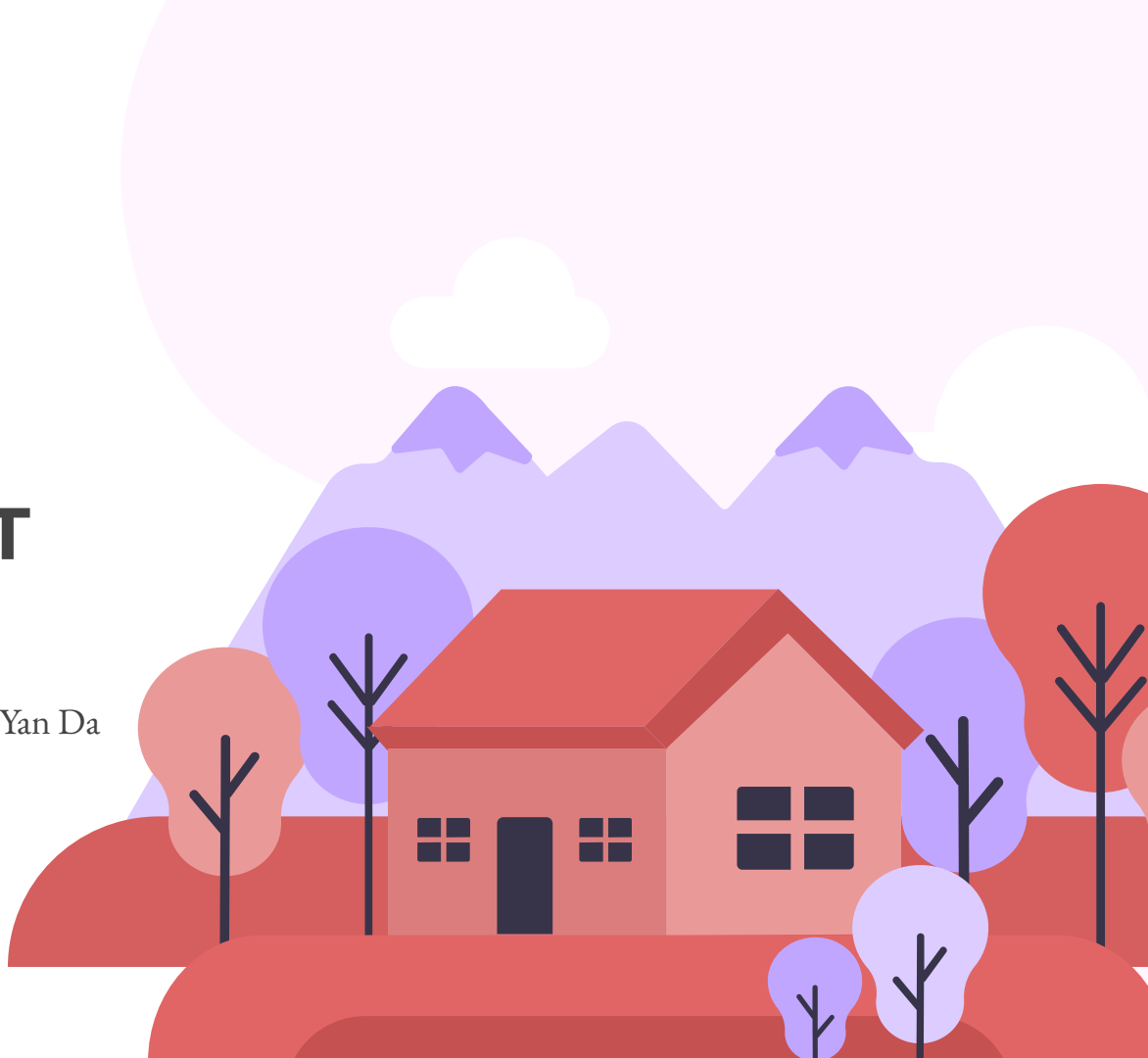
AMES HOUSING DEVELOPMENT

DSI 33
Mary-Anne | Wei Zhe | Daniel | Jimmy | Yan Da



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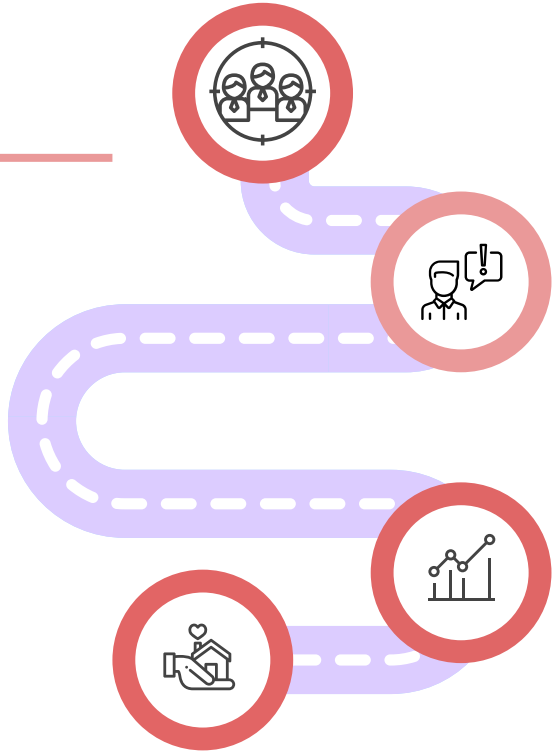


BACKGROUND

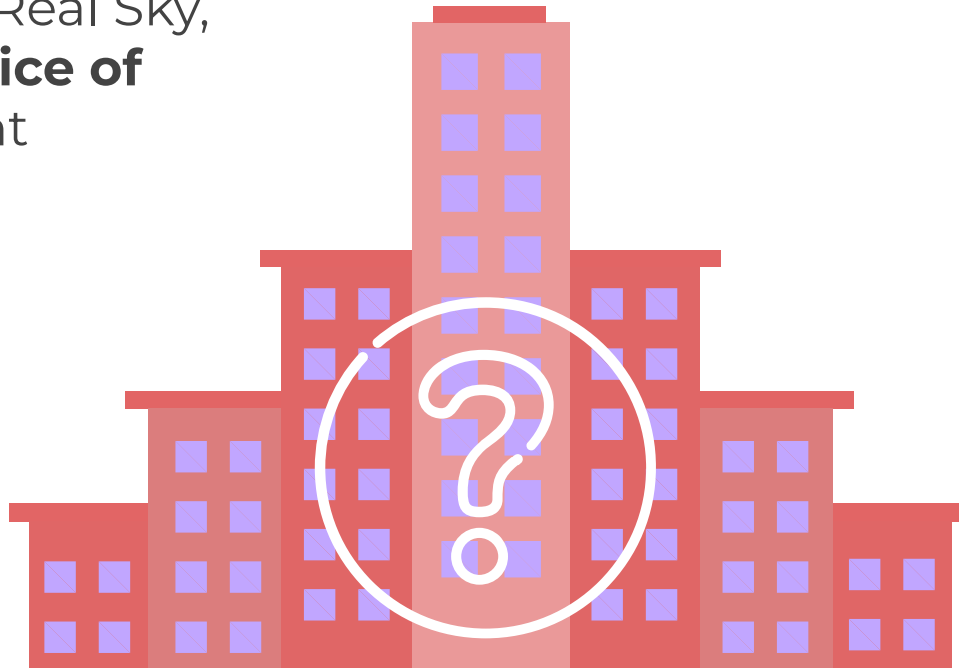
Real Sky Estate Development has been developing residential areas around Ames and is looking to **procure and develop new housing** in the area.

Previous housing developments **were not returning favourable profits** due to the recent pandemic and political tensions. It also caused a rise in the costs of living and building materials over the years.

Facing a forecasted recession in the upcoming year, Real Sky senior management team has reached out to our data science team to **pinpoint factors** that will direct towards **revamping the company's focus structure to improve the attractiveness and sales price** of new housing developments.

PROBLEM STATEMENT

What **core features** should we, Real Sky, focus on to **increase the sale price of homes** for our next development project?



WORKFLOW PROCESS

AMES HOUSING DATASET OVERALL

DATA

80 Features

2930 Entries

Home sales from Years 2006-2010

3 TYPES OF DATA

Numerical
Square foot | No. of

Ordinal
Excellent, poor, average

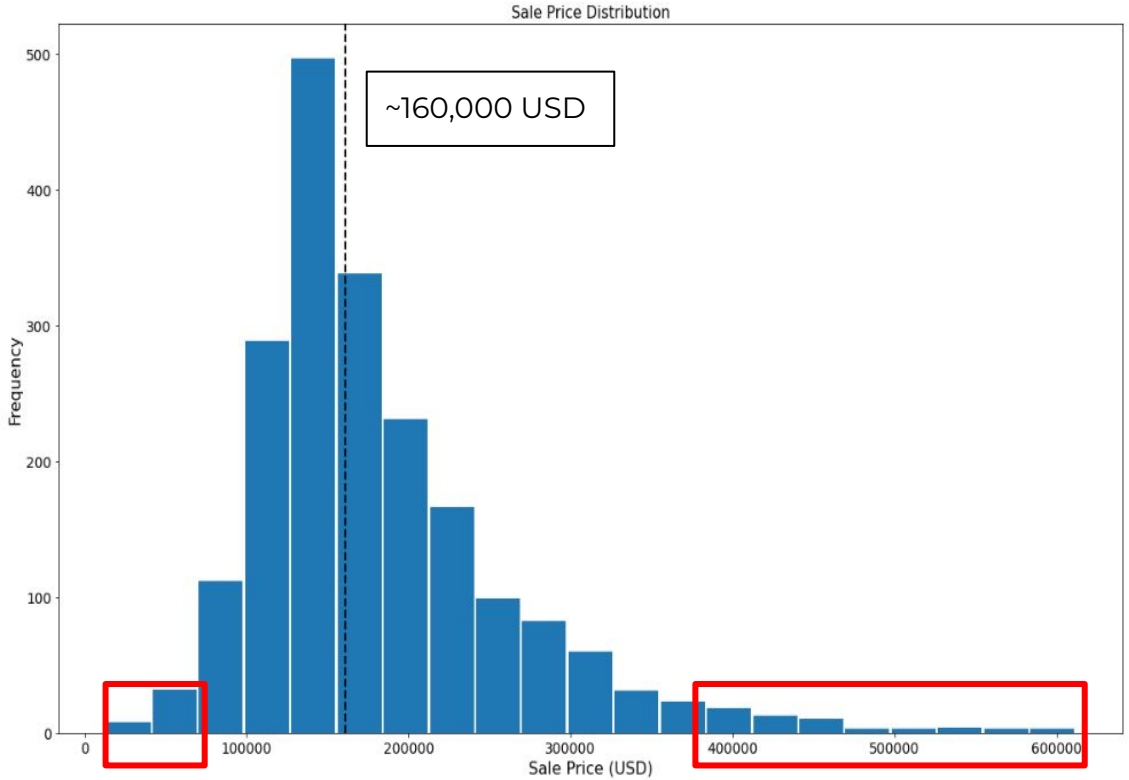
Nominal
Material types | Names

MISSING VALUES

Replaced with best fit values
Median Values

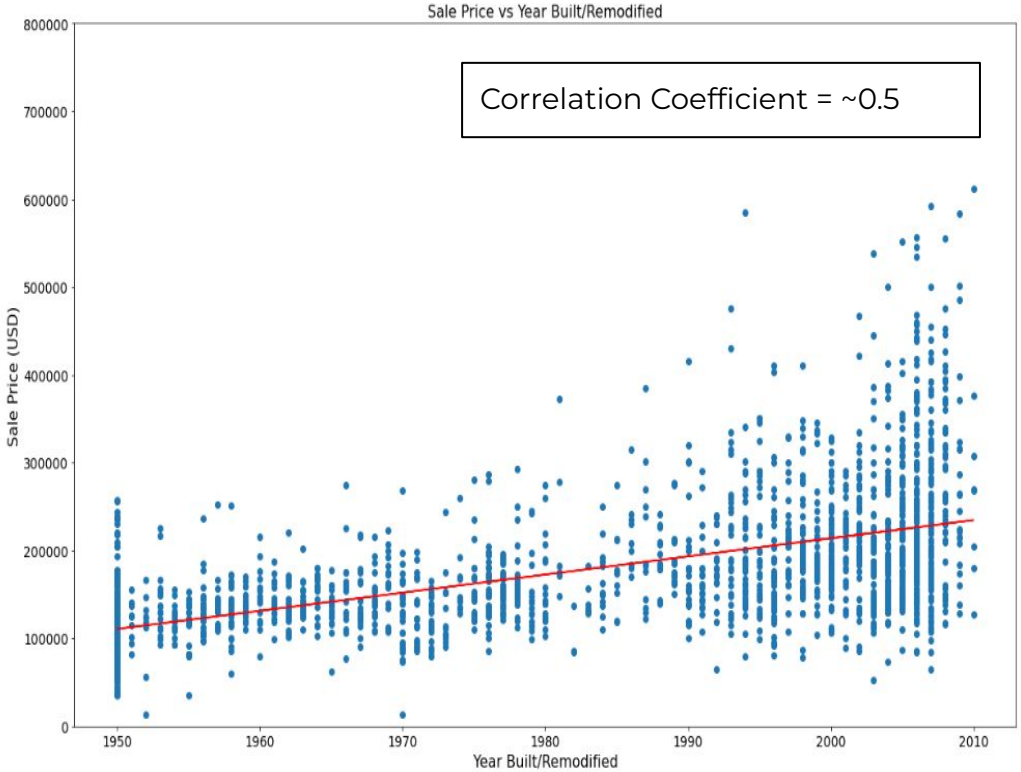
Removed
Misc Features : 97% Missing Values

EDA: DISTRIBUTION OF HOUSING SALE PRICE WITHIN 100K TO 300K USD



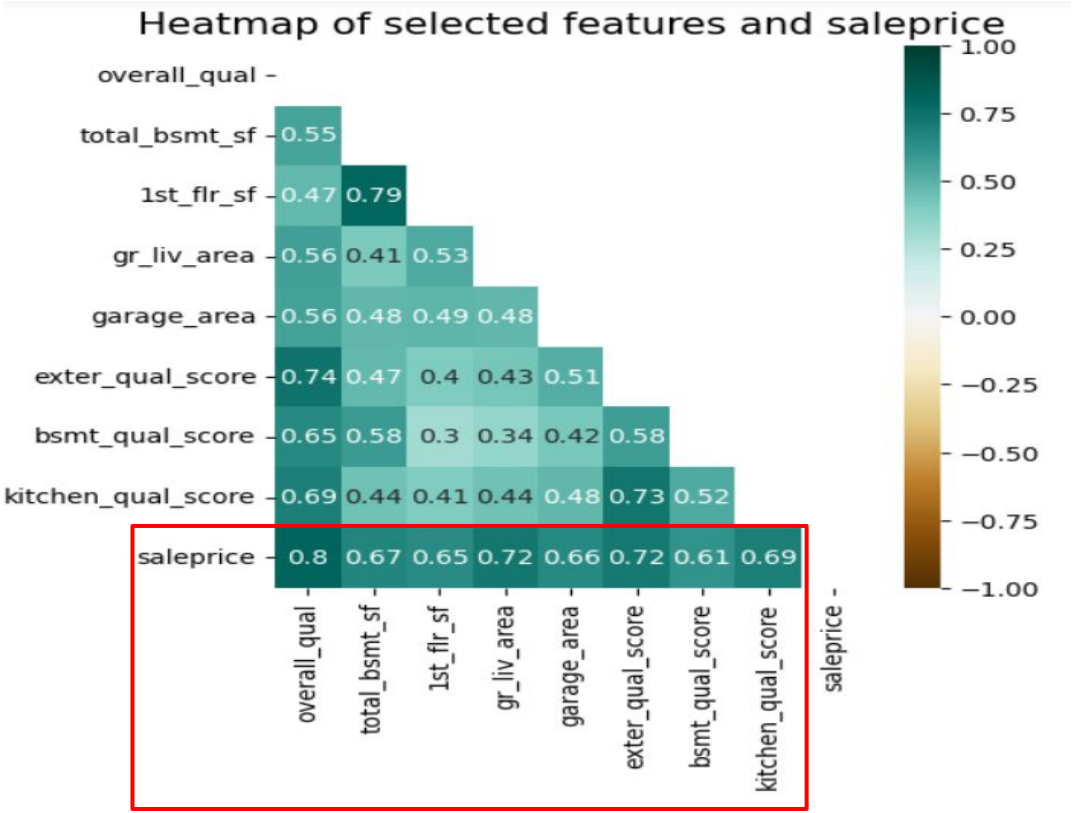
- Main distribution of sale prices within 100-300K USD range.
- Median sale price at ~160,000
- Limited data for sale prices < 50K and > 400K.

EDA: MINIMAL IMPACT OF YEAR BUILT/REMODIFIED ON SALE PRICES



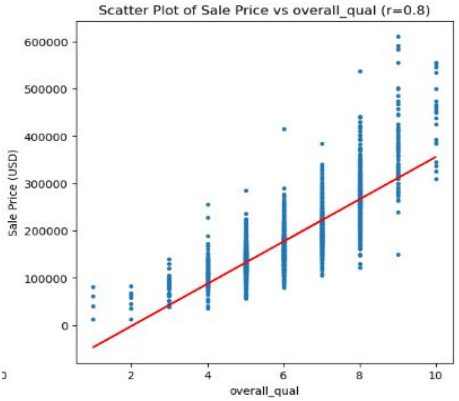
- Model creation for sale price prediction of new housing developments.
- Weak correlation coefficient value of ~0.5.
- Poor linearity between Sale Pricing and Year Built/Remodified.
- Not a significant factor that will affect sales price.

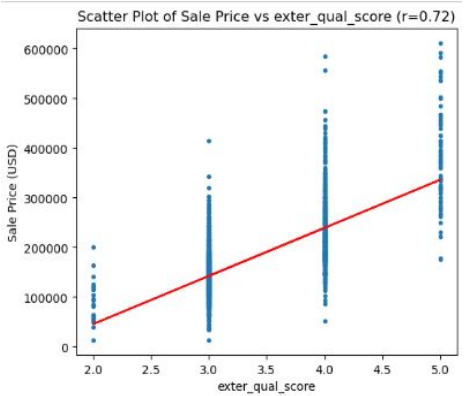
FEATURES SELECTION : FEATURES WITH > 0.6 CORRELATION COEFFICIENT WITH SALE PRICE

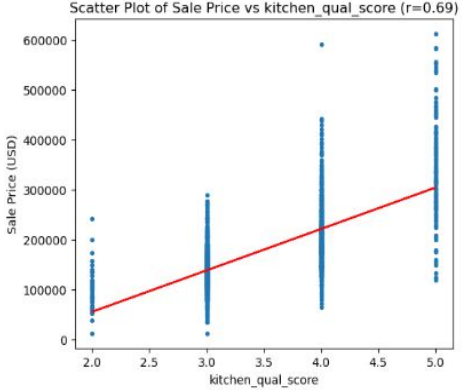


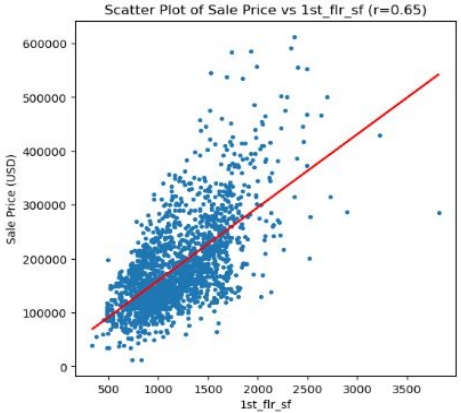
Selected Feature	Description	Corr. Coeff.
overall_qual	Overall material and finish of the house	**0.80**
gr_liv_area	Above ground living area	**0.72**
exter_qual_score	Exterior material quality	**0.72**
kitchen_qual_score	Kitchen quality	**0.69**
total_bsmt_sf	Total basement area (Square Feet)	**0.67**
garage_area	Size of garage (Square Feet	**0.66**
1st_flr_sf	Area of 1st floor (Square Feet)	**0.65**
bsmt_qual_score	Basement height	**0.61**

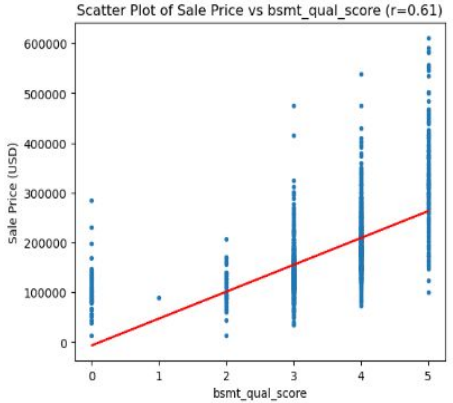
FEATURES SELECTION : POSITIVE CORRELATION BETWEEN SELECTED FEATURES AND SALE PRICE



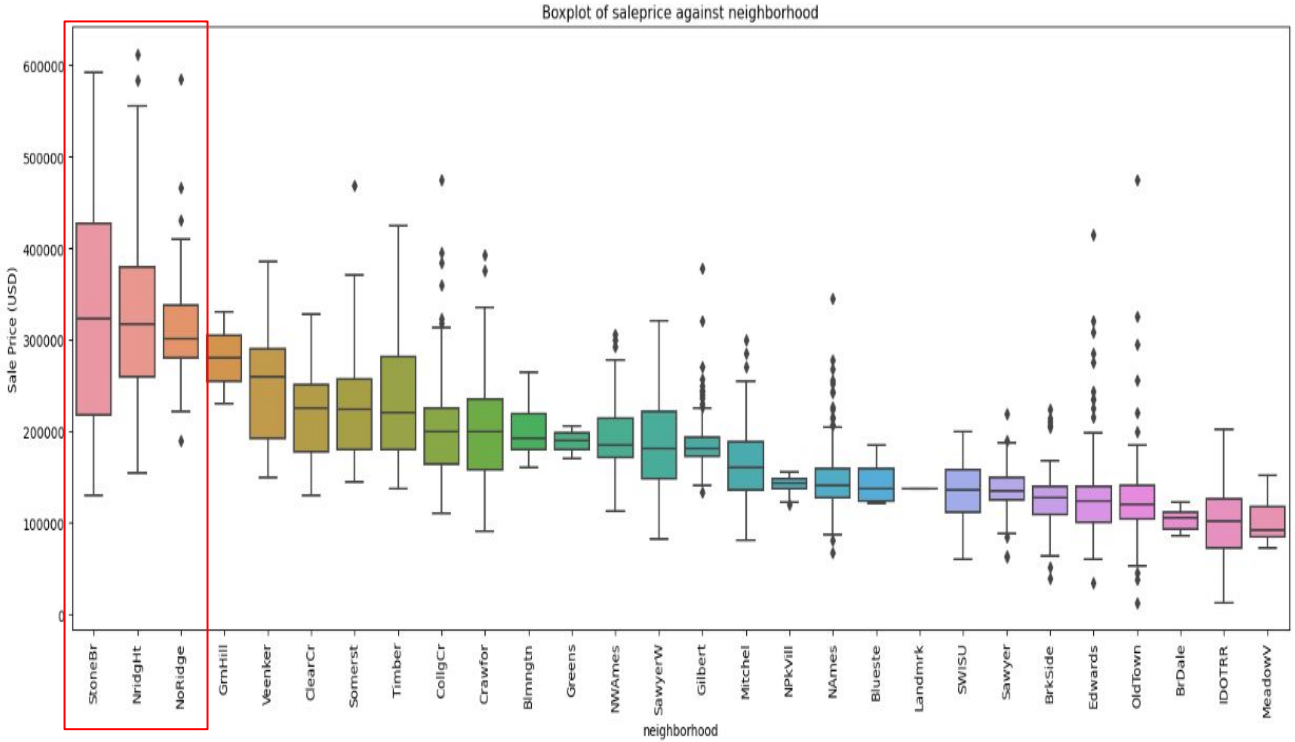








FEATURE SELECTION : SELECTION OF “Neighborhood” AS MODELLING FEATURE



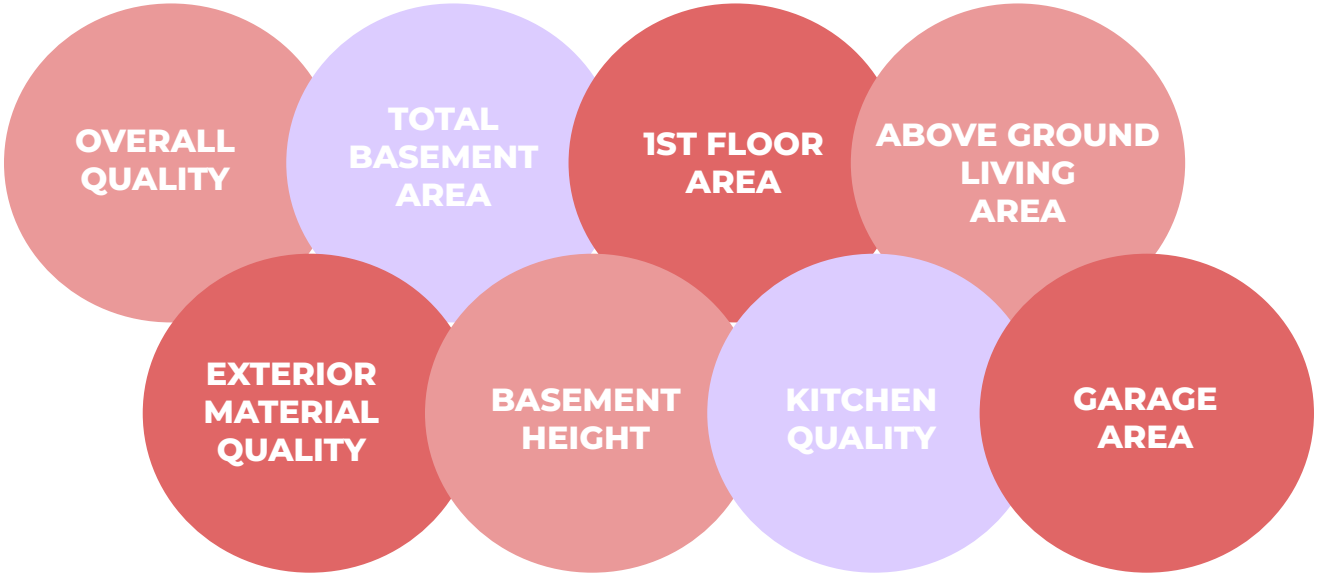
- Good location as one of the top 5 most desired home features from Forbes*.

- Top 3 locations with better sales price:
  - Stone Brook
  - Northridge Heights
  - North Ridge

Reference links:
https://www.forbes.com/sites/forbesrealestatecouncil/2020/04/27/15-most-desirable-home-features-to-todays-buyers/?sh=7997a5677a4e

CORE FEATURES: OVERVIEW OF SELECTED FEATURES

Numerical/Ordinal Features



Categorical Features

MODEL SELECTION - BEST PREDICTION MODEL: RIDGE REGRESSION

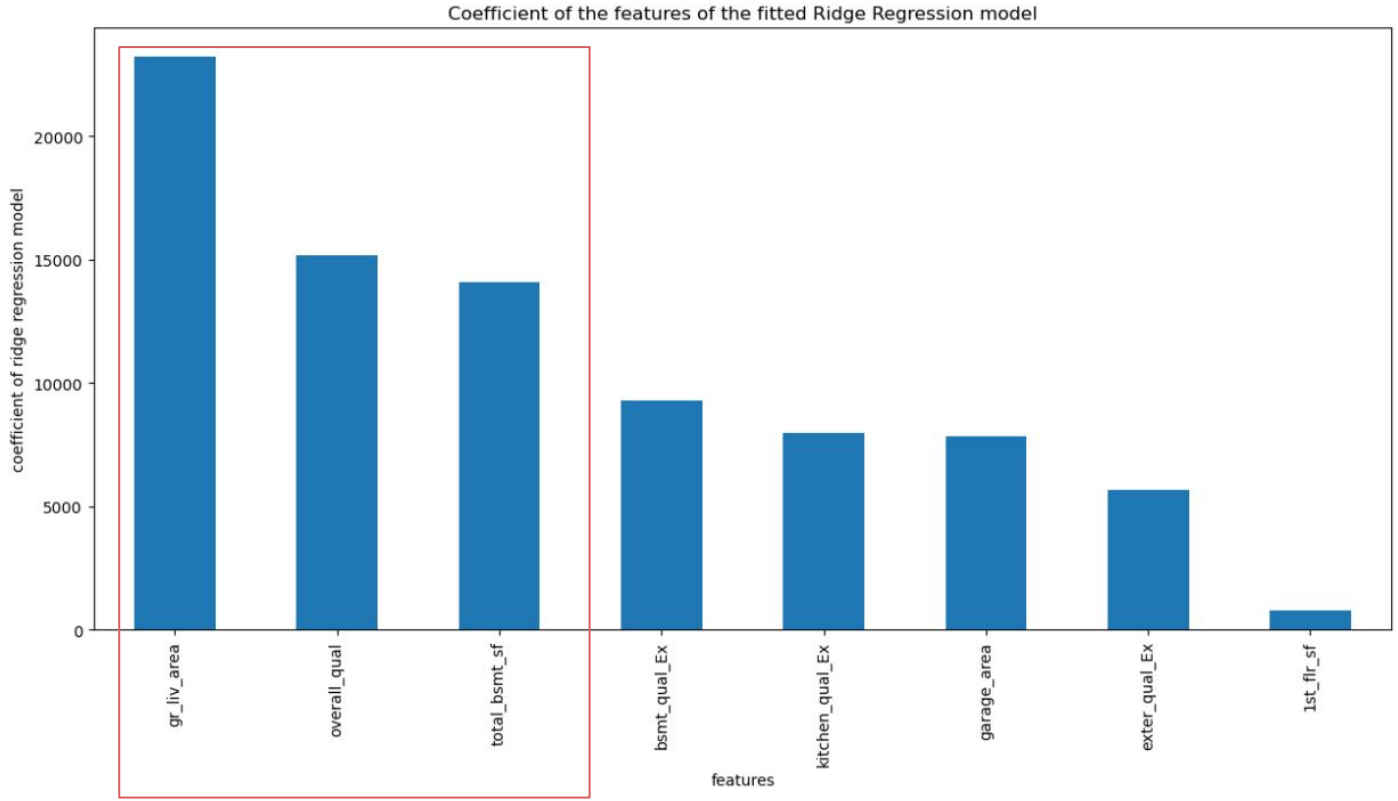
Model	Train R2 score	Train RMSE	Test R2 score	Test RMSE
Baseline	-	-	0.0	79277
Linear Regression	0.88816	26256	0.86899	29765
Lasso Regression	0.88816	26256	0.86898	29766
Ridge Regression	**0.88816**	**26256**	**0.86901**	**29763**

R2 score: measures how much the variability in sale price can be explained by the selected features in our model
RMSE (Root Mean Square Error) : measures the average difference of the predicted value from actual sale price

Higher R2 score → Better Model Performance

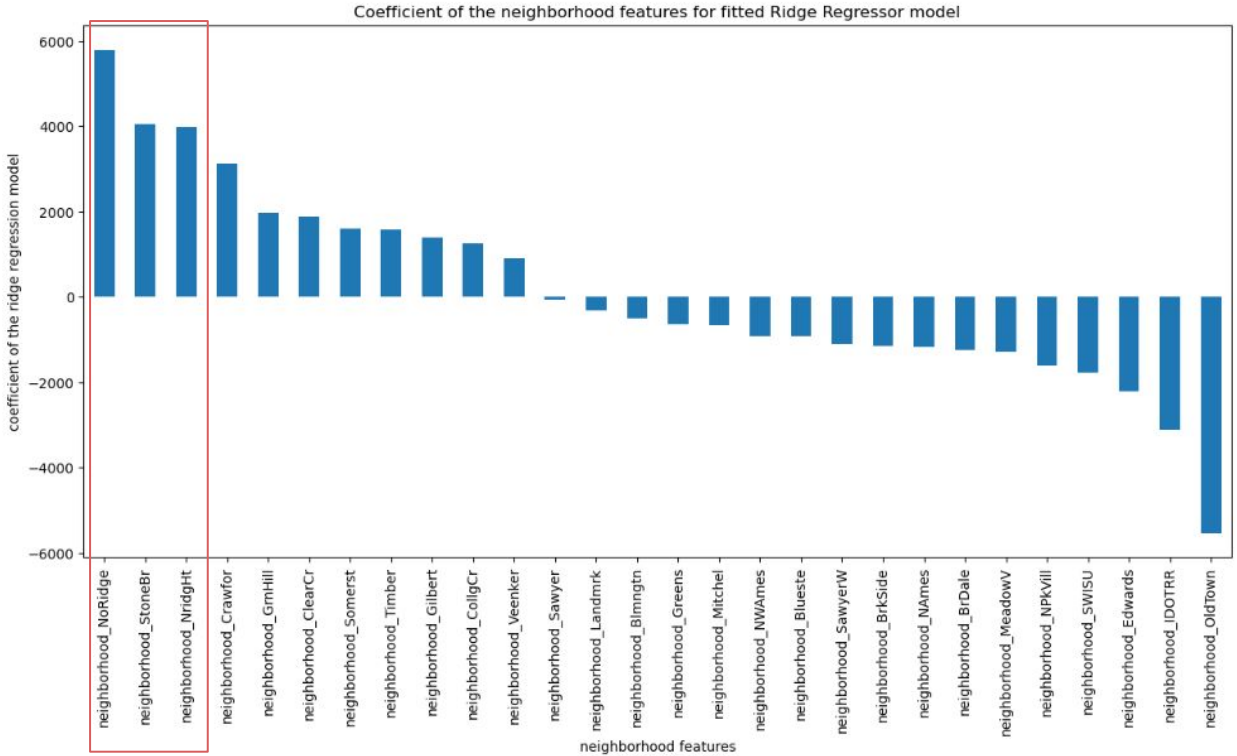
Lower RMSE → Better Model Performance

Top 3 features are ground living area, overall quality and total basement area



	Median
Ground Living Area	1444 sq. ft.
Overall Quality	Score 6
Total Basement Area	994 sq. ft.

DESIRABLE LOCATIONS



Top 3 neighborhoods:

- **Northridge, Stone Brook** and **Northridge Heights**

- Located North-west of Ames with lower crime rate and better education rating*

*www.neighborhoodscout.com/ia/ames

LIMITATIONS

INSUFFICIENT DATA

External factors skewing sale prices (eg. recession, natural disasters)

NEW DATA

More recent year data

TIME CONSTRAINT

Different models

MOVING FORWARD

MONITORING NEW DATA

- Change in trends
- Change in consumer preference

CLARITY IN FEATURES VALUES

Garage Qual (Ordinal): Garage quality

Ex	Excellent
Gd	Good
TA	Typical/Average
Fa	Fair
Po	Poor
NA	No Garage

RECOMMENDATIONS

Potential Development Area

North-West of Ames

Budget Allocation

Prioritization of Core Features

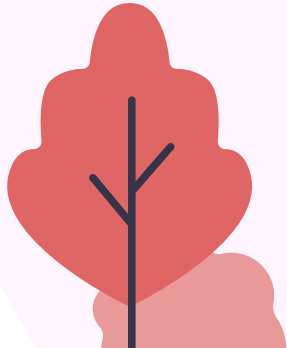
Marketing

Core Features

CONCLUSION

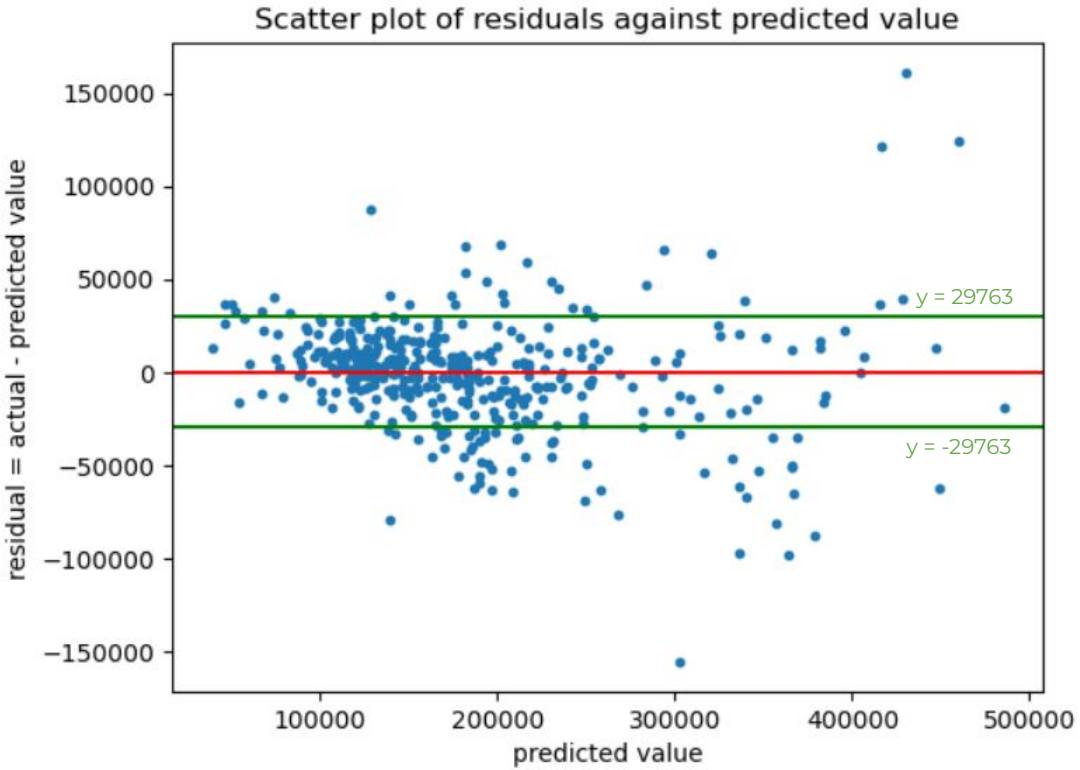
PROBLEM STATEMENT: What **core features** should we, Real Sky, focus on to **increase the sale price of homes** for our next development project?

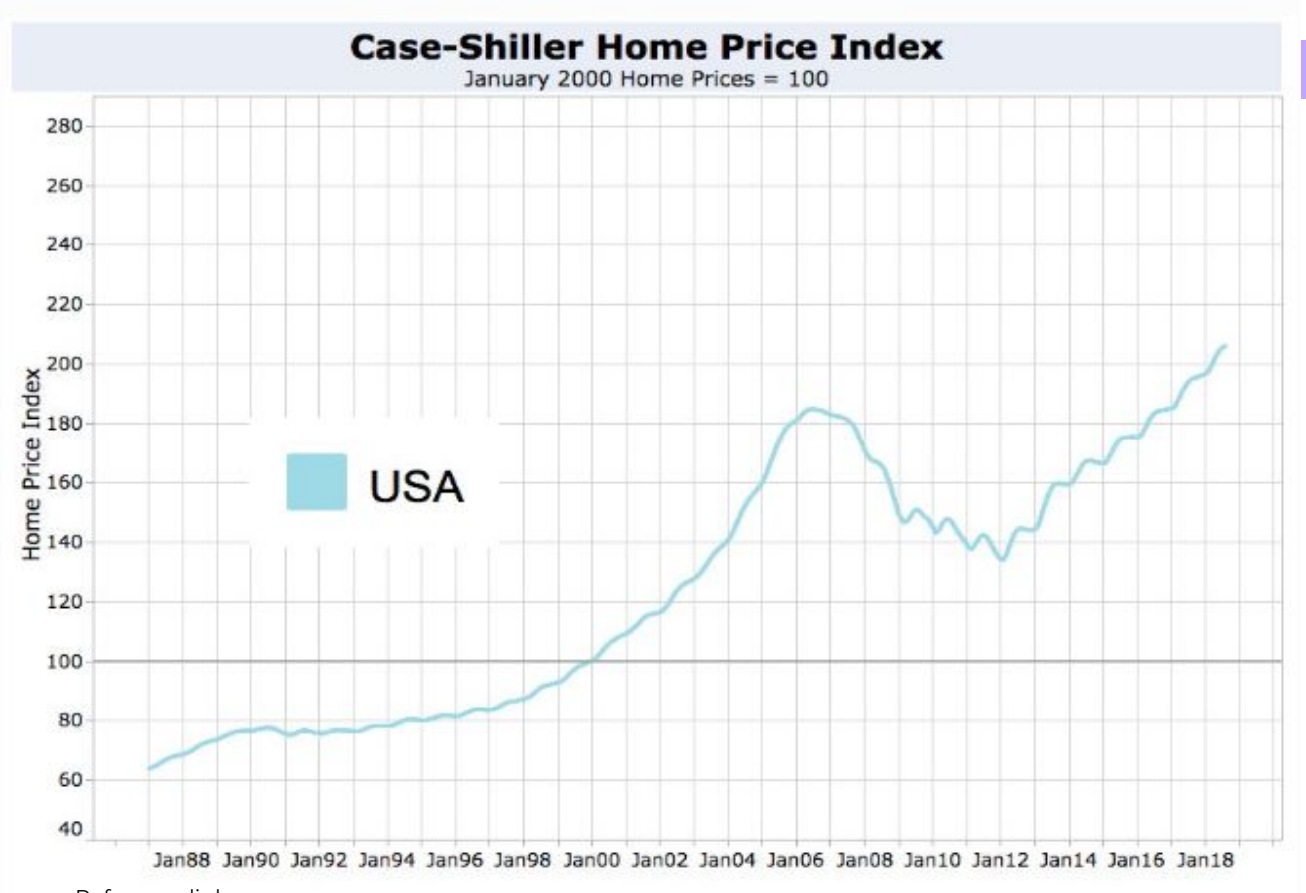
- **Top 3 Core features**
  - GROUND LIVING AREA , OVERALL QUALITY, TOTAL BASEMENT AREA
- **Model used : Ridge Regression (89% R2 Score)**
- **Top 3 Neighborhoods**
  - Northridge, Stone Brook and Northridge Heights



THANKS

RMSE for Ridge Regression = 29763





Reference link:
https://www.forbes.com/sites/johnwake/2018/11/02/the-next-housing-bust/?sh=353094318b79