

IOWA STATE REAL ESTATE



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DATA

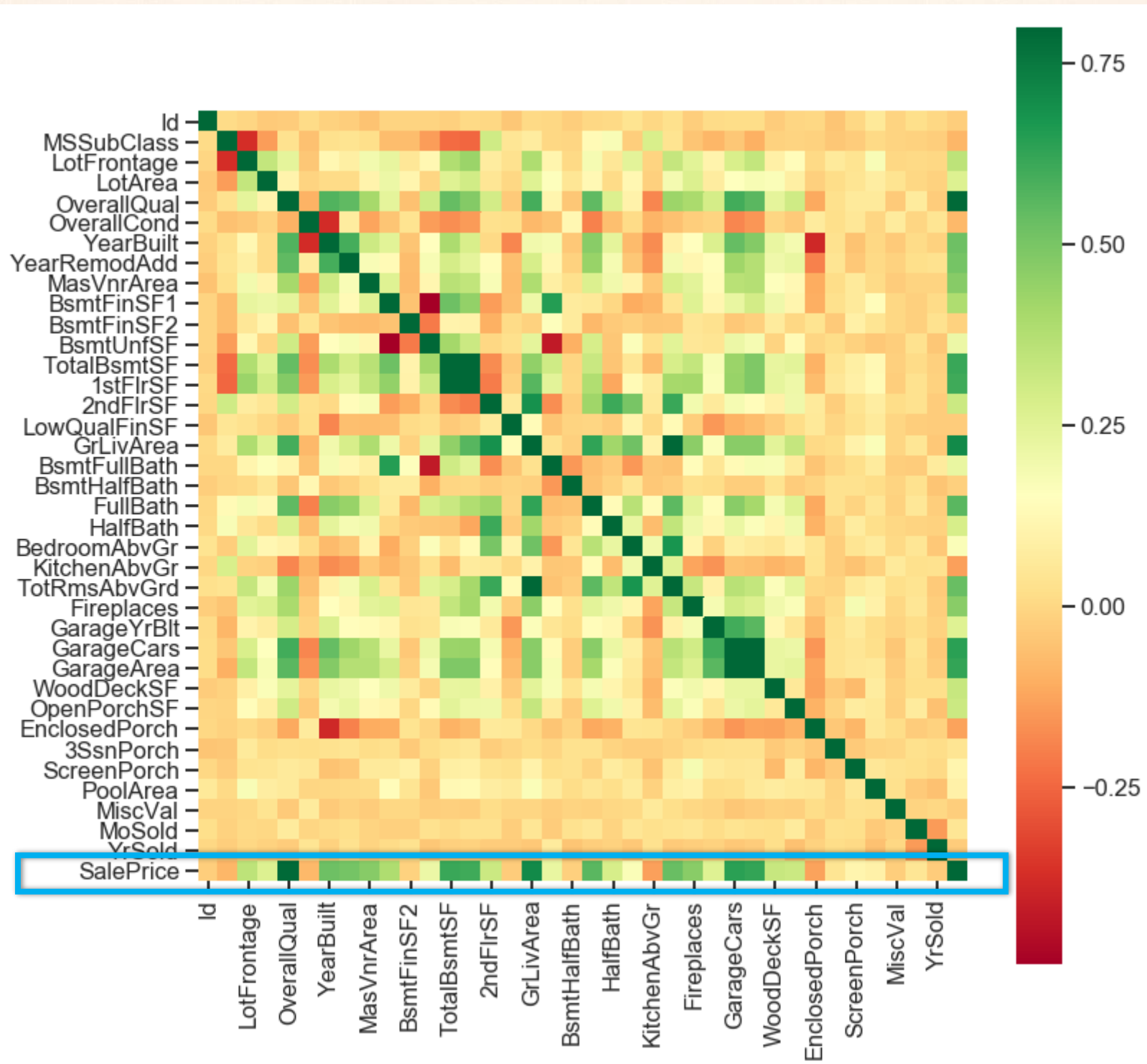
- 1460 observations and 81 attributes for period of 2006-2010
- Variable analysis: 38 Numerical, 43 Categorical
- Data cleaning:

1. Imputed Features with NaNs (e.g. PoolQC, Fence, FireplaceQu, etc.)

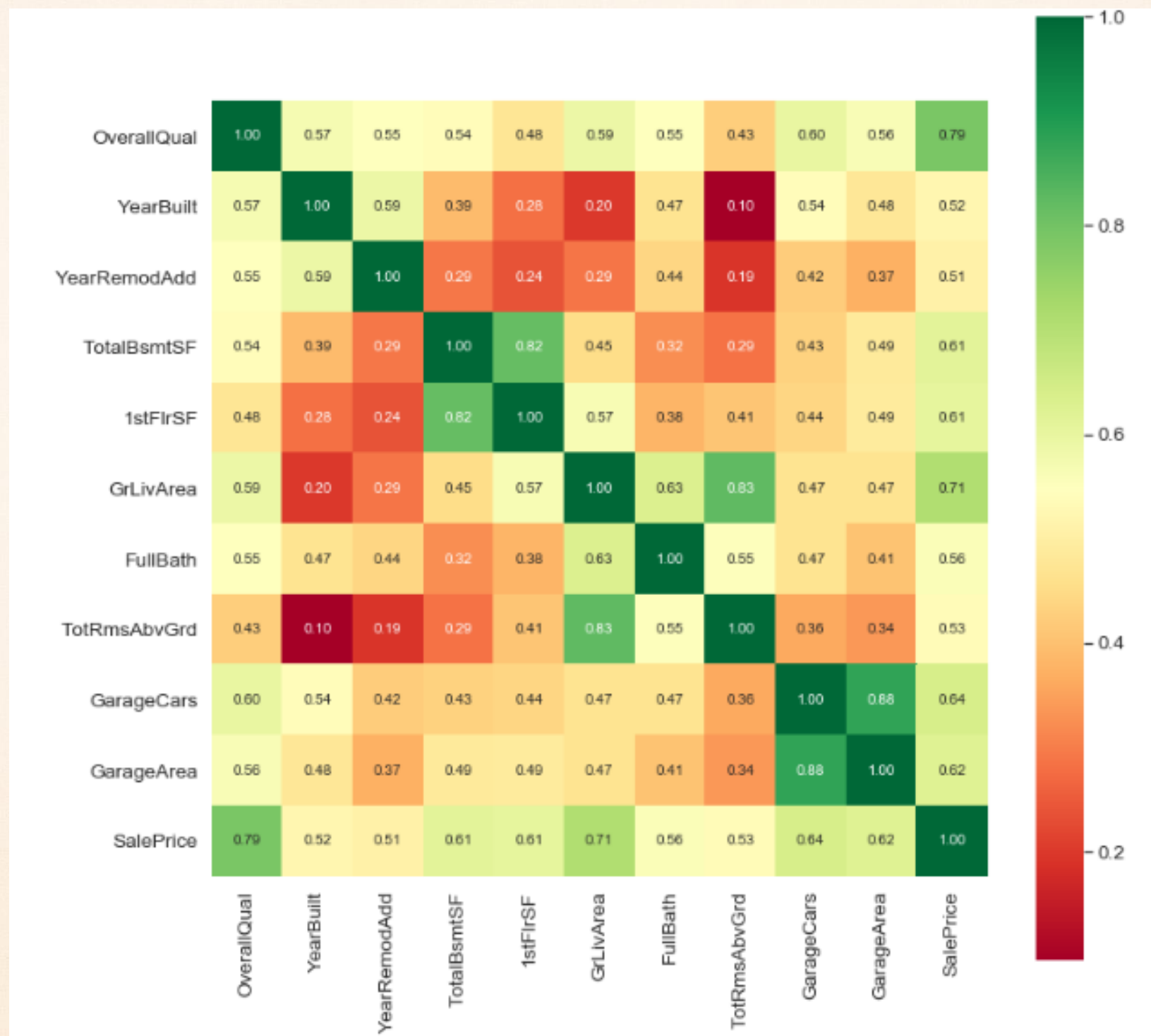
```
PoolQC: Pool quality  
Ex    Excellent  
Gd    Good  
TA     Average/Typical  
Fa     Fair  
NA     No Pool
```

- ## 2. Median and Mode used for filling NaNs (LotFrontage and Electrical respectively)
- ## 3. Second dataframe with categorical variables converted to numerical variables via `pd.get_dummies()`

Correlation Matrix



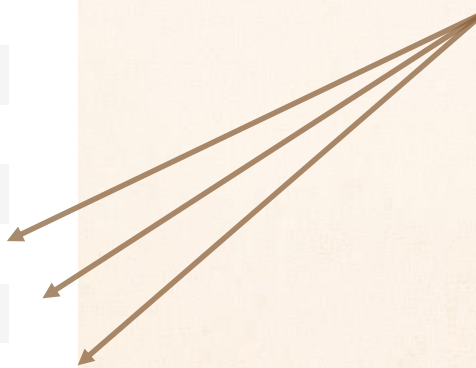
Focus: Top 10 Correlations with Sale Price > 0.5



CORRELATIONS

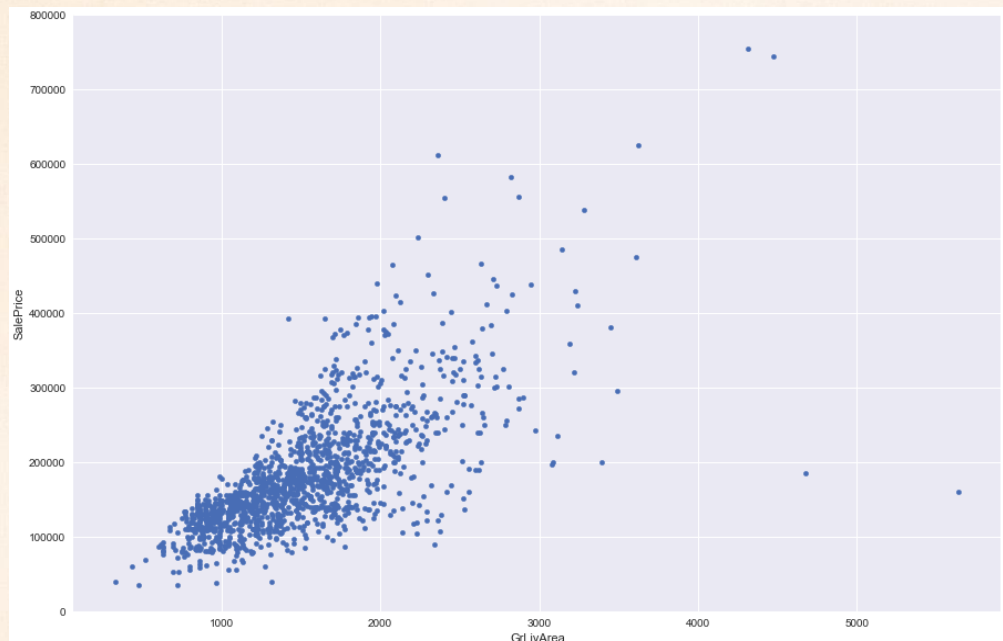
	index	Correlations
0	OverallQual	0.790982
1	GrLivArea	0.708624
2	GarageCars	0.640409
3	GarageArea	0.623431
4	TotalBsmtSF	0.613581
5	1stFlrSF	0.605852
6	FullBath	0.580884
7	BsmtQual_Ex	0.553105
8	TotRmsAbvGrd	0.533723
9	YearBuilt	0.522897
10	YearRemodAdd	0.507101
11	KitchenQual_Ex	0.504094
12	Foundation_PConc	0.497734
13	MasVnrArea	0.472614
14	Fireplaces	0.468929
15	ExterQual_Gd	0.452466
16	ExterQual_Ex	0.451164
17	BsmtFinType1_GLQ	0.434597
18	HeatingQC_Ex	0.434543
19	GarageFinish_Fin	0.419678
20	Neighborhood_NridgHt	0.402149

Assessed if any newly introduced numerical features from `pd.get_dummies()` positively impacted SalePrice more than the top 10 features previously found

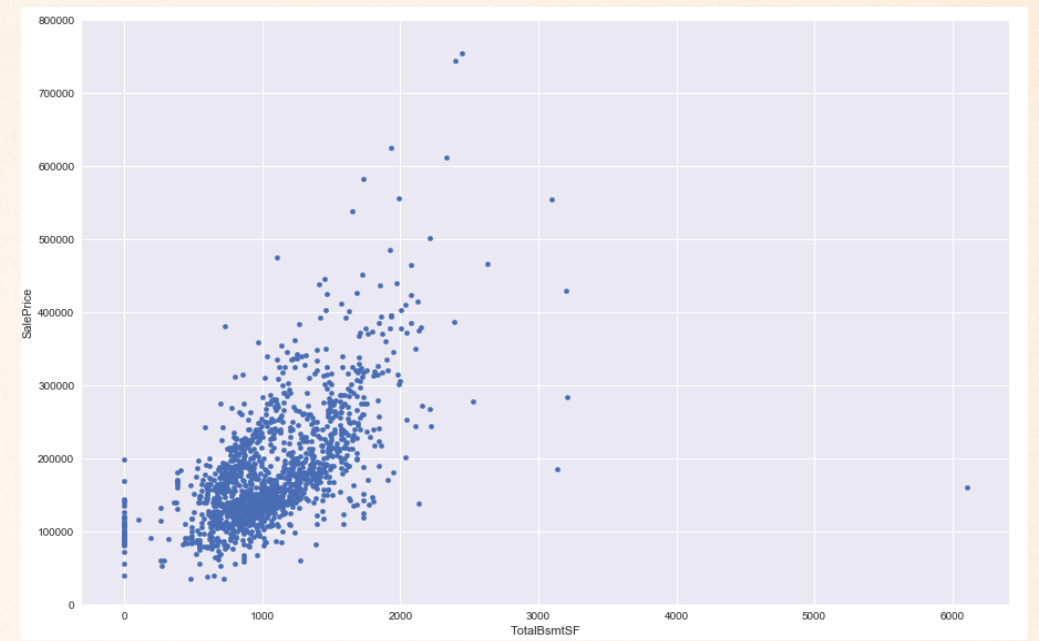


NUMERICAL FEATURES

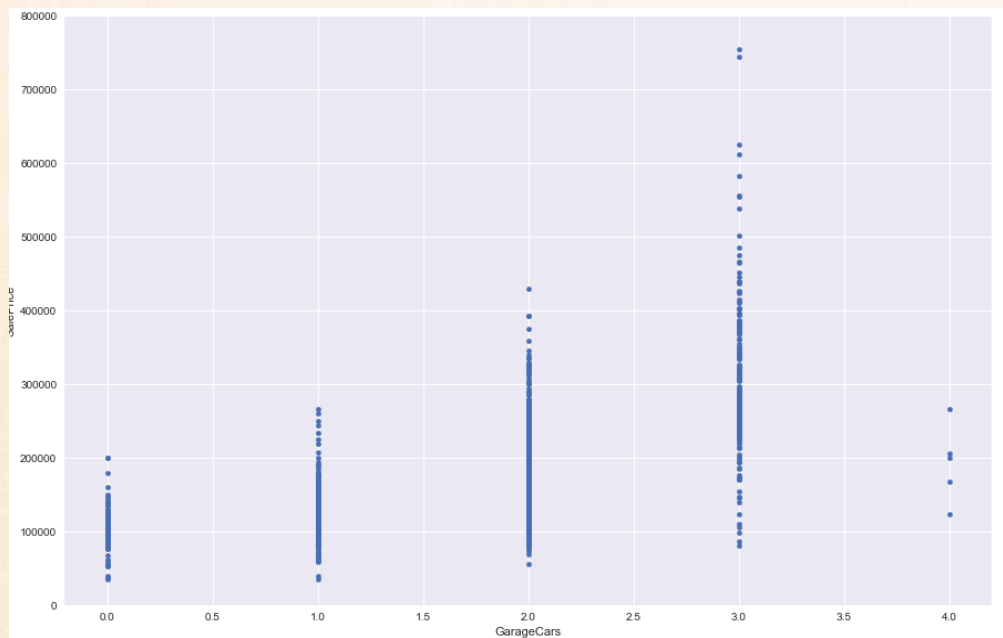
POSITIVELY CORRELATED VARIABLES TO SALE PRICE



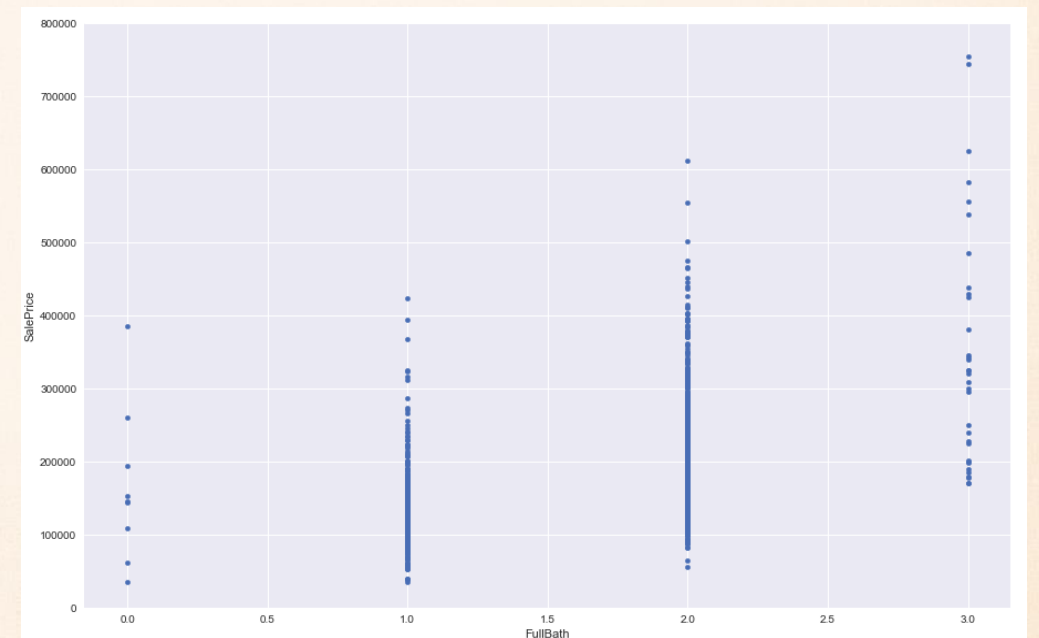
✦ Larger Living Area commanded higher sale price



✦ Sale price went up with higher 1st Floor SF

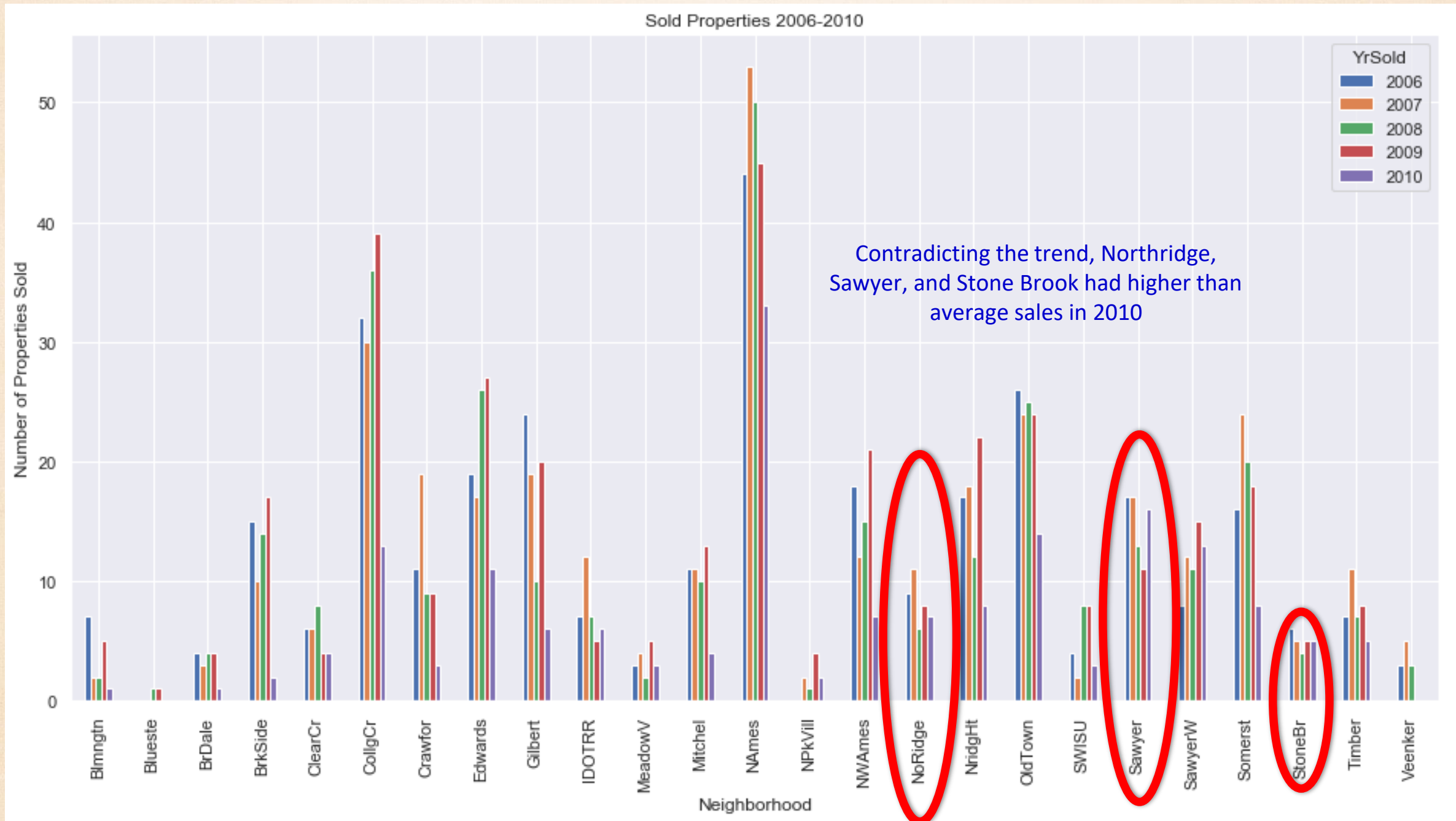


✦ Dwellings with space for 2-3 Garage spots commanded higher sale price



✦ Prices increased with the number of bathrooms

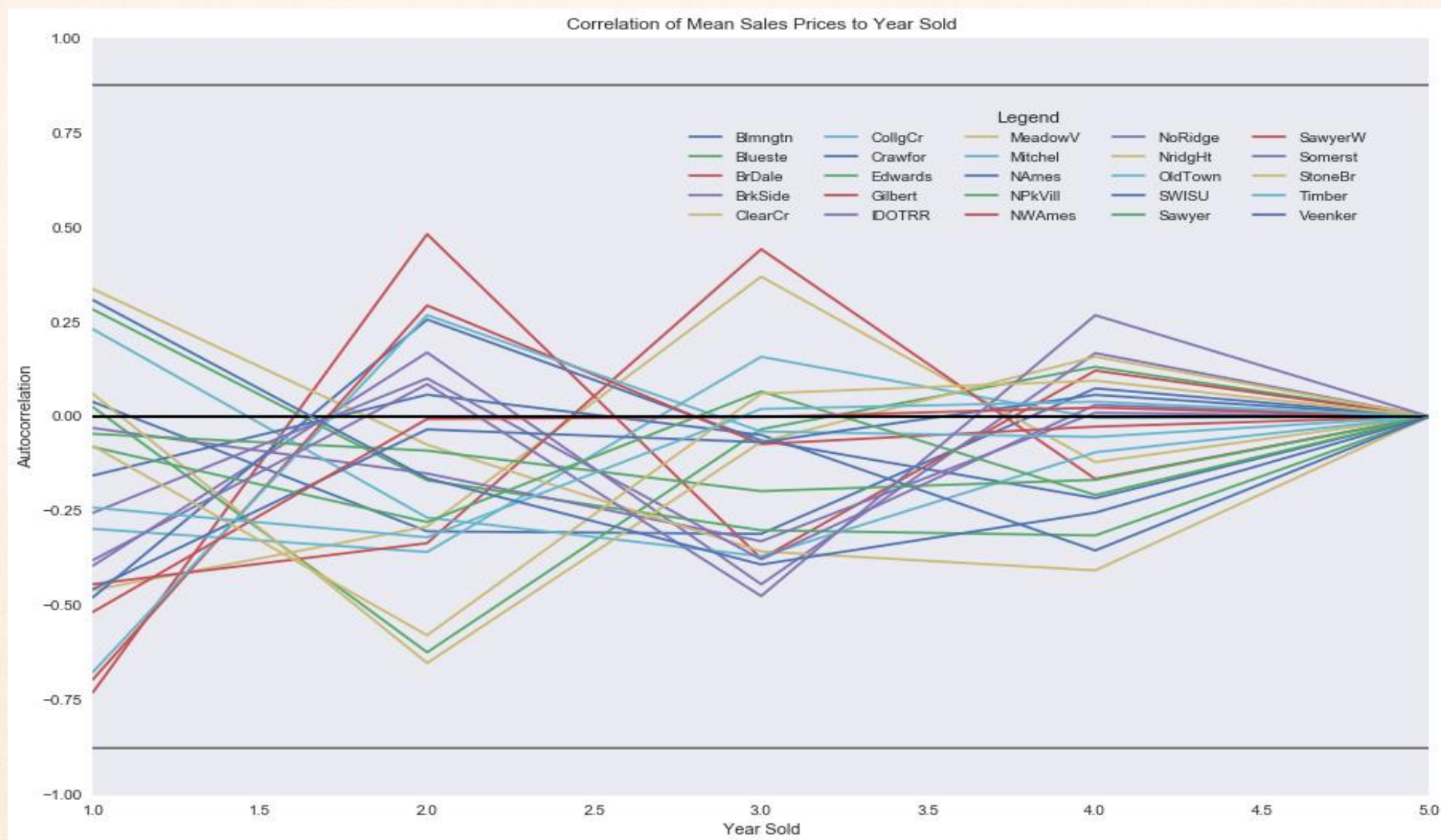
YEARLY SALES BY NEIGHBOURHOOD



TIME SERIES

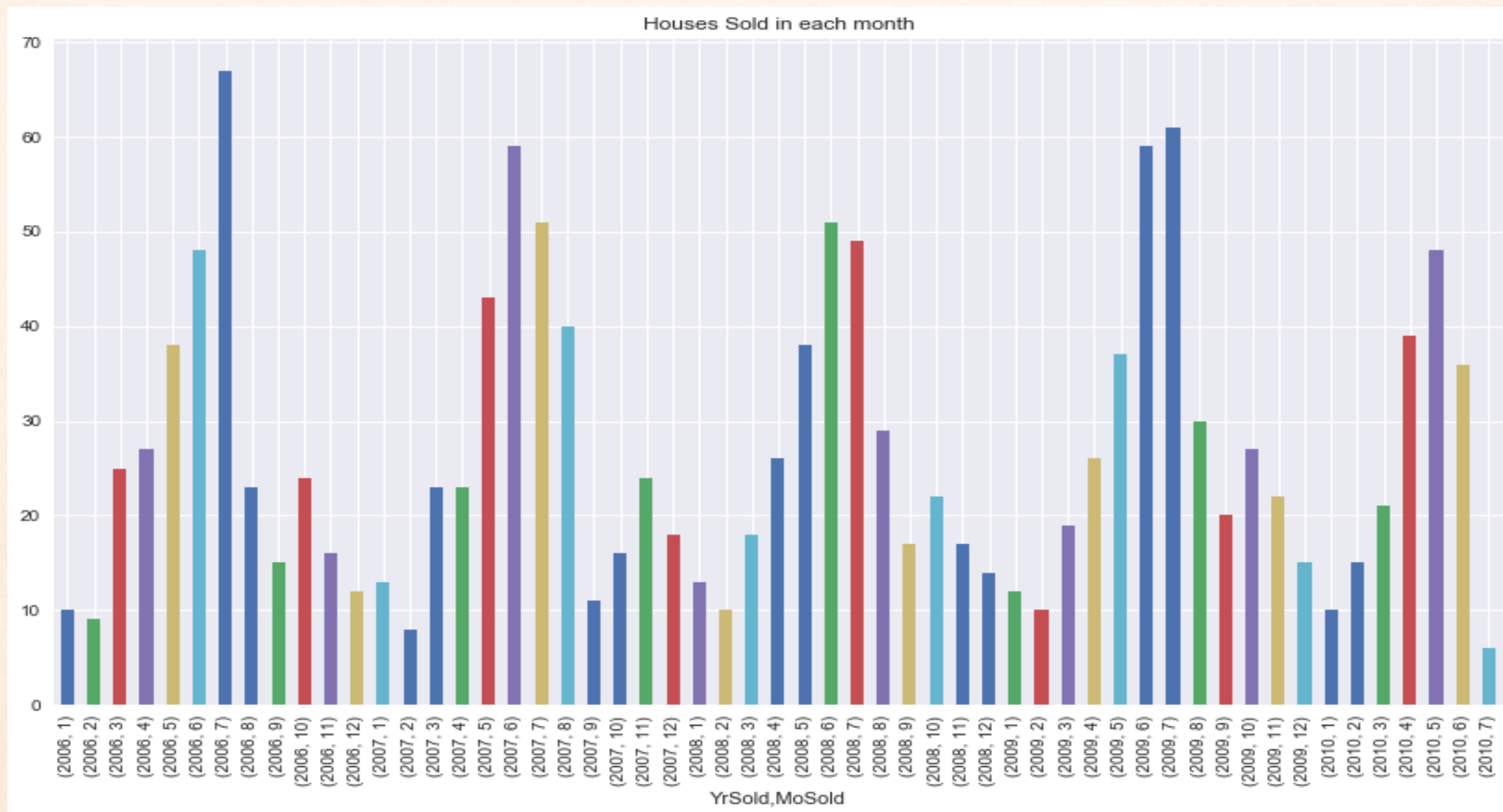
RELATIONSHIP TO TIME

Price volatility year over year ... now this is interesting!



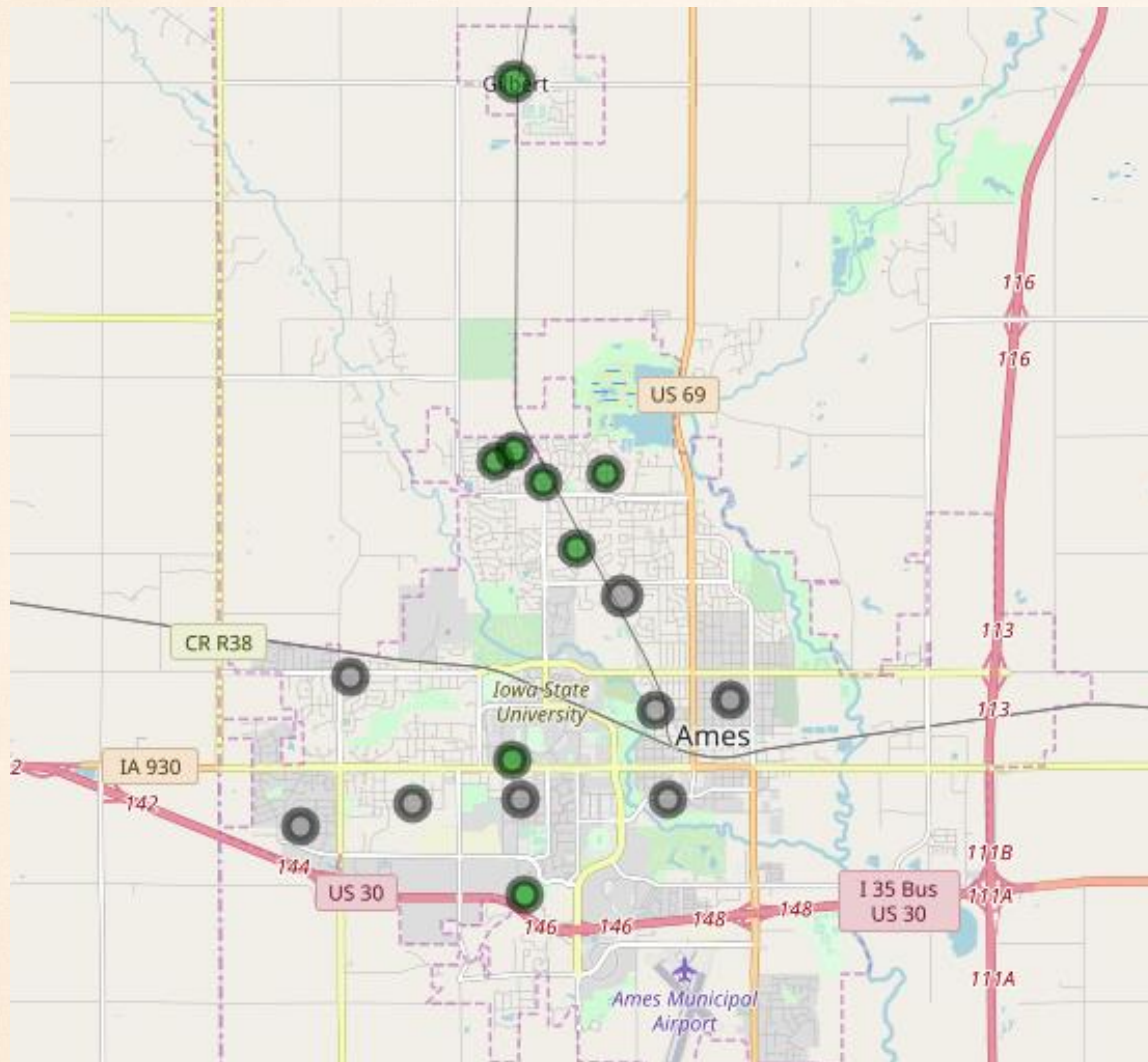
SEASONALITY

Sales tend to spike during summer !

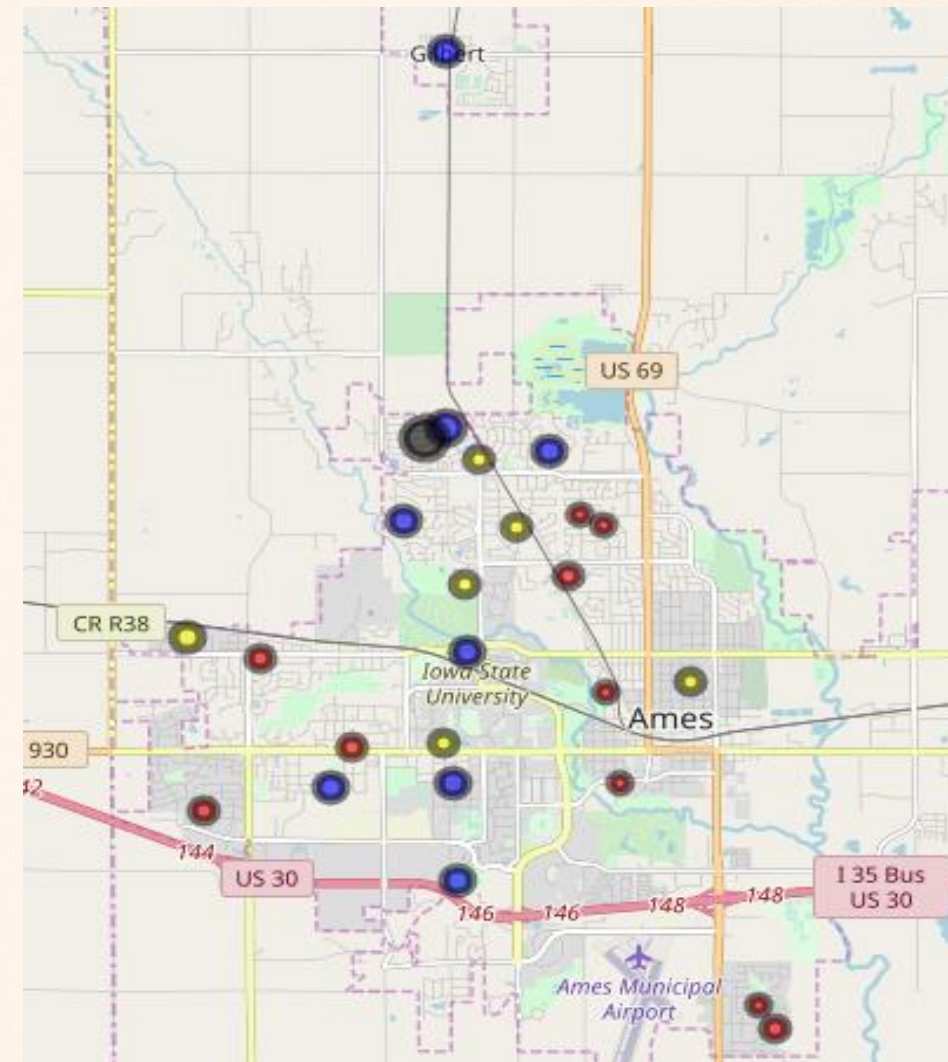


LOCATION, LOCATION,
LOCATION !

NEIGHBOURHOODS: AGE AND SIZE

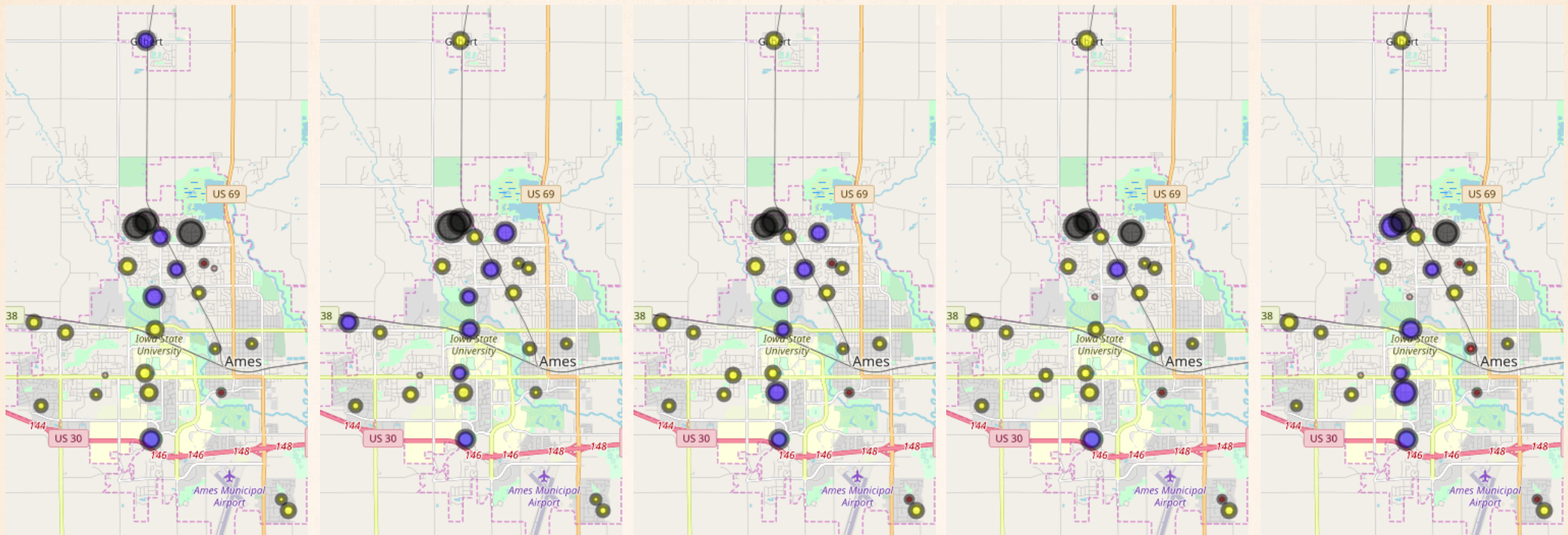


- New neighbourhoods
- Old neighbourhoods



- Sqft < 1,400
- Sqft < 1,600
- Sqft < 2,000
- Sqft > 2,000

Mean Prices Sold



2006

2007

2008

2009

2010

● < \$100,000

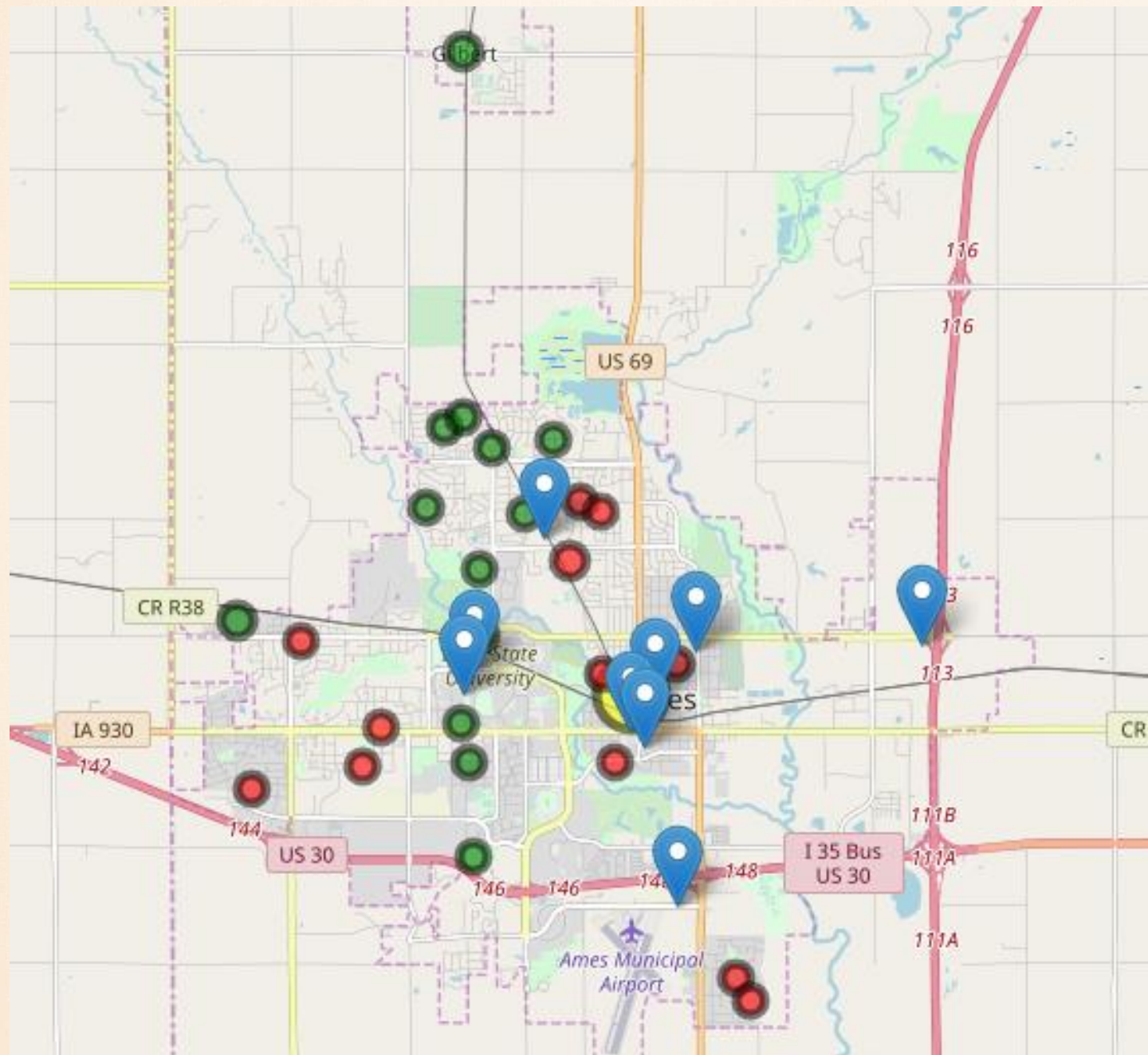
● \$100,000 - \$200,000





● \$200,000 - \$300,000

● > \$300,000

- 2006 – 2007: Migration from northern suburbs to city core
- 2007 – 2008: Continued migration to city core
- 2008 – 2009: Migration towards north from city core
- 2009 – 2010: Migration towards city core

Average Sale Price and Employment Centers



-  Major Employers
-  City centre
-  Prices >180k (Mean neighborhood price)
-  Prices <180k (Mean neighborhood price)



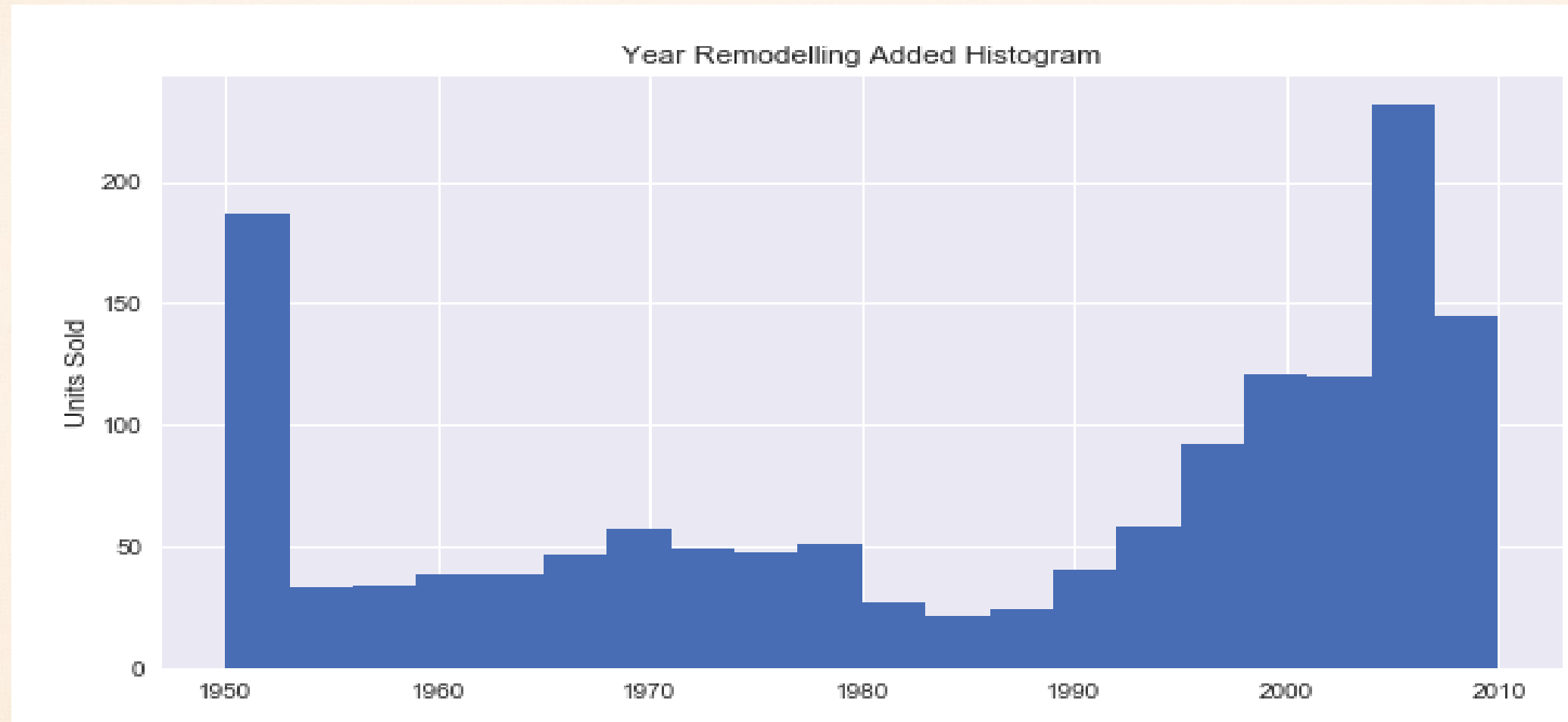
Neighbourhood & Renovation

	Neighborhood	YearBuilt	Name	long	lat	distance_to_core
0	Timber	1992.842105	Timberland	42.007234	-93.648143	3.13
1	NoRidge	1995.439024	Northridge	42.060431	-93.653055	4.51
2	CollgCr	1997.886667	College Creek	42.023780	-93.650083	2.39
3	Gilbert	1998.253165	Gilbert	42.107240	-93.650030	9.19
4	StoneBr	1998.480000	Stone Brook	42.059079	-93.634592	3.69
5	Somerst	2004.988372	Somerset	42.049758	-93.639465	2.90
6	Blmngtn	2005.235294	Bloomington Heights	42.057988	-93.645027	3.92
7	NridgHt	2005.675325	Northridge Heights	42.061875	-93.649814	4.49

- Houses remodeled prior to 1950's were in demand nearly as much as those done in recent years
- College Creek, Northridge Heights and Somerset are three most active old neighbourhoods

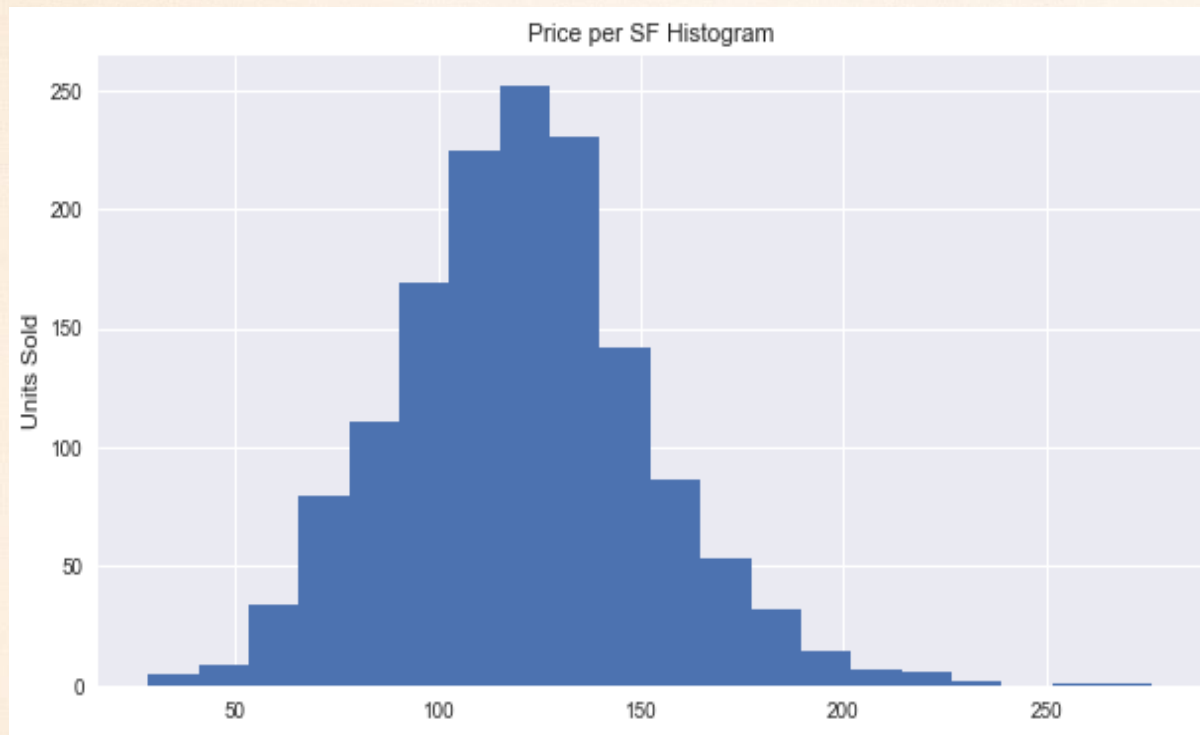
		Neighborhood Renovations																								
Renovation Year	>2000	0	0	0	34	4	0	19	44	3	25	0	1	70	0	0	0	0	49	14	4	2	0	0	3	0
	1960-1979	0	0	15	3	8	16	5	16	0	1	15	21	92	9	43	0	0	7	1	41	8	0	0	4	3
	1980-1999	0	2	0	9	11	33	10	9	30	7	0	16	30	0	21	34	0	27	6	17	35	6	9	10	6
	1940-1959	17	0	1	12	5	101	17	31	46	4	2	11	33	0	9	7	77	30	4	12	14	80	16	21	2
			Blmngtn	Blueste	BrDale	BrkSide	ClearCr	CollgCr	Crawfor	Edwards	Gilbert	IDOTR	MeadowV	Mitchel	NAMES	NPKVill	NWAMES	NoRidge	NridgHt	OldTown	SWISU	Sawyer	SawyerW	Somerst	StoneBr	Timber
		Neighborhood																								

Increased Trend of Remodeling:



Not normally distributed

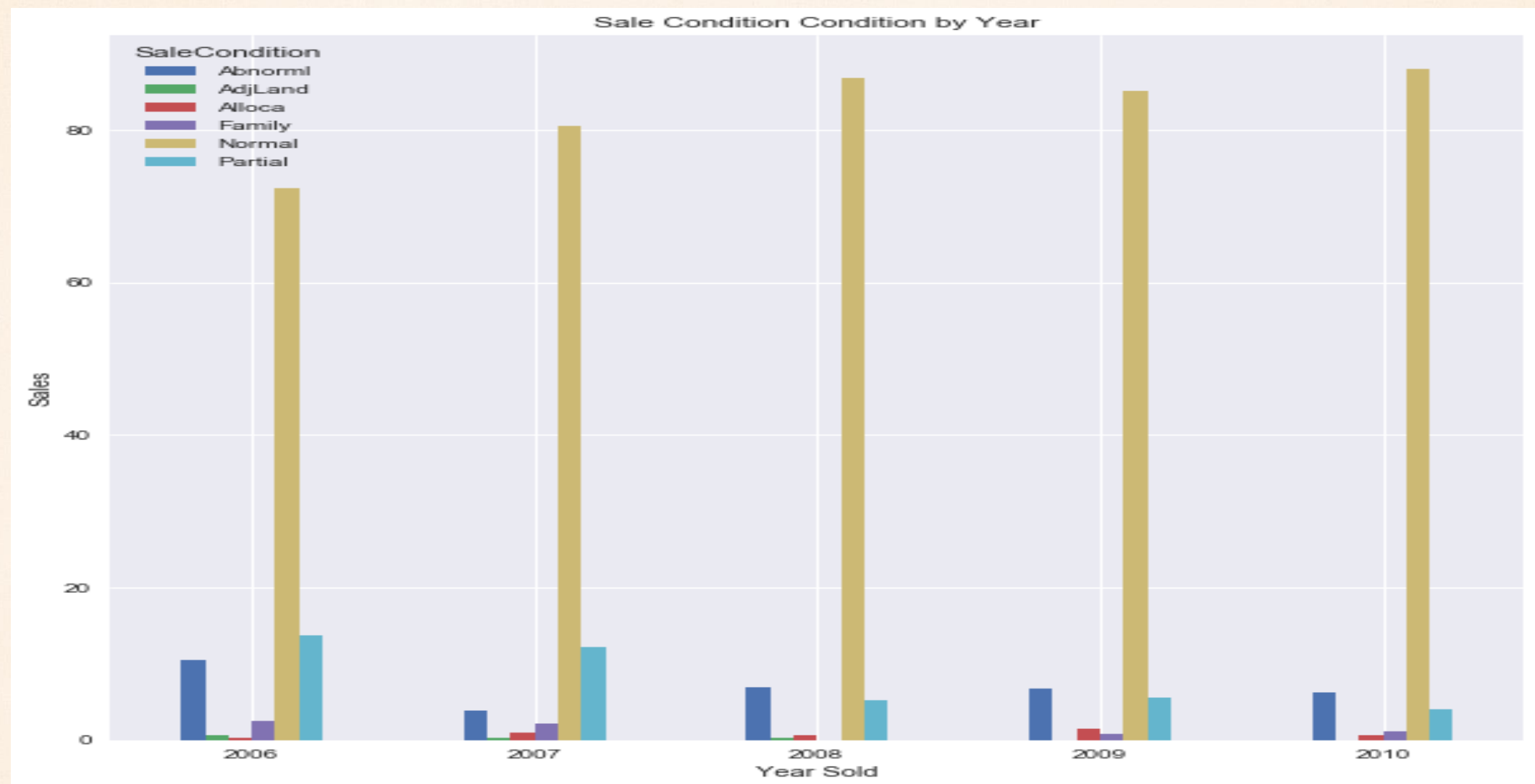
Price/Sqft and Sqft Range



- Engineered attribute Price/Sqft is shown to be normally distributed w.r.t. units sold
- \$150-200 per Sqft is the most prevalent price band
- Only two neighbourhoods had high Sqft > 251
- 19 neighbourhoods had Price/Sqft more than \$200

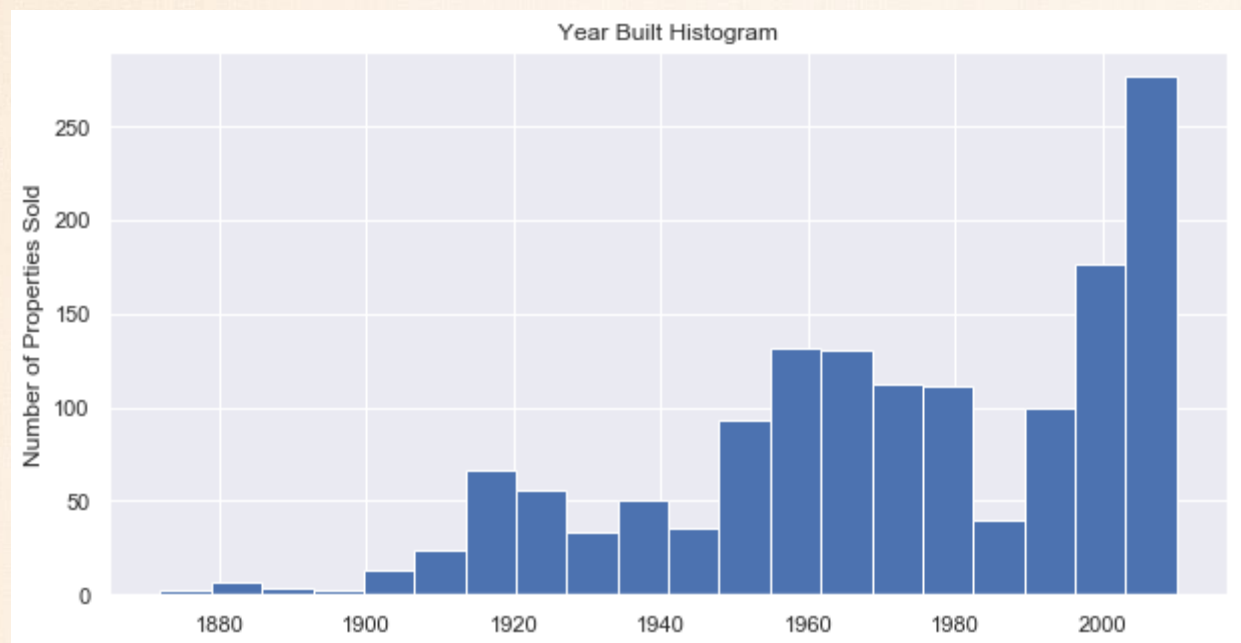
		Neighborhood Square Footage Ranges																								
SF Range	101-150	0	0	0	0	0	0	0	3	0	2	0	0	0	0	0	0	6	0	0	0	0	0	0	0	
	51-100	0	1	13	27	9	0	11	48	5	24	9	10	53	0	21	3	1	66	21	18	9	2	1	3	0
	151-200	13	1	3	29	12	113	33	44	70	10	8	29	162	8	51	29	26	40	4	48	45	55	8	20	6
	0-50	4	0	0	2	7	37	6	5	3	1	0	10	10	1	1	9	39	1	0	8	5	27	13	15	4
	201-250	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	10	0	0	0	0	2	2	0	1
	>251	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
		Blmngtn	Blueste	BrDale	BrkSide	ClearCr	CollgCr	Crawfor	Edwards	Gilbert	IDOTR	MeadowV	Mitchel	NAmes	NPKVill	NWAmes	NoRidge	NridgHt	OldTown	SWISU	Sawyer	SawyerW	Somerst	StoneBr	Timber	Veenker
		Neighborhood																								

Houses Sold by Sale Condition

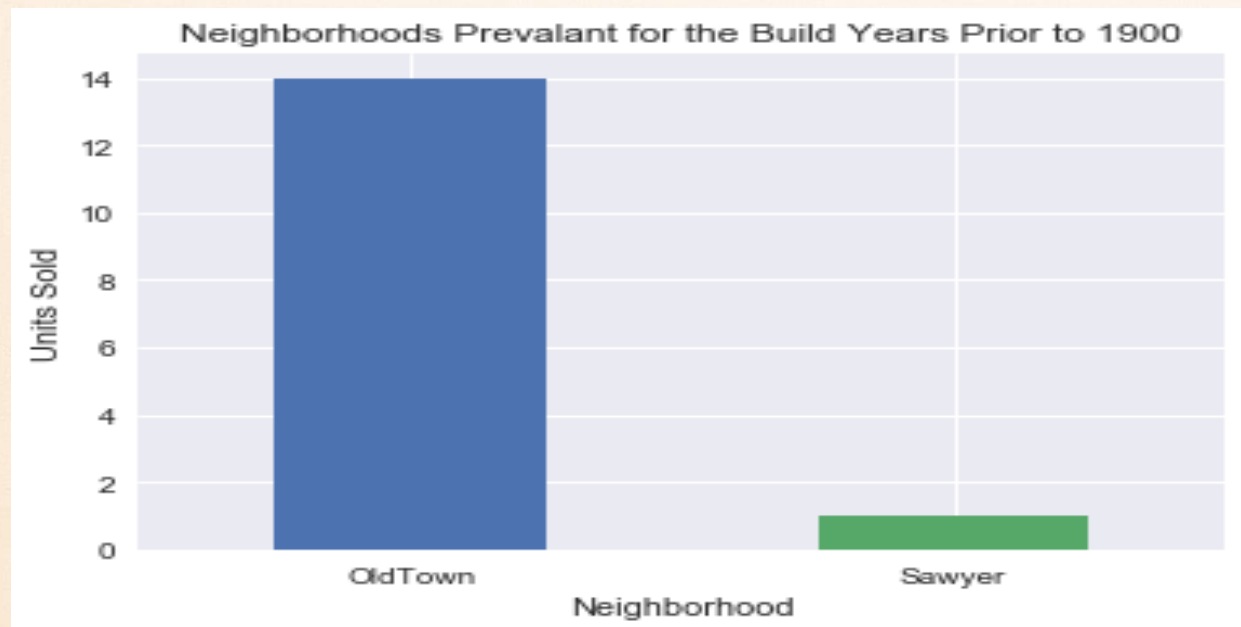


- Upward trend in Normal sales
- Abnormal and Partial sales declining
- No Family sales in 2008

2008 – Year of Old Neighbourhoods

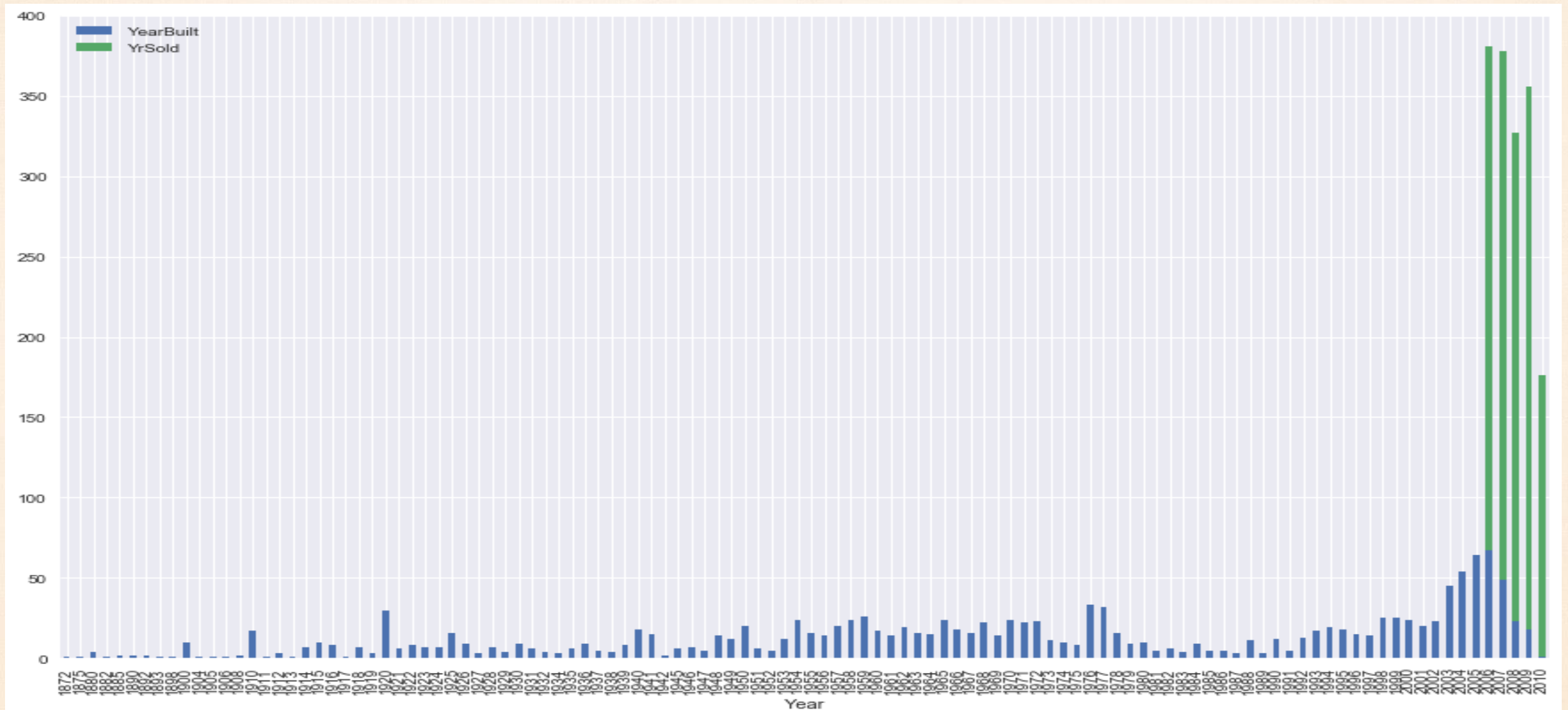


	YrBuilt_Group	mean
0	0-1899	2008.133333
1	1900-1919	2007.698630
2	1920-1939	2007.735099
3	1940-1959	2007.906504
4	1960-1979	2007.870523
5	1980-1999	2007.861607
6	>2000	2007.721649



- 2008 was the mean sale year for 19th century houses
- Old Town became more popular during the 5 year sales period in this category

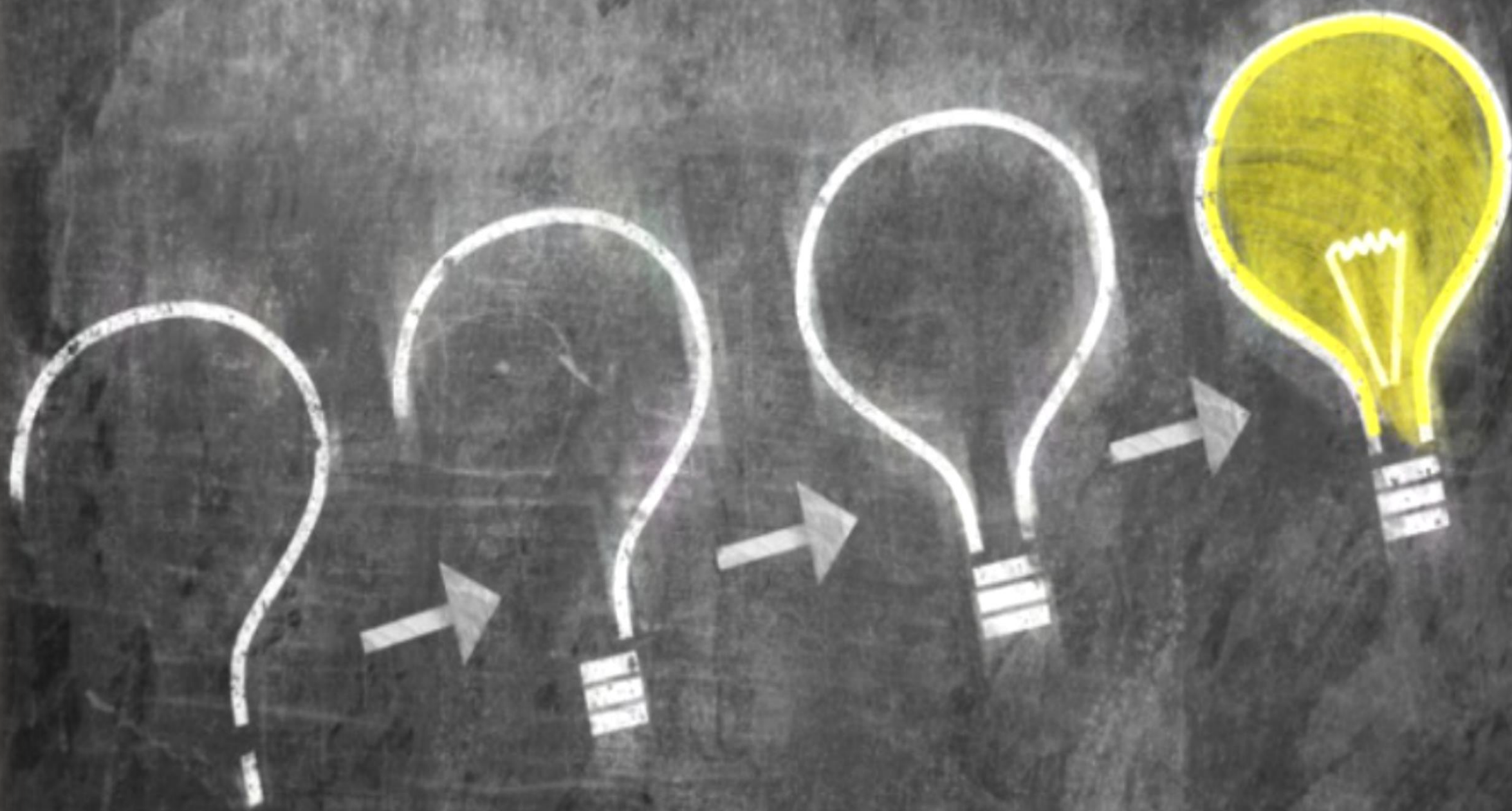
New Housing Peak



Preference of home buyers in Ames is towards newer builds

CONCLUSIONS

- Over time, satellite markets rotate in popularity and sales prices with a resulting trend to move out of the core and back in
- Houses in older neighbourhoods are more likely to increase in value.
- Inner city homes are closer to downtown core surrounded by employers, transportation hubs, arterial roads, and are considered starter homes
- Year 2008 saw a jump in sales for some neighbourhoods with old houses, e.g. Old Town, with a subsequent increase in average sale prices
- Northridge and Northridge Heights – adjacent neighbourhoods - one has high square footage and lower PPSF while the other has premium houses with a high PPSF; both tend to have some of the highest mean sale prices



APPENDIX

Demographics

In 2017, Ames had a population of 66,498.^[6] Iowa State University is home to 36,321 students (Fall 2017),^[7] which make up approximately one half of the city's population.

2010 Census

As of the census^[3] of 2010, there were 58,965 people, 22,759 households, and 9,959 families residing in the city. The population density was 2,435.6 inhabitants per square mile (940.4/km²). There were 23,876 housing units at an average density of 986.2 per square mile (380.8/km²). The racial makeup of the city was 84.5% White, 3.4% African American, 0.2% Native American, 8.8% Asian, 1.1% from other races, and 2.0% from two or more races. Hispanic or Latino of any race were 3.4% of the population.

There were 22,759 households of which 19.1% had children under the age of 18 living with them, 35.6% were married couples living together, 5.4% had a female householder with no husband present, 2.7% had a male householder with no wife present, and 56.2% were non-families. 30.5% of all households were made up of individuals and 6.2% had someone living alone who was 65 years of age or older. The average household size was 2.25 and the average family size was 2.82.

The median age in the city was 23.8 years. 13.4% of residents were under the age of 18; 40.5% were between the ages of 18 and 24; 22.9% were from 25 to 44; 15% were from 45 to 64; and 8.1% were 65 years of age or older. The gender makeup of the city was 53.0% male and 47.0% female.

Top employers [\[edit \]](#)

According to Ames's 2015 Comprehensive Annual Financial Report , the top employers in the city are:

#	Employer	# of Employees
1	Iowa State University	15,695
2	Mary Greeley Medical Center	1,287
3	City of Ames	1,226
4	Iowa Department of Transportation	920
5	McFarland Clinic	910
6	Hy-Vee	790
7	Ames Community School District	679
8	Danfoss	650
9	Wal-Mart	435
10	Ames Laboratory	432

Source: [Wikipedia](#)