Analysis of Sold Properties Data (King County, WA (May 2014-May 2015)

INCREASE YOUR PROPERTY VALUE AND STRETCH YOUR HOUSE BUYING BUDGET FURTHER

FLATIRON SCHOOL

Phase 2 Final Project

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Summary

This Project analyses the data on the properties sold

- In King County, WA
- From May 2014 to May 2015

The resulting model provides insight into

- what controllable property features increase its' value
- what external variables affect the price of a house.

Outline of the presentation

- Business Problem
- Data
- Final Model
- Results
- Conclusions

Business Problem

Inference Analysis of King County, WA house prices

Build a model(s) of a house sale price versus features of the property

This information can be helpful to

- house owners
- house buyers
- and real estate agents in the county

Project scope is limited, and further in-depth analysis would be beneficial

Data

- King County of Washington State
- Between **May 2014** and **May 2015**
- **21597** records
- **19** house features:

date
bedrooms
bathrooms
floors
sqft_living
sqft_above
sqft_basement

sqft_lot
sqft_lot15
sqft_living15
yr_built
yr_renovated

view
waterfront
condition
grade
lat
long
zipcode

Modifications to the Data

Added features:

- **month**
- **distance**
- **basement_exists**
- **renovation_done**

Removed features:

- **zipcode**
- **distance**
- **sqft_basement**
- **lat**
- **long**
- **date**

Limit values in data

Price < 1.5 M

Number of bedrooms < 9

Number of bathrooms < 5.5

Number of floors < 3.5

Square footage of a property lot between between 100 and 40000

Square footage of an average neighborhood lot between 100 and 40000

Distance < 30 miles

Final Model

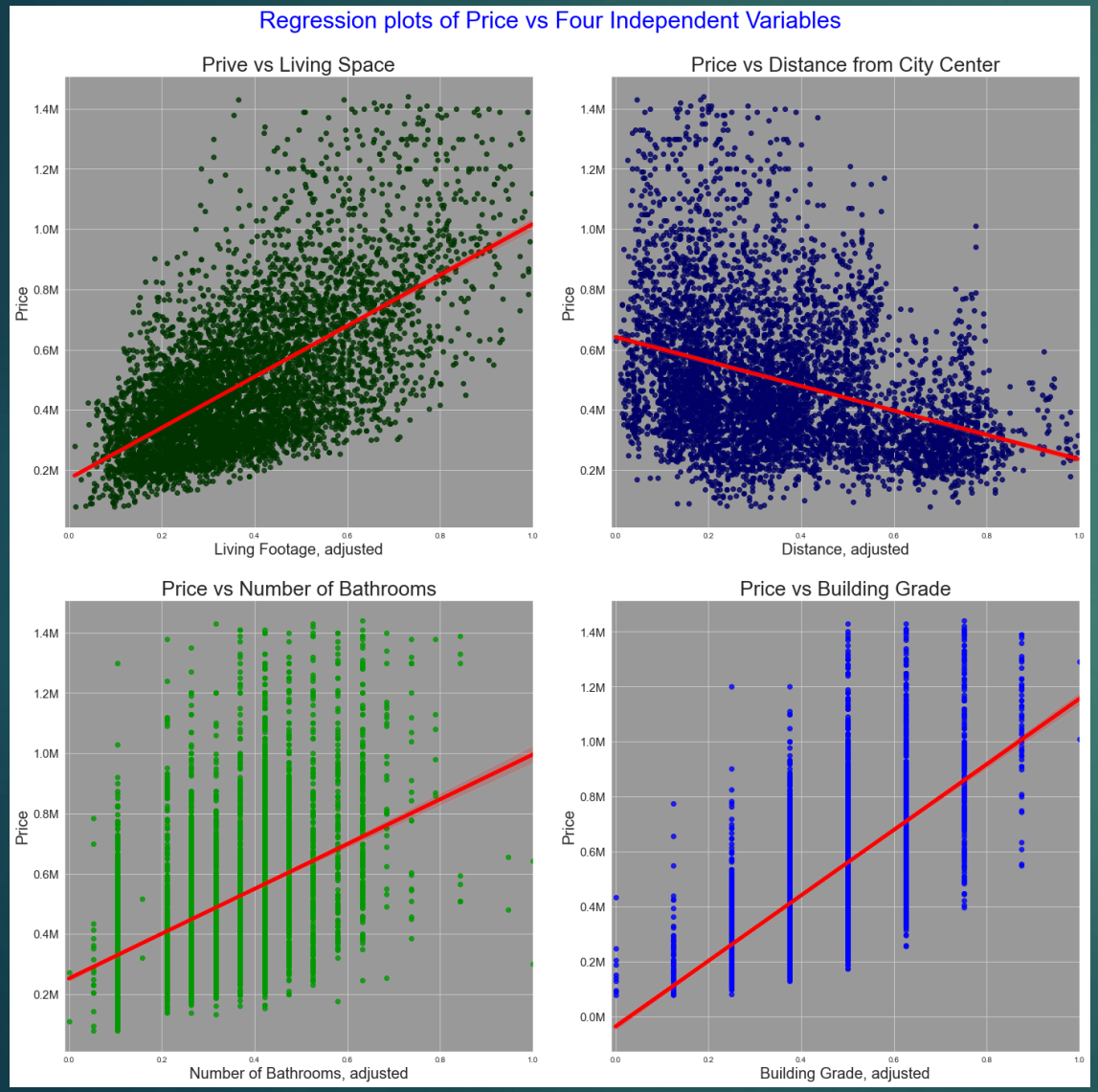
"It's better to solve the right problem approximately than to solve the wrong problem exactly"
Quote by John Tukey

- Several models were tested
- Final model has the best statistical characteristics
- The model is a Multiple Linear Regression model

The predictive variables have a linear correlation with the price

$$Price = grade + sqft\_living - distance + bathrooms - recent\_renovation\_new$$

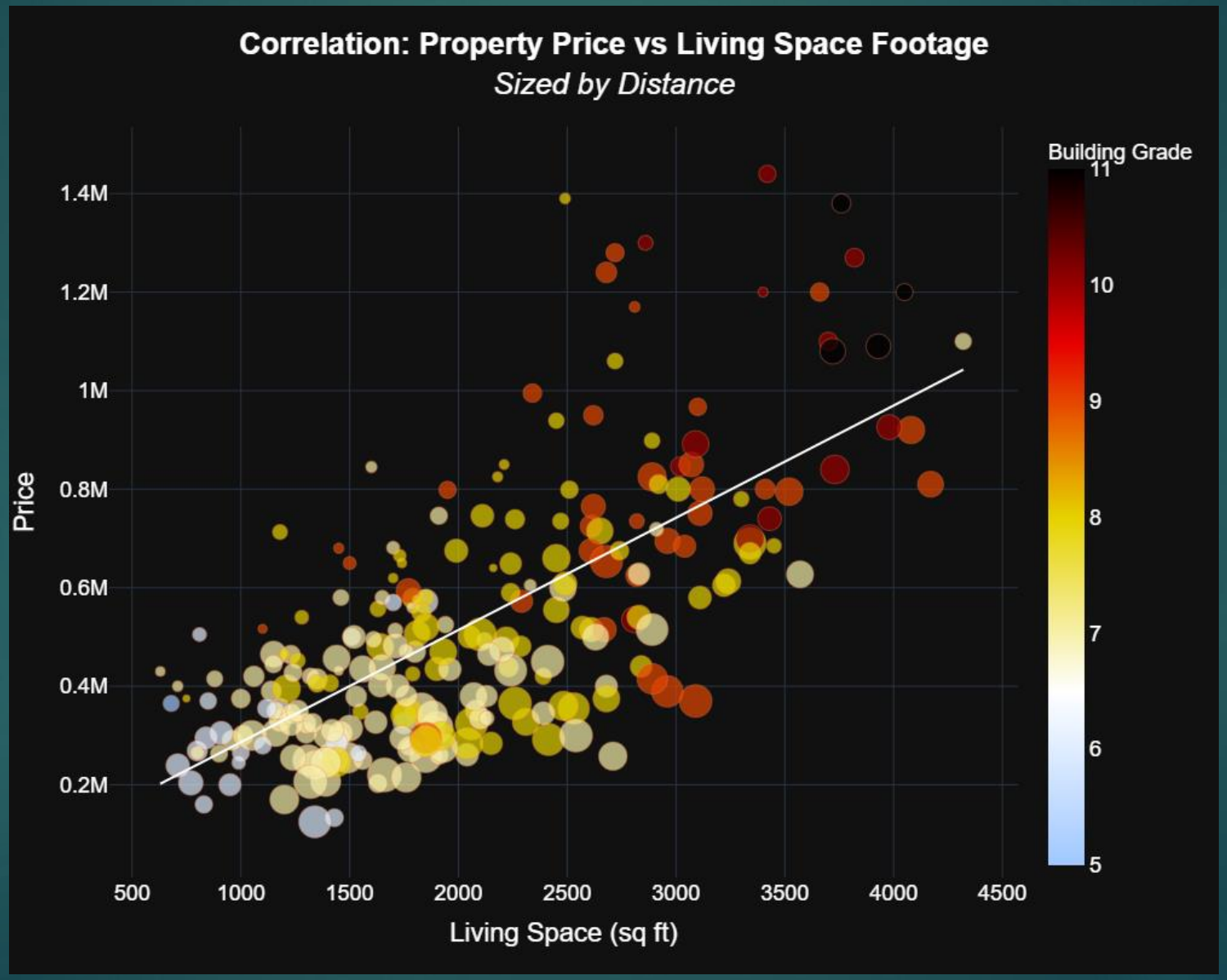
Visualizing linear Regression Model



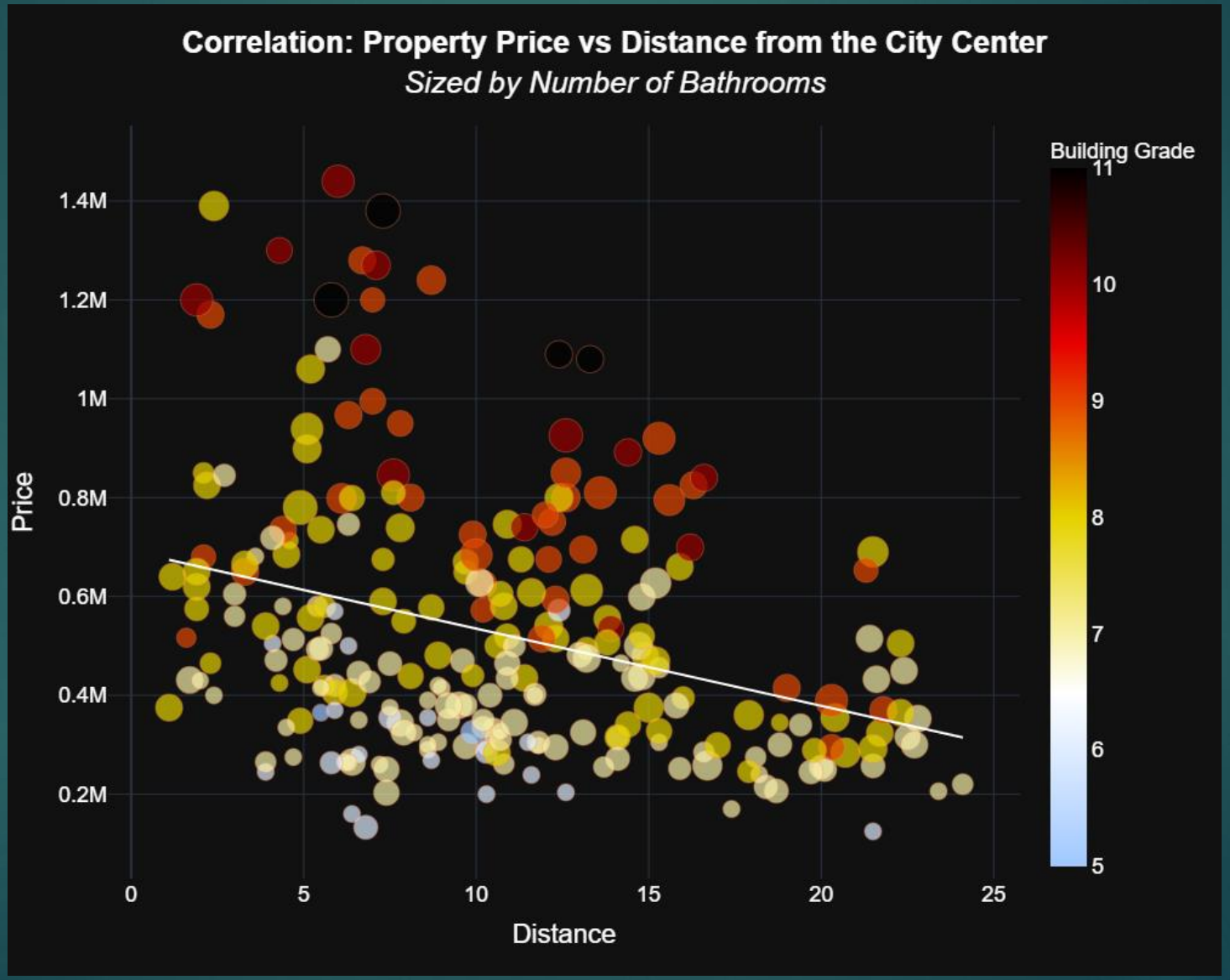
Recommendations to property owners:

- Increase the living space of your property
- Renovate with higher building quality
- Consider adding a bathroom

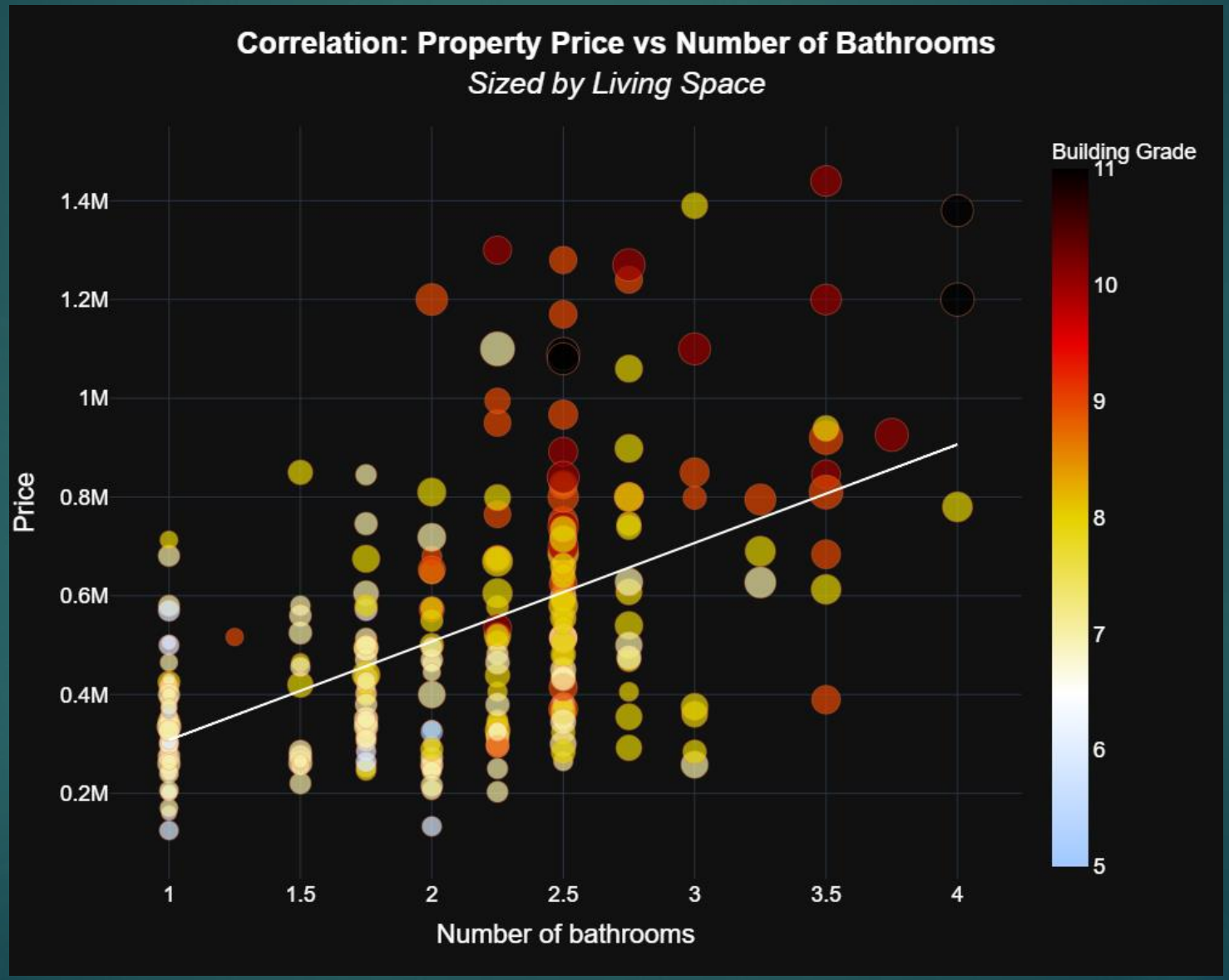
Visualizing the Correlations



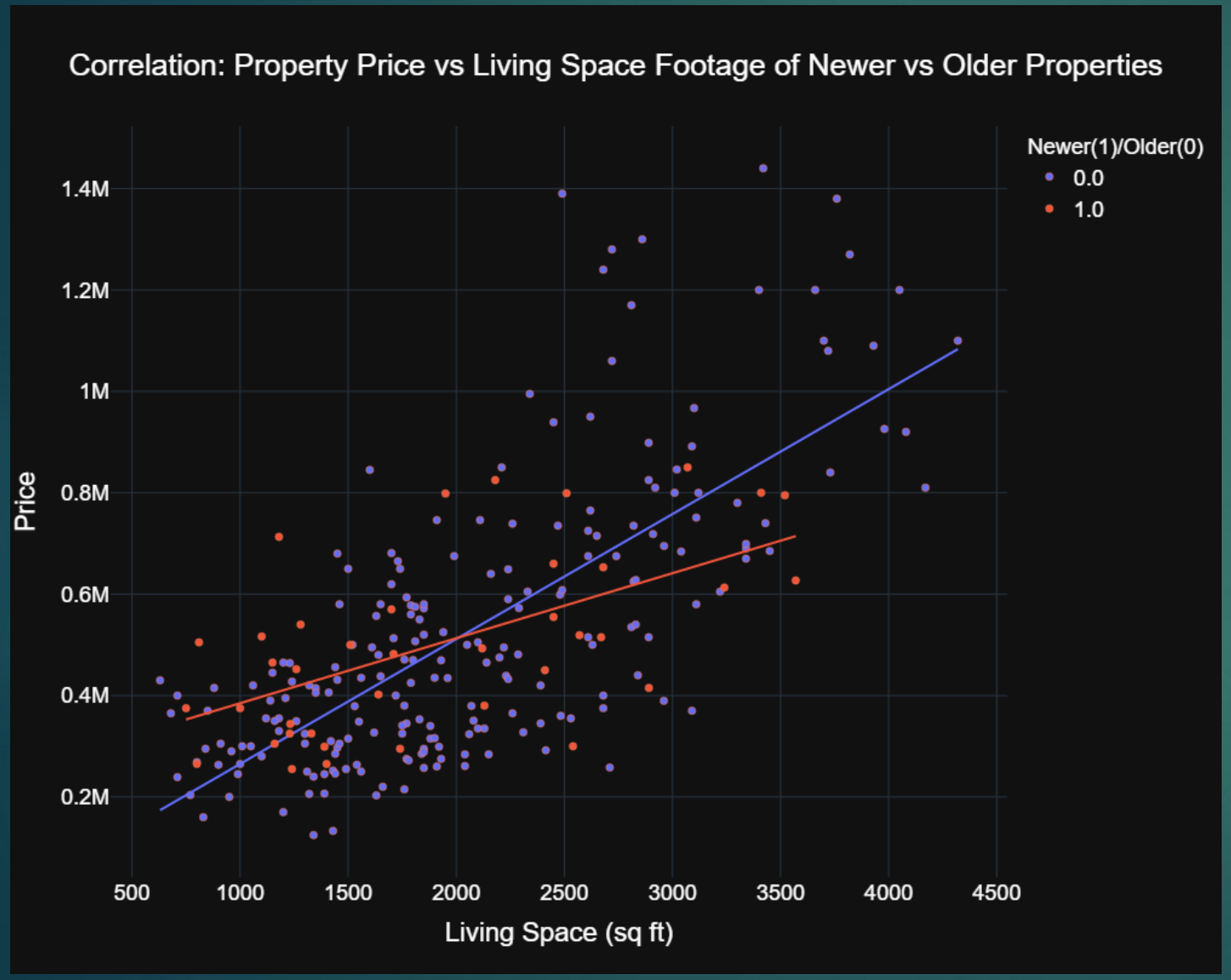
Visualizing the Correlations



Visualizing the Correlations



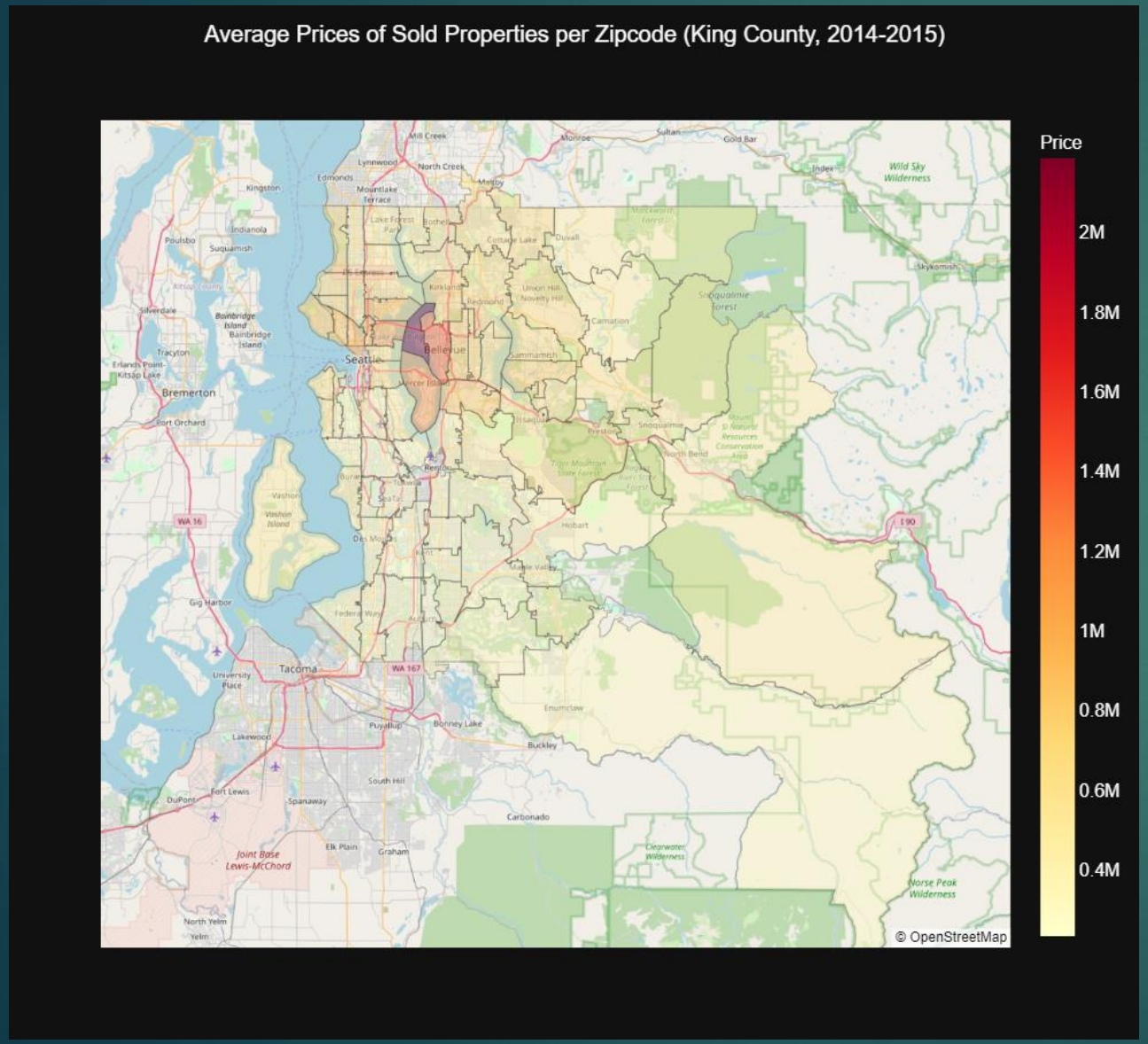
Visualizing the Correlations



Marker color represents if a property has been

renovated or built between 2006 and 2015

Visualizing the Differences between Zipcodes



Several zipcodes around Bellevue area are the most expensive ones

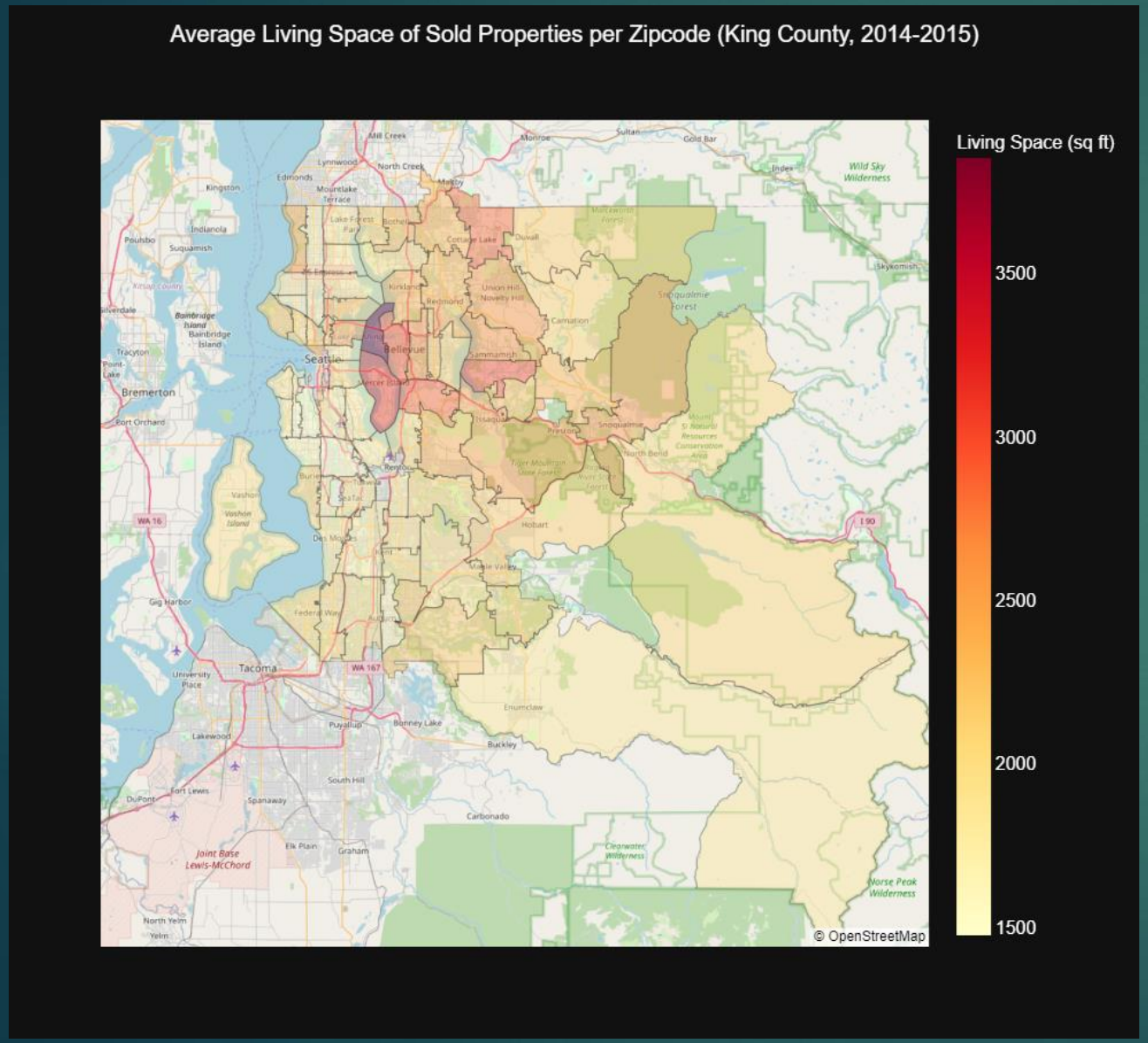
Bellevue zipcodes

Zipcodes 98039

Zipcode 98004

Zip[code 98040

Visualizing the Differences between Zipcodes



Zipcodes around Bellevue area are the most expensive ones

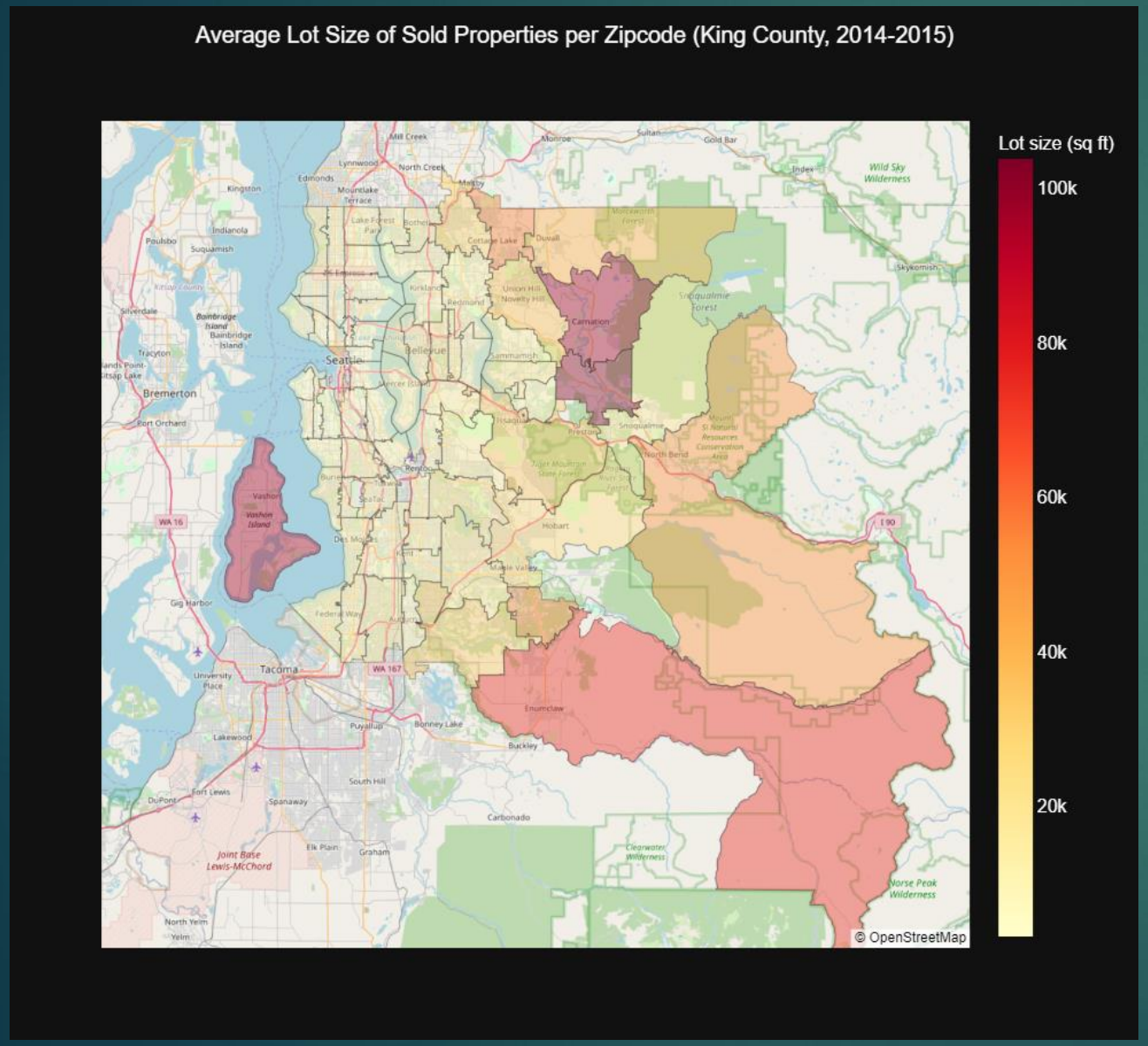
Zipcodes with similar living space footage but more affordable properties

Zipcodes 98077

Zipcode 98075

Zip[code 98006

Visualizing the Differences between Zipcodes



Zipcodes with bigger lots

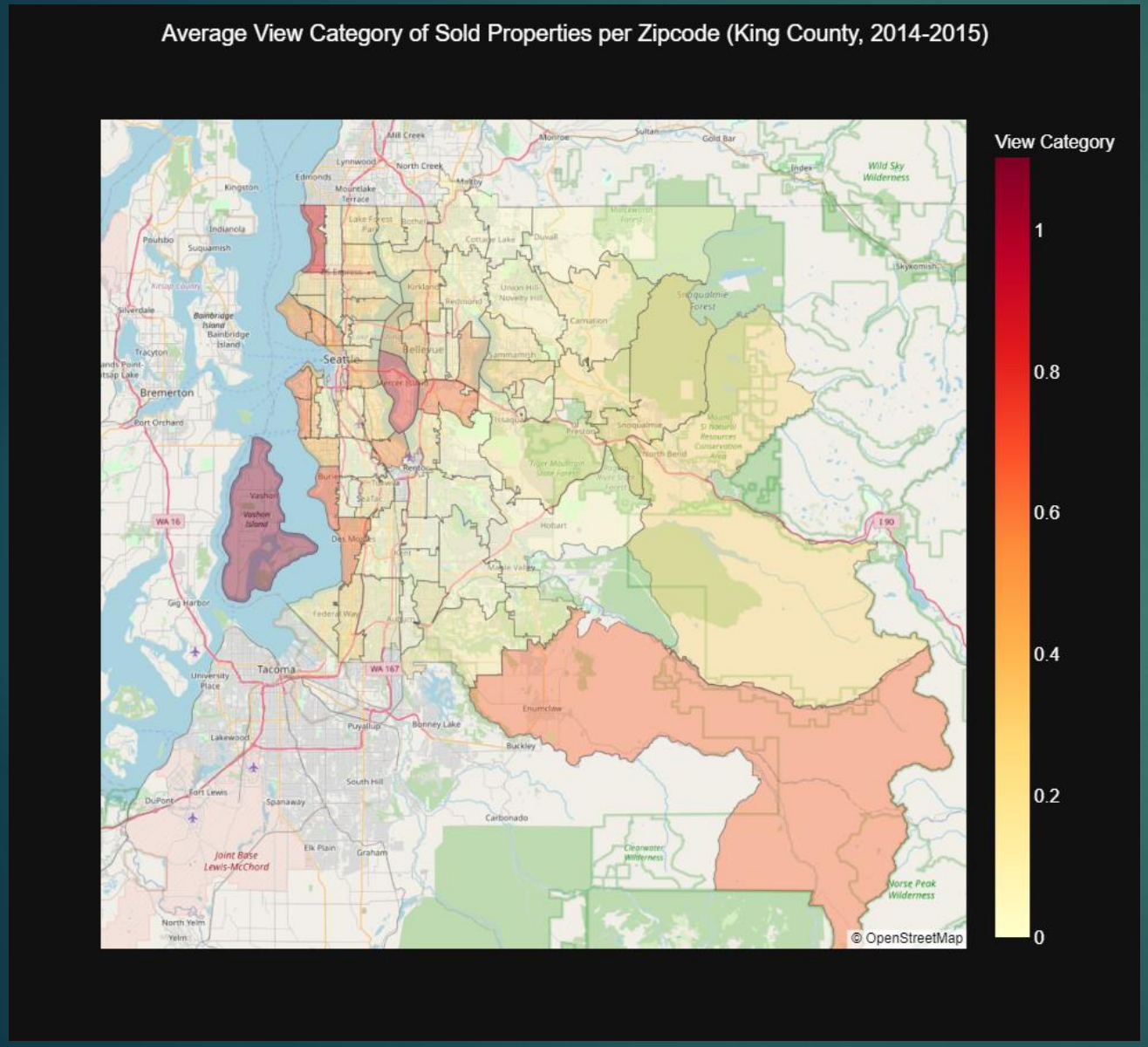
Zipcodes 98014

Zipcode 98024

Zipcode 98022

Zip[code 98070

Visualizing the Differences between Zipcodes



Zipcodes with a better view

Zipcodes 98198
Zipcode 98166
Zipcode 98022
Zipcode 98070
Zipcode 98177

Recommendations

Recommendations to property owners:

- Increase the living space of your property
- Renovate with higher building quality
- Consider adding a bathroom

Recommendations to potential home buyers:

- Properties further away from the city with the same features more affordable
- Properties in some zipcodes of the city are more affordable than others, with
    - better view
    - more considerable property lots
    - better quality construction and character
    - comparable distance

Conclusions:

Limitations of the model:

- Other important factors are not included in dataset
- Multiple linear regression models are limited in their predictive ability
- Strong unavoidable correlation of property features with each other

Additional analysis suggested:

- Add variables to the original dataset like
  - kitchen renovation
  - average commute time
  - crime index
  - nearby public school quality, etc.
- Update data

Thank you!

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Appendix: data description

The dataset used in this project has been downloaded from KAGGLE site. The dataset includes the information about properties sold in King County of Washington State between **May 2014** and **May 2015**. The area consists of Seattle city area but does not include the inner city. The dataset contains **21597** records and has **21** dependent and independent variables. The description of the data is as follows:

id - Unique ID for each home sold

date - Date of the sale

Between: May 2014 and May 2015

price - Price of each home sold

Minimum price: 78000
Maximum price: 7700000

bedrooms - Number of bedrooms

Values between 1 and 33

bathrooms - Number of bathrooms, where .5 accounts for a room with a toilet but no shower

Values between 0.5 and 8.0

sqft_living - Square footage of the house interior living space

Minimum value: 370
Maximum value: 13540

Appendix: data description (continued)

view - A categorical variable describing how good the view of the property was

Values: 1.0, 2.0, 3.0, 4.0

condition - A categorical variable describing the condition of the house

Values: 1, 2, 3, 4, 5

grade - A categorical variable describing the quality of construction, from 1 to 13; 1-3 falls short of building construction and design, 7 has an average level of construction and design, and 11-13 have a high quality level of construction and design.

Values between 3 and 13

sqft_above - The square footage of the interior housing space that is above ground level

Minimum value: 370
Maximum value: 9410

sqft_basement - The square footage of the interior housing space that is below ground level

Minimum value: 370
Maximum value: 9410

yr_built - The year the house was initially built

Minimum value: 1900
Maximum value: 2015

Appendix: modifications to the data

- Added a new variable **'month'** – a month of a year a property was sold
- Added a new variable **'distance'** – a distance at which a property is located from the center of Seattle
- Added a new variable **'basement_exists'**, values **1 and 0** – an indicator if a property has a basement
- Added a new variable **'renovation_done'** with values **[0,1,2,3,4]**
  - **0** representing renovation never done on houses more than 9 years old (built between 2015 and 2006)
  - **1** representing renovation done more than or equal 50 years ago
  - **2** representing renovation done between 30 and 49 years ago
  - **3** representing renovation done between 29 and 10 years ago
  - **4** representing renovation done between 9 and 1 year ago OR houses built less or equal 9 years ago (built between 2015 and 2006)

Appendix: modifications to the data (continued)

- Removed **'zipcode'** variable because there are better indicators of a location that can be used
  - Zipcodes boundaries are usually drawn out of convenience for postal services or other more formal reasons than geographic location
- Removed **'id'** field, it is not useful
- Removed **extreme values** from **'sqft_lot', 'sqft_lot15', 'bedrooms', and 'price'**
  - Price < 1.5 M
  - Number of bedrooms < 9
  - Number of bathrooms < 5.5
  - Number of floors < 3.5
  - Square footage of a property lot between 100 and 40000
  - Square footage of an average neighborhood lot between 100 and 40000
  - Distance < 30 miles
- Removed the original **'sqft_basement'** variable
- Removed the original **'lat' and 'long'** variables
- Removed the original **'date'** field