# Electrical Vehicle Analysis

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# Objectives

## Motivation

- Wide spread of electric vehicles in USA
- Environment friendly
- Technology innovation

## Our aim

- Analyze the distribution of the registered electric vehicles in USA
- Design a business plan for Auto repair company in Washington city

# 01

# Data cleaning and inspection

# Dataset :
# Electric Vehicle Population Data (data.wa.gov)

## Key Columns:

Electric Vehicle Type:
- Pure electric or plug-in hybrid.

Make & Model:
- Manufacturer & Model of car

Electric Range:
- Traveling distance purely using electricity

Location:
- Location of registered electric vehicles

| | count | unique | top | freq |
|---|---|---|---|---|
| **VIN (1-10)** | 210165 | 12377 | 7SAYGDEE6P | 1215 |
| **County** | 210165 | 203 | King | 107115 |
| **City** | 210165 | 758 | Seattle | 33854 |
| **State** | 210165 | 47 | WA | 209720 |
| **Make** | 210165 | 43 | TESLA | 91379 |
| **Model** | 210165 | 153 | MODEL Y | 44038 |
| **Electric Vehicle Type** | 210165 | 2 | BEV | 165554 |
| **Clean Alternative Fuel Vehicle (CAFV) Eligibility** | 210165 | 3 | Unkown | 118654 |
| **Legislative District** | 210165 | 50 | 41 | 13196 |
| **Vehicle Location** | 210165 | 931 | POINT (-122.13158 47.67858) | 5256 |
| **Electric Utility** | 210165 | 74 | PUGET SOUND ENERGY INC\|\|CITY OF TACOMA - (WA) | 76606 |

# Data cleaning

| | NaN |
|---|---|
| VIN (1-10) | 0 |
| County | 4 |
| City | 4 |
| State | 0 |
| Postal Code | 4 |
| Model Year | 0 |
| Make | 0 |
| Model | 0 |
| Electric Vehicle Type | 0 |
| Clean Alternative Fuel Vehicle (CAFV) Eligibility | 0 |
| Electric Range | 5 |
| Base MSRP | 5 |
| Legislative District | 445 |
| DOL Vehicle ID | 0 |
| Vehicle Location | 10 |
| Electric Utility | 4 |
| 2020 Census Tract | 4 |

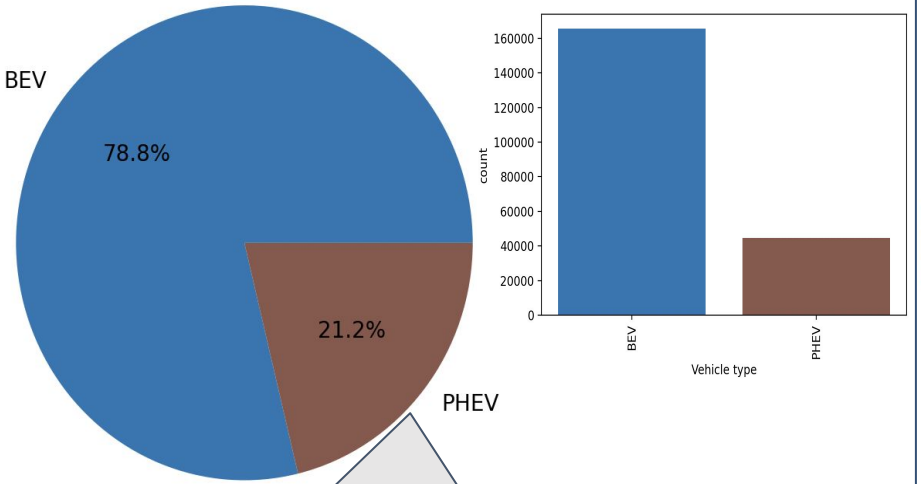
- Ensure that all field are valid through changing the NaN fields into string “nan”
- Fill NaN values using forward fill method (ffill)
- Ensure consistent formatting across each column

# 02

# EV Distribution Analysis over USA

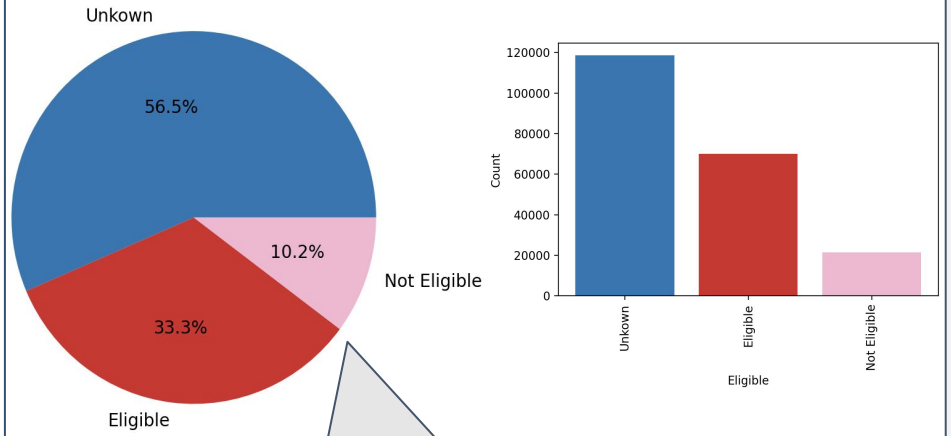
# Counting of EV over USA

## Count by the electric type



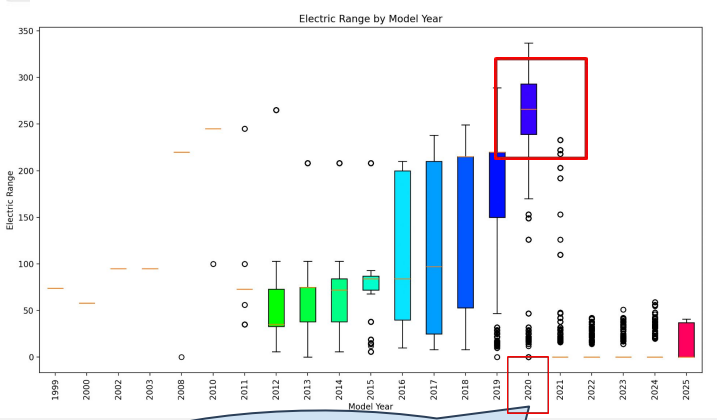

Battery Electric Vehicles(BEV) are more popular than Plug-in Hybrid Electric Vehicles(PHEV)

## Count of CAFV



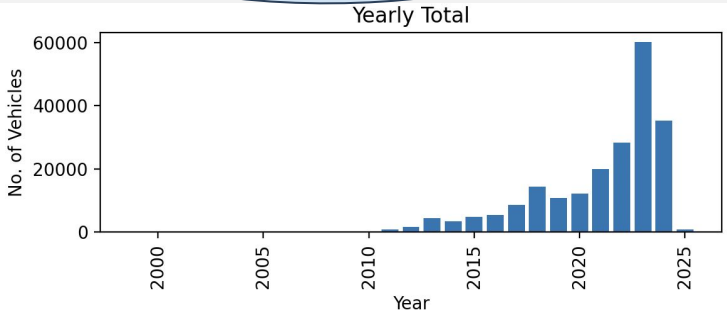

34 % of the vehicles are eligible for alternative fuel, while 10 % are not.

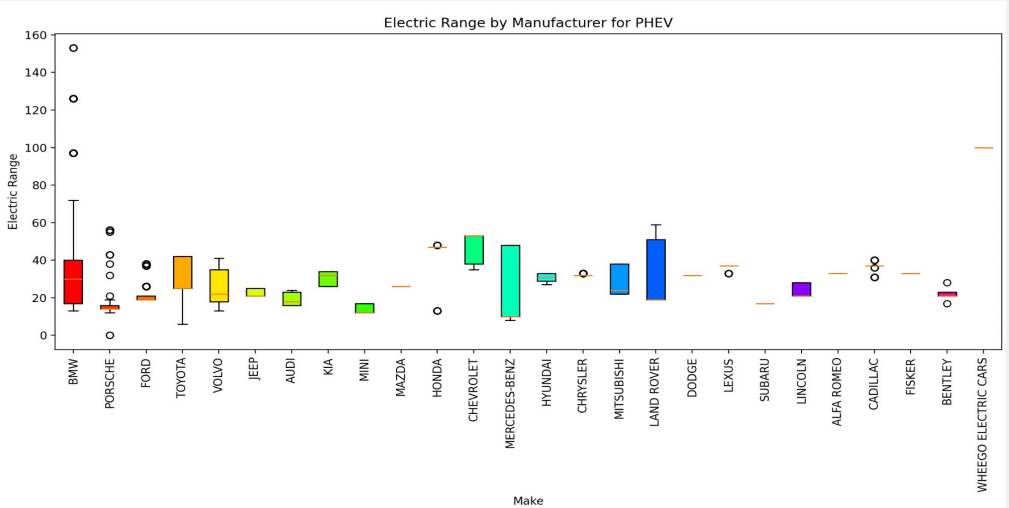
# Electrical range

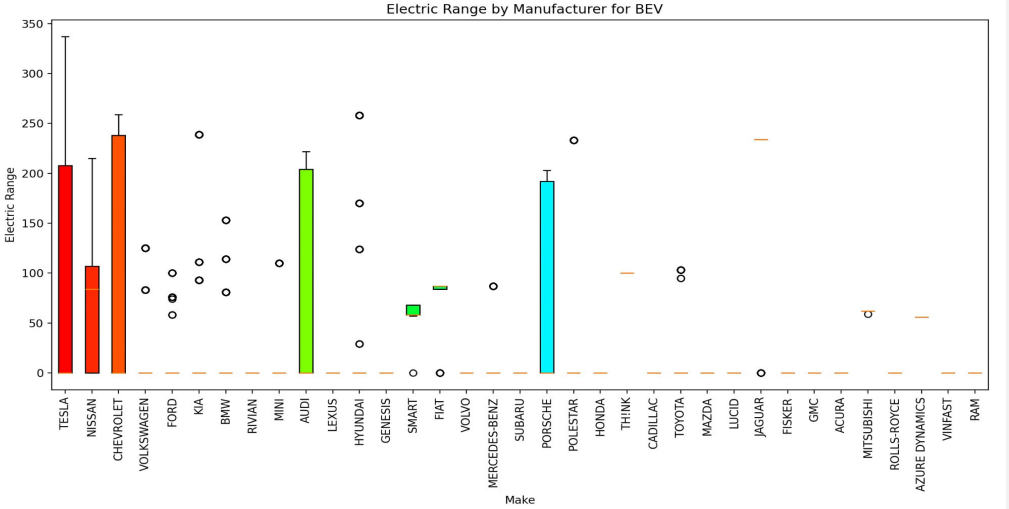



**Observation contradict with expectation!**

**Electric range trend over years does not align with technology and innovation.**

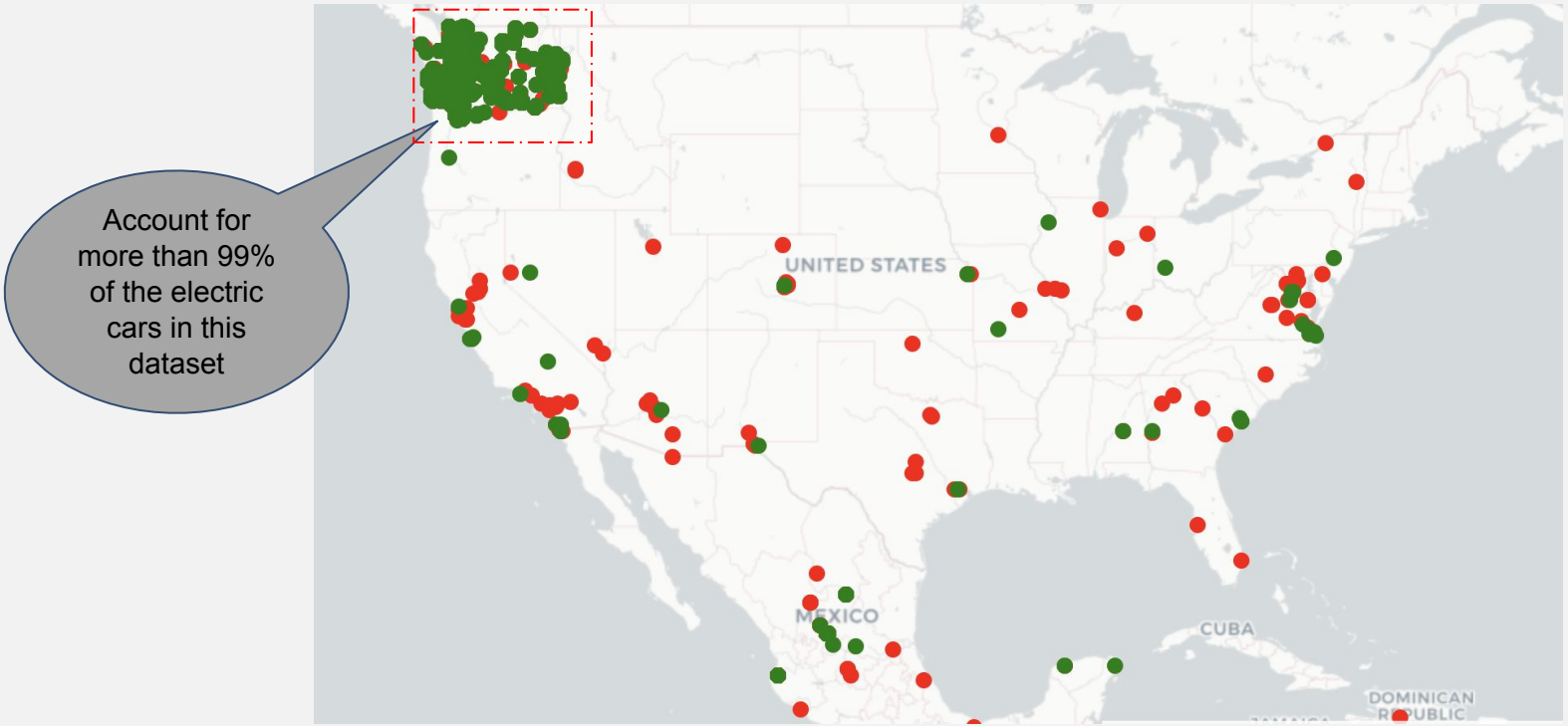


# BEV and PHEV distribution over USA

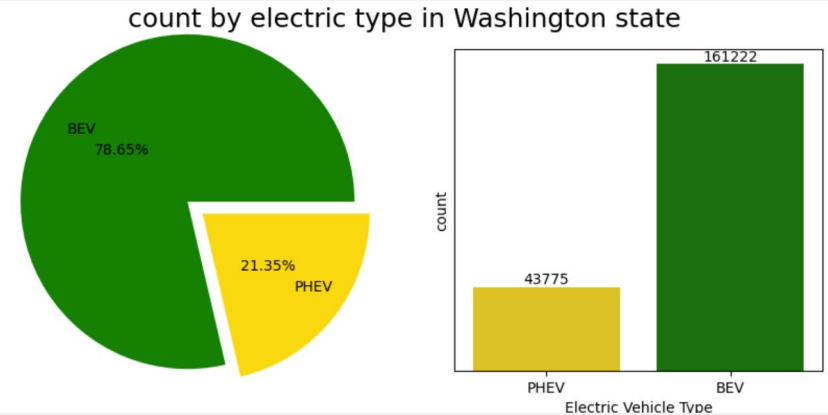
BEV(red) and PHEV(green) distribution over USA



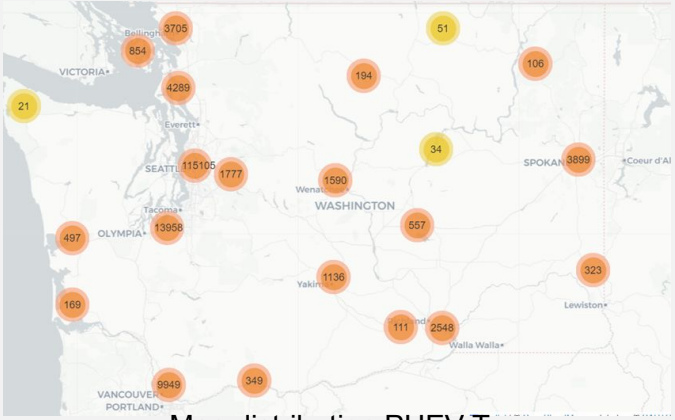
# 03

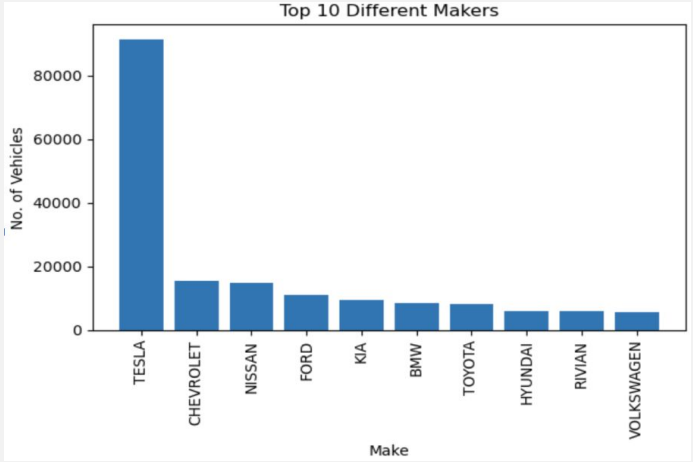
# Focus on Washington state

# Gross Counts of EV in Washington

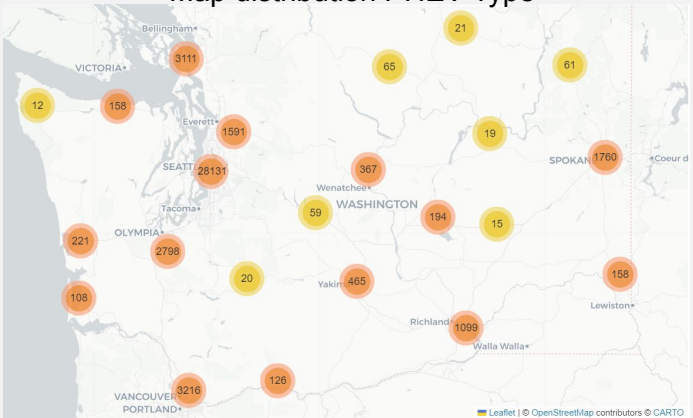



Map distribution BEV Type

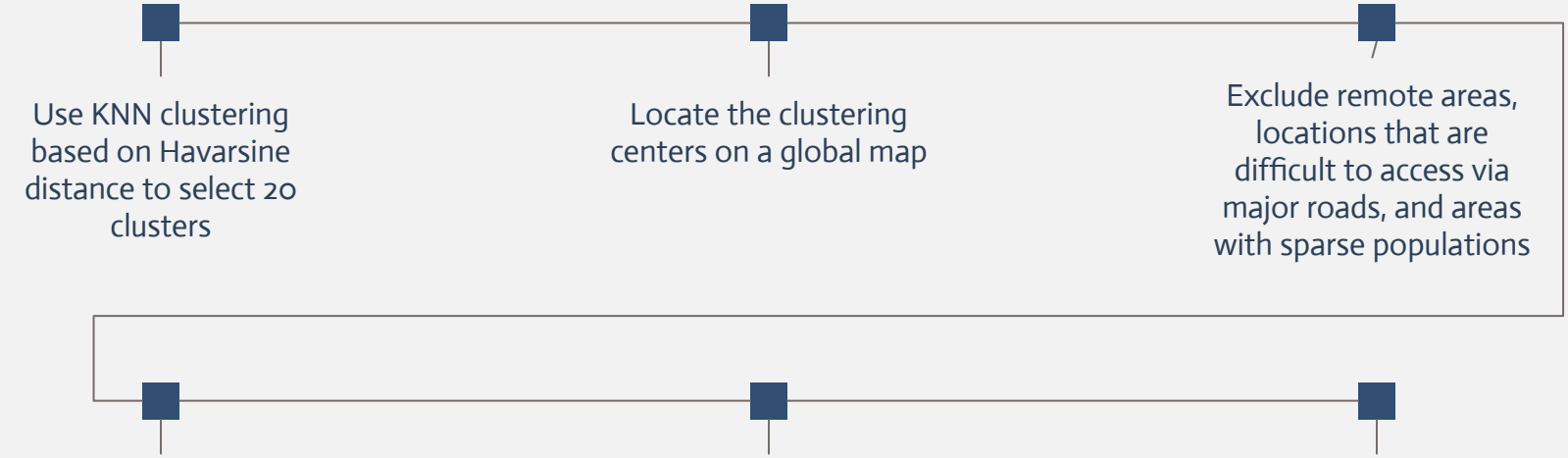


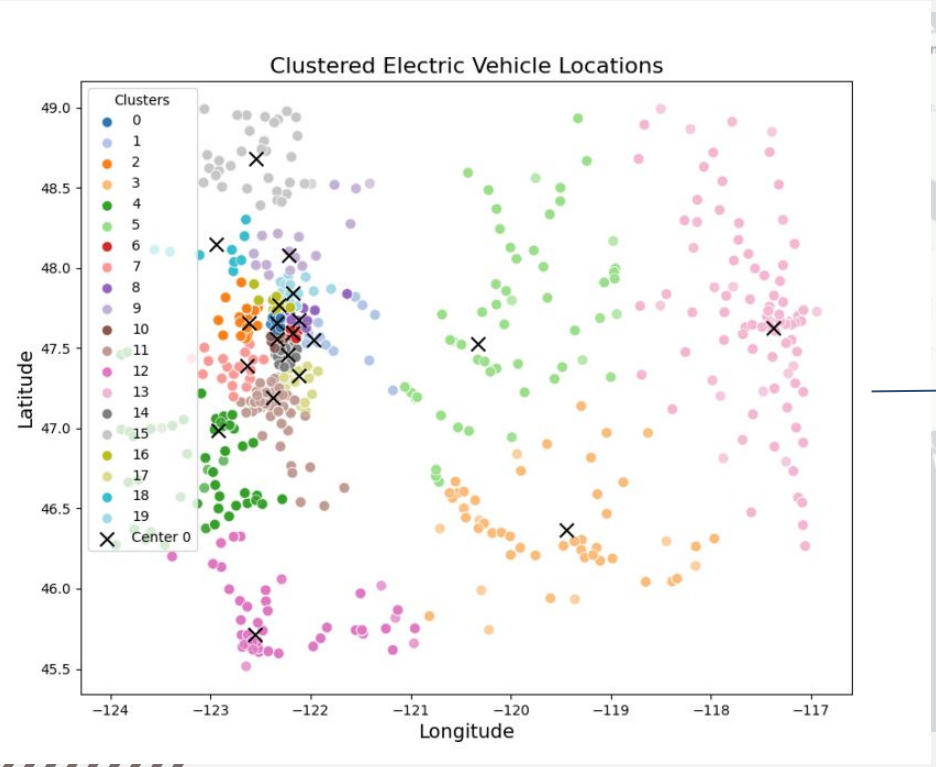

Map distribution PHEV Type

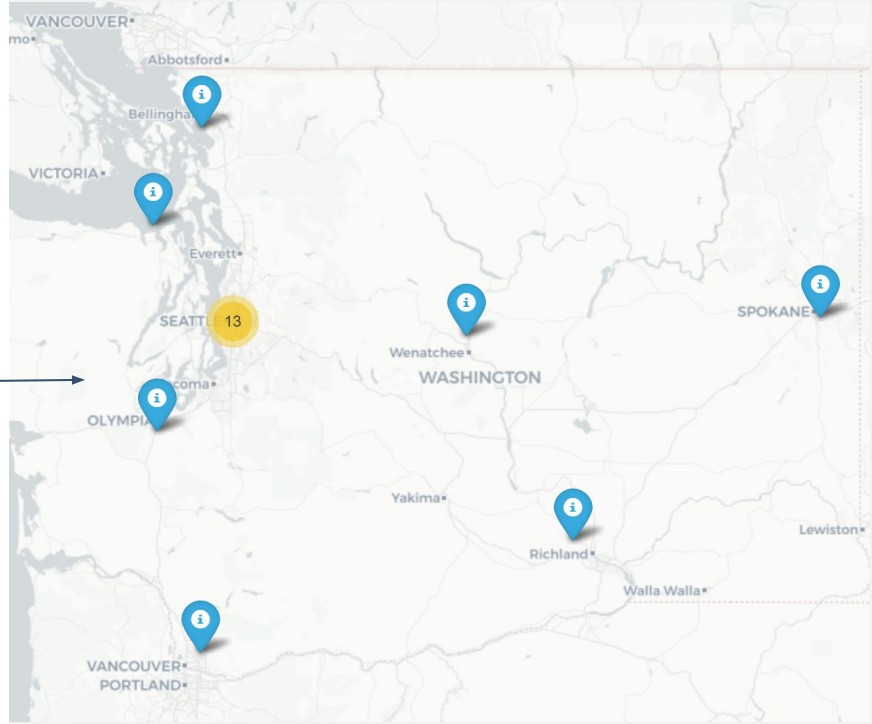


# Business planner for an Auto Repair company

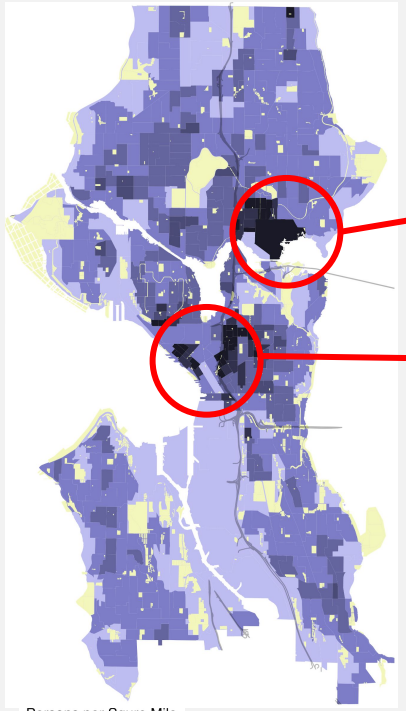


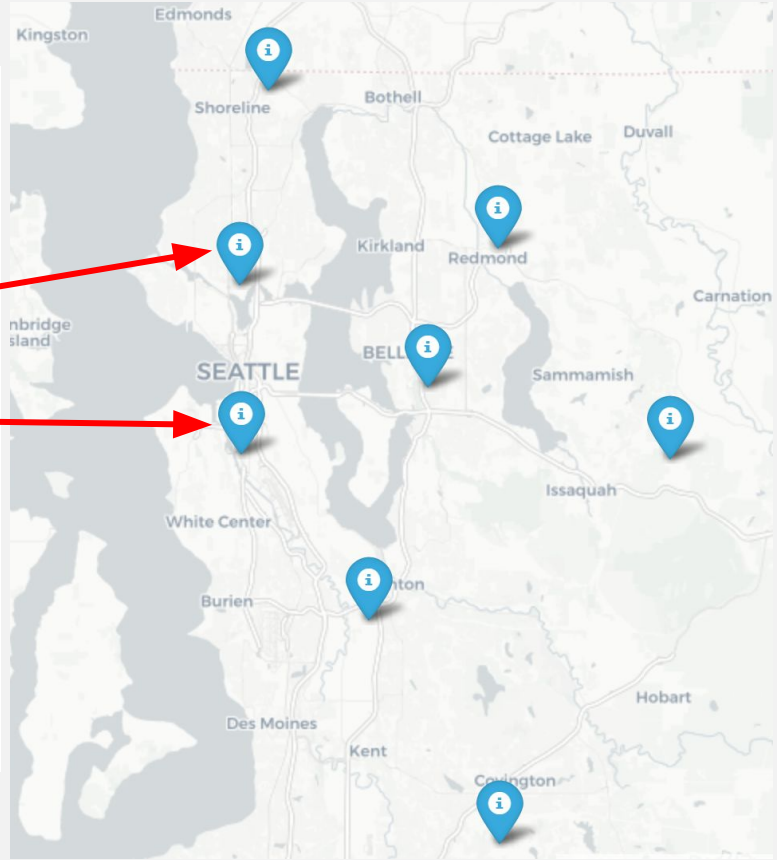
# Clustering


Clustered Electric Vehicle Locations
Clusters
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
Center 0
Latitude
Longitude
49.0
48.5
48.0
47.5
47.0
46.5
46.0
45.5
−124
−123
−122
−121
−120
−119
−118
−117


VANCOUVER
Abbotsford
VICTORIA
Everett
SEATTLE
13
Wenatchee
WASHINGTON
SPOKANE
OLYMPIA
Yakima
Richland
Lewiston
Walla Walla
VANCOUVER
PORTLAND

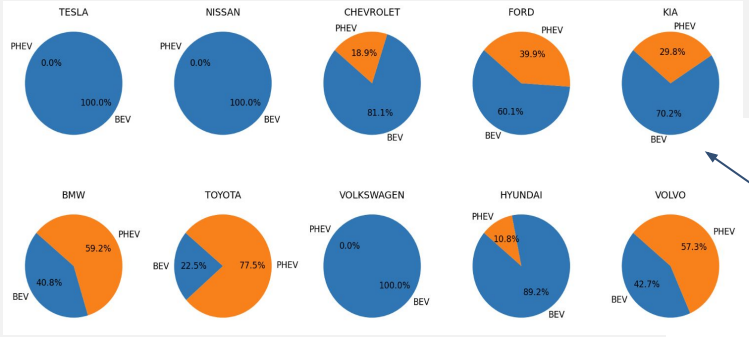
# Shattering

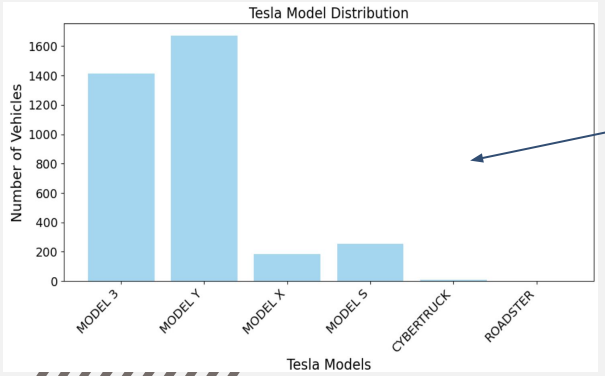

Persons per Squre Mile
0 - 5000
05001 - 10000
10001 - 15000
15001 - 20000
20001 - 25000
25000+

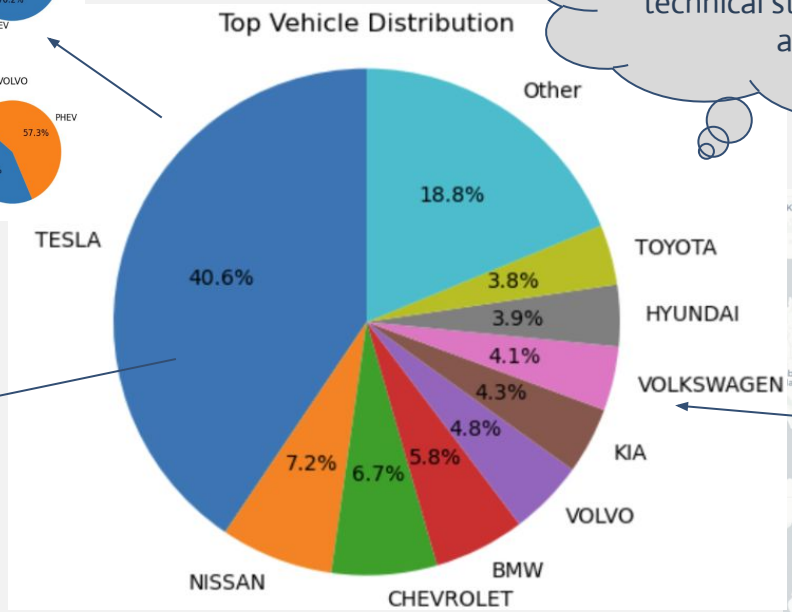

Edmonds
Kingston
Shoreline
Bothell
Cottage Lake
Duvall
Kirkland
Redmond
Carnation
SEATTLE
Sammamish
Issaquah
White Center
Burien
Hobart
Des Moines
Kent
Covington


SEATTLE
Puget
Sound
Lake
Washington
Elliott
Bay
dreamstime.com
ID 66665207 © Rainer Lesniewski

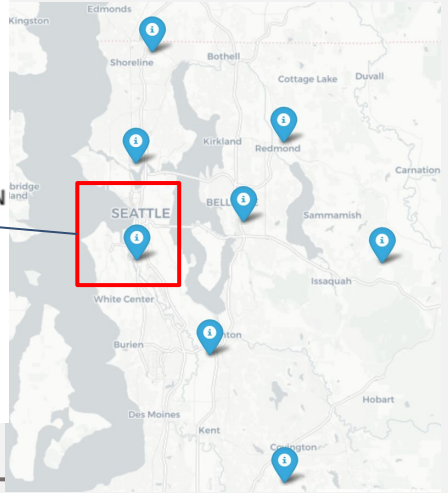
# Vehicle Distribution around Shop in Downtown Seattle




Equip with appropriate spare parts inventory, equipment, and technical staff based on the analysis



# Thanks!