



Residential Home Sale Price In Ames

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The Question:

What determines the value of a home in Ames?

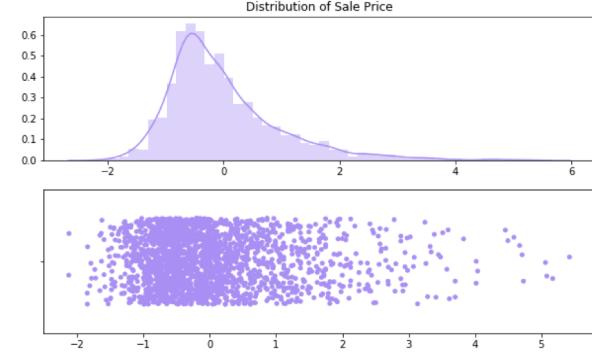
Outline:

- Model Walkthrough
- Key Features
- Recommendation

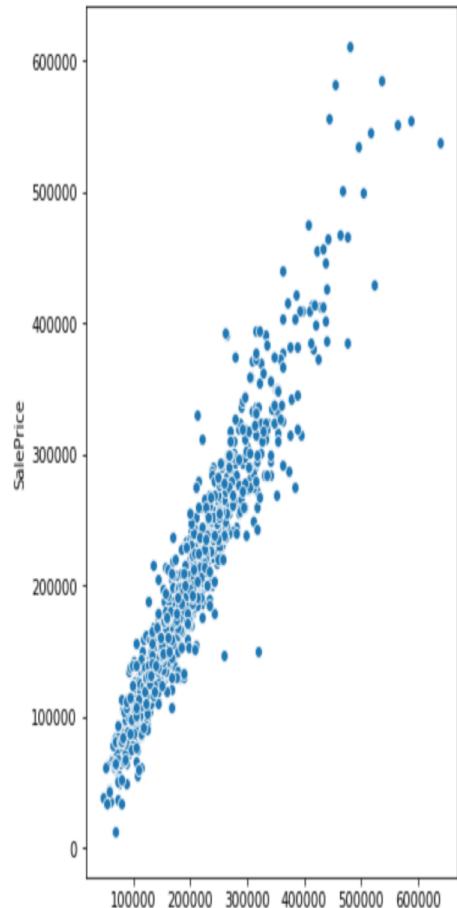
Modeling

Steps:

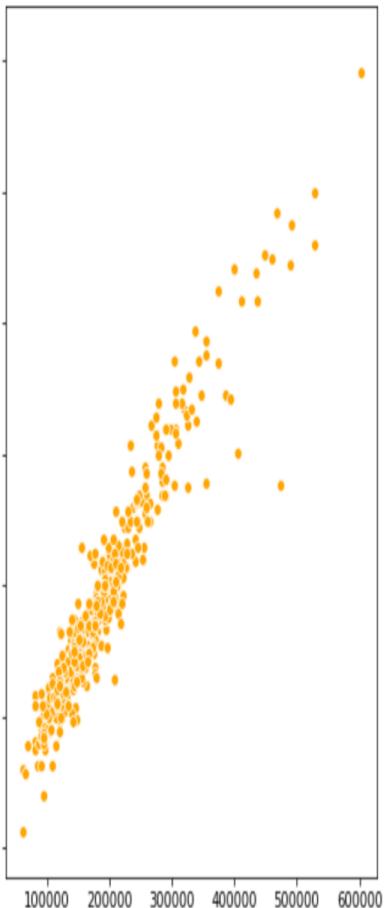
- EDA and Data Cleaning
 - Sale Price Trend
 - 42 Categorical Features and 39 Numerical Features
 - Numeric null -> mean, Categorical Null -> None
- Numerical Features Extraction
 - Run Linear Regression with all numeric features
 - Select the ones with p-values less than 0.05
- Bench Mark Models (dummies and selected numerical features, polynomial transformation, standardization of X)
 - Linear Regression
 - Ridge Regression
 - Lasso Regression
 - Elastic Net Regression
- Model Tuning (dummies and selected numerical features, polynomial transformation, standardization of X and Y)
- Key Features Selection
 - Select variables with high coefficients in Lasso Model
 - Run Linear Regression with selected variables and extract the features with p-value < 0.05



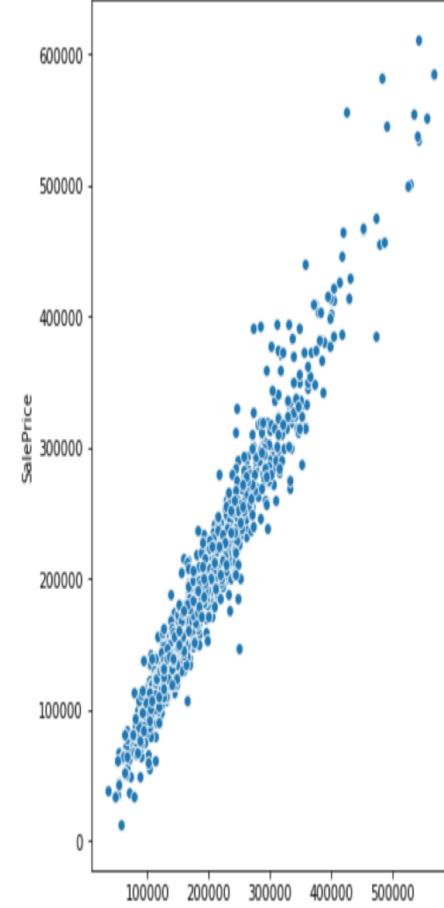
Y train hat vs Y train



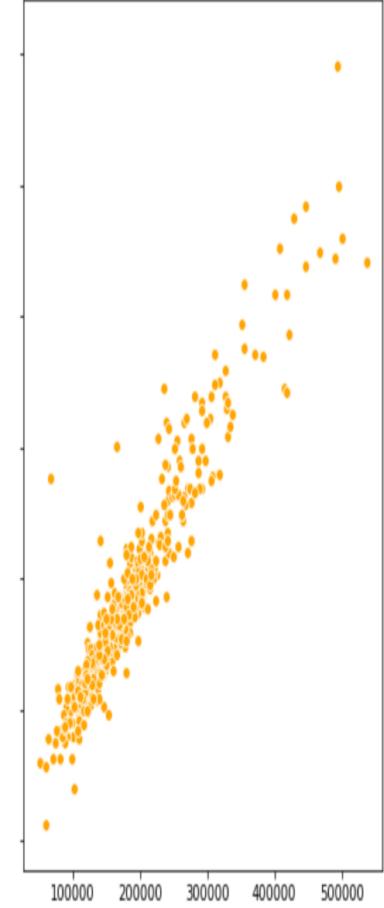
Y Test hat vs Y Test



Y train hat vs Y train



Y Test hat vs Y Test



Multi-Linear Regression Model, R² = 0.92

Lasso Regression Model, R² = 0.93

Key Features

```
results.pvalues[results.pvalues < 0.01].sort_values(ascending = True)
```

2nd Flr SF	4.479263e-105
2nd Flr SF Neighborhood_StoneBr	6.973964e-24
Overall Qual Year Built	1.772577e-20
Overall Cond	2.637874e-20
Overall Qual	5.340683e-19
Total Bsmt SF Neighborhood_NridgHt	1.369379e-12
Lot Area	3.727975e-12
1st Flr SF	5.158102e-10
Year Built	4.946925e-07
Lot Frontage 1st Flr SF	6.321421e-07
BsmtFin SF 1 Total Bsmt SF	8.944371e-07
const	1.745324e-06
BsmtFin SF 1 Neighborhood_OldTown	1.700293e-04
Lot Frontage Lot Area	2.493116e-04
Overall Qual Neighborhood_NoRidge	2.829986e-04
Overall Cond Exterior 1st_BrkFace	5.306161e-04
Total Bsmt SF Garage Area	5.847221e-04
Total Bsmt SF Neighborhood_NWAmes	1.056178e-03
Lot Frontage Bedroom AbvGr	2.610867e-03
Neighborhood_Sawyer	4.990712e-03
2nd Flr SF Garage Cond_Ex	5.100771e-03

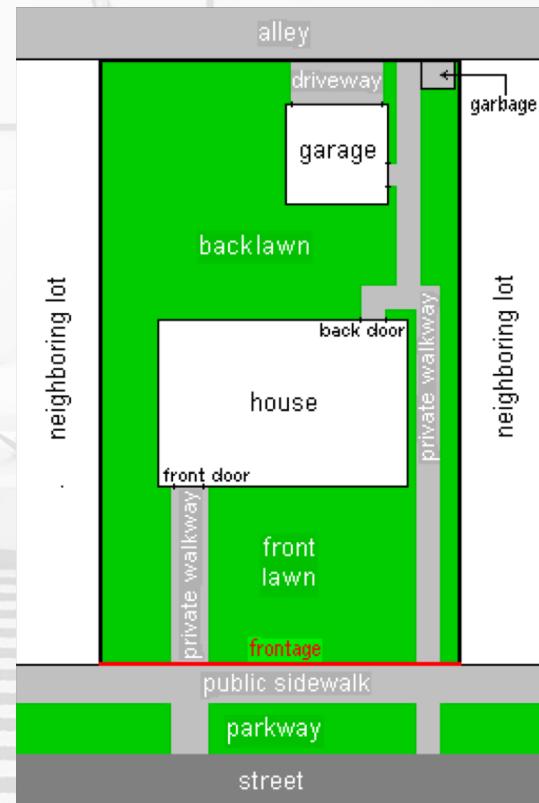
Size

1st Floor SF, 2st Floor SF, Lot Area

Stone Brook

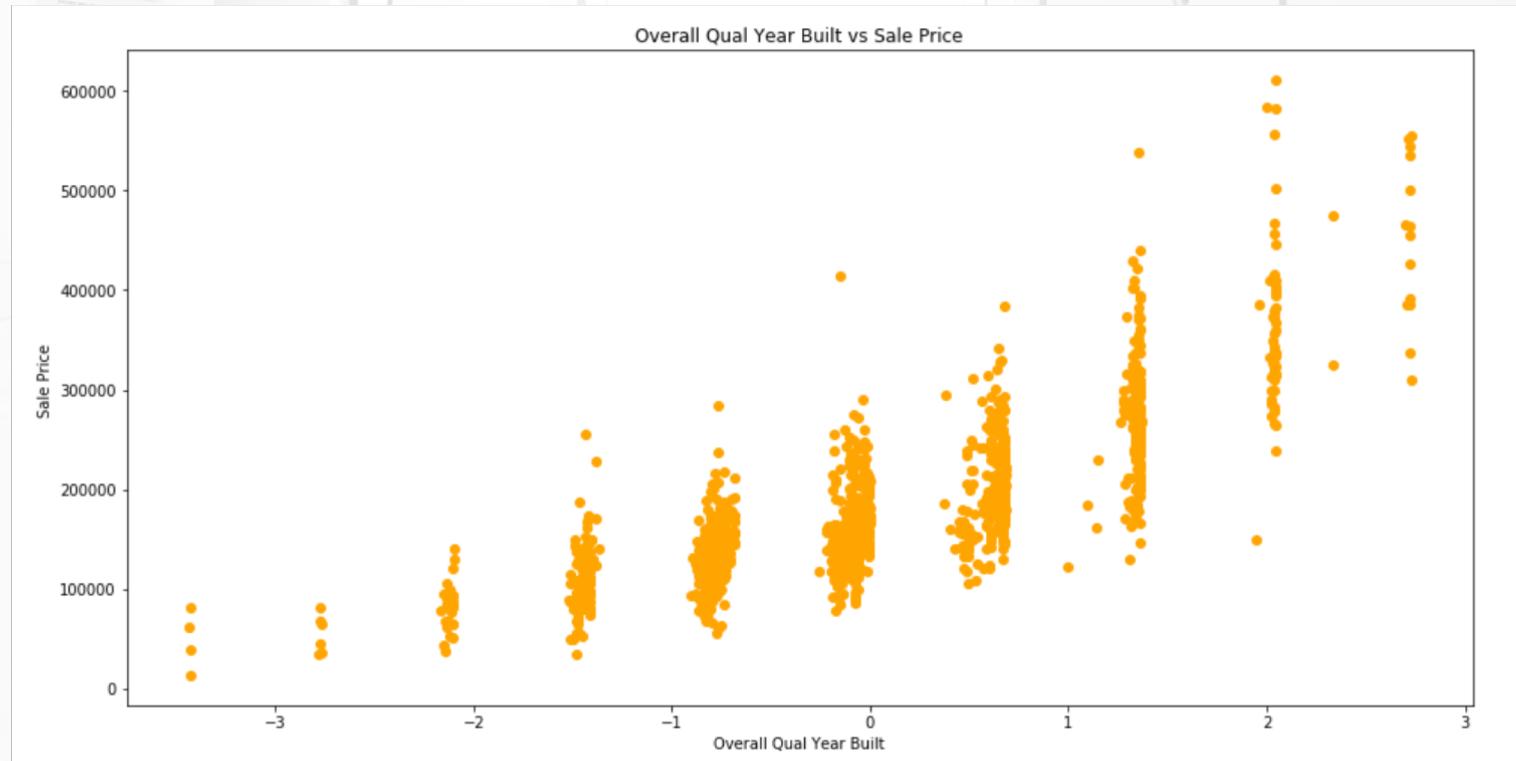


Lot Area



Overall Quality And Year Built

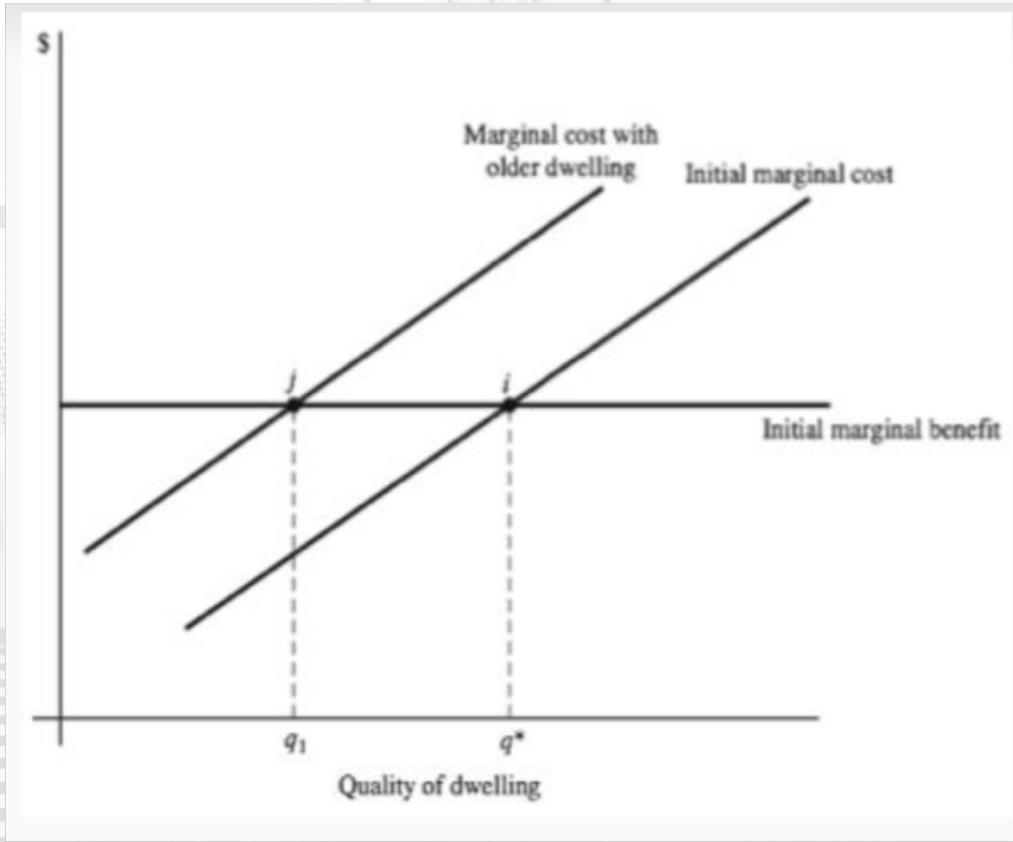
Overall Quality and Year Built have the strongest correlation with Sale Price



How to increase Sale Price?

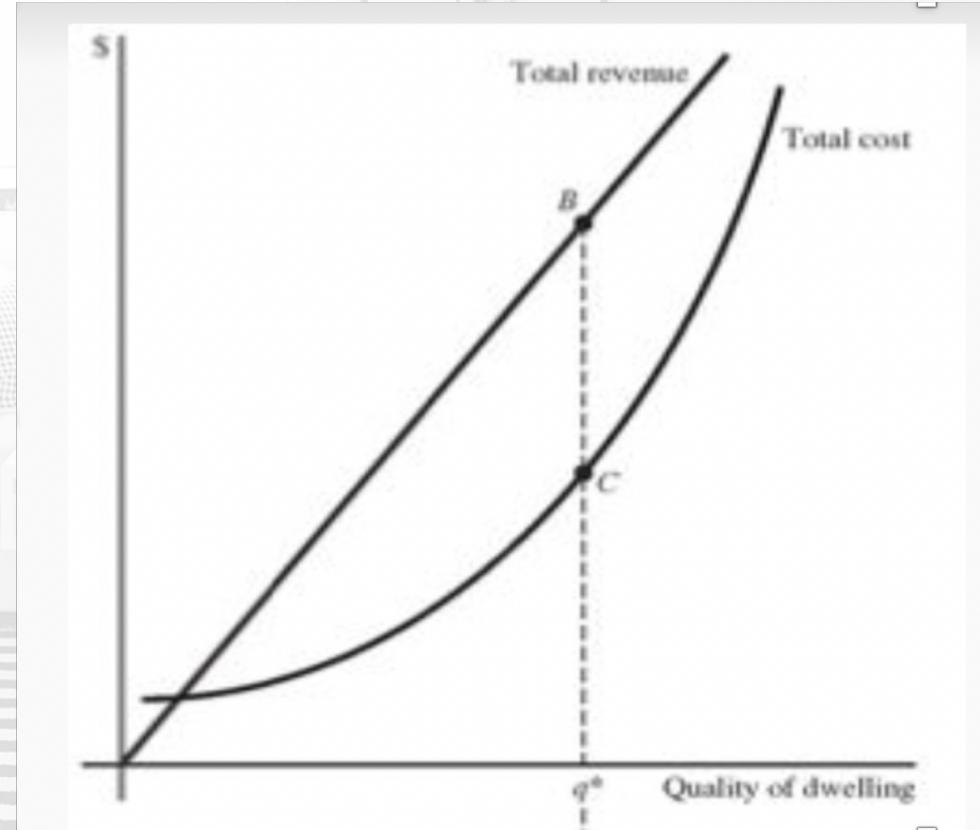
Maintenance and Age

- It's also true that the same quality-improving project costs more if the house is older:
 - Painting = need to remove lead-based paint?
 - Ceiling replacement?
 - Electrical Upgrade ?
 - Bathroom upgrade – how old is the plumbing?
- An owner can make a market-driven choice about how much to spend on quality, but the property's age shapes the cost side of that decision



The House Quality Ladder

- If the hedonic price of quality is fixed, the contribution of quality to the housing price will increase linearly as quality rises
- If quality is cheaper to add when a unit is low-quality, the total cost line will increase at an increasing rate



Conclusion: Improve Quality Of The House



Thank you

