Client Background
• Founded in 1965
• PepsiCo is a multi-billion-dollar company with 500+ different brands within the company portfolio.
• Primary business function is to Make, Move, and Sell Products

Transportation
• One of the largest privately owned fleets in North America.
• Various assets used to move food and beverage products

Sustainability
PepsiCo Positive (Pep+) is PepsiCo’s sustainability initiative to reduce emissions by 75% by 2030 and 100% by 2040.

Problem Statement
PepsiCo engineers are looking for a model to aid their transportation fleet decisions which are currently based on data trends and expert opinions.

System Model
PepsiCo Fleet Engineers have an annual budget to spend across all company fleets. They currently use knowledge of industry trends as well as fleet performance reports to guide their purchasing and retiring decisions for each asset.

Project Scope
The team set out to create a quantitative model which will provide insights on variable importance as it relates to maximizing asset MPG.

This analysis focuses on:
▪ Middle Mile Trips (300-750 mile)
▪ Tractor Trailers and Straight Trucks
▪ 2021 Beverage Fleet Data

Methodology
Random Forest Regression Model:
• Meant for large data sets
• Numerous input variables
• Multiple iterations of decision tree (prevents overfitting)
Variable Selection:

Data Manipulation/Preparation:
• Converted all data to yearly averages
• Normalized & One Hot Encoded
Assumptions:
• 2021 Data is reflective of entire fleet history
• Model Variable Importance is reflective of mental model for team in decision making process

Results
Mean Absolute Error: 0.42 MPG
Accuracy (MAPE): 92.9%

Asset Depreciation (Age & Mileage):
The average MPG as vehicles age does not indicate a clear age for retiring vehicles based on MPG efficiency alone. The same was found with make/model as vehicles age.

Discussion
Based on the above plots, tandem axle tractors experience a larger impact due to the climatic conditions than single axle tractors. Therefore, allocating mostly single axle tractors to northern regions during the winter could lead to reductions in cost and emissions.

Future Endeavors:
• Food Fleet Data
• More years of Data

Asset Specifications:
Winter Average Asset MPG per Region

Discussion Cont.
When comparing mileage and efficiency, the data shows a consistent downward trend over the first 5 mileage ranges, which alludes to the trend that a truck’s efficiency decreases with continued use. After the fifth range, we start to see that efficiency trend upward again, we think this may be due to shifting older assets towards easier routes, which helps maintain efficiency goals later in an asset’s useful life.

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