

PREDICTORS AND CLASSIFICATION OF CONSUMER DECISIONS AND ATTITUDES TOWARD ELECTRIC VEHICLES

Bipolar/Lithium Bomb Team

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EXECUTIVE SUMMARY

- Consumers' beliefs and attitudes impact intent to purchase EVs.
- However, Project 1 analyses were limited to demographic data
- Probe deeper into consumer attitudes that could influence the decision to purchase an EV
- EVs are pushing into the "mainstream" with familiarity affordability, and supply
- Manufacturers need to account for political ideology, local environmental quality, income, and COVID response efficacy

PROJECT QUESTIONS

- **Question 1:** What consumer attitudes and experiences drive intent to purchase an EV?
- **Question 2:** Which supervised machine learning models optimally classify consumers' attitudes and beliefs that will shape the future of EVs and the energy sector?

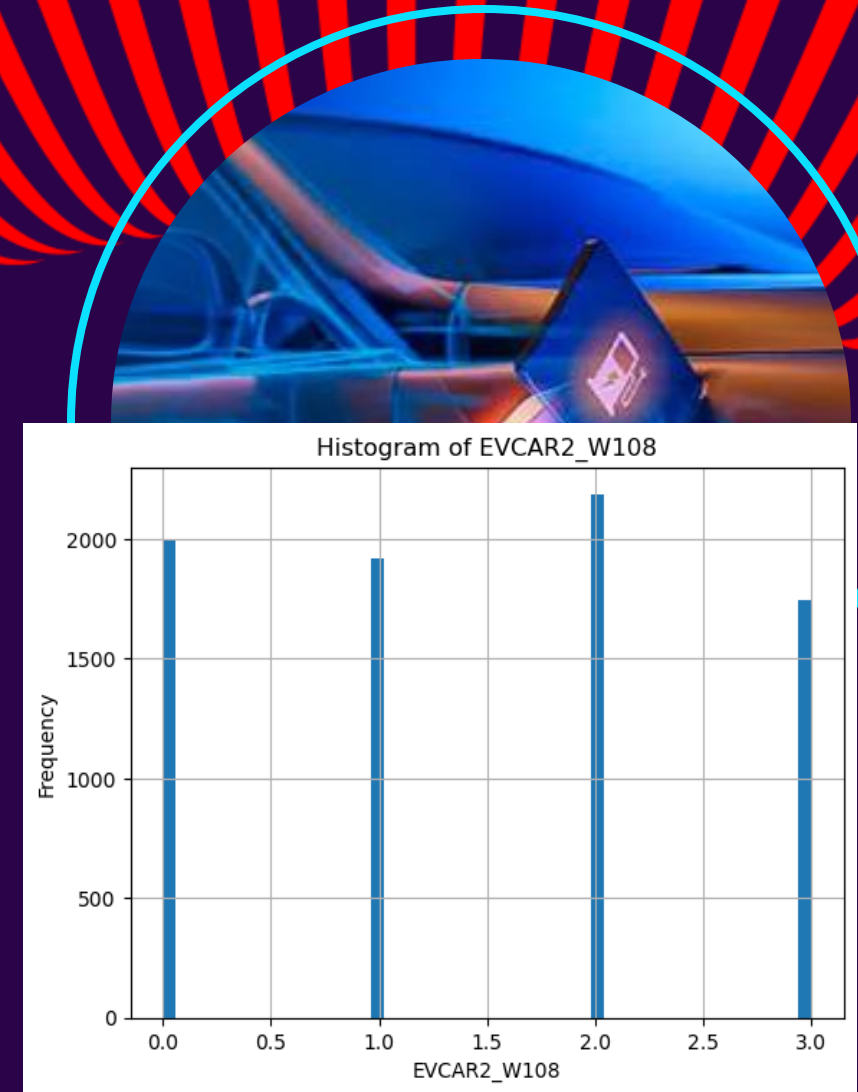
DATA EXTRACTION, CLEANING, AND EDA

Pew Research Center 

- Data source chosen was 2022 Pew Research Center's American Trends Panel (Wave 108 May 2022)
- Data cleanup and exploration was conducted in detail.
 - As part of Data Implementation, we performed EDA to guide feature evaluation, importance, and target selection.
 - We then used the results to inform our model selection and evaluation.
- Data was graphed and analyzed utilizing a variety of methods including gradient boosting regression and classification models
- Data Key to keep track of relevant survey questions and their recoding

DATA CLEANING AND EDA

- **Features and Potential Targets** - We took an initial look at the values and distributions of our features and potential targets with histograms to confirm the accuracy of the recoded response sets and if our primary target ordinal variable of interest was normally distributed.

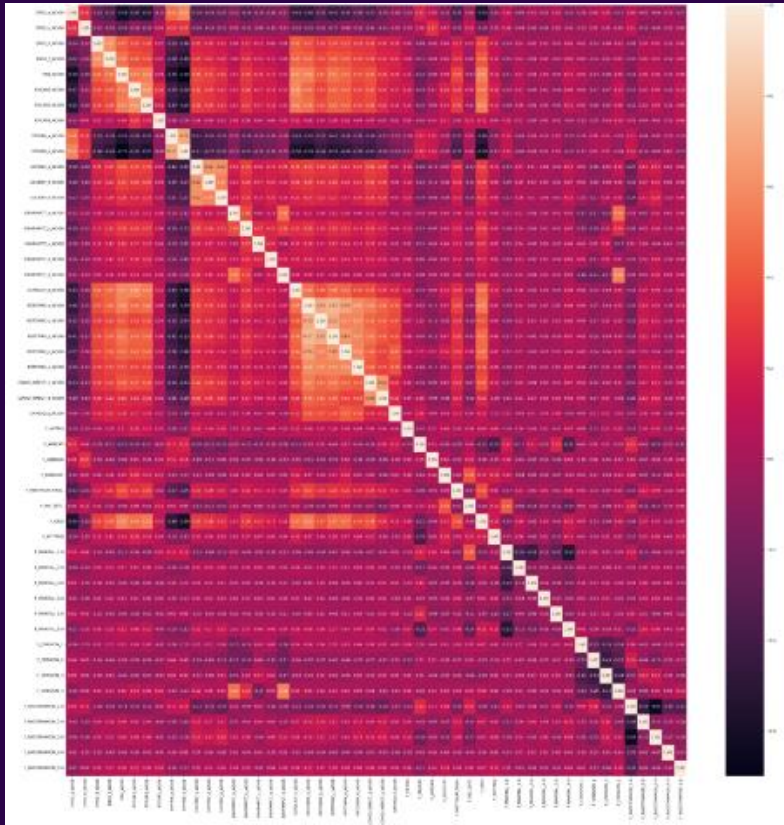


DATA CLEANING, PREP, AND EDA CONT...

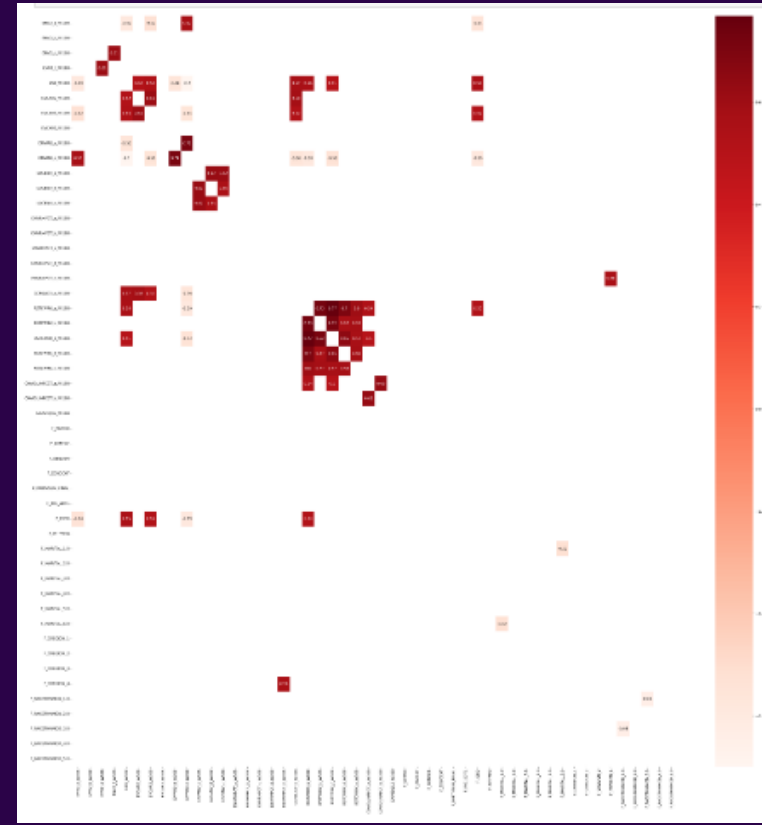
- **Balance Among Targets** - We printed the frequency of the values for each target to explore balance in greater detail.
- **Correlations** –A better understanding of the relationships between the target variables and the features based on the strength of the relationship.
- **VIF for multicollinearity**
- **Normality of distribution**



INITIAL HEAT MAP



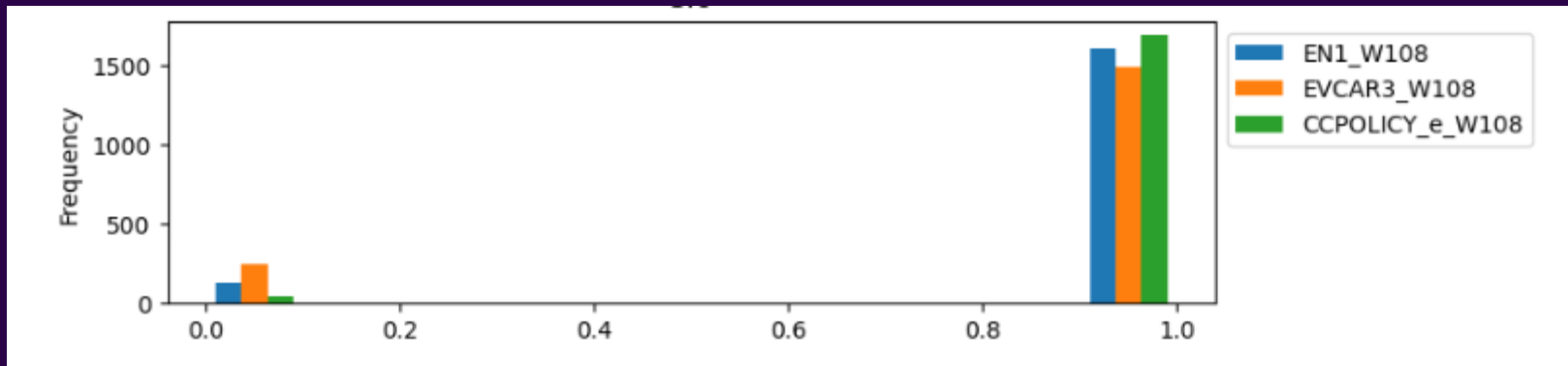
REVISED HEAT MAP



Revised heat map is filtering for absolute correlation coefficients greater than $r=0.5$

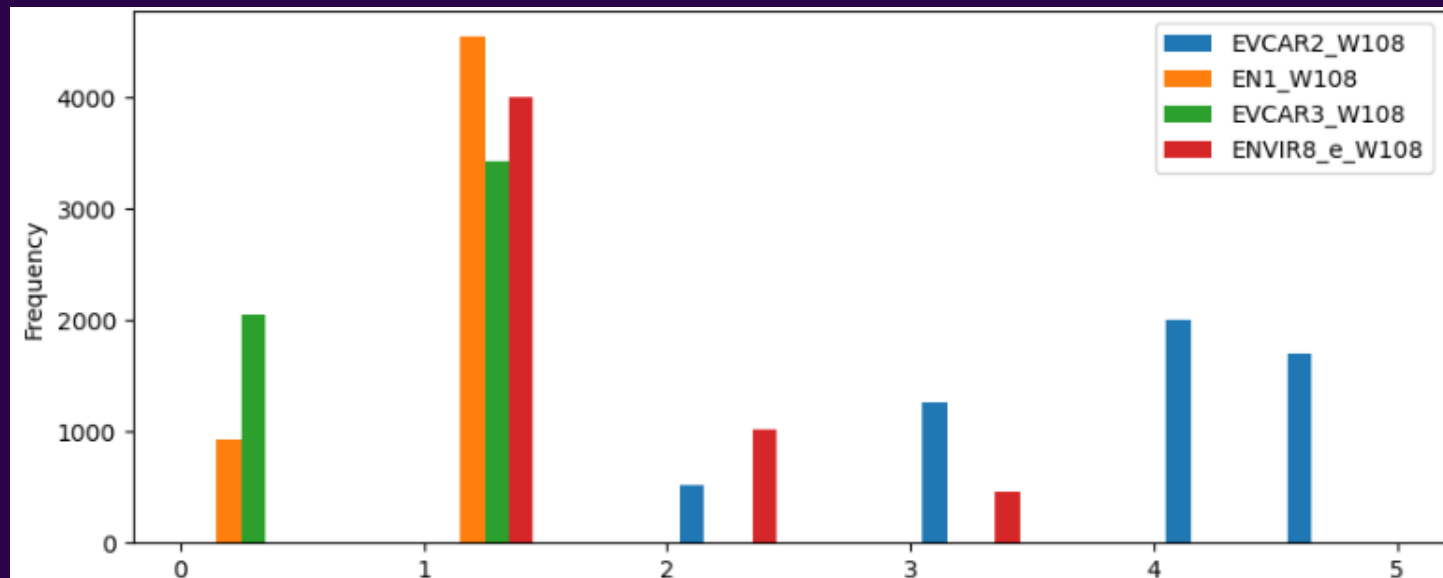
HOW LIKELY IS SOMEONE TO PURCHASE AN EV IN THE FUTURE?

The features with the highest correlations with EVCAR108 are EN1_W108 (i.e., developing alternative fuels is a priority), EVCAR3_W108 (i.e., favor or oppose phasing out gasoline cars) .



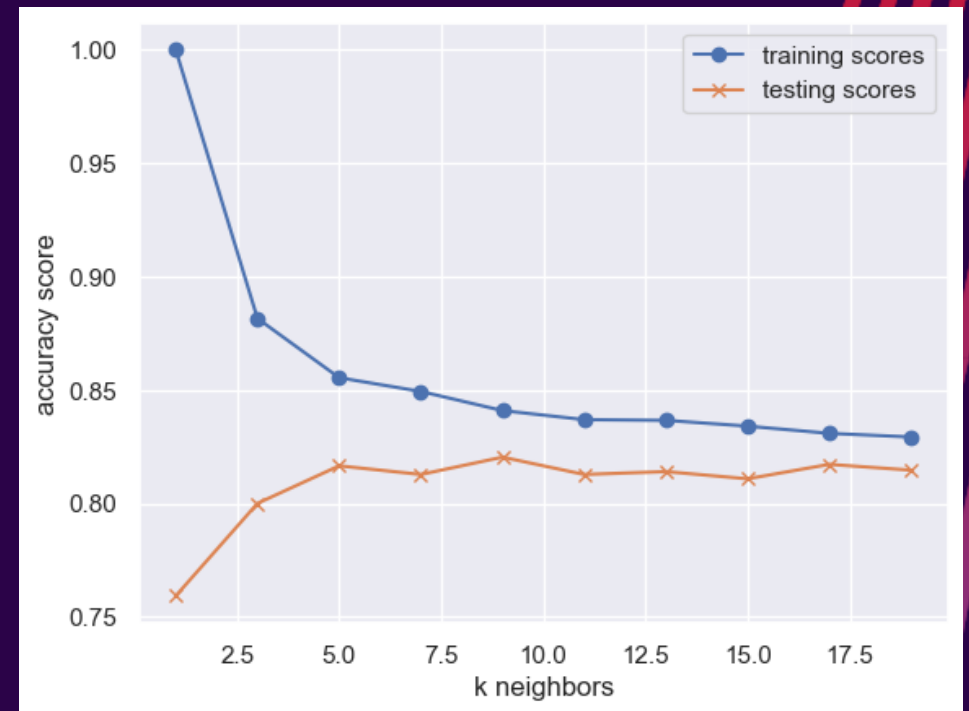
THOSE WHO OPPOSE PROVIDING INCENTIVES ARE NOT LIKELY TO BUY AN EV

Those who favor incentives favor the phasing out of gas vehicles (i.e., EVCAR3_W108), favor the development of alternative energy sources (EN1_W108), and feel that too little has been done to address climate change (i.e., ENVIR8_e_W108)

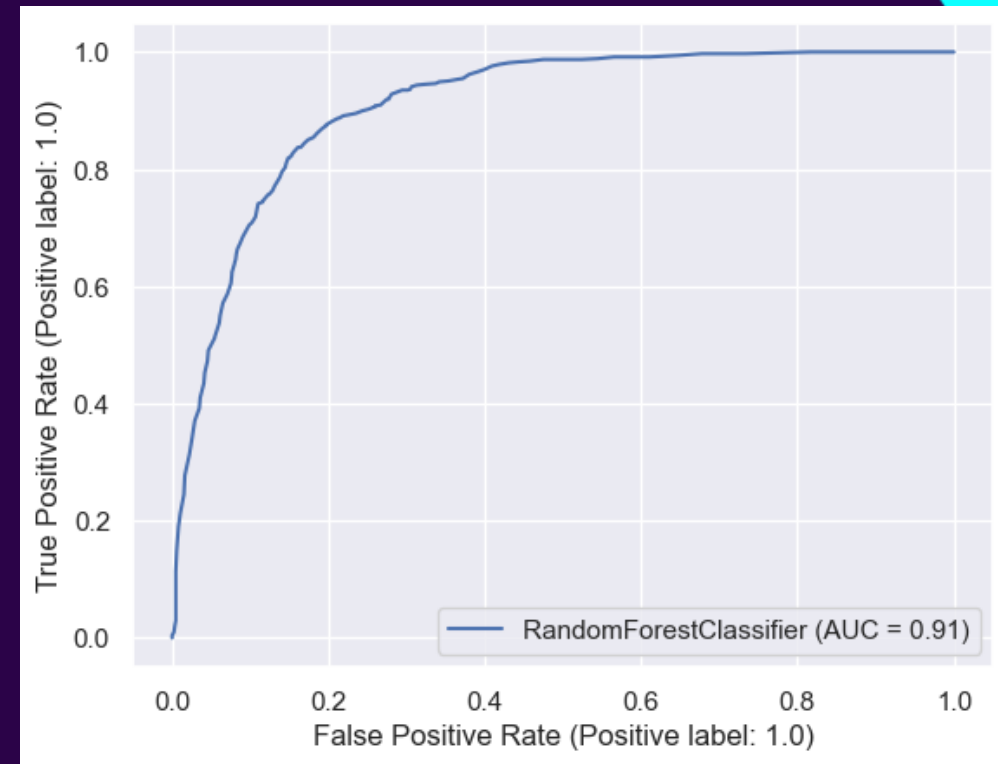
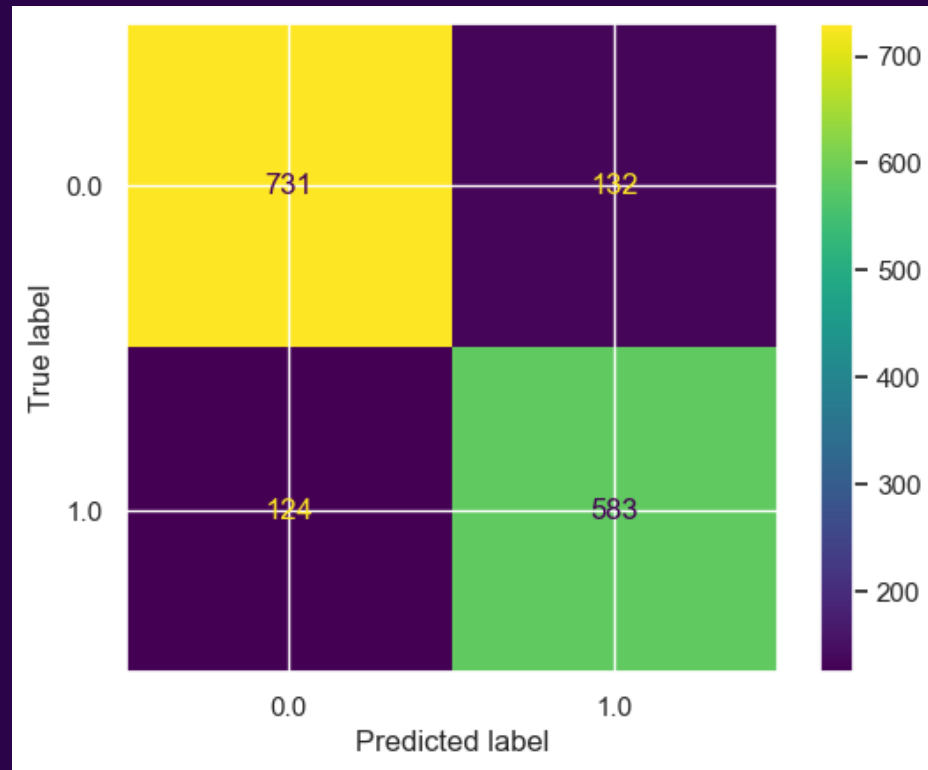


MODEL SELECTION AND MODEL EVALUATION METRICS

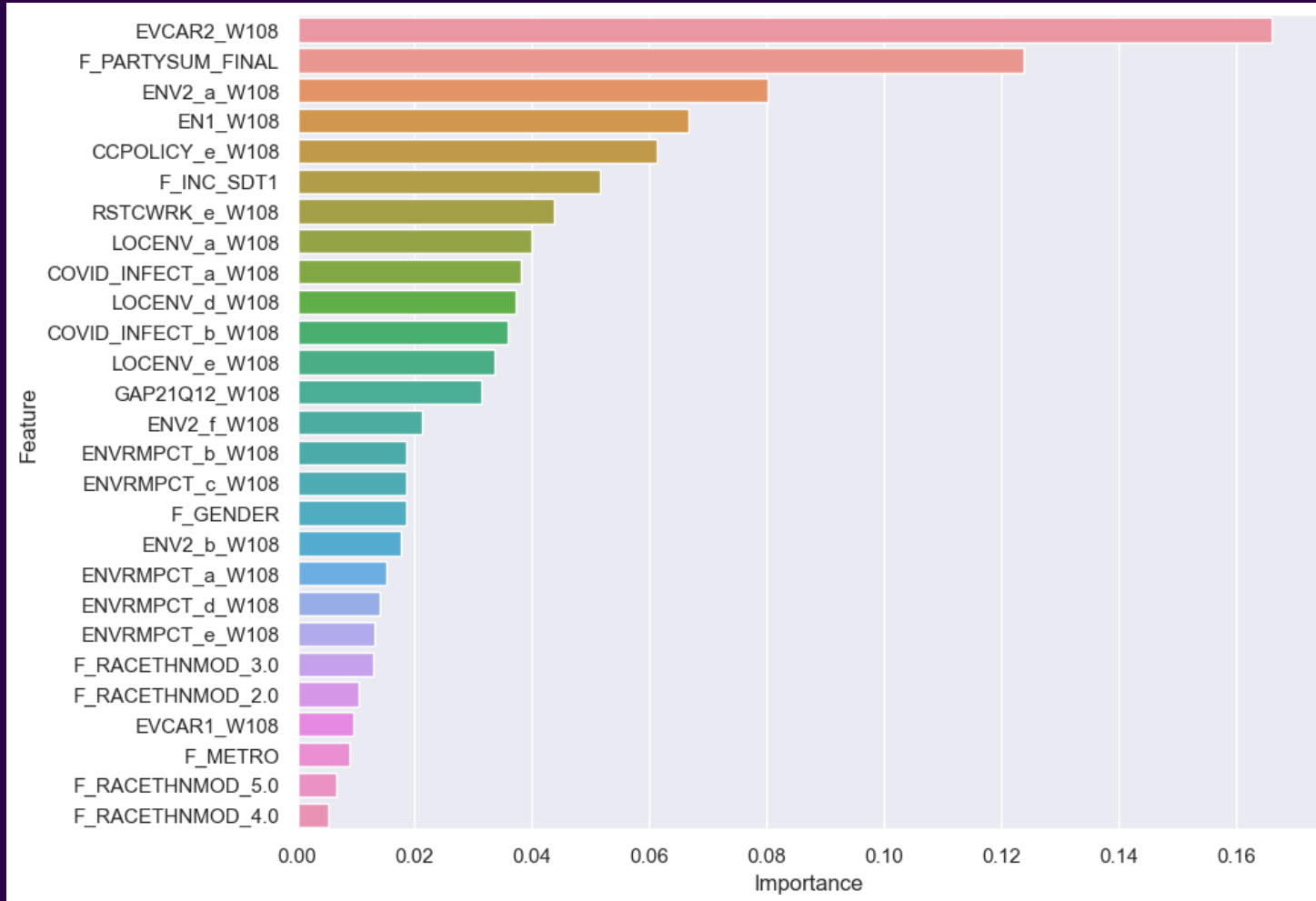
- Numerical prediction: Gradient Boosting Regression
- Classification Models:
 - Random Forest Classifier
 - Support Vector Classifier
 - K-Nearest Neighbors
- We chose Random Forest Classifier



RESULTS: RFC MODEL EVALUATION



RESULTS: RFC FEATURE RELEVANCE



SUMMARY OF FINDINGS

- Model Performance
 - EVCAR1_W108 (Very imbalanced)
 - Do you currently have an Electric Vehicle?
 - EVCAR2 (Poorer fit even with GB regression; Kurtosis)
 - Next time you purchase a vehicle, how likely are you to seriously consider purchasing and electric vehicle?
 - EVCAR3 (Better classification)
 - Do you favor or oppose phasing out the production of new gasoline cars and trucks by the year 2035?
- Manufacturers need to account for political ideology, local environmental quality, income, and COVID response efficacy

FUTURE CONSIDERATIONS

More Actual Purchase Data

Intent versus actual purchase

Infrastructure Support

Can our current grid support the number of EVs projected?

US vs Global Market

Alignment in the markets

Environmental Impact

Energy source - Lithium
Mines, etc.

Hidden Costs

What costs are incurred after purchase?

What is the True Cost

Economics of Use, e.g., End of Life/Battery Disposal

THANK YOU

The Bipolar/Lithium Bomb Team

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