HOME VALUE PATROL

Team 3

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HOME VALUE PATROL

Agenda

- ★ Introduction & Context
- ★ What? - Research Question
- ★ Data Description
- ★ Exploratory Data Analysis
- ★ Data Cleaning and Curation
- ★ Regression Analysis
- ★ Conclusion

WHY ?
this project

FBI

8,277,829 property crime offenses in the nation in 2014.

$14.3 billion estimated losses caused by property crimes in 2014.

Source: https://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s/2014/crime-in-the-u.s.-2014/offenses-known-to-law-enforcement/property-crime

WHAT? are we doing

RESEARCH QUESTION

Does crime in a neighborhood affect the home values over time?

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EMERGENCY DIAL 911

DATA description

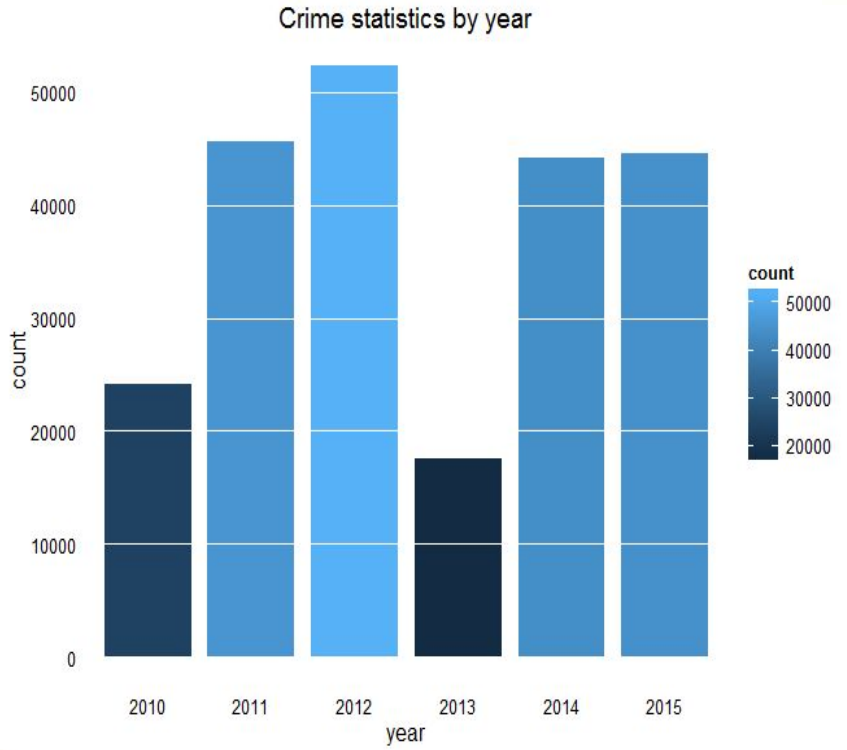
Seattle 911 Response

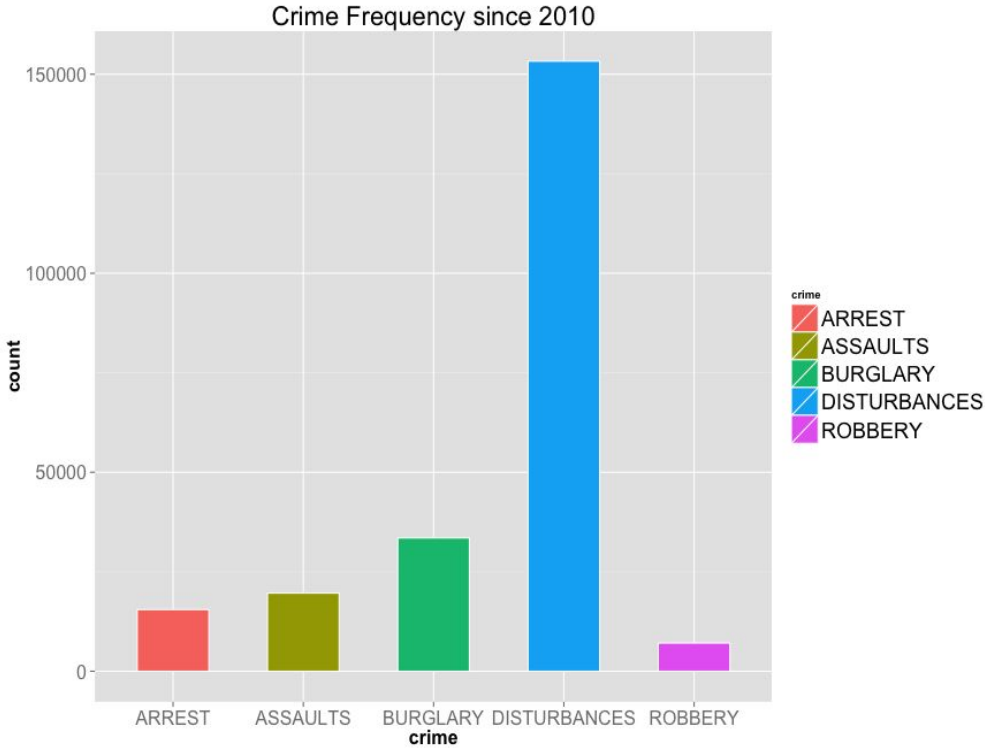
- ★ 1.14 million records
- ★ Timeline 2010-15
- ★ 19 variables
- ★ 46 crime types

Zillow Data Research

- ★ Time-series data
- ★ Dimensions: 5692 x 88
- ★ Year, Month, ZHVI, Neighborhood, Region

EXPLORATORY
Data Analysis





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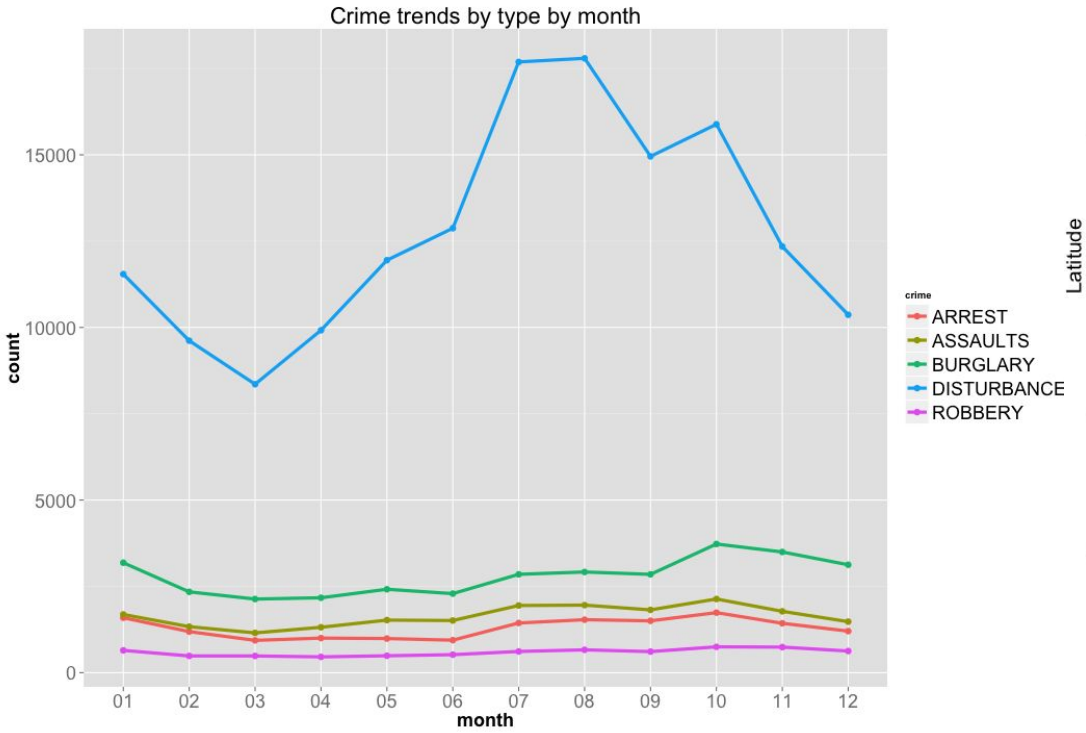
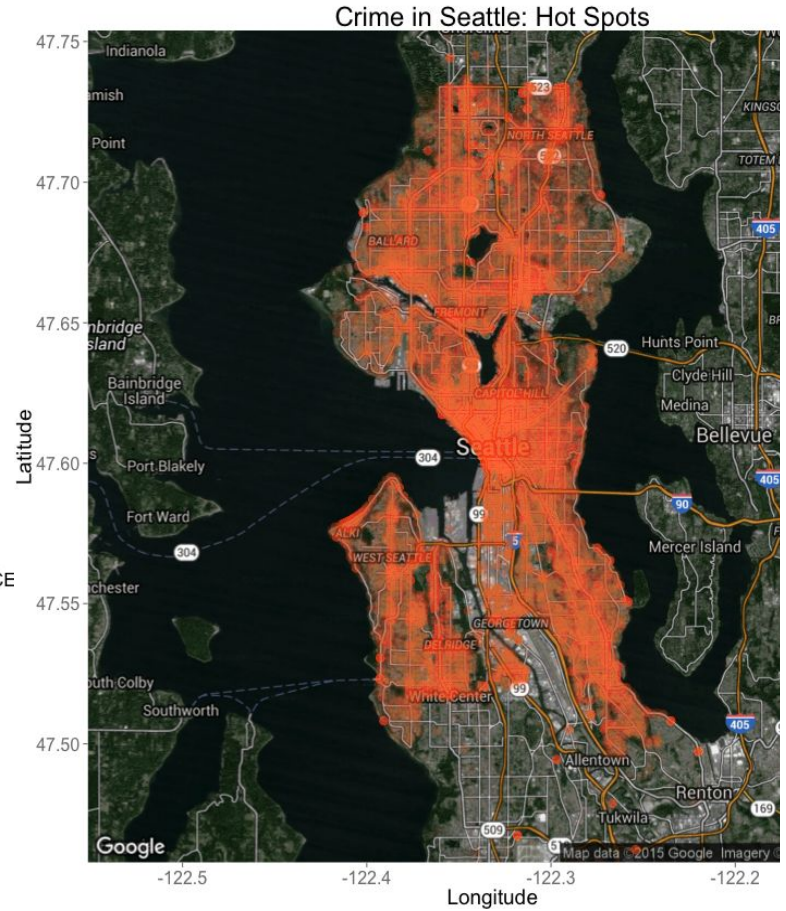
EXPLORATORY
Data Analysis





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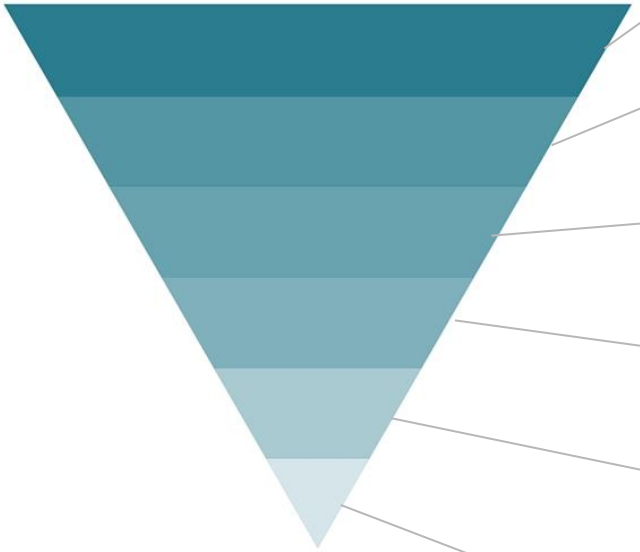
DATA!

Cleaning & Curation Methods



Getting rid of unwanted records and columns

Reverse Geocoding Latitudes & Longitudes ~ High Scale Conversion using Shapefiles in R

Data Transformation ~ Tidy Data (Method applied Hadley Wickham - Journal of Statistical Software, vol. 59, 2014.)

Data Aggregation by Year, Month & Neighborhood

Merging the clean datasets by Aggregated Matching

Ready for Regression Analysis

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DATA!

Cleaning - R Packages used

gpclib - General Polygon Clipping Library for R

rgeos - Interface to Geometry Engine - Open Source (GEOS)

maptools - Reading / Handling Spatial Objects

rgdal - Bindings for the Geospatial Data Abstraction Library

spatialEco - Spatial Analysis and Modelling

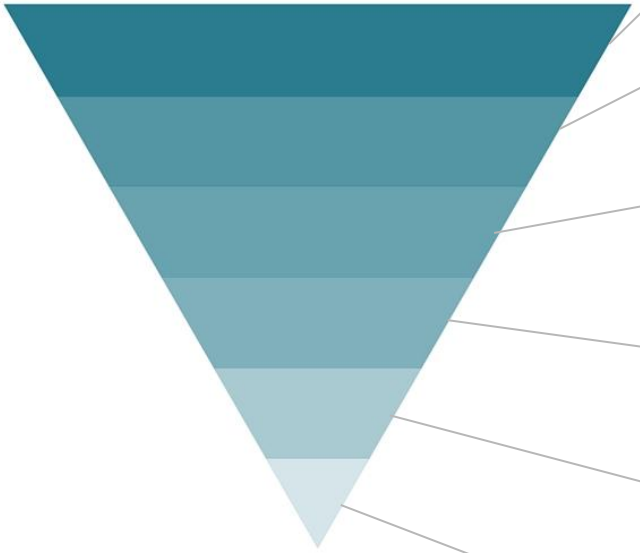
tidyr | ggplot2 | dplyr

Over 300 lines of R code written for the project:

https://github.com/akashjaswal/home-value-patrol/blob/master/project_code.R

DATA!

Cleaning & Curation numbers



1.14 Million records narrowed down to 229K values

Reverse geocoded 229K different Latitude-Longitude combinations and mapped them to 82 neighborhood zones

Zillow data transformed from dim [5692 x 88] to [20592 x 4] dataframes (Reduce & Transpose)

229K values aggregated to 5904 rows (5 Years, 60 Months, 82 Neighborhoods, 5 Crime types)

Final Merged Dataset to append the Zillow Home Value to each of the corresponding aggregated 911 value

Ready for Regression Analysis

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Data Analysis

Phew, Finally

Crimes aggregated by month, year and neighborhood with corresponding value of house during the same period and neighborhood

project_code.R* | aggregate.911.neighbor... | zillow.911.merged

Filter

	Neighborhood	Year	Month	Assault.Count	Burglary.Count	Arrest.Count	Disturbance.Count	Robbery.Count	home.value
4088	South Beacon Hill	2011	05	14	7	9	28	7	251500
2812	Minor	2014	04	6	8	9	63	1	445100
372	Bitter Lake	2012	03	5	8	9	41	2	253900
1399	First Hill	2011	07	13	8	9	78	4	216800
1740	Greenwood	2011	03	2	9	9	32	0	320500
3063	North College Park	2012	03	3	9	9	31	1	298900
216	Beacon Hill	2010	09	2	9	9	35	2	311200

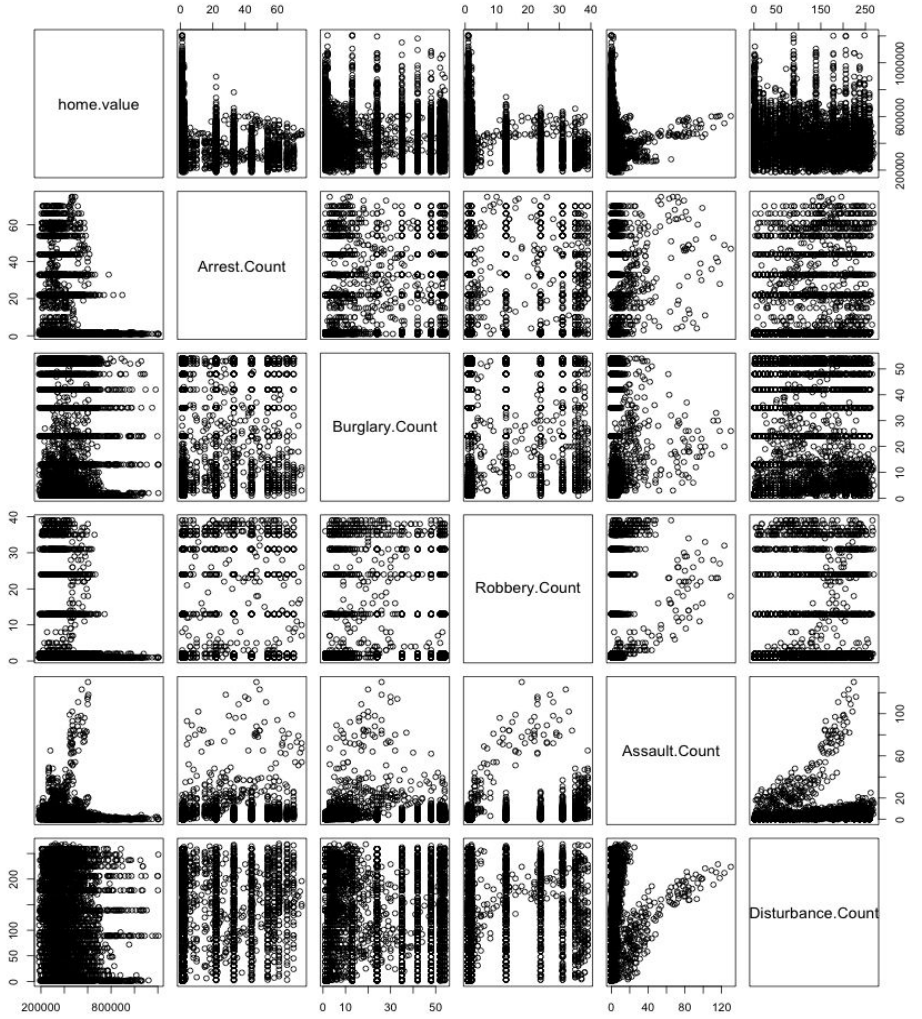
WHAT IS OUR MODEL?

Predicting home values as a function of property crimes

Data Analysis

Collinearity

- ✔ Linear Relationship between data
- ✔ Nearly normally-distributed residuals
- ✔ Constant variability
- ✔ Independent observations



Data Analysis

Multiple Regression

Multiple R-squared: 0.1106

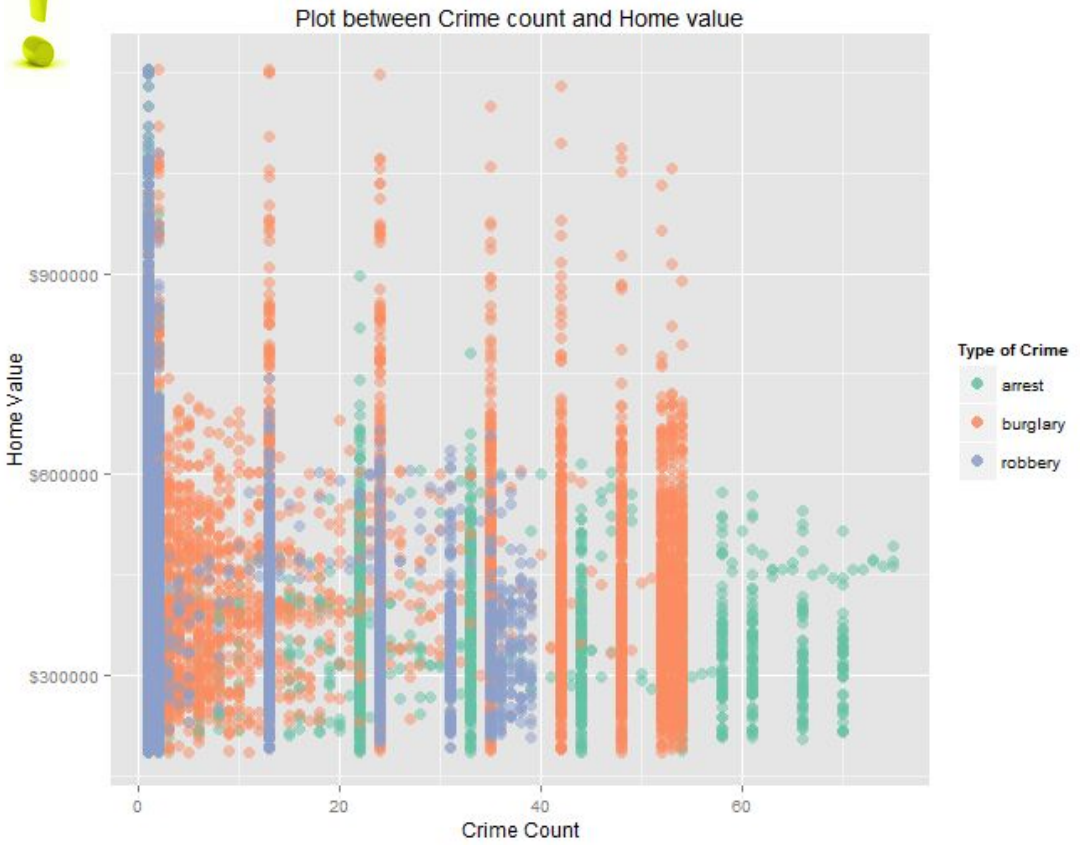
home.value = β_0 + β_1* **Assault.Count** + β_2* **Arrest.Count** + β_3* **Burglary.Count** + β_4* **Disturbance.Count** + β_5* **Robbery.Count**

	Estimate	Pr (>|t|)	95% Confidence Interval
(Intercept)	469028.28	< 2e-16	461599.3, 476457.2
Assault.Count	1401.19	5.18e-09	931.7, 1870.6
Arrest.Count	-2278.03	< 2e-16	-2531.6, -2024.4
Burglary.Count	-114.53	0.2973	-329.9, 100.87
Disturbance.Count	56.38	0.0273	6.3, 106.4
Robbery.Count	-2413.51	< 2e-16	-2876.40, -1950.6

Data Analysis

Model Interpretation

Assault Count	$ 1401.19
Arrest Count	$ 2278.03
Burglary Count	$ 114.53
Disturbance Count	$ 56.38
Robbery Count	$ 2413.51

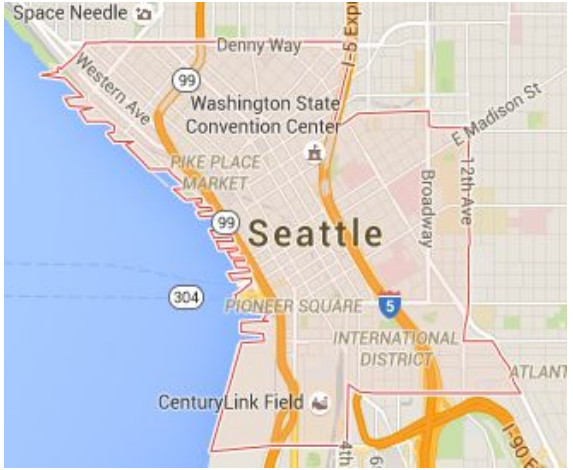


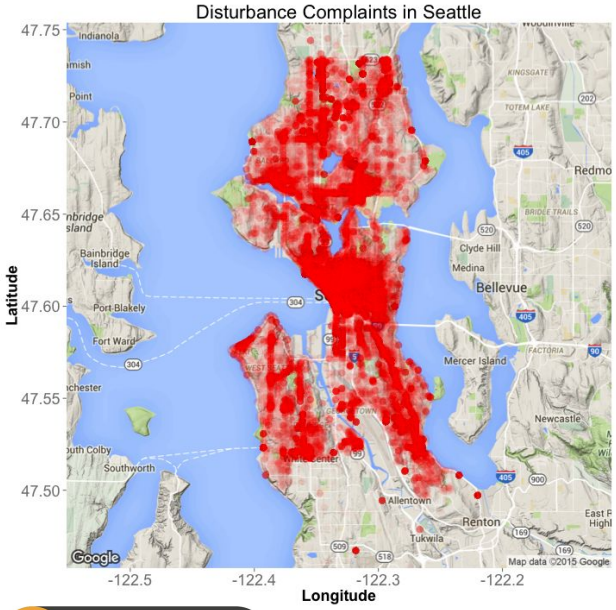
Data Analysis

Special Inferences

Since 2010, 4471 of total 17523 **assault** cases reported in Downtown Seattle

Disturbance complaints have **less or no correlation** with time or neighborhood ~ evenly distributed





Seattlers like to **Party**!

You are less likely to be arrested if you stay in an **expensive** house!

Burglary - **Unlawful entry** to a structure to commit theft or a felony. In order for burglary to take place, **a victim does not have to be present.**

Robbery - Take something from someone that has value by **utilizing intimidation**, **force or threat**. In order for robbery to take place, **a victim must be present at the scene**

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Project Scope !

Limitations and Key Learnings

Other Factors include:

- Distance from Workplace, UW and SeaTac Airport.
- Access to Transportation & Departmental Stores.
- History of neighborhood and past data.

Key Learnings

- ✔ Data Cleaning
- ✔ R Programming
- ✔ Open-ended questions
- ✔ Data Science

Thank you!

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