

**IS THE AUTOMOTIVE FUTURE ELECTRIC?
ELECTRIC VEHICLES**

Group 4

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INTRODUCTION

More and more, electric vehicles are becoming a viable option for car purchasers. Tens of thousands of EV's are sold each month and share the road with traditional, gasoline-powered automobiles. Manufacturers are rapidly building charging stations across the world in order to meet demands for these new vehicles. While gasoline is going nowhere anytime soon, electric vehicles are here to stay and look to compete with traditional automobiles for the average consumer.

Tesla has led the way in EV production and has forced other manufacturers to play catch-up. Now nearly every major car company has released at least one electric model. While initially a luxury, electric cars are now being built and priced for the average car purchaser, signaling that EV's have a place in the future of the automobile industry.

INSPIRATION & REASONING

Our inspiration comes from recent events and renewed focus of car companies on the electric vehicle market. Companies such as Ford and GM are eager to take a part in the electric vehicle market that Tesla has captured. Our focus was in the sought after EV features and the average sales of the top selling EV companies.

MACHINE LEARNING HYPOTHESIS

With the information we collected on electric vehicles, we wanted to look at the rising popularity of ev's and their sustainability in the market.

- Will electric vehicle prices level out with the rising popularity and increased availability from more car companies?
- Will electric vehicle sales continue to rise?

- Which features are the most sought after and which companies are at the top for each type of feature (acceleration, range, battery size, fast charge, body type and price) ?
- What's the ROI on EVs?
 - Based on analysis comparing Gas, Hybrid and Electric Vehicles, we believe that the ROI in an Electric Vehicle will pay off.

DESIGN CHOICES

Staying inline with the “living green” aesthetic, our color choices were blues and greens in our site style and visuals.

Our site was designed to be a streamlined site with a navigation bar in the upper left corner, a Tableau link and homepage with our predictions link.

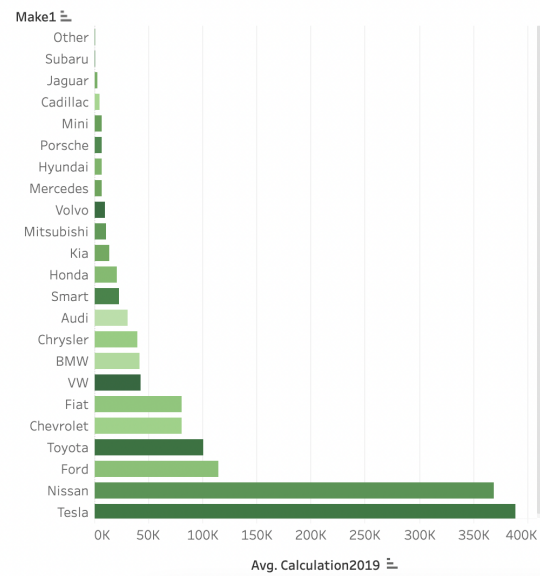
DATA CLEANING

- Python Pandas

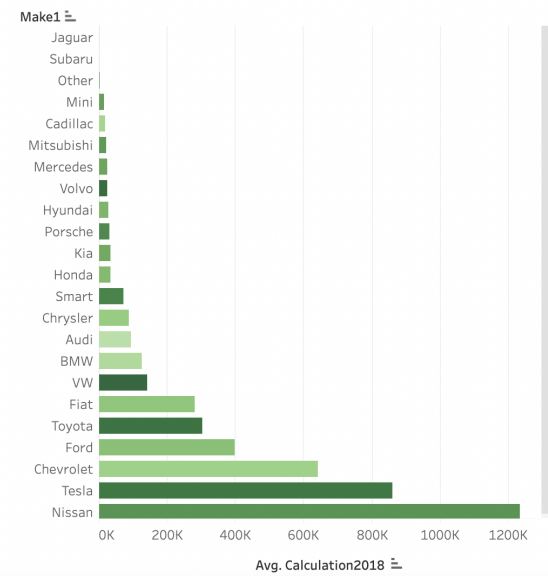
VISUALIZATIONS - Tableau Public

- 6 Dashboards
 - Sales Dashboard 1 (2018-1019) - Average Sales
https://public.tableau.com/views/Project4Group4Capstone/SalesDashboard?:language=en-US&:display_count=n&:origin=viz_share_link

2019 Sales



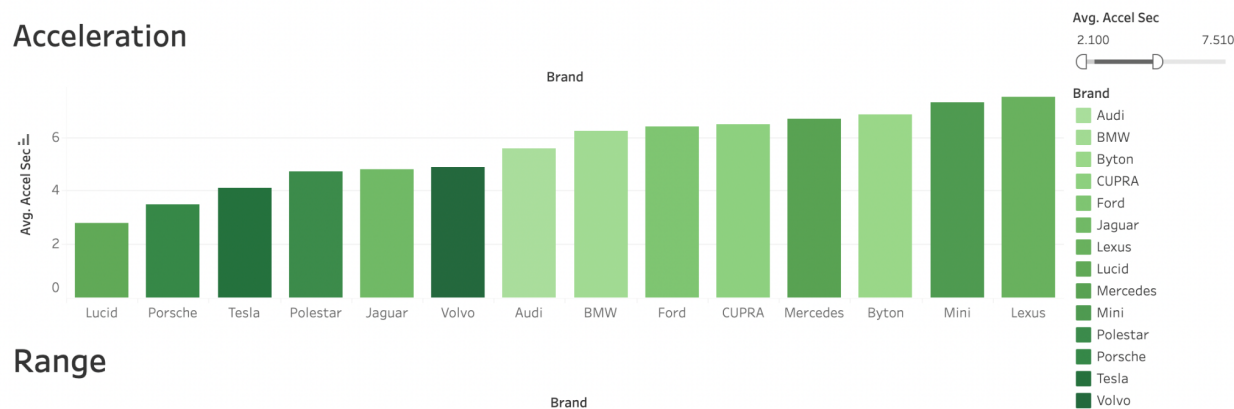
2018 Sales



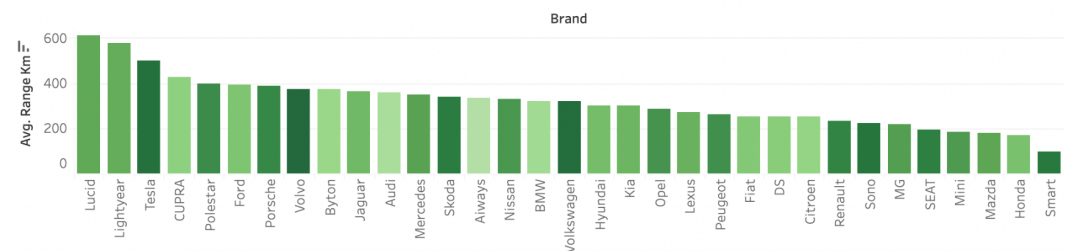
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- Features Dashboard 2 - Acceleration & Range
- https://public.tableau.com/views/Project4Group4Capstone/FeaturesDashboard?:language=en-US&publish=yes&:display_count=n&:origin=viz_share_link

Acceleration



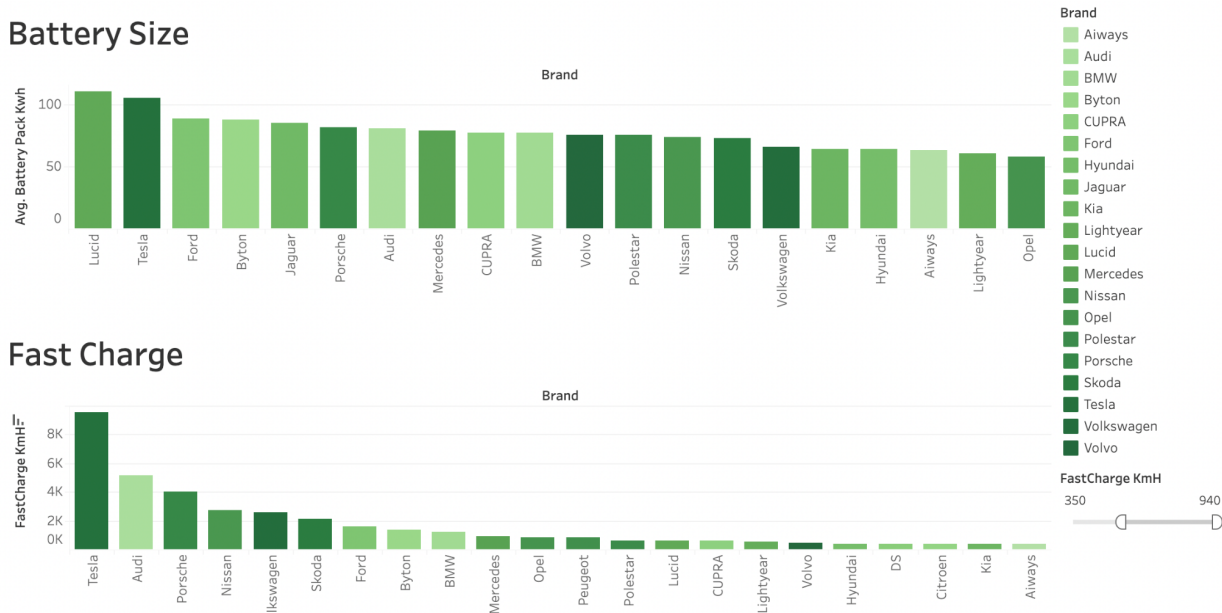
Range



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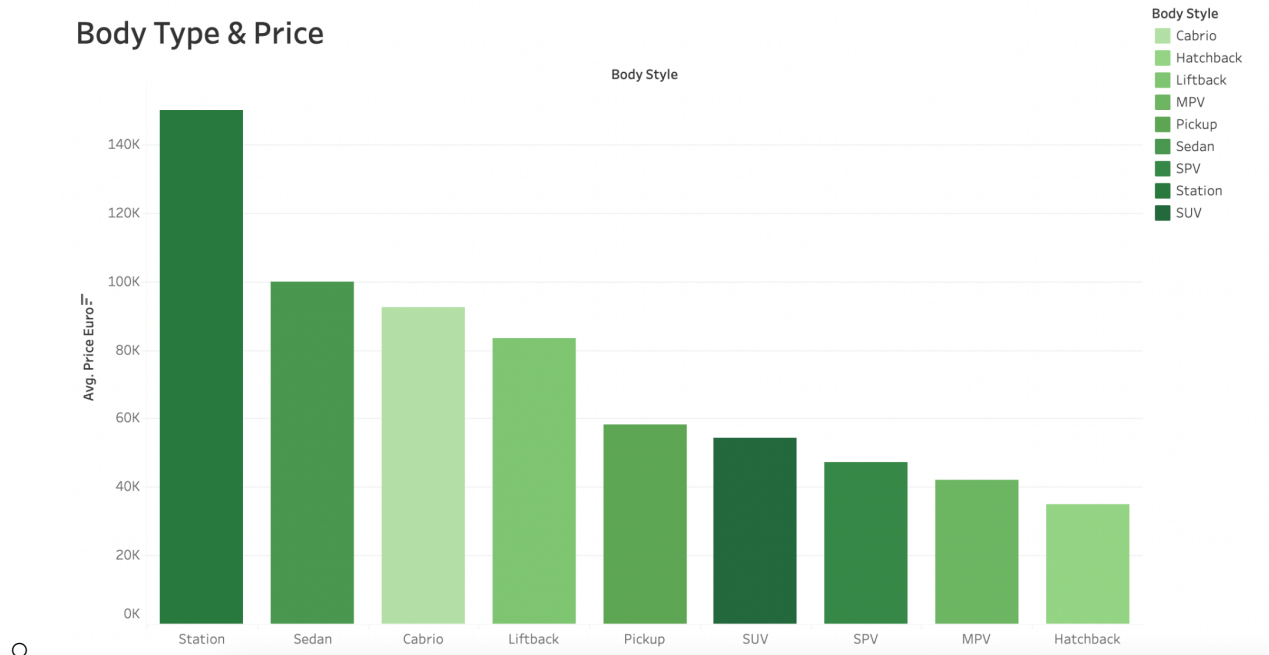
- Features Dashboard 3 - Battery Size & Fast Charge
- https://public.tableau.com/views/Project4Group4Capstone/FeaturesDashboard2?:language=en-US&publish=yes&:display_count=n&:origin=viz_share_link

Battery Size



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- Features Dashboard 4 - Body Type & Price
- https://public.tableau.com/views/Project4Group4Capstone/FeaturesDashboard3?:language=en-US&publish=yes&:display_count=n&:origin=viz_share_link

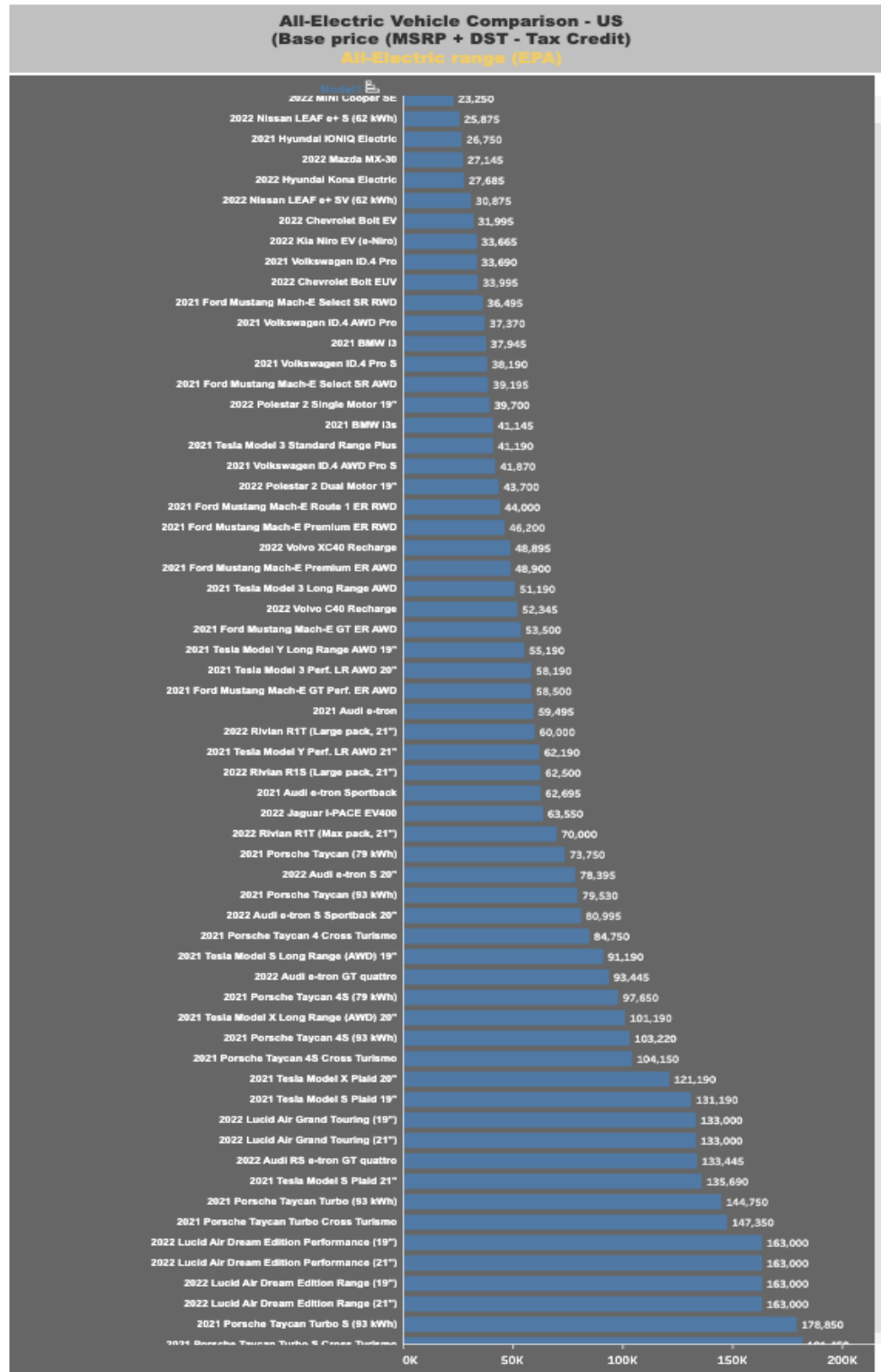


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- Features Dashboard 5 - 2021 Price of All-electric Vehicle Comparison - US

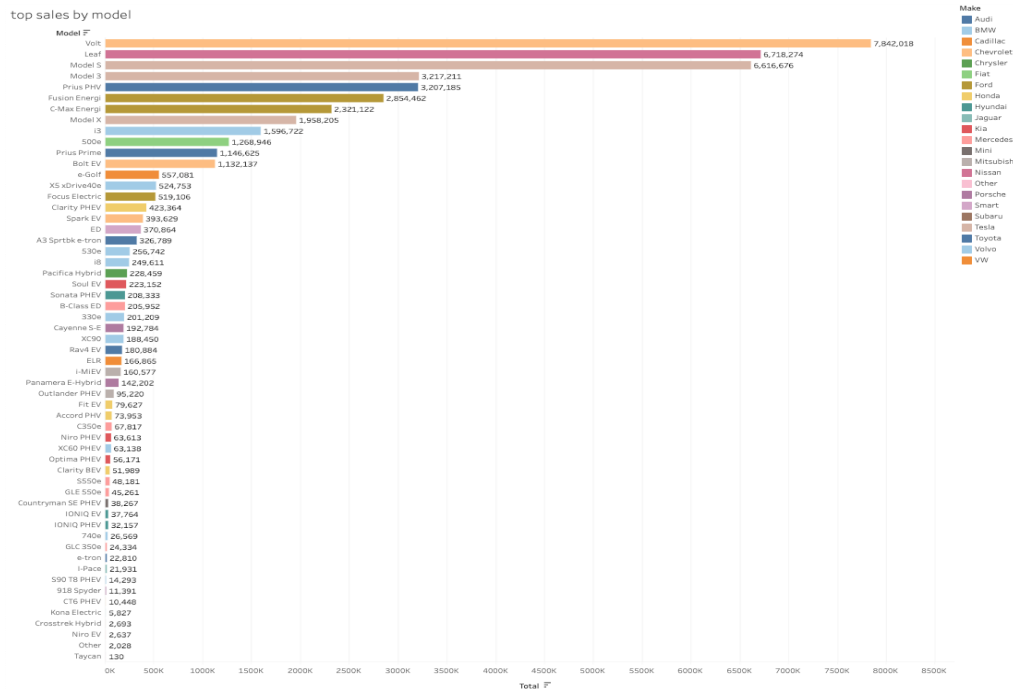
- <https://public.tableau.com/app/profile/jorge.serrano8339/viz/allvehicl/ecomparison/Sheet1>

2021 Price of All-electric Vehicle Comparison - US



- Features Dashboard 6 - 2021 Price of All-Electric Vehicle Comparison - US

- <https://public.tableau.com/app/profile/jorge.serrano8339/viz/ev-sales-bymakemodel/topsalesbymodel>
- 2021 Price of All-Electric Vehicle Comparison - US



CONCLUSIONS

Actionable Insights based on features below: Tesla and Audi were consistently in the top 5-6 when it came to features examined.

Top average sales were from Nissan, Tesla and Ford.

Sales

1) 2019 Top sales - Ford, Nissan and Tesla with Chevrolet dropping from the previous year.

2) 2018 sales top performers - Nissan, Tesla, Chevrolet, Ford and Toyota in that order.

Features

1) Fast charge Top Performers - Tesla, Audi, Porsche, Nissan, Volkswagen and Ford.

2) Battery Size - Tesla, Ford, Jaguar, Porsche, and Audi.

3) Acceleration Rate - Porsche, Tesla, Jaguar, Volvo and Audi.

4) Range - Tesla, Ford, Volvo, Jaguar and Audi.

5) Body Type - (Most expensive) Station, Sedan, Cabrio, Liftback, Pickup and SUV.

Cost

1) Least Expensive & Most Expensive - 2022 Nissan LEAF S - \$20,875 and the Most Expensive - 2021 Porsche Teycan Turbo S Cross Turismo - \$181,450

2) Top Sales by Model - Volt by Chevrolet (7,842,018 units), Leaf by Nissan (6,718,274 units), Model S & Model 3 by Tesla (6,616,676 & 2,217,211 units)

LIMITATIONS

One of our limitations includes the fact that our 2019 data was not complete, therefore we took the average sales for the Tableau Sales Visuals. Also we

needed a data source that could be merged with sales that had car models that matched with our original data source.

FUTURE WORK

We would like to examine charging station availability by state and how vehicle charging rate affects vehicle maintenance costs.

WORKS CITED / DATA SOURCES

- Sales
 - <https://www.kaggle.com/mathurinache/electriccarsalesbymodelinusa>
 - <https://afdc.energy.gov/data/>
 - https://public.tableau.com/app/profile/laura.bressan/viz/Book2_15907556068060/Autoelettriche2016
- Top Speed, Range, Efficiency, etc.
 - <https://www.kaggle.com/searoll/electric-cars-2021>
 - <https://www.kaggle.com/kkhandekar/quickest-electric-cars-ev-database>
 - <https://www.kaggle.com/divyanshugupta95/cars-dataset-with-battery-pack-capacity>
- Price Prediction
 - <https://www.analyticsvidhya.com/blog/2021/09/data-analysis-and-price-prediction-of-electric-vehicles/>
- Data
 - https://www.kaggle.com/divyanshugupta95/electric-vehicle-analysis/data?select=ElectricCarData_Norm.csv
- EV Comparison
 - <https://public.tableau.com/app/profile/brenden.roy/viz/ElectricCarComparison/Console>
- Charging Costs
 - <https://www.osti.gov/dataexplorer/biblio/dataset/1637673>

- Gas Vehicles vs EV
 - <https://www.self.inc/info/electric-cars-vs-gas-cars-cost/>
- Gas Vehicles vs EV vs Hybrids
 - <https://catalog.data.gov/dataset/electric-vehicle-population-data>

- Features Research

<https://www.kbb.com/car-advice/electric-cars-101/>

- Decision Behavior when purchasing an EV
 - <https://dataverse.harvard.edu/file.xhtml?persistentId=doi:10.7910/DVN/NAAVVP/QUA1ZP&version=2.0>

INSPIRATION SOURCES

- <https://media.ford.com/content/fordmedia/fna/us/en/news/2021/09/27/ford-to-lead-americas-shift-to-electric-vehicles.html>
- <https://www.caranddriver.com/features/g36278968/best-selling-evs-of-2021/>
- <https://www.forbes.com/sites/samabuelsamid/2021/09/27/114b-for-new-for-d-electric-truck-assembly-plant-and-3-battery-plants/?sh=3ffcfc892b05>