Housing Prices, Ames - Iowa

Thomas Osodo, James Seung Won Lee & Laura Suchomska

Facts & Figures

Ames is a city in Story County, Iowa, United States approximately 30 miles north of Des Moines in central Iowa.

Population: 66,498 (2017)

One of the **lowest unemployment** Rates in the US.

Ames has seen the **job market increase** by 2.3% over the last year.

Overall, United States, is 13.1% more expensive than Ames, Iowa

(Source: www.bestplaces.net/economy/city/iowa/ames)

Neighbourhood

It is possible to argue that neighbourhood is an important factor when it comes to housing prices.

Meadow V for example, presents the lowest prices in the sample, with an average of US$98K

Conversely, homes have the highest Mean prices in the sample (US£335K).

Median price: US$ 163K

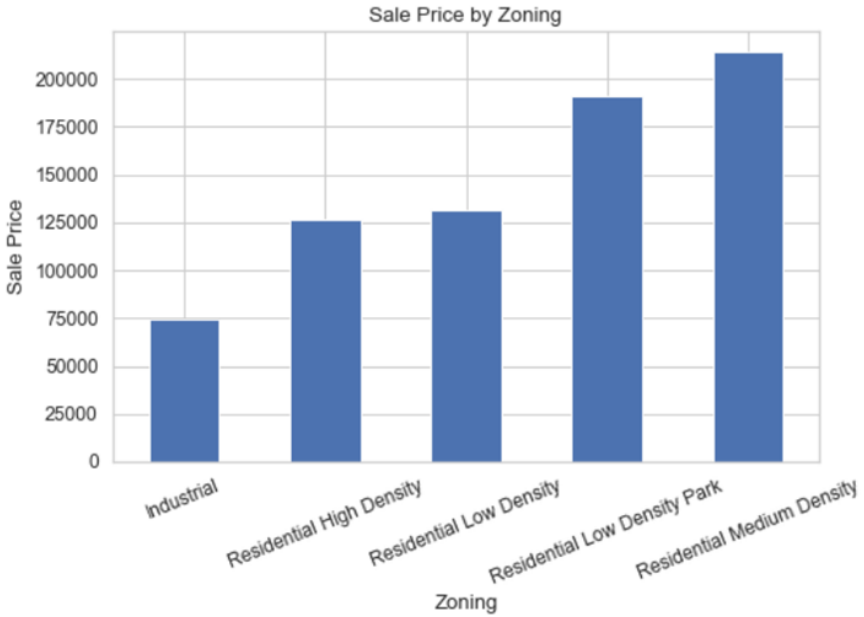
Price per Square Footage: US$ 2567K

Is it possible to predict housing prices by neighbourhood?

Not Always!

* R-squared: 0.553
(Appendix I)

Zone and Neighbourhood



24 neighbourhoods

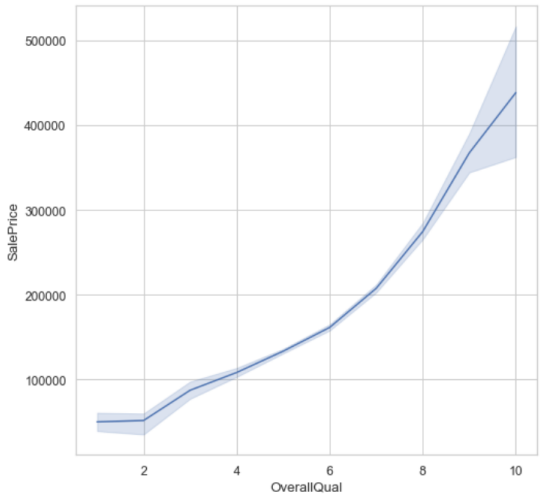
Only 13 were indicated as good predictors for Sale Prices

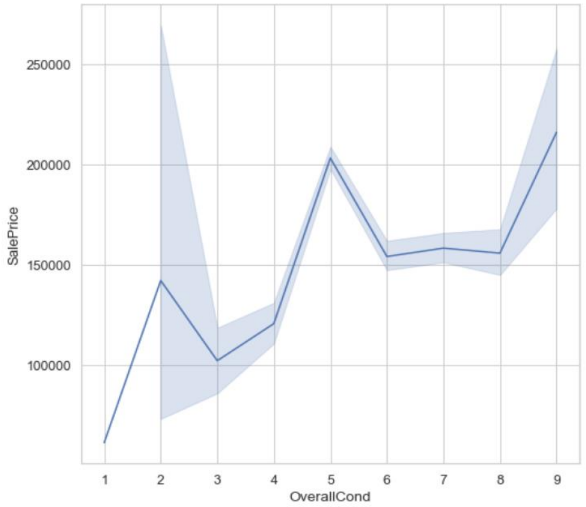
Zone is not a good predictor!

Are overall quality and condition of the property good predictors for Sale Prices?

* R-squared: 0.626
(Appendix II)

Graph Showing comparisons in Sale Prices according to the Properties' Overall Quality and Overall Condition





Overall Quality: ✓

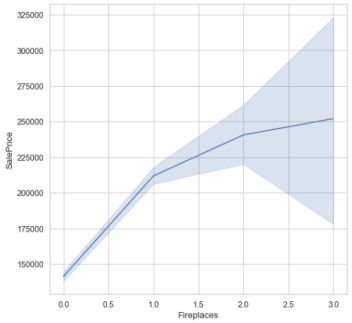
Overall Condition: ✗

Caveat: Overall quality definition

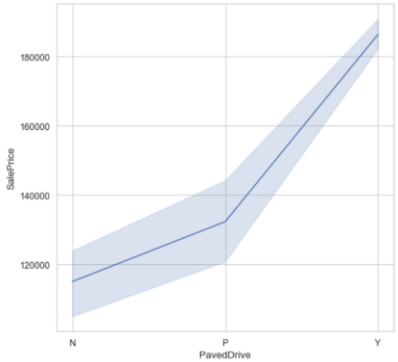
Potential Renovations

Projects to consider:

Fireplaces



Paved Entry



*R-Squared 0.656
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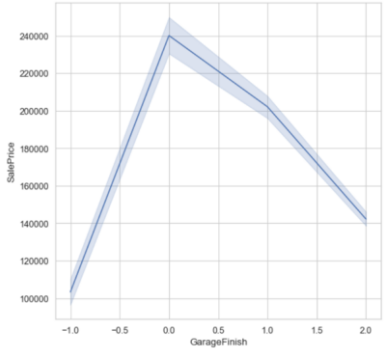
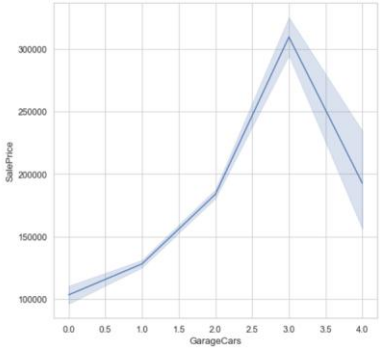
Projects to Avoid:

Garage Finish



Parking Spaces



In Sum:

Our findings showed:

Neighbourhood does not necessarily mean good Sale Prices

Invest in Quality Materials

Consider Renovations Projects including: Fireplaces and Paved Entry

Future Research:

Investigate with more specificity the Overall Quality and Condition items for better it of the model.

APPENDICES

APPENDIX I

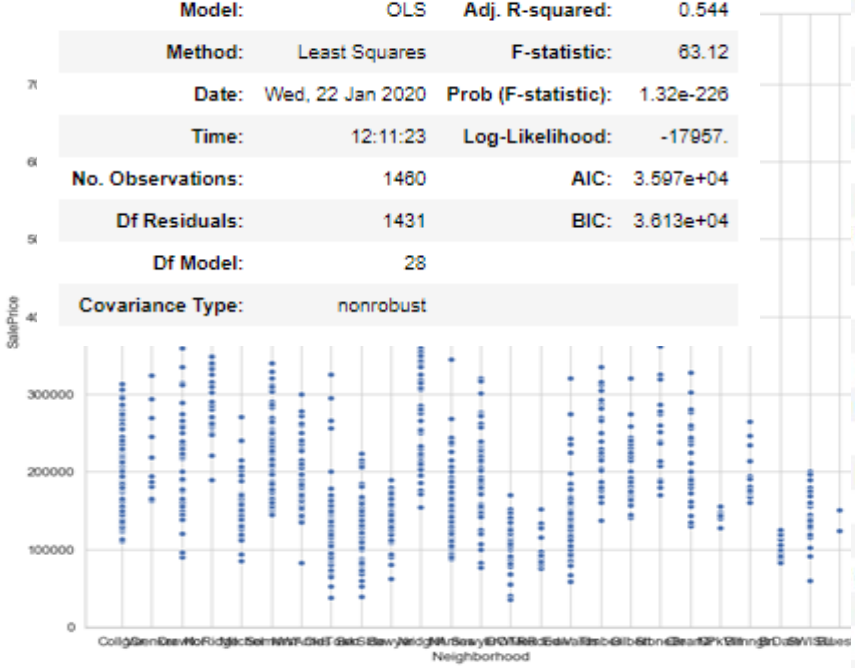
OLS Regression Results

Dep. Variable:	SalePri
Model:	Ol
Method:	Least Squar
Date:	Wed, 22 Jan 20
Time:	12:11:
No. Observations:	14
Df Residuals:	14

OLS Regression Results

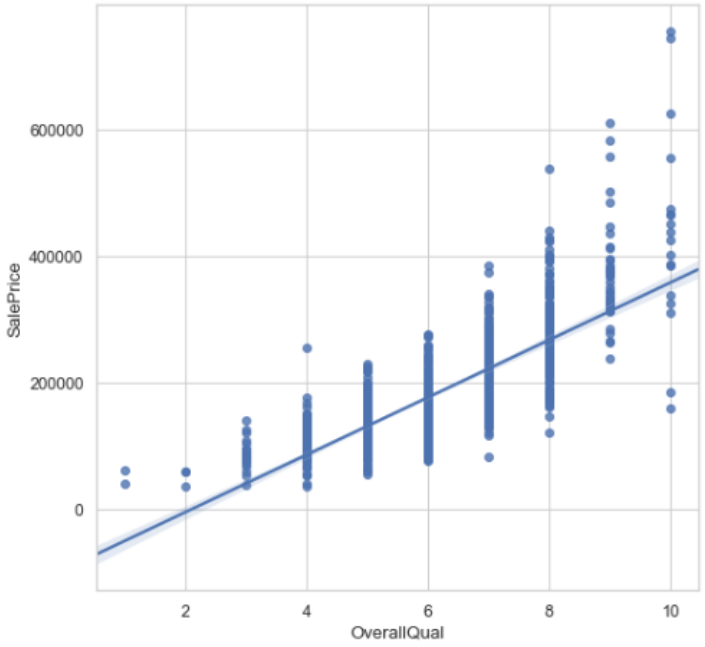
Dep. Variable:	SalePrice	R-squared:	0.553
Model:	OLS	Adj. R-squared:	0.544
Method:	Least Squares	F-statistic:	63.12
Date:	Wed, 22 Jan 2020	Prob (F-statistic):	1.32e-226
Time:	12:11:23	Log-Likelihood:	-17957.
No. Observations:	1460	AIC:	3.597e+04
Df Residuals:	1431	BIC:	3.613e+04
Df Model:	28		
Covariance Type:	nonrobust		

nonrobu



	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	1.535e+05	2.41e+04	6.365	0.000	1.06e+05	2.01e+05
MSZoning[T.FV]	-4831.0708	2.45e+04	-0.197	0.844	-5.28e+04	4.32e+04
MSZoning[T.RH]	6279.2586	2.48e+04	0.253	0.800	-4.24e+04	5.49e+04
MSZoning[T.RL]	4.171e+04	2.04e+04	2.041	0.041	1620.216	8.18e+04
MSZoning[T.RM]	3.63e+04	1.92e+04	1.890	0.059	-1378.801	7.4e+04
Neighborhood[T.Blueste]	-5.228e+04	4.07e+04	-1.286	0.199	-1.32e+05	2.75e+04
Neighborhood[T.BrDale]	-8.529e+04	1.99e+04	-4.296	0.000	-1.24e+05	-4.63e+04
Neighborhood[T.BrkSide]	-6.756e+04	1.52e+04	-4.458	0.000	-9.73e+04	-3.78e+04
Neighborhood[T.ClearCr]	1.738e+04	1.65e+04	1.053	0.293	-1.5e+04	4.97e+04
Neighborhood[T.CollgCr]	3137.3231	1.37e+04	0.228	0.819	-2.38e+04	3.01e+04
Neighborhood[T.Crawfor]	1.714e+04	1.5e+04	1.140	0.254	-1.24e+04	4.66e+04
Neighborhood[T.Edwards]	-6.583e+04	1.41e+04	-4.675	0.000	-9.34e+04	-3.82e+04
Neighborhood[T.Gilbert]	-2334.6170	1.44e+04	-0.163	0.871	-3.05e+04	2.58e+04
Neighborhood[T.IDOTRR]	-8.082e+04	1.77e+04	-4.565	0.000	-1.16e+05	-4.61e+04
Neighborhood[T.MeadowV]	-9.12e+04	1.96e+04	-4.657	0.000	-1.3e+05	-5.28e+04
Neighborhood[T.Mitchel]	-3.837e+04	1.51e+04	-2.540	0.011	-6.8e+04	-8733.784
Neighborhood[T.NAmes]	-4.903e+04	1.35e+04	-3.631	0.000	-7.55e+04	-2.25e+04
Neighborhood[T.NPkVill]	-5.249e+04	2.21e+04	-2.373	0.018	-9.59e+04	-9097.922
Neighborhood[T.NWAmes]	-6139.0548	1.45e+04	-0.425	0.671	-3.45e+04	2.22e+04
Neighborhood[T.NoRidge]	1.401e+05	1.55e+04	9.049	0.000	1.1e+05	1.7e+05
Neighborhood[T.NridgHt]	1.212e+05	1.44e+04	8.424	0.000	9.29e+04	1.49e+05
Neighborhood[T.OldTown]	-6.205e+04	1.51e+04	-4.122	0.000	-9.16e+04	-3.25e+04
Neighborhood[T.SWISU]	-4.551e+04	1.71e+04	-2.660	0.008	-7.91e+04	-1.2e+04
Neighborhood[T.Sawyer]	-5.825e+04	1.44e+04	-4.036	0.000	-8.66e+04	-2.99e+04
Neighborhood[T.SawyerW]	-5630.3413	1.48e+04	-0.380	0.704	-3.47e+04	2.34e+04
Neighborhood[T.Somerst]	6.537e+04	1.75e+04	3.733	0.000	3.1e+04	9.97e+04
Neighborhood[T.StoneBr]	1.153e+05	1.69e+04	6.834	0.000	8.22e+04	1.48e+05
Neighborhood[T.Timber]	4.706e+04	1.57e+04	3.005	0.003	1.63e+04	7.78e+04
Neighborhood[T.Veenker]	4.358e+04	2.08e+04	2.099	0.036	2846.981	8.43e+04

APPENDIX II



OLS Regression Results

Dep. Variable:	SalePrice	**R-squared:**	0.626
Model:	OLS	**Adj. R-squared:**	0.625
Method:	Least Squares	**F-statistic:**	1218.
Date:	Wed, 22 Jan 2020	**Prob (F-statistic):**	1.28e-311
Time:	12:11:25	**Log-Likelihood:**	-17827.
No. Observations:	1460	**AIC:**	3.566e+04
Df Residuals:	1457	**BIC:**	3.568e+04
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-9.398e+04	9006.458	-10.434	0.000	-1.12e+05	-7.63e+04
OverallQual	4.541e+04	924.629	49.110	0.000	4.36e+04	4.72e+04
OverallCond	-370.0065	1149.137	-0.322	0.748	-2624.146	1884.132

Omnibus:	591.452	**Durbin-Watson:**	1.989
Prob(Omnibus):	0.000	**Jarque-Bera (JB):**	5871.154
Skew:	1.606	**Prob(JB):**	0.00
Kurtosis:	12.284	**Cond. No.**	59.9

APPENDIX III

OLS Regression Results

Dep. Variable:	SalePrice	R-squared:	0.640
Model:	OLS	Adj. R-squared:	0.639
Method:	Least Squares	F-statistic:	861.2
Date:	Wed, 22 Jan 2020	Prob (F-statistic):	5.58e-322
Time:	12:11:26	Log-Likelihood:	-17799.
No. Observations:	1460	AIC:	3.561e+04
Df Residuals:	1456	BIC:	3.563e+04
Df Model:	3		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	1.365e+05	6533.040	20.889	0.000	1.24e+05	1.49e+05
KitchenQual	-3.481e+04	1632.175	-21.328	0.000	-3.8e+04	-3.16e+04
Fireplaces	1.894e+04	2190.111	8.646	0.000	1.46e+04	2.32e+04
GrLivArea	75.4168	2.830	26.646	0.000	69.865	80.969

Omnibus:	286.742	Durbin-Watson:	2.022
Prob(Omnibus):	0.000	Jarque-Bera (JB):	7006.107
Skew:	-0.205	Prob(JB):	0.00
Kurtosis:	13.724	Cond. No.	8.56e+03

OLS Regression Results

Dep. Variable:	SalePrice	R-squared:	0.089
Model:	OLS	Adj. R-squared:	0.081
Method:	Least Squares	F-statistic:	11.73
Date:	Wed, 22 Jan 2020	Prob (F-statistic):	6.83e-23
Time:	12:11:27	Log-Likelihood:	-18476.
No. Observations:	1460	AIC:	3.698e+04
Df Residuals:	1447	BIC:	3.705e+04
Df Model:	12		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	1.57e+05	9.41e+04	1.668	0.095	-2.76e+04	3.42e+05
RoofStyle[T.Gable]	-4.442e+04	5.51e+04	-0.806	0.421	-1.53e+05	6.37e+04
RoofStyle[T.Gambrel]	-6.612e+04	5.97e+04	-1.107	0.268	-1.83e+05	5.1e+04
RoofStyle[T.Hip]	2984.2166	5.53e+04	0.054	0.957	-1.06e+05	1.11e+05
RoofStyle[T.Mansard]	-4.79e+04	6.32e+04	-0.758	0.448	-1.72e+05	7.6e+04
RoofStyle[T.Shed]	-1.355e+04	7.94e+04	-0.171	0.865	-1.69e+05	1.42e+05
RoofMatl[T.CompShg]	5.801e+04	7.63e+04	0.760	0.447	-9.16e+04	2.08e+05
RoofMatl[T.Membran]	8.448e+04	1.21e+05	0.698	0.485	-1.53e+05	3.22e+05
RoofMatl[T.Metal]	2.298e+04	1.21e+05	0.190	0.849	-2.15e+05	2.6e+05
RoofMatl[T.Roll]	2.44e+04	1.08e+05	0.226	0.821	-1.87e+05	2.36e+05
RoofMatl[T.Tar&Grv]	3.243e+04	9.41e+04	0.345	0.730	-1.52e+05	2.17e+05
RoofMatl[T.WdShake]	1.051e+05	8.53e+04	1.231	0.218	-6.23e+04	2.72e+05
RoofMatl[T.WdShngl]	2.698e+05	8.24e+04	3.275	0.001	1.08e+05	4.31e+05

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Neighbourhood

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Conversely, homes have the highest Mean prices in the sample (US£335K).

Median price: US$ 163K

Price per Square Footage: US$ 2567K

Is it possible to predict housing prices by neighbourhood?

Not Always!

* R-squared: 0.553
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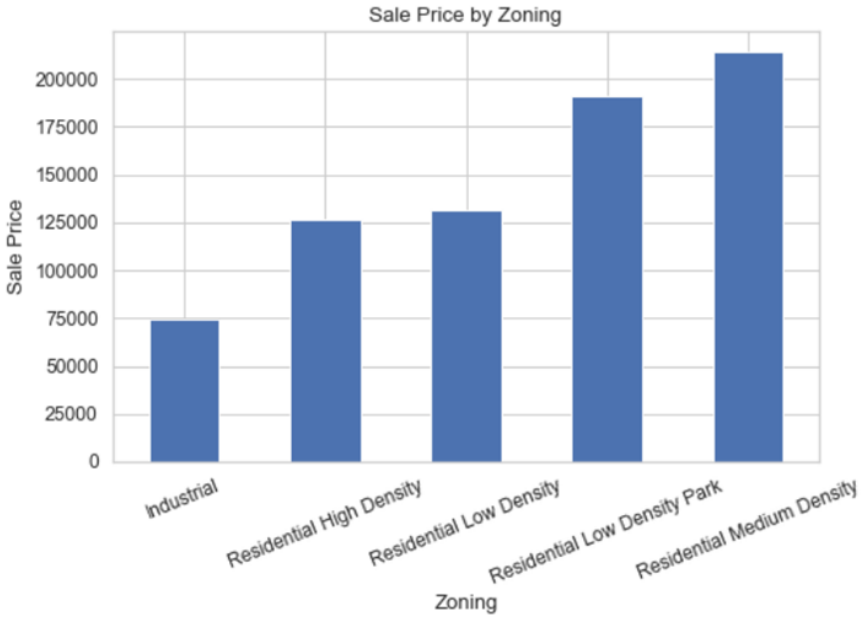
Zone and Neighbourhood



24 neighbourhoods

Only 13 were indicated as good predictors for Sale Prices

Zone is not a good predictor!

Are overall quality and condition of the property good predictors for Sale Prices?

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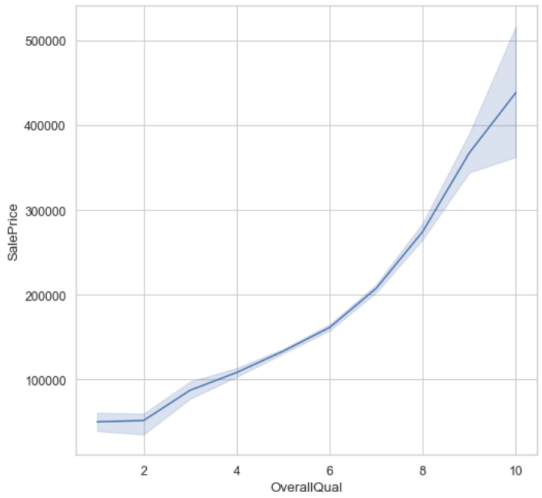
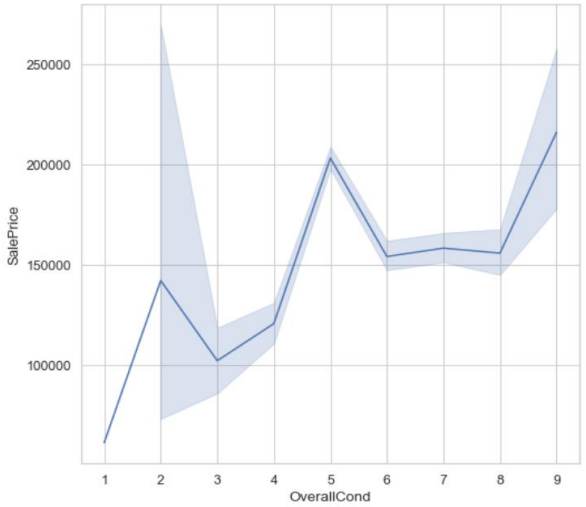




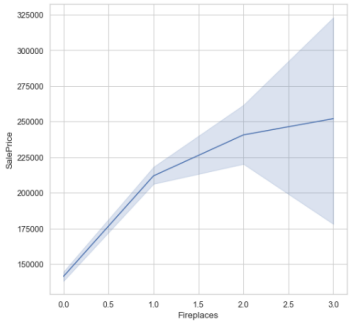
Overall Quality: ✓

Overall Condition: ✗

Potential Renovations

Projects to consider:

Fireplaces



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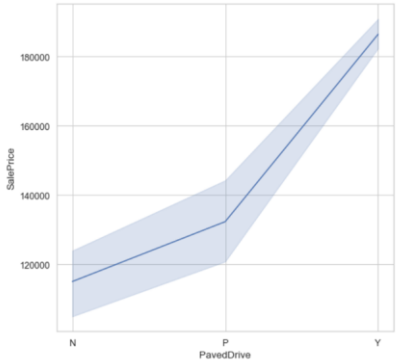

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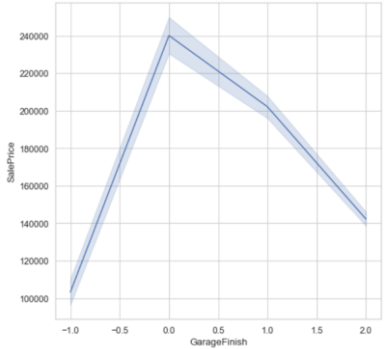

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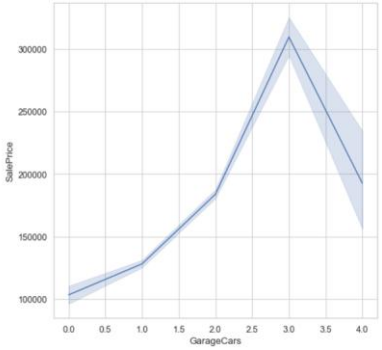

In Sum:

Our findings showed:

Neighbourhood does not necessarily mean good Sale Prices

Invest in Quality Materials

Consider Renovations Projects including: Fireplaces and Paved Entry

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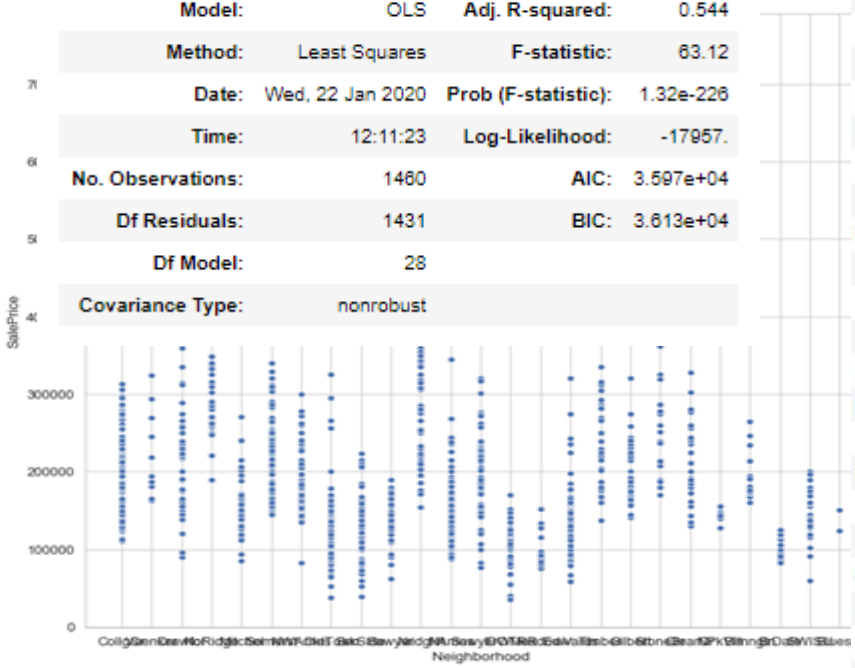

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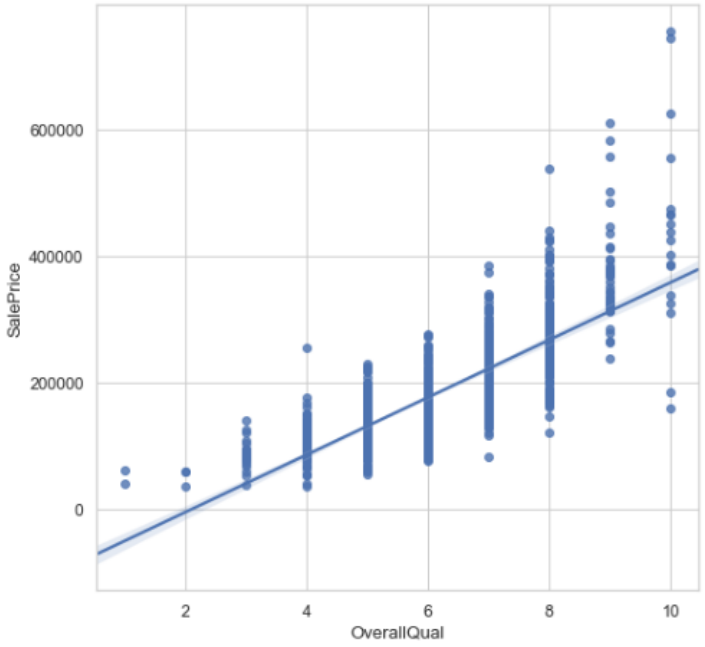
Neighborhood[T.SWISU]	-4.551e+04	1.71e+04	-2.660	0.008	-7.91e+04	-1.2e+04
Neighborhood[T.Sawyer]	-5.825e+04	1.44e+04	-4.036	0.000	-8.66e+04	-2.99e+04
Neighborhood[T.SawyerW]	-5630.3413	1.48e+04	-0.380	0.704	-3.47e+04	2.34e+04
Neighborhood[T.Somerst]	6.537e+04	1.75e+04	3.733	0.000	3.1e+04	9.97e+04
Neighborhood[T.StoneBr]	1.153e+05	1.69e+04	6.834	0.000	8.22e+04	1.48e+05
Neighborhood[T.Timber]	4.706e+04	1.57e+04	3.005	0.003	1.63e+04	7.78e+04
Neighborhood[T.Veenker]	4.358e+04	2.08e+04	2.099	0.036	2846.981	8.43e+04

APPENDIX II



OLS Regression Results

Dep. Variable:	SalePrice	**R-squared:**	0.626
Model:	OLS	**Adj. R-squared:**	0.625
Method:	Least Squares	**F-statistic:**	1218.
Date:	Wed, 22 Jan 2020	**Prob (F-statistic):**	1.28e-311
Time:	12:11:25	**Log-Likelihood:**	-17827.
No. Observations:	1460	**AIC:**	3.566e+04
Df Residuals:	1457	**BIC:**	3.568e+04
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-9.398e+04	9006.458	-10.434	0.000	-1.12e+05	-7.63e+04
OverallQual	4.541e+04	924.629	49.110	0.000	4.36e+04	4.72e+04
OverallCond	-370.0065	1149.137	-0.322	0.748	-2624.146	1884.132

Omnibus:	591.452	**Durbin-Watson:**	1.989
Prob(Omnibus):	0.000	**Jarque-Bera (JB):**	5871.154
Skew:	1.606	**Prob(JB):**	0.00
Kurtosis:	12.284	**Cond. No.**	59.9

APPENDIX III

OLS Regression Results

Dep. Variable:	SalePrice	R-squared:	0.640
Model:	OLS	Adj. R-squared:	0.639
Method:	Least Squares	F-statistic:	861.2
Date:	Wed, 22 Jan 2020	Prob (F-statistic):	5.58e-322
Time:	12:11:26	Log-Likelihood:	-17799.
No. Observations:	1460	AIC:	3.561e+04
Df Residuals:	1456	BIC:	3.563e+04
Df Model:	3		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	1.365e+05	6533.040	20.889	0.000	1.24e+05	1.49e+05
KitchenQual	-3.481e+04	1632.175	-21.328	0.000	-3.8e+04	-3.16e+04
Fireplaces	1.894e+04	2190.111	8.646	0.000	1.46e+04	2.32e+04
GrLivArea	75.4168	2.830	26.646	0.000	69.865	80.969

Omnibus:	286.742	Durbin-Watson:	2.022
Prob(Omnibus):	0.000	Jarque-Bera (JB):	7006.107
Skew:	-0.205	Prob(JB):	0.00
Kurtosis:	13.724	Cond. No.	8.56e+03

OLS Regression Results

Dep. Variable:	SalePrice	R-squared:	0.089
Model:	OLS	Adj. R-squared:	0.081
Method:	Least Squares	F-statistic:	11.73
Date:	Wed, 22 Jan 2020	Prob (F-statistic):	6.83e-23
Time:	12:11:27	Log-Likelihood:	-18476.
No. Observations:	1460	AIC:	3.698e+04
Df Residuals:	1447	BIC:	3.705e+04
Df Model:	12		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	1.57e+05	9.41e+04	1.668	0.095	-2.76e+04	3.42e+05
RoofStyle[T.Gable]	-4.442e+04	5.51e+04	-0.806	0.421	-1.53e+05	6.37e+04
RoofStyle[T.Gambrel]	-6.612e+04	5.97e+04	-1.107	0.268	-1.83e+05	5.1e+04
RoofStyle[T.Hip]	2984.2166	5.53e+04	0.054	0.957	-1.06e+05	1.11e+05
RoofStyle[T.Mansard]	-4.79e+04	6.32e+04	-0.758	0.448	-1.72e+05	7.6e+04
RoofStyle[T.Shed]	-1.355e+04	7.94e+04	-0.171	0.865	-1.69e+05	1.42e+05
RoofMatl[T.CompShg]	5.801e+04	7.63e+04	0.760	0.447	-9.16e+04	2.08e+05
RoofMatl[T.Membran]	8.448e+04	1.21e+05	0.698	0.485	-1.53e+05	3.22e+05
RoofMatl[T.Metal]	2.298e+04	1.21e+05	0.190	0.849	-2.15e+05	2.6e+05
RoofMatl[T.Roll]	2.44e+04	1.08e+05	0.226	0.821	-1.87e+05	2.36e+05
RoofMatl[T.Tar&Grv]	3.243e+04	9.41e+04	0.345	0.730	-1.52e+05	2.17e+05
RoofMatl[T.WdShake]	1.051e+05	8.53e+04	1.231	0.218	-6.23e+04	2.72e+05
RoofMatl[T.WdShngl]	2.698e+05	8.24e+04	3.275	0.001	1.08e+05	4.31e+05

OLS Regression Results

Dep. Variable:	SalePrice	**R-squared:**	0.089
Model:	OLS	**Adj. R-squared:**	0.081
Method:	Least Squares	**F-statistic:**	11.73
Date:	Wed, 22 Jan 2020	**Prob (F-statistic):**	6.83e-23
Time:	12:11:27	**Log-Likelihood:**	-18476.
No. Observations:	1460	**AIC:**	3.698e+04
Df Residuals:	1447	**BIC:**	3.705e+04
Df Model:	12		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	1.57e+05	9.41e+04	1.668	0.095	-2.76e+04	3.42e+05
RoofStyle[T.Gable]	-4.442e+04	5.51e+04	-0.806	0.421	-1.53e+05	6.37e+04
RoofStyle[T.Gambrel]	-6.612e+04	5.97e+04	-1.107	0.268	-1.83e+05	5.1e+04
RoofStyle[T.Hip]	2984.2166	5.53e+04	0.054	0.957	-1.06e+05	1.11e+05
RoofStyle[T.Mansard]	-4.79e+04	6.32e+04	-0.758	0.448	-1.72e+05	7.6e+04
RoofStyle[T.Shed]	-1.355e+04	7.94e+04	-0.171	0.865	-1.69e+05	1.42e+05
RoofMatl[T.CompShg]	5.801e+04	7.63e+04	0.760	0.447	-9.16e+04	2.08e+05
RoofMatl[T.Membran]	8.448e+04	1.21e+05	0.698	0.485	-1.53e+05	3.22e+05
RoofMatl[T.Metal]	2.298e+04	1.21e+05	0.190	0.849	-2.15e+05	2.6e+05
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RoofMatl[T.Tar&Grv]	3.243e+04	9.41e+04	0.345	0.730	-1.52e+05	2.17e+05
RoofMatl[T.WdShake]	1.051e+05	8.53e+04	1.231	0.218	-6.23e+04	2.72e+05
RoofMatl[T.WdShngl]	2.698e+05	8.24e+04	3.275	0.001	1.08e+05	4.31e+05

Omnibus:	443.786	**Durbin-Watson:**	2.005
Prob(Omnibus):	0.000	**Jarque-Bera (JB):**	1626.866
Skew:	1.451	**Prob(JB):**	0.00
Kurtosis:	7.280	**Cond. No.**	198.