# STAT 444 Final Project: Ames Housing Dataset Regression Analysis

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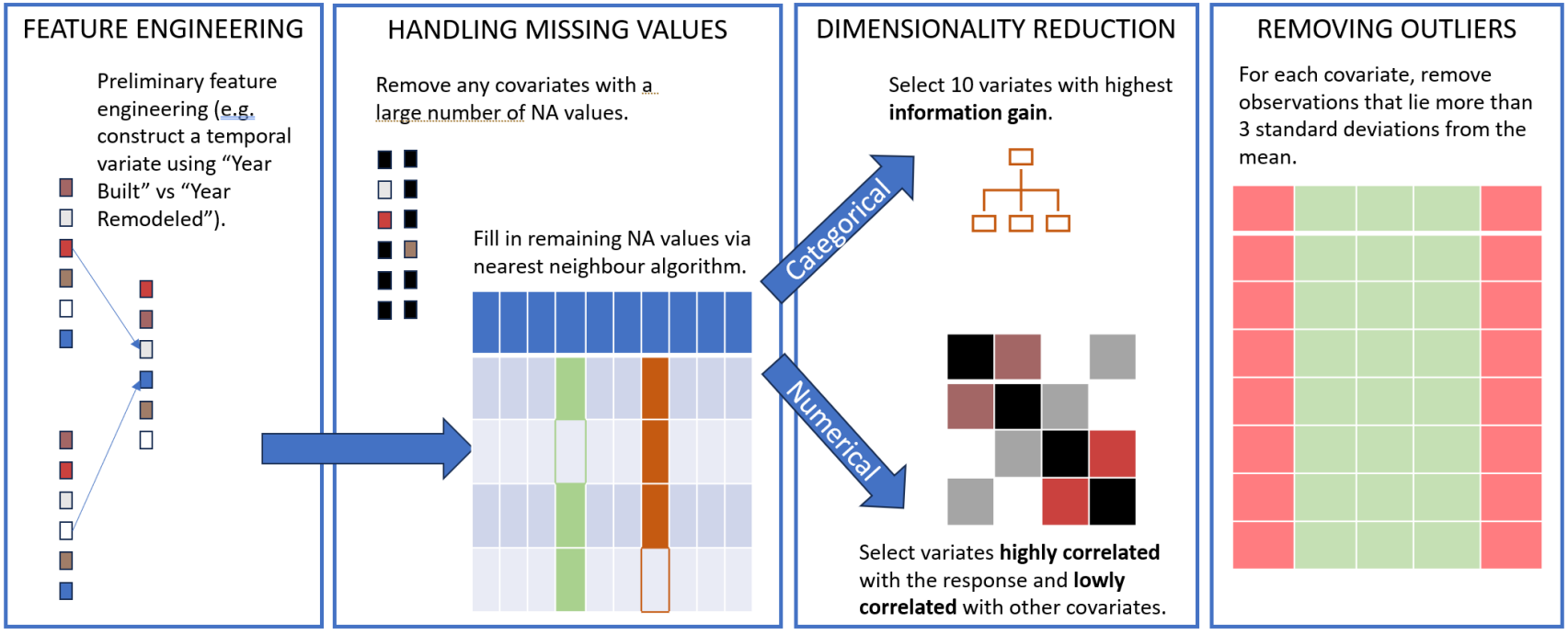
# Exploratory Data Analysis and Preprocessing

## Metadata:

- In the original dataset, 80 covariates, $n = 2930$ observations
  - 23 nominal, 23 ordinal, 14 discrete, 20 continuous
- After data pre-processing, 19 covariates.
  - 7 nominal, 4 ordinal, 4 discrete, 4 continuous
- Response 'SalePrice' was log-transformed for a more normal distribution.

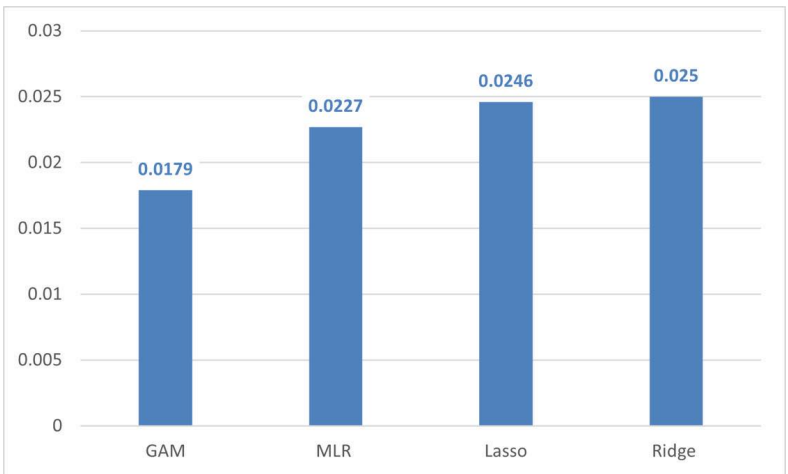


# Methods & Models

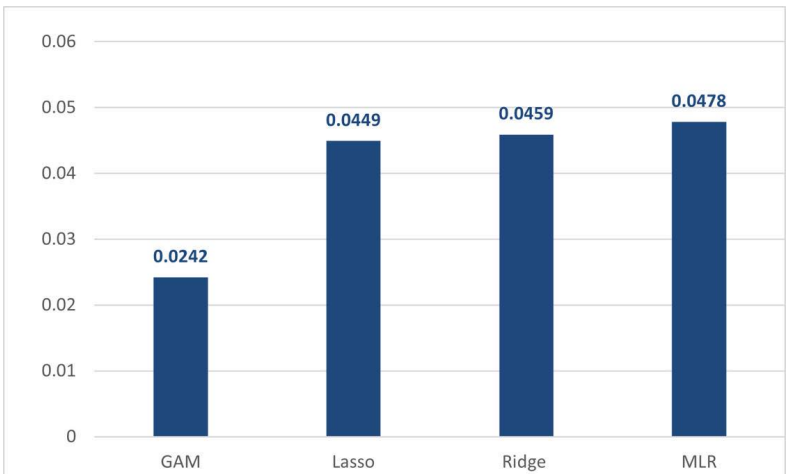
We compared four regression techniques to identify the most suitable model:

1. Multiple Linear Regression
2. Ridge
3. Lasso
4. GAM

We assessed their performance using a 20-fold CV scheme, then tested their final performance under an 80:20 Train/Test split.




**(a)** CV Score




**(b)** Test Score

**Figure 1:** Comparison of Model Performance

# Final Model Analysis: GAM Model

The GAM model appeared to generate the best predictions. Why?

- Lots of non-linearity in the final list of (continuous) covariates
- If it was addressed, we would expect better regression performance
- In the end, our predictions were accurate with RMSE of approx. $18,000

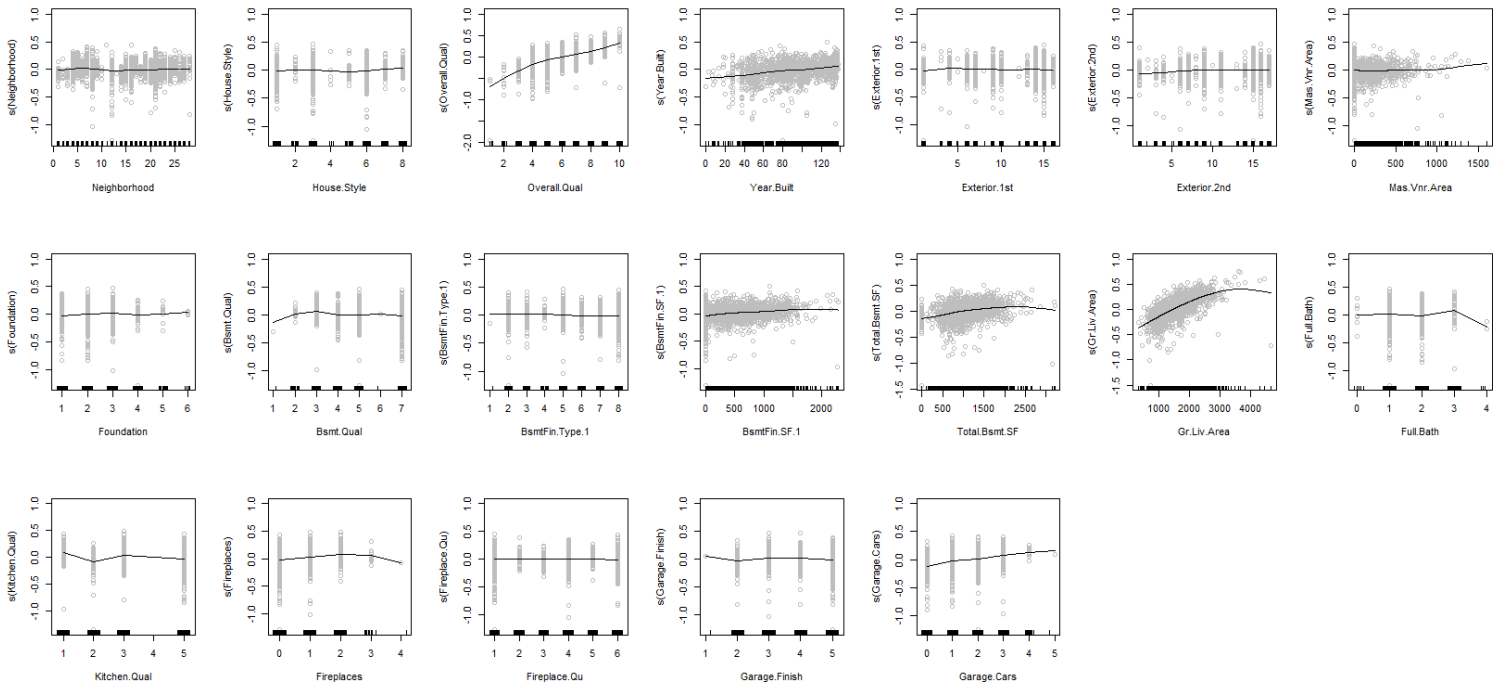



**Figure 2:** Fitted Smooths and Plotted Data of the final GAM model