Predicting Housing Prices in Ames, Iowa

Agenda

1. Background
2. Problem Statement
3. Methodology
4. Key Findings
5. Conclusion & Recommendations
6. Limitations & Next Steps

Background

Ames, Iowa Demographics (2019)

👨‍👩‍👧‍👦 66,258

🏠 $234,100 (median)

💰 $50,528 per capita

Mean property prices

$236,588

All housing units

$127,269

2 unit structures

🏘️ $248,938

Detached houses

2. Problem Statement

We: Team of data-driven property agents in Ames, Iowa.

You: Home owners in Ames, Iowa.

Why us? Provide insights backed by data instead of mere gut feel.

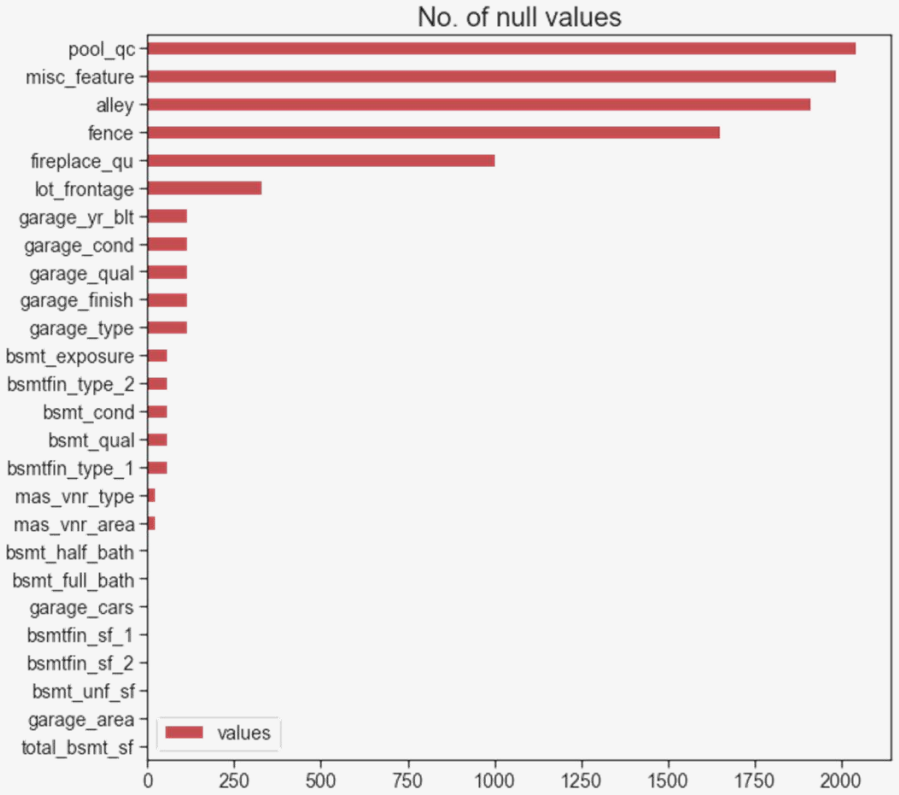
What's in it for homeowners:

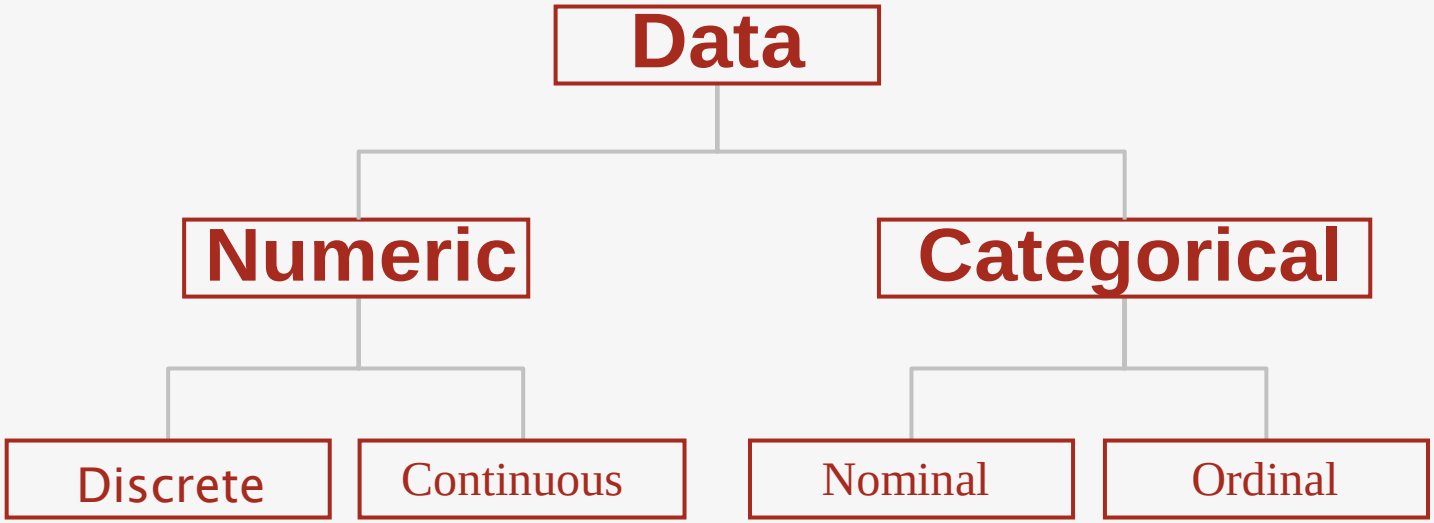
1. Optimal selling price
2. Favourable features of house &/or surroundings
3. Ways to enhance house's attractiveness to potential buyers

3. Methodology

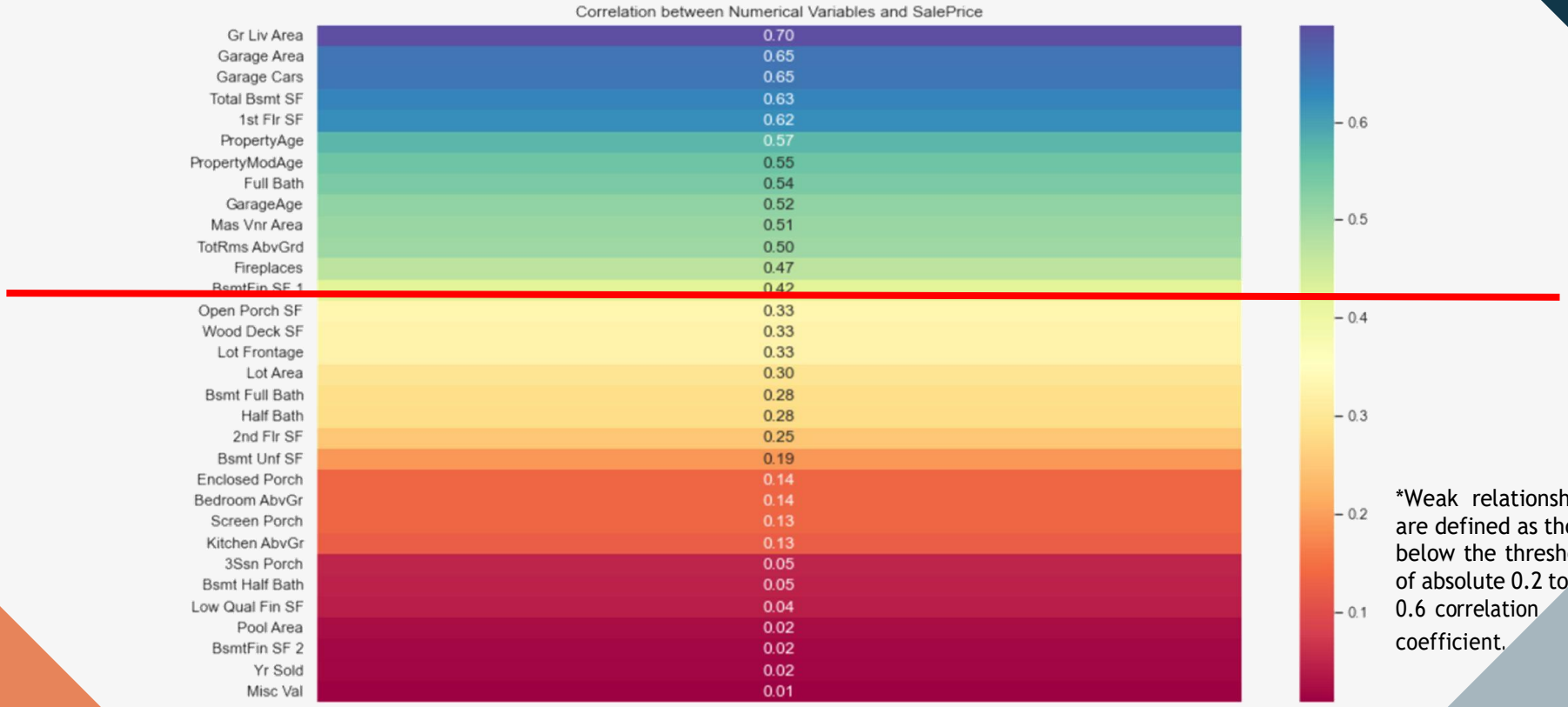
1. **Scope of data:** Housing prices between 2006 to 2010 in Ames, Iowa
2. **Exploratory Data Analysis (EDA) & Data cleaning**
3. **Data preprocessing & modelling**

A lot of our data is missing.




Data
Numeric
Categorical
Discrete
Continuous
Nominal
Ordinal

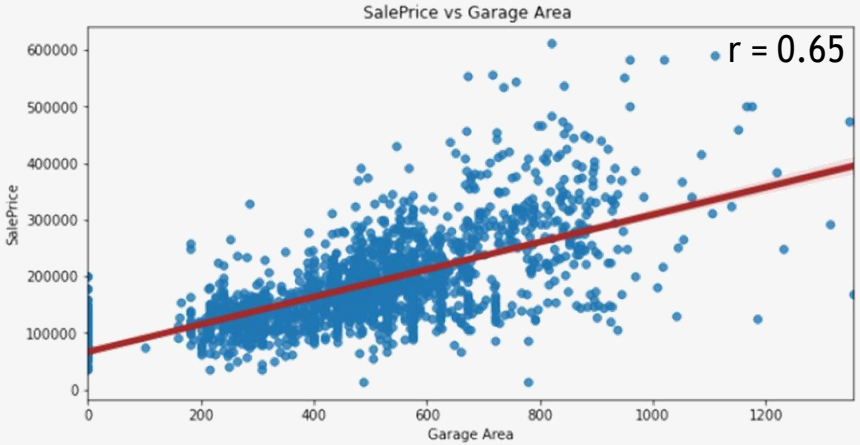
Excluded numeric data with Weak relationships* to SalePrice



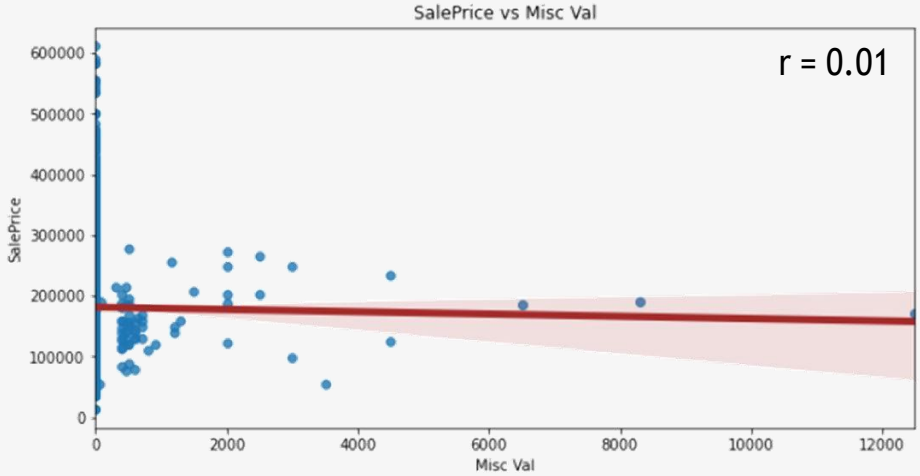
*Weak relationships are defined as those below the threshold of absolute 0.2 to 0.6 correlation coefficient.

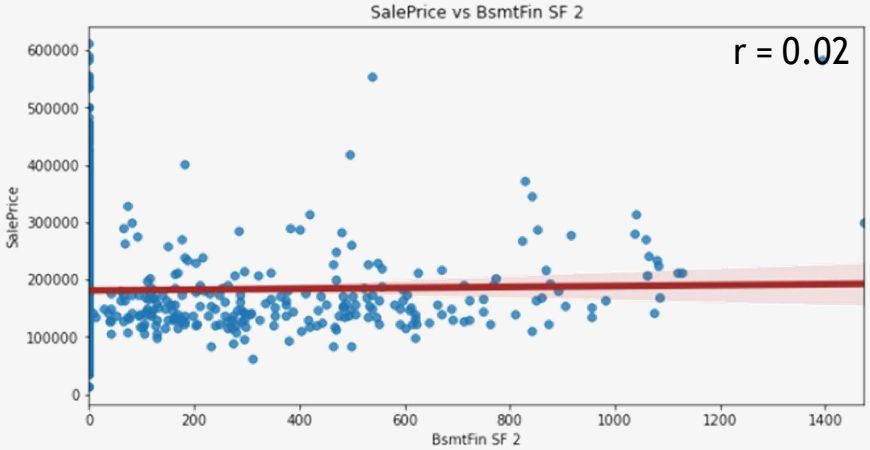
As ground liv area ↑ SalePrice ↑

As garage area ↑ SalePrice ↑

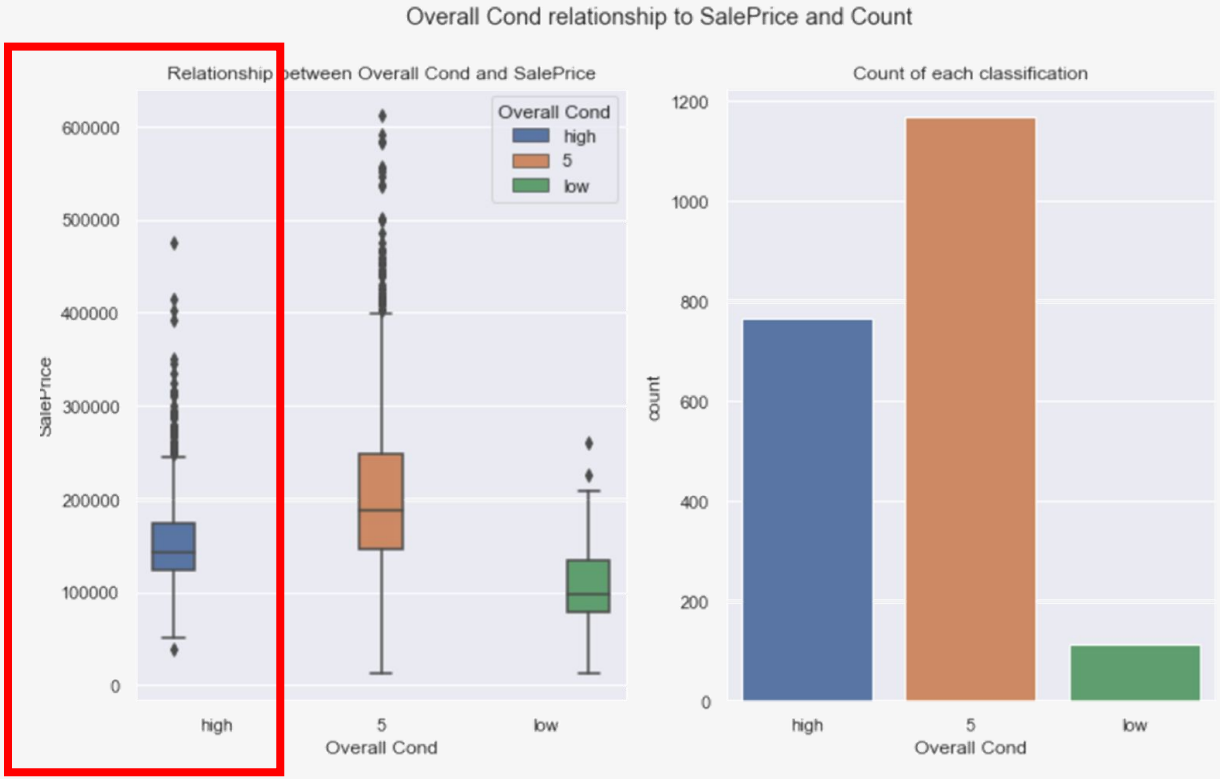


Data has insignificant relationship with SalePrice

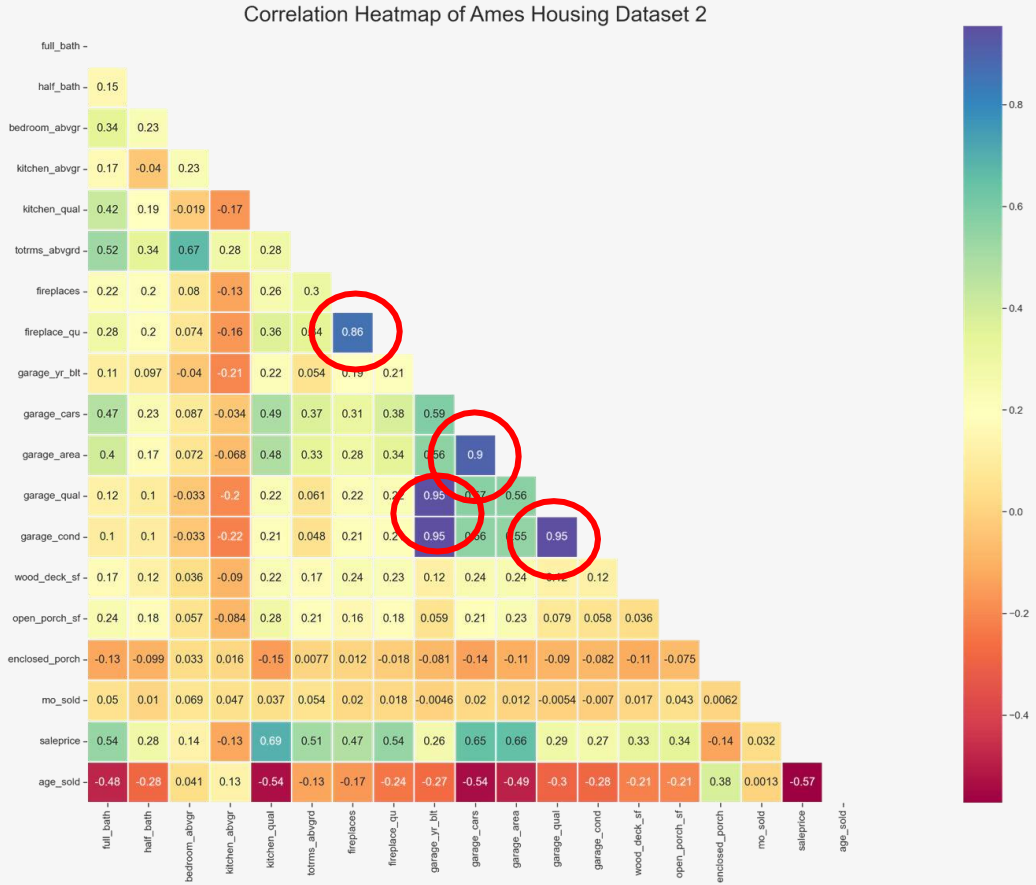




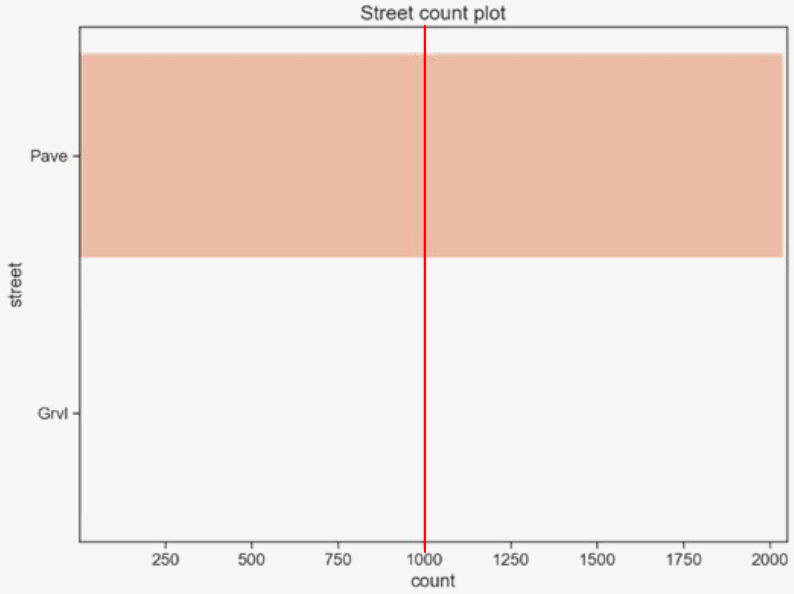
Excellent overall condition does not mean ↑ price

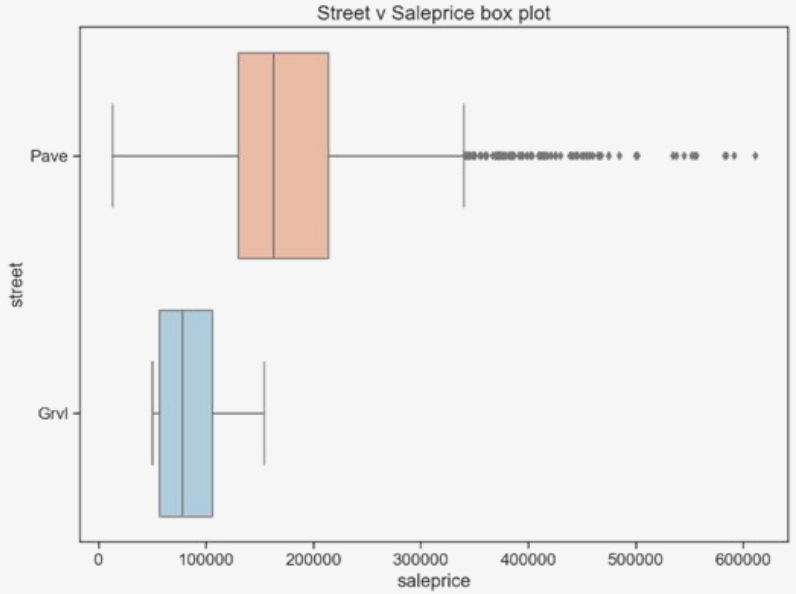


Some data points are highly related to each other



Excluded categorical data that had a single, dominant category





Feature Engineering

Variables with weak correlation with Sale Price:

- OpenPorchSF
- EnclosedPorch
- 3SsnPorch
- ScreenPorch
- PoolArea
- Bsmt_Cond
- BsmtFinType1
- BsmtFinSF2
- BsmtFinType2
- WoodDeckSF

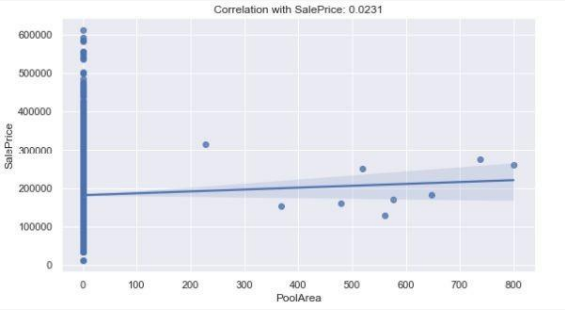
Feature Engineering

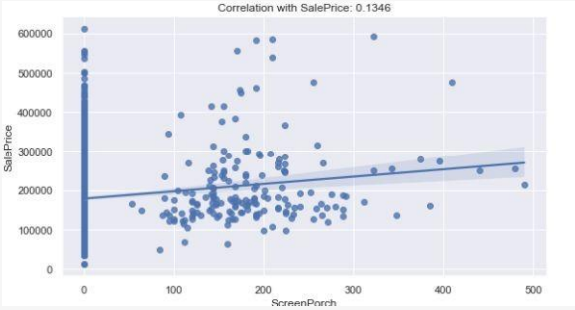
OpenPorchSF
EnclosedPorch
3SsnPorch
ScreenPorch
PoolArea

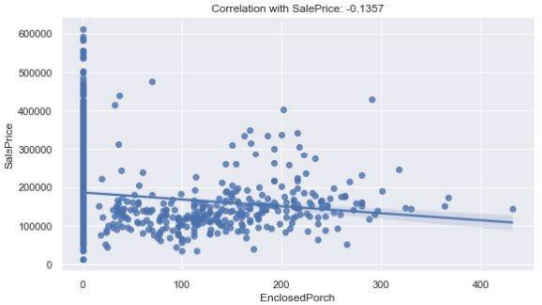
TotallivingPremiseSF

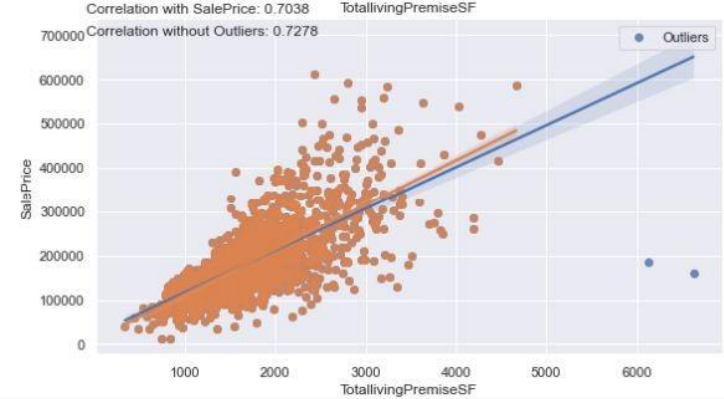
OpenPorchSF + EnclosedPorch + 3SsnPorch + ScreenPorch + PoolArea + GrLivArea

Feature Engineering









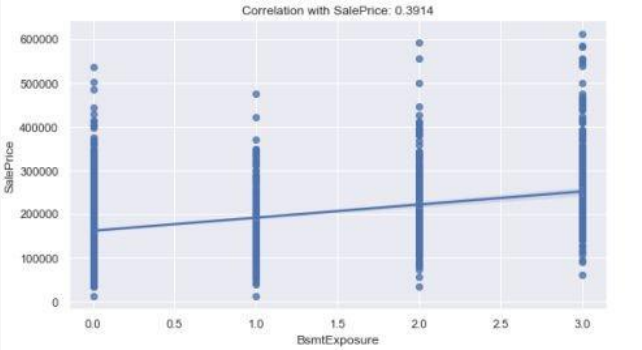
Feature Engineering

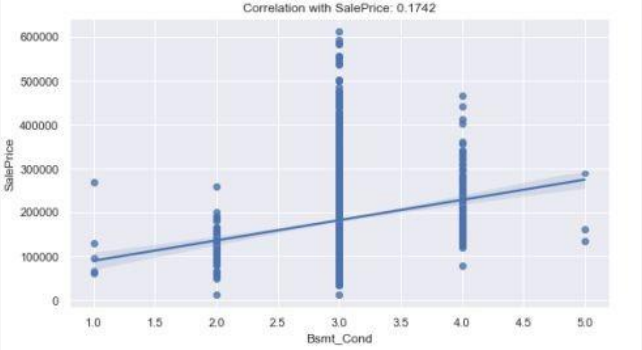
TotalBsmtSF
Bsmt_Qual
Bsmt_Cond
BsmtExposure

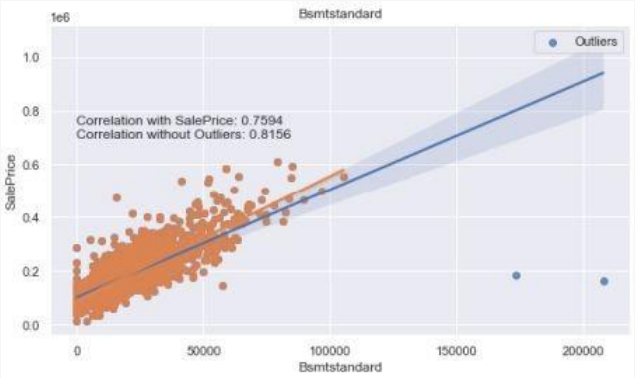
Bsmtstandard

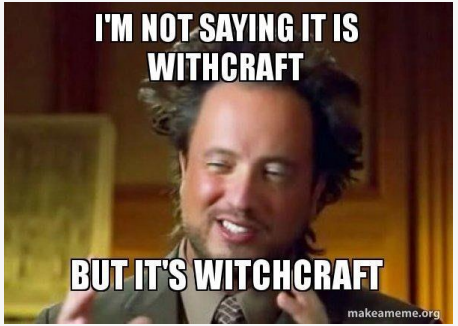
TotalBsmtSF x (Bsmt_Qual ^2 + Bsmt_Cond+ BsmtExposure^2)

Feature Engineering









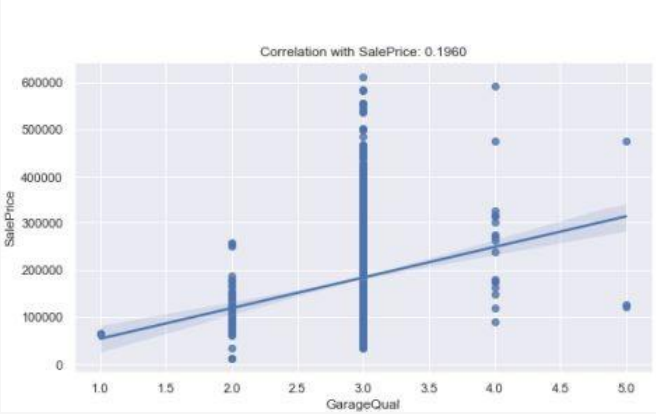
Feature Engineering

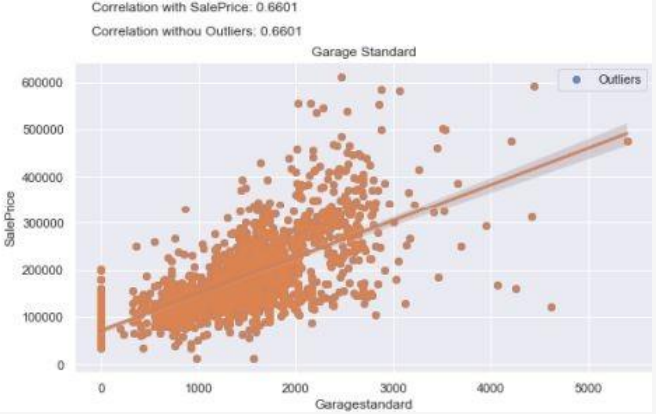
GarageArea
GarageQual

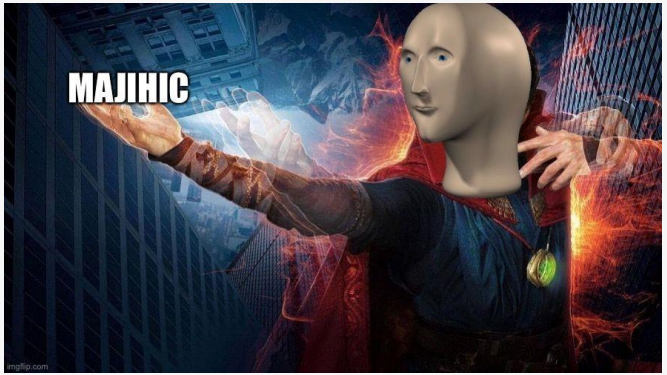
GarageArea x GarageQual

Garagestandard

Feature Engineering







List Of Regressions Used

- Linear Regression
- Lasso Regression
- Ridge Regression

Agent 1’s Model - Ridge Regression

- Ridge Regression best, based on Root Mean Square Error (RMSE)
- Imputed continuous, numerical variables using average, and categorical variables using the most observed categories.

Agent 2’s Model - Lasso Regression

- Rank features based on the strength of their influence

  → the stronger, the better

- Imputed continuous, numerical variables using iterative imputer

H2H Model Performance

Model	Metric (RMSE)	Stability
Model 1 - Agent 1’s Ridge	26, 364	Less stability
Model 2 - Agent 2’s Lasso	25, 530	More stability

Final number of features: Model 1 - 44 features (16 categorical and 28 numerical features)
Final number of features: Model 2 - 57 features (32 categorical and 25 numerical features)

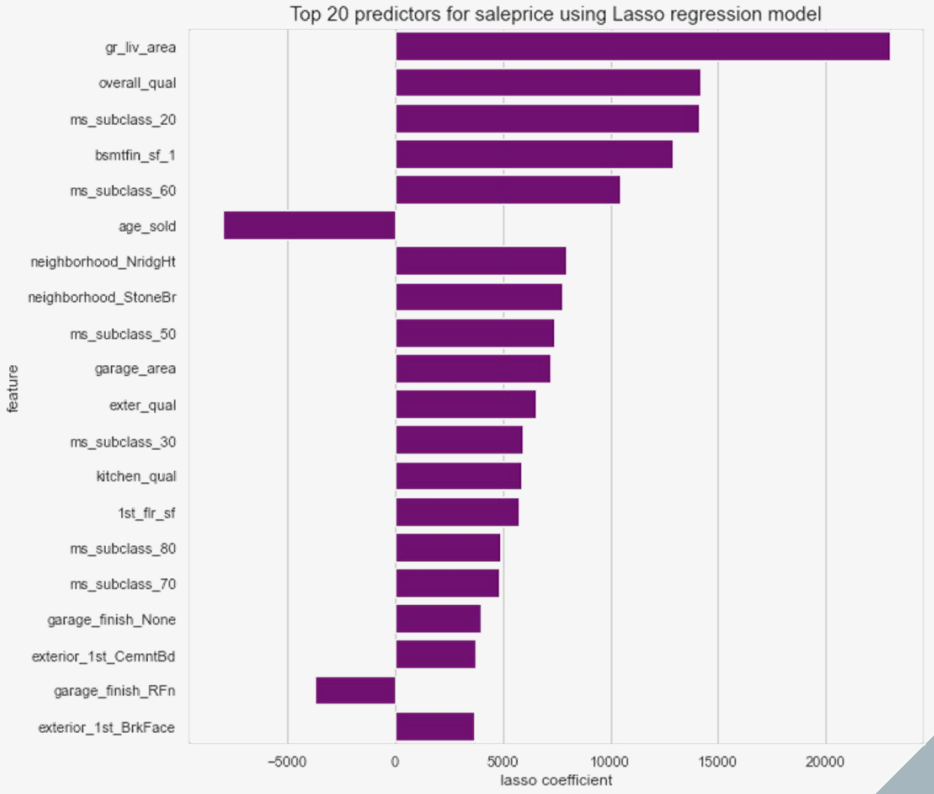
Top 3 Tips to enhancing your house's value

Want better offers for your house?

1. Maintain good / excellent quality of house thru regular maintenance and upkeep of interior / exterior features

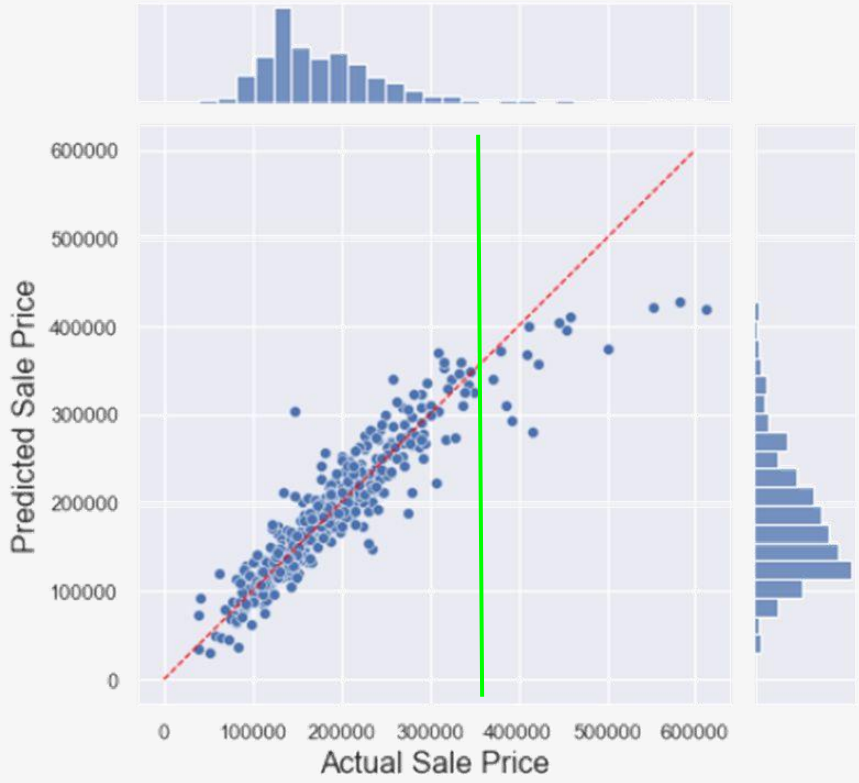
2. Have good / excellent quality kitchen to attract better prices

3. Consider remodelling esp if house is old, to reinstate it to its former glory, i.e. Uplift overall quality of house

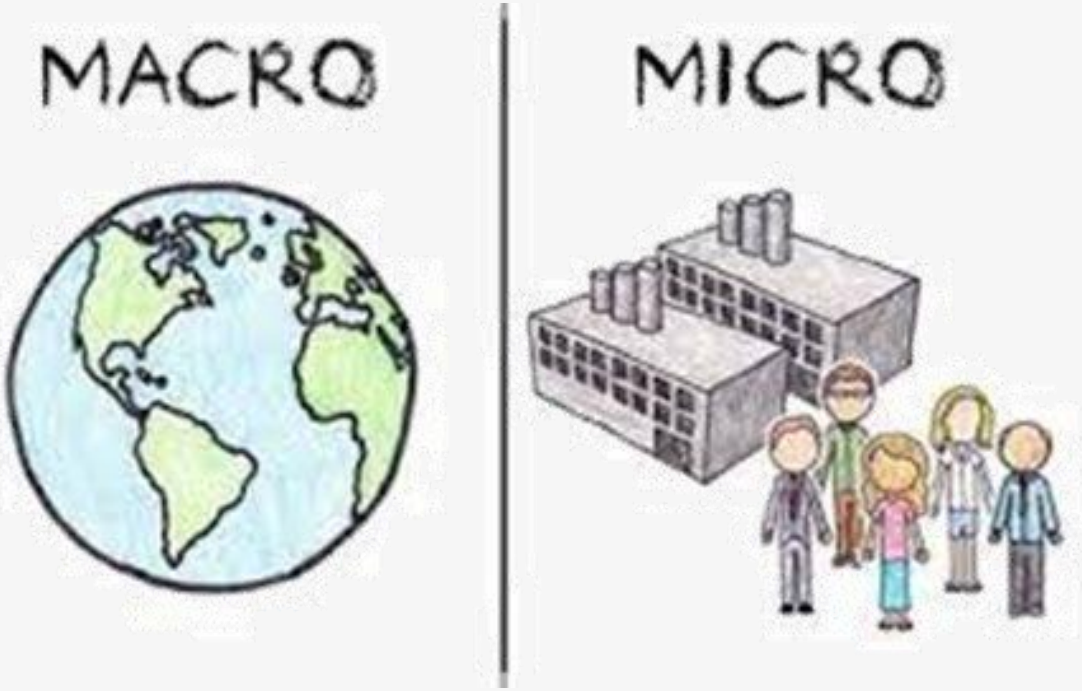


Technical Limitations and Next Steps

1. Our pricing model will underprice properties with high expected Sale Price
2. Looking at the increasing size of error as Sale Price gets large, can experiment with non-linear forms



General Limitations



MICRO	MACRO
Lacking further data points	Bank interest mortgages
Ambiguity in given dataset (overall qual? Bsmt qual? How is it determined?)	Unemployment rates
Dataset is specific to Ames only	Crime rates

THANK YOU