Predicting Airline Delays in the USA

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Background

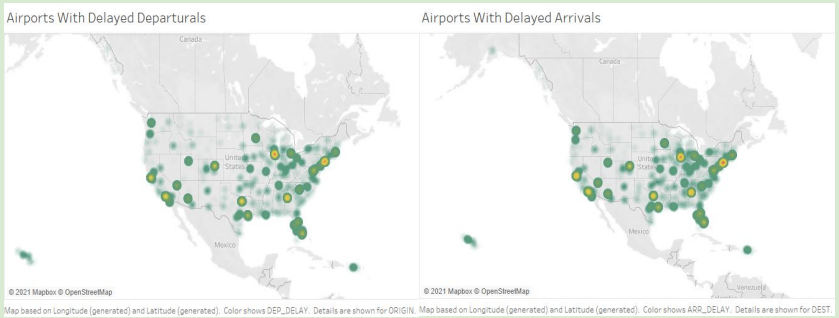
The airline industry provides air transportation for passengers and cargo by using aircraft. Delayed flights cost airlines over $23 billion in the US alone and cancellations can significantly affect customer experience and cause financial loss to the business. The total cost of delays from 2016-2019 was over US$23 billion.

Data

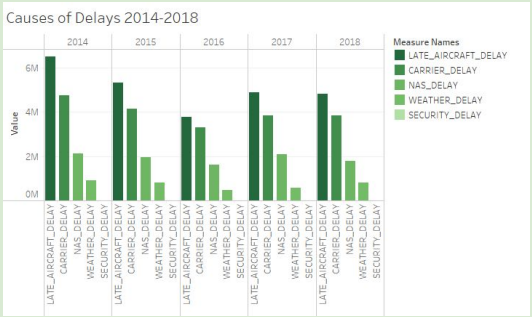
Data on flights was obtained from the Bureau on Transportation Statistics. 7 million observations with 28 columns were obtained from the raw dataset. Additional columns were created to create geopoints and incorporate data on holidays and days of the week.

Data Analysis

Data analysis was conducted using Tableau and Sql.



The geo maps above reveal a direct correlation between delayed departure and late arrival flights. From the data it was inferred that if a flight leaves the origin airport late, it would most likely arrive late to the destination airport. Very few delayed departed flights make it to the destination airport on time.



Late aircraft delays accounted for the largest source of delays with delays due to security checks and weather conditions accounting for the least number of delays. From year to year, the sources of delays have not changed.

Modeling

A neural network with 58 inputs and 480 nodes in hidden layer was used to classify flights as delayed on not delayed. The model used a binary cross-entropy loss function.

Class	Precision	Recall	F1-score
Not delayed	.96	.90	.93
Delayed	.66	.84	.74

The model suggests that a flight occuring in January was an important predictor. This suggests that airlines can do more to prevent delays in this season where bad weather and the holiday season intersect.

Summary

Our data analysis shows that delay patterns have not changed year to year. Airlines can do more to prevent delays. We introduce a neural network to predict departure delays. We recommend that airline better plan for January where bad weather and the holiday season result in more delays.