Deloitte.

Flight Delay Analysis

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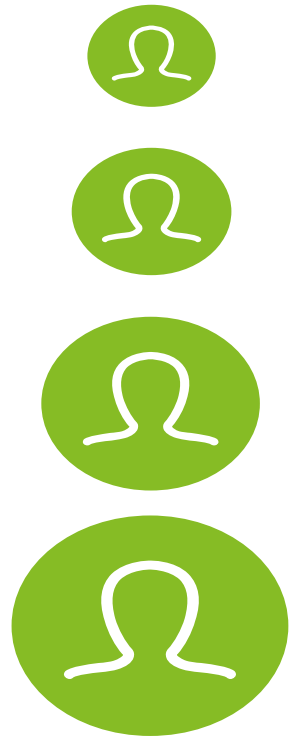
Business Problem



Increased Expense for Crew, Fuel, and Maintenance

- Delayed flights cause more expenses for relocating staff
- Fuel expenses increase due to idle time

Cost of Delays on the Industry

- Estimated cost of $8 billion per year for the industry*
- Estimated cost of $17 billion per year for passengers*

Decreased Customer Satisfaction

- Airlines depend on repeat customers and word of mouth
- Competition is fierce in the industry, airlines that experience delays frequently lose business.

Customers Do Not Like Uncertainty

- Delayed flights cause stress and anxiety for travelling, especially for those customers traveling with connecting flights

*According to 2010 study commissioned by the Federal Aviation Administration

Data Gathering

Full Dataset:

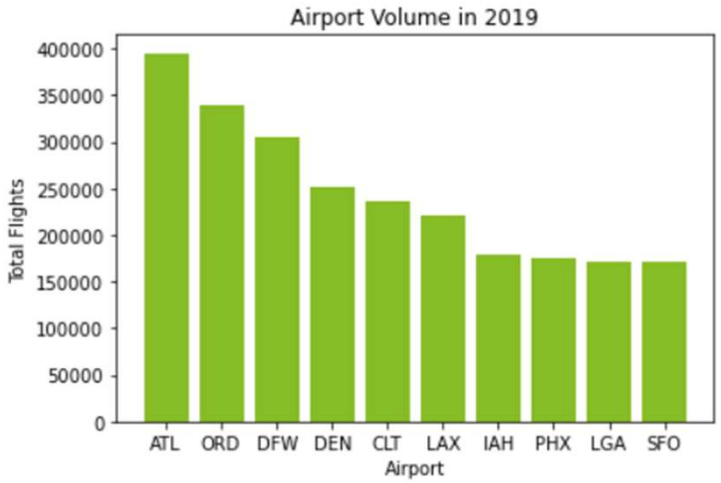
- Source: US DOT Bureau of Transportation Domestic Flight Data
- Includes Data from 2009 – 2019
- +4 million flights per year (40 million in total)

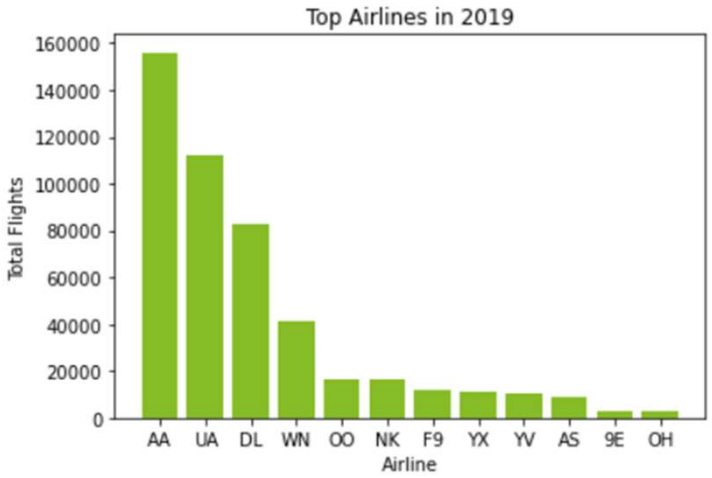
Selected Data:

- Top domestic carriers that travel nationwide
- Top 10 airports by volume
- 472,000+ data points used in analysis
- 2019 data used in analysis

Variables:

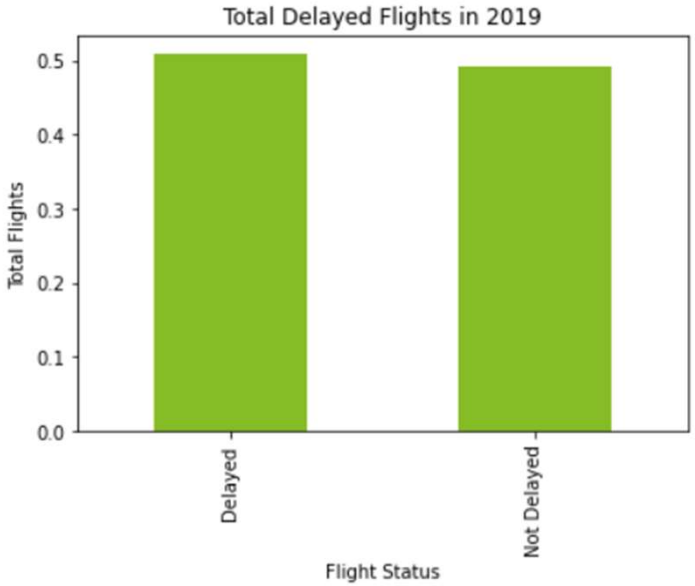
- Year
- Month
- Day of the Week
- Carrier
- Flight Number
- Departure/ Arrival times
- Origin
- Destination
- Departure time
- Time to Taxi out/in
- Wheels on/off
- Distance





Model Selection

Target Variable: Delay



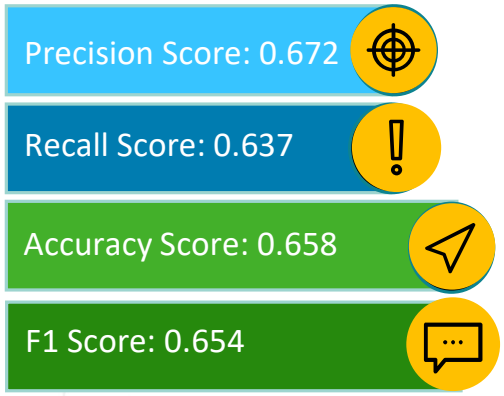
Problem: Binary Classification

	Computational Needs	Advantages
Logistic Regression	• Training time: 1.92 seconds • Prediction time: 0.01 seconds	• Less tuning needed, easier to perform on large datasets.
Random Forest	• Training time: 41.26 Seconds • Prediction time: 0.77 Seconds	• Can handle missing values. • Performs better with more explanatory variables.
XGboost	• Training Time: 17.05 Seconds • Prediction Time: 0.32 Seconds	• Less randomization than RF • More parameters than other two methods

Modeling

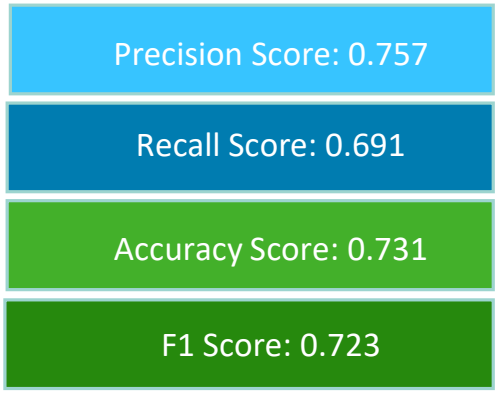
Logistic Regression

True Delays: 47,840
True Delays Predicted: 30,498



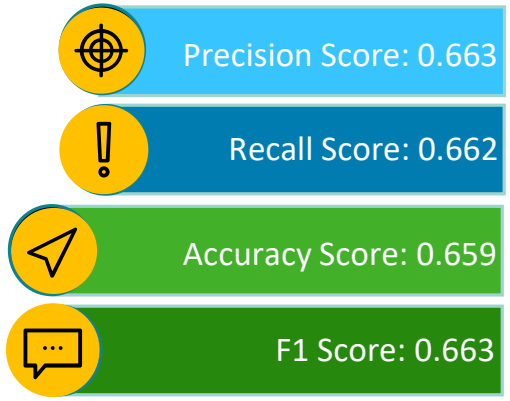
XGboost ★

True Delays: 47,840
True Delays Predicted: 33,064



Random Forest

True Delays:47,840
True Delays Predicted: 31,717



Recommendations and Way Forward