# Ames Predicting Property Price

Prepared for : Management of BestEstate Co.

DSI 31's Best Team

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# Introduction & Problem Statement

# Introduction

BestEstate Co

**Web/App usage: 5.27 session by day. 158.1 sessions by month**
**Web/App success: 1.27 success session by month**
**Web/App price prediction accuracy : Around 81%**

**Goal:** To develop a regression model that will make accurate predictions of house prices in the city of Ames in Iowa.

1. Homeowners can more accurately determine the asking price at which to list their property. They won't undervalue their home in this manner and miss out on possible profit.
2. Vice versa, homebuyers can avoid unintentionally making overpriced purchases by knowing what is a fair price to pay for a specific house.

# Problem Statement

1. To determine the features that can be improved to drive up prices.

2. To pinpoint the features that have a negative impact on prices.

# 02

# EDA

# Ames Housing Dataset

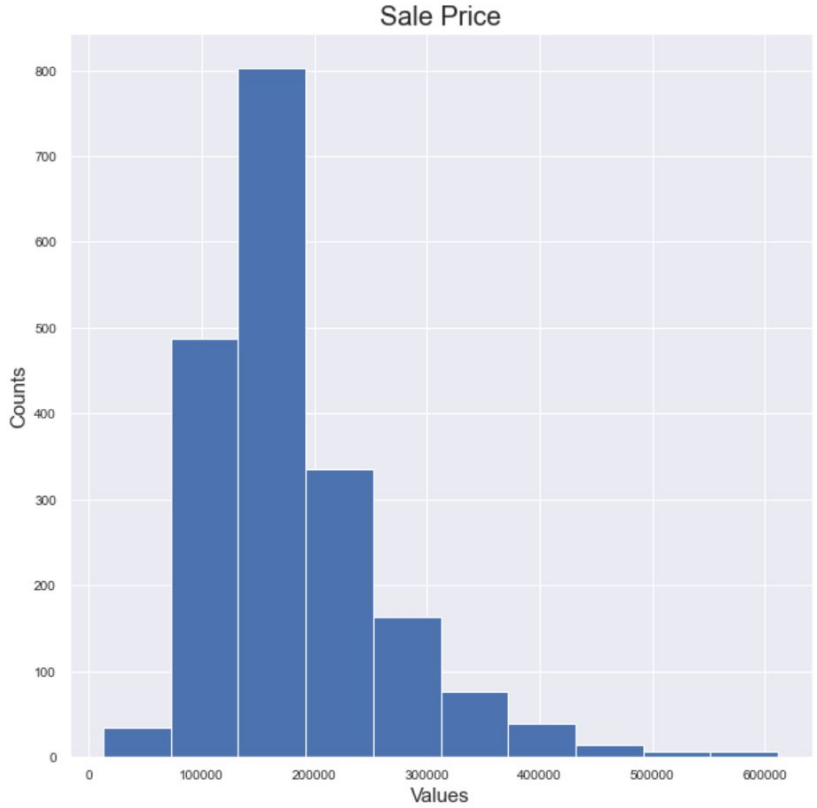
- 80 columns and over 2000 rows of different features relating to houses

- Used by the Ames Assessor's Office to compute assessed values for individual residential properties sold in Ames, IA from 2006 to 2010.

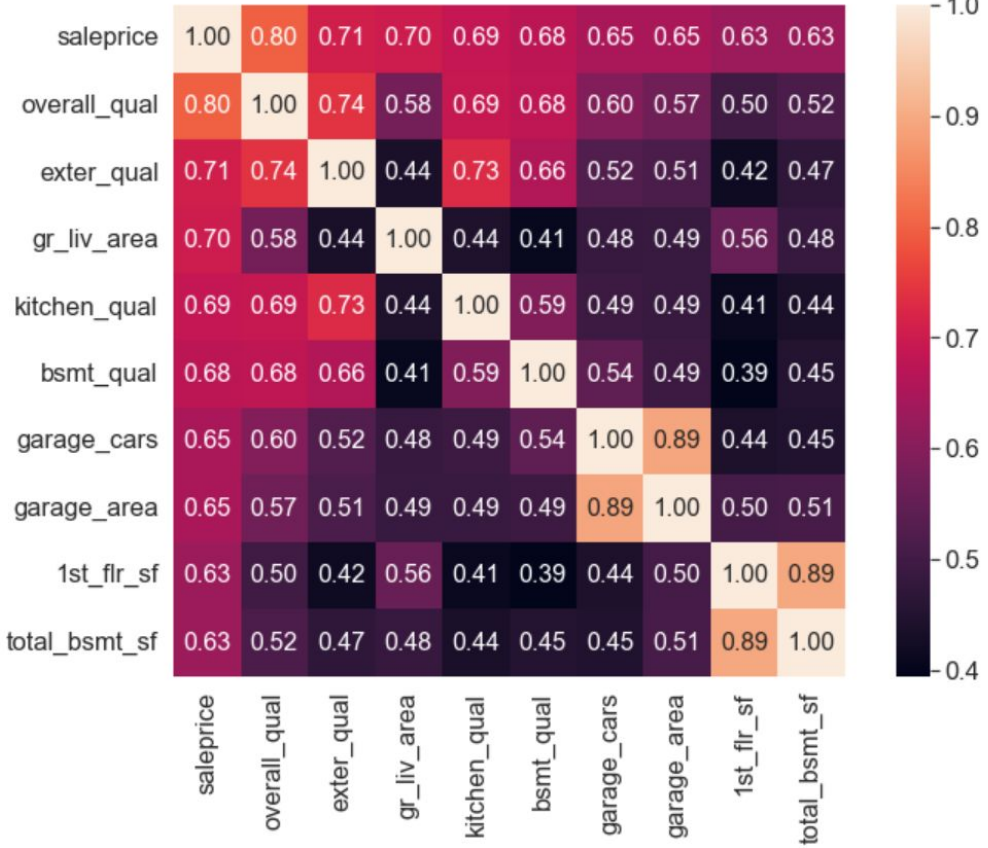
# Data Cleaning for columns with >5% missing values

| column name | no of null rows | % of missing values |
|---|---|---|
| pool_qc | 2042 | 99.56 |
| misc_feature | 1986 | 96.83 |
| alley | 1911 | 93.17 |
| fence | 1651 | 80.50 |
| fireplace_qu | 1000 | 48.76 |
| lot_frontage | 330 | 16.09 |
| garage_yr_blt | 114 | 5.56 |
| garage_cond | 114 | 5.56 |
| garage_qual | 114 | 5.56 |
| garage_finish | 114 | 5.56 |
| garage_type | 113 | 5.51 |

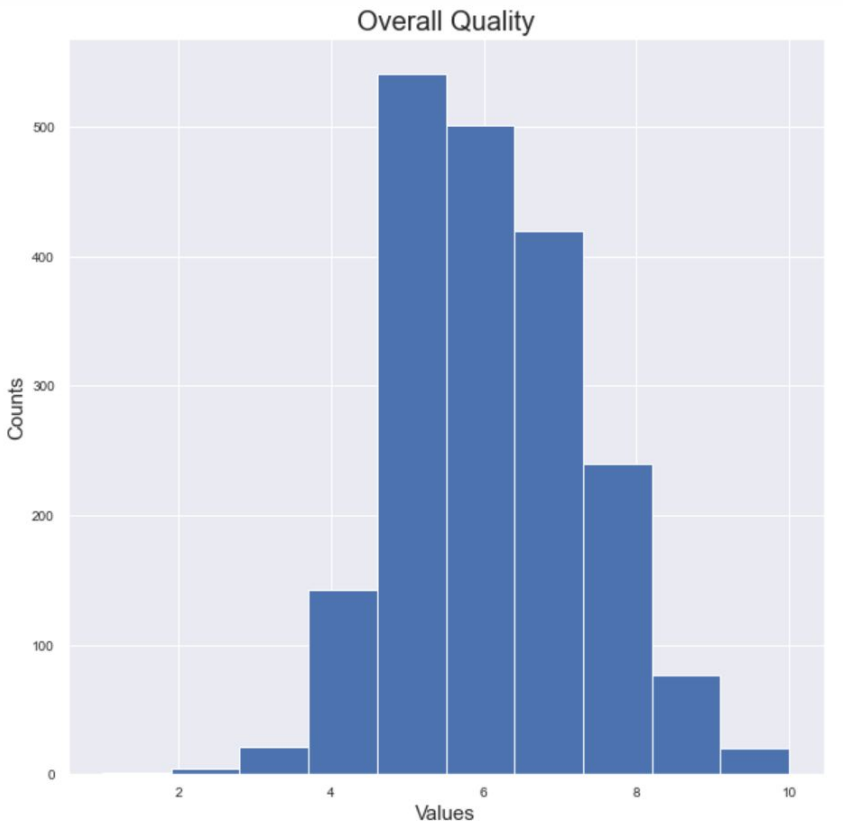
# Sale Prices are mostly in the 150-200k range



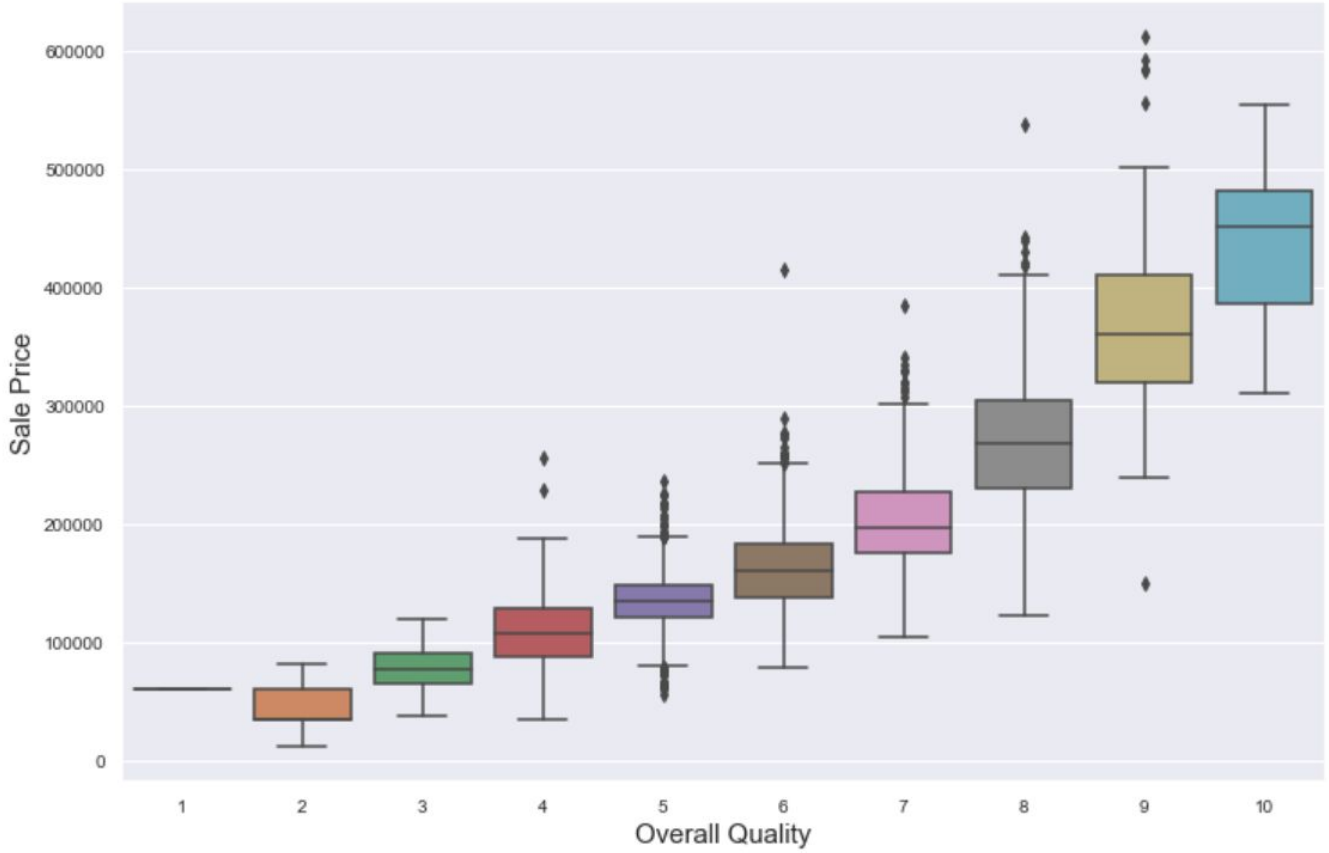
# Top 10 Features correlating with Sale Price



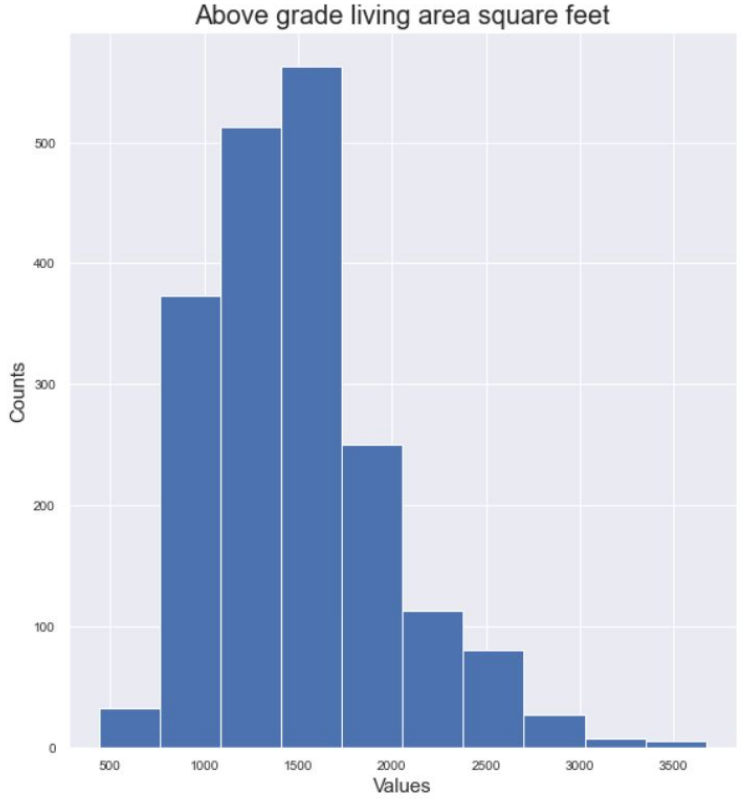
# Most of Ames houses have mid-range Overall Quality score



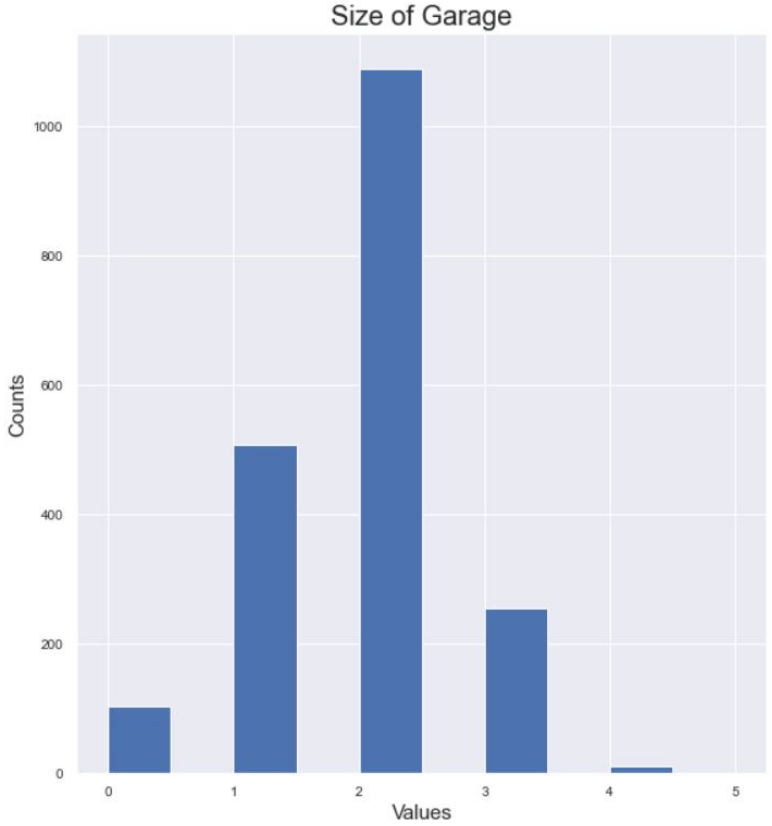
# Sale Price increases with Overall Quality

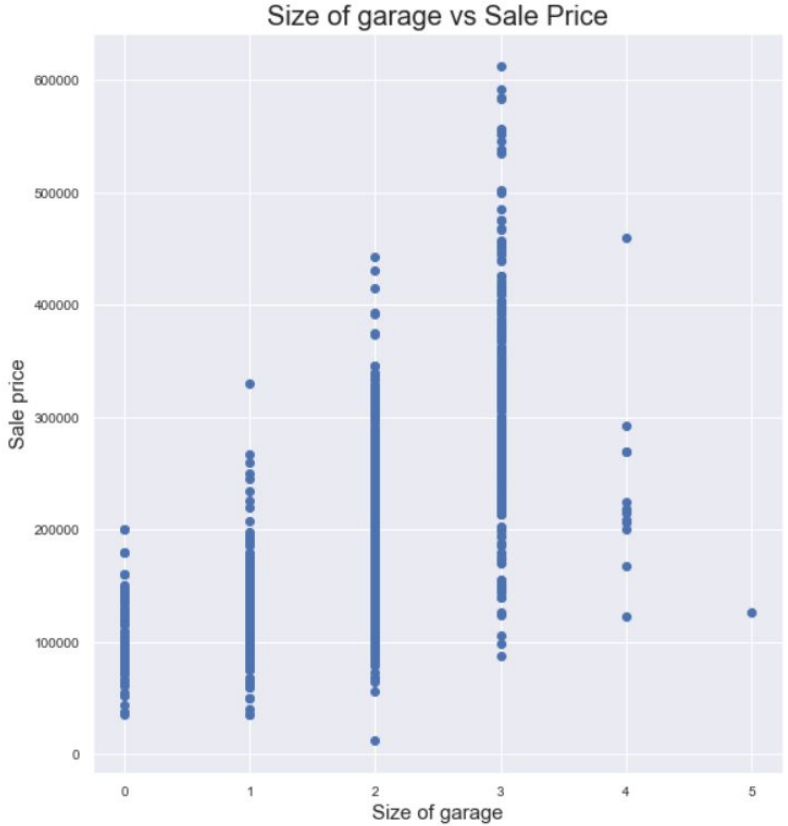


# In general, Sale Price increases as Above Grade Living Area increases




# Most houses have space for 2 cars but we see higher range of sale prices for houses with 3 cars garage space.



# 03
# Model Selection

# Model Test Results

| Model | Test Results |
|---|---|
| Baseline Model | -0.00115 |
| Linear Regression | 0.89199 |
| Ridge Regression | 0.89355 |
| Lasso Regression | 0.89233 |

- **Ridge Regression** is the best performing model!
- This is in line with our understanding of machine learning models.

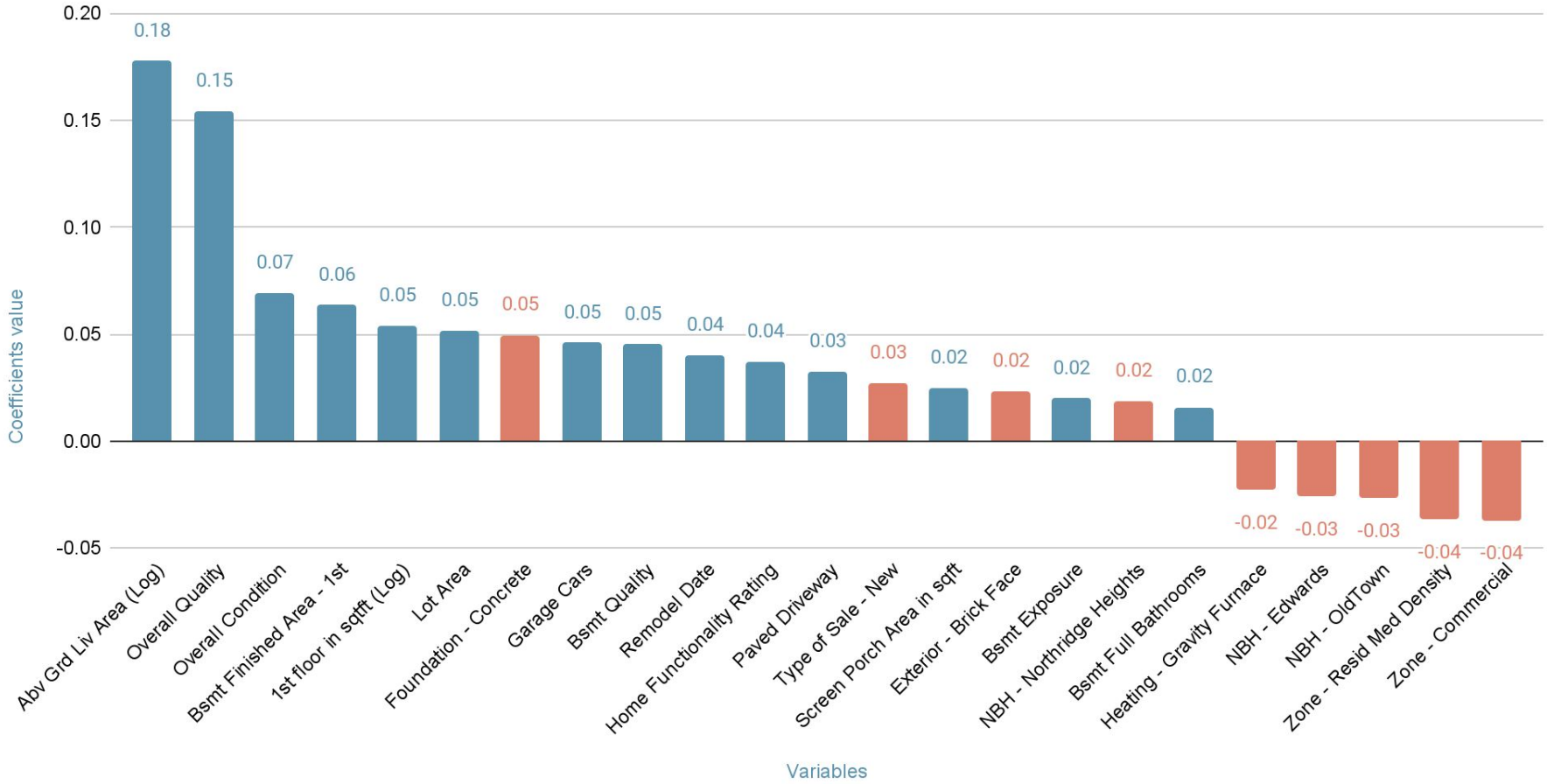
# Interpretation of Model Coefficients

- Positive coefficient means increase in a variable will cause the sale price to increase.

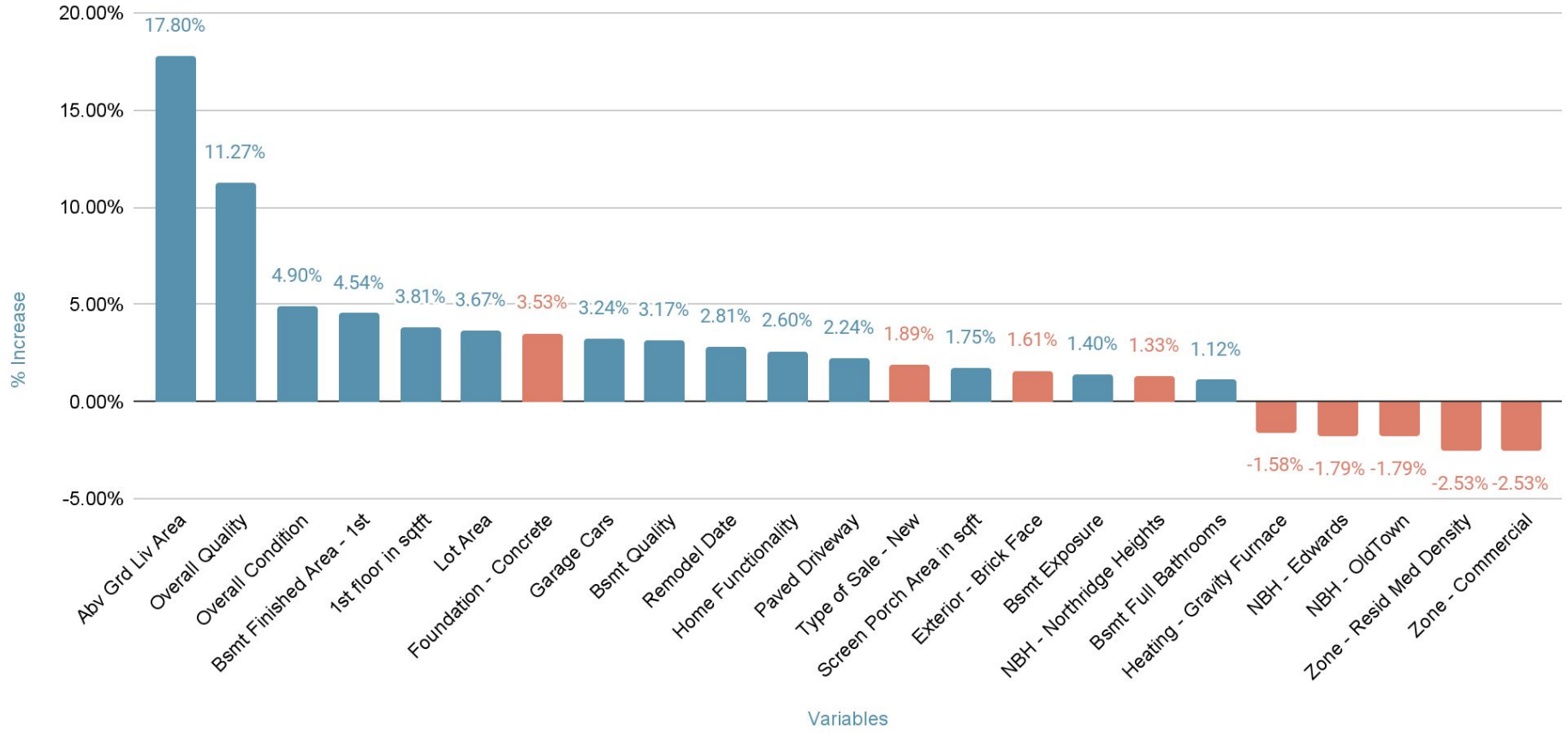
- Negative coefficient means increase in a variable will  then cause the sale price to decrease.

- Value signifies the impact a change in a variable will have on the sale price.

# Model Coefficients



# % Increase for Every 1 Unit Increase in Variables



# Interpretation of Model Coefficients

- Average Sale Price = $183,000

| Variable | Coefficient values | % ↑ for every 1 Unit ↑ in Variable | % ↑ in Monetary Value |
|---|---|---|---|
| Abv Grd Liv Area (Sqft) | 0.178 | 17.80% | $33,000 |
| Overall Quality | 0.154 | 11.27% | $21,000 |
| Overall Condition | 0.069 | 4.90% | $9,000 |
| Zone - Resid Med Density | -0.037 | -2.53% | -$5,000 |
| Zone - Commercial | -0.037 | -2.53% | -$5,000 |

# 04

# Limitations & Improvements

# Limitations

## Some inputs have unclear ratings:

- Condition, quality
  - Excellent, Good, Average, Fair

## Multicollinearity:

- Corr threshold > 0.7

## External Factors:

- eg. black swan events

# Future Improvements

- Uncover new valuable inputs
- Test different categorical groupings
- Hyperparameter Tuning

# 05

# Conclusion

# Conclusion

## Based on test results,

- Our model can predict 89.36% of the changes in sale prices accurately with the changes in inputs

## Characteristics most impactful on sale price:

- ‘Above grade living area square feet’
- Overall material & finish quality

## Model accuracy ≈ Quality of Data

# 06

# Recommendations

# Recommendations

## Value-add to current product/service offering

- Buyers & Sellers should make informed decision
  - Utility
  - Investment

## Valuation is only a benchmark

- 3 valuation methods
  - Sales Comparison
  - Cost
  - Income Capitalisation
- “10 different valuers, 10 different valuations”