Predicting Home Values Through Random Forest

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Introduction

Goal
- Predict Home Prices

Client
- Keller Williams Realty, Inc.
- Other Real Estate Investment Companies

Value
- Sharper report analyses to help the negotiation of sales, purchases and other strategic agreements related to real estate properties.

Data

Housing Dataset

- Originally compile by Professor Dean De Cock at Truman State University
- Consists of 2930 observations and 80 explanatory variables for the sale of homes between years 2006-2010.
- Data is from records of city of Ames, Iowa

Weather Dataset

- Subtracted from the National Center for Environmental Information Webpage.
- Includes daily, monthly and yearly records from different weather stations in the city.
- Data is from records of city of Ames, Iowa

Cleaning Data

Bad Data and Outliers

◦ Random Forest not very sensitive to outliers

Exploratory Data analysis for error type data
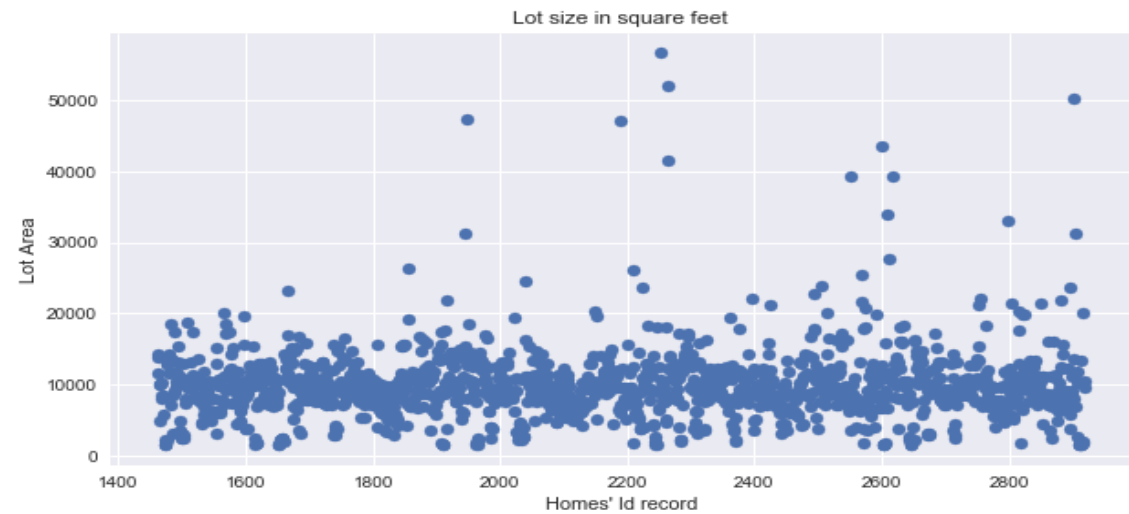
Cleaning Data Continue..

Housing Data
- Attached homes' Feature data set to price data set
- Filtered cells to dates 2006 and 2009 to match weather dates available
- Built and sorted a Date Time Index for the sale of homes
- Rest of cleaning was done in future steps after splitting the data to build model

Weather Data
- Subtracted the best dates and weather station available from the data
- Filtered to the most significant weather variables
- Dates were filtered to match housing data sets
- Corrupted values were deleted, and averages obtained

At the end the two datasets were joined

Cleaning Data Continue..
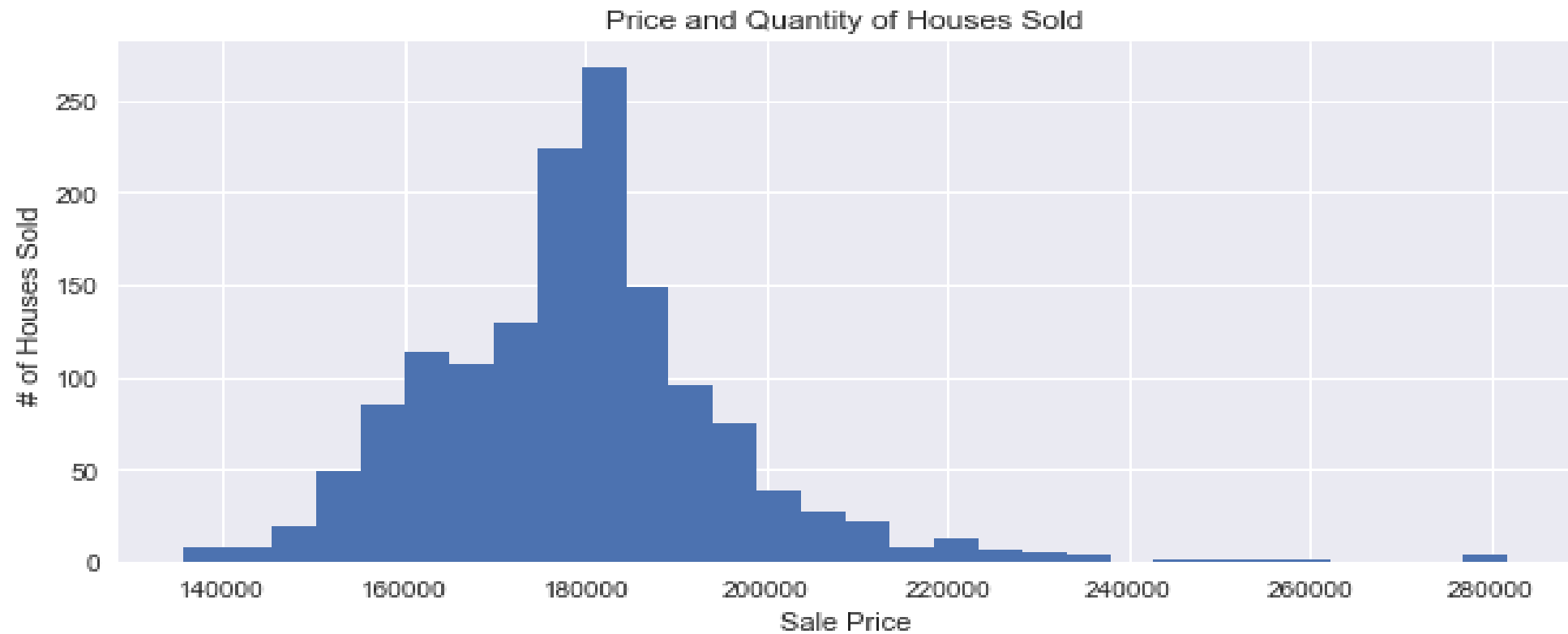
Splitting the data into train and test to fit model

Train
◦ Filled NaN values with means and modes
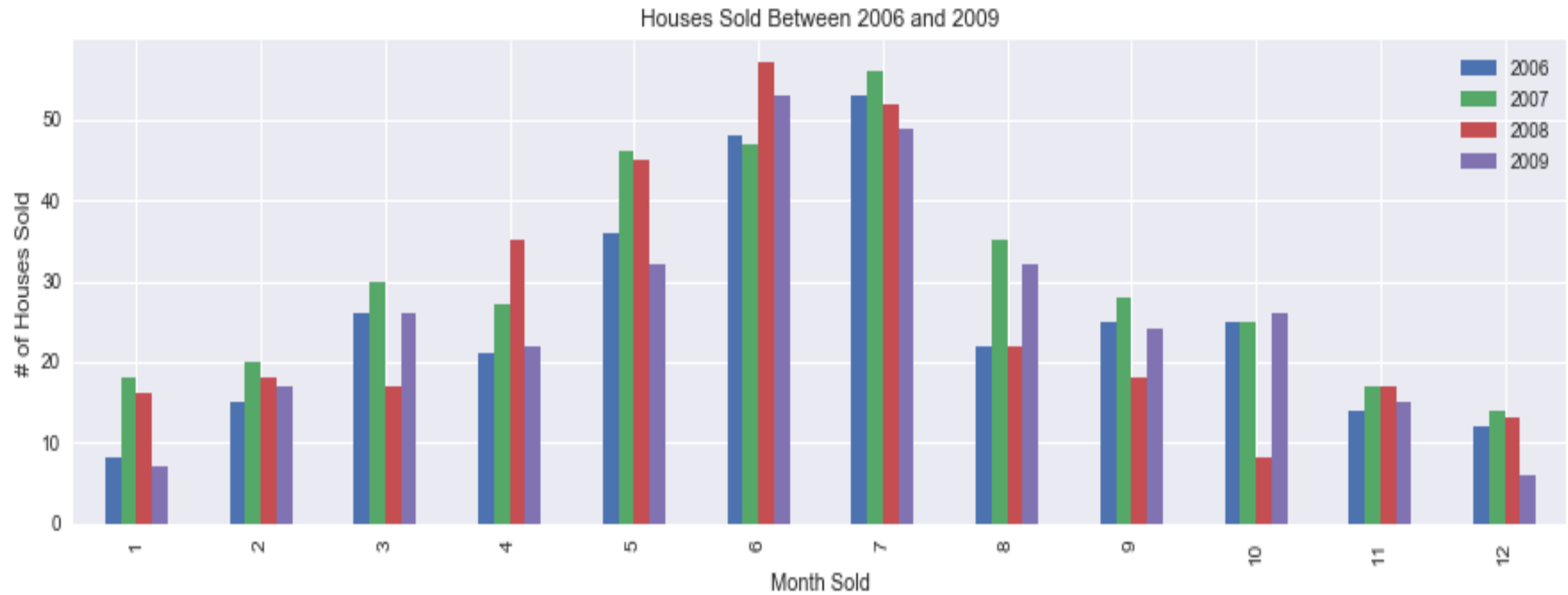◦ Built dummy columns for categorical variables

Test
◦ Used means and mode values from training data for any NaN values.
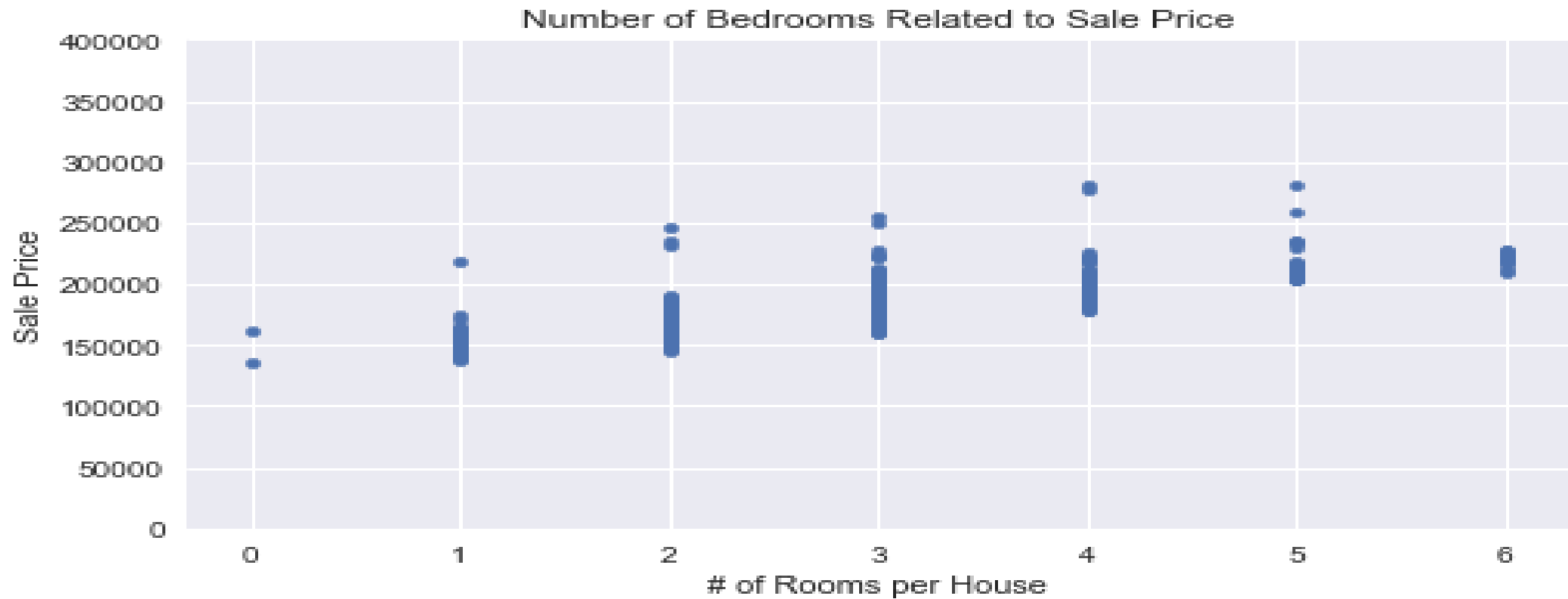◦ Re-index and transfer the dummy variables from out training data
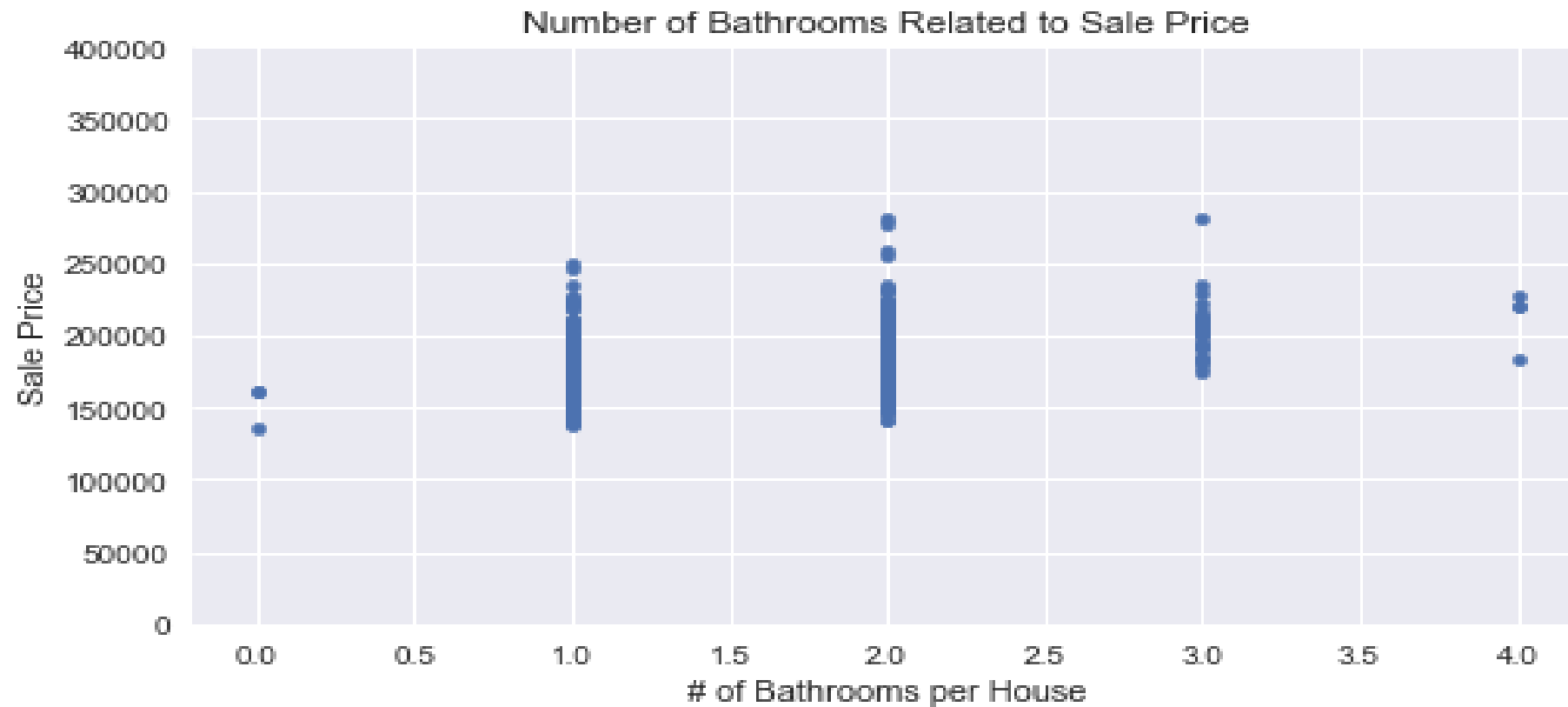
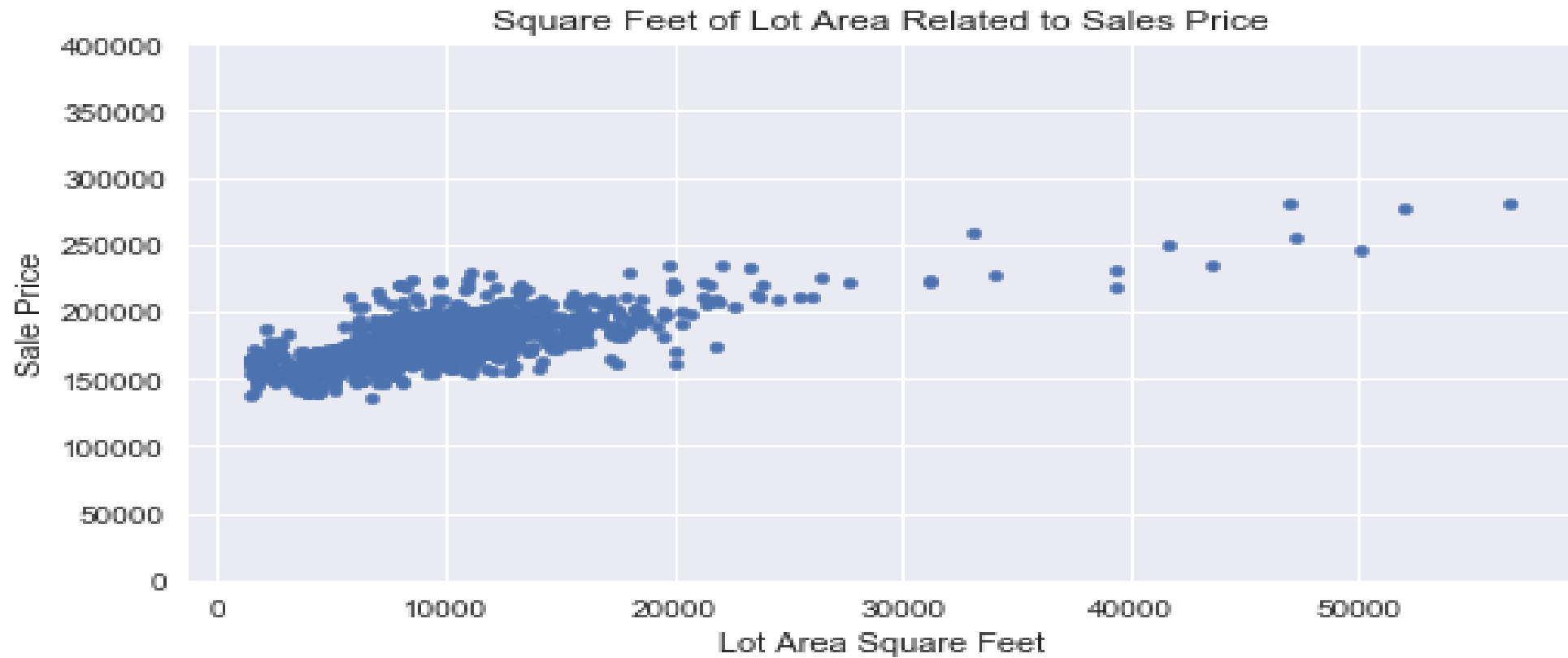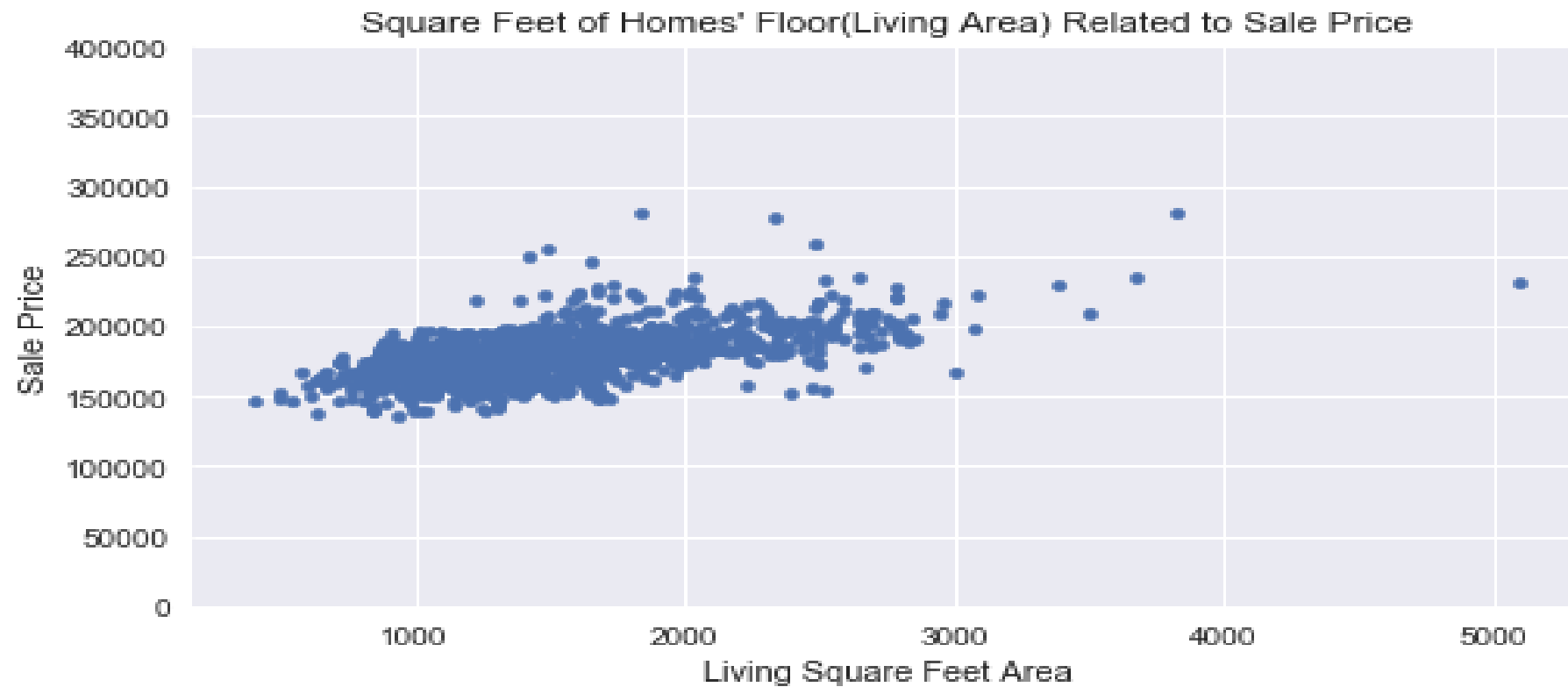# Exploratory Data Analysis

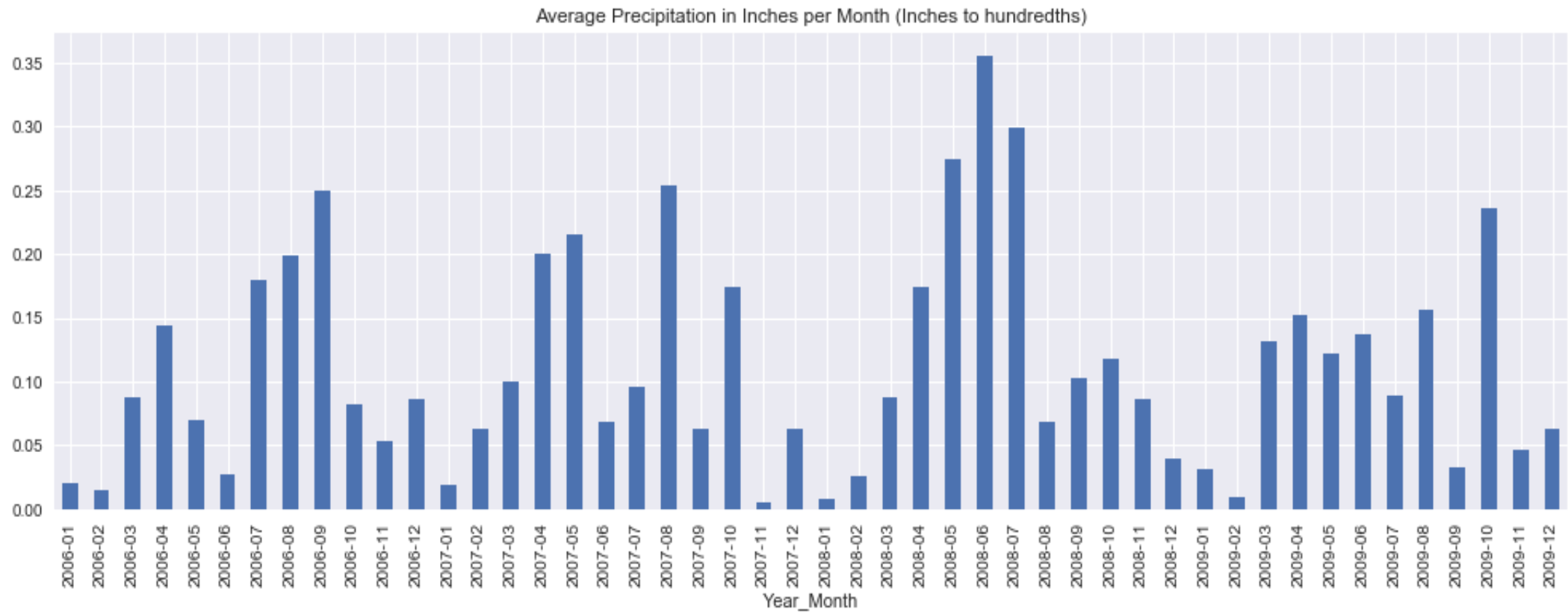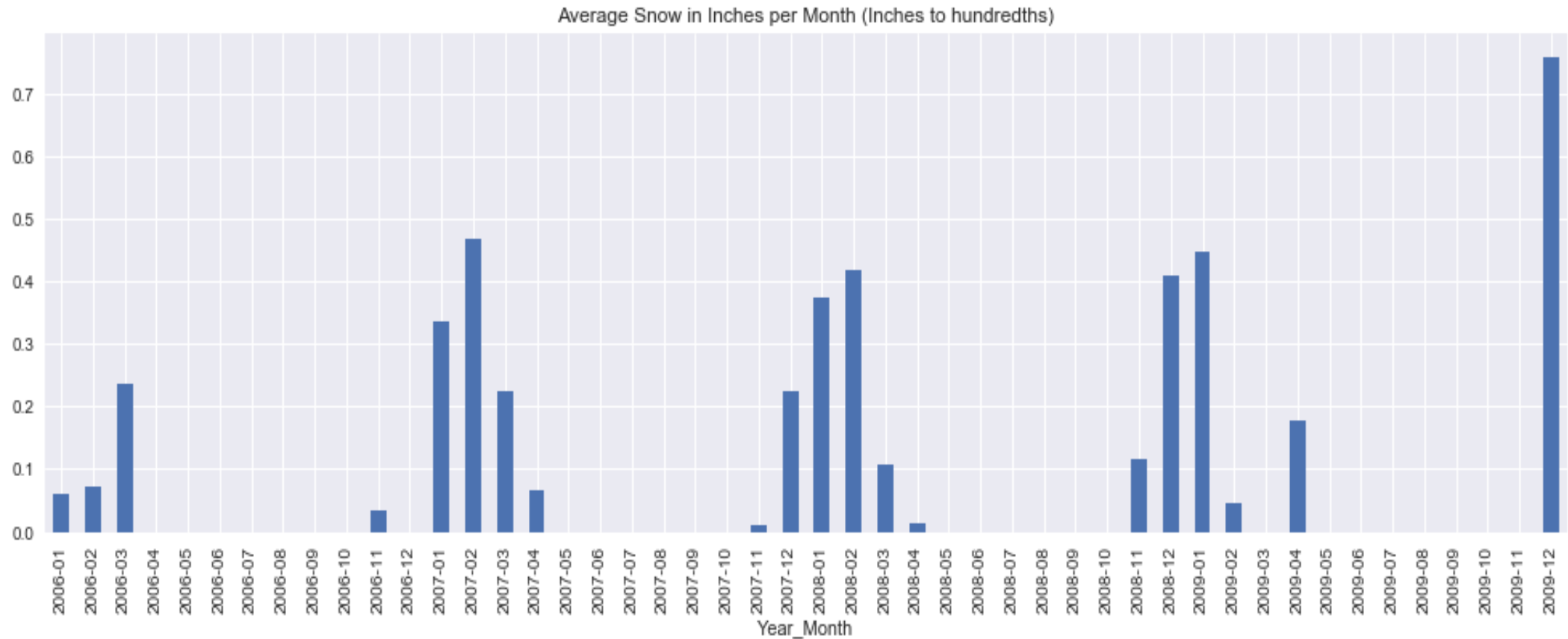# Exploratory Data Analysis

Exploratory Data Analysis

Number of Bedrooms Related to Sale Price

Exploratory Data Analysis

Number of Bathrooms Related to Sale Price

Exploratory Data Analysis

Exploratory Data Analysis

Square Feet of Homes' Floor(Living Area) Related to Sale Price

Exploratory Data Analysis

Average Precipitation in Inches per Month (Inches to hundredths)

Exploratory Data Analysis

Average Snow in Inches per Month (Inches to hundredths)

Exploratory Data Analysis

Average Minimum and Maximum Temperature per Month
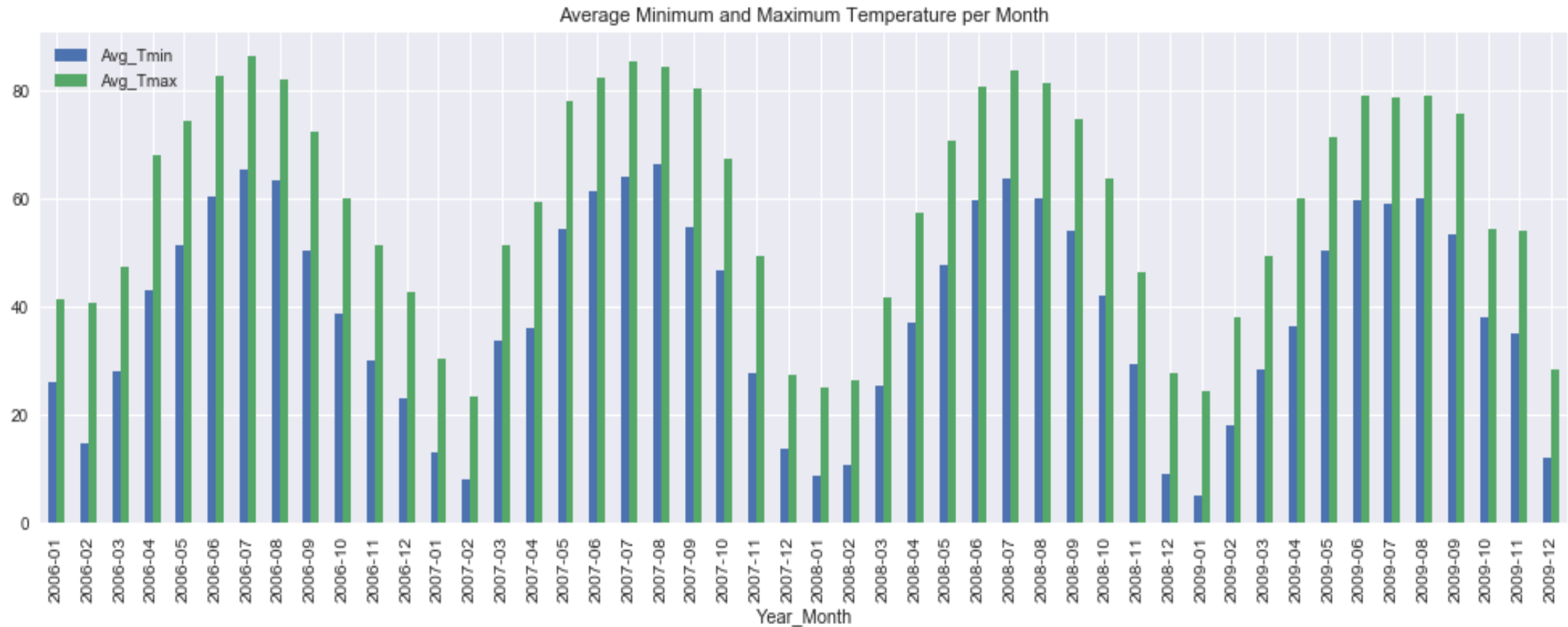
Inferential Analysis

Alpha set at .05

Significant price difference analysis about population.

Central unit vs not a central unit

P-value: 0.010090621217186681

One story houses vs Two story houses
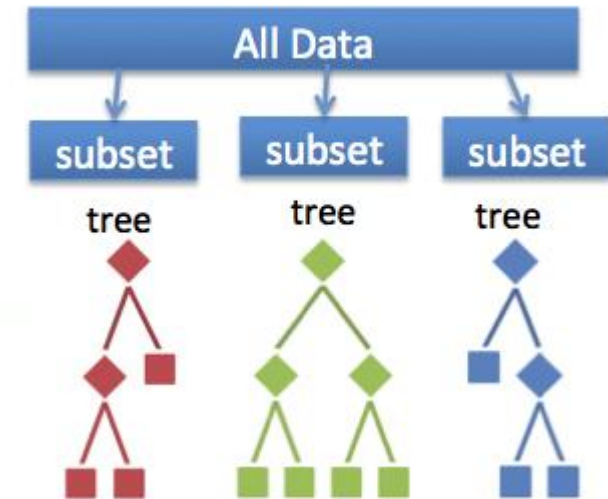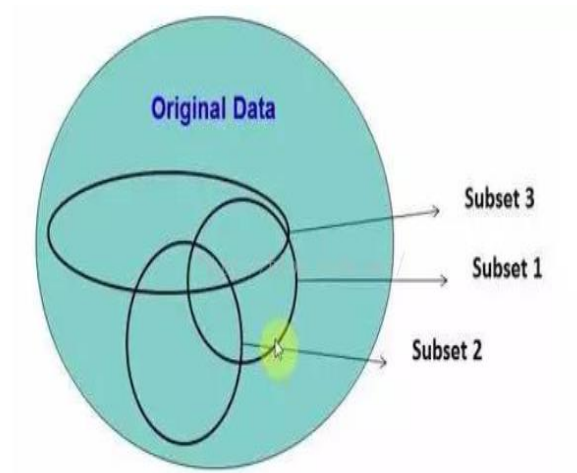
P-value: 3.5535259636604621e-13

Good privacy fence vs minimum privacy fence

P-value: 0.37003494954970051

Modeling and Analysis

Random Forest Predictive Algorithm

◦ Continues Target variable(Regression)

◦ Based on Decision Trees Models

◦ Bootstrapping

◦ Root Mean Square Error Accuracy
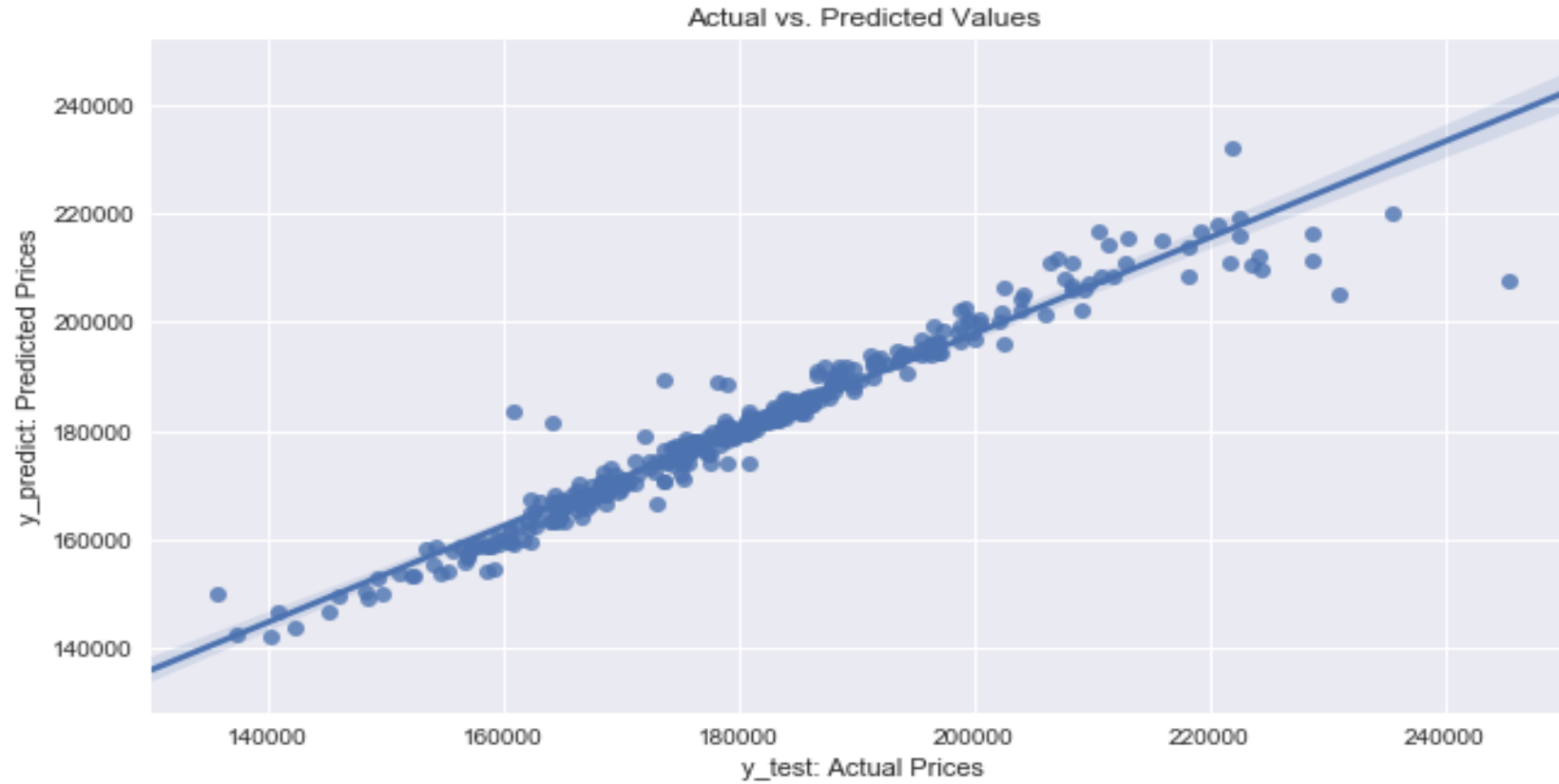
◦ Feature Importance

Modeling and Analysis

Main packages and libraries

Scikit-learn and math

- ◦ RandomForestRegressor()
- ◦ Param_grid(GridSearchCV)
- ◦ Fit()
- ◦ Best_estimators()
- ◦ Predict()
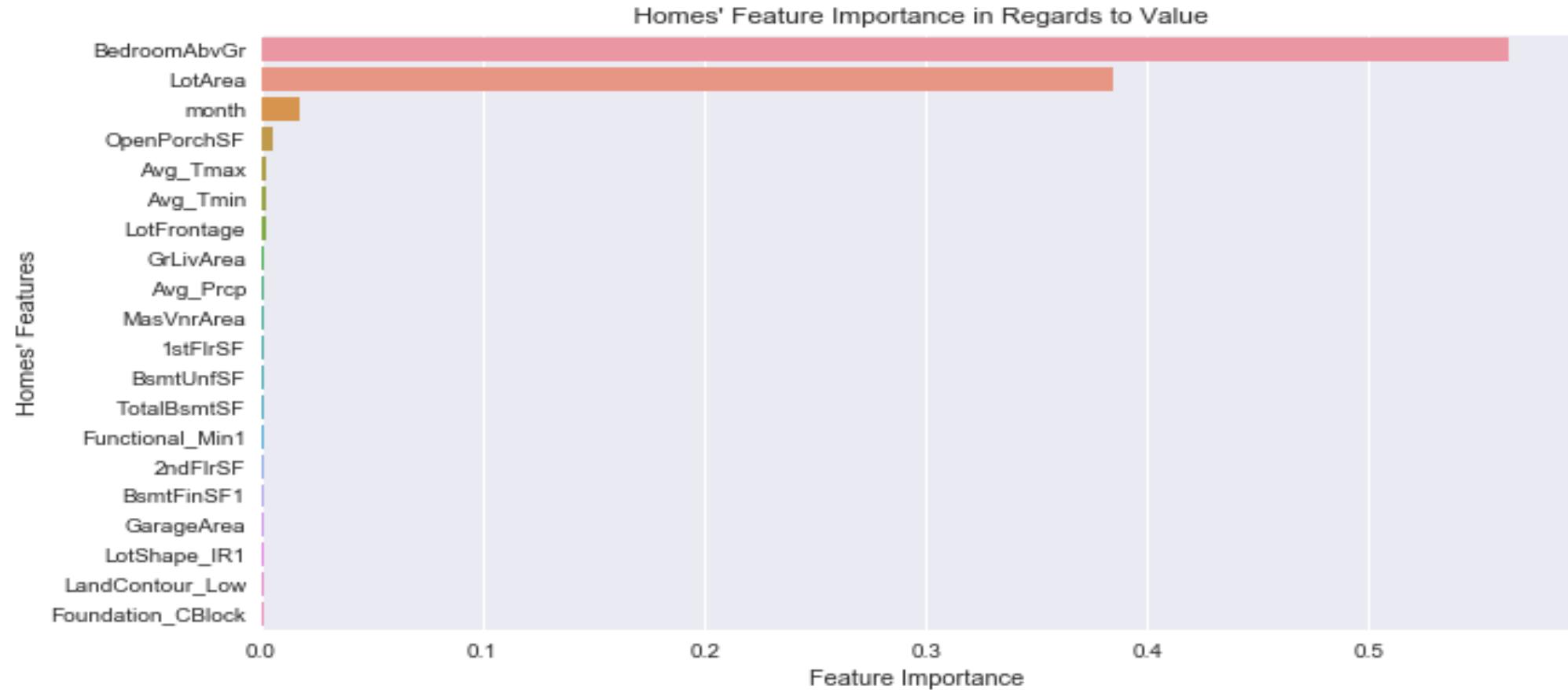- ◦ RMSE = sqrt(mean_squared_error(y_test, y_predict)

Modeling and Analysis

Actual vs. Predicted Values

Modeling and Analysis

Feature Importance related to predicted price value

	Features	Importance
20	BedroomAbvGr	5.67e-01
2	LotArea	3.81e-01
34	month	1.72e-02
38	Avg_Tmax	2.60e-03
28	OpenPorchSF	2.22e-03
39	Avg_Tmin	1.96e-03
1	LotFrontage	1.77e-03
12	1stFlrSF	1.55e-03
215	Functional_Min1	1.42e-03
36	Avg_Prcp	1.35e-03

Modeling and Analysis

Homes' Feature Importance in Regards to Value

Thank you!

Any Questions?