

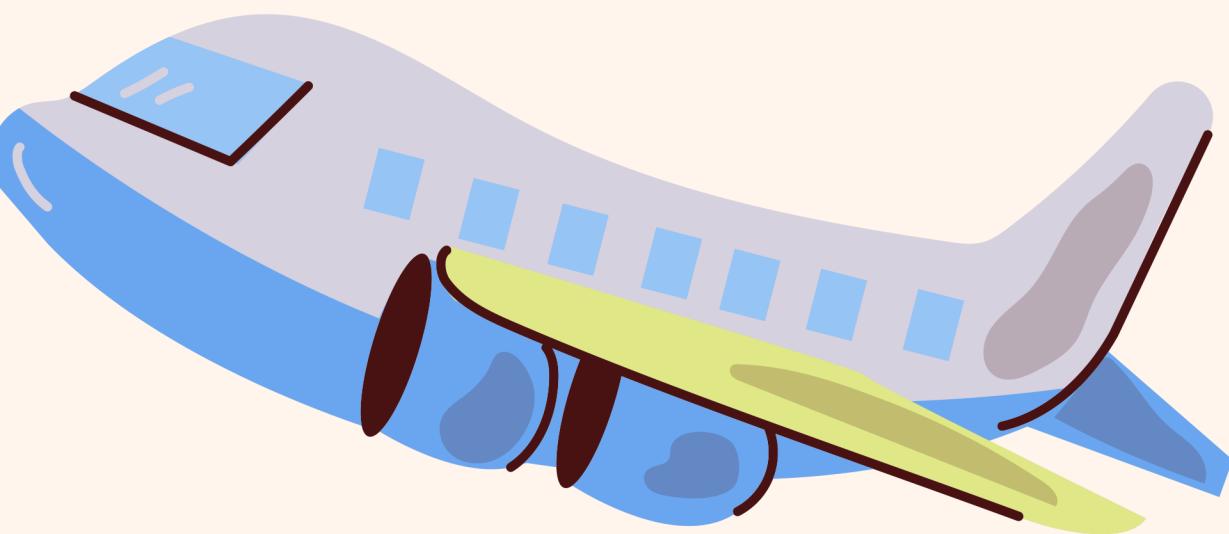
FLIGHT FARES & OIL PRICE DYNAMICS

TURBULENCE IN

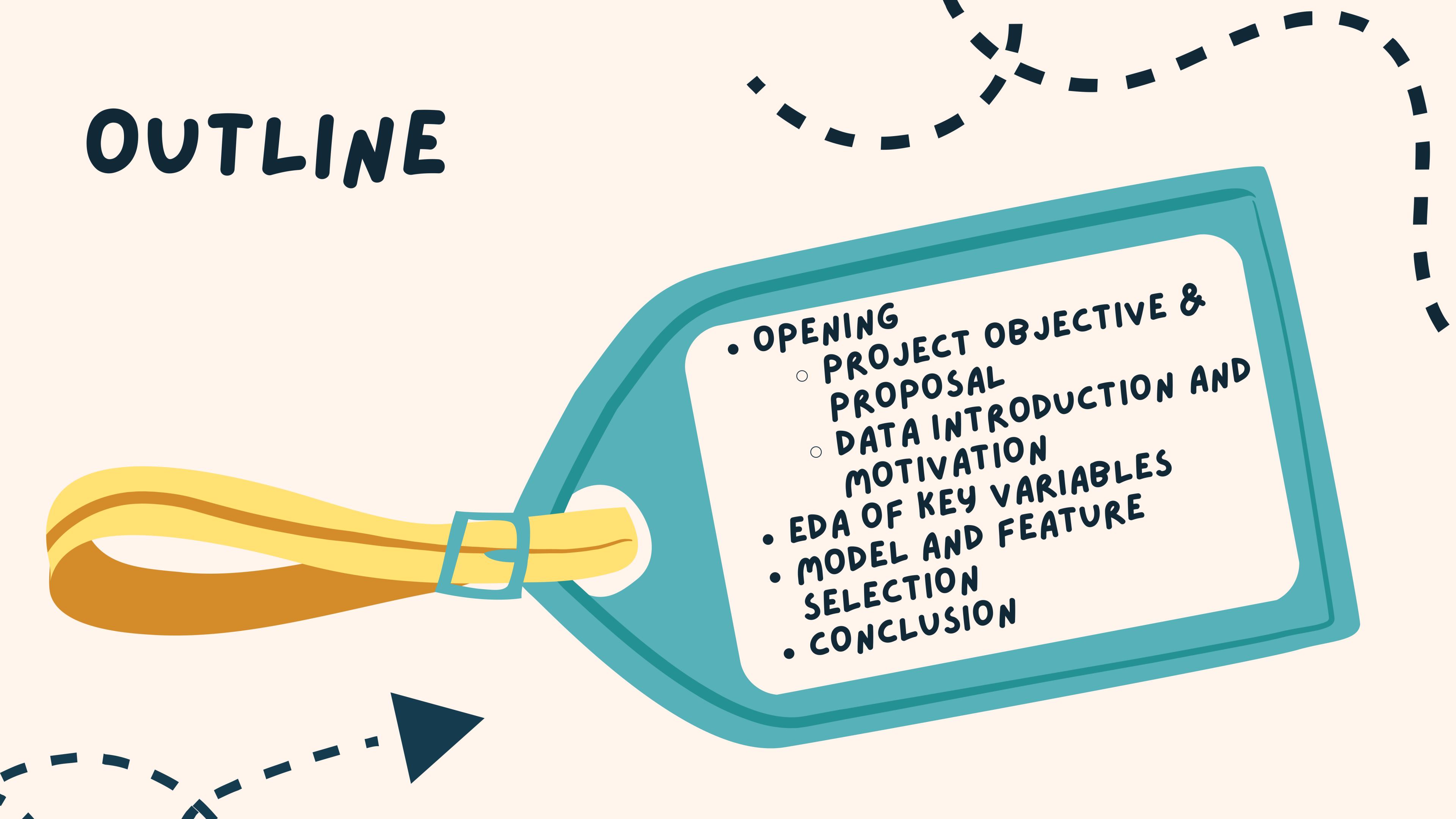
B8 Team Project

TEAM INTRODUCTION

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- Yiwen Fan
- Yicheng Jiang
- Che Wang
- Xizhi Wang



OUTLINE

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- OPENING PROJECT OBJECTIVE & PROPOSAL
 - DATA INTRODUCTION AND MOTIVATION
 - EDA OF KEY VARIABLES
 - MODEL AND FEATURE SELECTION
 - CONCLUSION

PROJECT PROPOSAL

What factors impact Flight Price?

- Flight Duration?
- Seats remaining?
- Seasonality (month or day of week)
- Oil Price?

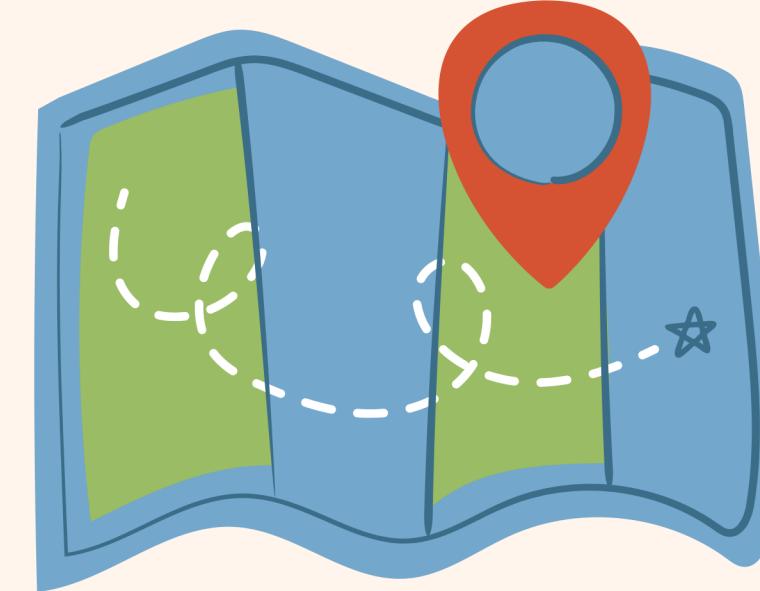


DATA INTRODUCTION



1.

One way flight ticket prices
between April 2022 and October
2022 from Expedia.com

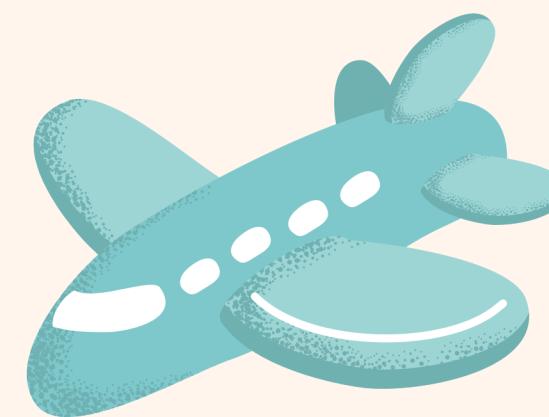


2.

Daily Oil Prices from the last ten
years for West Texas
Intermediate Crude Oil

- Sample Columns:
- Starting Airport
 - Ending Airport
 - Travel Duration
 - Seats Remaining
 - Total Fare

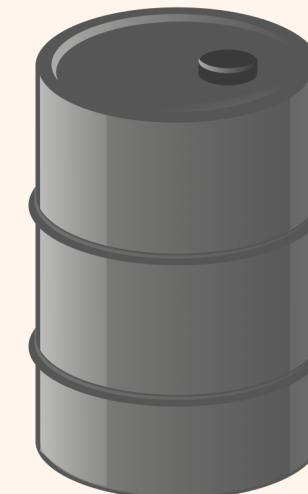
DATA MOTIVATION



Airline Perspective

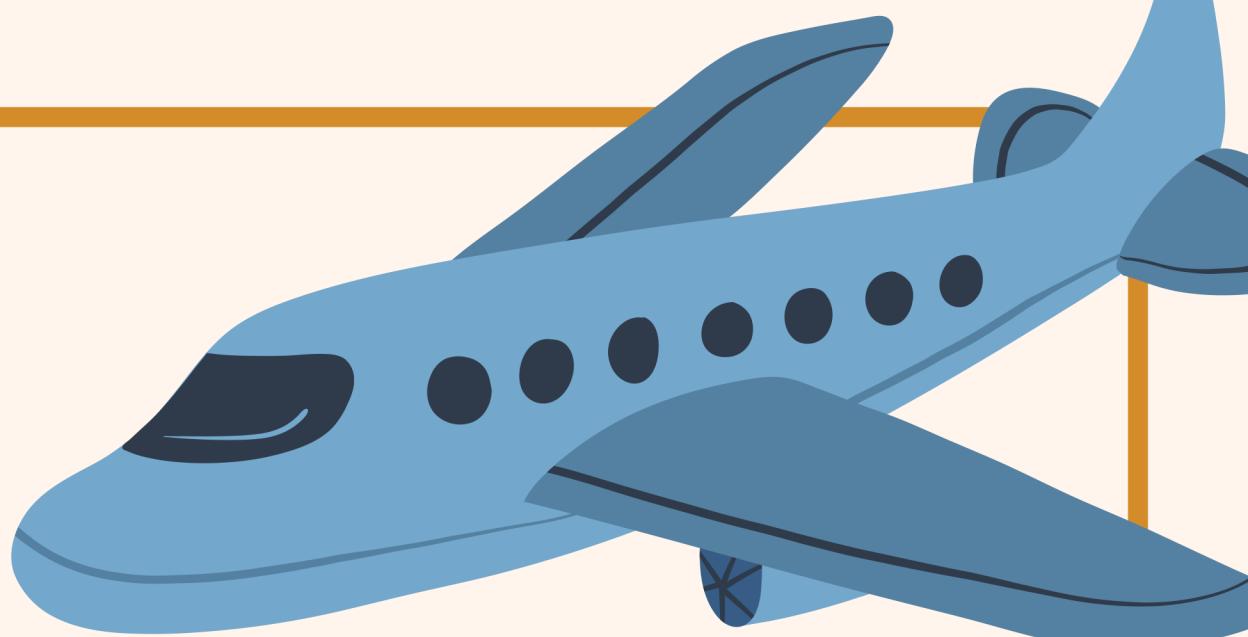
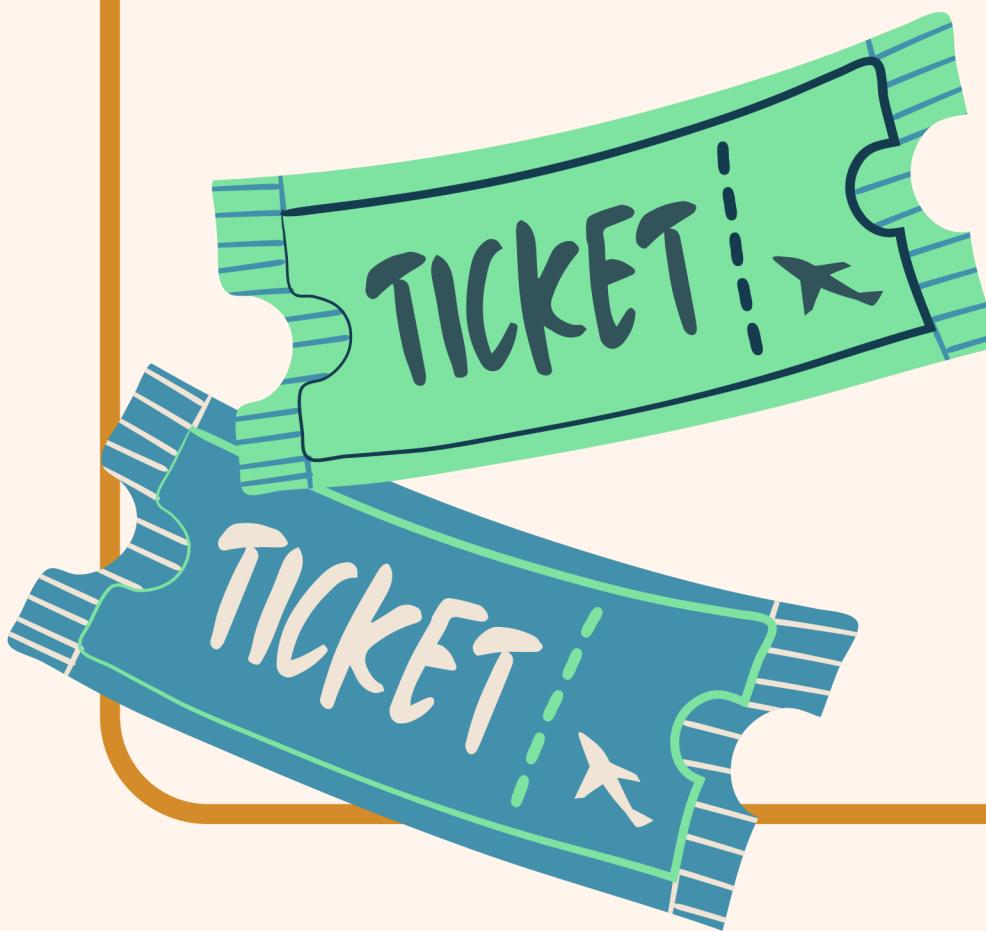


Customer Perspective

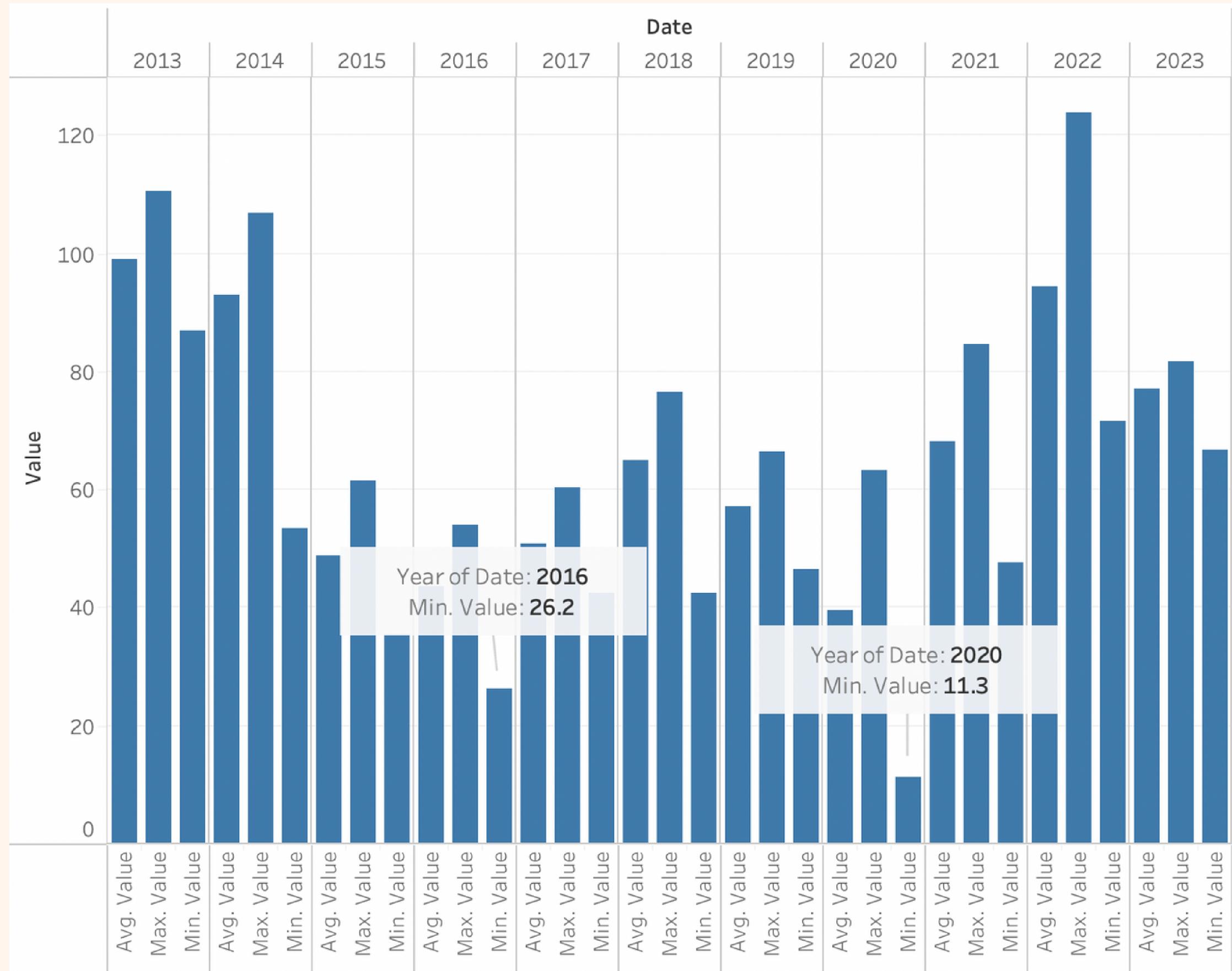


Oil Company Perspective

EXPLORATORY DATA ANALYSIS OF KEY VARIABLES



CRUDE OIL PRICE HISTORY



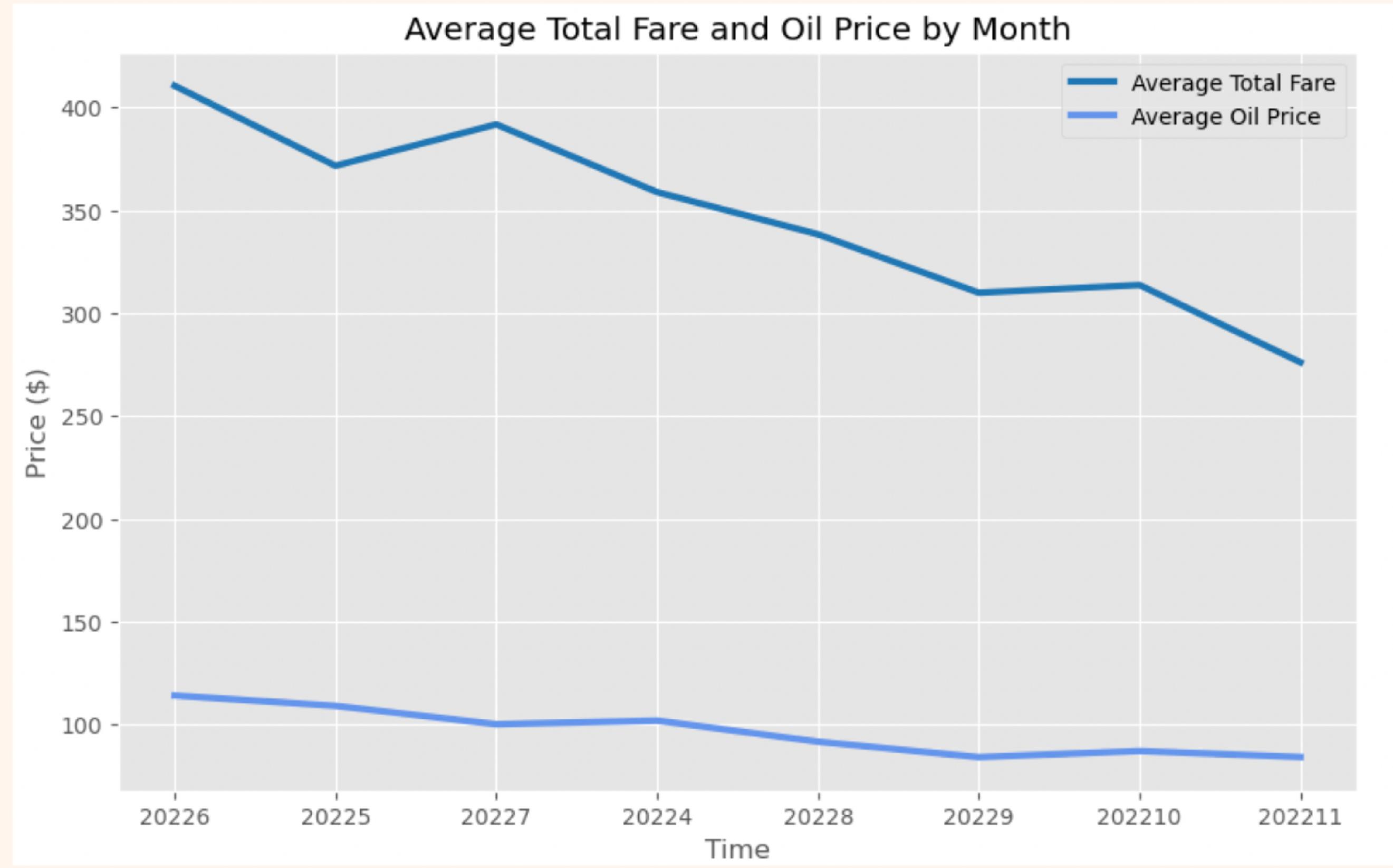
"The initial drop in oil prices from mid-2014 to early 2015 was primarily driven by supply factors, including booming U.S. oil production, receding geopolitical concerns, and shifting OPEC policies."

- by Word Bank

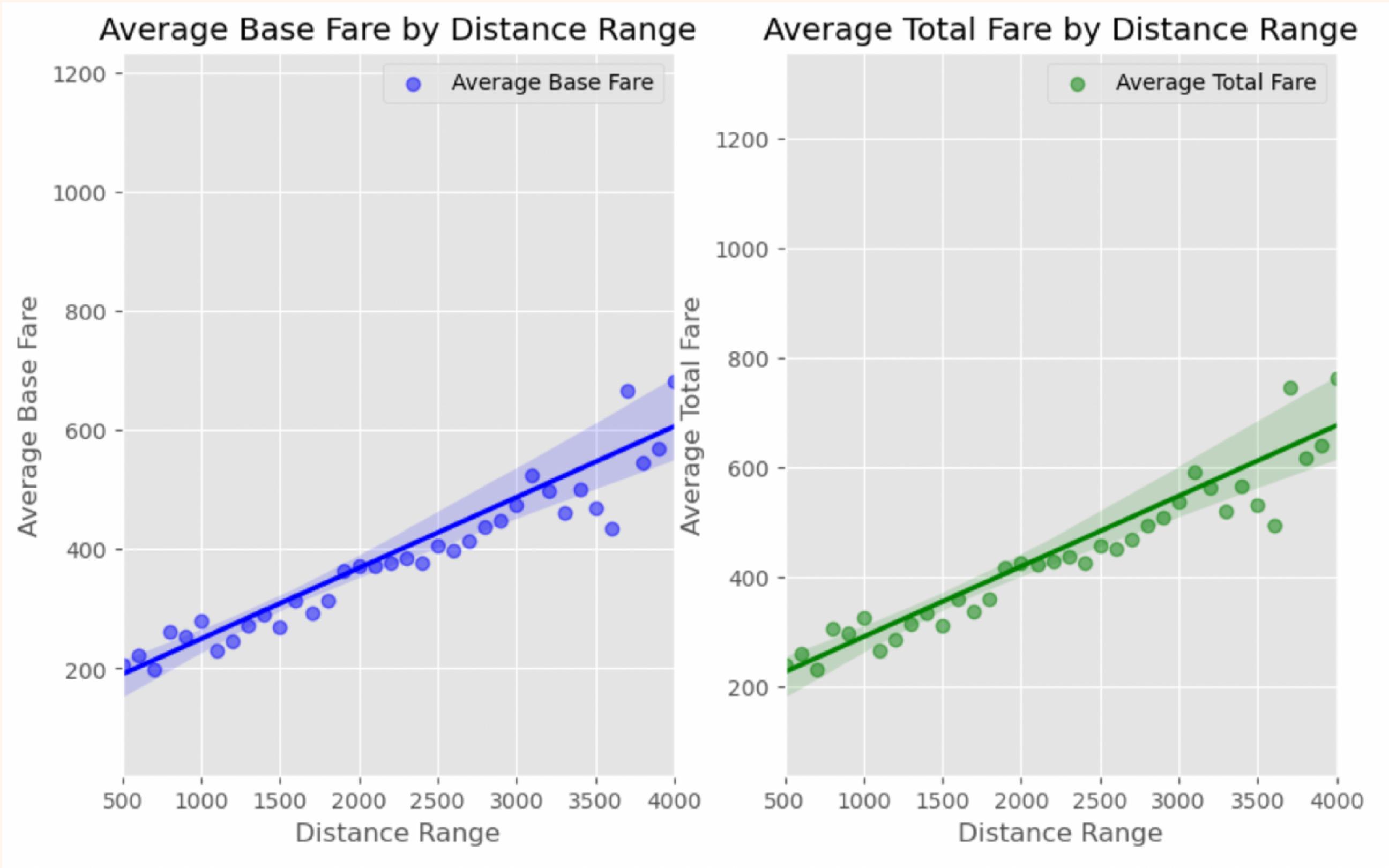
"Higher production from shale has also reduced the global price of oil by 10 percent as of 2019."

- by National archives

AIRLINE TICKET PRICES CORRELATED WITH OIL PRICES



TRAVEL DISTANCE OF FLIGHT.

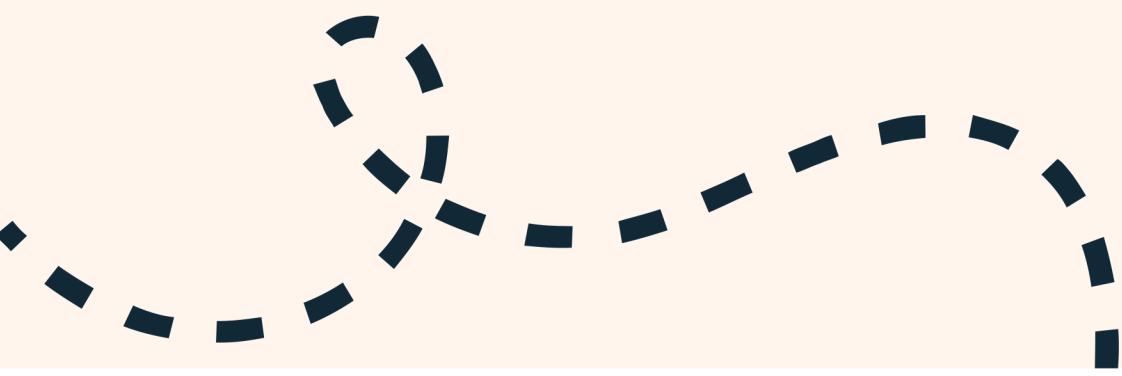


A positive correlation
between flight distance
and fares

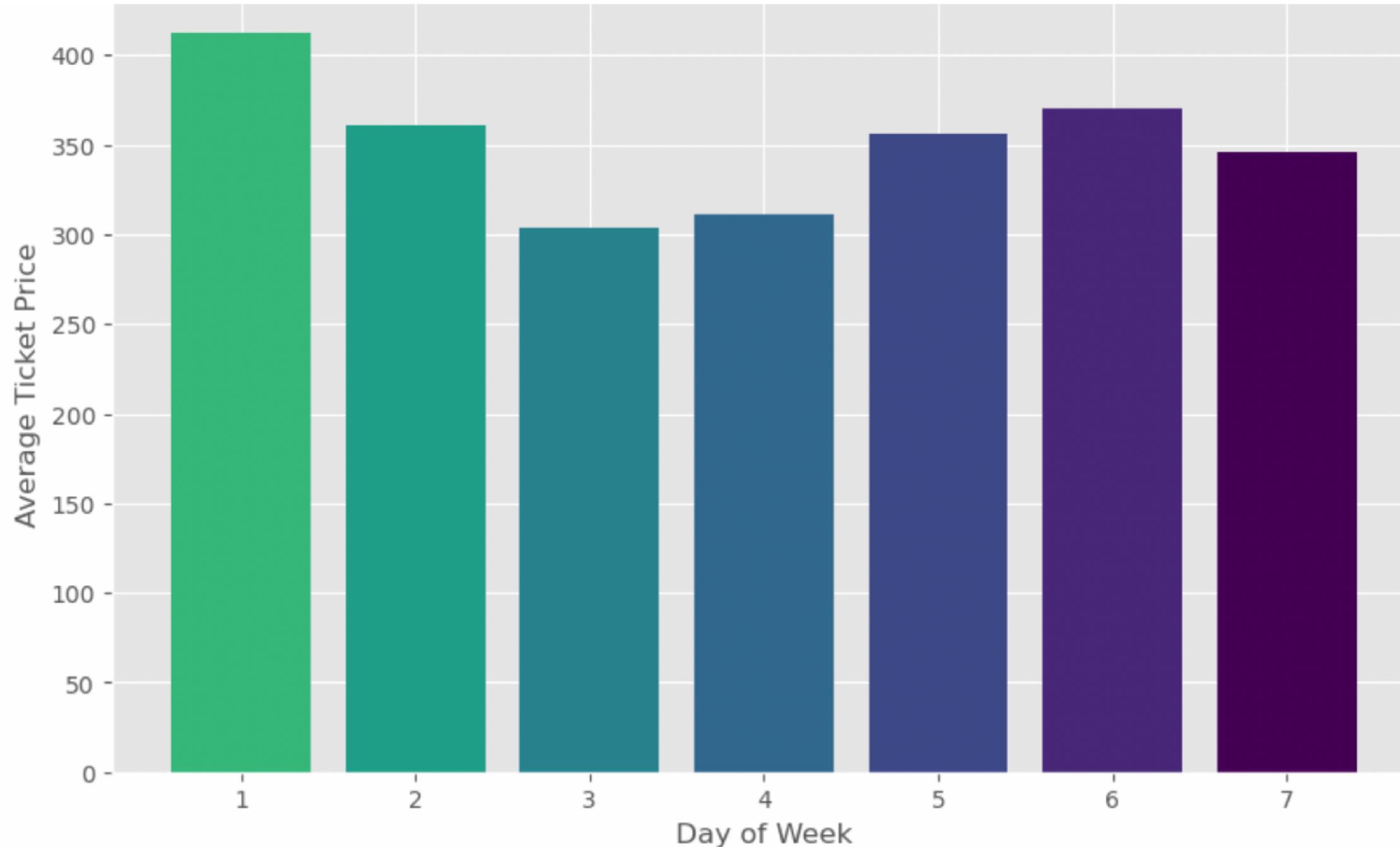
POSSIBLE REASONS

- Increased fuel costs associated with longer flights
- Higher demand for longer flights

FLIGHT DATE



Ticket Price by the Day of Week



Note: 1=Sunday, 2=Monday, 3=Tuesday, 4=Wednesday, 5=Thursday, 6=Friday, 7=Saturday

Weekday flights are cheaper than weekend flights.

Sunday flights are typically the most expensive.

POSSIBLE REASONS

- People prefer to return home on Sunday after a weekend trip
- Sunday flights may be more convenient for some travelers who want to maximize their weekend time

MACHINE LEARNING CAN WE PREDICT THE TICKETS PRICE?



FEATURE ENGINEERING & FEATURE SELECTION



NUMERICAL	CATEGORICAL	BOOLEAN
travelDurationMin	startingAirport	isBasicEconomy
seatsRemaining	destinationAirport	isNonStop
totalTravelDistance	flightMonth	
oilPriceAvg	flightDayOfWeek	
diffDays		

MACHINE LEARNING MODELS

LINEAR REGRESSION

Models the relationship between the independent variables and the dependent variable

RIDGE REGRESSION

Analyzes data that may contain multicollinearity using L2 regularization

LASSO REGRESSION

Uses a shrinkage method wherein it shrinks the data values towards a central point as in the mean

RANDOM FOREST REGRESSOR

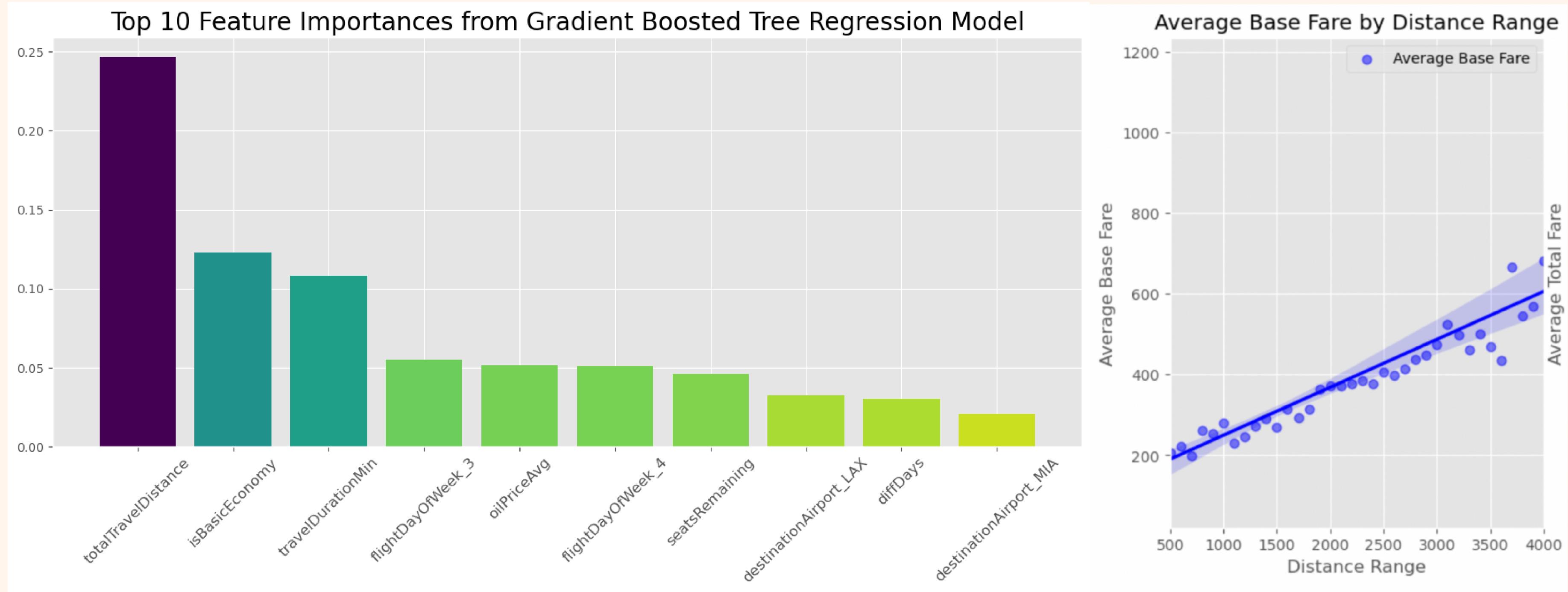
Fits multiple decision trees on several sub-samples and control over-fitting in the models

BEST MODEL: GRADIENT BOOSTED TREE

Combine multiple decision trees to make more accurate predictions



FEATURE IMPORTANCE



CONCLUSIONS



POTENTIAL USAGES OF MODEL



Price Alerts



Identifying Trends



Competitive Analysis



Price Negotiation



Budget Planning



Seat Management



Route Optimization



Oil Cost Management

LIMITATIONS

External Factors

Such as geopolitical events, natural disasters, and changes in airline regulations or policies.

Dynamic Market Conditions

The model may need to be frequently updated and retrained to maintain its accuracy and relevance.





CHALLENGES

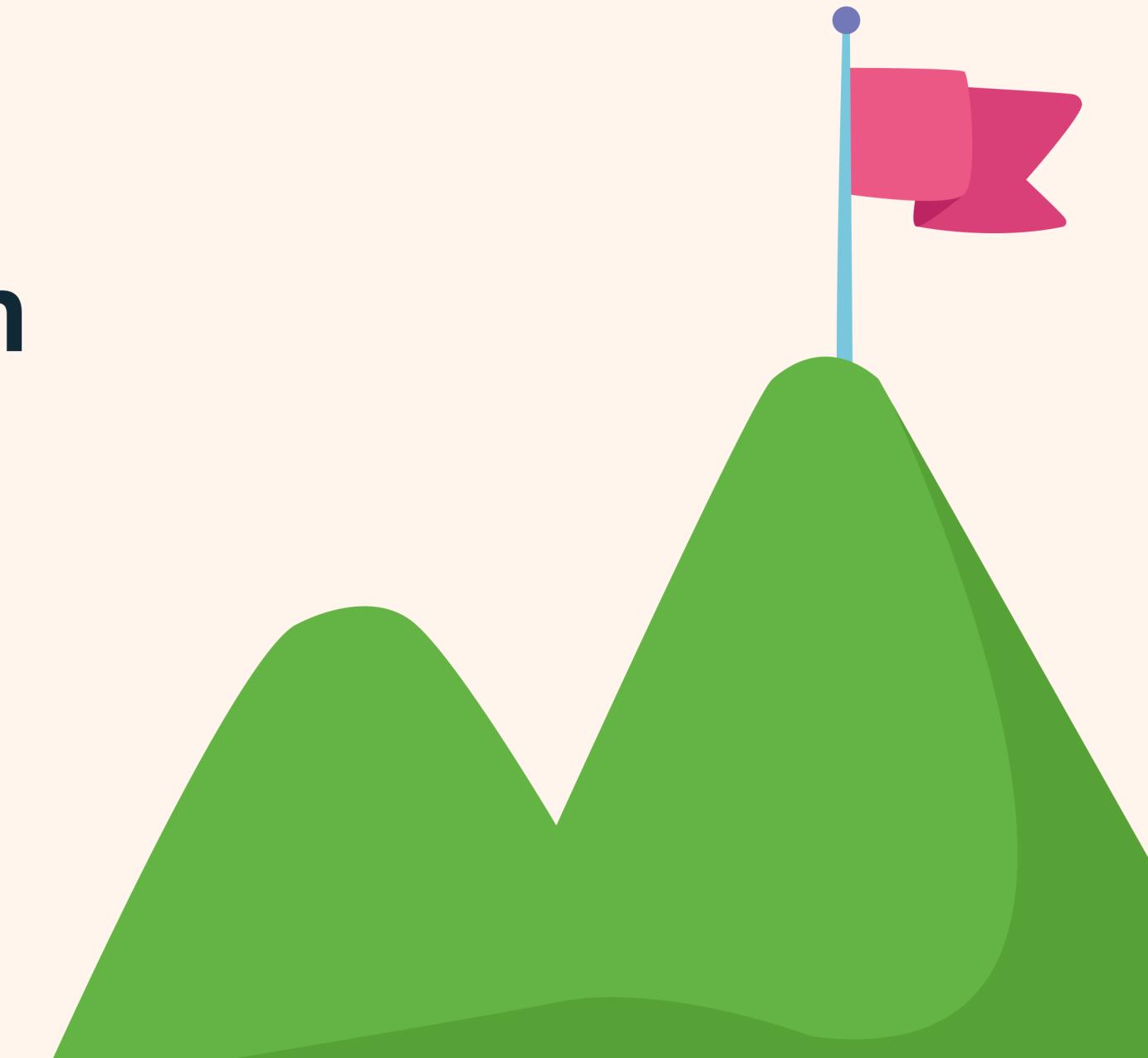
Large data size

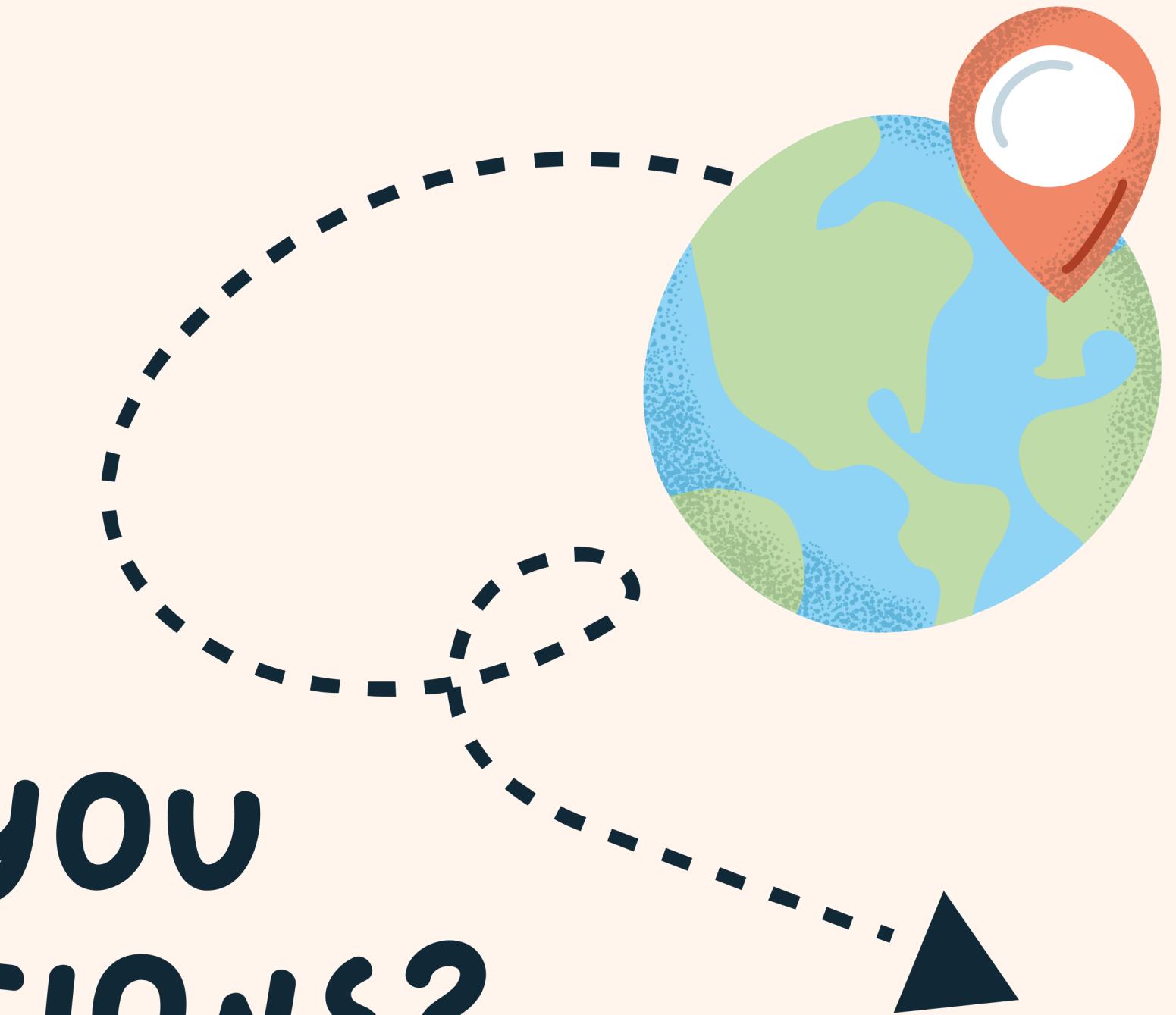
30 GB

Memory issues during visualization

Parsing travel duration strings

Professional jargon: ISO 8601
such as: PT2H30M, P1DT10H40M





**THANK YOU
ANY QUESTIONS?**

REFERENCE

- European Interest in Libyan Oil (<https://channel16.dryadglobal.com/european-interest-in-libyan-oil>)
- The Impact of the COVID-19 Pandemic on Food Price Indexes and Data Collection (<https://www.bls.gov/opub/mlr/2020/article/the-impact-of-the-covid-19-pandemic-on-food-price-indexes-and-data-collection.htm#:~:text=After%20the%20onset%20of%20the,a%20plunge%20in%20oil%20prices>)
- How Airlines handle Oil Price volatiliy (<https://www.investopedia.com/articles/investing/081415/4-ways-airlines-hedge-against-oil.asp>)

