IDENTIFYING KEY FACTORS AND FLIGHT PRICE PREDICTION

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AGENDA

- INTRO
- DATA OVERVIEW
- EDA
- REGRESSION
- CONCLUSION

INTRO

MOTIVATION

As international students who travel a lot between our home country and US, it is crucial for us to find the best value for flight tickets during the summer vacation period

GOAL

Identify key factors of flight prices for 04/16/2022 - 10/05/2022 to generate price predictions for customers.

METHOD

Use PySpark for EDA and Regression Model on a large-scale dataset of flight prices and related variables

DATA OVERVIEW

The dataset contains purchasable flight tickets available on **Expedia** website during the period **between April 16, 2022 and October 5, 2022**. It contains **82.1 M rows and 28 columns** of information that includes details on flight dates, starting and destination airports, fares, travel duration, and other relevant information.

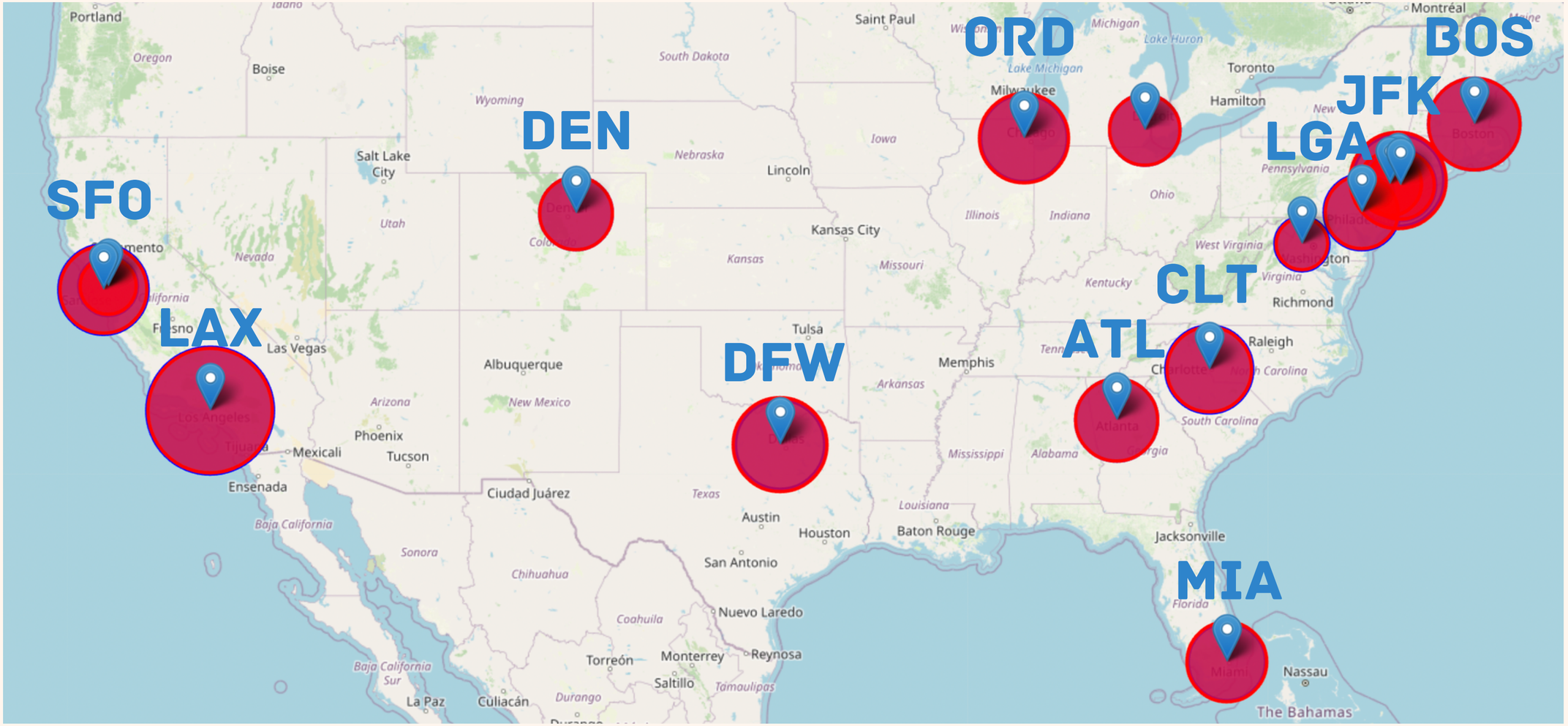
Column type	Attribution
BASIC INFO	legId, searchDate, flightDate, startingAirport, destinationAirport
FARE INFO	fareBasisCode, baseFare, totalFare, and seatsRemaining fields
FLIGHT DETAILS	travelDuration, elapsedDays, isBasicEconomy, isRefundable, isNonStop, totalTravelDistance, segmentsDepartureTimeEpochSeconds, segements

PART 1 : EDA

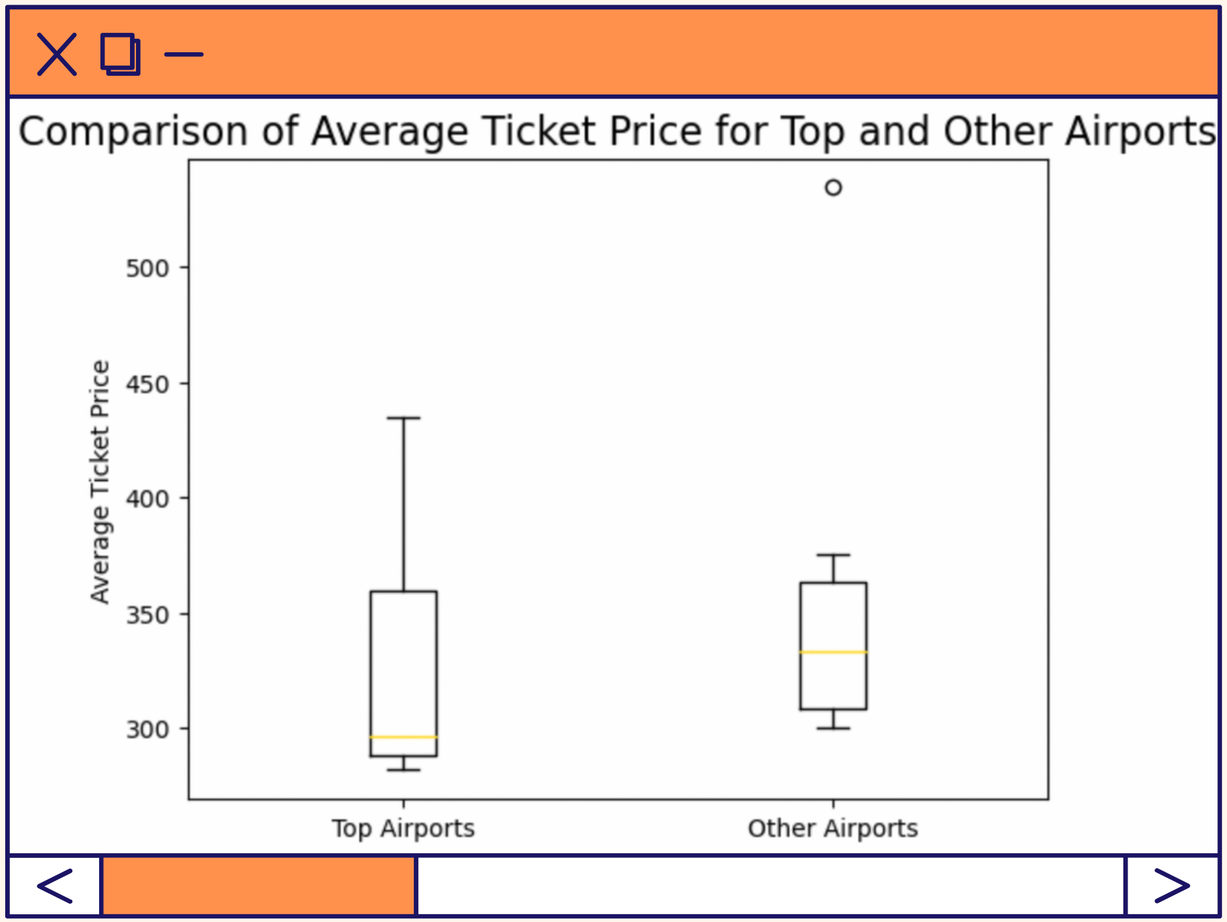

BAGGAGE TAG
WEIGHT
CHECKED PIECES
TOR
TORONTO, CANADA
FINAL DSTN.
TRANSFER
FLIGHT
FLIGHT
FLIGHT
TRANSFER
AC-87-93-27
AIR TRAVEL EXPRESS
PCS.
WT.
PRG
CZECH REPUBLIC
FLIGHT
TO
PRAGUE
78-90-42
SA
674103
SOUTHEAST AIRLINES
TO
ROM
ROME, ITALY
PCS.
FLIGHT
WGT.
ATLANTIC AIRWAYS
PCS.
WGT.
DATE
TO
BRAZIL
RIO DE JANEIRO
TRANSFER
FLIGHT NO.
A 14-72-09
ATLANTIC AIRWAYS
TO
BRAZIL
RIO DE JANEIRO
A 14-72-09
PRINTED IN HANOI
BAGGAGE TAG
VIETNAM
HANOI, VIETNAM
HAN
WGT.
PCS.
FLIGHT
DATE
94-37-46
PCS.
AIR TRAVEL EXPRESS
WT.
PRG
CZECH REPUBLIC
FLIGHT
TO
PRAGUE
78-90-42

A. TRAVEL ROUTE

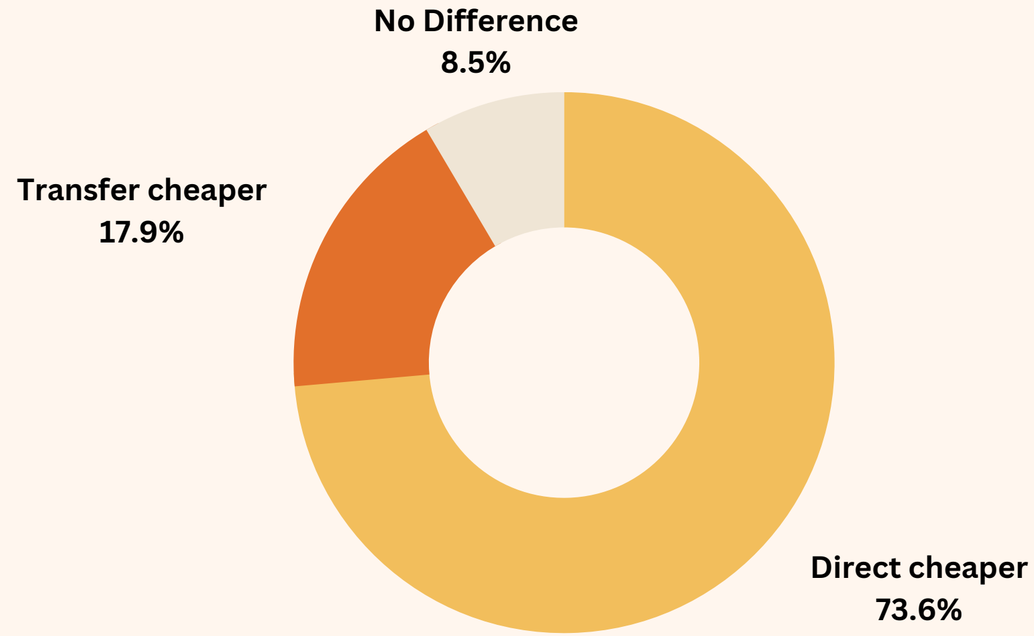
WHAT ARE SOME POPULAR AIRPORTS



POPULAR OR DIRECT = EXPENSIVE?

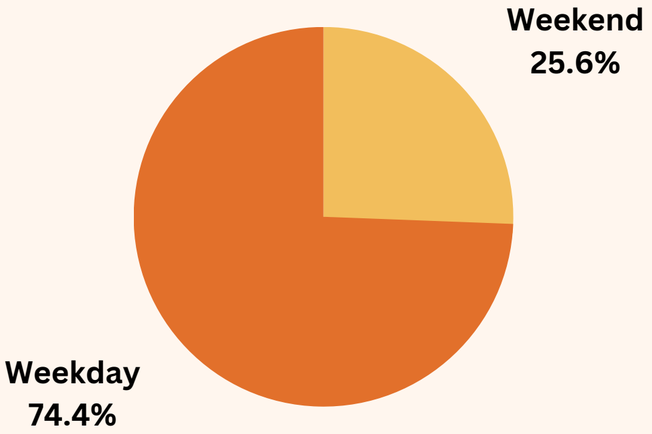


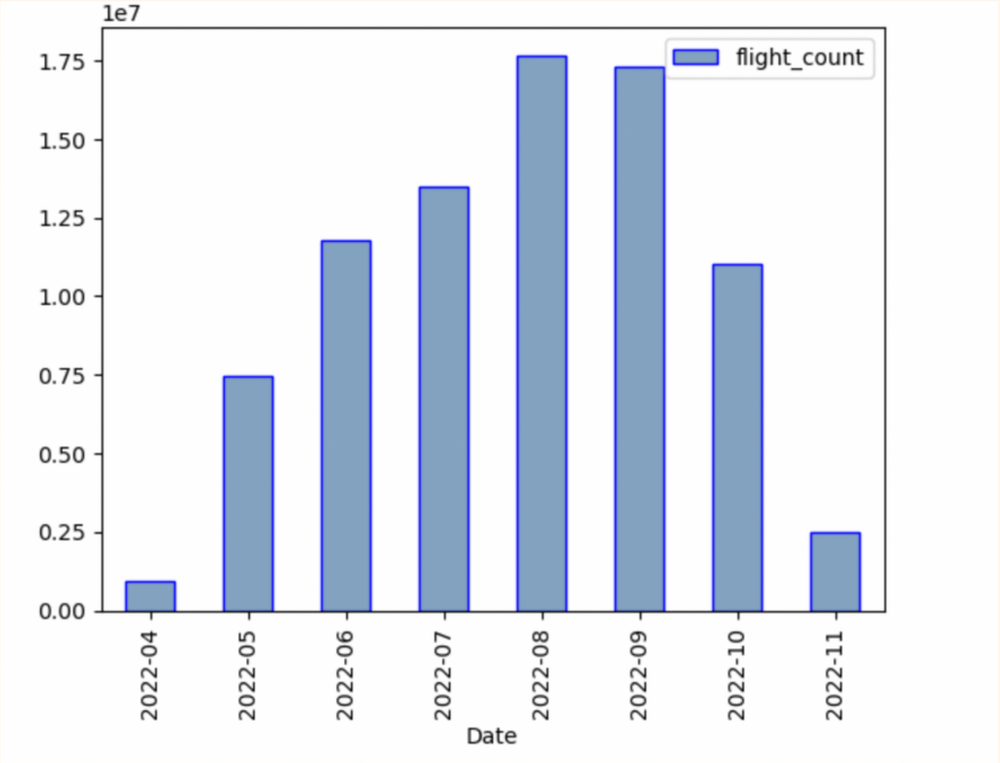
TRANSFER VS DIRECT ON SAME ROUTE

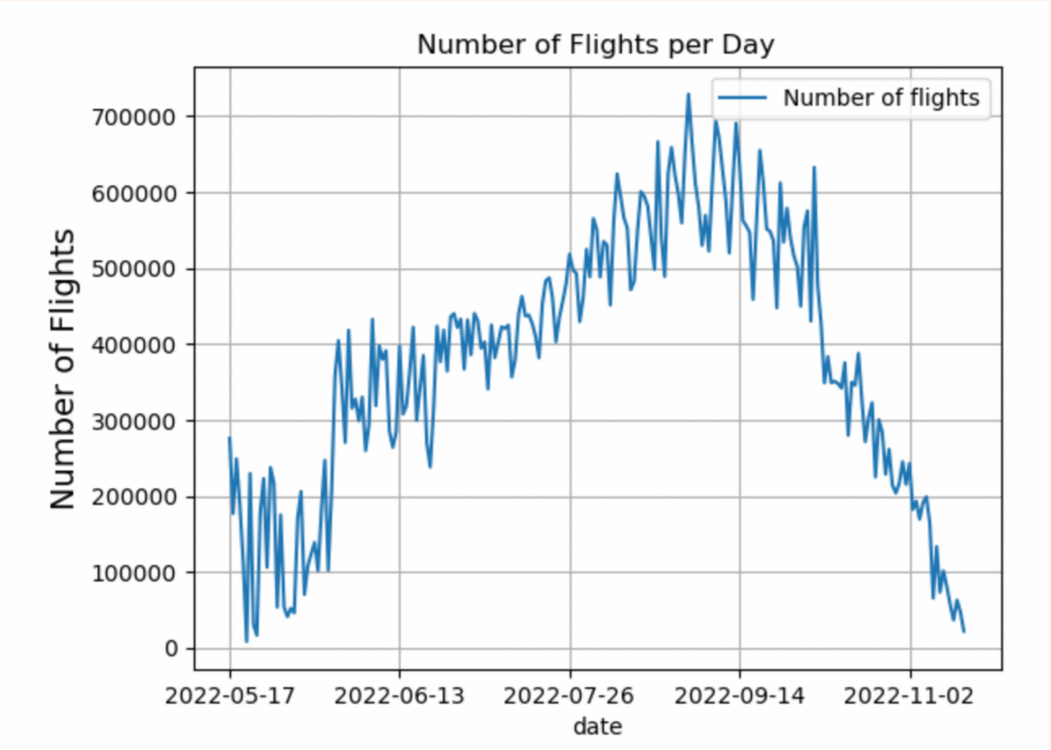


B. TIME

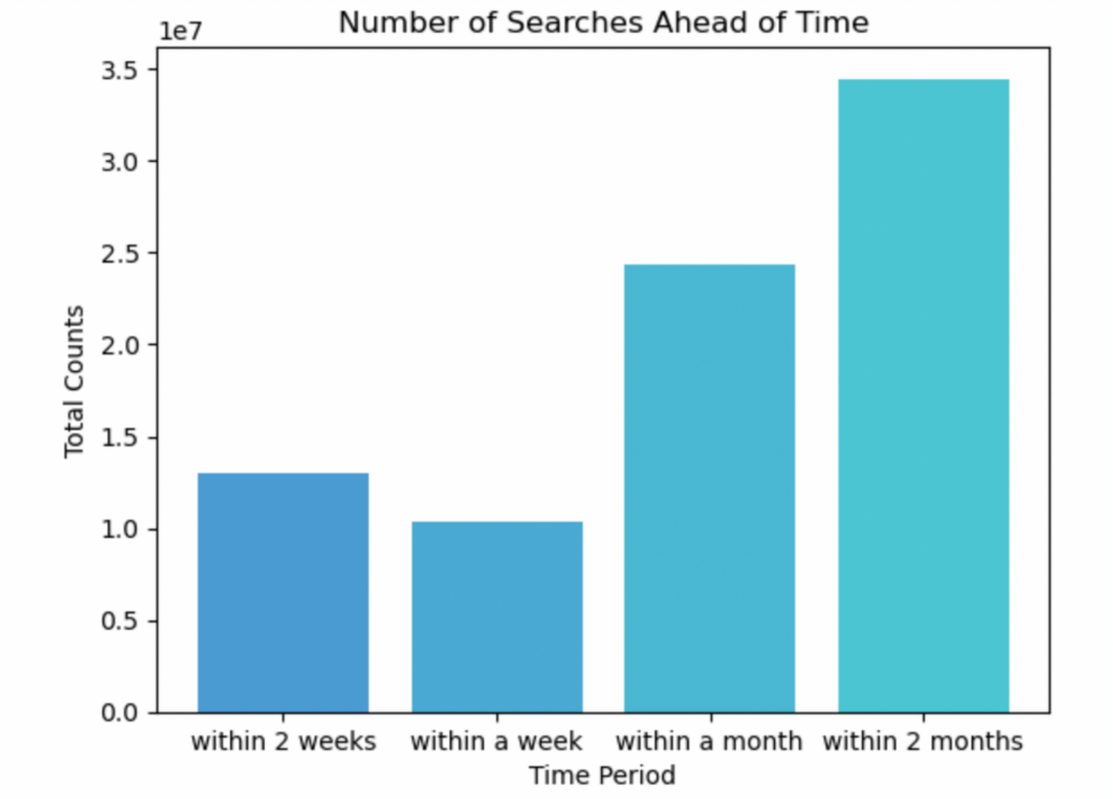
DAILY PURCHASABLE TICKETS

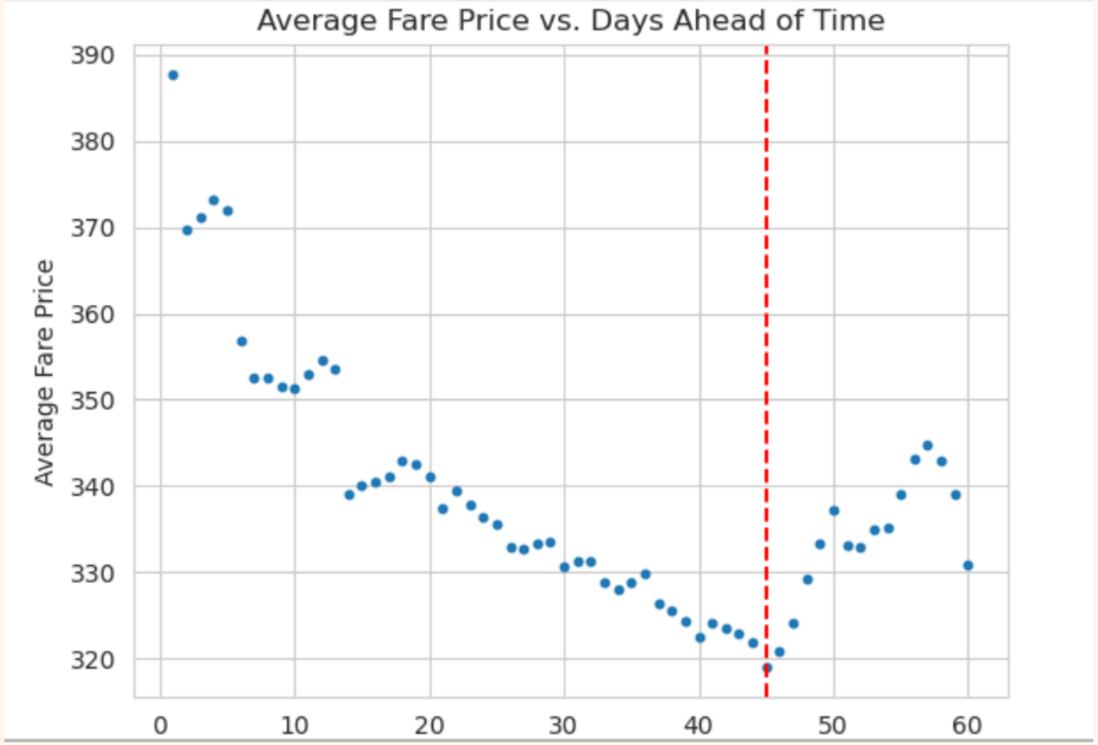






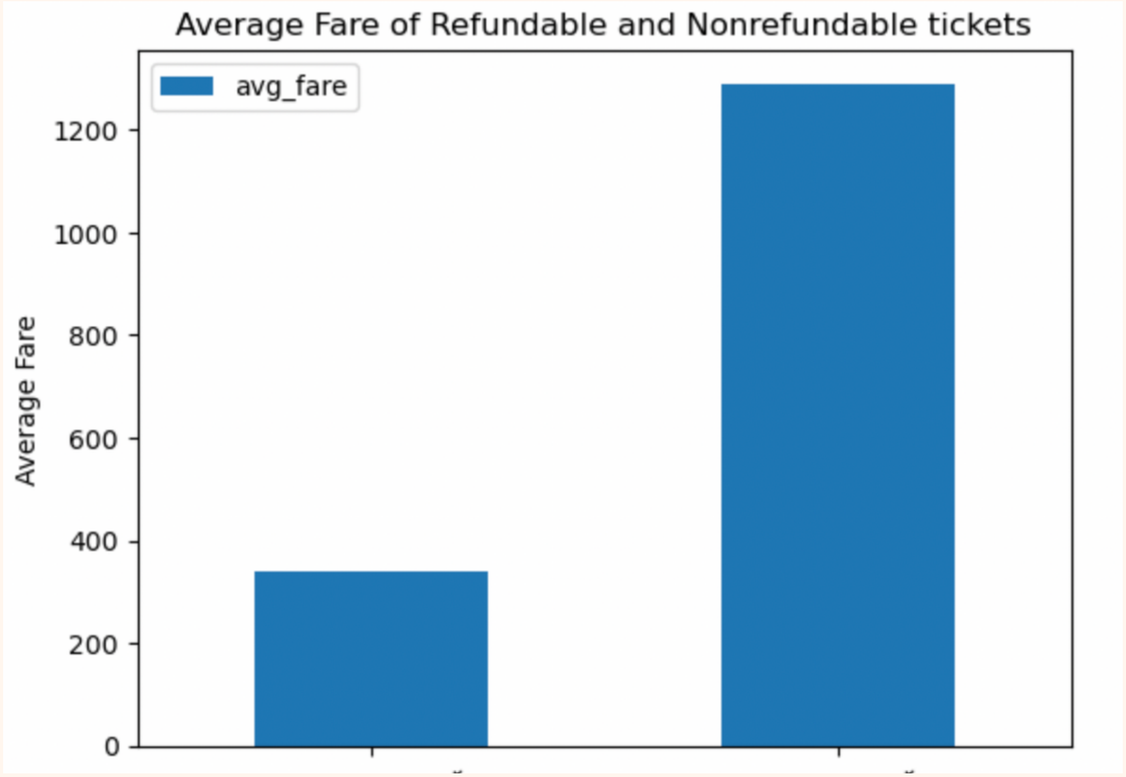
SEARCH EARLY = CHEAP?





C. SALES SITUATION

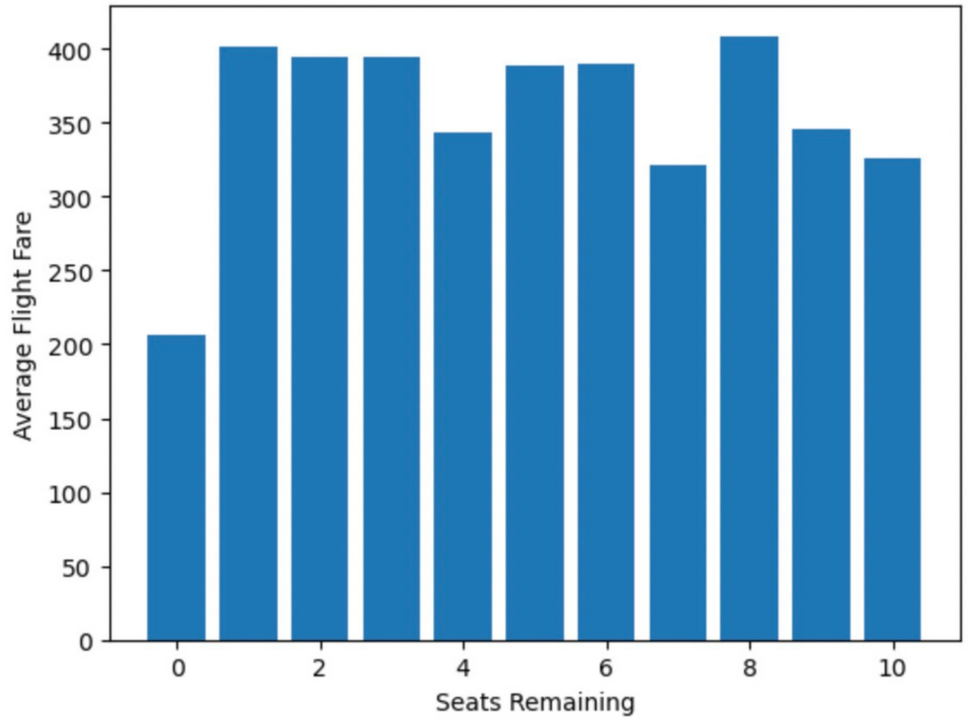
NON REFUNDABLE TICKET = CHEAP?



"A significant difference in average flight fare between refundable ticket and non-refundable ticket."

MORE EMPTY SEATS = CHEAP?

REMAINING SEATS AND CORRESPONDING AVERAGE FLIGHT FARE



OLS REGRESSION ANALYSIS

OLS Regression Results

Dep. Variable:	avg_fare	R-squared:	0.027
Model:	OLS	Adj. R-squared:	-0.081
Method:	Least Squares	F-statistic:	0.2466
Date:	Sun, 30 Apr 2023	Prob (F-statistic):	0.631
Time:	11:14:29	Log-Likelihood:	-59.762
No. Observations:	11	AIC:	123.5
Df Residuals:	9	BIC:	124.3
Df Model:	1		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	341.6940	34.528	9.896	0.000	263.586	419.802
seatsRemaining	2.8980	5.836	0.497	0.631	-10.305	16.101

Omnibus:	5.707	Durbin-Watson:	1.741
Prob(Omnibus):	0.058	Jarque-Bera (JB):	2.514
Skew:	-1.141	Prob(JB):	0.285
Kurtosis:	3.527	Cond. No.	11.3

PART 2 : REGRESSION

FEATURE ENGINEER

- Date difference : Search Date -Flight Date
- Flight duration : Deal with transfer flight
- Drop null value

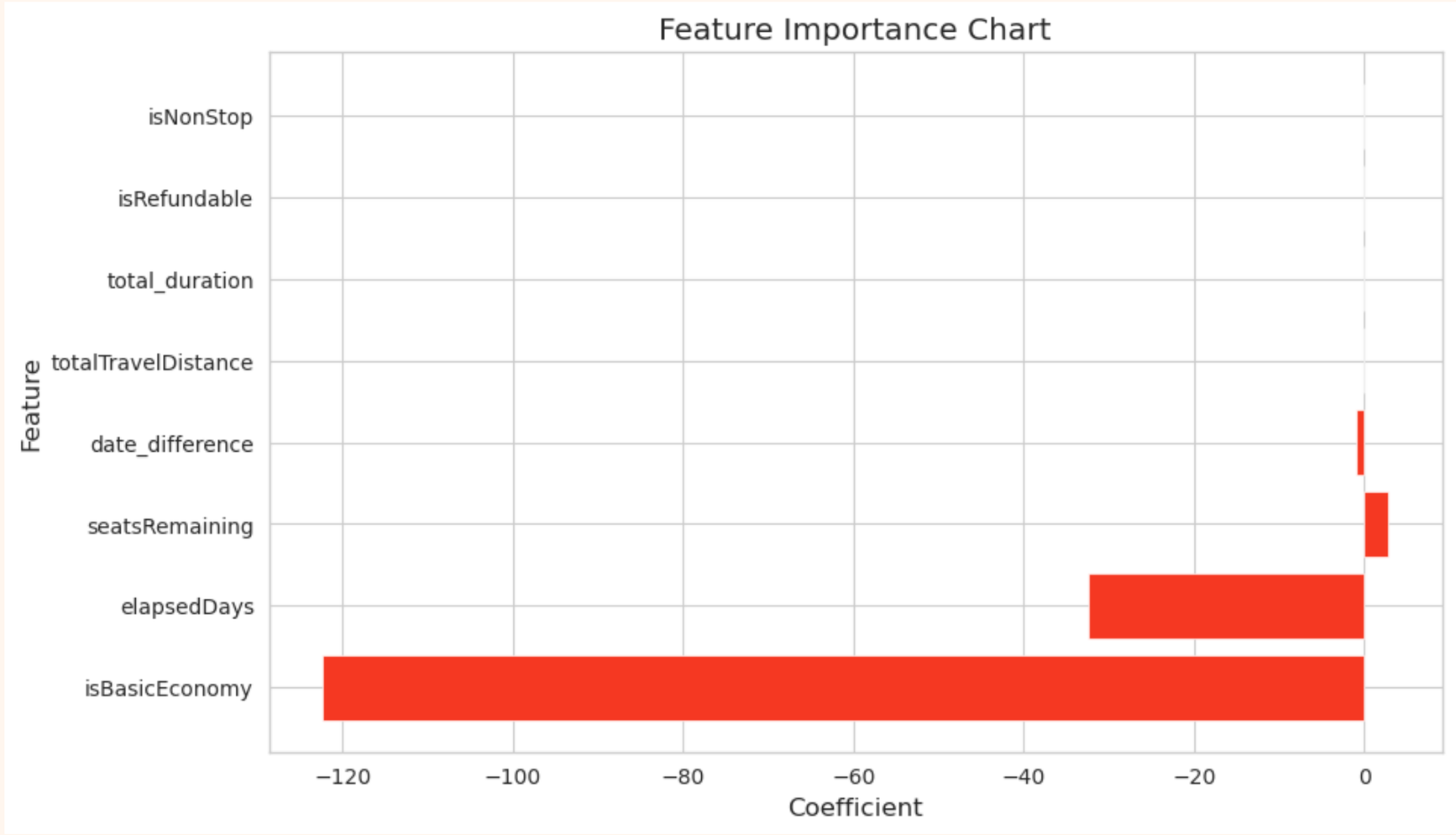
TRANSFORMER

RFormula (formula="totalFare ~ . ",
featuresCol="**features**", labelCol="**totalFare**")

MODEL FITTING

Linear Regression: R-squared value: 0.5358
MAE: 72.1836
Random Forest : R-squared value: 0.5055
MAE: 77.5210
RF has higher MSE, MAE, and RMSE than LR

FEATURE IMPORTANCE



CONCLUSION & SUGGESTIONS

- Impactful pricing factors:
  - Class of the ticket listing
  - Elapsed days
  - Seats remaining
  - Search & flight date difference
- Direct flight ticket is cheaper than transfer flight
- 45 days earlier
- Non-refundable
- Avoid peak time periods

Future Works:

- Expand the dataset to:
  - A whole year
  - Including international flights

THANK YOU!