EDA Project
house sells data

Diving into data :)

Content

- Quick overview
  - Pairplot
  - Histplot
  - Corrplot
- Questioning
- Linear Regression

King County Data Set

* **id** - unique identified for a house
* **dateDate** - house was sold
* **pricePrice** - is prediction target
* **bedroomsNumber** - # of bedrooms
* **bathroomsNumber** - # of bathrooms
* **sqft_livingsquare** - footage of the home
* **sqft_lotsquare** - footage of the lot
* **floorsTotal** - floors (levels) in house
* **waterfront** - House which has a view to a waterfront
* **view** - Has been viewed
* **condition** - How good the condition is (Overall)

* **grade** - overall grade given to the housing unit, based on King County grading system

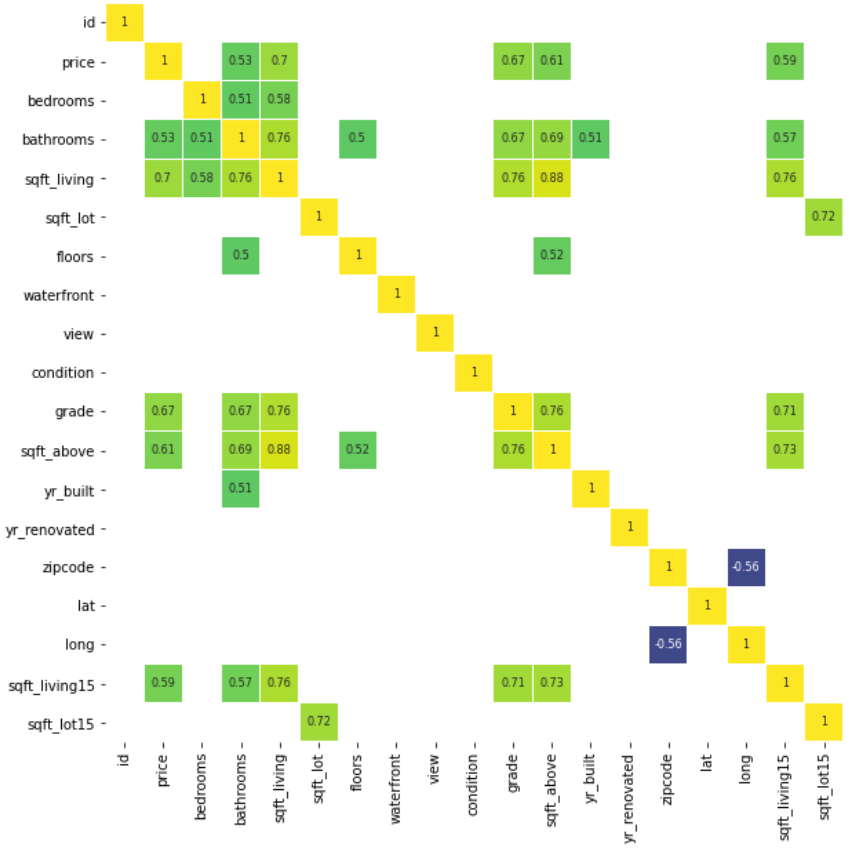
King County Data Set

* **sqft_above** - square footage of house apart from basement
* **sqft_basement** - square footage of the basement
* **yr_built** - Built Year
* **yr_renovated** - Year when house was renovated
* **zipcode** - zip
* **lat** - Latitude coordinate
* **long** - Longitude coordinate

* **sqft_living15** - The square footage of interior housing living space for the nearest 15 neighbors

* **sqft_lot15** - The square footage of the land lots of the nearest 15 neighbors

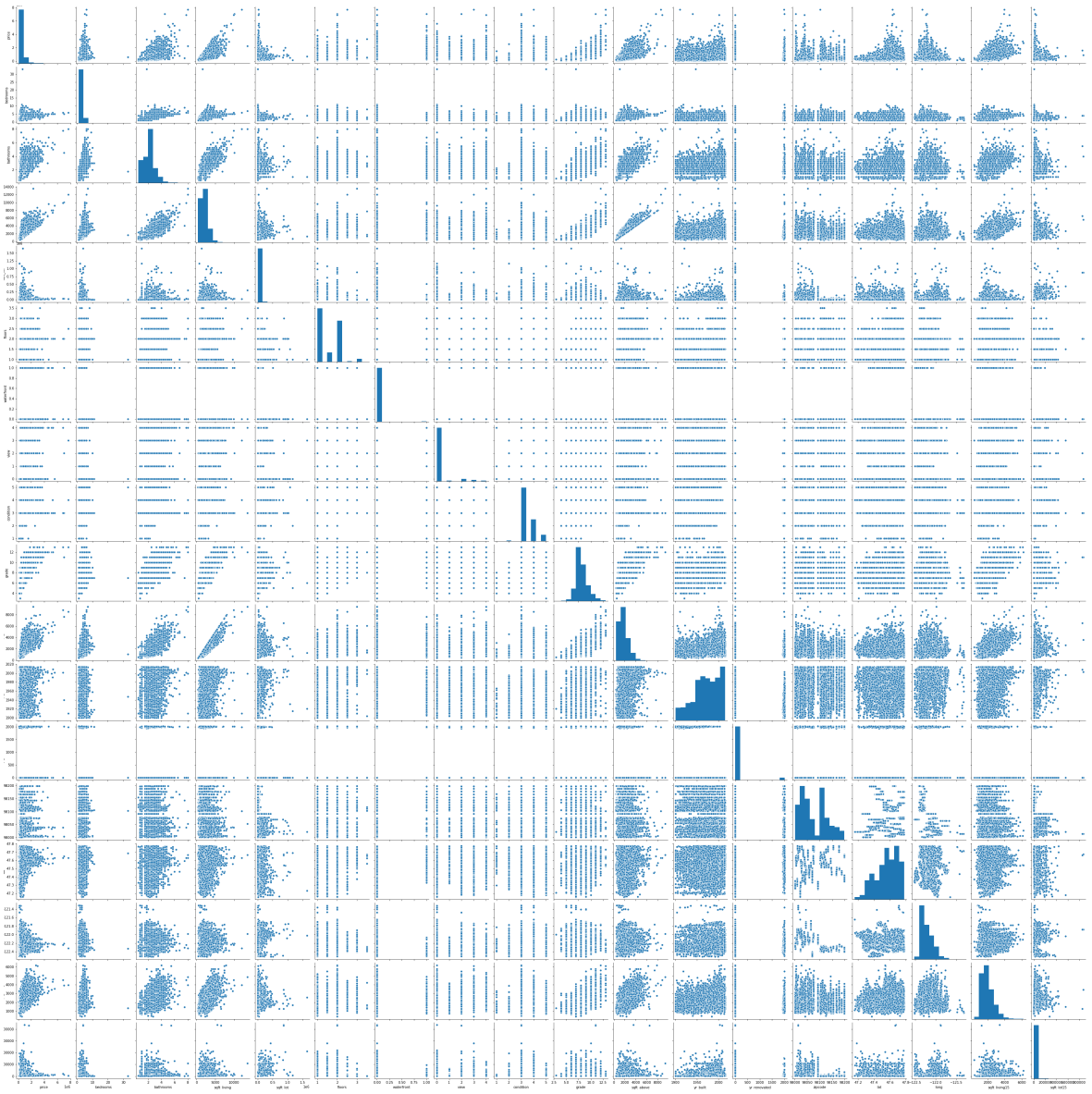
Corrplot of the numerical data



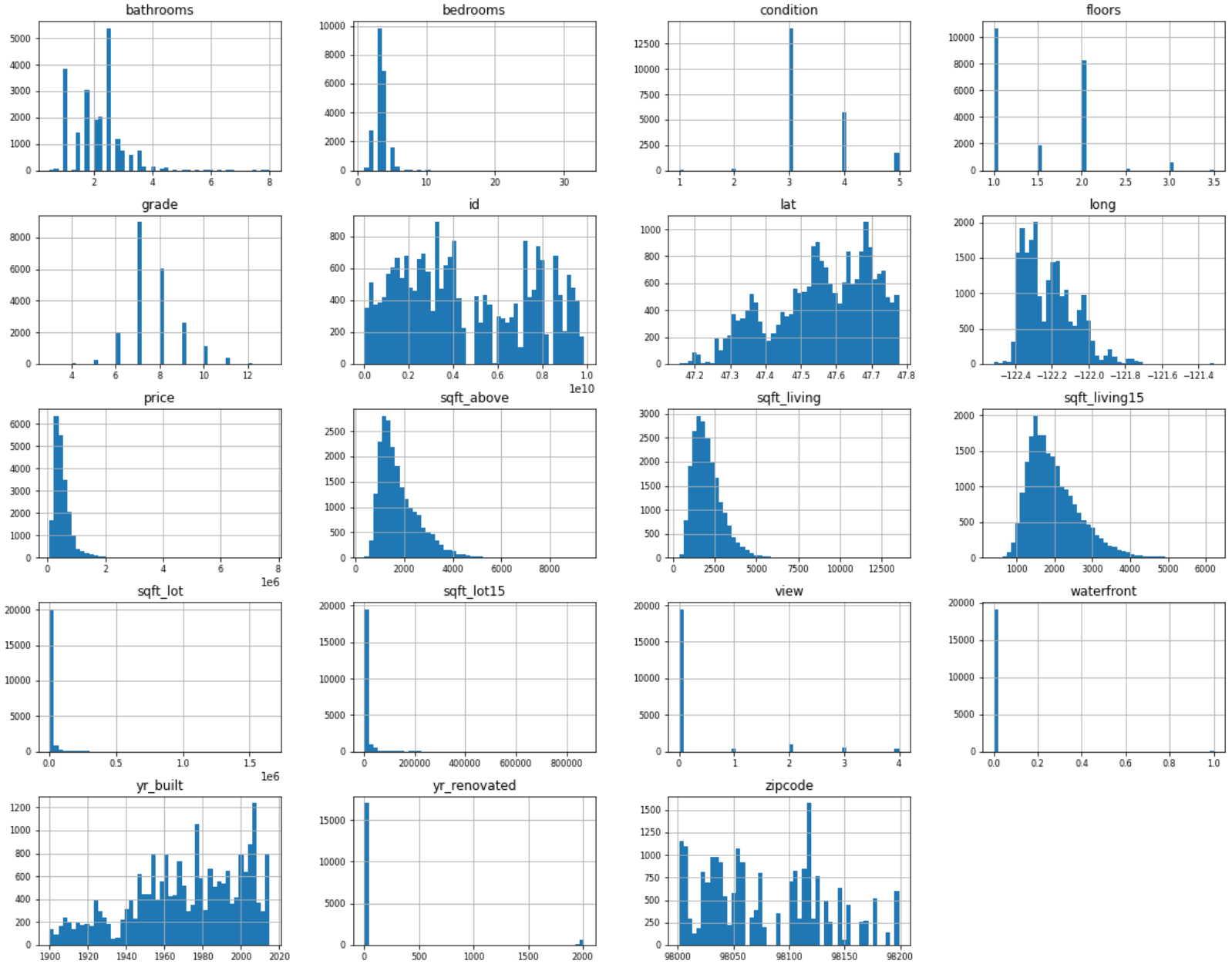
King County Data Set

#	Column	Non-Null Count	Dtype
0	id	21597 non-null	int64
1	price	21597 non-null	float64
2	bedrooms	21597 non-null	int64
3	bathrooms	21597 non-null	float64
4	sqft_living	21597 non-null	int64
5	sqft_lot	21597 non-null	int64
6	floors	21597 non-null	float64
7	waterfront	19221 non-null	float64
8	view	21534 non-null	float64
9	condition	21597 non-null	int64
10	grade	21597 non-null	int64
11	sqft_above	21597 non-null	int64
12	sqft_basement	21597 non-null	object
13	yr_built	21597 non-null	int64
14	yr_renovated	17755 non-null	float64
15	zipcode	21597 non-null	int64
16	lat	21597 non-null	float64
17	long	21597 non-null	float64
18	sqft_living15	21597 non-null	int64
19	sqft_lot15	21597 non-null	int64
20	datetime	21597 non-null	datetime64[ns]

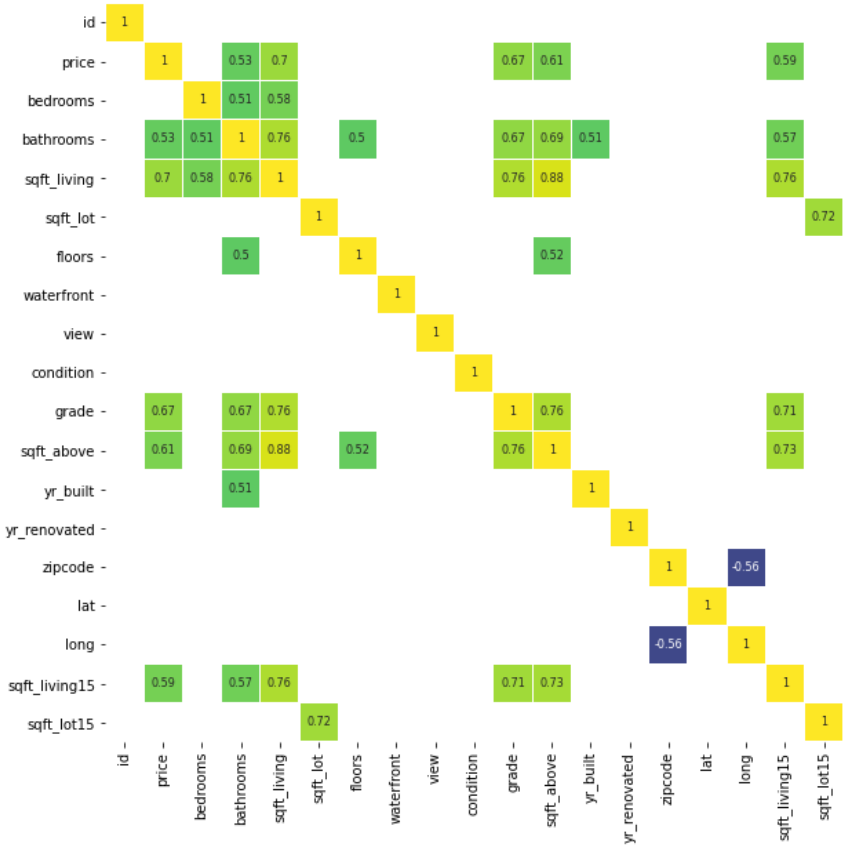
Pairplot of the numerical data



Histplot of the numerical data



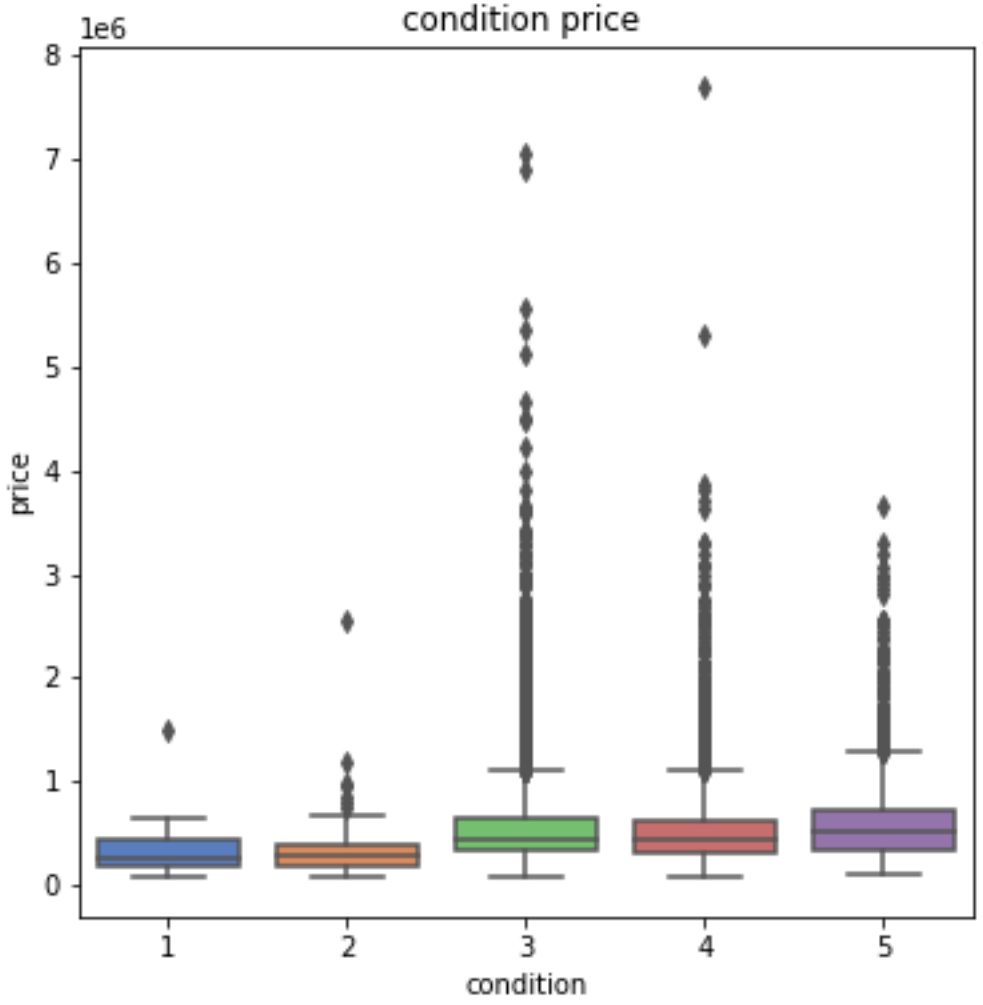
Corrplot of the numerical data

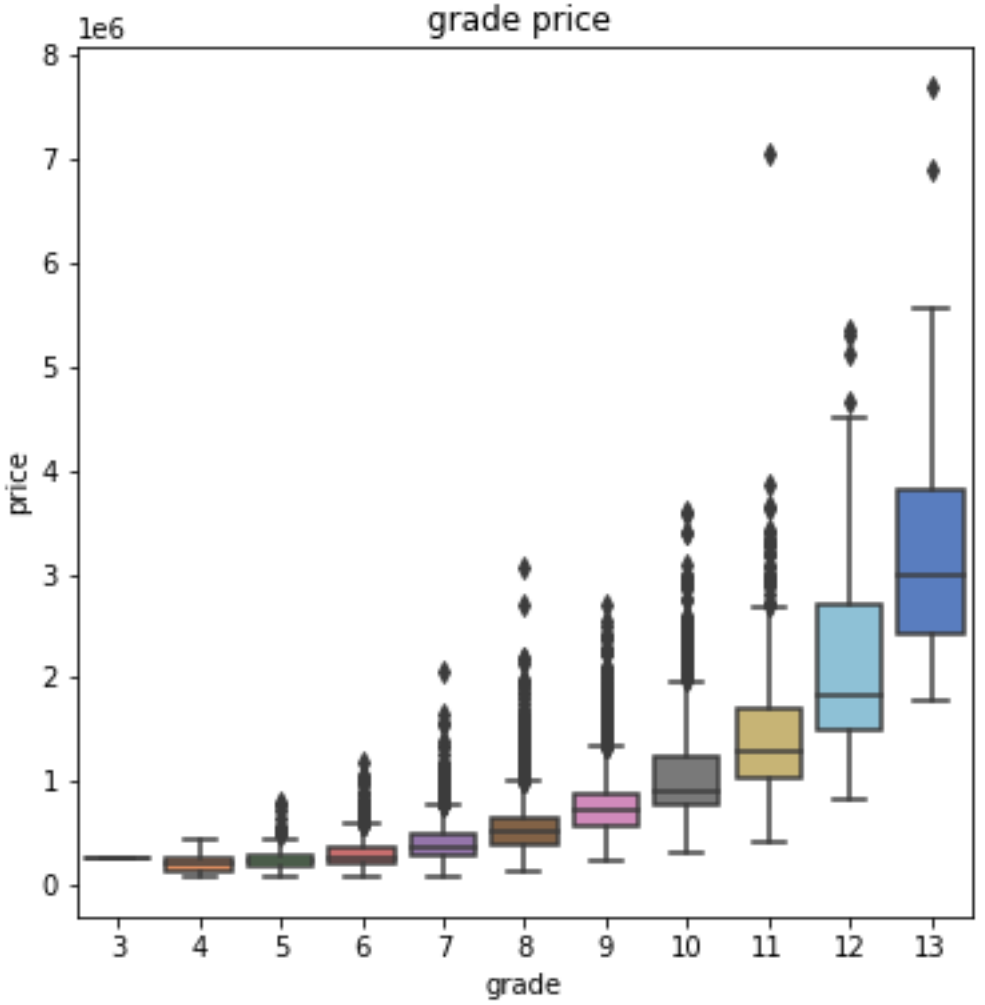


Questions

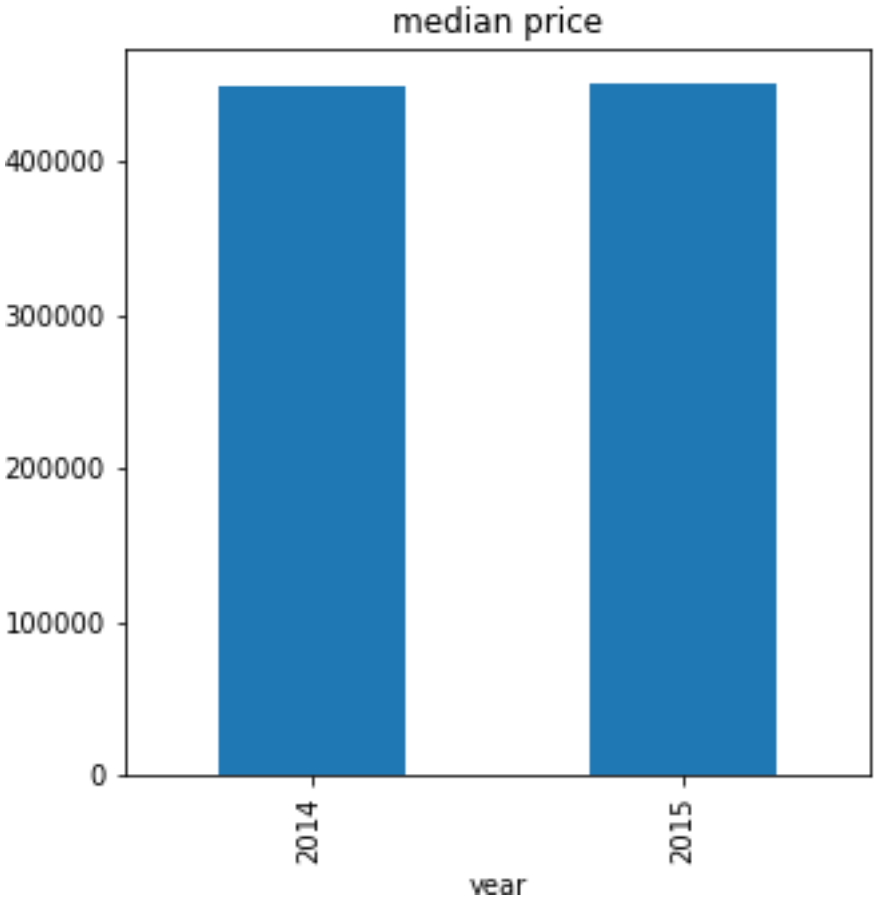
- Is condition or grade better to estimate the price?
- What is the best time to buy or sell a house?
- Is a house with a waterfront more expensive than others?
- Does the house size effect the price?
- Do the neighbours effect the house price?

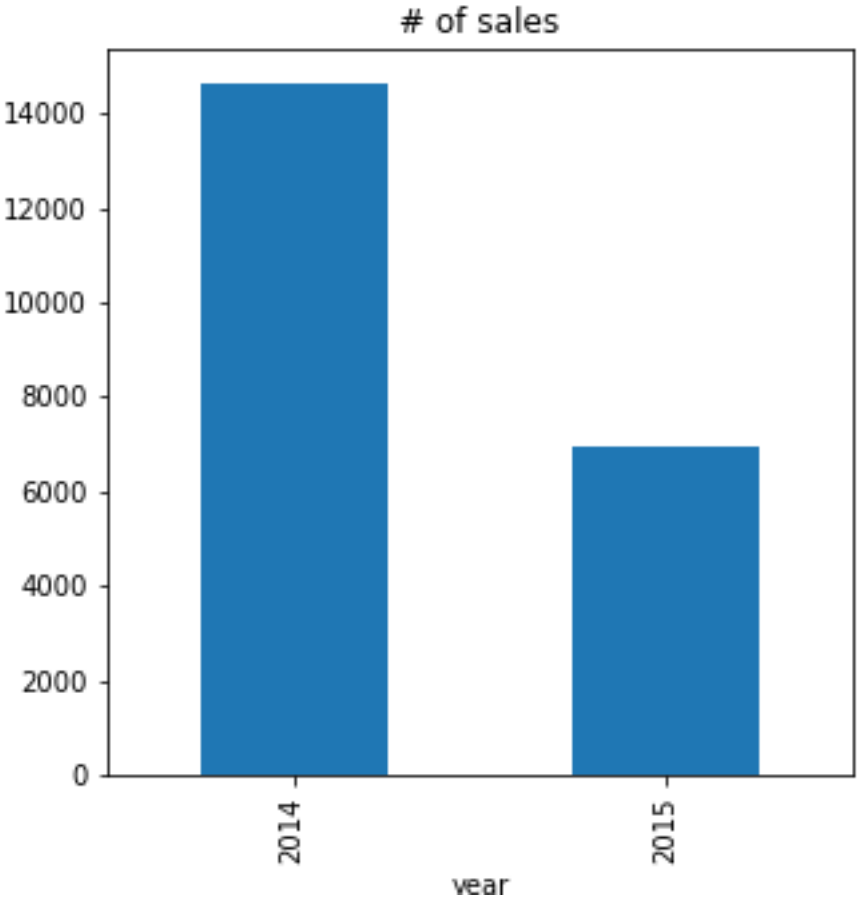
Is condition or grade better to estimate the price?





What is the best time to buy or sell a house?





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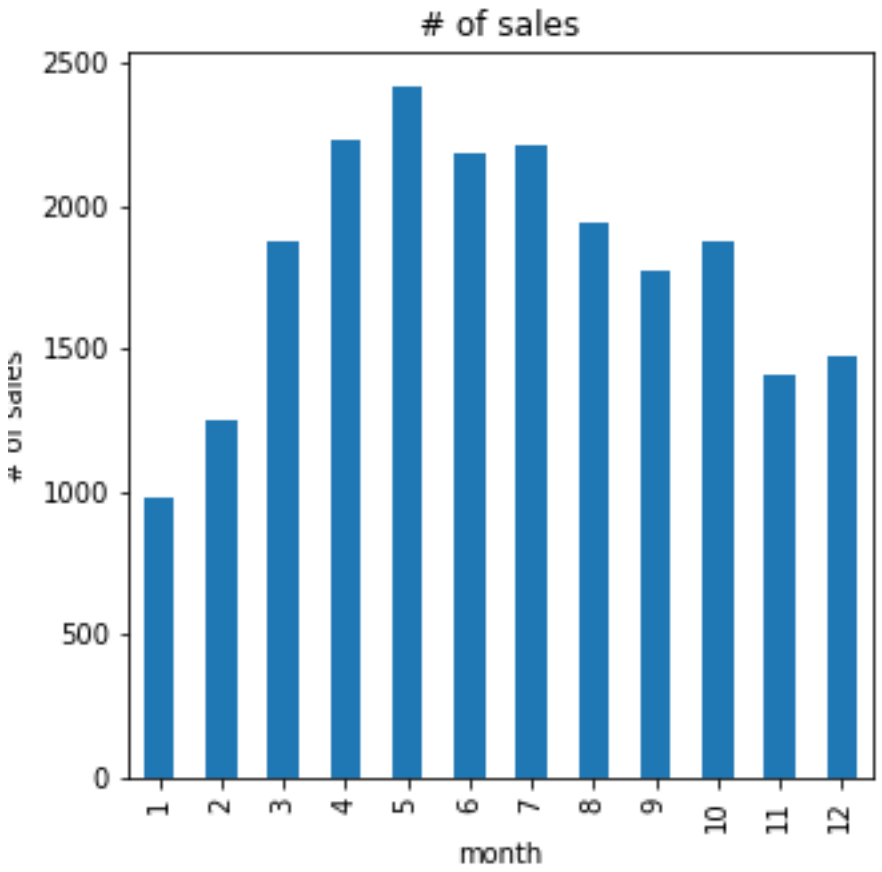
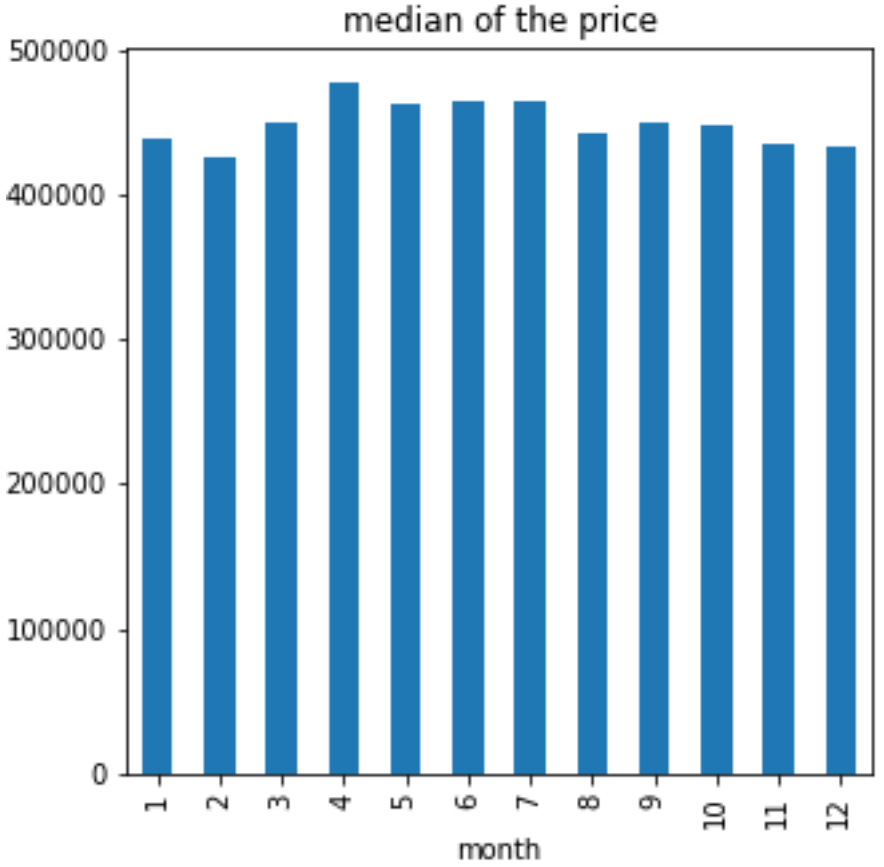
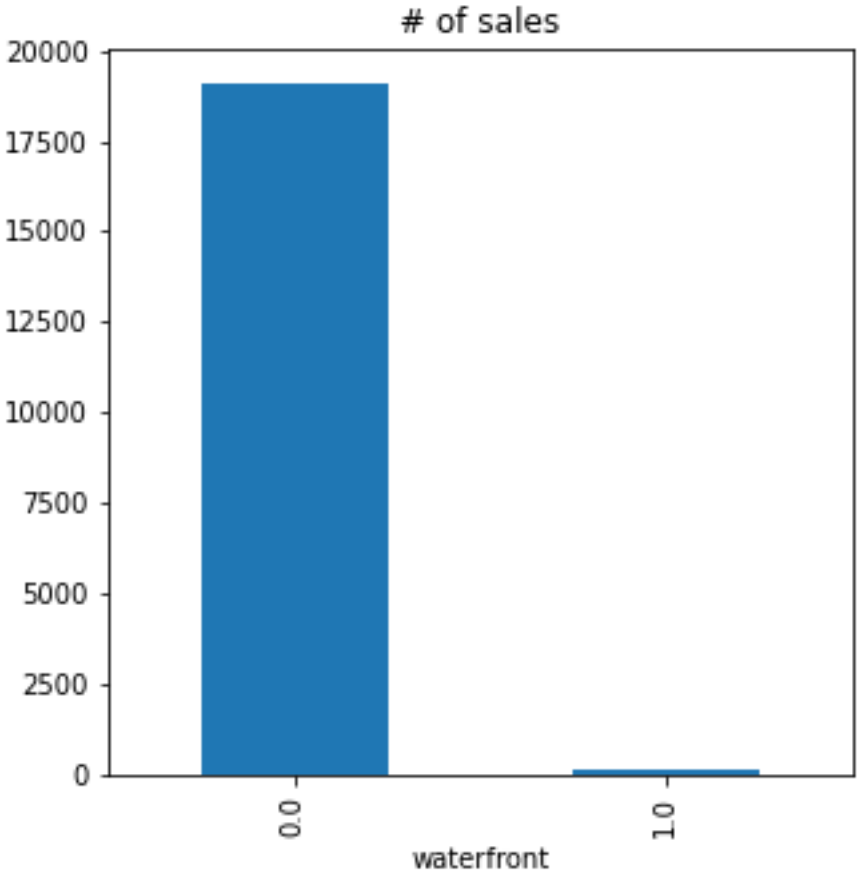
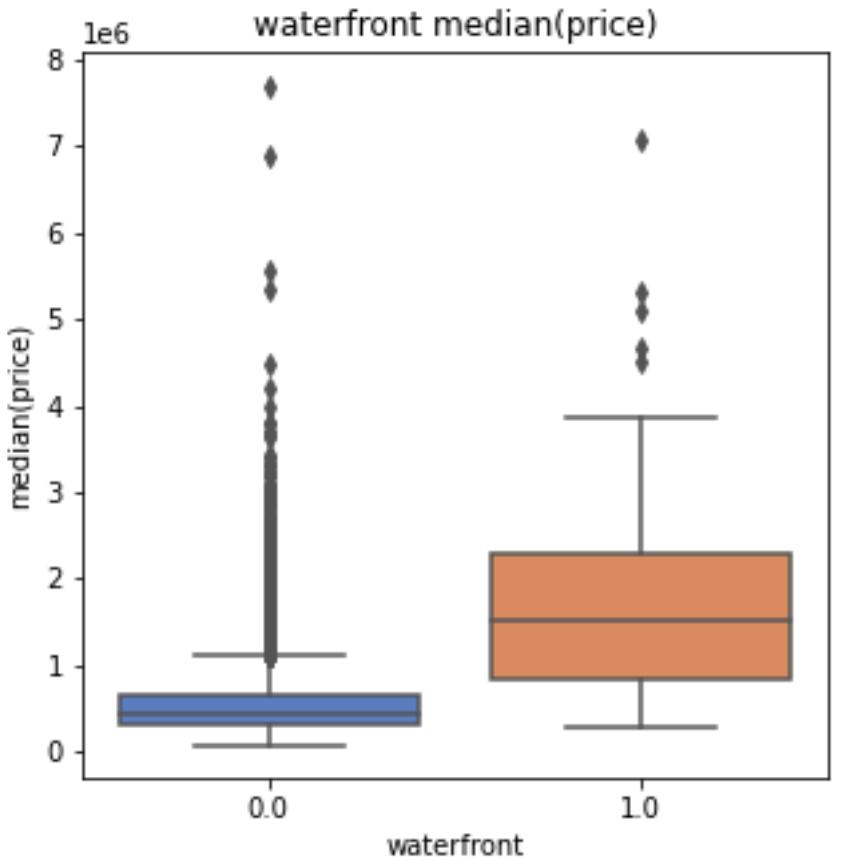


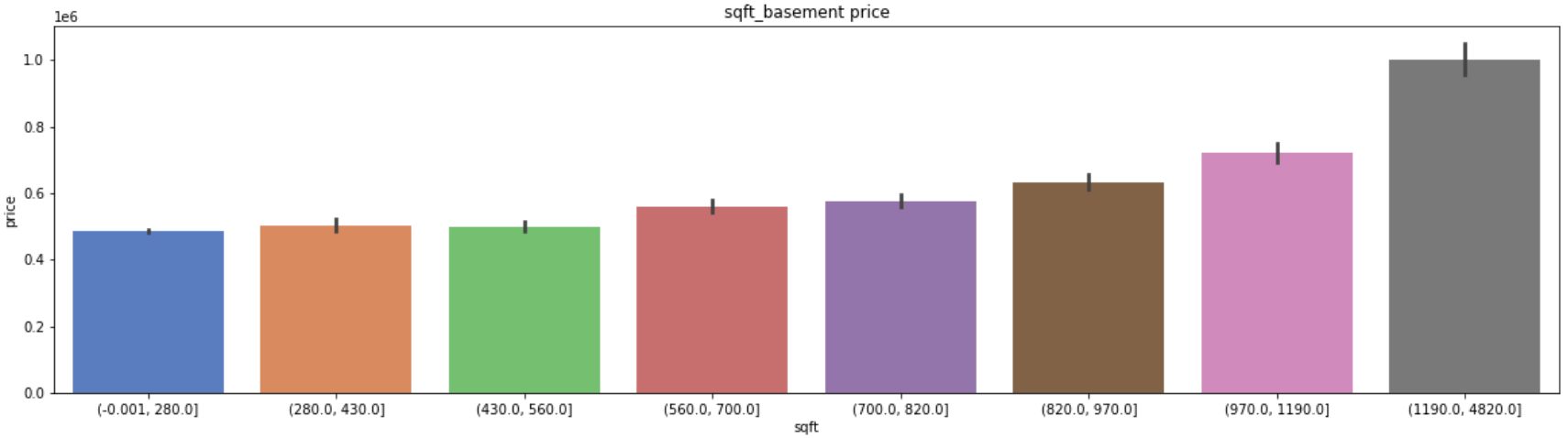


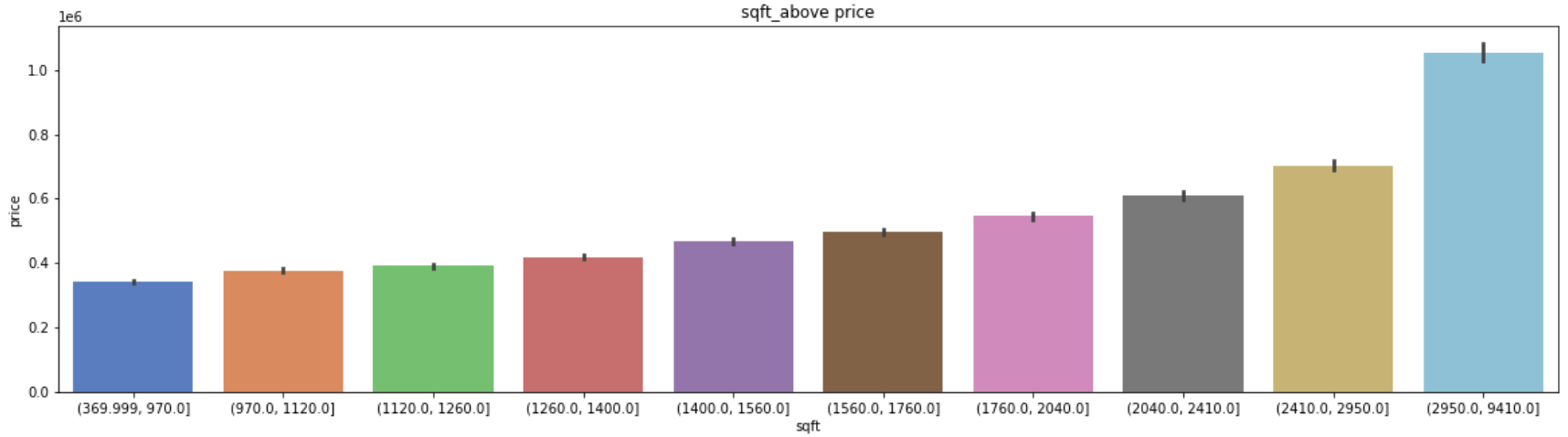
Is a house with a waterfront more expensive than others?





Does the house size effect the price?





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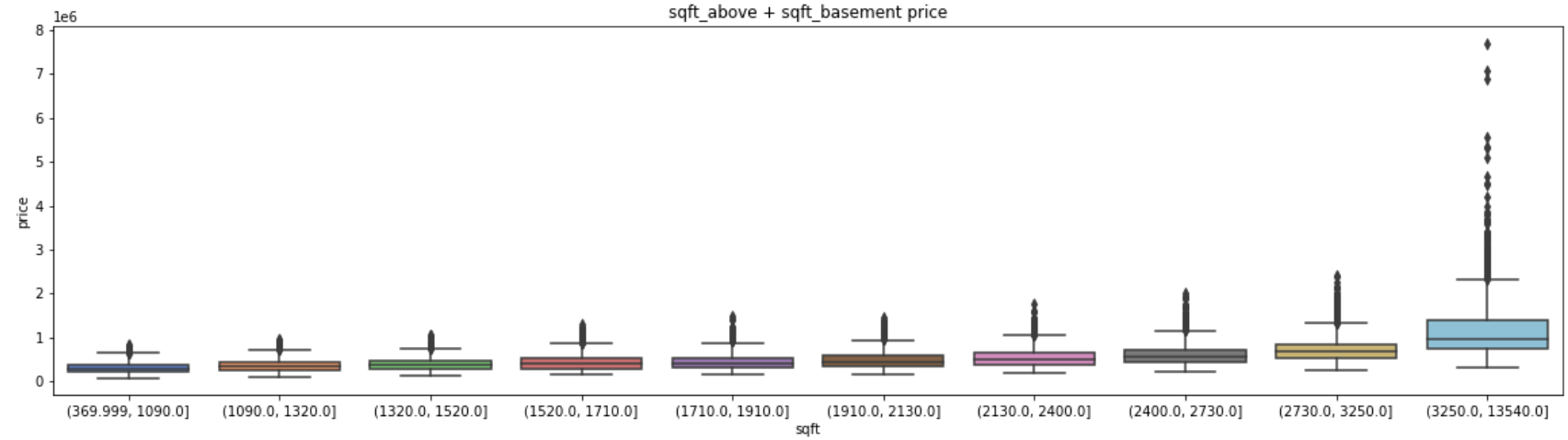
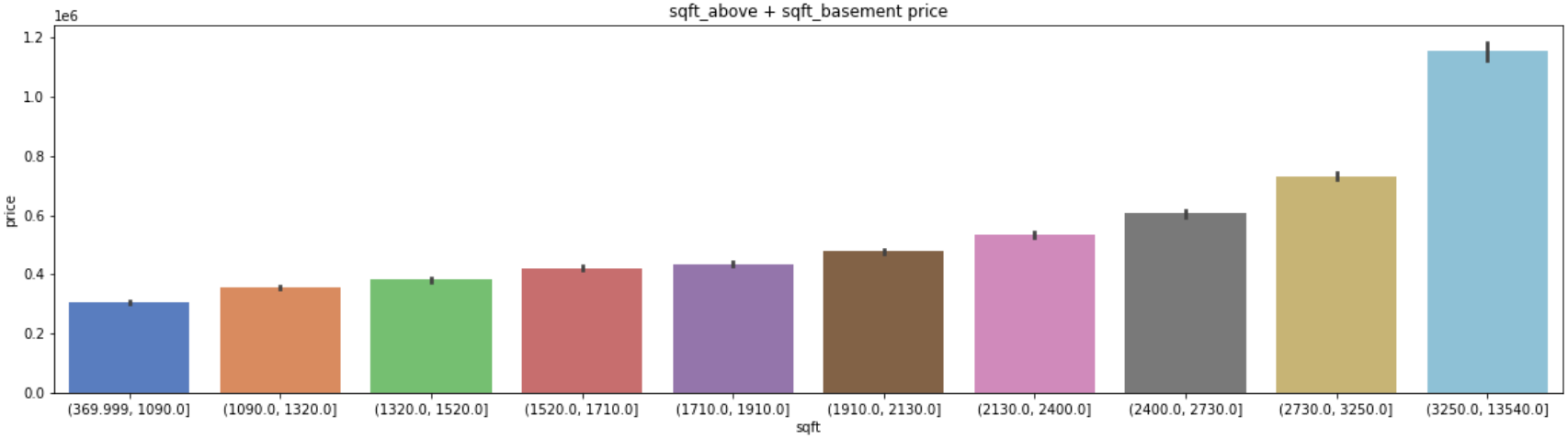
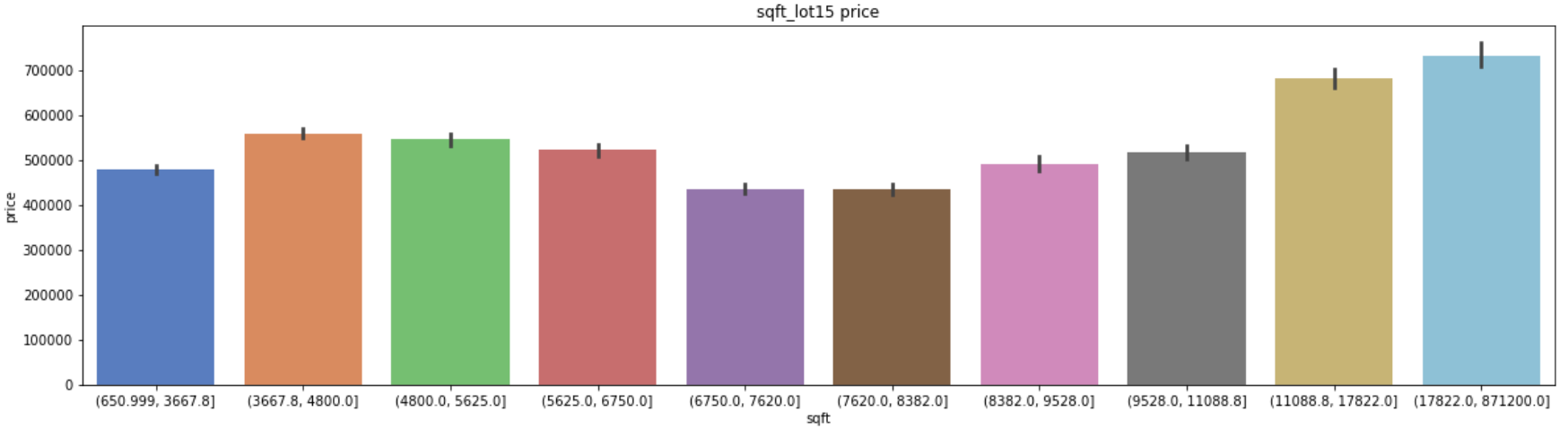
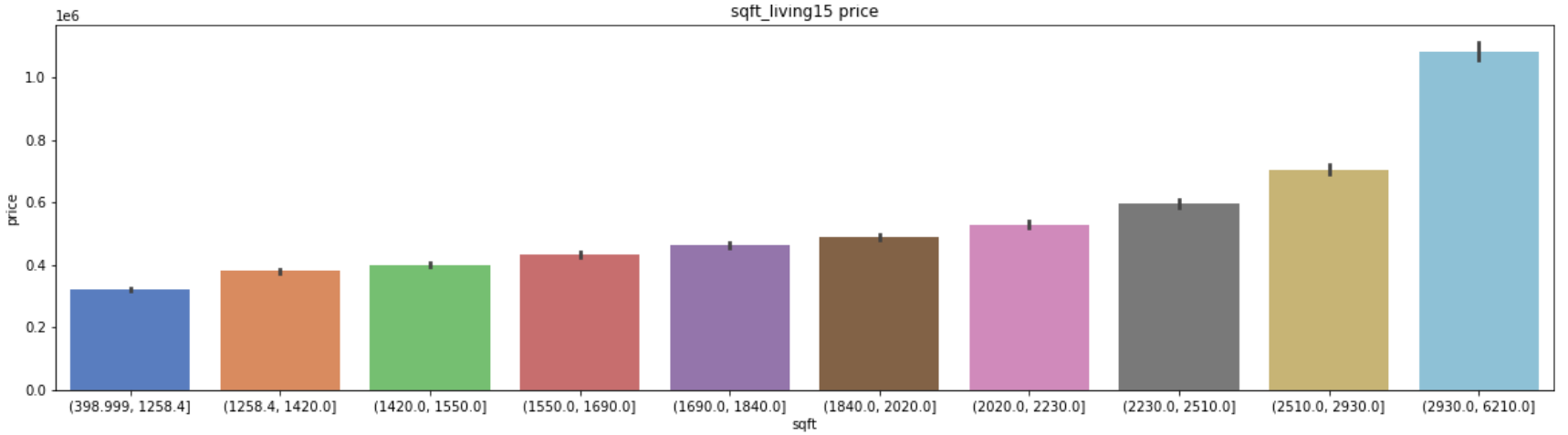




Do the neighbours effect the house price?





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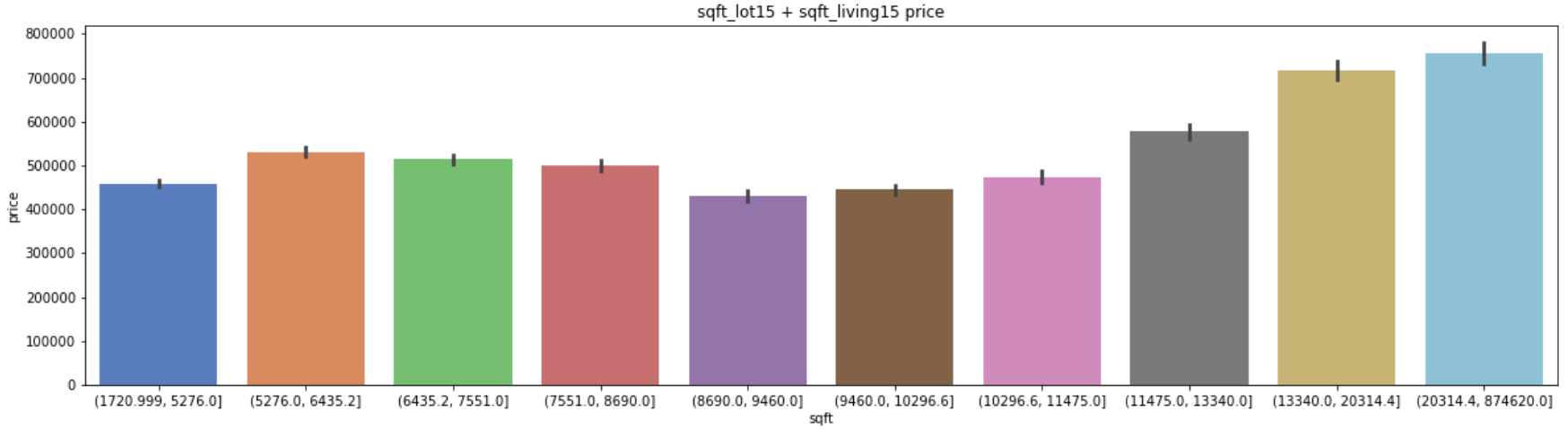
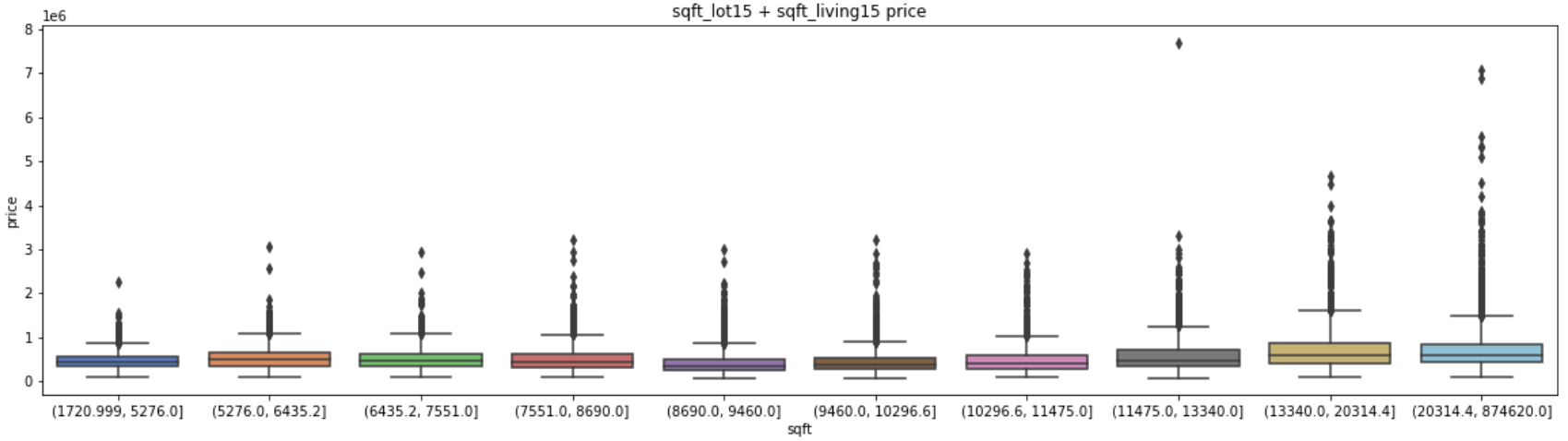
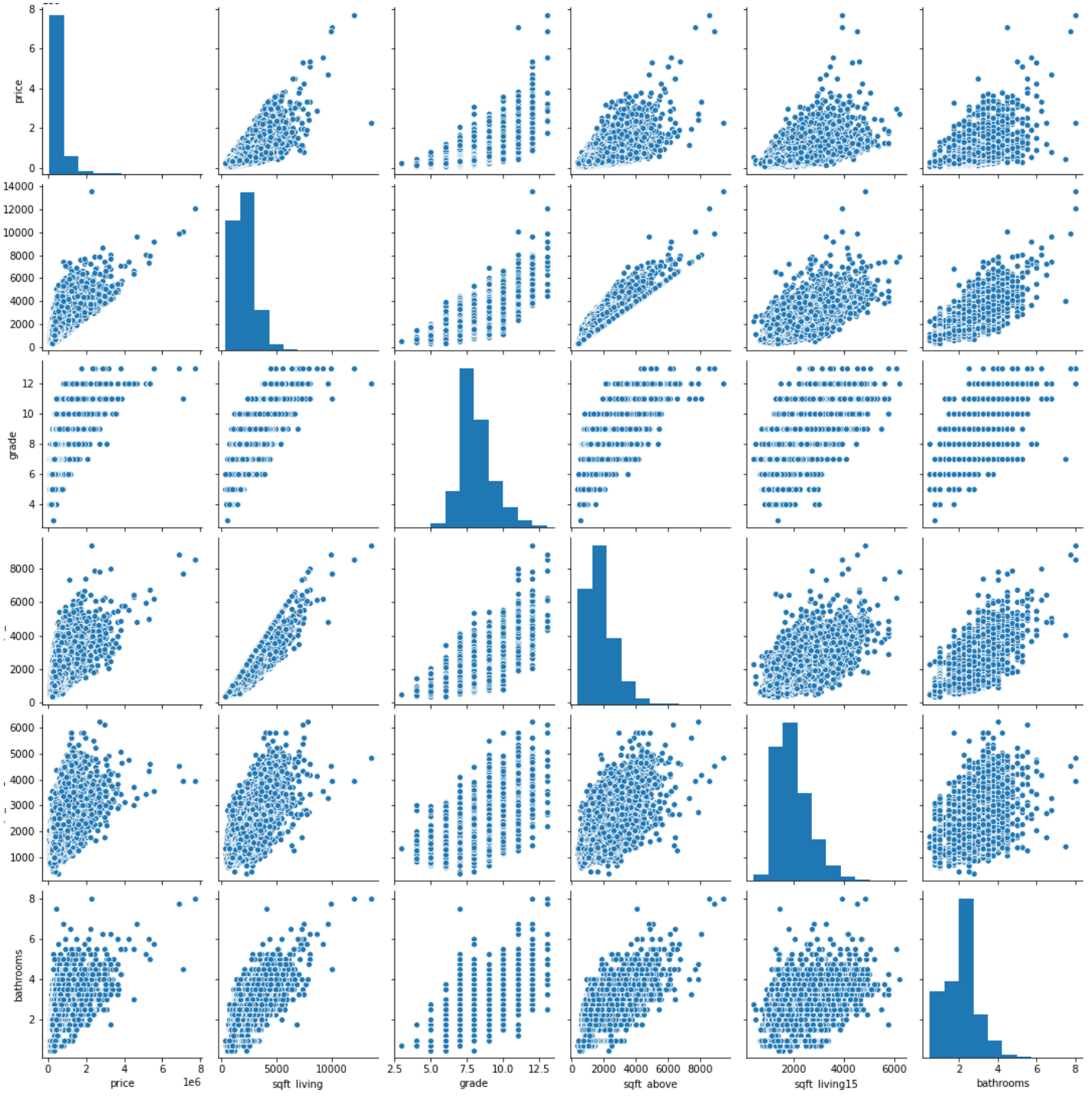
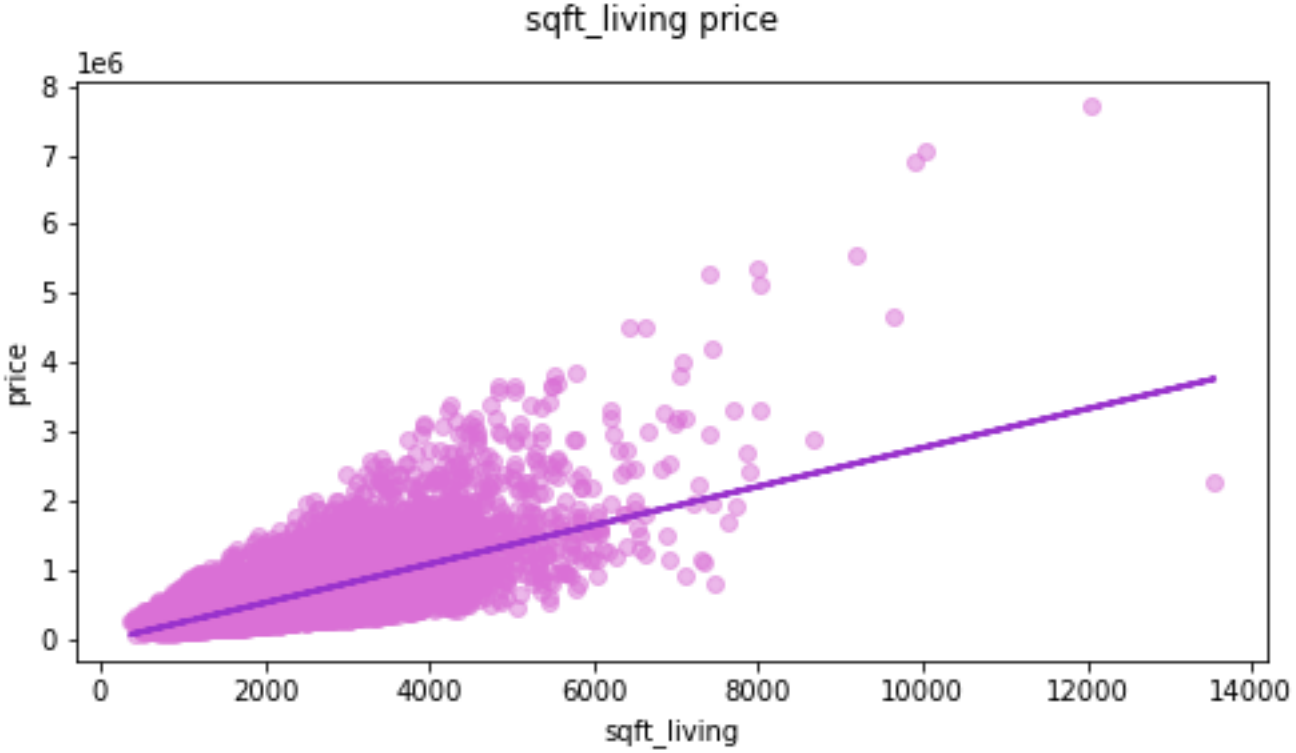





price
grade
bathrooms
1e6
price
sqft_living
grade
sqft_above
sqft_living15
bathrooms

Linear Regression with statsmodels.formula.api

- R-squared: 0.493
- price ~ sqft_living



Multi Linear Regression with statsmodels.formula.api

- R-squared: 0.854
- Adj. R-squared: 0.847

Code:

```
model = smf.ols('price ~ datetime + C(bedrooms) + C(bathrooms) +\
                      sqft_living +  sqft_lot +\
                      C(floors) +   sqft_living15\
                      C(waterfront)     + C(view) + \
                      C(condition)      + C(grade) +\
                      sqft_above        + sqft_basement_num +\
                      C(yr_built)       + C(yr_renovated) +\
                      C(zipcode)        + lat + \
                      long              +  sqft_lot15', data=data)
```

Multi Linear Regression with sklearn

```
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
from scipy import stats
import seaborn as sns

import statsmodels.formula.api as smf
import pathlib

from sklearn.metrics import mean_squared_error, r2_score
from sklearn.metrics import accuracy_score
from sklearn import linear_model
from sklearn.model_selection import train_test_split

import pickle
```

Multi Linear Regression with sklearn

```
data = pd.read_csv('kc_house_prices/King_County_House_prices_dataset.csv')
data['sqft_basement_num'] = pd.to_numeric(data[data['sqft_basement']!
='?'].sqft_basement)
data.head()


data = data.replace([np.inf, -np.inf], np.nan)
data.dropna(inplace=True)


Y = data['price']

X = data[['price', 'bedrooms', 'bathrooms', 'sqft_living', 'sqft_lot',
       'floors', 'waterfront', 'view', 'condition', 'grade', 'sqft_above',
       'yr_built', 'yr_renovated', 'zipcode', 'lat', 'long',
       'sqft_living15', 'sqft_lot15', 'sqft_basement_num']]

X = pd.get_dummies(data=X, drop_first=True)
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size = .20,
random_state = 42)
```

Multi Linear Regression with sklearn

```
my_model = linear_model.LinearRegression() # Do not use fit_intercept = False if you
have removed 1 column after dummy encoding
my_model.fit(X_train, Y_train)
y_pred = my_model.predict(X_test)

#print('Coefficients: \n', regr.coef_)
# The mean squared error
print('Mean squared error: %.2f'
      % mean_squared_error(Y_test, y_pred))

# The coefficient of determination: 1 is perfect prediction
print('Coefficient of determination: %.2f'
      % r2_score(Y_test, y_pred))

_> output
Mean squared error: 0.00
Coefficient of determination: 1.00
```

Multi Linear Regression with sklearn

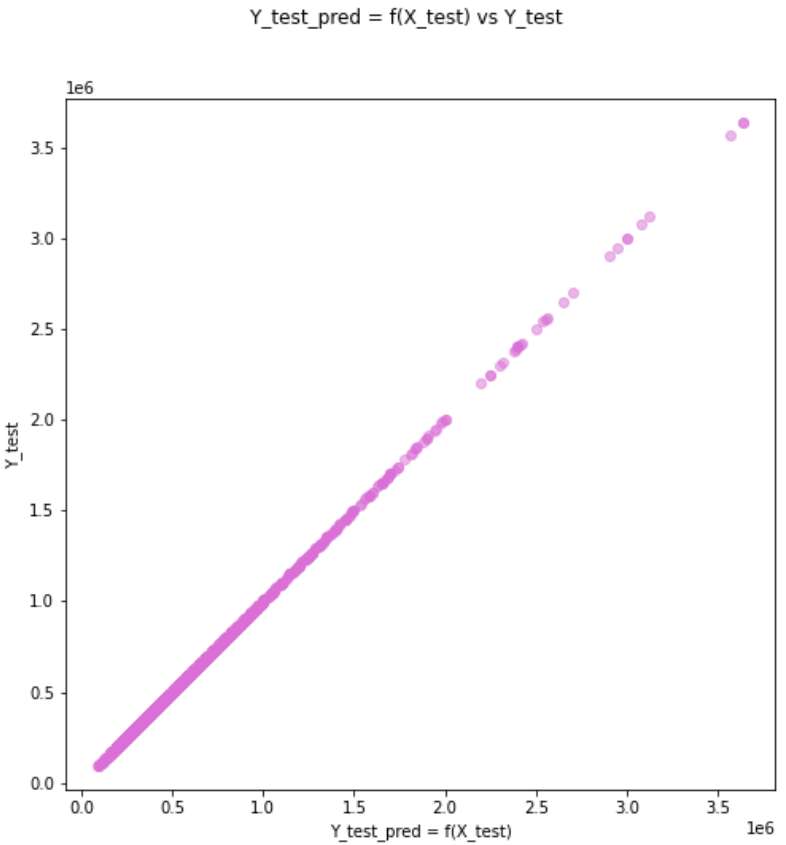
```
# save the model to disk
filename = 'finalized_model.sav'
pickle.dump(my_model, open(filename, 'wb'))

print('\n some time later...')

# load the model from disk
loaded_model = pickle.load(open(filename, 'rb'))
result = loaded_model.score(X_test, Y_test)
print(result)
```

Multi Linear Regression with sklearn

```
fig, ax = plt.subplots(figsize=(8, 8))
ax.scatter(y_pred, Y_test, \
         alpha=0.5, color='orchid')
fig.suptitle(\
    'Y_test_pred = f(X_test) vs Y_test ')
ax.axis('equal')
ax.set_ylabel("Y_test");
ax.set_xlabel("Y_test_pred = f(X_test)");
plt.show()
```



To improve

- Renovation via price
- Model
  - Refine the linear model
  - Cut outliners
  - Normalize the data set
  - Compare linear model to other models
- Map Gps points
- Convert to „normale“ units Sqrf to sqrm :)
- Create use case for customers
  - I like to have/sell that house with these properties and I want to have ...