchenAbvGr, BsmtUnfSF)
570	651	0.029993	(3SsnPorch, BsmtFinSF2)
571	105	0.029993	(BsmtFinSF2, 3SsnPorch)
572	314	0.028976	(BsmtHalfBath, Fireplaces)
573	470	0.028976	(Fireplaces, BsmtHalfBath)
574	116	0.028167	(BsmtUnfSF, LowQualFinSF)
575	220	0.028167	(LowQualFinSF, BsmtUnfSF)
576	359	0.027080	(HalfBath, LowQualFinSF)
577	229	0.027080	(LowQualFinSF, HalfBath)
578	241	0.026799	(LowQualFinSF, ScreenPorch)
579	683	0.026799	(ScreenPorch, LowQualFinSF)
580	650	0.026451	(3SsnPorch, BsmtFinSF1)
581	78	0.026451	(BsmtFinSF1, 3SsnPorch)
582	237	0.025444	(LowQualFinSF, WoodDeckSF)
583	575	0.025444	(WoodDeckSF, LowQualFinSF)
584	605	0.025324	(OpenPorchSF, BsmtHalfBath)
585	319	0.025324	(BsmtHalfBath, OpenPorchSF)
586	45	0.024947	(LotArea, GarageYrBlt)
587	487	0.024947	(GarageYrBlt, LotArea)
588	638	0.024822	(EnclosedPorch, Fireplaces)
589	482	0.024822	(Fireplaces, EnclosedPorch)
590	663	0.024600	(3SsnPorch, KitchenAbvGr)
591	429	0.024600	(KitchenAbvGr, 3SsnPorch)
592	317	0.024536	(BsmtHalfBath, GarageArea)
593	551	0.024536	(GarageArea, BsmtHalfBath)
594	402	0.024478	(BedroomAbvGr, 3SsnPorch)
595	662	0.024478	(3SsnPorch, BedroomAbvGr)
596	213	0.024358	(2ndFlrSF, 3SsnPorch)
597	655	0.024358	(3SsnPorch, 2ndFlrSF)
598	304	0.023855	(BsmtHalfBath, 2ndFlrSF)
599	200	0.023855	(2ndFlrSF, BsmtHalfBath)

600	443	0.023836	(TotRmsAbvGrd, BsmtHalfBath)
601	313	0.023836	(BsmtHalfBath, TotRmsAbvGrd)
602	666	0.023544	(3SsnPorch, GarageYrBlt)
603	510	0.023544	(GarageYrBlt, 3SsnPorch)
604	295	0.023148	(BsmtFullBath, ScreenPorch)
605	685	0.023148	(ScreenPorch, BsmtFullBath)
606	715	0.022381	(PoolArea, HalfBath)
607	377	0.022381	(HalfBath, PoolArea)
608	467	0.021272	(Fireplaces, LowQualFinSF)
609	233	0.021272	(LowQualFinSF, Fireplaces)
610	539	0.020934	(GarageCars, PoolArea)
611	721	0.020934	(PoolArea, GarageCars)
612	524	0.020891	(GarageCars, BsmtHalfBath)
613	316	0.020891	(BsmtHalfBath, GarageCars)
614	652	0.020764	(3SsnPorch, BsmtUnfSF)
615	132	0.020764	(BsmtUnfSF, 3SsnPorch)
616	657	0.020643	(3SsnPorch, GrLivArea)
617	267	0.020643	(GrLivArea, 3SsnPorch)
618	51	0.020423	(LotArea, 3SsnPorch)
619	649	0.020423	(3SsnPorch, LotArea)
620	323	0.020025	(BsmtHalfBath, PoolArea)
621	713	0.020025	(PoolArea, BsmtHalfBath)
622	306	0.018918	(BsmtHalfBath, GrLivArea)
623	254	0.018918	(GrLivArea, BsmtHalfBath)
624	50	0.018340	(LotArea, EnclosedPorch)
625	622	0.018340	(EnclosedPorch, LotArea)
626	238	0.018251	(LowQualFinSF, OpenPorchSF)
627	602	0.018251	(OpenPorchSF, LowQualFinSF)
628	101	0.018227	(BsmtFinSF2, GarageArea)
629	543	0.018227	(GarageArea, BsmtFinSF2)
630	42	0.017784	(LotArea, KitchenAbvGr)
631	406	0.017784	(KitchenAbvGr, LotArea)
632	381	0.015728	(BedroomAbvGr, BsmtFinSF2)
633	95	0.015728	(BsmtFinSF2, BedroomAbvGr)
634	219	0.014807	(LowQualFinSF, BsmtFinSF2)
635	89	0.014807	(BsmtFinSF2, LowQualFinSF)
636	717	0.014525	(PoolArea, KitchenAbvGr)
637	431	0.014525	(KitchenAbvGr, PoolArea)
638	512	0.014501	(GarageYrBlt, PoolArea)
639	720	0.014501	(PoolArea, GarageYrBlt)
640	352	0.014259	(HalfBath, LotArea)
641	40	0.014259	(LotArea, HalfBath)
642	170	0.014241	(1stFlrSF, LowQualFinSF)
643	222	0.014241	(LowQualFinSF, 1stFlrSF)
644	133	0.012579	(BsmtUnfSF, ScreenPorch)
645	679	0.012579	(ScreenPorch, BsmtUnfSF)
646	362	0.012340	(HalfBath, BsmtHalfBath)

647	310	0.012340	(BsmtHalfBath, HalfBath)
648	483	0.011257	(Fireplaces, 3SsnPorch)
649	665	0.011257	(3SsnPorch, Fireplaces)
650	621	0.010700	(EnclosedPorch, LotFrontage)
651	23	0.010700	(LotFrontage, EnclosedPorch)
652	90	0.009640	(BsmtFinSF2, GrLivArea)
653	246	0.009640	(GrLivArea, BsmtFinSF2)
654	266	0.009113	(GrLivArea, EnclosedPorch)
655	630	0.009113	(EnclosedPorch, GrLivArea)
656	320	0.008555	(BsmtHalfBath, EnclosedPorch)
657	632	0.008555	(EnclosedPorch, BsmtHalfBath)
658	349	0.008106	(FullBath, ScreenPorch)
659	687	0.008106	(ScreenPorch, FullBath)
660	726	0.007992	(PoolArea, 3SsnPorch)
661	674	0.007992	(3SsnPorch, PoolArea)
662	231	0.007522	(LowQualFinSF, KitchenAbvGr)
663	413	0.007522	(KitchenAbvGr, LowQualFinSF)
664	11	0.007234	(LotFrontage, BsmtHalfBath)
665	297	0.007234	(BsmtHalfBath, LotFrontage)
666	456	0.006683	(TotRmsAbvGrd, 3SsnPorch)
667	664	0.006683	(3SsnPorch, TotRmsAbvGrd)
668	15	0.006069	(LotFrontage, KitchenAbvGr)
669	405	0.006069	(KitchenAbvGr, LotFrontage)
670	618	0.005842	(OpenPorchSF, 3SsnPorch)
671	670	0.005842	(3SsnPorch, OpenPorchSF)
672	305	0.005842	(BsmtHalfBath, LowQualFinSF)
673	227	0.005842	(LowQualFinSF, BsmtHalfBath)
674	129	0.005316	(BsmtUnfSF, WoodDeckSF)
675	571	0.005316	(WoodDeckSF, BsmtUnfSF)
676	375	0.004972	(HalfBath, 3SsnPorch)
677	661	0.004972	(3SsnPorch, HalfBath)
678	35	0.004779	(LotArea, LowQualFinSF)
679	217	0.004779	(LowQualFinSF, LotArea)
680	115	0.004469	(BsmtUnfSF, 2ndFlrSF)
681	193	0.004469	(2ndFlrSF, BsmtUnfSF)
682	240	0.004296	(LowQualFinSF, 3SsnPorch)
683	656	0.004296	(3SsnPorch, LowQualFinSF)
684	353	0.004262	(HalfBath, BsmtFinSF1)
685	67	0.004262	(BsmtFinSF1, HalfBath)
686	455	0.004151	(TotRmsAbvGrd, EnclosedPorch)
687	637	0.004151	(EnclosedPorch, TotRmsAbvGrd)
688	597	0.003093	(OpenPorchSF, BsmtFinSF2)
689	103	0.003093	(BsmtFinSF2, OpenPorchSF)
690	109	0.002618	(BsmtUnfSF, LotArea)
691	31	0.002618	(LotArea, BsmtUnfSF)
692	625	0.002538	(EnclosedPorch, BsmtUnfSF)
693	131	0.002538	(BsmtUnfSF, EnclosedPorch)

694	173	0.001956	(1stFlrSF, BsmtHalfBath)
695	303	0.001956	(BsmtHalfBath, 1stFlrSF)
696	228	0.000710	(LowQualFinSF, FullBath)
697	332	0.000710	(FullBath, LowQualFinSF)
698	146	0.000315	(TotalBsmtSF, BsmtHalfBath)
699	302	0.000315	(BsmtHalfBath, TotalBsmtSF)
700	658	0.000106	(3SsnPorch, BsmtFullBath)
701	294	0.000106	(BsmtFullBath, 3SsnPorch)

```
[8]: df1 = df.loc[df[0]>0.75]
df1.drop_duplicates(subset = [0], inplace = True)
```

<ipython-input-8-5ed87f2c7c19>:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
df1.drop_duplicates(subset = [0], inplace = True)

```
[9]: df1.head()
```

```
[9]:   index      0      pairs
0    559  0.882475  (GarageArea, GarageCars)
2    441  0.825489  (TotRmsAbvGrd, GrLivArea)
4    167  0.819530  (1stFlrSF, TotalBsmtSF)
```

Which variables are highly correlated in the Ames Housing data set?

```
[ ]: # write answer here

"""
There are three sets of variables that are highly correlated.

Garage Area with Garage Cars, Total Rooms Above Ground with Total Square
Feet of Living Space Above Ground, and First Floor Square Feet with Total
Basement Square Feet.

"""
```

1.6 Make a data decision

Now that you know which variables are correlated with each other, which would you drop from the dataset?

```
[ ]: # write answer here
```

```
[ ]: #__SOLUTION__
"""
Since three different pairs of variables are highly correlated, the correct
approach would be to drop one variable from each pair.

One approach would be to drop Garage Area, Total Rooms, and Total Basement
Square Feet.

Garage Area: The size of the garage is dependent on how many cars are in it.

If you wanted to still keep the information captured by Garage Area,
you could create a new variable "Average space per car" before dropping
Garage Area.

Total Rooms: There are other variables that count the number of kitchens,
bathrooms, bedrooms, etc.

Total Basement Square Feet: The first floor of a building is usually built
upon the foundation, which contains the basement.

To keep the information that there is a basement, you could create
a variable "HasBasement", when TotalBsmtSF >0, before deleting the original
variable.
"""
```

1.7 Address the colinearity

Remove the chosen variables from `ames_preprocessed`.

```
[81]: # write code here

ames_preprocessed.drop(columns = ["GarageArea", "TotRmsAbvGrd", "TotalBsmtSF"],
                        inplace = True, axis = 1)
```

/opt/anaconda3/envs/learn-env/lib/python3.8/site-packages/pandas/core/frame.py:4163: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
return super().drop(

1.8 Summary

Good job! You got some hands-on practice creating and interpreting a scatter matrix and correlation matrix to identify if variables are collinear in the Ames Housing data set. You also edited the Ames Housing data set so highly correlated variables are removed.