Airline Customer Satisfaction Analysis

Jana Hatch, Nebeyu Samuel, Kyle Wass, Raya Young

Key Variables

Customer Tweet Sentiment (Kaggle Data Set) (Independent Variable)

Focusing primarily on positive factors and negative issues, variables of interest include:

1. airline_sentiment
2. negativereason
3. airline
4. retweet_count
5. text

Airline Occupancy (US DOS BTS Data) (Dependent Variable)

Filtering the six airlines and date ranges by the ones mentioned in the Twitter data, we can combine datasets from MIT and JBLevins.

Data: https://www.kaggle.com/crowdflower/twitter-airline-sentiment

http://web.mit.edu/airlinedata/www/default.html

https://jblevins.org/notes/airline-data

https://www.transtats.bts.gov/DL_SelectFields.asp

Research Questions

- Does customer sentiment affect airline occupancy?
  - How do different airlines compare in customer satisfaction (occupancy)?
- What drives (or flies really) customers away from an airline?
  - How can airlines expect better loyalty?

Types of Analyses

- **Cluster analysis** - To analyze customers, we will group variable ratings to identify customer trends.

- **Regression analysis** - To analyze airlines, we will make a scoring system for Tweets, and map this to occupancy rates to make a connection.

- **Perceptual maps** - Using a quadrant system, choose values that are most popular, and rank customers on these variables. Use to rate airline value. How do customers impact airline occupancy.

AIRLINE CUSTOMER SATISFACTION ANALYSIS

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Executive Summary

- Customers turn to Twitter to vocalize complaints and issues, and the airline sector is no exception, with over 67% of investigated tweets having a negative sentiment.

- Words such as “cancelled”, “delayed”, “service”, and time words (“time”, “hours”, etc.) are common across all negative customer tweets

- Larger airline companies received a higher percentage of negative tweets, and among those tweets, had a greater percentage of customer service and flight complaints.

- Airlines with lower frequencies of customer service issues had slightly higher occupancy rates.

- Customer service should be the focus of improvement for any airline looking to improve consumer loyalty and satisfaction.

Research Objective

- Determine if trends in customer sentiment found in Tweets directed at airlines can predict customer satisfaction.

- Investigate average occupancy per airline as it relates to customer satisfaction, and see if any specific customer issues correlate to airline occupancy.

- Identify what actions airlines can take to improve customer loyalty.

Research Plan and Methodology

Using data from the U.S. Department of Transportation, filter information to match the airlines and date range from the U.S. Airline Sentiment Twitter data from Kaggle.

Apply regression analysis to determine which customer issues with airline can be used to significantly predict occupancy rates.

Apply text analysis to Tweets and determine terms with highest occurence and visualize with word clouds, and relate to airline occupancy.

Generate a perceptual map to demonstrate potential relationships between airline issues and occupancy rates.

Comparing Word Frequencies in Customer Tweets at Airlines

All Tweets

Negative Tweets

Airline Specific Word Clouds from Negative Tweets

American

JetBlue

Southwest

Airline Specific Word Clouds from Negative Tweets

United

US Airways

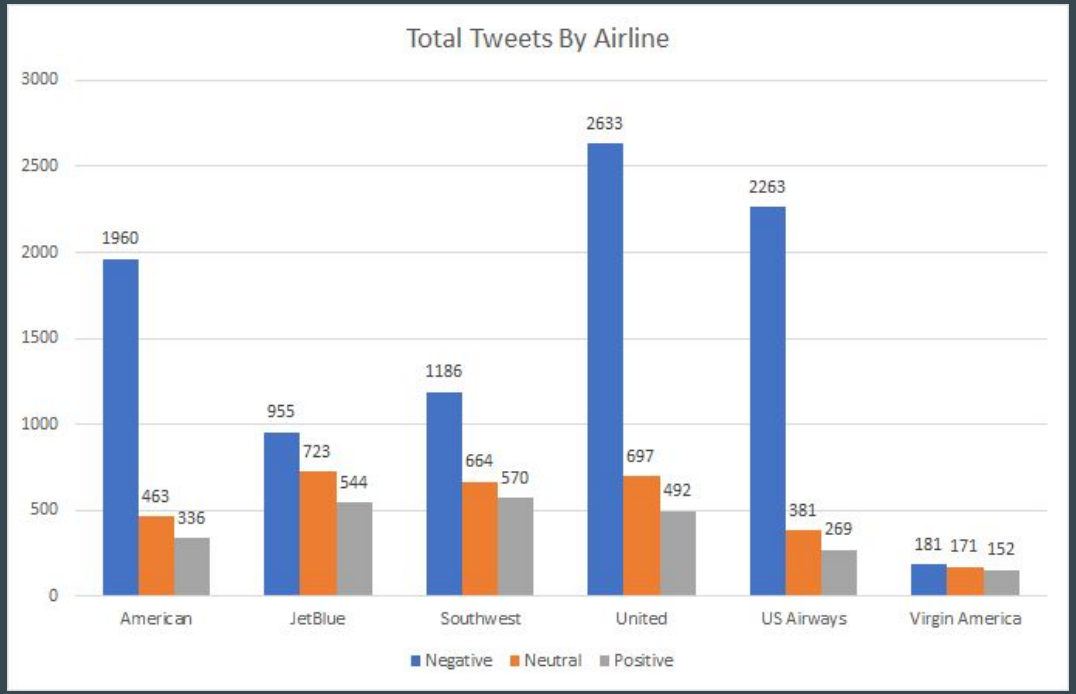
Virgin America

Counts of Words by Airline

Distribution of Tweet Sentiment By Airline

- The largest airlines had the highest volume of tweets directed at them by customers.

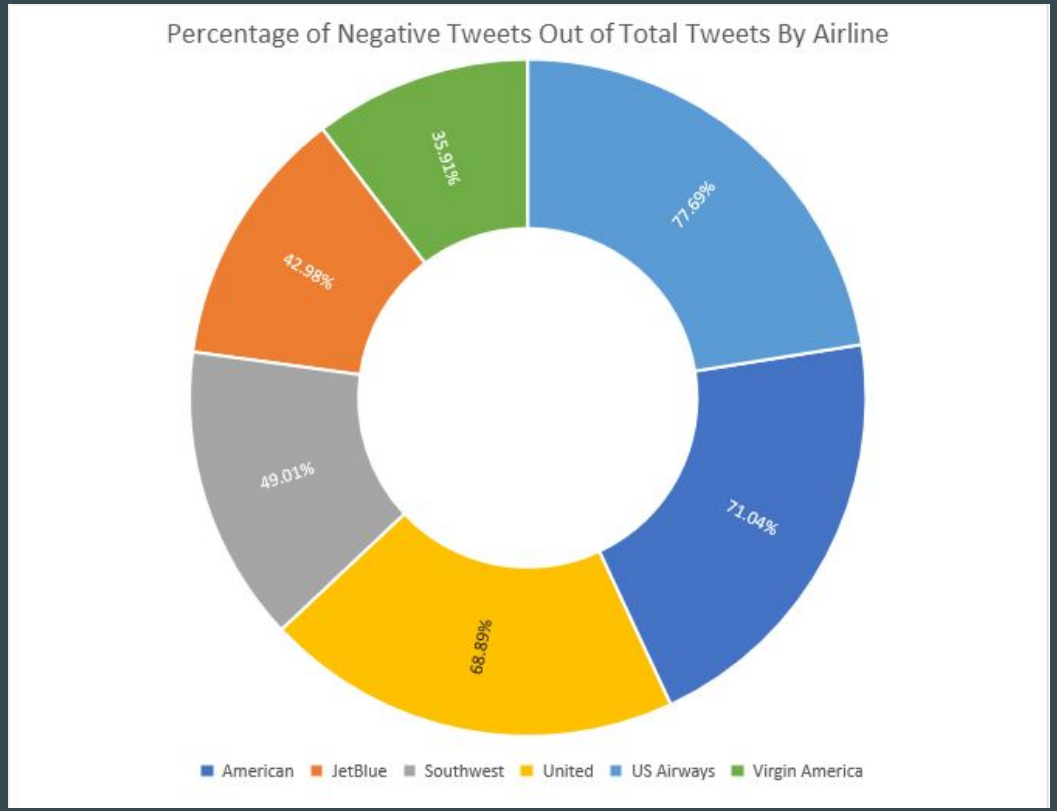
- Virgin America had a noticeably smaller volume of activity, and a more equal distribution of tweets by customer sentiment.



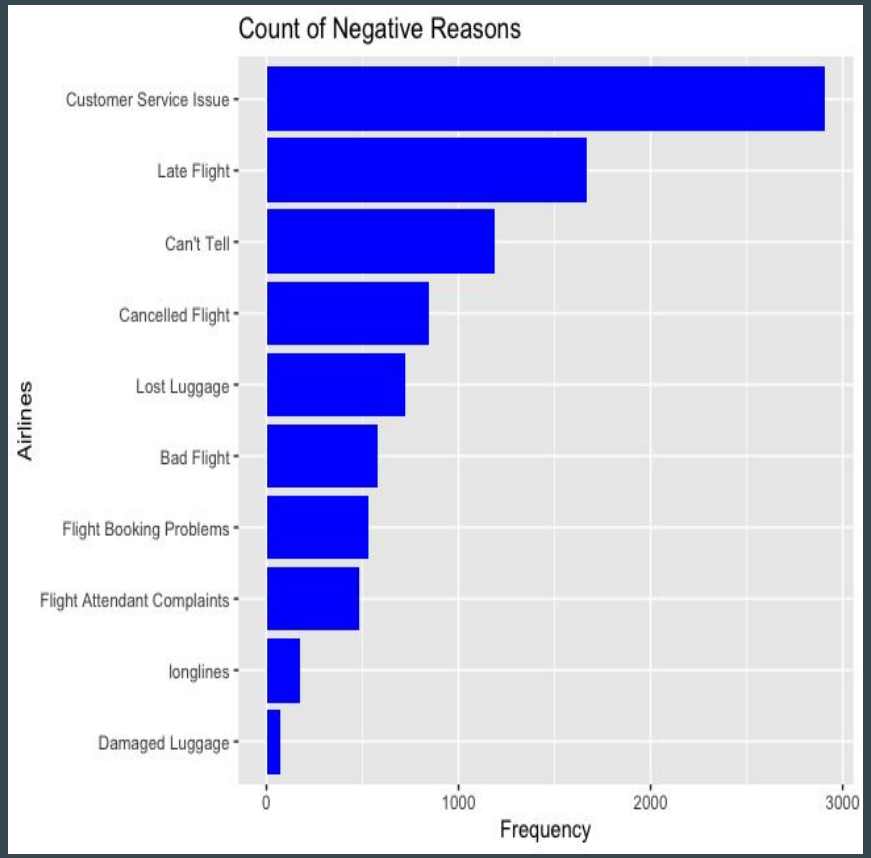
Percentage of Total Tweets That Were Negative

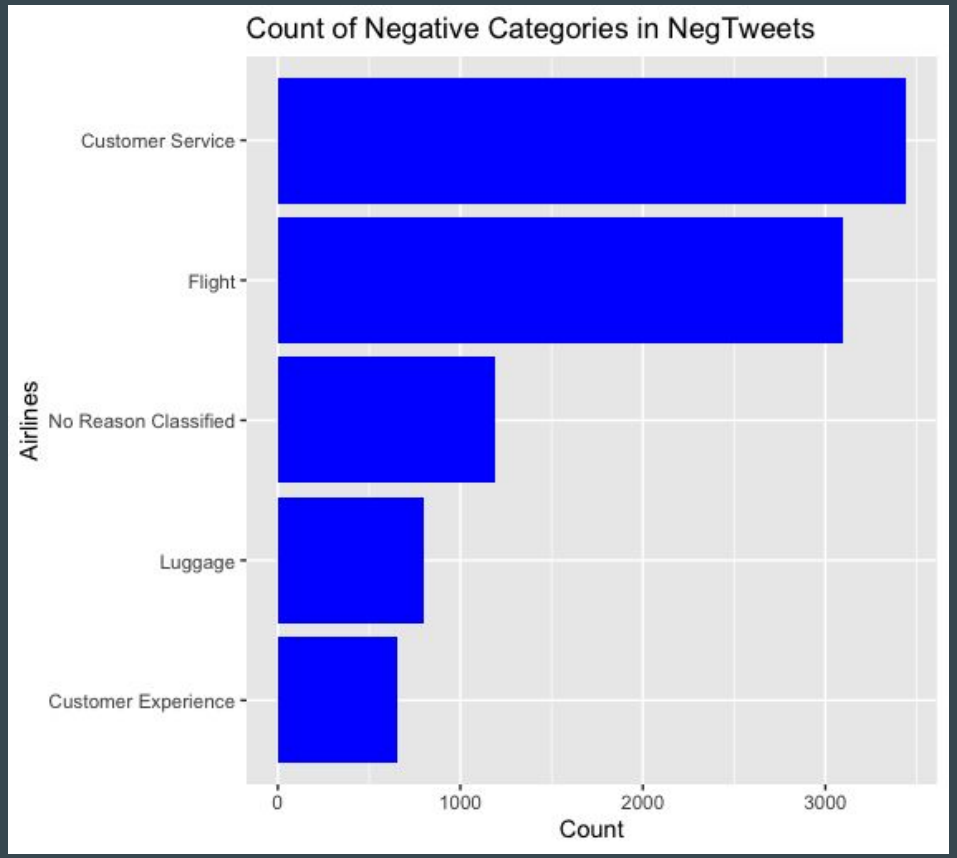
- US Airways and American had more than twice as many negative tweets than Virgin America based on the total number of tweets directed at each airline.

- JetBlue, which had a noticeably larger total volume of tweets than Virgin America, still had ~35% lower percentage of negative tweets than US Airways.



Distribution of Negative Reasons in Tweets

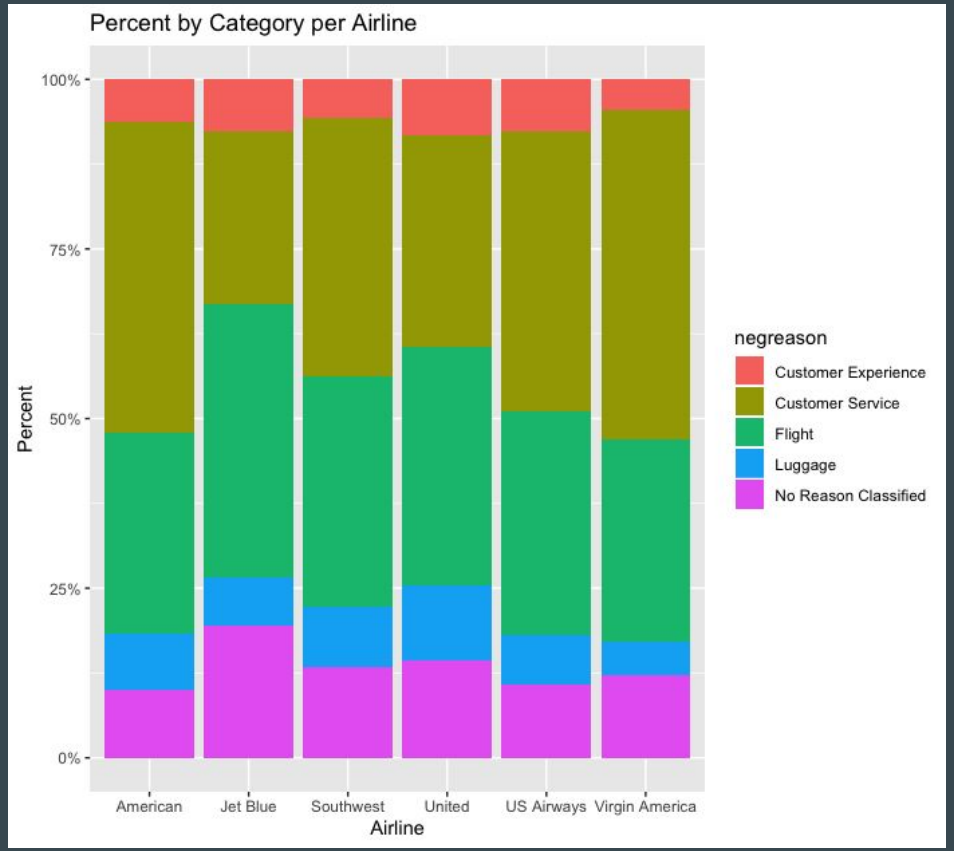




Distribution of Negative Categories in Tweets by Airline

- Across all targeted airline companies, customer service issues and flight issues were the most frequently vocalized concerns on Twitter.

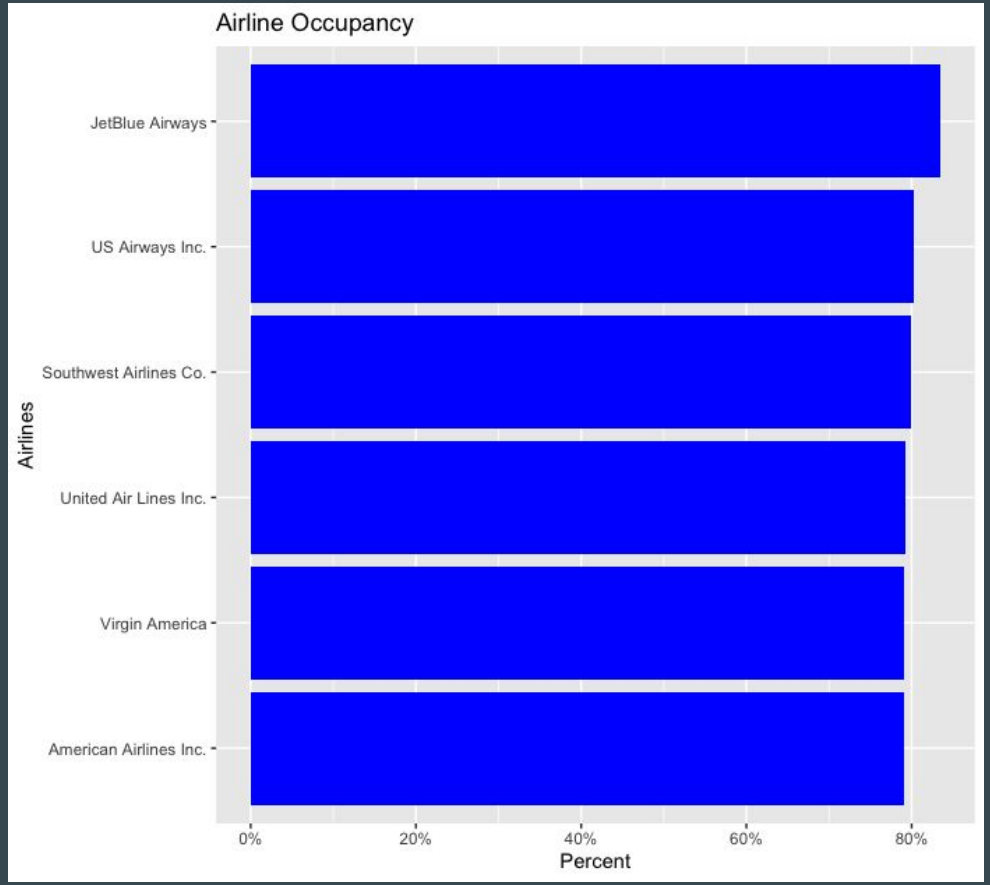
- JetBlue and United were the only airlines with a higher percentage of flight complaints than customer service issues.



Comparing Mean Occupancy Rate By Airline

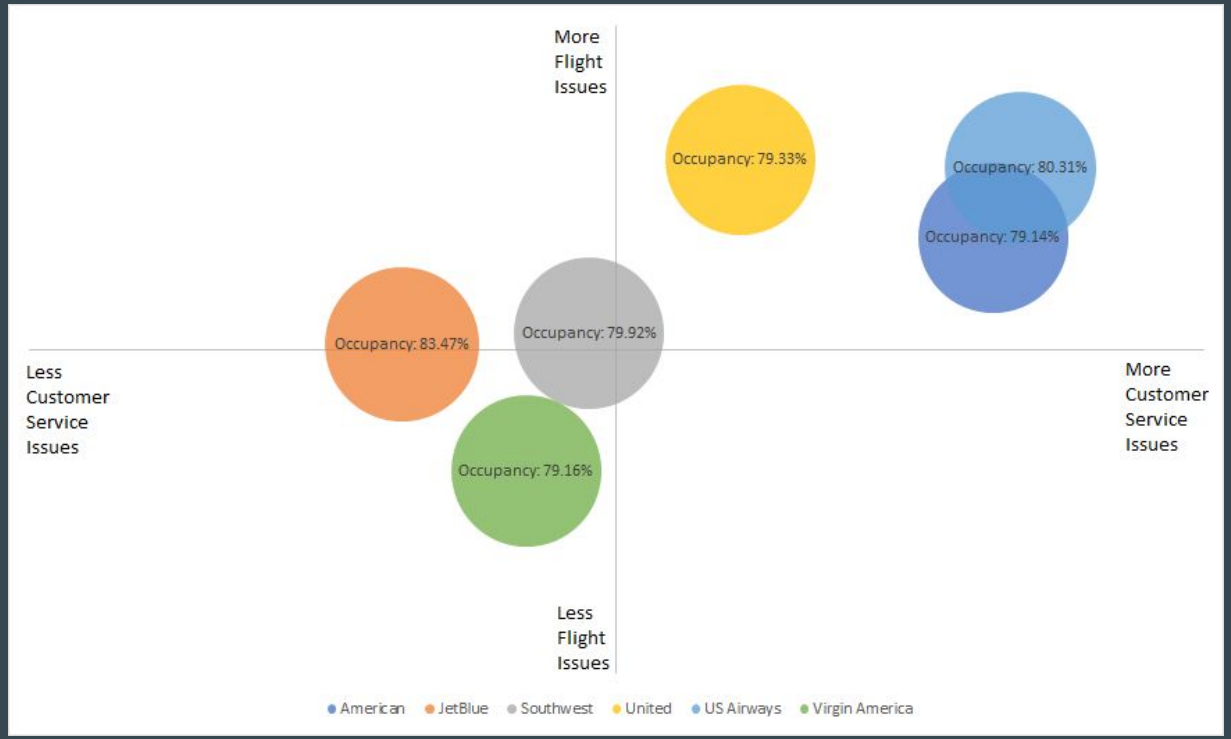
- Across all airlines, average occupancy rates for February 2015 averaged between approximately 79% and 84%.

- JetBlue Airways showcased the highest occupancy, at ~83.47%, a full 3.15% higher than the second most occupied airline.



Perceptual Map: Airlines Ranked By Customer Service and Flight Issues

- American, United, and US Airways had noticeably more complaints than the other airlines.
- Virgin America had the least flight issue complaints, but had the second lowest occupancy rate.
- JetBlue had the lowest percentage of customer service complaints and the highest occupancy rate!



Data Findings

- **Customer service** was the biggest point of issue across every airline, with **flight** issues taking up the second highest volume of complaints by problem type.

- United Airlines had the highest number of complaints among all the airlines represented, although occupancy was similar to most other airlines.
    - Even with the most tweets directed at them, United Airlines still had the highest percentage of negative tweets.

- JetBlue had the lowest percentage of customer service complaints and had an over 3% higher occupancy rate than the second highest airline company.
    - Amusingly, JetBlue had a significant number of tweets complaining about one tweet made by the airline, where the company used the word “fleek”.

Conclusion

- Customer sentiment alone cannot explain airline occupancy rates, as there are many additional factors that impact flight occupancy.
  - Data does not take into consideration differences between flight routes, flight times, seating class, available alternatives for flight bookings, etc.

- Flight issues had a less noticeable impact on occupancy rates than customer service.
  - Most flight issues are outside of an airline company's control; flight delays and cancellations can occur due to weather, airport problems, or aircraft issues, while luggage problems are the result of airport staff rather than airline employees.

Recommendations

- Given the high volume of complaints even within a week, most airlines should prioritize improving their customer experience.
  - Make improvements with booking services, flight availabilities.
  - Train employees to better handle customer issues and calm/control people when unavoidable issues such as delays or aircraft problems occur.

- Customer complaints should be used to directionally impact changes, rather than making adjustments in direct response to outspoken issues.
  - In general, most communication with companies on social media regards issues with a product or service, due to the ability to reach a company representative faster than using traditional support lines.
  - Sentiment measured on these platforms will typically skew negatively due to the nature of complaints and the frustration that drove consumers to these platforms.

Appendix

References

https://www.kaggle.com/crowdflower/twitter-airline-sentiment

https://www.transtats.bts.gov/DL_SelectFields.asp

https://rstudio-pubs-static.s3.amazonaws.com/176952_0e0d277a8d3649e7a77e090da532e31f.html

Issues With the Data, And What Could Have Helped

Assigning a valuable dependent variable within the datasets was difficult since the granularity of data was limited.

Our desired model was to predict occupancy rates based on airline tweets:

- The most immediate problem with this regression was that occupancy rate could be calculated at most at a monthly frequency, while our data from Twitter only spanned 8 days.
    - The data we could use to predict occupancy therefore was limited to six data points, one for each airline. This is insufficient to build a regression model.
- Another issue was that the airline sentiment score was a preset value in our dataset that was not defined in any documentation

Data that could improve model:

- Seat classification
    - Knowing what seat class each customer was in would allow for a more granular analysis. It is easy to imagine that first class and coach customers would have different levels of expectation with regards to potential flight and travel issues.
- Twitter data over a longer period of time
    - The timeframe of the customer tweet dataset was the most limiting factor in the analysis. Additional days of data were not found to be readily available, and we did not have the resources necessary to scrape a full historical dataset of tweets.