Assignment 4

INFO8675-22S-Sec4-Advanced Data Analytics

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Question 1

Introduction

The objective of this project is to build a model that can help real estate agents predict the value of prices of houses using the given features in the dataset using multiple regression.

We are given 2 datasets and data description file:

1. train.csv – This file contains the training dataset and there are 1,460 data
2. test.csv – This file contains the test dataset and there are 1,459 data.
3. data_desctiption.txt – This file has a full description of each column.

The **train dataset** contains 81 variables (23 nominal, 23 ordinal, 15 discrete and 20 continuous, See **Table below** for the Variables Definitions) used to describe every aspect of the house and evaluate its value.

The **test dataset** (similar to the train dataset) contains 80 variables (23 nominal, 23 ordinal, 15 discrete and 19 continuous) used. This dataset does not have the SalePrice variable. We will be using the train dataset as a model to predict the sale prices of the houses in the test dataset.

Data Exploration and Descriptive Statistics

Variables Definitions and Data Types

Nominal (categorical) Variable - meaning they are non-numerical and have no clear ordering of the category (E.g. Neighborhood, Type of roofing).

Ordinal Variable - meaning they are categorical but have a clear ordering of the categories (E.g. Heating Quality (Excellent, Good, Average, Poor))

Discrete Variable - meaning they are numerical but at set intervals (E.g. Year Built, Number of Fireplaces)

Continuous Variable - meaning they are numerical and can theoretically take any value in a range (E.g. 1st Floor Square Feet).

S/No	Variable	Description	Number of Non-Missing Values	Number of missing values	Data Type	Type
1.	Id	Observation Number	1460	0	Numerical	Discrete
2.	MSSubClass	Identifies the type of dwelling involved in the sale	1460	0	Numerical	Nominal
3.	MSZoning	Identifies the general zoning classification of the sale	1460	0	Categorical	Nominal
4.	LotFrontage	Linear feet of street connected to property	1201	259	Numerical	Continuous
5.	LotArea	Lot size in square feet	1460	0	Numerical	Continuous
6.	Street	Type of road access to property	1460	0	Categorical	Nominal
7.	Alley	Type of alley access to property	91	1369	Categorical	Nominal
8.	LotShape	General shape of property	1460	0	Categorical	Ordinal
9.	LandContour	Flatness of the property	1460	0	Categorical	Nominal

10.	Utilities	Type of utilities available	1460	0	Categorical	Ordinal
11.	LotConfig	Lot configuration	1460	0	Categorical	Nominal
12.	LandSlope	Slope of property	1460	0	Categorical	Ordinal
13.	Neighborhood	Physical locations within city limits	1460	0	Categorical	Nominal
14.	Condition1	Proximity to various conditions	1460	0	Categorical	Nominal
15.	Condition2	Proximity to various conditions (if more than one is present)	1460	0	Categorical	Nominal
16.	BldgType	Type of dwelling	1460	0	Categorical	Nominal
17.	HouseStyle	Style of dwelling	1460	0	Categorical	Nominal
18.	OverallQual	Rates the overall material and finish of the house	1460	0	Numerical	Ordinal
19.	OverallCond	Rates the overall condition of the house	1460	0	Numerical	Ordinal
20.	YearBuilt	Original construction date	1460	0	Numerical	Discrete
21.	YearRemodAdd	Remodel date (same as construction date if no remodeling or additions)	1460	0	Numerical	Discrete
22.	RoofStyle	Type of roof	1460	0	Categorical	Nominal
23.	RoofMatl	Roof material	1460	0	Categorical	Nominal
24.	Exterior1st	Exterior covering on house	1460	0	Categorical	Nominal
25.	Exterior2nd	Exterior covering on house (if more than one material)	1460	0	Categorical	Nominal
26.	MasVnrType	Masonry veneer type	1452	8	Categorical	Nominal
27.	MasVnrArea	Masonry veneer area in square feet	1452	8	Numerical	Continuous
28.	ExterQual	Evaluates the quality of the material on the exterior	1460	0	Categorical	Ordinal
29.	ExterCond	Evaluates the present condition of the material on the exterior	1460	0	Categorical	Ordinal
30.	Foundation	Type of foundation	1460	0	Categorical	Nominal
31.	BsmtQual	Evaluates the height of the basement	1423	37	Categorical	Ordinal
32.	BsmtCond	Evaluates the general condition of the basement	1423	37	Categorical	Ordinal
33.	BsmtExposure	Refers to walkout or garden level walls	1422	38	Categorical	Ordinal
34.	BsmtFinType1	Rating of basement finished area	1423	37	Categorical	Ordinal
35.	BsmtFinSF1	Type 1 finished square feet	1460	0	Numerical	Continuous
36.	BsmtFinType2	Rating of basement finished area (if multiple types)	1422	38	Categorical	Ordinal
37.	BsmtFinSF2	Type 2 finished square feet	1460	0	Numerical	Continuous
38.	BsmtUnfSF	Unfinished square feet of basement area	1460	0	Numerical	Continuous
39.	TotalBsmtSF	Total square feet of basement area	1460	0	Numerical	Continuous
40.	Heating	Type of heating	1460	0	Categorical	Nominal
41.	HeatingQC	Heating quality and condition	1460	0	Categorical	Ordinal

42.	CentralAir	Central air conditioning	1460	0	Categorical	Nominal
43.	Electrical	Electrical system	1459	1	Categorical	Ordinal
44.	1stFlrSF	First Floor square feet	1460	0	Numerical	Continuous
45.	2ndFlrSF	Second floor square feet	1460	0	Numerical	Continuous
46.	LowQualFinSF	Low quality finished square feet (all floors)	1460	0	Numerical	Continuous
47.	GrLivArea	Above grade (ground) living area square feet	1460	0	Numerical	Continuous
48.	BsmtFullBath	No of Basement full bathrooms	1460	0	Numerical	Discrete
49.	BsmtHalfBath	No of Basement half bathrooms	1460	0	Numerical	Discrete
50.	FullBath	No of Full bathrooms above grade	1460	0	Numerical	Discrete
51.	HalfBath	No of Half baths above grade	1460	0	Numerical	Discrete
52.	BedroomAbvGr	No of Bedrooms above grade (does NOT include basement bedrooms)	1460	0	Numerical	Discrete
53.	KitchenAbvGr	No of Kitchens above grade	1460	0	Numerical	Discrete
54.	KitchenQual	Kitchen quality	1460	0	Categorical	Ordinal
55.	TotRmsAbvGrd	Total rooms above grade (does not include bathrooms)	1460	0	Numerical	Discrete
56.	Functional	Home functionality (Assume typical unless deductions are warranted)	1460	0	Categorical	Ordinal
57.	Fireplaces	Number of fireplaces	1460	0	Numerical	Discrete
58.	FireplaceQu	Fireplace quality	770	690	Categorical	Ordinal
59.	GarageType	Garage location	1379	81	Categorical	Nominal
60.	GarageYrBlt	Year garage was built	1379	81	Numerical	Discrete
61.	GarageFinish	Interior finish of the garage	1379	81	Categorical	Ordinal
62.	GarageCars	Size of garage in car capacity	1460	0	Numerical	Discrete
63.	GarageArea	Size of garage in square feet	1460	0	Numerical	Continuous
64.	GarageQual	Garage quality	1379	81	Categorical	Ordinal
65.	GarageCond	Garage condition	1379	81	Categorical	Ordinal
66.	PavedDrive	Paved driveway	1460	0	Categorical	Ordinal
67.	WoodDeckSF	Wood deck area in square feet	1460	0	Numerical	Continuous
68.	OpenPorchSF	Open porch area in square feet	1460	0	Numerical	Continuous
69.	EnclosedPorch	Enclosed porch area in square feet	1460	0	Numerical	Continuous
70.	3SsnPorch	Three season porch area in square feet	1460	0	Numerical	Continuous
71.	ScreenPorch	Screen porch area in square feet	1460	0	Numerical	Continuous
72.	PoolArea	Pool area in square feet	1460	0	Numerical	Continuous
73.	PoolQC	Pool quality	7	1453	Categorical	Ordinal
74.	Fence	Fence quality	281	1179	Categorical	Ordinal
75.	MiscFeature	Miscellaneous feature not covered in other categories	54	1406	Categorical	Nominal
76.	MiscVal	$Value of miscellaneous	1460	0	Numerical	Continuous

		feature				
77.	MoSold	Month Sold (MM)	1460	0	Numerical	Discrete
78.	YrSold	Year Sold (YYYY)	1460	0	Numerical	Discrete
79.	SaleType	Type of sale	1460	0	Categorical	Nominal
80.	SaleCondition	Condition of sale	1460	0	Categorical	Nominal
81.	SalePrice	Price of House	1460	0	Numerical	Continuous

Question 2

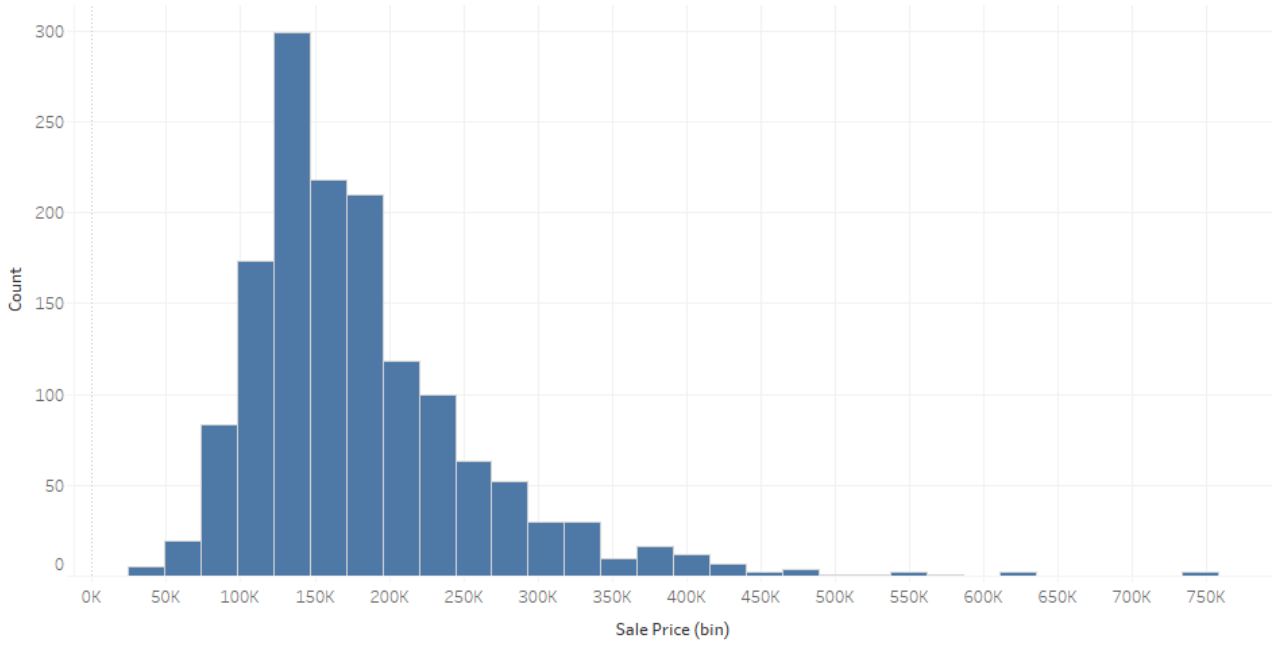
Descriptive Statistics

I performed descriptive statistics for all the numerical variables in the train dataset. (**See Appendix I**).

I have only picked just the SalePrice distribution to explain my observations. I also plotted the histogram plot for it as seen below.

Sale Price Distribution

SalePrice	
Mean	180921.1959
Standard Error	2079.105324
Median	163000
Mode	140000
Standard Deviation	79442.50288
Sample Variance	6311111264
Kurtosis	6.53628186
Skewness	1.88287576
Range	720100
Minimum	34900
Maximum	755000
Sum	264144946
Count	1460
Q1 Excl	129925
Q3 Excl	214000
IQR (using Q's Excl)	84075
Q1 Incl	129975
Q3 Incl	214000
IQR (using Q's Incl)	84025



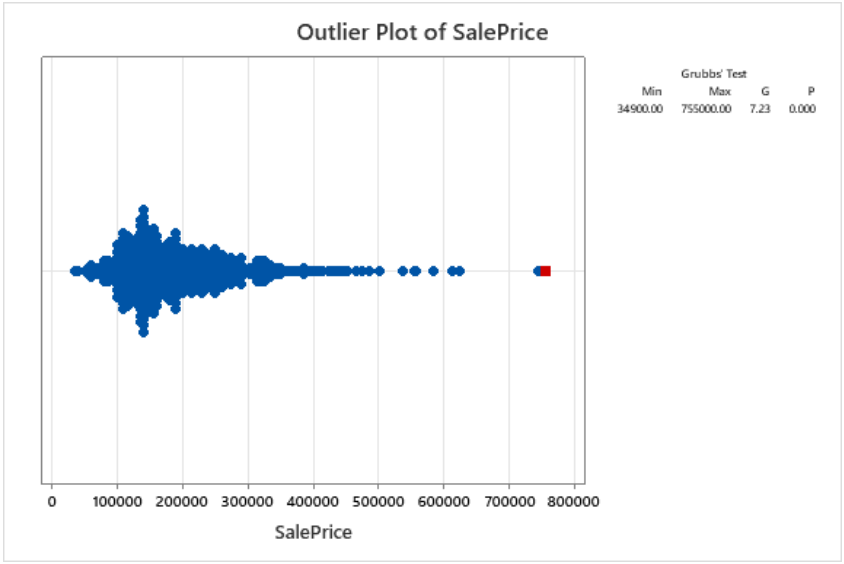
This chart looks good. No missing values. However, it shows that the distribution of the SalePrice is right-skewed, and it has some extreme high values. This shows that the data contain some outliers.

Also, from the chart, we can see that we have more inexpensive houses than expensive ones. From the descriptive statistics, the median sale price is 163,000. The least expensive house is 34,900 and the most expensive house is 755,000. The average sale price is 180,921.

75% of the prices of houses are below 214,000 and 25% above 214,000.

Outliers

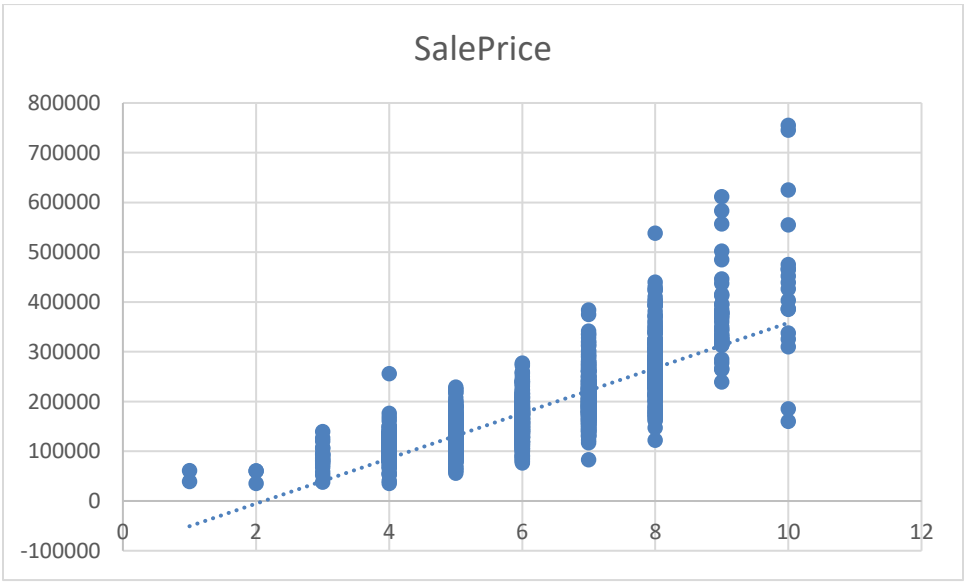
I ran the outlier test on each numerical independent variable and some of the variables have one or two outliers while some do not have. (**See Appendix 2** for outlier plots for all the variables).

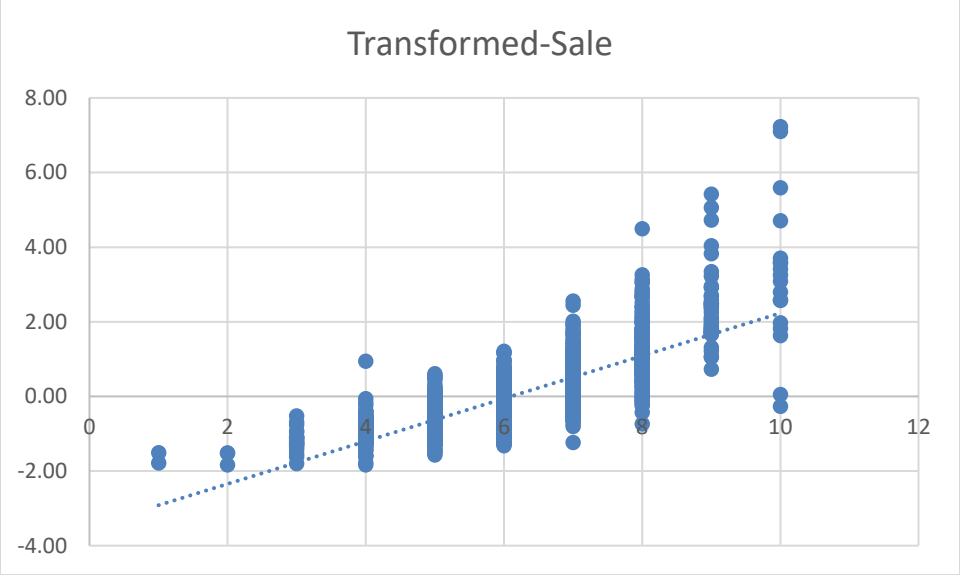


Outlier

Variable	Row	Outlier
SalePrice	692	755000

I have decided to not remove the outliers but rather, proceed with my analysis using the values provided in the original data. I drew 2 scatter plots for my SalePrice using both its original values and its transformed values and there doesn't seem to be much influence or difference in the regression line as can be seen below:





Missing Values

There are some variables that need to be examined because of the number of missing values

- Lot Frontage 259
- Alley 1369
- MasVnrType 8
- MasVnrArea 8
- BsmtQual 37
- BsmtCond 37
- BsmtExposure 38
- BsmtFinType1 37
- BsmtFinType2 38
- Electrical 1
- FireplaceQu 690
- GarageType 81
- GarageYrBlt 81
- GarageFinish 81
- GarageQual 81
- GarageCond 81
- PoolQC 1453
- Fence 1179
- MiscFeature 1406

I have no plan to remove any variable or any value. I intend to perform some normalization for the variables and imputations for missing values.

Imputations

Lot Frontage Imputation

For Lot Frontage, there is a large number of null values (259), it doesn't make sense to put 0 as a value for this, considering the existing values in the dataset. I thought of the option of using the mean of the overall Lot frontage OR the mean Lot Frontage for the Neighbourhood of each house (i.e group each Neighbourhood and find the average of the Lot Frontage). I chose to use the latter as it seemed more appropriate to me in that we can assume that same neighbourhood will probably have the same Lot Frontage size. I used Pivot Table in Excel to perform the calculations.

Alley Imputation

Alley has 1369 missing values. I changed NA to None.

MasVnr Imputation

MasVnrType and MasVnrArea both have 8 missing values. It implies that these are homes that do not have Masonry Veneer, so I changed the NA for MasVnrType to None and that of MasVnrArea to 0 because it's a numerical variable. I assumed that MasVnrArea having NA as a value implies that the house does not have Masonry Veneer.

Basement Imputation

Looking at the basement variables with NA values, it means that these are just homes without basements, so I changed the NA for the variables BsmtQual, BsmtCond, BsmtExposure, BsmtFinType1, BsmtFinType2 to None.

Electrical Imputation

There's only one missing value for this variable, so I just assumed a value with the highest frequency from the valid list of values. I changed that one value from NA to SBrkr. That's the value that has the highest frequency. Moreover, I would not be using this variable to predict the price. It does not seem it will affect the price of a house.

FirePlace Quality, PoolQuality, Fence and Misc Feature Imputation

I changed the missing values of variables FireplaceQu, PoolQC, Fence and MiscFeature from NA to None. I could have also dropped these variables completely because the "NA" values correspond to the absence of a feature and not necessarily a missing value.

Garage Imputation

Looking at these variables, GarageType, GarageYrBlt, GarageFinish, GarageQual and GarageCond, all of these show 81 missing values out of 1460. All these variables are related to Garage which means that "NA" just represent houses without garages.

So for the variables that are GarageType, GarageFinish, GarageQual and GarageCond, I changed the values NA to None.

I imputed the year the house was built - YearBuilt for the missing value for the variable GarageYrBlt. I assumed that the Year the house was built is the same for those missing values.

Ordinal Variables Imputation

I mapped some categorical variables (ordinal variables – these are variables that are categorical but have a clear order (e.g: Heating Quality (Excellent, Good, Average, Poor))).

Note: For the four variables ExterQual, ExterCond, KitchenQual and HeatingQC, I used the same scale for them. I realized that the average condition is the majority in most cases, so for me, the appropriate match to use is -4, -1, 0, 1, 4 with -4 being Poor and 4 being Excellent. The idea is that Excellent or Poor has a larger than proportional impact.

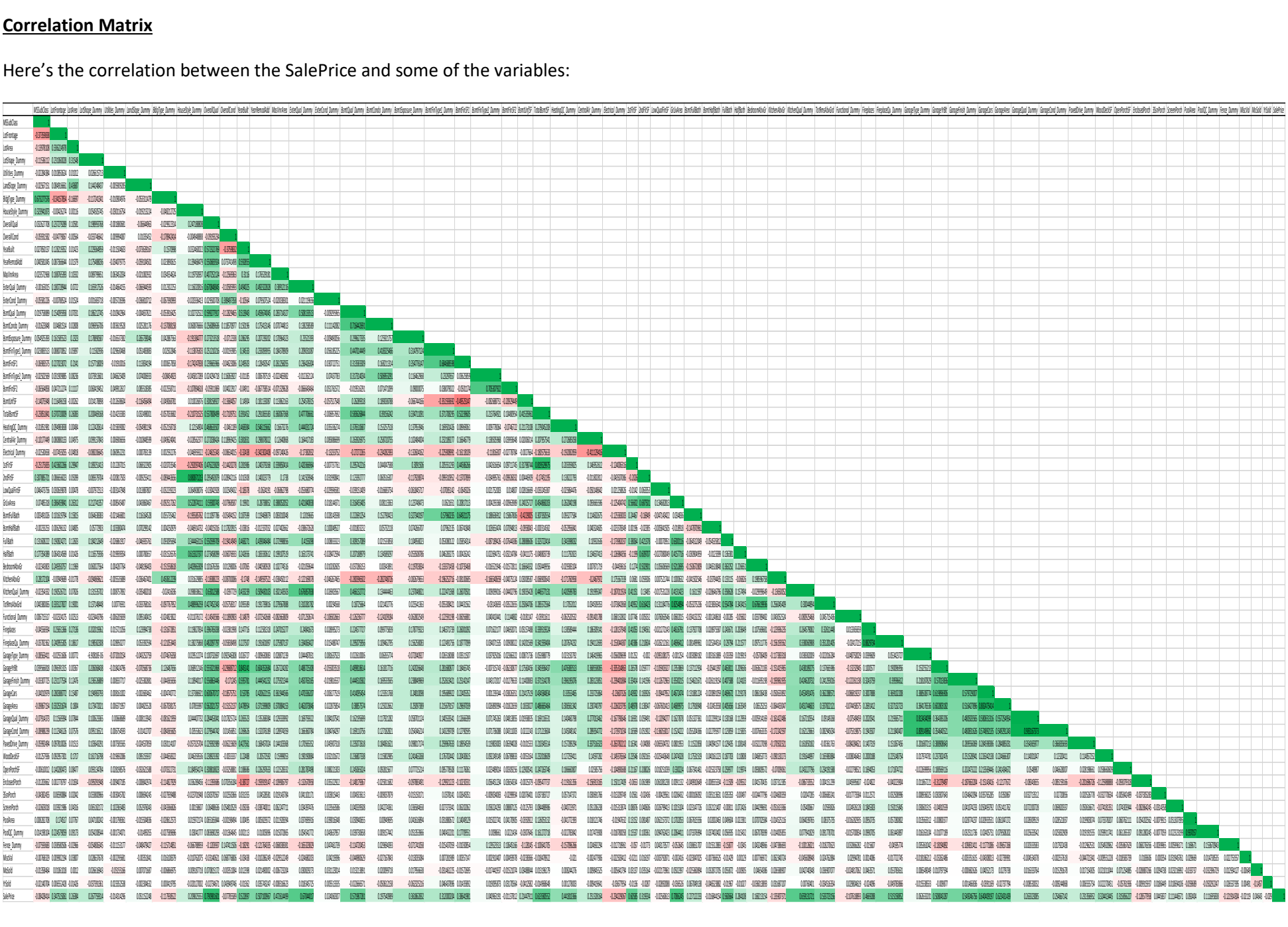
I assigned numeric values to Lot Shape according to irregularity (0,1,2,3).

All missing values have been fixed. Data has been cleaned.

Question 3

Correlation Matrix

Here's the correlation between SalePrice and some of the variables:



The dark green means there's a strong positive correlation (value is 1 or close to 1) between the 2 variables intercepting at that point. As the value of one variable increases, the value of the other also increases.

The dark red means there's a strong negative correlation (value is negative and close to -1) between the 2 variables intercepting at that point. As the value of one variable increases, the value of the other also decreases.

Independent Variables highly correlated with each other

There is multicollinearity in our train data. Below pairs of variables are highly correlated with each other (correlation > 0.80):

- GarageCond and GarageQual 0.983167373
- PoolQC and PoolArea 0.937057
- Fireplaces and FireplaceQu 0.88297336
- GarageArea and GarageCars 0.882475414
- 2ndFlrSF and HouseStyle 0.880871213
- GarageYrBlt and YearBuilt 0.845140666
- GrLivArea and TotRmsAbvGrd 0.825489374
- 1stFlrSF and TotalBsmtSF 0.819529975
- GarageQual and GarageType 0.813434099
- GarageCond and GarageType 0.809149862

Multicollinearity has a negative impact on our prediction models and makes standard errors of our estimates increase. Therefore, for each pair of highly correlated variables, I will remove a variable that has a lower correlation with SalePrice.

Independent Variables highly correlated with SalePrice

From the above correlation matrix, there's a strong positive correlation (correlation > 0.50) between SalePrice and the following variables:

- OverallQual 0.7909816
- GrLivArea 0.708624
- ExterQual 0.67044017
- KitchenQual 0.659131721
- GarageCars 0.6404092
- GarageArea 0.62343144

- TotalBsmtSF 0.613580552
- 1stFlrSF 0.60585
- BsmtQual 0.571987281
- FullBath 0.56066
- GarageFinish 0.549246756
- TotalRmsAbvGrd 0.533723156
- YearBuilt 0.522897333
- FirePlaceQu 0.515158852
- GarageYrBlt 0.508043287
- YearRemodAdd 0.507100967

**It's quite surprising that LotArea has no strong correlation with SalePrice (one would expect that a higher lot size will mean higher sale price).

Variables Selected

Based on the high correlation with SalePrice, the following variables have been selected

- OverallQual 0.7909816
- GrLivArea 0.708624
- ExterQual 0.67044017
- KitchenQual 0.659131721
- GarageCars 0.6404092
- TotalBsmtSF 0.613580552
- BsmtQual 0.571987281
- FullBath 0.56066
- GarageFinish 0.549246756
- YearBuilt 0.522897333
- FirePlaceQu 0.515158852
- YearRemodAdd 0.507100967

Looking at this selection, I will further drop a few variables because they had missing values in the original train data and I had to perform imputations for those missing values. I will then replace them with another variable that they have high correlation with.

- FirePlaceQu – will be replaced with Fireplaces

- BsmtQual – will be replaced with TotalBsmtSF
- GarageFinish – will be replaced with GarageCars

Other Variables Dropped

- GarageArea 0.62343144 – This variable was dropped because it has strong correlation with GarageCars.
- 1stFlrSF 0.60585 – This variable was dropped because it has strong correlation with TotalBsmtSF.
- TotalRmsAbvGrd 0.533723156 – This variable was dropped because it has strong correlation with GrLivArea.
- GarageYrBlt 0.508043287 - This variable was dropped because it has strong correlation with YearBuilt
- YearRemodAdd 0.592854976 - This variable was dropped because it has strong correlation with YearBuilt
- ExterQual 0.67044017 - This variable was dropped because it has high correlation with OverallQual

Final List of Variables Selected

- OverallQual
- GrLivArea
- KitchenQual
- GarageCars
- TotalBsmtSF
- FullBath
- YearBuilt
- Fireplaces

Question 5

Test dataset with predicted Saleprice is attached (See Excel File attached)

Regression Model

I ran a regression on the Train data (**See Appendix III**) which I applied on the test data to predict the SalePrice.

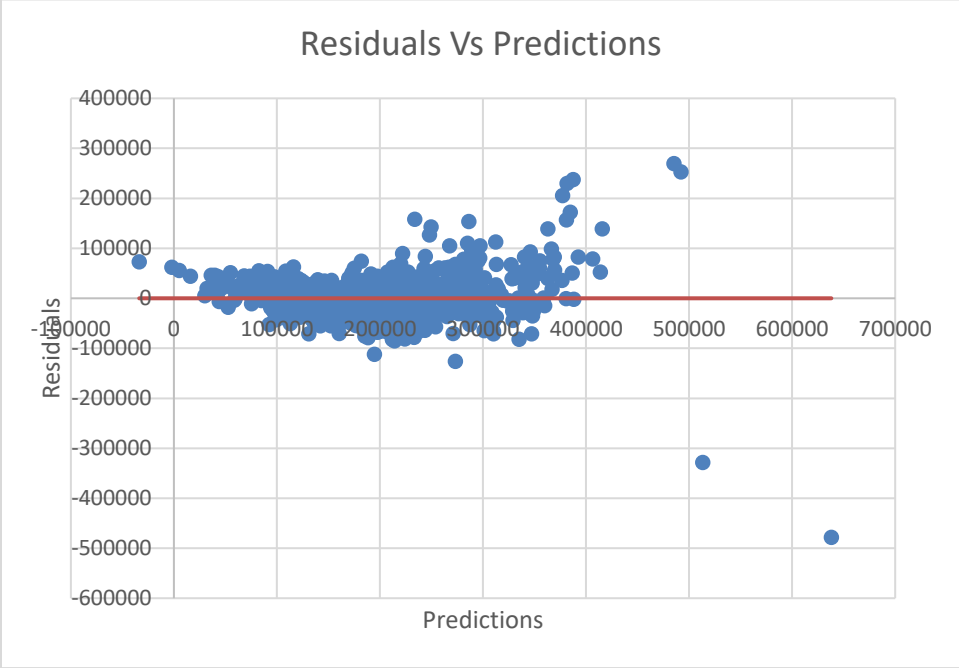
My Regression Equation

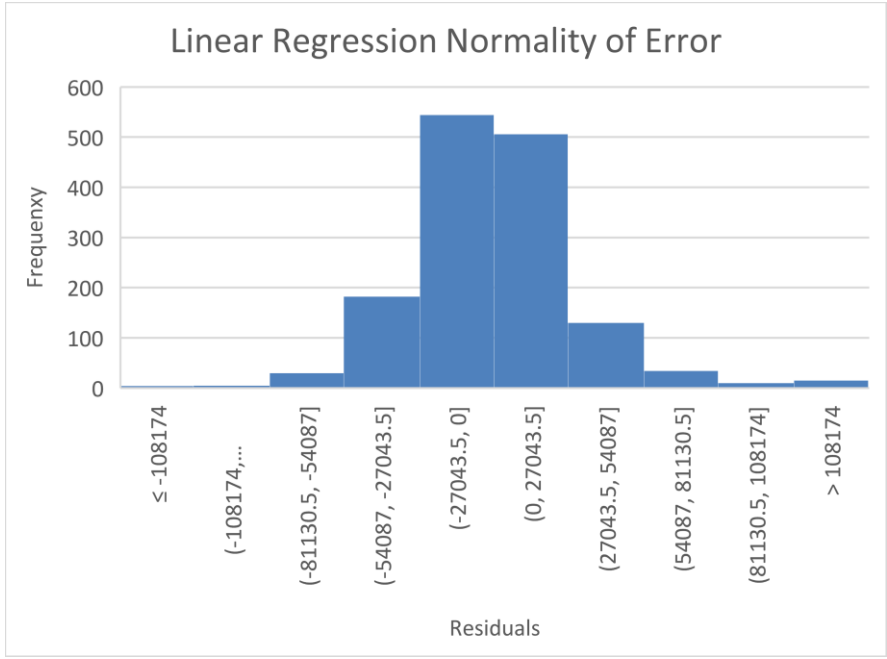
The multivarible regression equation is

$$\hat{y} = -616780.4777 + 14675.8470\,x_1 + 47.6874x_2 + 14567.3427x_3 + 12865.7383x_4 + 23.5988x_5 + (-2526.9026x_6) + 292.6977x_7 + 9382.3888x_8$$

Residual Plots

I created a residual versus prediction plot as shown below:



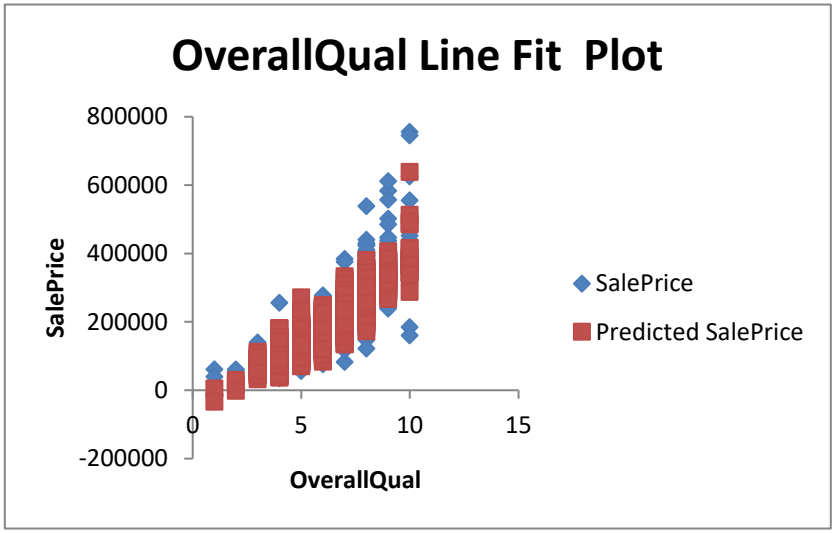


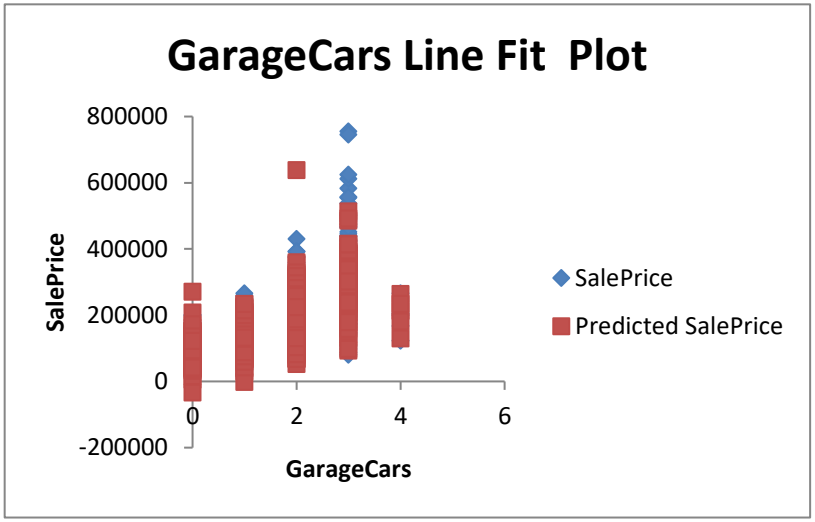
From the Residuals Vs Predictions plot, we can see that the majority of the data points have approximately equal variances for each prediction. The model fit to the data are satisfactory because the residuals approximate the random errors that make the relationship between the independent variables and the dependent variable a statistical relationship. The Normality of Error plot is normally distributed with just one or two outliers. This suggests that the model fits the data well.

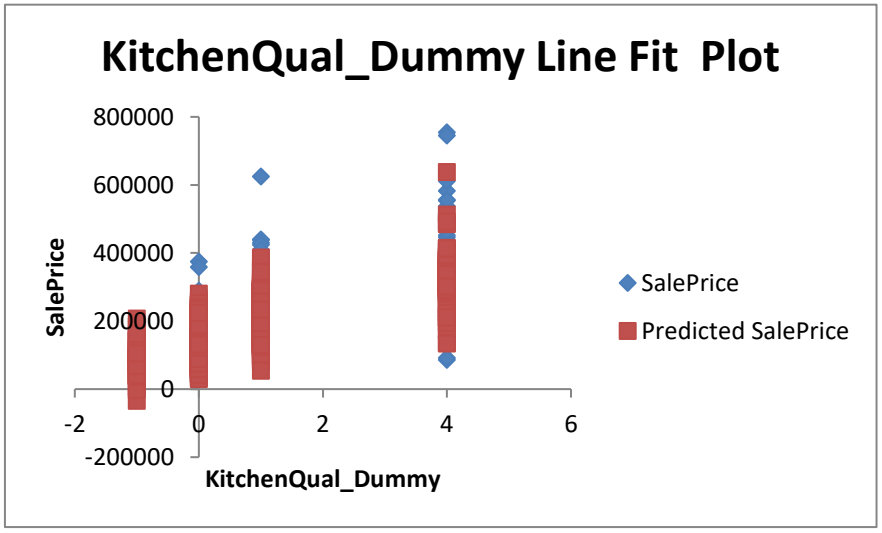
The residuals from the model appear to be normally distributed. This seems a good sign. It shows that the linear regression model used for the predictions is appropriate.

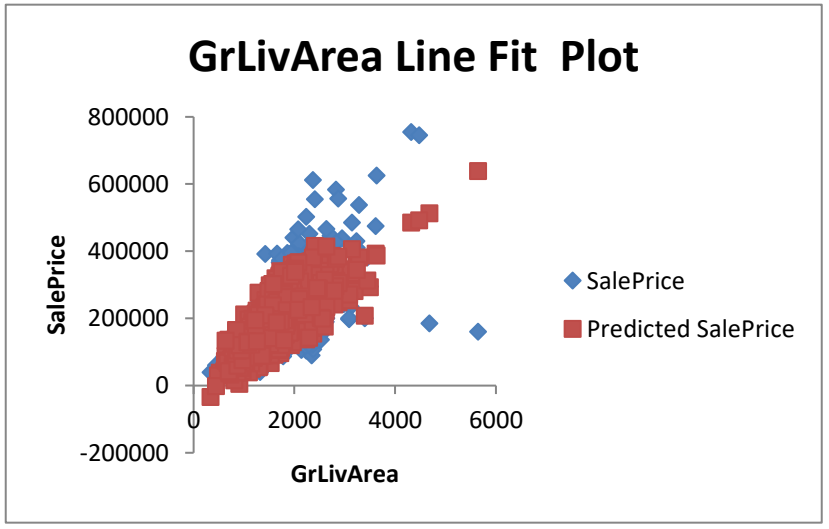
Question 6

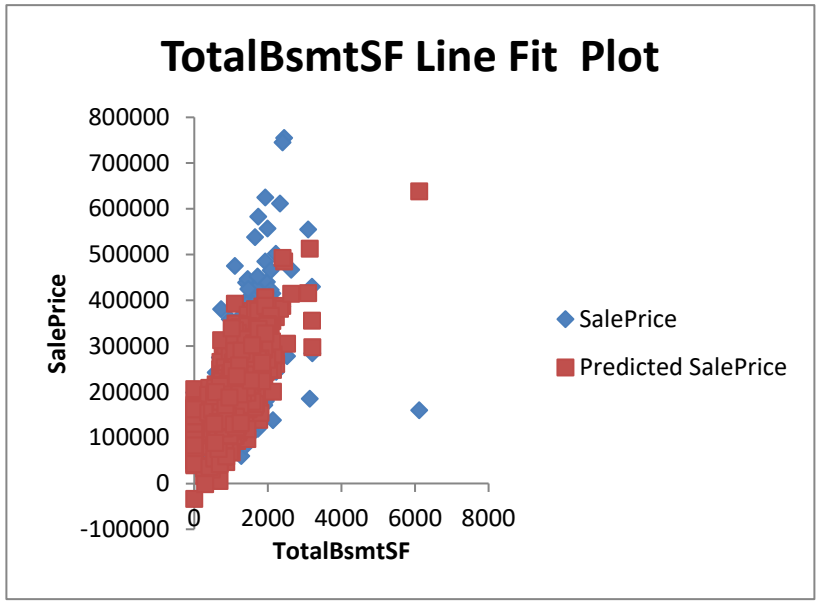
Model Fitting Plots

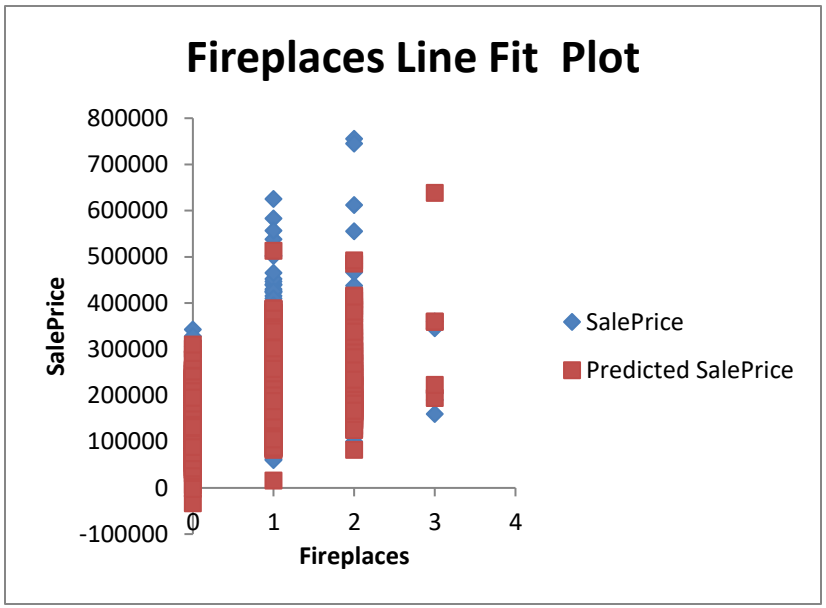


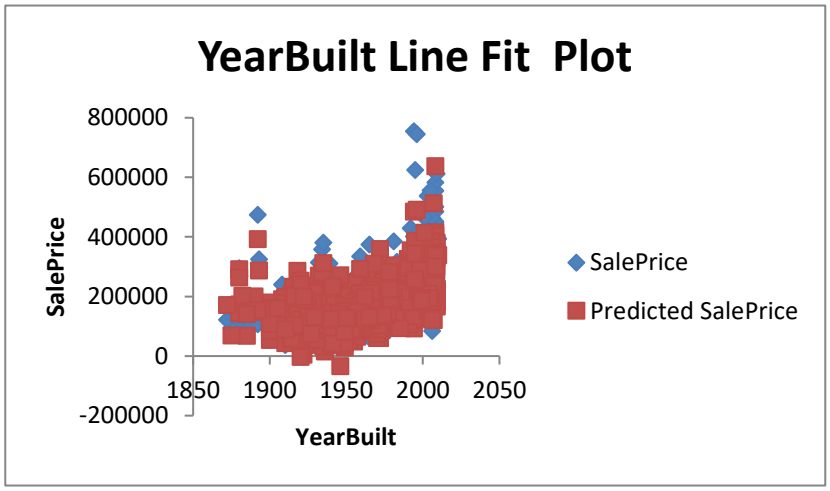


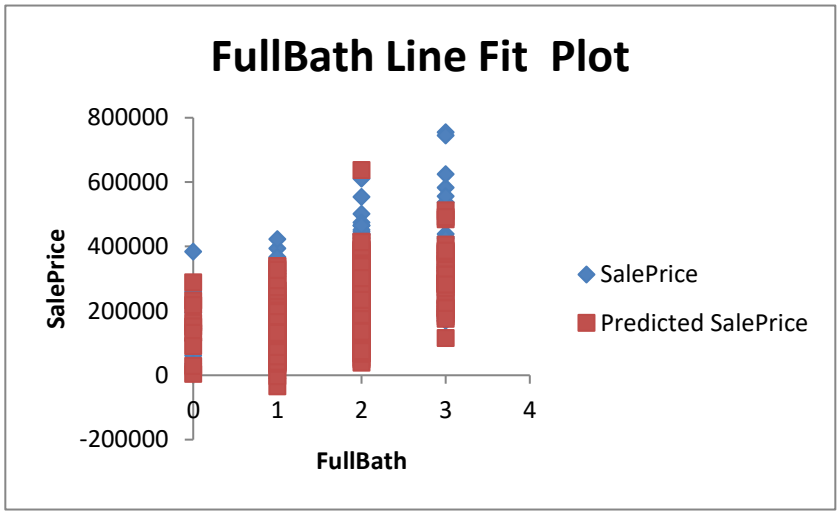





TotalBsmtSF Line Fit Plot
800000
700000
600000
500000
400000
300000
200000
100000
0
-100000
SalePrice
0
2000
4000
6000
8000
TotalBsmtSF
SalePrice
Predicted SalePrice


Fireplaces Line Fit Plot
800000
700000
600000
500000
400000
300000
200000
100000
0
-100000
SalePrice
0
1
2
3
4
Fireplaces
SalePrice
Predicted SalePrice


YearBuilt Line Fit Plot
800000
600000
400000
200000
0
-200000
SalePrice
1850
1900
1950
2000
2050
YearBuilt
SalePrice
Predicted SalePrice


FullBath Line Fit Plot
800000
600000
400000
200000
0
-200000
SalePrice
0
1
2
3
4
FullBath
SalePrice
Predicted SalePrice

Reason for choosing this model

This model is satisfactory because it explains much variation in the train data. By running a multicollinearity between variables and being able to pick the right variables and using it for our regression, we were able to explain 79.4% of the variability in our values of the dependent variable, Saleprice.

The coefficient of determination for the multivariable regression model R^2 is 0.7940, so the regression model explains approximately 79.4% of the variation in the Saleprice. This shows that there is a strong relationship between the model and the dependent variable, Saleprice.

Question 7

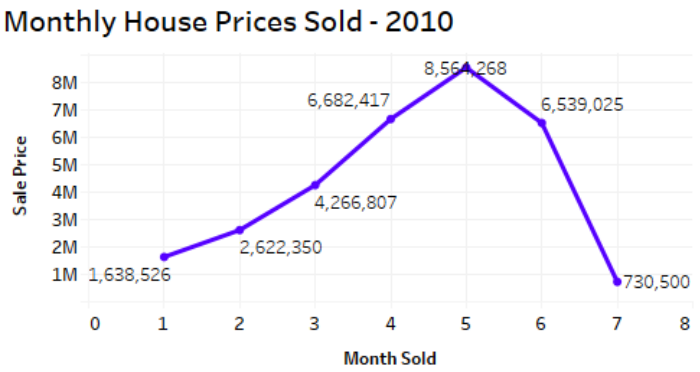
Fictitious Data Set created to test the model is attached (Excel file attached)

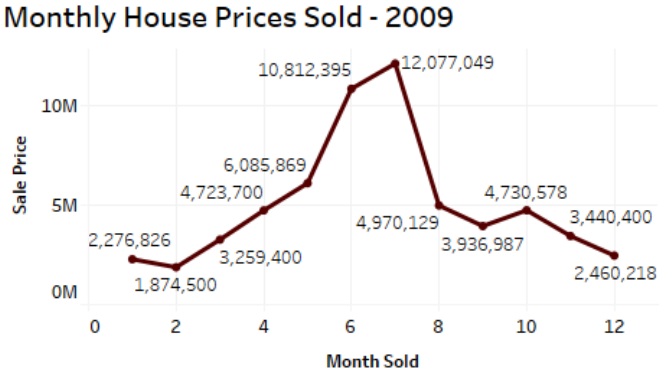
Question 8

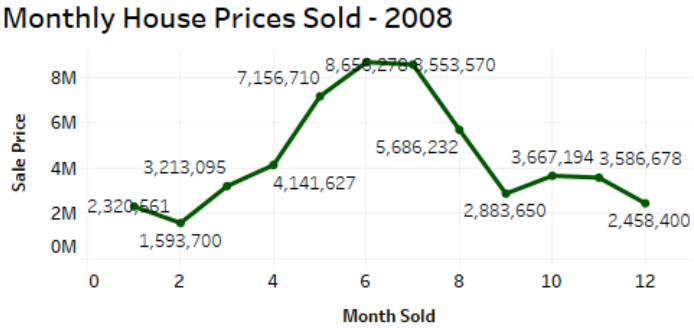
Gradient Descent?

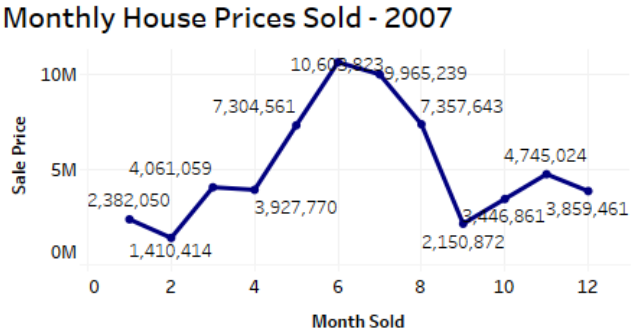
Question 9

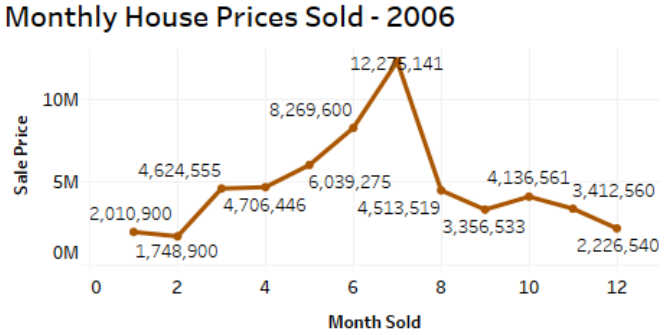
Time Series Analysis on the House Prices







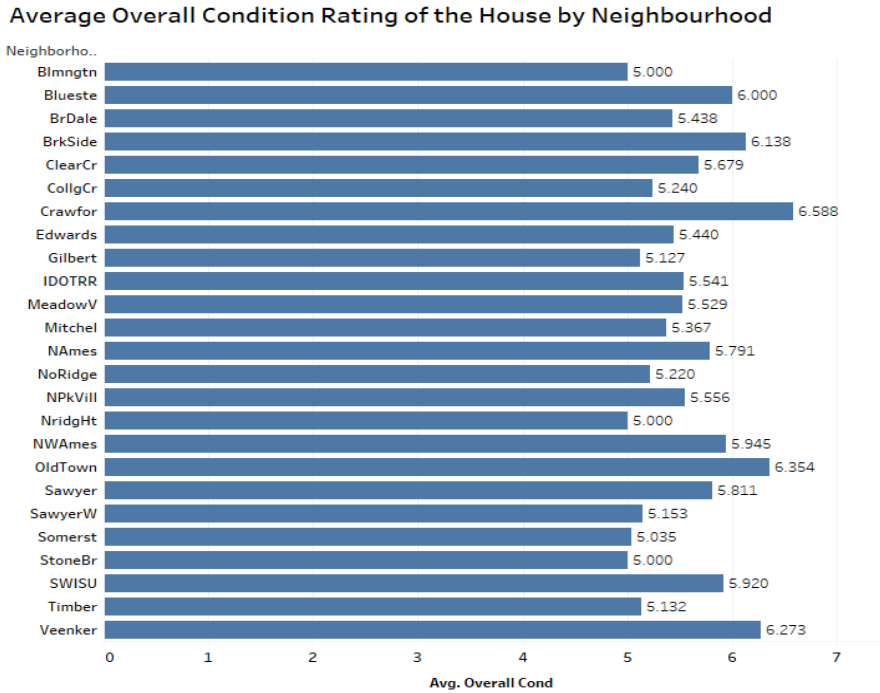


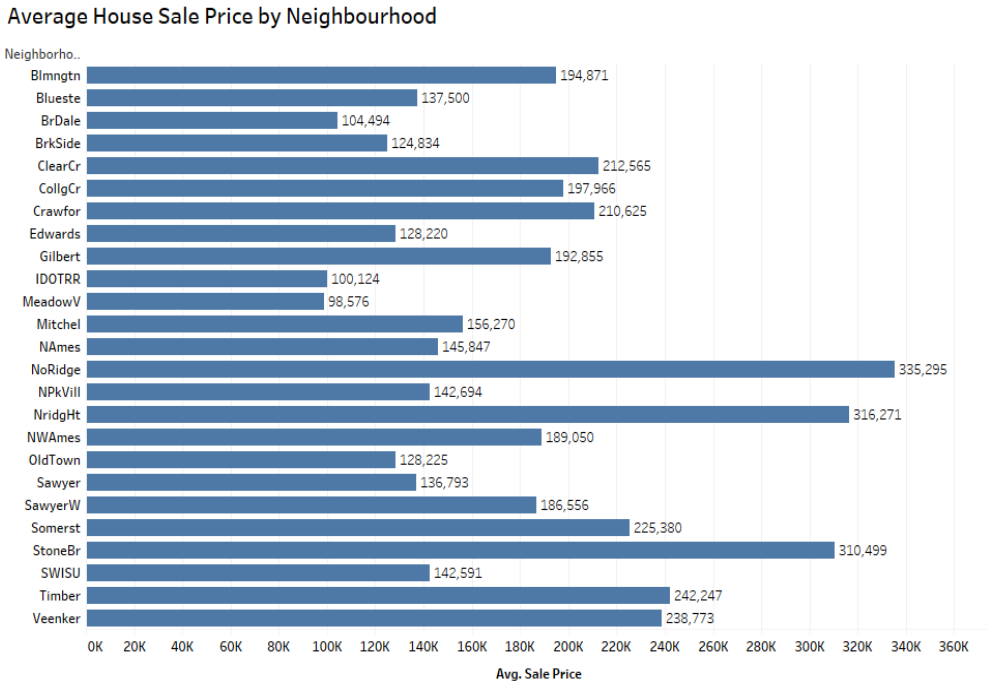


Looking at the time series analysis above, we could see a strong seasonal trend in house sales, with peaks in Month 6 and 7. From Month 2, we could see that there's steady rise in the house sales up till around the peak of Month 6 for all the years except for year 2010 whose peak was at Month 5. Then it started to

decrease again till Month 9, then it picked up again till Month 10 and then started to decrease till Month 12 Note: For our dataset, the data stopped mid-year in Month 7 of 2010.

Question 10





Data Visualization and Key Insights

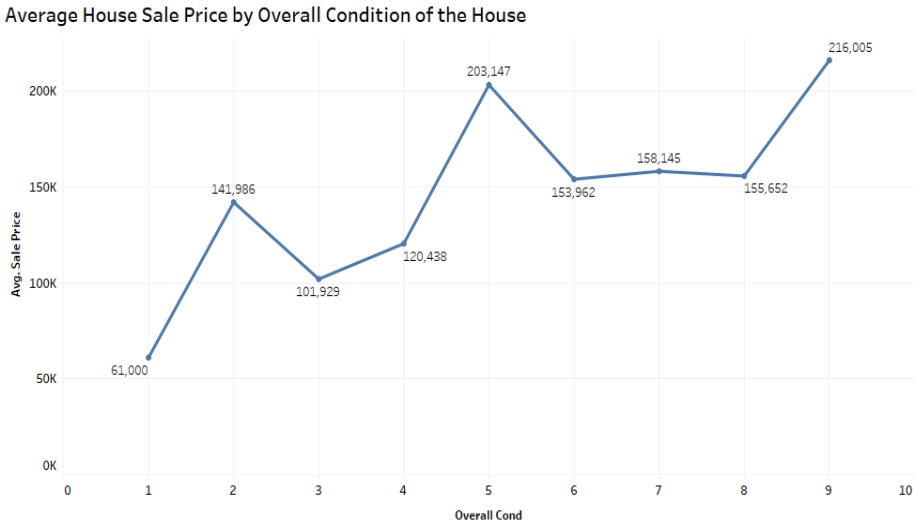
Key Insight 1

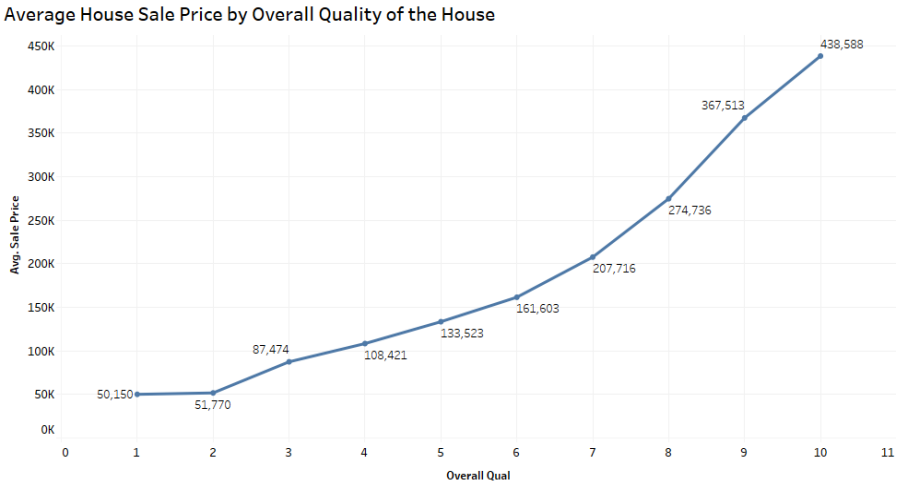
Looking at the neighbourhood compared to the average overall condition of the house, we could see that some neighbourhoods had higher average overall condtions while some had lower. We could also see, that Crawfor neighbourhood had the highest average overall condition of 6.588 followed by OldTown with 6.354 and then Veenker with 6.273. The neighbourhoods with the lowest average overall condition were Blmngtn, NridgHt, StoneBr and they all tie at 5.000.

I went further to examine the relationship between sale price and neighbourhood by plotting a chart comparing the neighborhood to average sale price. We could see that many of the neighbourhoods with lower average overall condition were the same neighbourhoods with higher average sale prices, and vice versa.

I therefore came to a conclusion that neighborhood had more importance than the condition of a house when determining the sale price. It appears that people value desirable neighborhoods and are willing to pay more money for a house in neighborhoods, such as NoRidge, NridgHt and StoneBr.

Key Insight 2

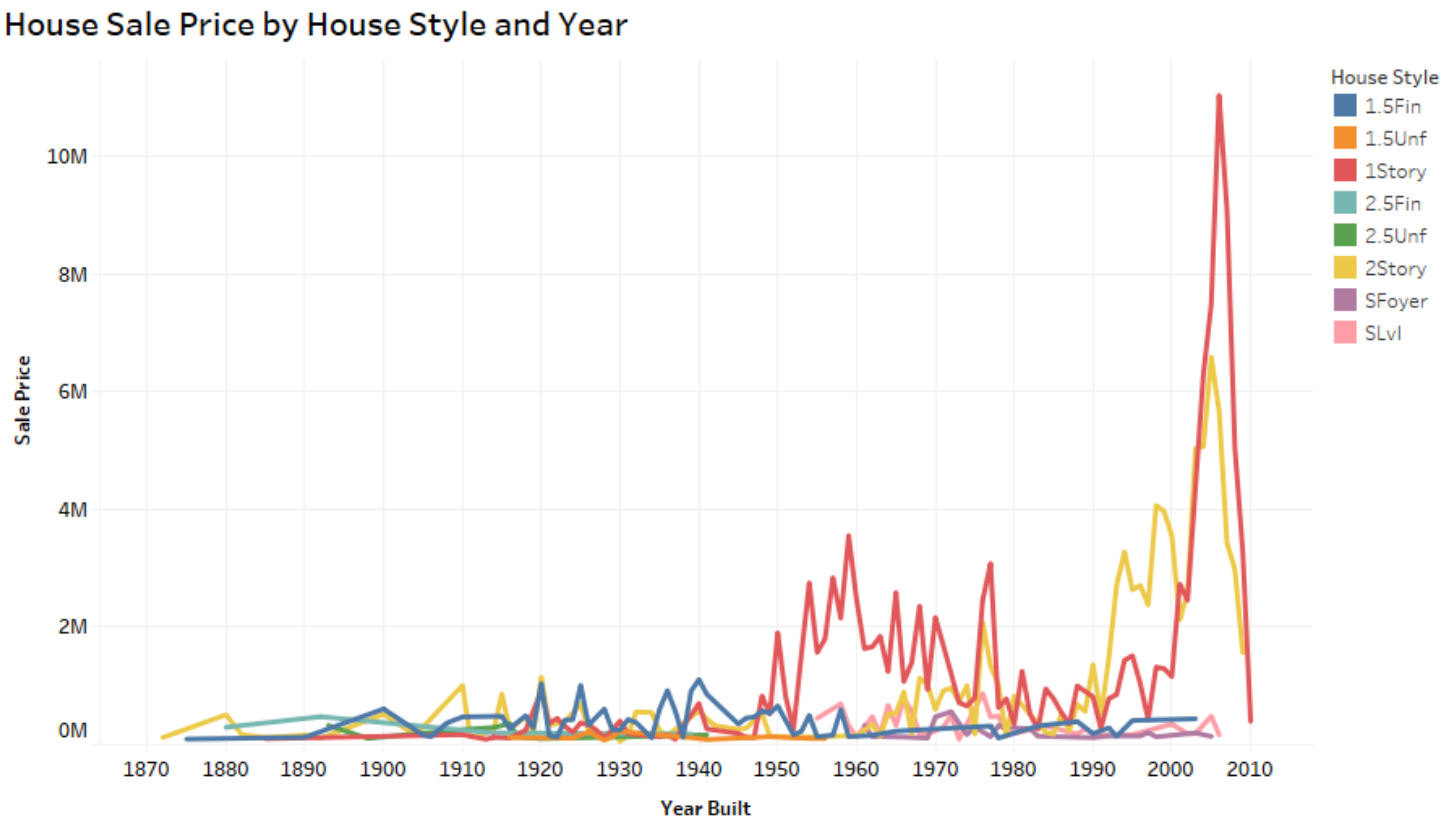




I found something intriguing about this dataset. Comparing the overall house condition ratings to sale price, there was no linear relationship between them as we can see from the graph. On the other hand, the overall quality rating had a linear relationship with sale price. As the overall quality rating increased, the sale price also increased. This was not the case with overall condition.

Rather, the houses with overall condition ratings of 5 seemed to have a higher average sale price of $203,147 than houses with higher ratings from 6 to 8. This is higher than the overall average sale price of the dataset which is $180,921. I found this strange and would probably want to investigate.

Key Insight 3



The line plot above shows that the relationship between house sale price and house year built. The house price trend was increasing. The newer the house the higher the price. The most popular house style was 1Story, followed by 2Story and then 1.5Fin as we can see from the graph. The price range disctribution is wide from around year 2000. From 2006 to 2010, only house styles 1Story and 2Story were available in the market. The other house styles disappeared. All these, we can see in the graph.

APPENDIX

Appendix I

Descriptive Statistics of the Train Dataset Numerical Variables (with no missing values)

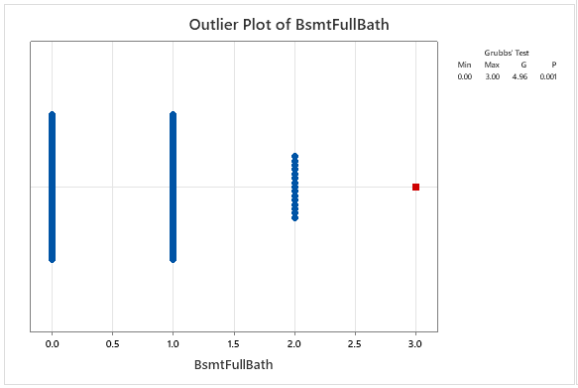
	LotArea	*OverallQual*	*OverallCond*	*BsmtFinSF1*	*BsmtFinSF2*	*BsmtUnfSF*	*TotalBsmtSF*	*1stFlrSF*	*2ndFlrSF*	*LowQualFinSF*	*GrLivArea*	*BsmtFullBath*
Mean	10516.82808	6.099315068	5.575342466	443.639726	46.54931507	567.240411	1057.429452	1162.626712	346.9924658	5.844520548	1515.463699	0.425342466
Standard Error	261.2216422	0.036194674	0.02912329	11.93663259	4.221918328	11.56418675	11.48144309	10.11746351	11.42447131	1.272524201	13.75245018	0.013580511
Median	9478.5	6	5	383.5	0	477.5	991.5	1087	0	0	1464	0
Mode	7200	5	5	0	0	0	0	864	0	0	864	0
Standard Deviation	9981.264932	1.382996547	1.112799337	456.0980908	161.3192728	441.8669553	438.7053245	386.587738	436.5284359	48.62308143	525.4803834	0.518910606
Sample Variance	99625649.65	1.912679448	1.238322364	208025.4685	26023.90778	195246.4062	192462.3617	149450.0792	190557.0753	2364.204048	276129.6334	0.269268217
Kurtosis	203.243271	0.096292778	1.106413461	11.11823629	20.11333755	0.474993988	13.25048328	5.745841482	-0.553463558	83.23481667	4.895120581	-0.839098265
Skewness	12.20768785	0.216943928	0.693067472	1.685503072	4.255261109	0.920268453	1.524254549	1.376756622	0.813029816	9.011341288	1.366560356	0.59606661
Range	213945	9	8	5644	1474	2336	6110	4358	2065	572	5308	3
Minimum	1300	1	1	0	0	0	0	334	0	0	334	0
Maximum	215245	10	9	5644	1474	2336	6110	4692	2065	572	5642	3
Sum	15354569	8905	8140	647714	67962	828171	1543847	1697435	506609	8533	2212577	621
Count	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460
Q1 Excl	7544.5	5	5	0	0	223	795.25	882	0	0	1128.5	0
Q3 Excl	11604.5	7	6	712.75	0	808	1298.75	1391.75	728	0	1778.25	1
IQR (using Q's Excl)	4060	2	1	712.75	0	585	503.5	509.75	728	0	649.75	1
Q1 Incl	7553.5	5	5	0	0	223	795.75	882	0	0	1129.5	0
Q3 Incl	11601.5	7	6	712.25	0	808	1298.25	1391.25	728	0	1776.75	1
IQR (using Q's Incl)	4048	2	1	712.25	0	585	502.5	509.25	728	0	647.25	1
Confidence Level(95.0%)	512.4100924	0.070999156	0.057127991	23.41479426	8.281678128	22.68420775	22.52189851	19.84632809	22.41014317	2.496172361	26.97668618	0.026639412

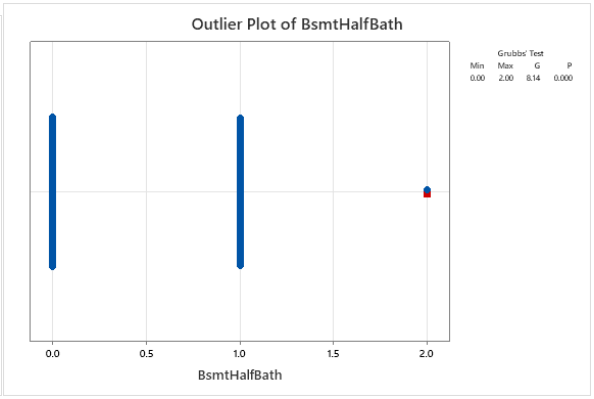
	BsmtHalfBath	*FullBath*	*HalfBath*	*BedroomAbvGr*	*KitchenAbvGr*	*TotRmsAbvGrd*	*Fireplaces*	*GarageCars*	*GarageArea*	*WoodDeckSF*	*OpenPorchSF*	*EnclosedPorch*
Mean	0.057534247	1.565068493	0.382876712	2.866438356	1.046575342	6.517808219	0.613013699	1.767123288	472.980137	94.24452055	46.66027397	21.95410959
Standard Error	0.006248442	0.014418125	0.013161112	0.021349887	0.005766514	0.042538487	0.01687169	0.019558128	5.595528439	3.28026617	1.733999495	1.599561225
Median	0	2	0	3	1	6	1	2	480	0	25	0
Mode	0	2	0	3	1	6	0	2	0	0	0	0
Standard Deviation	0.238752646	0.550915801	0.502885381	0.815778044	0.220338198	1.625393291	0.644666386	0.74731501	213.8048415	125.3387944	66.25602768	61.1191486
Sample Variance	0.057002826	0.30350822	0.252893707	0.665493817	0.048548922	2.641903349	0.41559475	0.558479724	45712.51023	15709.81337	4389.861203	3735.550326
Kurtosis	16.39664195	-0.857042821	-1.076927284	2.230874582	21.53240384	0.880761566	-0.217237208	0.220997764	0.917067202	2.992950925	8.490335806	10.43076594
Skewness	4.103402698	0.036561558	0.675897448	0.211790096	4.488396777	0.676340836	0.649565183	-0.34254893	0.179980907	1.541375757	2.36434174	3.089871904
Range	2	3	2	8	3	12	3	4	1418	857	547	552
Minimum	0	0	0	0	0	2	0	0	0	0	0	0
Maximum	2	3	2	8	3	14	3	4	1418	857	547	552
Sum	84	2285	559	4185	1528	9516	895	2580	690551	137597	68124	32053
Count	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460	1460
Q1 Excl	0	1	0	2	1	5	0	1	331.5	0	0	0
Q3 Excl	0	2	1	3	1	7	1	2	576	168	68	0
IQR (using Q's Excl)	0	1	1	1	0	2	1	1	244.5	168	68	0
Q1 Incl	0	1	0	2	1	5	0	1	334.5	0	0	0
Q3 Incl	0	2	1	3	1	7	1	2	576	168	68	0
IQR (using Q's Incl)	0	1	1	1	0	2	1	1	241.5	168	68	0
Confidence Level(95.0%)	0.01225689	0.028282469	0.025816722	0.041879752	0.011311544	0.083443124	0.033095361	0.038365053	10.97613973	6.434541476	3.401398269	3.137685333

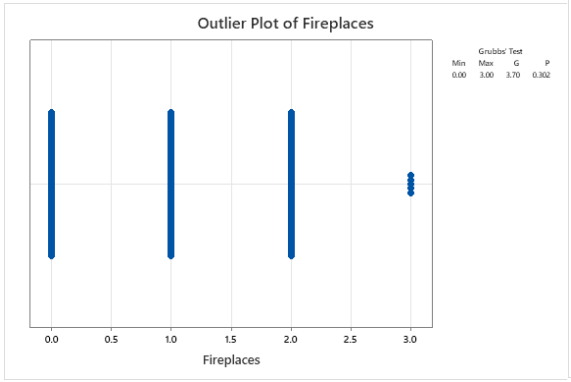
	3SsnPorch	*ScreenPorch*	*PoolArea*	*MiscVal*	*SalePrice*
Mean	3.409589041	15.0609589	2.75890411	43.4890411	180921.1959
Standard Error	0.767269608	1.459238251	1.05148818	12.98413298	2079.105324
Median	0	0	0	0	163000
Mode	0	0	0	0	140000
Standard Deviation	29.31733056	55.75741528	40.17730694	496.1230245	79442.50288
Sample Variance	859.505871	3108.889359	1614.215993	246138.0554	6311111264
Kurtosis	123.6623794	18.43906784	223.2684989	701.0033423	6.53628186
Skewness	10.30434203	4.122213743	14.82837364	24.47679419	1.88287576
Range	508	480	738	15500	720100
Minimum	0	0	0	0	34900
Maximum	508	480	738	15500	755000
Sum	4978	21989	4028	63494	264144946
Count	1460	1460	1460	1460	1460
Q1 Excl	0	0	0	0	129925
Q3 Excl	0	0	0	0	214000
IQR (using Q's Excl)	0	0	0	0	84075
Q1 Incl	0	0	0	0	129975
Q3 Incl	0	0	0	0	214000
IQR (using Q's Incl)	0	0	0	0	84025
Confidence Level(95.0%)	1.505069363	2.862429012	2.062590033	25.46956187	4078.354849

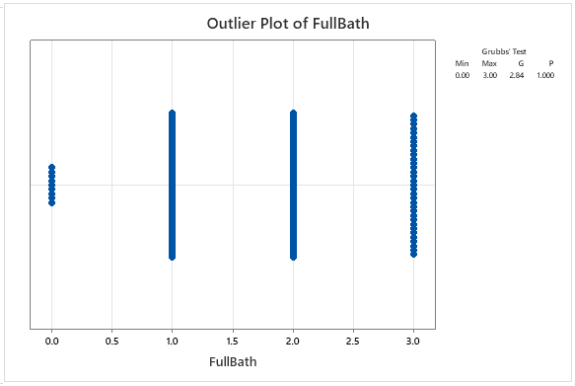
Appendix II

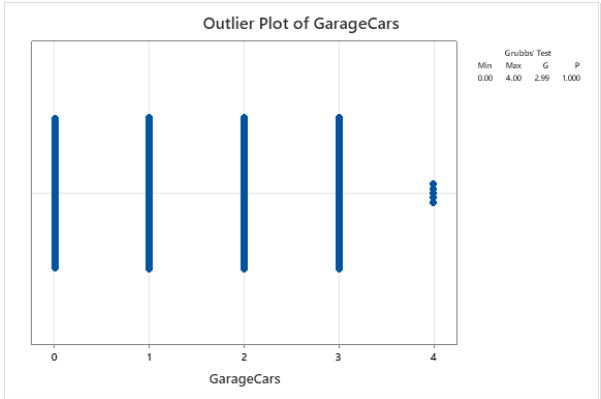
Outlier Plots for Numerical Variables (with no missing values) in the train dataset

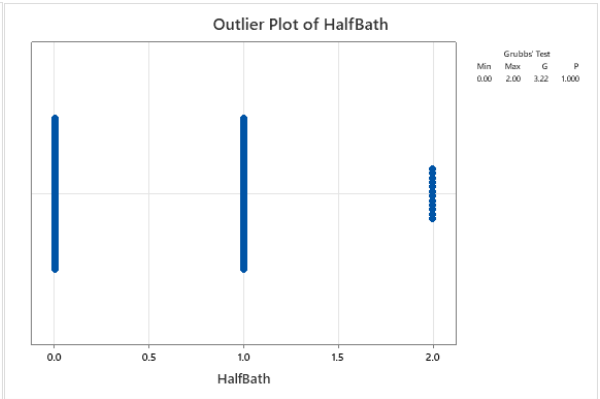












Outlier Plot of KitchenAbvGr
Grubbs' Test
Min Max G P
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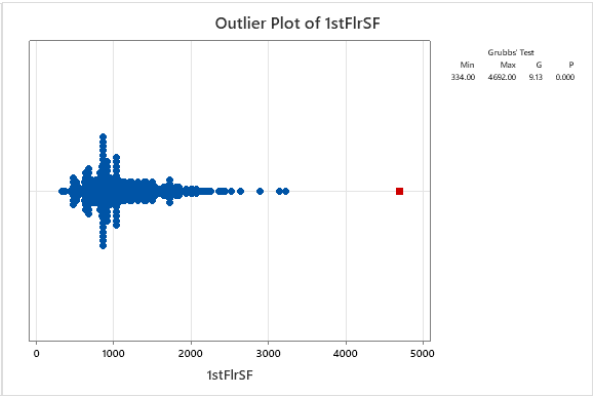
0.0 0.5 1.0 1.5 2.0 2.5 3.0
KitchenAbvGr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Grubbs' Test
Min Max G P
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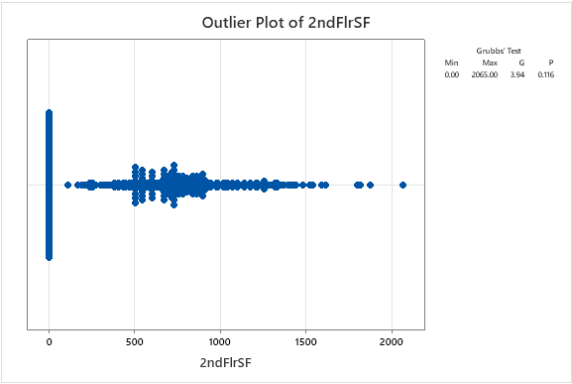
1stFlrSF


Outlier Plot of 2ndFlrSF
Grubbs' Test
Min Max G P
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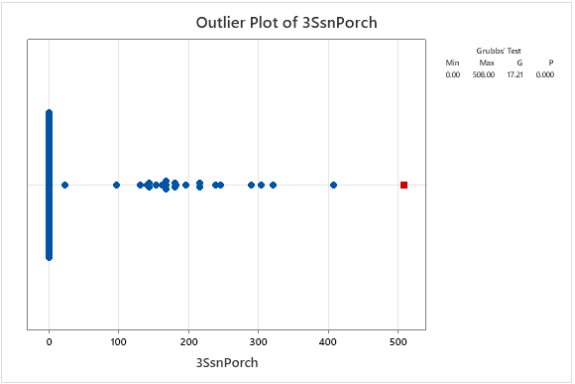
2ndFlrSF


Outlier Plot of 3SsnPorch
Grubbs' Test
Min Max G P
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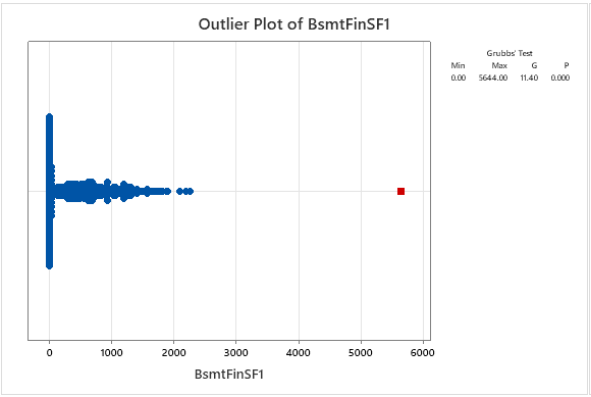
3SsnPorch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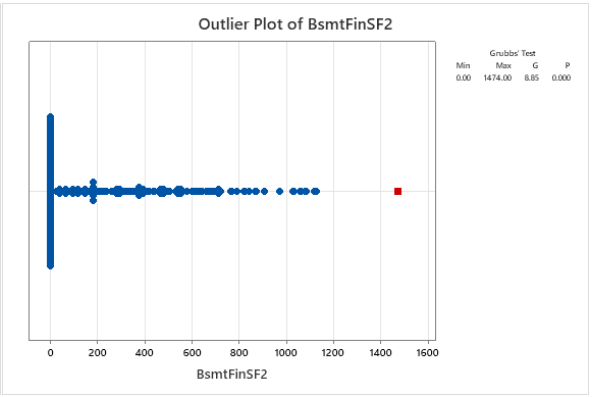
BsmtFinSF1


Outlier Plot of BsmtFinSF2
Grubbs' Test
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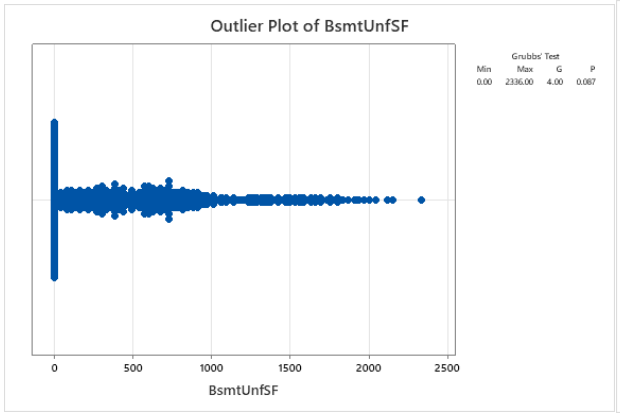
BsmtFinSF2


Outlier Plot of BsmtUnfSF
Grubbs' Test
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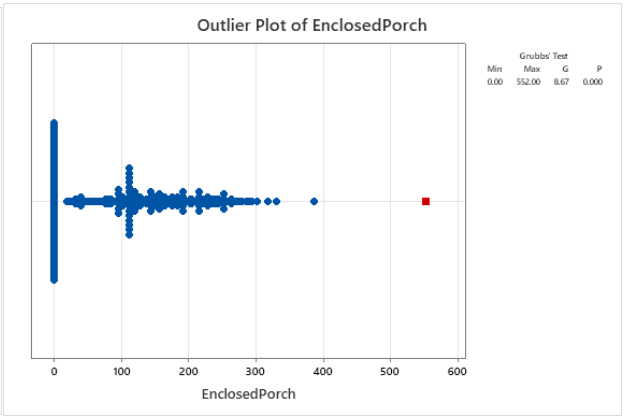
BsmtUnfSF


Outlier Plot of EnclosedPorch
Grubbs' Test
Min Max G P
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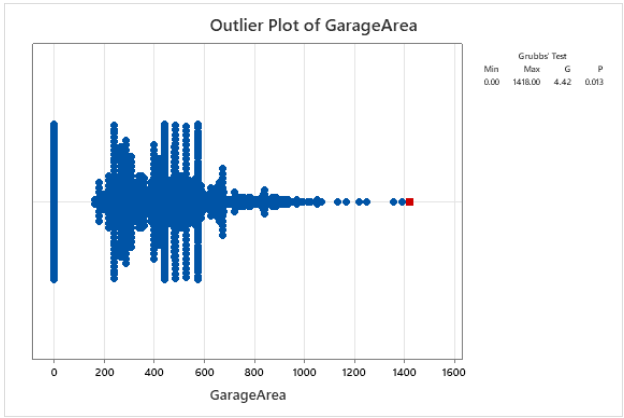
EnclosedPorch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Grubbs' Test
Min Max G P
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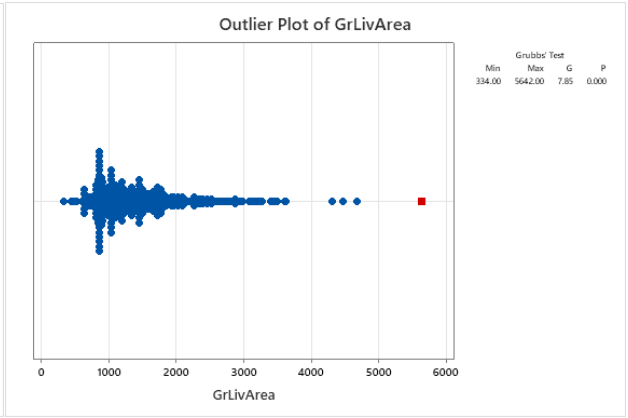
GarageArea


Outlier Plot of GrLivArea
Grubbs' Test
Min Max G P
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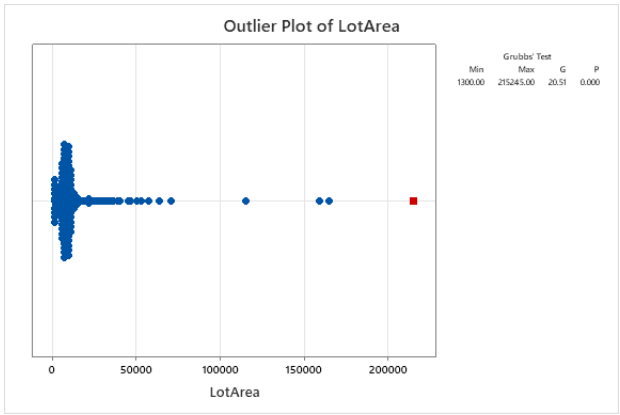
GrLivArea


Outlier Plot of LotArea
Grubbs' Test
Min Max G P
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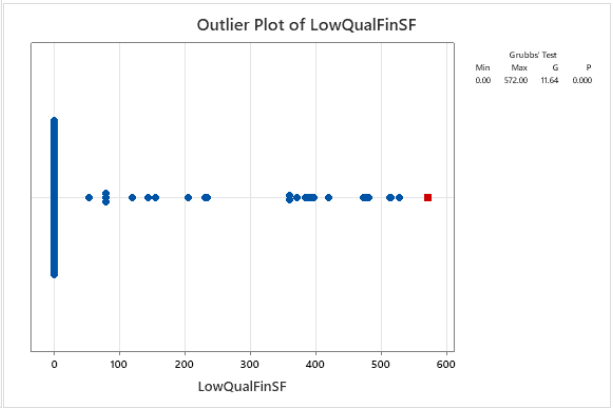
LotArea


Outlier Plot of LowQualFinSF
Grubbs' Test
Min Max G P
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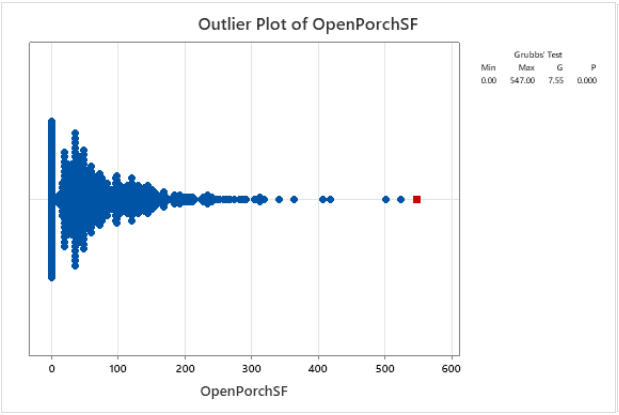
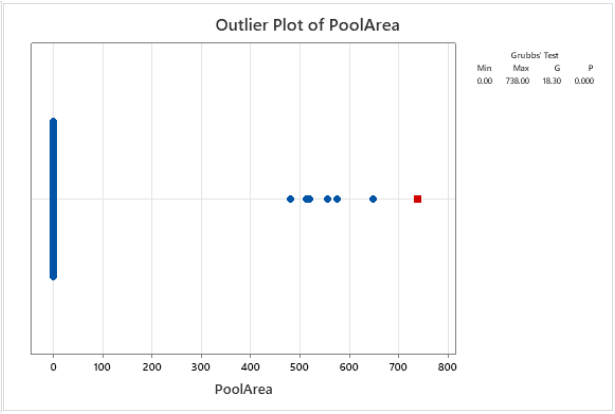
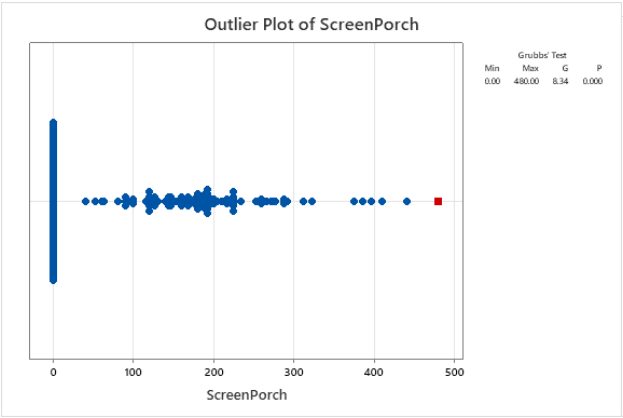
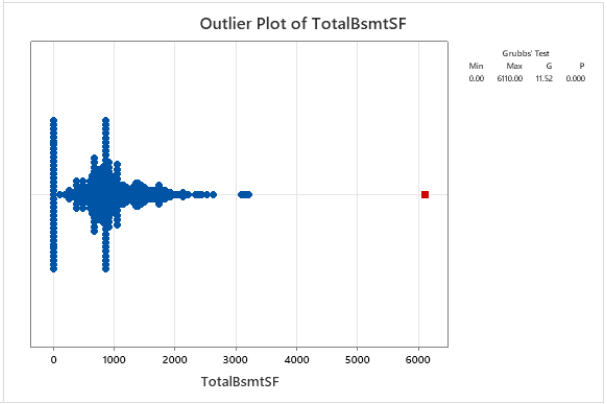
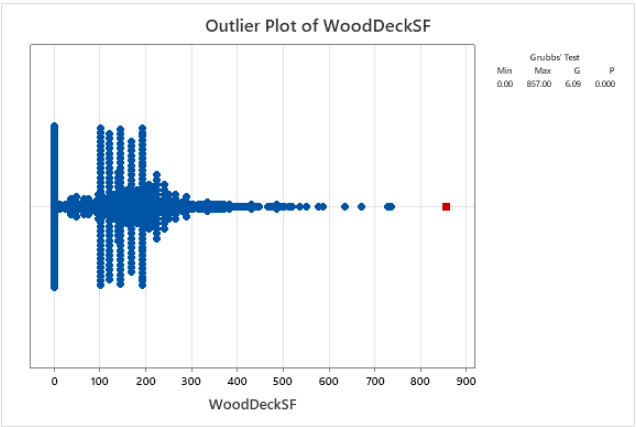
LowQualFinSF

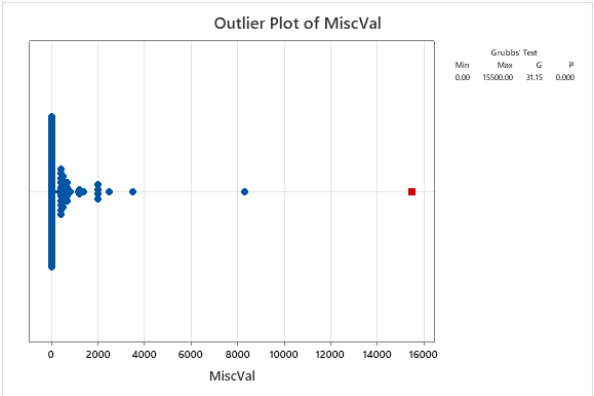

Outlier Plot of OpenPorchSF
Grubbs' Test
Min Max G P
0.00 547.00 7.55 0.000
0 100 200 300 400 500 600
OpenPorchSF

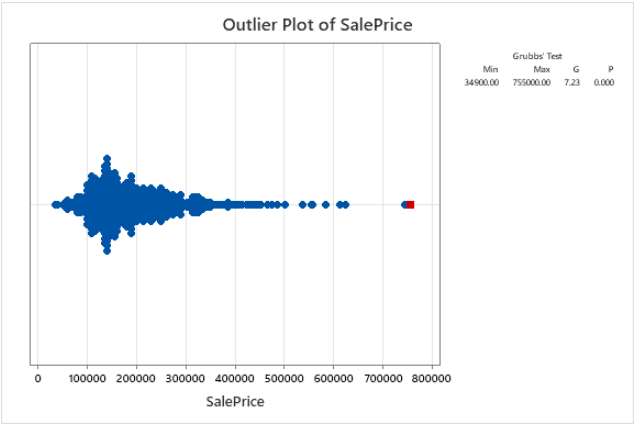

Outlier Plot of PoolArea
Grubbs' Test
Min Max G P
0.00 738.00 18.30 0.000
0 100 200 300 400 500 600 700 800
PoolArea


Outlier Plot of ScreenPorch
Grubbs' Test
Min Max G P
0.00 480.00 8.34 0.000
0 100 200 300 400 500
ScreenPorch


Outlier Plot of TotalBsmtSF
Grubbs' Test
Min Max G P
0.00 6110.00 11.52 0.000
0 1000 2000 3000 4000 5000 6000
TotalBsmtSF


Outlier Plot of WoodDeckSF
Grubbs' Test
Min Max G P
0.00 857.00 6.09 0.000
0 100 200 300 400 500 600 700 800 900
WoodDeckSF


Outlier Plot of MiscVal
Grubbs' Test
Min Max G P
0.00 15500.00 31.15 0.000
0 2000 4000 6000 8000 10000 12000 14000 16000
MiscVal


Outlier Plot of SalePrice
Grubbs' Test
Min Max G P
34900.00 755000.00 7.23 0.000
0 100000 200000 300000 400000 500000 600000 700000 800000
SalePrice

Appendix III

Regression (Train Dataset)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.891059769
R Square	0.793987511
Adjusted R Square	0.792851674
Standard Error	36157.10351
Observations	1460

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	8	7.31097E+12	9.13871E+11	699.0327902	0
Residual	1451	1.89694E+12	1307336134		
Total	1459	9.20791E+12			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-616780.4777	86116.37481	-7.162174198	1.2581E-12	-785706.3798	-447854.5755	-785706.3798	-447854.5755
OverallQual	14675.84701	1177.108592	12.46770868	5.75042E-34	12366.8305	16984.86351	12366.8305	16984.86351
GrLivArea	47.68741021	2.942724293	16.20519133	2.05866E-54	41.9149615	53.45985891	41.9149615	53.45985891
KitchenQual_Dummy	14567.34269	1187.495777	12.26727958	5.49345E-33	12237.95068	16896.7347	12237.95068	16896.7347
GarageCars	12865.73832	1726.566272	7.451633065	1.57677E-13	9478.905495	16252.57115	9478.905495	16252.57115
TotalBsmtSF	23.59878728	2.71964349	8.67716205	1.06971E-17	18.26393394	28.93364063	18.26393394	28.93364063
FullBath	-2526.902598	2520.260644	-1.002635423	0.316203969	-7470.6465	2416.841305	-7470.6465	2416.841305
YearBuilt	292.6976964	45.20886685	6.474342686	1.29978E-10	204.015972	381.3794209	204.015972	381.3794209
Fireplaces	9382.388756	1705.008847	5.502838753	4.41215E-08	6037.84298	12726.93453	6037.84298	12726.93453

Residual Output and Probability Output for the Train Data

RESIDUAL OUTPUT

PROBABILITY OUTPUT

Observation	Predicted SalePrice	Residuals	Standard Residuals
1	209214.9849	-714.9848564	-0.019828833
2	169668.494	11831.50602	0.328125767
3	223146.5438	353.4562187	0.009802479
4	206206.5504	-66206.55039	-1.836120871
5	275352.3716	-25352.37156	-0.703102915
6	146884.7278	-3884.727795	-0.107736013
7	252389.9132	54610.0868	1.514513588
8	228676.0003	-28676.00027	-0.795277843
9	197655.6634	-67755.66337	-1.879082764
10	127988.943	-9988.942989	-0.27702556
11	116226.212	13273.78802	0.368124892
12	348765.7986	-3765.79858	-0.104437723
13	106223.4856	37776.51438	1.047664409
14	237096.7507	42403.24929	1.17597867
15	154004.9193	2995.080669	0.083063233
16	134128.1212	-2128.121196	-0.059019655
17	152047.3714	-3047.371442	-0.084513425
18	100139.8343	-10139.83433	-0.281210263
19	160349.6818	-1349.681771	-0.037431022
20	128176.2771	10823.7229	0.300176696
21	283084.1007	42215.8993	1.170782851
22	153015.6507	-13615.65069	-0.377605845
23	258768.4359	-28768.43588	-0.79784138
24	142647.7619	-12747.76193	-0.353536495
25	142479.7605	11520.23953	0.319493345
26	258819.2736	-2519.273578	-0.06986757
27	129581.4576	5218.542404	0.144726988
28	267035.3969	38964.60312	1.080613936
29	169832.2192	37667.78081	1.044648877
30	38791.68713	29708.31287	0.823907197
31	92361.25543	-52361.25543	-1.452146251
32	144488.0575	4861.942503	0.134837324
33	211282.757	-31382.75699	-0.870344925
34	191207.5522	-25707.55216	-0.712953217

Percentile	SalePrice
0.034246575	34900
0.102739726	35311
0.171232877	37900
0.239726027	39300
0.308219178	40000
0.376712329	52000
0.445205479	52500
0.51369863	55000
0.582191781	55000
0.650684932	55993
0.719178082	58500
0.787671233	60000
0.856164384	60000
0.924657534	60000
0.993150685	61000
1.061643836	62383
1.130136986	64500
1.198630137	66500
1.267123288	67000
1.335616438	67000
1.404109589	68400
1.47260274	68500
1.54109589	72500
1.609589041	73000
1.678082192	75000
1.746575342	75500
1.815068493	76000
1.883561644	76500
1.952054795	78000
2.020547945	79000
2.089041096	79000
2.157534247	79000
2.226027397	79500
2.294520548	79900

35	301768.212	-24268.212	-0.673035679	2.363013699	79900
36	285448.0959	23551.9041	0.653170154	2.431506849	80000
37	141643.4968	3356.50324	0.093086645	2.5	80000
38	153575.2172	-575.2171559	-0.015952624	2.568493151	80000
39	128493.0477	-19493.04767	-0.540604993	2.636986301	80000
40	49461.65557	32538.34443	0.902393086	2.705479452	80500
41	165299.2498	-5299.249761	-0.146965263	2.773972603	81000
42	154284.4015	15715.59849	0.435844161	2.842465753	81000
43	136768.8581	7231.141918	0.200542854	2.910958904	81000
44	111881.9968	18368.0032	0.509403886	2.979452055	82000
45	122311.5075	18688.49247	0.518292086	3.047945205	82000
46	315383.8757	4516.124276	0.125246671	3.116438356	82000
47	255699.1483	-16013.14834	-0.444096176	3.184931507	82500
48	253938.573	-4238.572953	-0.117549279	3.253424658	82500
49	85459.50939	27540.49061	0.763786503	3.321917808	82500
50	110459.5829	16540.41711	0.458719038	3.390410959	83000
51	165307.5057	11692.49428	0.324270524	3.45890411	83000
52	145275.9169	-30775.91692	-0.853515295	3.52739726	83500
53	112538.4467	-2538.446675	-0.070399302	3.595890411	84000
54	288992.4042	96007.59577	2.662599839	3.664383562	84500
55	135326.5289	-5326.528905	-0.147721801	3.732876712	84500
56	177775.7718	2724.22819	0.075551622	3.801369863	84500
57	226793.2377	-54293.23773	-1.505726342	3.869863014	84900
58	210078.9518	-13578.9518	-0.376588067	3.938356164	85000
59	345809.5232	92970.47679	2.578370748	4.006849315	85000
60	99740.68451	25159.31549	0.697748848	4.075342466	85000
61	178162.1215	-20162.12147	-0.559160564	4.143835616	85000
62	79837.89756	21162.10244	0.586893257	4.212328767	85400
63	230067.3709	-27567.3709	-0.76453198	4.280821918	85500
64	164038.7706	-24038.77062	-0.66667253	4.349315068	86000
65	227652.8758	-8152.875829	-0.226105504	4.417808219	86000
66	289590.0026	27409.99742	0.760167507	4.48630137	86000
67	243817.9267	-63817.92674	-1.769876645	4.554794521	87000
68	212287.6691	13712.33089	0.380287098	4.623287671	87000
69	74809.55518	5190.444818	0.143947752	4.691780822	87000
70	227483.0385	-2483.038493	-0.068862654	4.760273973	87000

71	261354.6724	-17354.67244	-0.48130096	4.828767123	87500
72	105491.1556	24008.84437	0.665842579	4.897260274	88000
73	202381.6708	-17381.67083	-0.482049713	4.965753425	88000
74	129151.4407	15748.55927	0.436758269	5.034246575	88000
75	91936.35986	15463.64014	0.428856544	5.102739726	88000
76	87772.10217	3227.897834	0.089520003	5.171232877	89000
77	92642.90033	43107.09967	1.195498707	5.239726027	89471
78	114249.4129	12750.58708	0.353614845	5.308219178	89500
79	138932.1689	-2432.168918	-0.067451877	5.376712329	89500
80	107894.9126	2105.087431	0.058380854	5.445205479	90000
81	202356.2816	-8856.281607	-0.245613212	5.51369863	90000
82	169712.0406	-16212.04063	-0.4496121	5.582191781	90000
83	256984.043	-11984.04304	-0.33235611	5.650684932	90350
84	129410.6168	-2910.616761	-0.080720777	5.719178082	91000
85	179295.5929	-10795.59294	-0.299396561	5.787671233	91000
86	273670.5234	-13670.52339	-0.379127642	5.856164384	91000
87	193294.8191	-19294.81905	-0.535107475	5.924657534	91300
88	167361.1386	-2861.138569	-0.079348587	5.993150685	91500
89	67345.46624	17654.53376	0.489617081	6.061643836	91500
90	93608.54998	29991.45002	0.831759502	6.130136986	92000
91	85482.89907	24417.10093	0.677164848	6.198630137	92900
92	141821.968	-43221.96803	-1.198684377	6.267123288	93000
93	108718.8074	54781.19263	1.519258903	6.335616438	93000
94	198288.0493	-64388.04932	-1.78568798	6.404109589	93000
95	195652.0337	9097.966348	0.252315908	6.47260274	93500
96	170828.8419	14171.15806	0.393011854	6.54109589	93500
97	219500.6423	-5500.642318	-0.152550527	6.609589041	94000
98	95847.46918	-1097.469176	-0.030436355	6.678082192	94500
99	79544.40235	3455.597649	0.095834852	6.746575342	94750
100	93626.72051	35323.27949	0.979628305	6.815068493	95000
101	218718.5198	-13718.51984	-0.380458738	6.883561644	95000
102	196988.2306	-18988.23055	-0.526604788	6.952054795	96500
103	129725.3447	-10761.34473	-0.298446748	7.020547945	96500
104	209487.7541	-10587.75411	-0.293632521	7.089041096	97000
105	191491.767	-21991.76697	-0.609902526	7.157534247	97000
106	251370.0314	-1370.031394	-0.037995383	7.226027397	97000

107	69052.445	30947.555	0.858275372	7.294520548	97500
108	93357.51557	21642.48443	0.600215796	7.363013699	98000
109	89720.12855	25279.87145	0.701092253	7.431506849	98000
110	211449.7586	-21449.75861	-0.594870889	7.5	98000
111	162935.1768	-26035.17684	-0.722039304	7.568493151	98300
112	178660.8354	1339.164622	0.037139348	7.636986301	98600
113	332984.0225	50985.97754	1.414005366	7.705479452	99500
114	247339.063	-30339.06302	-0.84139993	7.773972603	99900
115	207227.6335	52272.36647	1.449681074	7.842465753	100000
116	173169.1198	2830.880228	0.078509426	7.910958904	100000
117	128437.3899	10562.61008	0.292935196	7.979452055	100000
118	147151.8826	7848.117353	0.21765357	8.047945205	100000
119	325897.1015	-5897.101482	-0.163545617	8.116438356	100000
120	189373.675	-25383.67503	-0.703971061	8.184931507	100000
121	158816.544	21183.45602	0.58748546	8.253424658	100000
122	90629.85343	9370.146569	0.259864342	8.321917808	100000
123	131704.623	4295.376984	0.119124638	8.390410959	100000
124	175338.2783	-21438.27831	-0.594552503	8.45890411	101000
125	188357.1867	-7357.186701	-0.204038482	8.52739726	101800
126	83345.42107	1154.578931	0.032020192	8.595890411	102000
127	150829.3444	-22829.34441	-0.633131246	8.664383562	102000
128	84276.60728	2723.39272	0.075528451	8.732876712	102000
129	159163.0669	-4163.066942	-0.115455254	8.801369863	102776
130	185177.2123	-35177.21233	-0.975577392	8.869863014	103000
131	240070.9375	-14070.9375	-0.390232415	8.938356164	103200
132	222657.3377	21342.6623	0.591900763	9.006849315	103600
133	156132.1657	-5382.165653	-0.149264788	9.075342466	104000
134	213261.9502	6738.04978	0.186867821	9.143835616	104900
135	179235.7454	764.2546492	0.021195243	9.212328767	104900
136	203608.0162	-29608.01616	-0.821125646	9.280821918	105000
137	136070.8919	6929.108102	0.192166484	9.349315068	105000
138	237272.503	-66272.50302	-1.83794995	9.417808219	105000
139	264614.7897	-34614.78968	-0.959979601	9.48630137	105000
140	197057.1845	34442.81549	0.955210202	9.554794521	105000
141	87276.83083	27723.16917	0.768852768	9.623287671	105500
142	231664.6133	28335.38667	0.785831531	9.691780822	105900

143	136144.2918	29855.70817	0.827994943	9.760273973	106000
144	213039.1565	-9039.156476	-0.250684921	9.828767123	106000
145	175024.5562	-50024.55619	-1.387342055	9.897260274	106000
146	197474.4099	-67474.40988	-1.871282699	9.965753425	106250
147	90736.46175	14263.53825	0.395573854	10.03424658	106500
148	234171.1526	-11671.15258	-0.32367865	10.10273973	106500
149	161546.1684	-20546.16843	-0.569811423	10.17123288	107000
150	118836.7261	-3836.72612	-0.106404772	10.23972603	107000
151	126957.6072	-4957.607248	-0.137490416	10.30821918	107000
152	267463.1141	104938.8859	2.91029328	10.37671233	107400
153	192751.8323	-2751.832311	-0.076317173	10.44520548	107500
154	175058.947	59941.05299	1.66235845	10.51369863	107500
155	130014.5473	-5014.547339	-0.139069548	10.58219178	107500
156	97661.97764	-18661.97764	-0.517556744	10.65068493	107900
157	100158.7461	9341.253917	0.259063056	10.71917808	108000
158	301965.4245	-32465.42446	-0.900370781	10.78767123	108000
159	233377.8238	21522.17619	0.596879261	10.85616438	108000
160	267692.6515	52307.34854	1.450651239	10.92465753	108000
161	160489.1009	2010.899133	0.055768709	10.99315068	108000
162	376480.4934	36019.50655	0.998936923	11.06164384	108000
163	227288.766	-7288.76597	-0.202140955	11.13013699	108480
164	74787.12818	28412.87182	0.787980444	11.19863014	108500
165	161567.505	-9567.505015	-0.265337728	11.26712329	108959
166	99192.5431	28307.4569	0.785056949	11.33561644	109000
167	194500.3898	-4500.389791	-0.124810303	11.40410959	109000
168	332178.422	-6554.421965	-0.181775231	11.47260274	109008
169	218989.3648	-35489.36481	-0.984234386	11.54109589	109500
170	231710.4598	-3710.459825	-0.102903001	11.60958904	109500
171	130824.688	-2324.68795	-0.064471084	11.67808219	109500
172	191388.4825	23611.51748	0.654823424	11.74657534	109500
173	221540.9406	17459.05939	0.484195947	11.81506849	109900
174	174933.5509	-11933.55088	-0.3309558	11.88356164	109900
175	199263.8563	-15263.85634	-0.423315896	11.95205479	109900
176	217937.6889	25062.31113	0.695058605	12.02054795	110000
177	208615.9543	2384.04571	0.066117266	12.0890411	110000
178	190714.0017	-18214.00171	-0.505132929	12.15753425	110000

179	363062.8762	138774.1238	3.848653399	12.2260274	110000
180	111666.0408	-11666.04084	-0.323536885	12.29452055	110000
181	191861.3839	-14861.3839	-0.412154039	12.3630137	110000
182	172297.8045	27802.19547	0.771044422	12.43150685	110000
183	113030.5035	6969.496546	0.193286586	12.5	110000
184	238895.6878	-38895.68782	-1.078702693	12.56849315	110000
185	109868.9626	17131.03741	0.475098841	12.6369863	110000
186	392519.6257	82480.37434	2.287446422	12.70547945	110000
187	189734.8189	-16734.81895	-0.464110427	12.7739726	110000
188	119765.0278	15234.97222	0.422514846	12.84246575	110000
189	164341.4259	-11004.42586	-0.305188171	12.9109589	110500
190	290729.6351	-4729.635127	-0.131168015	12.97945205	110500
191	270301.3727	44698.62725	1.239636893	13.04794521	111000
192	188561.026	-4561.025972	-0.12649194	13.11643836	111250
193	208308.7093	-16308.70931	-0.452293034	13.18493151	112000
194	212150.2569	-82150.25689	-2.278291202	13.25342466	112000
195	105728.7251	21271.2749	0.589920961	13.32191781	112000
196	169315.1451	-20815.14513	-0.577271013	13.39041096	112000
197	297629.8743	14242.12571	0.394980015	13.45890411	112000
198	287145.4543	-52145.45432	-1.446161391	13.52739726	112000
199	152498.0191	-48498.01912	-1.345006266	13.59589041	112000
200	310500.9076	-35600.90764	-0.987327827	13.66438356	112500
201	128785.8952	11214.10484	0.311003244	13.73287671	112500
202	178596.7464	-7096.746441	-0.196815635	13.80136986	113000
203	119267.8646	-7267.864574	-0.201561292	13.86986301	113000
204	165445.789	-16445.789	-0.456094695	13.93835616	113000
205	115041.7696	-5041.769607	-0.139824509	14.00684932	113000
206	191466.4574	-10966.45736	-0.304135182	14.07534247	113000
207	158373.3275	-14473.32747	-0.401391985	14.14383562	113000
208	113746.4371	27253.5629	0.755829074	14.21232877	114500
209	223528.7688	53471.23116	1.482929453	14.28082192	114500
210	147181.9819	-2181.981887	-0.060513385	14.34931507	114504
211	79106.19505	18893.80495	0.523986062	14.41780822	115000
212	180948.162	5051.837982	0.140103738	14.48630137	115000
213	228163.5187	24514.48132	0.67986552	14.55479452	115000
214	134308.5713	21691.42868	0.601573178	14.62328767	115000

215	142917.2254	18832.7746	0.522293494	14.69178082	115000
216	147889.0579	-13439.05788	-0.372708358	14.76027397	115000
217	210128.6288	-128.6287814	-0.00356729	14.82876712	115000
218	95222.46056	11777.53944	0.3266291	14.89726027	115000
219	222041.0108	89458.98918	2.480985887	14.96575342	115000
220	197019.5213	-29779.52135	-0.825882037	15.03424658	115000
221	215133.7684	-10233.76842	-0.283815358	15.10273973	115000
222	233824.9296	-33824.92963	-0.938074238	15.17123288	115000
223	170249.411	9650.58898	0.267641914	15.23972603	116000
224	103625.9187	-6625.918718	-0.183758066	15.30821918	116000
225	387963.2321	-1713.232056	-0.047513443	15.37671233	116000
226	118274.0943	-6274.094252	-0.17400084	15.44520548	116050
227	275937.1118	14062.88818	0.390009181	15.51369863	116500
228	116693.5902	-10693.59022	-0.296567697	15.58219178	116900
229	117069.3629	7930.637146	0.21994211	15.65068493	117000
230	223991.7934	-31491.79345	-0.873368857	15.71917808	117000
231	140123.9472	7876.052773	0.21842831	15.78767123	117000
232	353493.4232	49506.5768	1.372976819	15.85616438	117000
233	126661.3744	-32161.37436	-0.891938492	15.92465753	117500
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235	225027.4654	-8527.465364	-0.236494079	16.06164384	118000
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237	208560.3324	-23060.33244	-0.639537288	16.19863014	118000
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239	256940.1462	61059.85385	1.693386401	16.33561644	118000
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241	235242.4722	27257.52775	0.755939032	16.47260274	118400
242	95422.28235	15077.71765	0.418153671	16.54109589	118500
243	104476.4322	-25476.43215	-0.706543515	16.60958904	118500
244	143345.6869	-23345.68687	-0.647451085	16.67808219	118500
245	246591.5356	-41591.53561	-1.153467235	16.74657534	118500
246	230704.1266	10795.87345	0.299404341	16.81506849	118858
247	139583.8849	-2583.884918	-0.071659451	16.88356164	118964
248	173622.5973	-33622.59727	-0.932462909	16.95205479	119000
249	206834.533	-26834.53303	-0.744208026	17.02054795	119000
250	234704.942	42295.05803	1.172978177	17.0890411	119000

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252	247018.2143	-12018.21433	-0.33330379	17.2260274	119000
253	190124.9872	-17124.98717	-0.474931048	17.29452055	119000
254	161326.7851	-3326.785129	-0.092262466	17.3630137	119000
255	133417.0485	11582.95148	0.321232549	17.43150685	119200
256	247941.2238	-17941.22384	-0.49756792	17.5	119500
257	195586.3015	11913.69847	0.330405229	17.56849315	119500
258	232072.4941	-12072.49411	-0.334809143	17.6369863	119500
259	224447.4161	7052.583904	0.195590866	17.70547945	119500
260	81514.58313	15485.41687	0.429460483	17.7739726	119750
261	176179.9968	-179.9967767	-0.00499189	17.84246575	119900
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264	129026.2967	973.7032999	0.027003928	18.04794521	120000
265	95726.75381	-22726.75381	-0.630286078	18.11643836	120000
266	197105.1167	-21605.11675	-0.59917947	18.18493151	120000
267	176833.8686	8166.131408	0.226473124	18.25342466	120000
268	177423.1853	2076.81465	0.057596759	18.32191781	120000
269	98717.42067	21782.57933	0.604101079	18.39041096	120000
270	149415.9784	-1415.978444	-0.039269643	18.45890411	120500
271	263577.5791	2422.42087	0.067181533	18.52739726	120500
272	197533.3623	43966.63772	1.219336466	18.59589041	120500
273	278658.3589	11341.64109	0.314540235	18.66438356	120500
274	168659.3656	-29659.36557	-0.82254973	18.73287671	121000
275	105233.9646	19266.03541	0.534309212	18.80136986	121500
276	224626.7157	-19626.71573	-0.544312038	18.86986301	121600
277	218675.4196	-17675.41957	-0.490196311	18.93835616	122000
278	97771.96479	43228.03521	1.198852639	19.00684932	122000
279	354846.9186	60451.08138	1.676503179	19.07534247	122000
280	218472.3941	-26472.39413	-0.734164748	19.14383562	122000
281	226314.2409	2185.759139	0.060618141	19.21232877	122500
282	183634.3788	1365.621197	0.037873074	19.28082192	122500
283	211692.1945	-4192.194533	-0.116263056	19.34931507	122900
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295	196696.5423	-29696.54225	-0.823580759	20.17123288	124000
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307	249394.0207	-24394.0207	-0.676524759	20.99315068	125000
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311	187275.6737	-21675.67373	-0.601136243	21.26712329	125000
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322	289186.374	64813.62598	1.797490592	22.02054795	127000

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324	92692.14451	33482.85549	0.92858742	22.15753425	127000
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338	216671.8531	-2671.853138	-0.074099093	23.11643836	128000
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343	67987.45177	19512.54823	0.541145806	23.45890411	128200
344	310536.4143	-44536.4143	-1.235138205	23.52739726	128500
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366	108867.4346	38132.56537	1.05753885	25.03424658	130000
367	187182.4933	-28182.49334	-0.781591307	25.10273973	130000
368	159444.4605	5555.539501	0.154073003	25.17123288	130000
369	138642.1791	-6642.179106	-0.184209019	25.23972603	130000
370	163607.058	-1607.058001	-0.044568894	25.30821918	130000
371	188571.5523	-16171.55232	-0.448489229	25.37671233	130000
372	121105.3653	13326.63471	0.369590501	25.44520548	130000
373	115744.1	9255.899951	0.256695916	25.51369863	130000
374	115823.951	7176.049033	0.199014951	25.58219178	130000
375	228780.84	-9280.839952	-0.257387582	25.65068493	130000
376	5120.389741	55879.61026	1.549721562	25.71917808	130000
377	128145.1714	19854.82863	0.550638344	25.78767123	130250
378	284176.2198	55823.78017	1.548173214	25.85616438	130500
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389	211470.8601	-20470.86013	-0.567722881	26.60958904	132000
390	369517.6393	56482.36074	1.566437774	26.67808219	132000
391	108570.4619	10429.53807	0.289244681	26.74657534	132000
392	214078.5342	921.4657657	0.025555213	26.81506849	132000
393	82392.67622	24107.32378	0.66857373	26.88356164	132000
394	82460.53768	17539.46232	0.486425779	26.95205479	132250

395	101425.015	7574.985011	0.210078731	27.02054795	132500
396	121005.6973	7994.302745	0.221707762	27.0890411	132500
397	120733.0493	2266.950653	0.062869843	27.15753425	132500
398	154864.8992	14635.10083	0.405878481	27.2260274	132500
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409	259257.7375	20742.26249	0.575249743	27.97945205	133900
410	312761.3289	26988.67111	0.748482771	28.04794521	133900
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415	252277.2911	-24277.29107	-0.67328747	28.39041096	134450
416	204163.2469	-23029.24691	-0.638675186	28.45890411	134500
417	165438.3701	-15938.37008	-0.442022334	28.52739726	134500
418	233056.6876	5943.312368	0.164827193	28.59589041	134800
419	106689.3305	19310.66946	0.535547057	28.66438356	134900
420	127627.273	14372.72701	0.39860201	28.73287671	134900
421	212685.5487	-6385.548692	-0.177091831	28.80136986	135000
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423	122165.3934	-9165.393375	-0.254185877	28.93835616	135000
424	303037.5432	11962.45676	0.331757453	29.00684932	135000
425	148770.8153	-9770.815288	-0.270976176	29.07534247	135000
426	166244.4052	-31244.40519	-0.866507984	29.14383562	135000
427	226974.634	48025.36603	1.331898074	29.21232877	135000
428	89727.71914	19280.28086	0.534704284	29.28082192	135000
429	194753.4688	646.5311572	0.017930391	29.34931507	135000
430	197969.1629	-22969.1629	-0.637008863	29.41780822	135000

431	116986.2879	-31586.28791	-0.875989493	29.48630137	135000
432	109119.3037	-29219.30371	-0.810345397	29.55479452	135000
433	139856.8783	-17356.8783	-0.481362136	29.62328767	135000
434	184195.0474	-3195.047364	-0.088608954	29.69178082	135000
435	61506.16956	19493.83044	0.540626701	29.76027397	135000
436	212866.6758	-866.6757619	-0.02403571	29.82876712	135000
437	125065.2944	-9065.294354	-0.251409809	29.89726027	135000
438	109319.9502	9680.049774	0.268458956	29.96575342	135500
439	94296.54691	-3946.546911	-0.109450456	30.03424658	135500
440	144201.8114	-34201.81138	-0.948526382	30.10273973	135750
441	415852.3321	139147.6679	3.85901298	30.17123288	135900
442	97177.8834	20822.1166	0.577464354	30.23972603	135960
443	152017.1606	10882.83935	0.301816185	30.30821918	136000
444	220273.2081	-47773.2081	-1.324904922	30.37671233	136000
445	226797.53	-16797.53001	-0.465849607	30.44520548	136000
446	190810.1558	-63310.15579	-1.755794521	30.51369863	136500
447	217178.8692	-27178.86925	-0.753757578	30.58219178	136500
448	227273.1796	-27373.17959	-0.75914643	30.65068493	136500
449	139449.2948	-19949.29478	-0.553258194	30.71917808	136500
450	79490.83096	40509.16904	1.123449724	30.78767123	136500
451	119043.0155	-9043.015475	-0.250791944	30.85616438	136900
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453	180494.1128	23505.88725	0.651893958	30.99315068	137000
454	217555.1378	-7555.137841	-0.209528305	31.06164384	137000
455	178829.6262	9170.373757	0.254323999	31.13013699	137000
456	184567.4265	-9067.426543	-0.251468941	31.19863014	137000
457	132295.3787	-34295.37869	-0.951121305	31.26712329	137000
458	181883.8125	74116.18752	2.055480584	31.33561644	137450
459	191681.2435	-30681.24353	-0.850889697	31.40410959	137500
460	135747.3273	-25747.32725	-0.714056308	31.47260274	137500
461	221242.9718	42192.02824	1.17012083	31.54109589	137500
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463	113062.23	-50679.22998	-1.405498268	31.67808219	137500
464	153107.4076	35592.59238	0.987097219	31.74657534	137500
465	104638.6411	19361.35888	0.536952838	31.81506849	137900
466	217022.3685	-38282.36849	-1.061693373	31.88356164	138000

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468	164266.6593	-17766.6593	-0.492726683	32.02054795	138000
469	261563.8751	-11563.87507	-0.320703499	32.0890411	138500
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471	226144.6282	-14144.62817	-0.392276094	32.2260274	138800
472	207638.1883	-17638.18827	-0.489163767	32.29452055	138887
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474	286132.5449	153867.4551	4.267240085	32.43150685	139000
475	279004.9233	-28004.92334	-0.776666719	32.5	139000
476	123516.5211	8983.478912	0.249140803	32.56849315	139000
477	206495.6181	2404.381898	0.066681254	32.6369863	139000
478	380494.9079	-494.9079379	-0.013725391	32.70547945	139000
479	267726.6194	29273.38059	0.811845123	32.7739726	139000
480	107421.4834	-17950.48342	-0.497824718	32.84246575	139000
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483	233009.2428	-78009.24276	-2.163447544	33.04794521	139000
484	163446.2895	553.7105425	0.015356177	33.11643836	139400
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487	131444.3948	24555.60518	0.681006017	33.32191781	139600
488	169354.6943	5645.305671	0.156562508	33.39041096	139900
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495	80920.54382	10379.45618	0.287855749	33.86986301	140000
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517	195843.7086	-37843.70862	-1.049527922	35.37671233	141000
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520	222659.0365	11340.96355	0.314521445	35.58219178	142000
521	54702.2372	51547.7628	1.42958548	35.65068493	142000
522	161867.6392	-11867.63922	-0.329127857	35.71917808	142000
523	183644.5013	-24644.50132	-0.683471393	35.78767123	142000
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526	207472.6726	-31472.67257	-0.872838573	35.99315068	142500
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540	244599.0183	27400.9817	0.759917472	36.95205479	143250
541	334672.9247	-19672.92473	-0.545593563	37.02054795	143500
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555	250837.1096	33162.89044	0.919713759	37.97945205	144152
556	112294.9561	705.0439285	0.019553139	38.04794521	144500
557	126973.9014	14026.09856	0.388988887	38.11643836	144500
558	92984.13078	15015.86922	0.416438415	38.18493151	144900
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567	349243.3105	-24243.31053	-0.672345081	38.80136986	145000
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569	265173.4803	51426.51974	1.42622302	38.93835616	145000
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574	178660.8354	-8660.835378	-0.240192859	39.28082192	145500

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579	191280.1817	-45280.18172	-1.255765271	39.62328767	146500
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585	129072.7556	3927.244405	0.108915136	40.03424658	147000
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635	151825.7445	-7825.744518	-0.2170331	43.45890411	152000
636	207757.8588	-7757.858813	-0.21515041	43.52739726	153000
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638	136190.3865	-43190.38647	-1.197808519	43.66438356	153000
639	69868.26817	15131.73183	0.419651658	43.73287671	153337
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643	359931.9542	-14931.95422	-0.414111181	44.00684932	153575
644	149258.8517	2741.14828	0.07602087	44.07534247	153900
645	330418.4116	40459.5884	1.122074693	44.14383562	153900
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648	162869.6571	-7869.657133	-0.218250938	44.34931507	154000
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650	60920.77416	23579.22584	0.653927873	44.48630137	154000
651	207225.0943	-1275.09433	-0.035362472	44.55479452	154300
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660	160592.8967	6407.10331	0.17768961	45.17123288	155000
661	205370.1368	-7470.136817	-0.207170953	45.23972603	155000
662	296939.851	105060.149	2.913656296	45.30821918	155000
663	188503.4094	-78503.40943	-2.177152377	45.37671233	155000
664	122974.6906	14525.30943	0.402833612	45.44520548	155000
665	340222.432	82777.56798	2.295688559	45.51369863	155000
666	256151.8152	-25651.81524	-0.711407453	45.58219178	155000
667	214076.0362	-85076.03619	-2.359432485	45.65068493	155000
668	212835.4682	-19335.4682	-0.536234806	45.71917808	155835
669	158264.5822	9735.417836	0.269994491	45.78767123	155900
670	82432.05985	55067.94015	1.527211336	45.85616438	156000
671	181181.0224	-7681.022353	-0.213019488	45.92465753	156000
672	123672.0528	-20072.05277	-0.556662669	45.99315068	156000
673	168638.6396	-3638.639606	-0.100911195	46.06164384	156000
674	220646.3441	36853.65586	1.02207057	46.13013699	156500
675	147127.9227	-7127.922707	-0.197680253	46.19863014	156932
676	169185.2294	-20685.22937	-0.573668031	46.26712329	157000
677	142030.0811	-55030.08115	-1.526161384	46.33561644	157000
678	100547.6012	8952.398754	0.24827885	46.40410959	157000
679	291707.9741	80792.02588	2.240623082	46.47260274	157000
680	124214.2773	4285.72275	0.118856895	46.54109589	157000
681	133807.5255	9192.47451	0.254936924	46.60958904	157000
682	123628.2444	35805.75556	0.99300892	46.67808219	157500

683	194683.9929	-21683.99292	-0.601366961	46.74657534	157500
684	276690.3032	8309.696765	0.230454654	46.81506849	157900
685	207335.8185	13664.18151	0.378951761	46.88356164	157900
686	239039.3282	-31539.32821	-0.874687149	46.95205479	158000
687	210715.7091	17159.29086	0.4758824	47.02054795	158000
688	173316.107	-24516.10703	-0.679910606	47.0890411	158000
689	233853.0923	158146.9077	4.385923089	47.15753425	158000
690	199852.6896	-5152.689611	-0.142900678	47.2260274	158000
691	165445.789	-24445.789	-0.677960461	47.29452055	158000
692	485162.1531	269837.8469	7.483472551	47.3630137	158500
693	270815.0802	64184.91983	1.780054545	47.43150685	158900
694	105699.9579	2780.042143	0.077099522	47.5	159000
695	141733.0718	-233.0718385	-0.006463833	47.56849315	159000
696	177954.767	-1954.766958	-0.054211983	47.6369863	159000
697	73122.1656	15877.8344	0.440343485	47.70547945	159000
698	116155.455	7344.545005	0.203687887	47.7739726	159434
699	115200.8159	23299.18409	0.646161414	47.84246575	159500
700	206920.7499	-10920.74989	-0.302867567	47.9109589	159500
701	272415.3834	40084.61664	1.111675519	47.97945205	159500
702	168453.9236	-28453.9236	-0.789118942	48.04794521	159895
703	340936.7189	20982.28107	0.581906231	48.11643836	159950
704	152256.9342	-12256.93421	-0.339924261	48.18493151	160000
705	213290.7796	-290.7796008	-0.008064255	48.25342466	160000
706	39282.96855	15717.03145	0.435883902	48.32191781	160000
707	242622.0464	59377.95356	1.646741889	48.39041096	160000
708	226788.2058	27211.79418	0.754670693	48.45890411	160000
709	204634.9174	-25094.91743	-0.695962883	48.52739726	160000
710	106163.2208	3736.779223	0.103632923	48.59589041	160000
711	32225.99797	19774.00203	0.548396762	48.66438356	160000
712	84834.49682	17941.50318	0.497575667	48.73287671	160000
713	214676.1723	-25676.17232	-0.712082953	48.80136986	160000
714	110176.696	18823.30402	0.522030844	48.86986301	160000
715	172529.0672	-42029.06715	-1.165601394	48.93835616	160000
716	168607.0308	-3607.030799	-0.100034581	49.00684932	160200
717	201091.2466	-41591.24663	-1.153459221	49.07534247	161000
718	165173.561	-8173.561002	-0.226679171	49.14383562	161000

719	273036.2696	67963.73039	1.884853132	49.21232877	161500
720	121860.6439	6639.356102	0.184130728	49.28082192	161500
721	250439.1847	24560.81525	0.681150509	49.34931507	161750
722	156063.4002	-13063.40025	-0.362290162	49.41780822	162000
723	103333.221	21166.77898	0.587022952	49.48630137	162000
724	113973.0942	21026.90584	0.583143819	49.55479452	162000
725	324985.5548	-4985.554775	-0.138265491	49.62328767	162000
726	117900.5637	2599.436289	0.07209074	49.69178082	162500
727	198666.8097	23333.19025	0.647104514	49.76027397	162900
728	196464.3376	-1964.337583	-0.054477408	49.82876712	162900
729	185317.5763	-75317.57635	-2.088798965	49.89726027	163000
730	104583.9957	-1583.99566	-0.043929301	49.96575342	163000
731	243888.5263	-7388.526293	-0.20490763	50.03424658	163000
732	191984.8597	-4484.859703	-0.124379604	50.10273973	163000
733	239450.3836	-16950.38363	-0.47008873	50.17123288	163500
734	125243.9141	6156.085947	0.17072809	50.23972603	163500
735	110545.9749	-2545.974904	-0.070608084	50.30821918	163900
736	193221.468	-30221.46798	-0.83813864	50.37671233	163990
737	68280.14947	25219.85053	0.69942768	50.44520548	164000
738	251937.0638	-12037.06379	-0.333826546	50.51369863	164000
739	116151.8094	62848.19061	1.742982739	50.58219178	164000
740	210554.8462	-20554.84623	-0.570052086	50.65068493	164500
741	110847.4803	21152.51973	0.586627497	50.71917808	164500
742	135173.9776	6826.022384	0.189307585	50.78767123	164700
743	188188.5961	-9188.596125	-0.254829364	50.85616438	164900
744	143310.1336	31689.86639	0.878862057	50.92465753	164990
745	223909.8563	-43909.85633	-1.217761735	50.99315068	165000
746	286900.9694	12899.0306	0.357731662	51.06164384	165000
747	246022.0901	-10022.09007	-0.277944836	51.13013699	165000
748	264265.162	1713.838	0.047530247	51.19863014	165000
749	237414.7161	22985.28395	0.637455952	51.26712329	165000
750	91945.91326	6054.086736	0.167899323	51.33561644	165000
751	66405.15707	30094.84293	0.83462692	51.40410959	165000
752	185991.5326	-23991.53257	-0.665362467	51.47260274	165000
753	197184.5155	19815.48446	0.549547203	51.54109589	165150
754	313035.2866	-37535.28655	-1.040974385	51.60958904	165400

755	158507.924	-2507.924024	-0.06955281	51.67808219	165500
756	164406.6673	8093.332651	0.22445418	51.74657534	165500
757	228063.4803	-16063.48032	-0.445492044	51.81506849	165500
758	162243.8437	-3343.843737	-0.092735556	51.88356164	165600
759	180867.1185	-1467.118472	-0.04068792	51.95205479	166000
760	293851.3809	-3851.380876	-0.106811196	52.02054795	166000
761	116599.5021	10900.49795	0.302305915	52.0890411	167000
762	117448.2888	-17448.28879	-0.483897243	52.15753425	167000
763	200838.2444	14361.75556	0.398297736	52.2260274	167000
764	285548.5416	51451.45839	1.426914649	52.29452055	167000
765	281916.1154	-11916.1154	-0.330472258	52.3630137	167240
766	298536.7739	-34404.77393	-0.954155187	52.43150685	167500
767	202756.5647	-6256.564741	-0.173514691	52.5	167500
768	153570.6444	6429.355646	0.178306739	52.56849315	167500
769	248591.8674	-31754.86743	-0.880664746	52.6369863	167900
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771	121093.7232	13806.2768	0.382892521	52.7739726	168000
772	114087.9168	-12087.91678	-0.335236863	52.84246575	168000
773	159782.2047	-52782.20466	-1.463820529	52.9109589	168000
774	105052.6948	9447.30517	0.262004199	52.97945205	168000
775	285021.9324	109978.0676	3.050046017	53.04794521	168500
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779	171033.1208	-27033.1208	-0.749715505	53.32191781	169000
780	144029.5017	-9029.50173	-0.250417164	53.39041096	169000
781	188886.4408	-12886.44084	-0.357382507	53.45890411	169500
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783	208421.6391	-21321.63912	-0.591317723	53.59589041	169900
784	161530.0014	3969.998606	0.110100847	53.66438356	169990
785	124104.9958	3895.00417	0.10802101	53.73287671	170000
786	173445.0741	-11945.07413	-0.331275377	53.80136986	170000
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788	229702.6527	3297.347302	0.09144606	53.93835616	170000
789	88421.90886	19478.09114	0.5401902	54.00684932	170000
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792	166541.7859	-19741.78585	-0.547503303	54.21232877	170000
793	222589.7158	47200.28418	1.309015897	54.28082192	171000
794	229959.7407	-4959.740728	-0.137549584	54.34931507	171000
795	221387.0399	-26887.03986	-0.74566421	54.41780822	171000
796	170798.4248	201.5751739	0.005590329	54.48630137	171000
797	159378.4348	-15878.43476	-0.440360135	54.55479452	171000
798	93680.4249	16319.5751	0.452594378	54.62328767	171500
799	406279.5076	78720.49235	2.183172785	54.69178082	171750
800	168787.206	6212.793957	0.172300786	54.76027397	171900
801	186070.1197	13929.8803	0.386320444	54.82876712	172000
802	111194.563	-1294.56298	-0.035902401	54.89726027	172400
803	204049.522	-15049.52204	-0.417371716	54.96575342	172500
804	377201.5553	205731.4447	5.705595554	55.03424658	172500
805	114748.7555	3251.244457	0.09016748	55.10273973	172500
806	254171.5714	-26491.57139	-0.734696595	55.17123288	172500
807	110007.5329	25492.46707	0.706988215	55.23972603	172500
808	173010.886	50489.11404	1.400225741	55.30821918	172785
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810	154807.7101	-48807.71008	-1.353594994	55.44520548	173000
811	183179.7214	-2179.721372	-0.060450694	55.51369863	173000
812	165445.789	-20945.789	-0.580894188	55.58219178	173000
813	99110.89356	-43117.89356	-1.195798057	55.65068493	173000
814	157510.2265	389.7734922	0.010809674	55.71917808	173000
815	89562.46301	26437.53699	0.733198047	55.78767123	173000
816	224128.6516	771.3484093	0.021391976	55.85616438	173500
817	120107.7678	16892.23224	0.468476004	55.92465753	173733
818	271029.5509	-29.5509345	-0.000819543	55.99315068	173900
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824	145668.8677	-6168.867653	-0.171082568	56.40410959	174000
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833	226278.0723	10721.92765	0.297353586	57.02054795	175000
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843	152074.5158	22825.48422	0.633024191	57.70547945	176000
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849	191125.9801	48874.01988	1.355433978	58.11643836	176000
850	180625.6184	6374.381638	0.176782133	58.18493151	176432
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855	187850.2814	-17850.28145	-0.495045794	58.52739726	177000
856	115348.1189	11651.88111	0.32314419	58.59589041	177000
857	144545.3649	2454.635104	0.068074937	58.66438356	177000
858	172165.2745	1834.725532	0.050882848	58.73287671	177000
859	185435.5899	-33435.58987	-0.927276592	58.80136986	177500
860	243366.5823	6633.417654	0.183966036	58.86986301	177500
861	171157.5413	18792.45872	0.521175405	58.93835616	177500
862	129020.6641	2479.335892	0.068759969	59.00684932	178000

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864	122168.9351	10331.06487	0.286513702	59.14383562	178000
865	206444.4052	44135.59477	1.224022189	59.21232877	178000
866	127846.5633	20653.43672	0.572786318	59.28082192	178000
867	262419.3094	-13519.30944	-0.374933992	59.34931507	178000
868	102492.9626	26507.03736	0.735125516	59.41780822	178000
869	167468.7219	1531.278087	0.042467273	59.48630137	178400
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871	104940.3341	4559.665939	0.126454222	59.62328767	178900
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876	328805.1109	-25328.11089	-0.702430088	59.96575342	179200
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880	107484.9113	29015.08872	0.804681858	60.23972603	179600
881	144364.168	12635.83196	0.350432316	60.30821918	179665
882	222205.7516	-34705.75162	-0.962502268	60.37671233	179900
883	179422.3405	-1422.34047	-0.039446082	60.44520548	179900
884	137003.7023	-18503.70232	-0.51316726	60.51369863	179900
885	106261.2501	-6261.250148	-0.173644632	60.58219178	179900
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887	170683.6905	-25683.69054	-0.712291457	60.71917808	180000
888	124846.7625	10653.23753	0.295448587	60.78767123	180000
889	279909.6631	-11909.66311	-0.330293315	60.85616438	180000
890	182785.8955	-33285.89555	-0.923125086	60.92465753	180000
891	119575.0826	3324.917386	0.092210668	60.99315068	180000
892	182212.3062	-9712.30624	-0.269353532	61.06164384	180000
893	132100.288	22399.71196	0.621216155	61.13013699	180000
894	146840.0918	18159.90818	0.503632741	61.19863014	180000
895	129725.3447	-10867.34473	-0.30138647	61.26712329	180000
896	182480.7881	-42480.7881	-1.17812907	61.33561644	180000
897	86717.6602	19782.3398	0.548627995	61.40410959	180500
898	163344.9689	-20391.96893	-0.565534974	61.47260274	180500

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902	125436.7397	27563.26026	0.764417979	61.74657534	181000
903	207289.4927	-27289.49269	-0.756825523	61.81506849	181000
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909	123626.2597	7373.740329	0.204497568	62.2260274	181500
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1153	246331.0308	-16331.03081	-0.452912081	78.93835616	227000
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1155	224818.5579	-23018.55792	-0.638378746	79.07534247	227680
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1164	132238.2605	-23279.2605	-0.645608868	79.69178082	230000
1165	183091.8285	10908.17146	0.302518726	79.76027397	230000
1166	216297.0063	16872.9937	0.467942458	79.82876712	230000
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1389	337496.9833	40003.01669	1.109412489	95.10273973	328900
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1391	215302.3096	19697.69043	0.546280395	95.23972603	335000
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1394	161476.7201	1523.27992	0.042245458	95.44520548	336000
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1399	157002.2652	-19002.26522	-0.526994014	95.78767123	340000
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1414	263564.3308	-6564.330818	-0.182050035	96.81506849	372402
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1436	197124.1402	-23124.14019	-0.641306883	98.32191781	410000
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1439	147752.3034	1947.69663	0.0540159	98.52739726	423000
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1447	125898.4761	32001.52388	0.887505323	99.07534247	451950
1448	257642.8135	-17642.8135	-0.48929204	99.14383562	465000
1449	88716.9213	23283.0787	0.645714759	99.21232877	466500
1450	133865.9919	-41865.99193	-1.161078793	99.28082192	475000
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1459	129111.9647	13013.03527	0.360893379	99.89726027	745000
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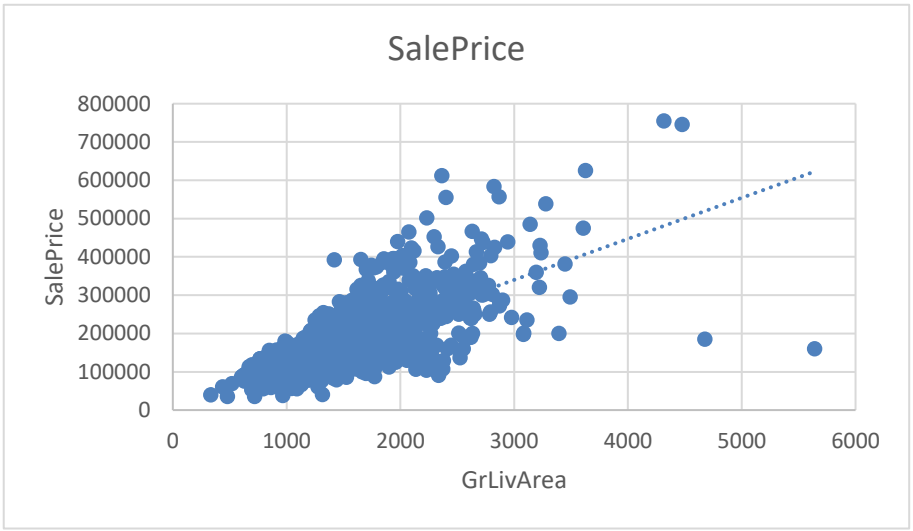
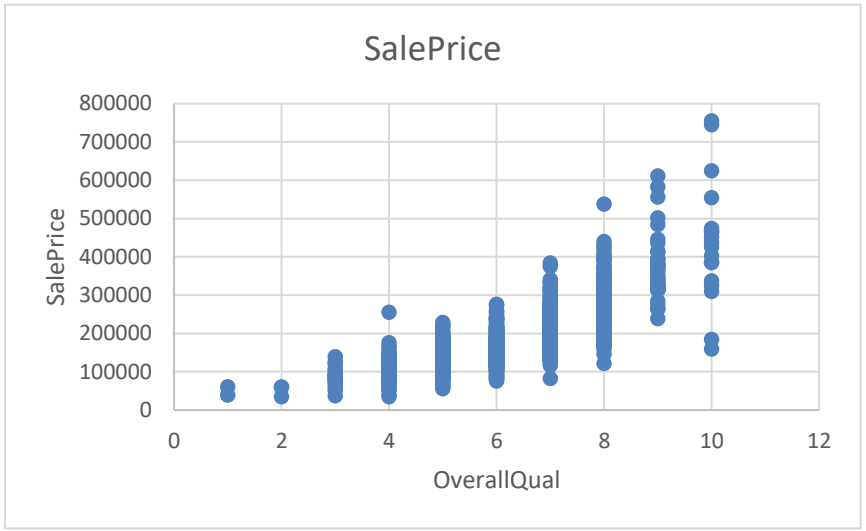
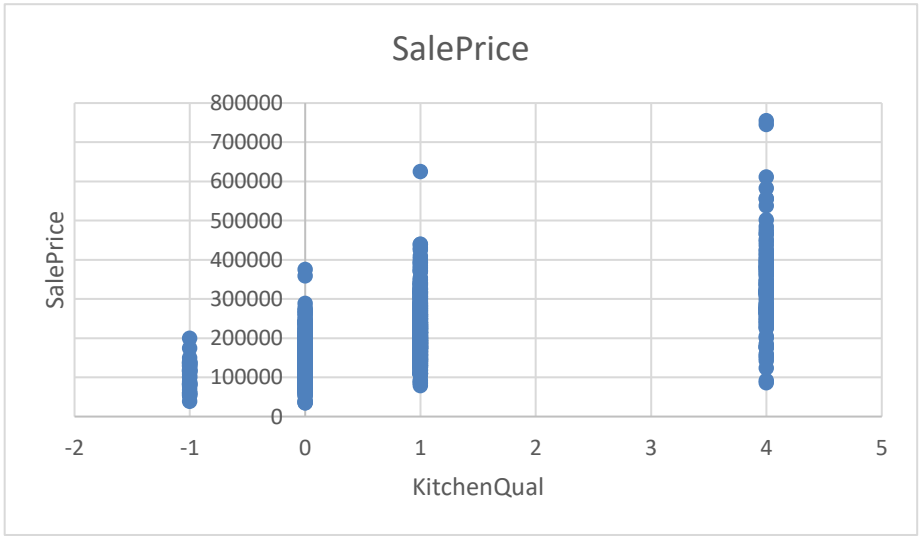
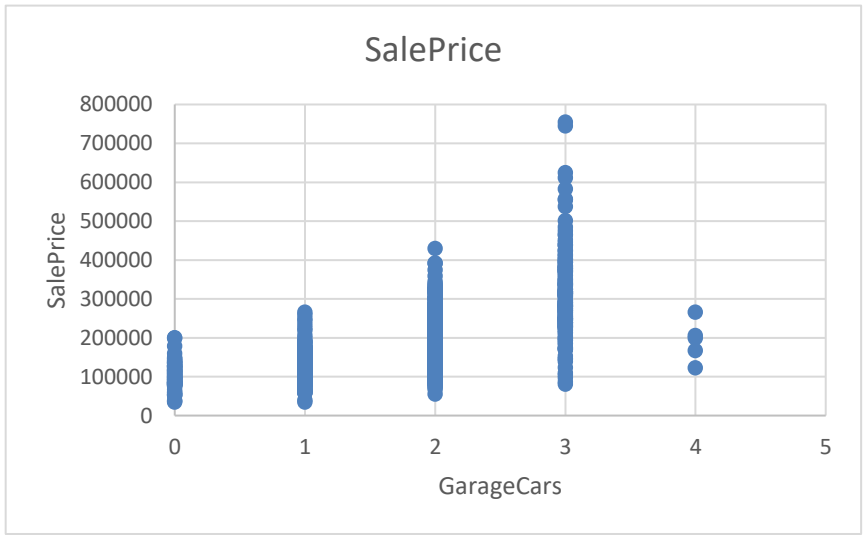
Appendix IV

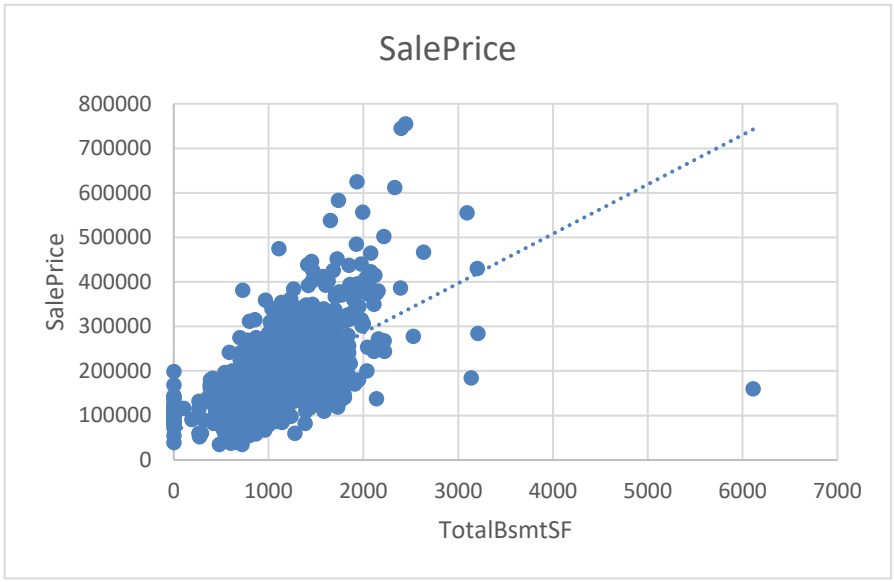
Scatter Plots for the dependent variable, SalePrice Vs each independent variable







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2000
3000
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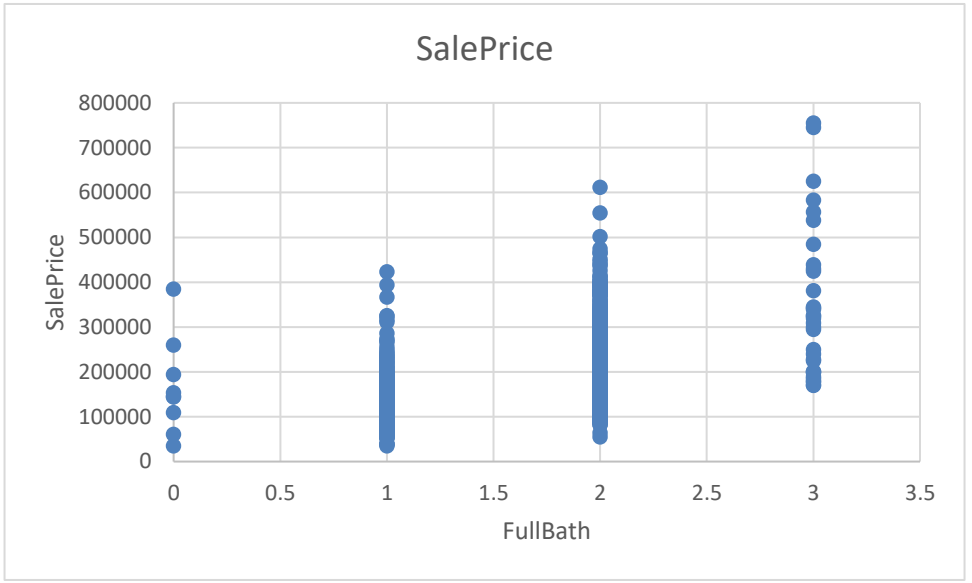
7000
TotalBsmtSF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2
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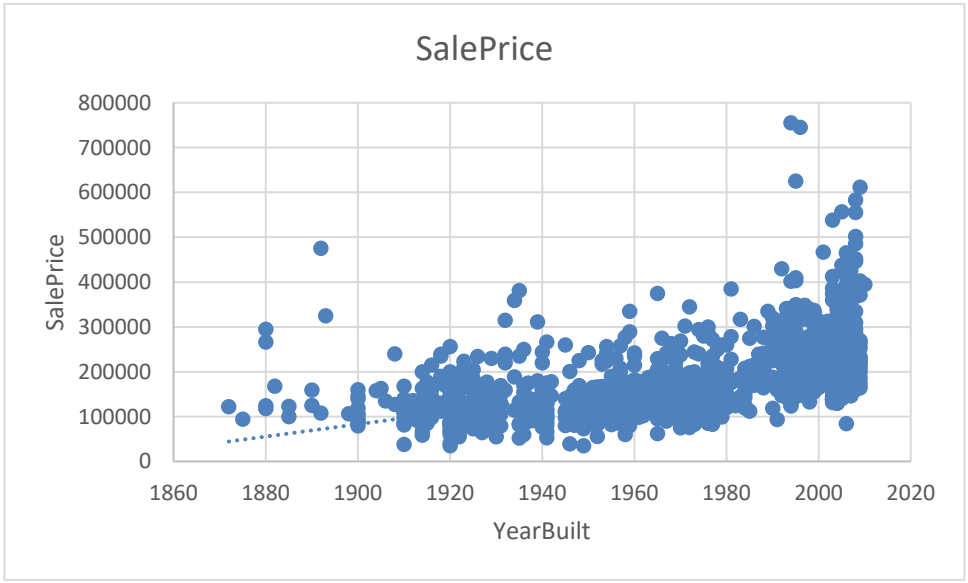
3
3.5
FullBath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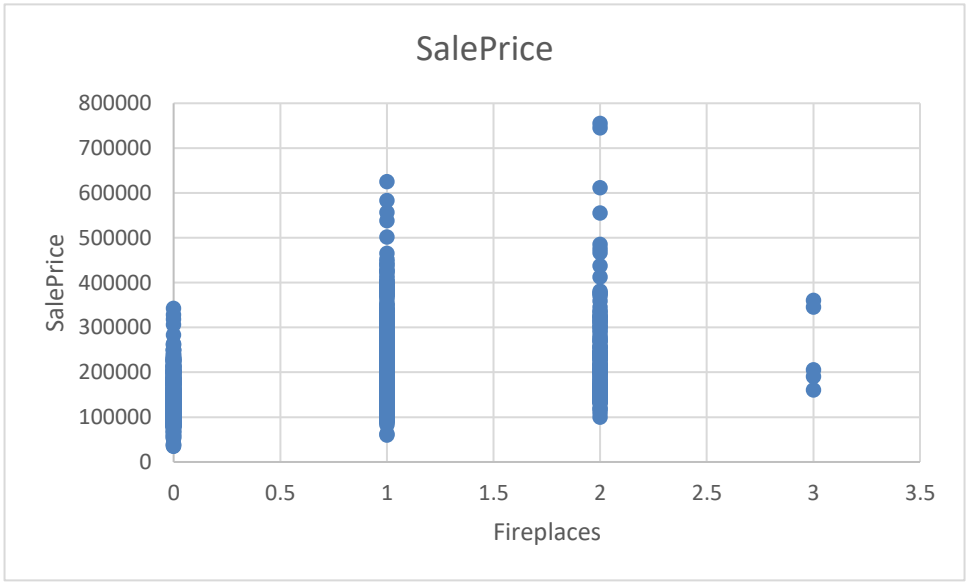
1880
1900
1920
1940
1960
1980
2000
2020
YearBuilt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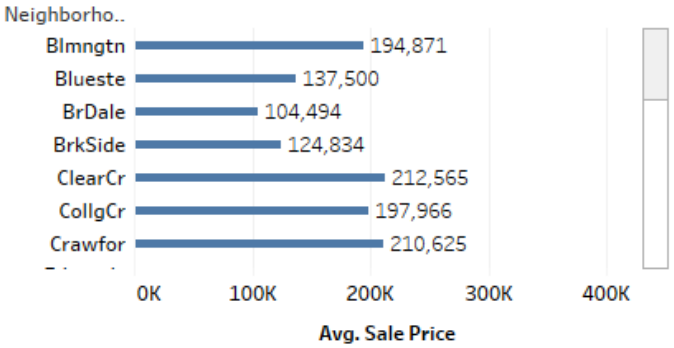
2.5
3
3.5
Fireplaces

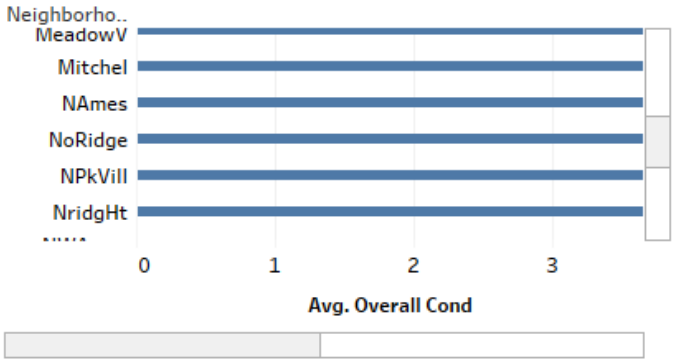
Dashboard

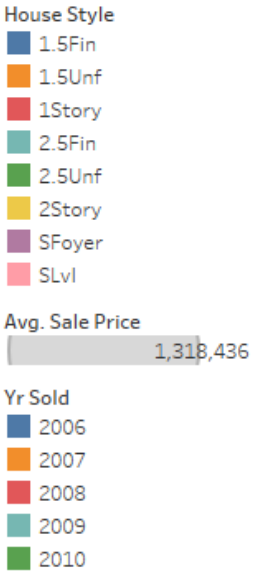
House Sale Price Analysis

Average House Sale Price by Neighbourhood

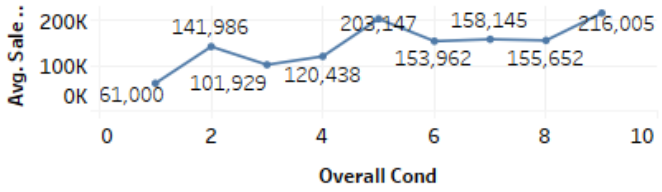


Average Overall Condition Rating of the House by Neighbourhood

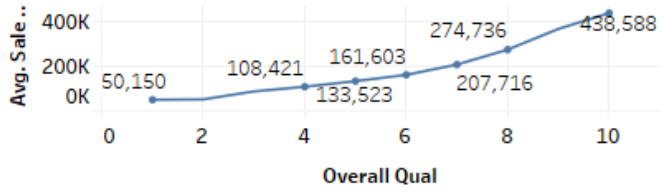




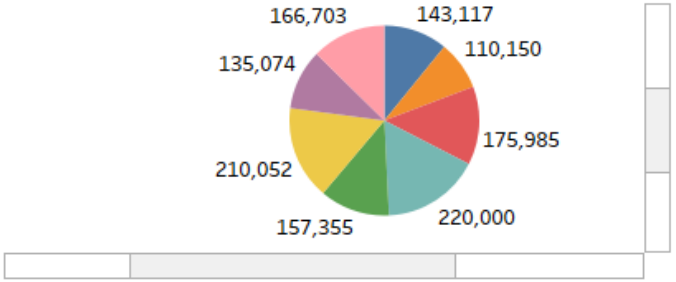
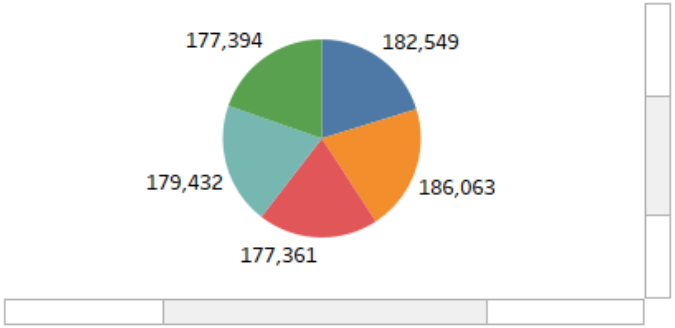
Average House Sale Price by Overall Condition of the House



Average House Sale Price by Overall Quality of the House



Average Price of Houses Sold by House Style



Average House Sale Price per year