Tesla TrendSetter

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https://github.com/SamuelWinter6/sql-project.git

Overview

Stakeholders

- Product Developers/Designers ~ Product Improvement
- Marketing ~ Customer Satisfaction

Problem

- Providing a platform for data driven decision making

Solution

- Extract relevant data, appropriately Transform data, Load data into a database for analysis, Draw insights from collected data

Role & Prime Directive

Role

- Create a data pipeline to provide a platform for data analysis
- Answer “what”, “when”, and “how”

Prime Directive

- Analyze/contrast popular Tesla models vs their competitor counterparts in various aspects
- Draw insights for further improvement in specific model components

Data Engineering

- The Data Engineering team is building a state-of-the- art analytics platform for business and operation intelligence. At Tesla, we have enormous amounts of data and we want to give meaning to it and help business users to make data driven decisions. Our platform will allow users to answer "what", "when" and "how" questions as well as allow them to ask "what if?" Interns will help design, develop, maintain and support our Enterprise Data Warehouse & BI platform within Tesla. This position offers a unique opportunity to impact to the entire organization by developing data tools and creating a data driven culture.

Maintenance & Car Models Specs Data Sources

CIS Automotive API

- Data containing specific car model specifications i.e. model year, mpge, drive, etc.

NHTSA Complaints API

- Complaints made by customers with specifications car components
  - ODINumber ~ Complaint ID
  - Component ~ Cause issue to make a complaint
  - Issue Date
  - Make
  - Model

Descriptive Insights ~ CIS Automotive

Descriptive Question:

How does the average fuel efficiency for Tesla models compare to other brands by car class?

Insights:

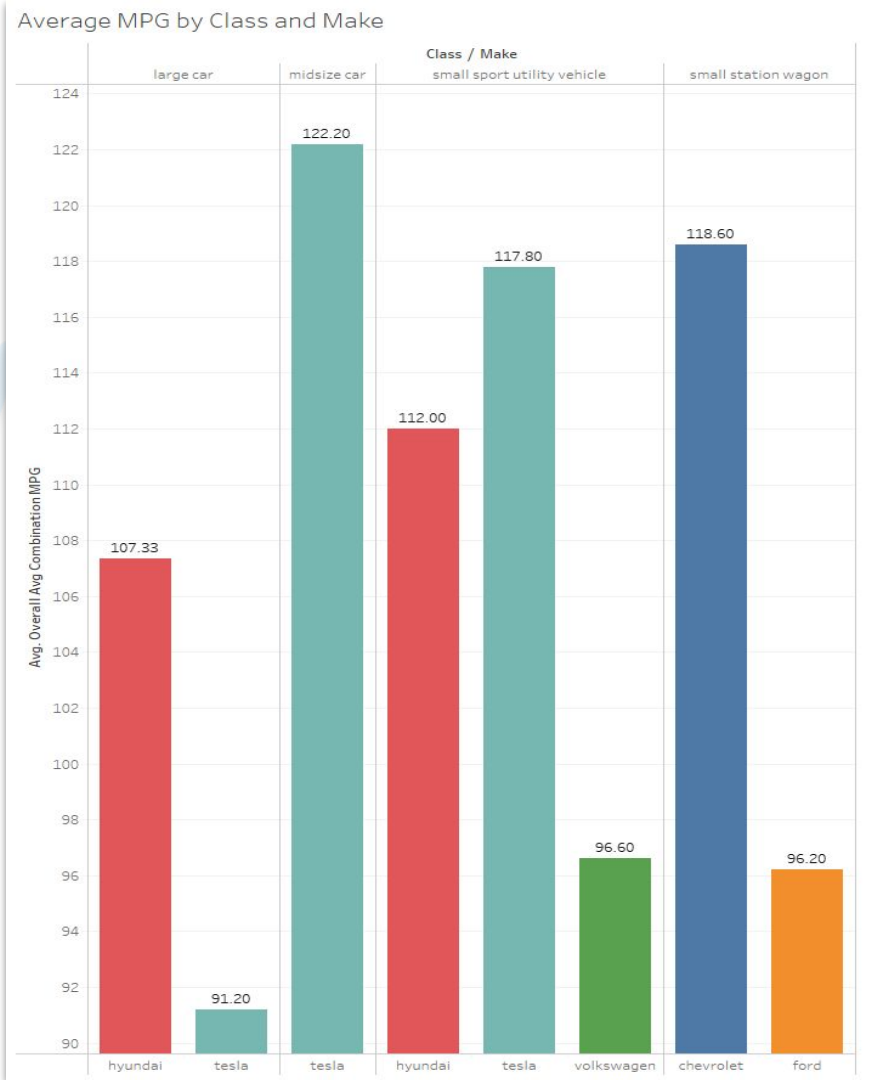
Tesla model offerings in Large Car Class lag behind competitors (Hyundai Ioniq 5)

Recommendation:

Increase MPGe in models considered Large Cars, to keep up with competition

Prediction:

Increasing MPGe would result in more competitive options for potential customers



Diagnostic Insights ~ CIS Automotive

Diagnostic Question: What class & models yield the highest MPGe Rank, what is the difference between tesla models and competitors per car class?

Diagnostic Insights ~ CIS Automotive Continued

Insights:

Tesla has no competitive model that outperforms its competitors in MPGe in the Large Car Class. With no model offerings in the Small Station Wagon Car Class.

Recommendation:

- Improve MPGe in models considered Large Cars to keep up with competition.
- Potentially tap into the Small Station Wagon Car Class with a new model.

Prediction:

- Increasing MPGe would result in more competitive options for potential customers, increasing chances of a customer buying.
- With a new model offering in Small Station Wagon Car Class, Tesla could expand its offerings to potential customers.

Descriptive Insights ~ NHTSA API

Descriptive Question:

What are the overall incident counts for each car make, highlighting potential differences in reliability or maintenance issues?

Insights:

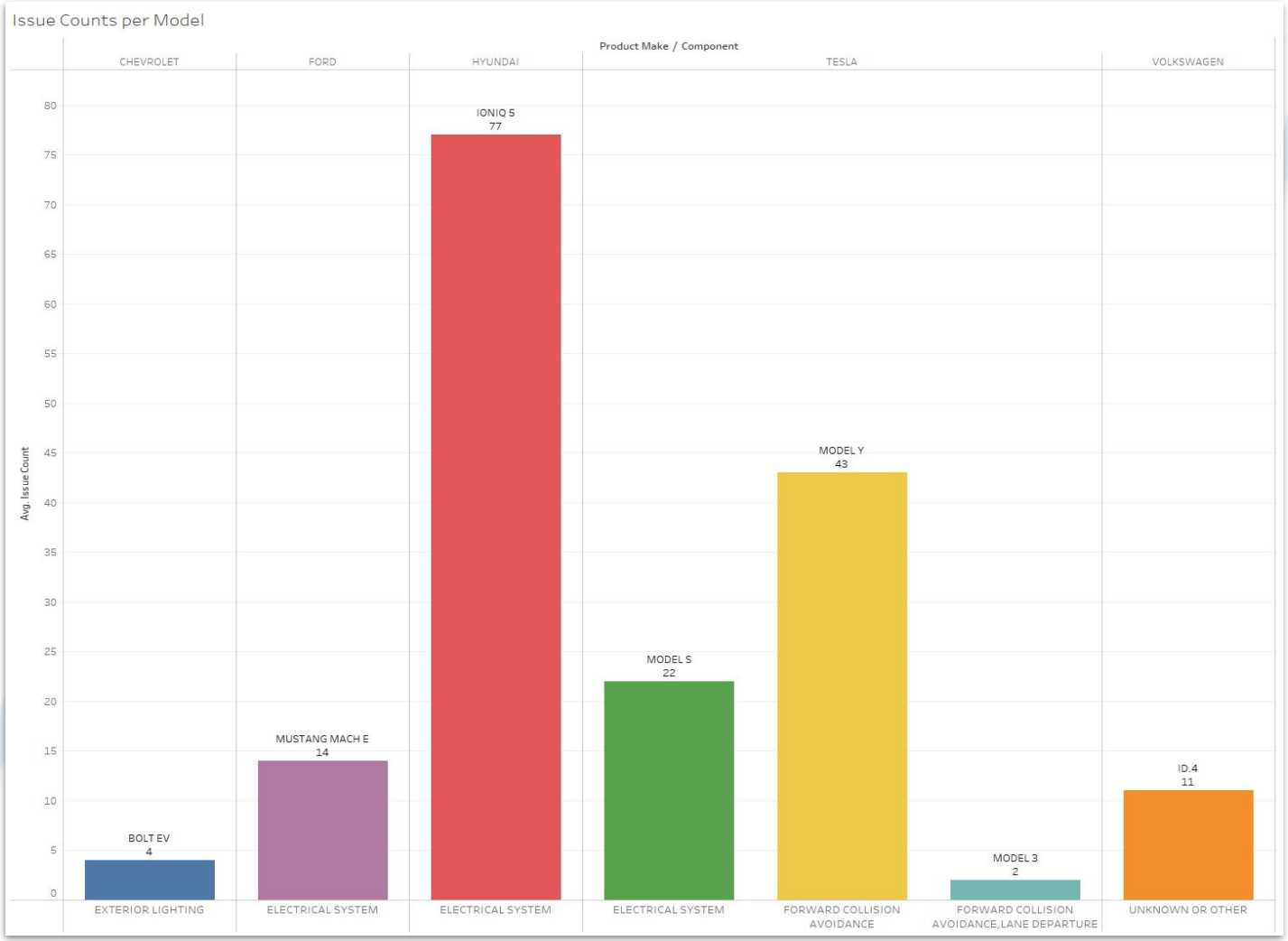
Model Y has the most amount of incident reports being Forward Collision Avoidance

Recommendation:

Evaluate systems and product engineering aspects related to Forward collision avoidance to better streamline the safety of the model as it seems like a common issue for specifically the Model Y.

Prediction:

Increase redundancy and safety measures building more trust with customers


Issue Counts per Model
Product Make / Component
CHEVROLET
FORD
HYUNDAI
TESLA
VOLKSWAGEN
Avg. Issue Count
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
BOLT EV
4
MUSTANG MACH E
14
IONIQ 5
77
MODEL S
22
MODEL Y
43
MODEL 3
2
ID.4
11
EXTERIOR LIGHTING
ELECTRICAL SYSTEM
ELECTRICAL SYSTEM
ELECTRICAL SYSTEM
FORWARD COLLISION AVOIDANCE
FORWARD COLLISION AVOIDANCE,LANE DEPARTURE
UNKNOWN OR OTHER
Product Model
BOLT EV
ID.4
IONIQ 5
MODEL 3
MODEL S
MODEL Y
MUSTANG MACH E

Diagnostic Insights ~ NHTSA API

Diagnostic Question:

How do maintenance issue frequencies for Tesla models compare to their competitors, and what are the specific common issues for each category of cars?

Insights:

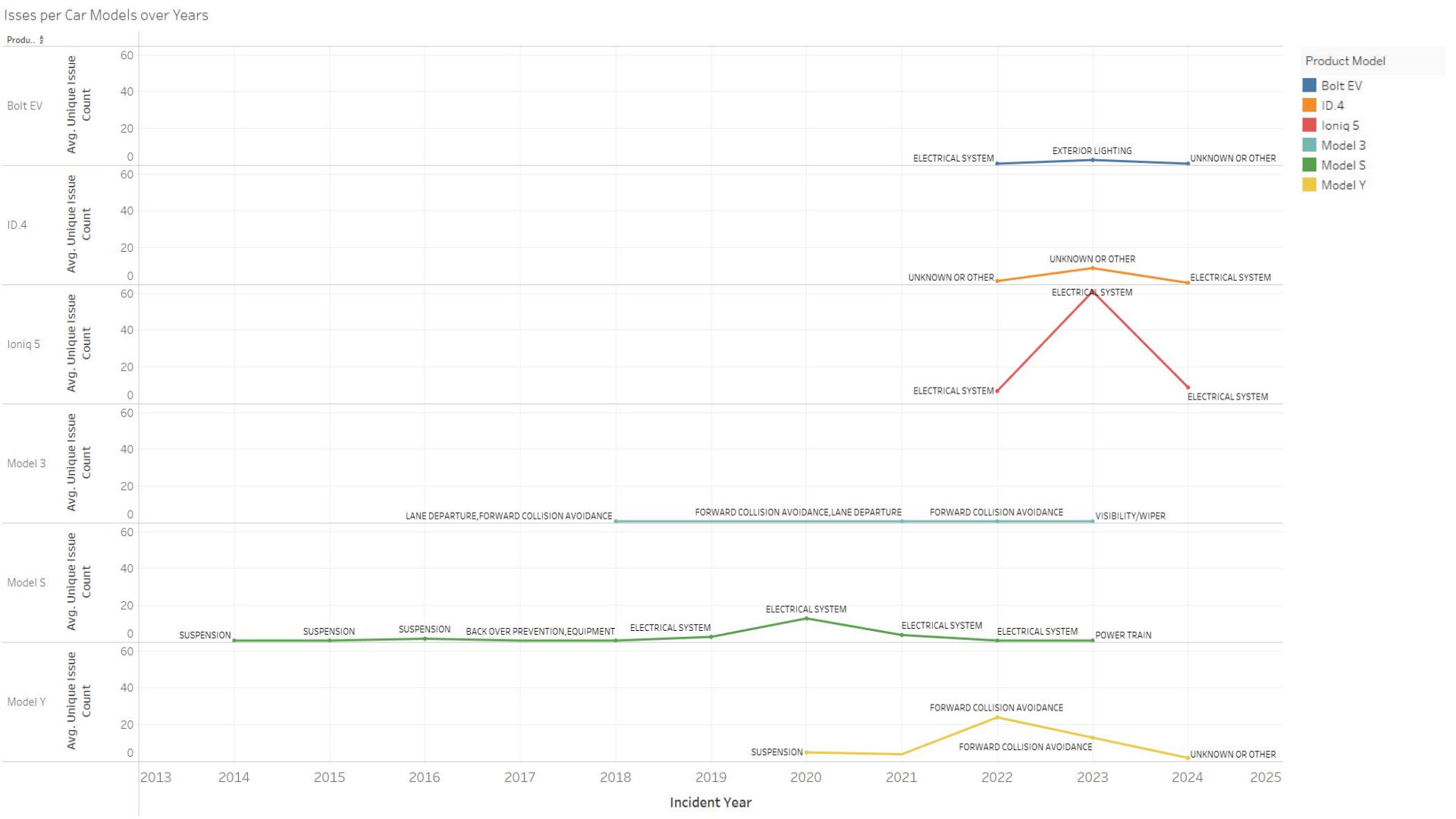
- In the year 2022 the Model Y experienced a spike in issue complaints about Forward Collision Avoidance
- In the year 2020 the Model S experienced a spike in issue complaints relating to Electrical Systems Component

Recommendation:

Diagnose and source issues related to Forward Collision Avoidance, as it's a common issue between the Tesla model Y & 3. Despite marginal improvement in the decrease of issues related to Forward Collision Avoidance in recent years.

Prediction:

By refining product components, models will be viewed as a more attractive compared alternative competitor models experiencing more issues.


Isses per Car Models over Years
Produ..
Bolt EV
ID.4
Ioniq 5
Model 3
Model S
Model Y
Avg. Unique Issue Count
0
20
40
60
ELECTRICAL SYSTEM
EXTERIOR LIGHTING
UNKNOWN OR OTHER
UNKNOWN OR OTHER
UNKNOWN OR OTHER
ELECTRICAL SYSTEM
ELECTRICAL SYSTEM
ELECTRICAL SYSTEM
ELECTRICAL SYSTEM
LANE DEPARTURE,FORWARD COLLISION AVOIDANCE
FORWARD COLLISION AVOIDANCE,LANE DEPARTURE
FORWARD COLLISION AVOIDANCE
VISIBILITY/WIPER
SUSPENSION
SUSPENSION
SUSPENSION
BACK OVER PREVENTION,EQUIPMENT
ELECTRICAL SYSTEM
ELECTRICAL SYSTEM
ELECTRICAL SYSTEM
ELECTRICAL SYSTEM
POWER TRAIN
SUSPENSION
FORWARD COLLISION AVOIDANCE
FORWARD COLLISION AVOIDANCE
UNKNOWN OR OTHER
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Incident Year
Product Model
Bolt EV
ID.4
Ioniq 5
Model 3
Model S
Model Y

Customer Satisfaction Data Sources

Cars.com & Edmunds.com

- Automotive forms with customer published reviews, containing:
  - Overall rating (5 star rating scale)
  - Date posted
  - Summary of user experience
  - Rating breakdown; Comfort, Reliability, Performance, and Value

Descriptive Insights ~ Customer Satisfaction

Descriptive Question:

What is the average overall customer satisfaction ratings for each car model?

Insights:

Model S and 3 saw an increase in overall rating while Model Y decreased

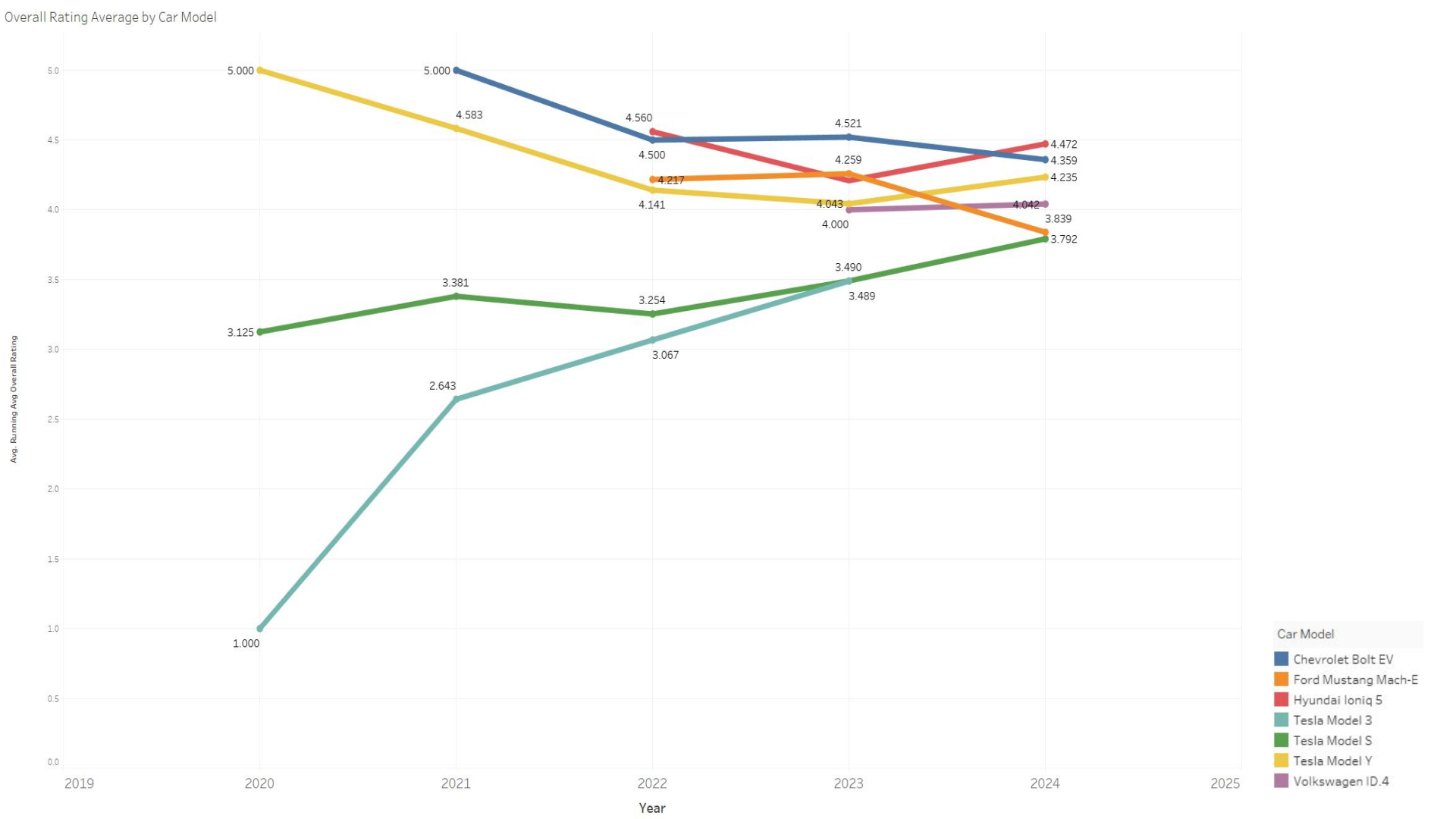
Recommendation:

Investigate aspects of customer reviews that influenced these changes

Prediction:

Attempt to fix specific car attributes that caused decreases in customer satisfaction to increase product attractiveness

Overall Rating Average by Car Model



Diagnostic Insights ~ Customer Satisfaction

Diagnostic Question:

How do customer satisfaction aspects (comfort, performance, reliability) trend over time for each car model, and which models show the greatest improvement or decline?

Insights:

Performance & Comfort saw the biggest decreases in customer ratings for Models 3 & S

Recommendation:

Improve on performance and Comfort features in Tesla Models 3 & S

Prediction:

Improvement in these attributes of Tesla Models would increase average overall customer satisfaction and lead to increased customer loyalty.

Attribute Rating Changes Over Years

Car Model

- Chevrolet Bolt EV
- Ford Mustang Mach-E
- Hyundai Ioniq 5
- Tesla Model 3
- Tesla Model S
- Tesla Model Y
- Volkswagen ID.4

Key Insights & Connections

Model Component Complains:

- Diagnose Forward Collision Avoidance for Model Y

Fuel Efficiency Rankings:

- Improve Large Car models MPGes to better compete with alternative models

Customer Satisfaction:

- Improve model S & 3 Comfort and Performance features to improve overall customer satisfaction

Connections:

These key insights were drawn by establishing a platform for data analysis through an ETL process from several data sources. Providing insight into “what”, “why”, and “how” and formulating decisions that would benefit Tesla's current Model selection.