How Does EV Population Growth Correlate to Charge Stations in US States?

Electric Vehicle Population Correlation Analysis

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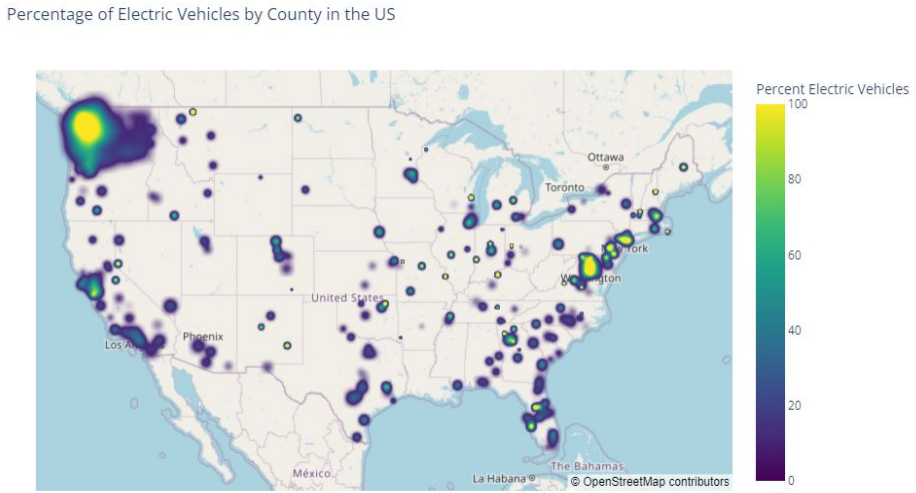
Introduction

- Electric vehicles are a very hot trend nowadays, 14% of new cars sold in 2022 was electric vehicles.
- Many factor may relate, but charging ports population is the most important one.
- EV and charging ports in the US

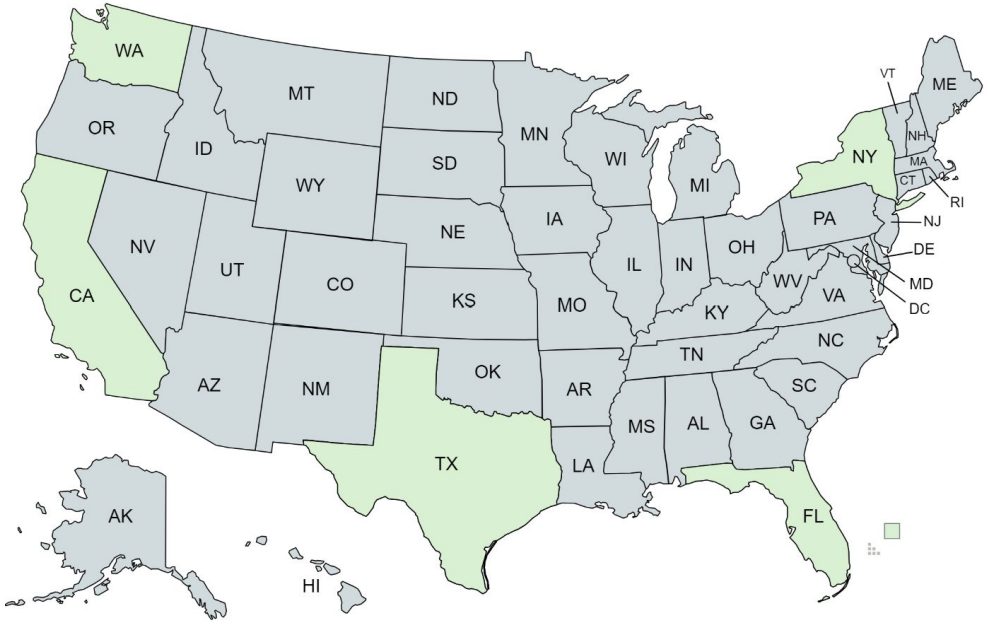


Data Overview

- EV Data: Alternative Fuels Data Center (afdc.energy.gov)
  - Alternative Fueling Station Counts by State (Charging Infra)
  - Vehicle Registration Counts by State (Market Shares)
- State Data
  - Area by State (density)

Methodology

- Find the top 5 states with highest EV population and extract data for 2016-2022



Methodology

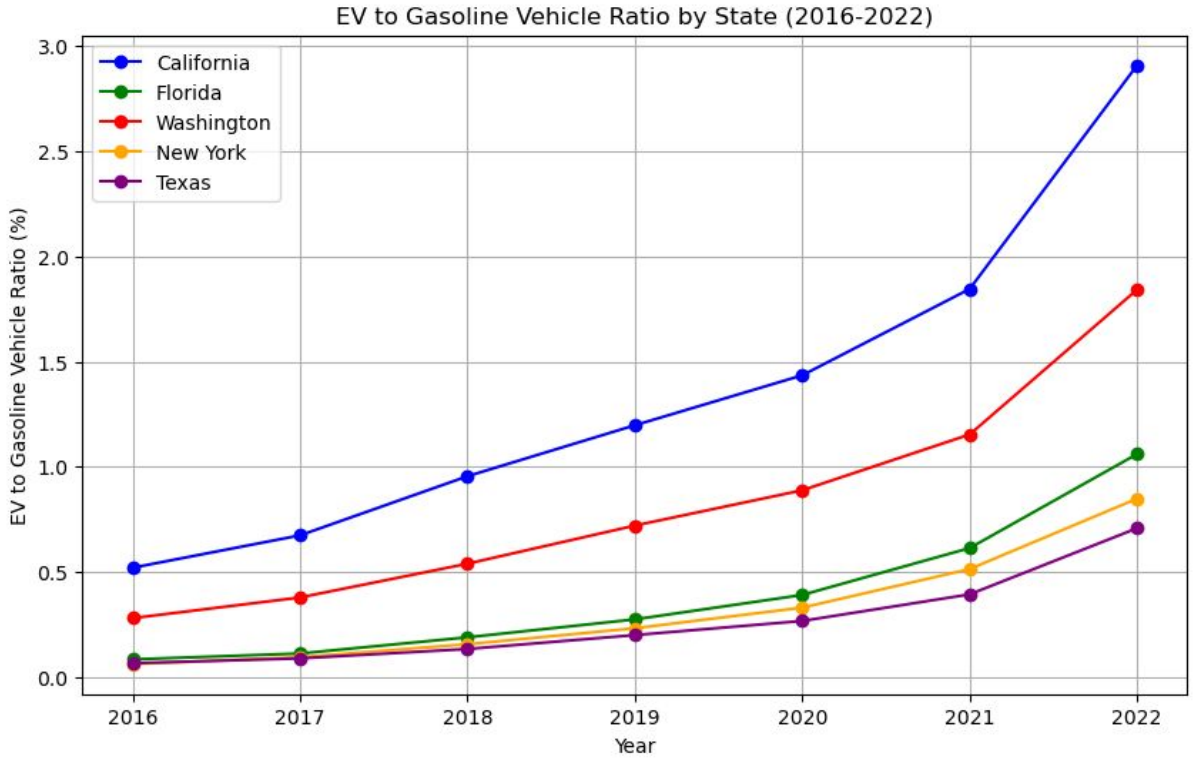
- Divide the EV population by the total vehicle population for each state from 2016 to 2022 to draw the EV ratio per year (market share)

$$\frac{\text{\# of EVs}}{\text{total \# of vehicles}} = \text{Market Share}$$

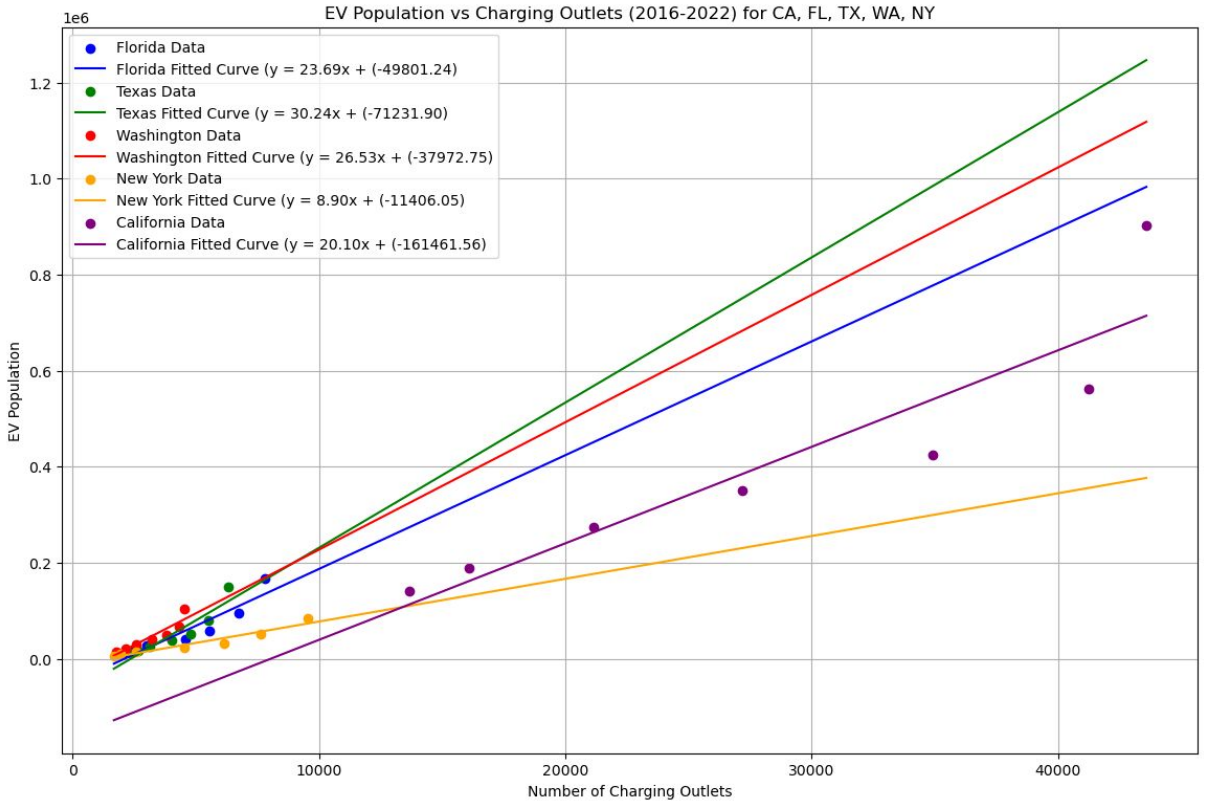
Methodology

- Trend Analysis
  - Extract the number of charging outlets in these five states and plot of **charging outlets (x) against EV population (y)** and linearly fit the curve to y=kx+b (`scipy.optimize.curve_fit`)
  - Divide the number of charging outlets by the land area of each state and perform the same linear fit to find the relationship between **charging outlets density** and the number of EVs.

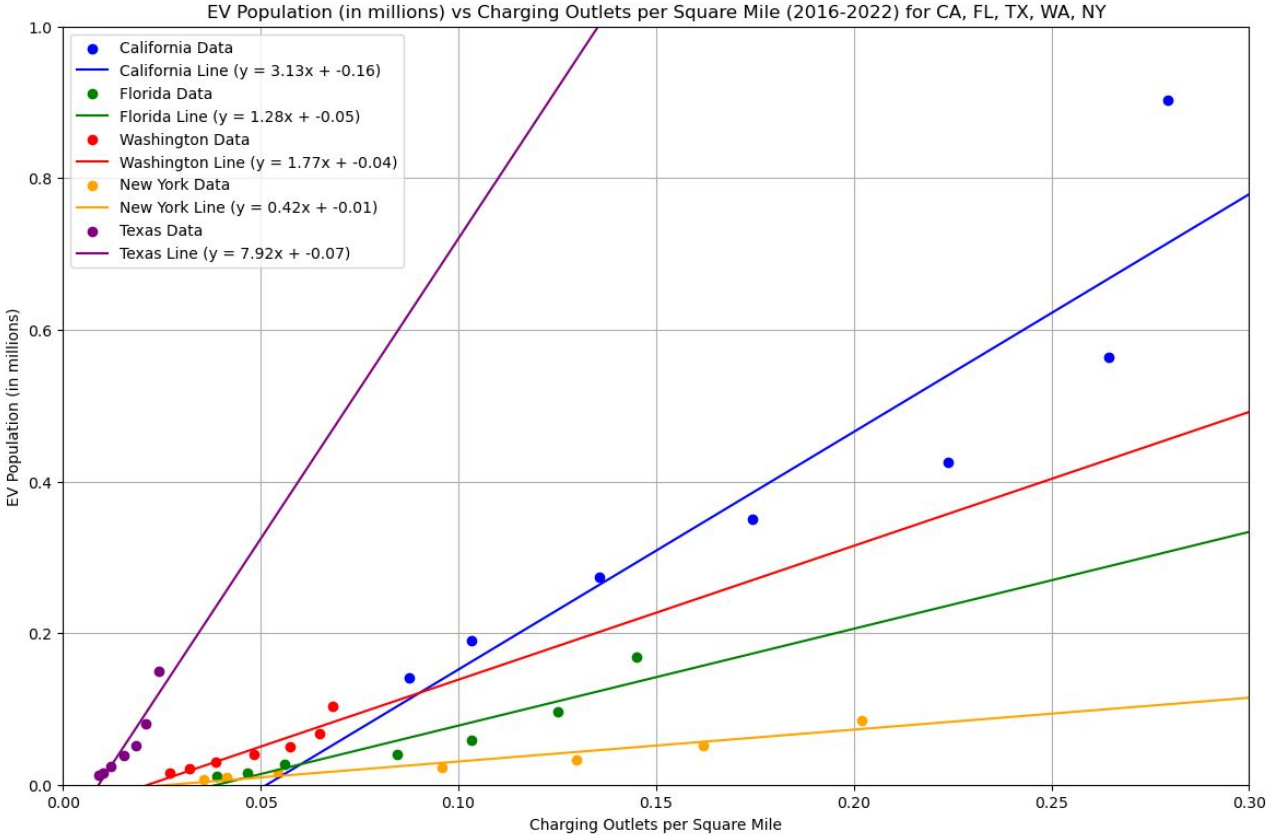
EV Population Growth from 2016 to 2022



How does the number of charging outlets correlate the number of electric vehicles?



How does the density of charging outlets correlate the number of electric vehicles?



Conclusion

- The ratio of EVs to charging ports is a critical metric for assessing the adequacy of charging infrastructure.
- Ideally, this ratio should be low to ensure that EV drivers have reliable access to charging facilities, reducing wait times and improving the overall user experience.
- Investment in charging infrastructure has been ramping up, but the pace varies significantly across regions.
- Urban areas tend to have better coverage compared to rural areas, highlighting the need for a more equitable distribution of charging stations.

Thank you