CSML1010 – Project Proposal

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Twitter US Airline – Sentiment Analysis

- **Dataset from Twitter**
  - 14,640 thousand tweets
  - 15 Features
  - 6 US Airlines
  - Positive | Neutral | Negative

- **Aligns with a business problem**
  - How to stop negative tweet trends before they go out of control?
  - Identify the early tweets accurately -> Sentiment Analysis!

- **Presents an interesting ML/Data challenge**
  - Data is messy (Twitter character limit, slang, emojis, @ and #)

Loading Data

- **Loading Data**
  - Available as CSV and SQL
  - UTF-8 encoding to preserve emojis 👍

- **Check for NULL Values**

Column 'negativereason' has a few missing nulls, but they are null only if 'airline_sentiment' is positive or neutral.

```
df_tweets['negativereason'].isnull().sum()
```

```
5462
```

```
df_tweets['airline_sentiment'].loc[df_tweets['negativereason'].isnull()].unique()
```

```
array(['neutral', 'positive'], dtype=object)
```

Cleaning Data

- **Twitter data notoriously unclean**
  - Character limit forces non-standard English
- **Remove noise for sentiment analysis**
  - @ Mentions, **RT** re-tweets
- **Retain value-adds**
  - Emojis 💻, hashtags #
  - Add important context and content

- **Clean text itself**
  - Remove HTML, translate slang, remove STOP words and grammar, lemmatize

Data Cleaning Challenges

– **How to extract emojis?**

  - **emot 2.1**

    ```
    pip install emot
    ```

  - ```
    18    True
    Name: emojis_flag, dtype: object
    18    [❤, ☺, 👍]
    Name: emojis, dtype: object
    18    I ❤️ flying @VirginAmerica. ☺👍
    Name: text, dtype: object
    18    I ❤️ flying . ☺👍
    Name: text_cleaned, dtype: object
    18    I  flying .
    Name: text_cleaned_without_emojis_emoticons, dtype: object
    ```
    ```

Data Cleaning Challenges

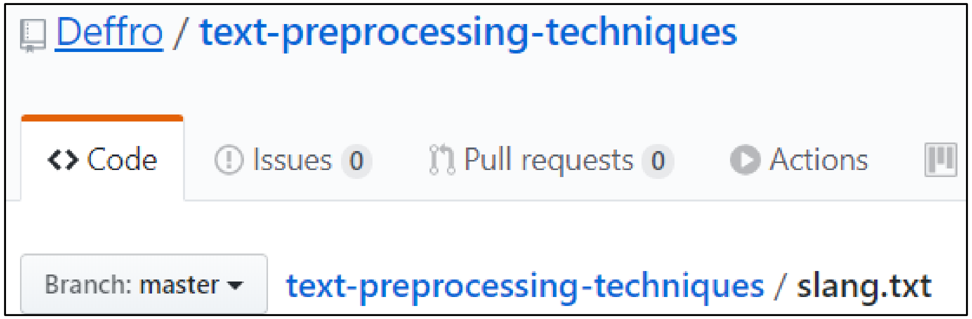
- **Extract Hashtags?**

```
def extract_and_remove_hashtags(df_tweets):
    regex_to_replace= r'#(\w+)'
    replace_value= ''
    df_tweets['hashtags'] = ''
    df_tweets['text_cleaned_without_emojis_emoticons_hashtags'] = ''

    for i, row in df_tweets.iterrows():
        df_tweets.at[i, 'hashtags'] = re.findall(regex_to_replace, df_tweets.at[i, 'text_cleaned'])
        df_tweets.at[i, 'text_cleaned_without_emojis_emoticons_hashtags'] = re.sub(regex_to_replace, replace_value,  df_tweets.a
t[i, 'text_cleaned'])
```

- **Text to lowercase**

- **Convert Slang**
  - Find and replace based on an existing dictionary



Text Cleaning

- **Remove stop words**
  - “The”, “and”, “You”, etc. -> noise

- **Remove punctuation & numbers**

- **Lemmatize**

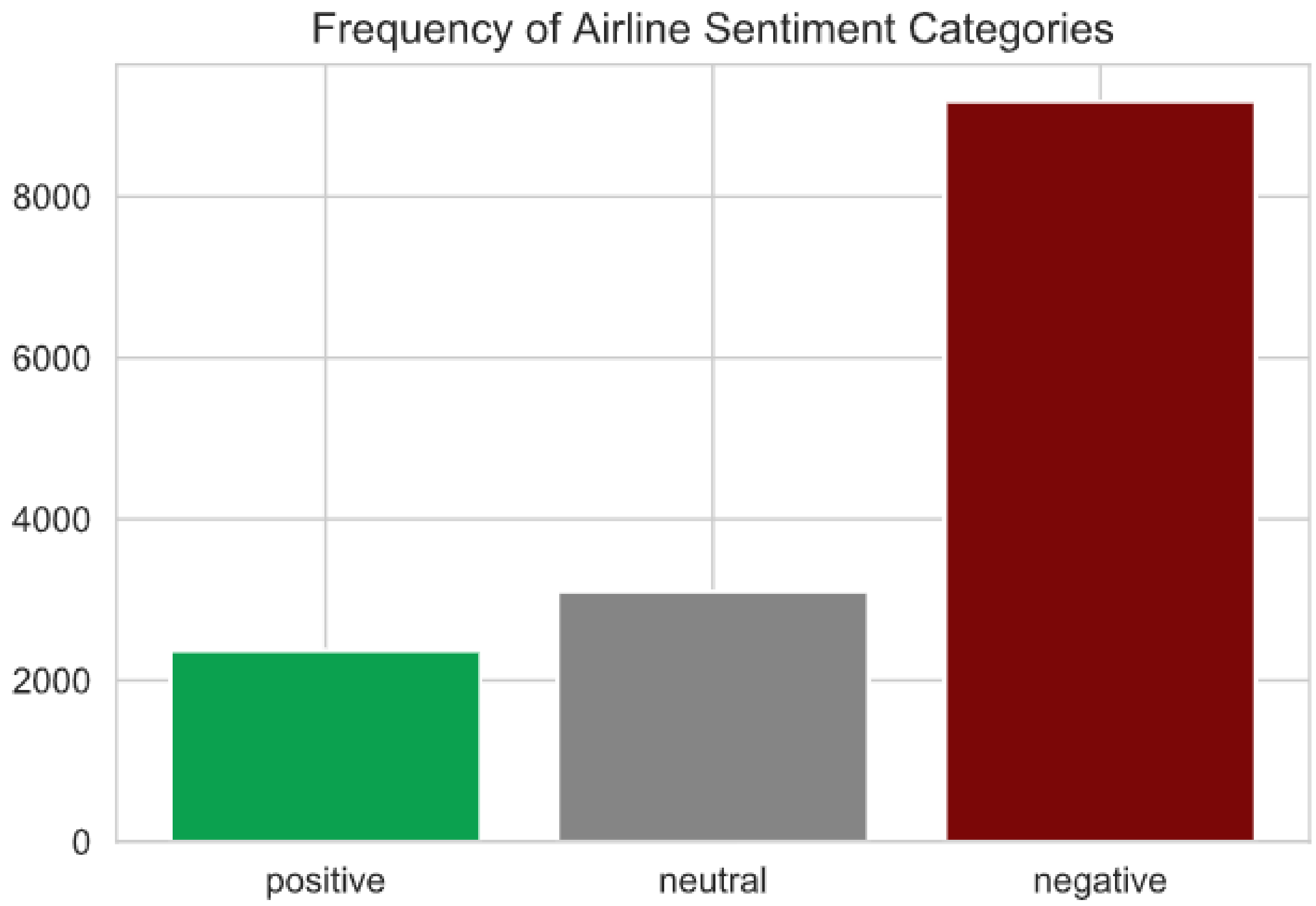
- **Tokenize**

Data Exploration

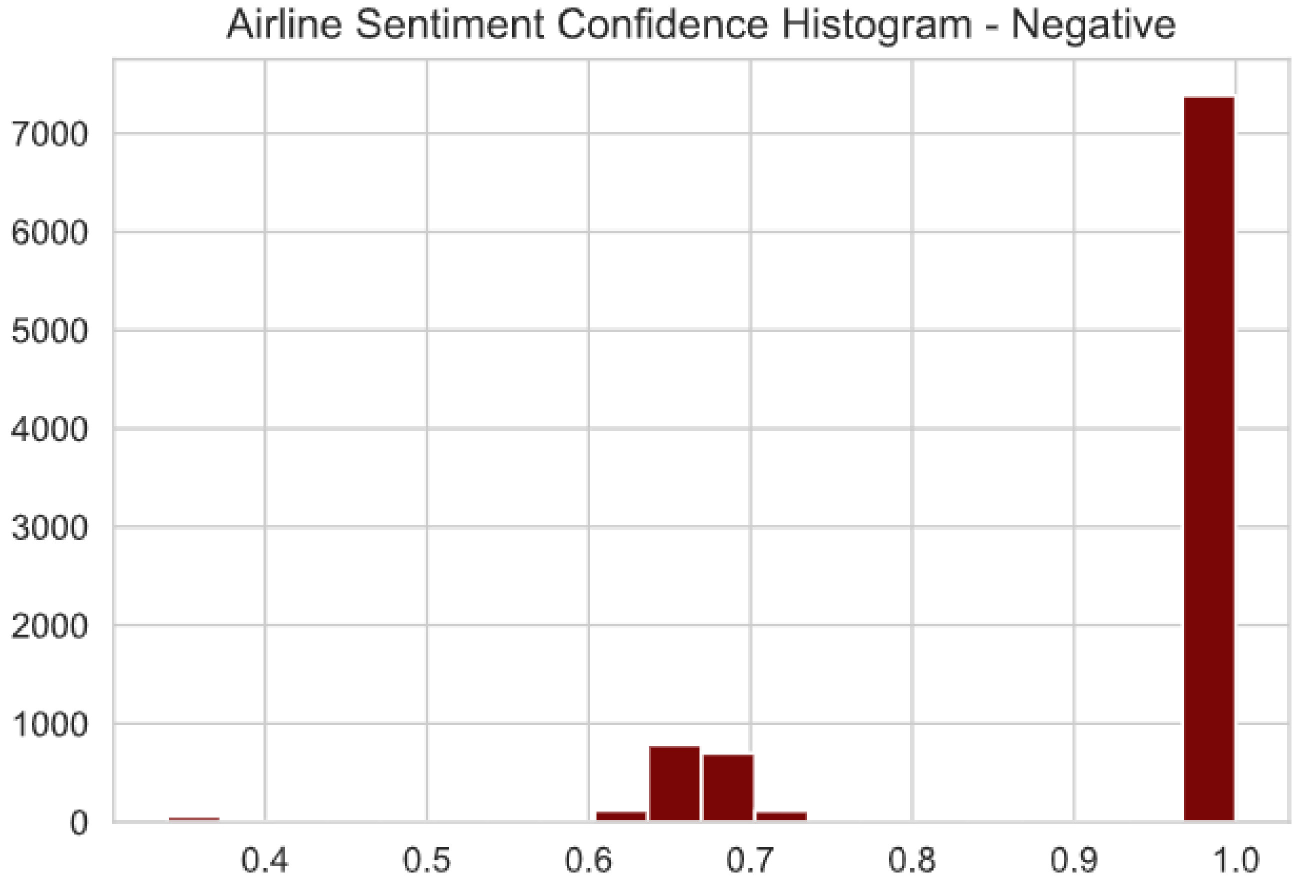
- **15 columns**
  - 6 main features that interest us
    1. airline_sentiment
    2. airline_sentiment confidence
    3. negativereason
    4. negativereason_confidence
    5. airline
    6. text

- **Engineered Features**
    1. emojis
    2. emoticons
    3. cleaned text (lemmas)

Data Exploration



Data Exploration



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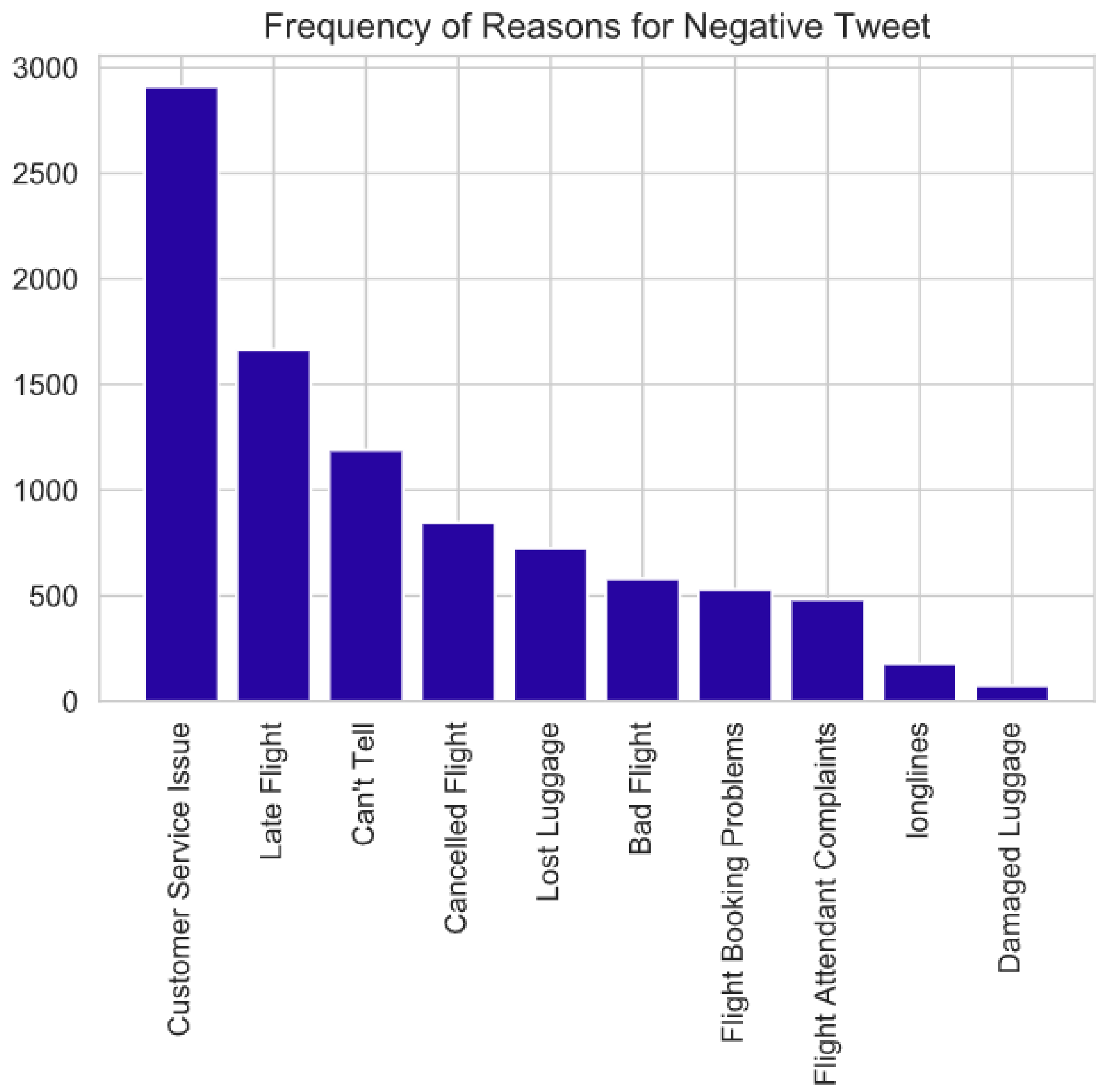

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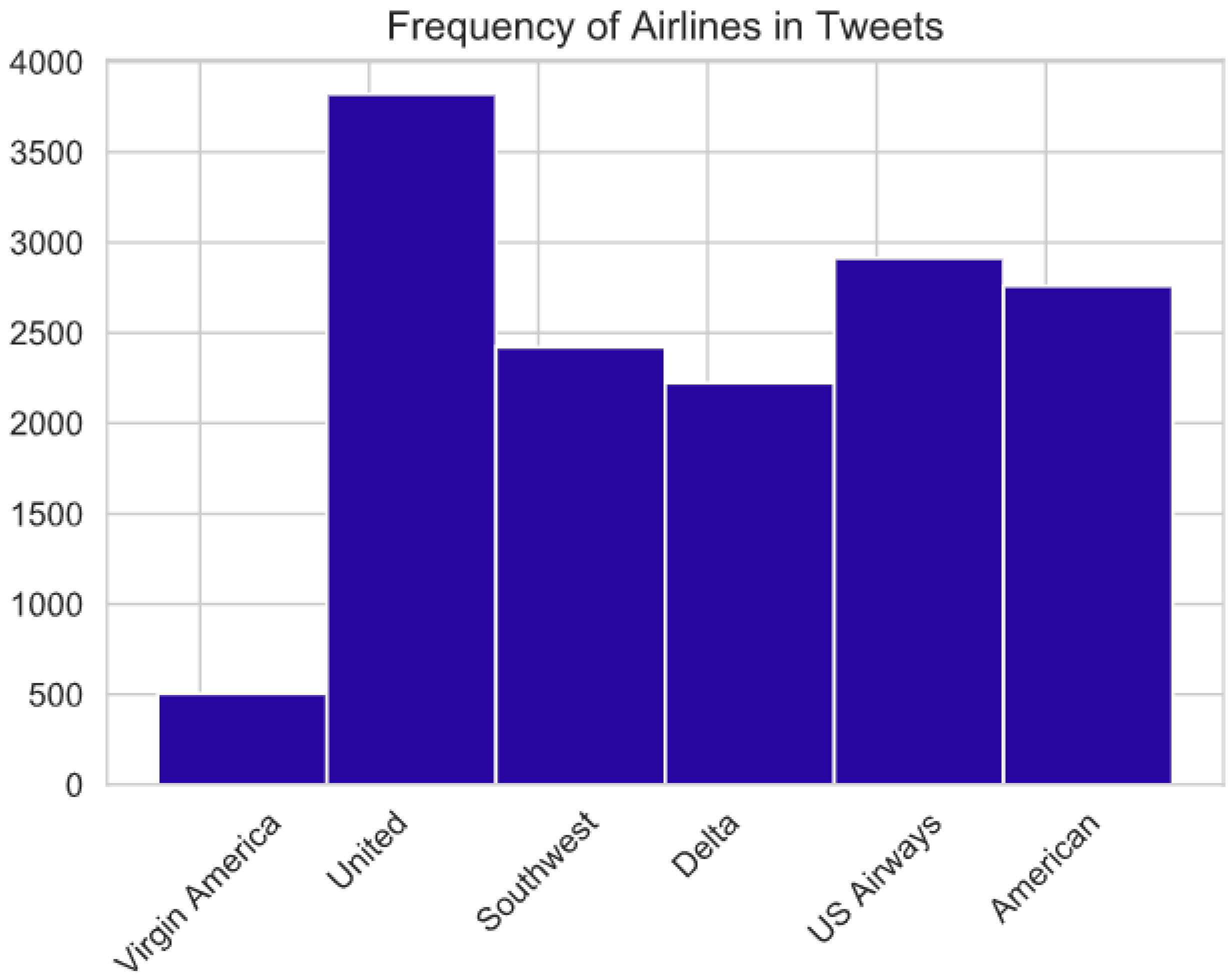
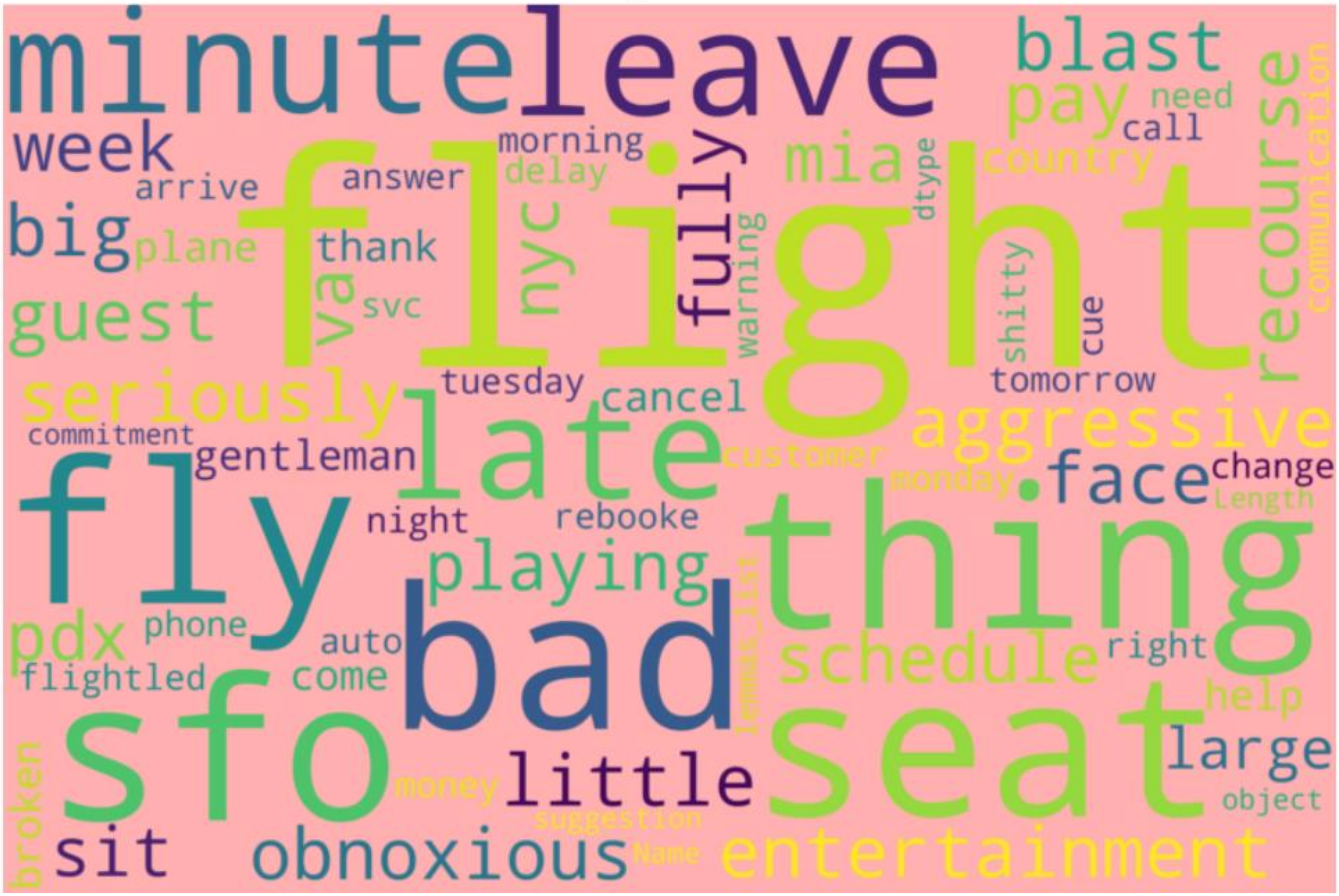


Data Exploration

Word Cloud for Positive Sentiment Tweets

Data Exploration

Word Cloud for Negative Sentiment Tweets



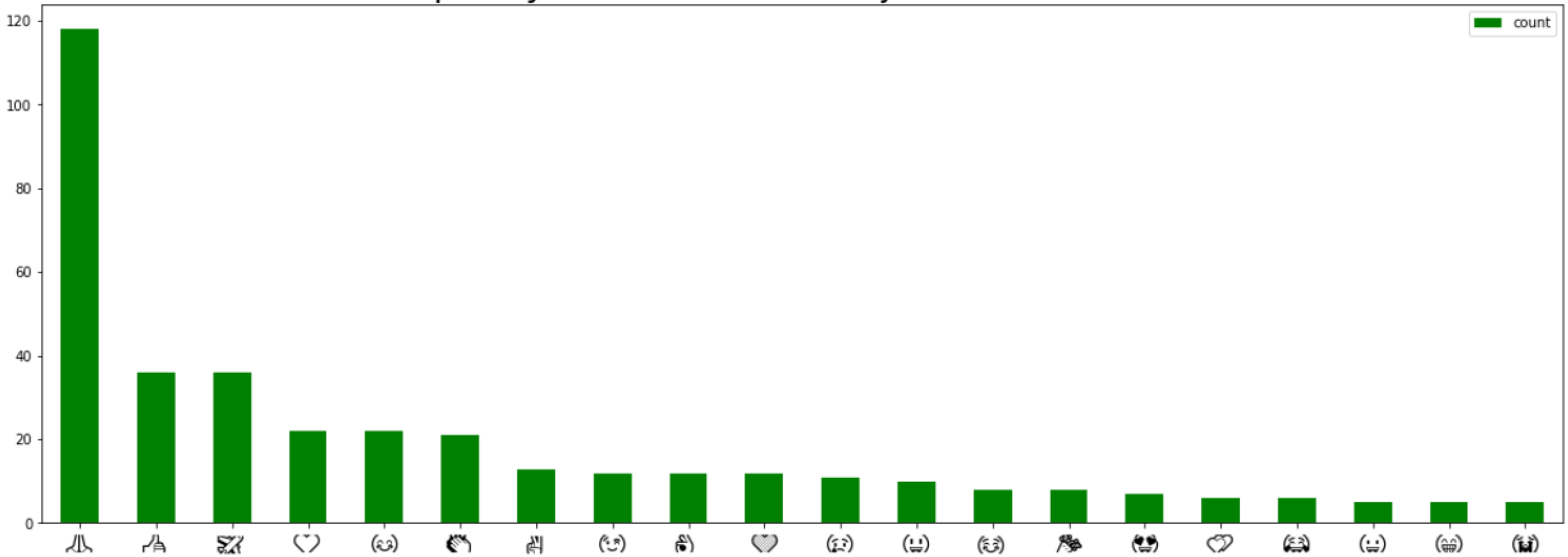
Data Exploration – Emojis & Hashtags

- **Is there value in the extracted emojis and hashtags?**

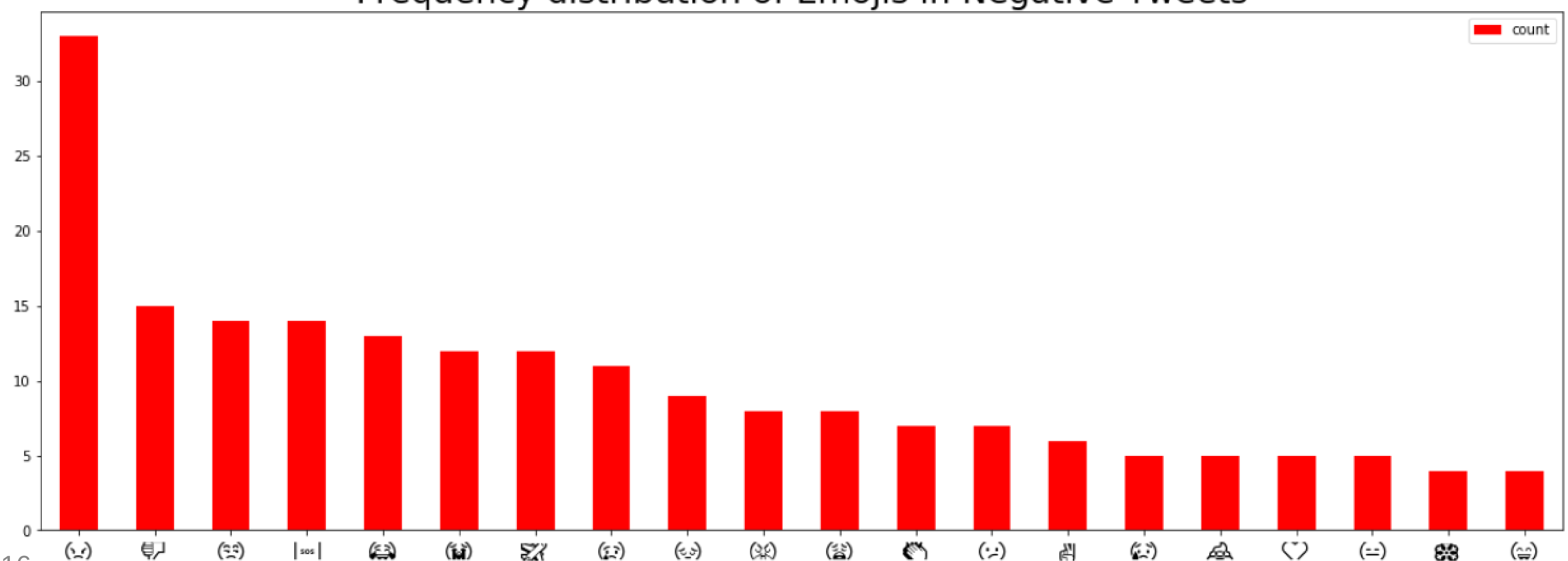
- **Method:**
  - Plot frequency by sentiment class (positive, neutral, negative)

  - If there is a clear difference – emojis & hashtags are differentiators -> add context

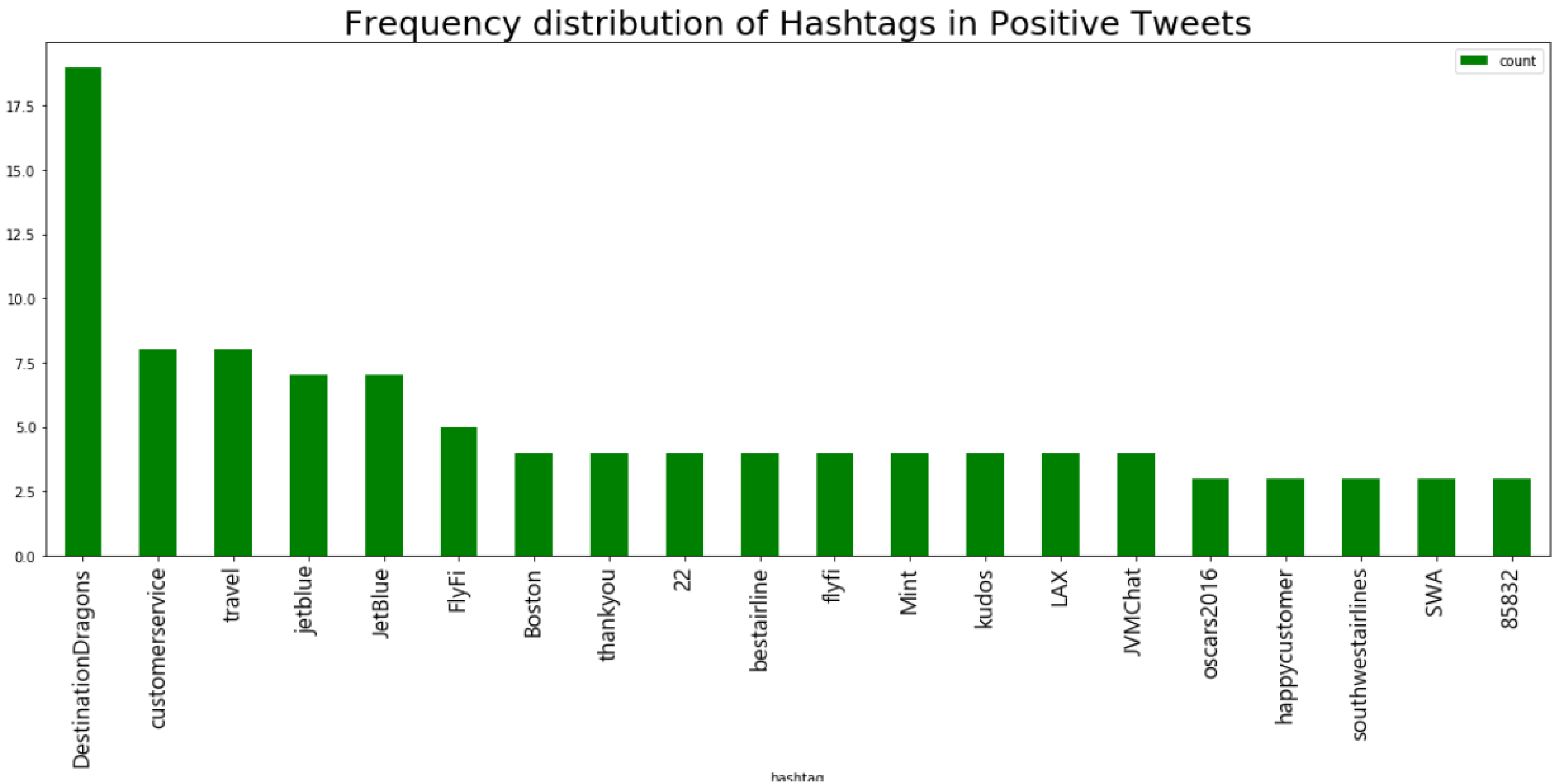
Frequency distribution of Emojis in Positive Tweets



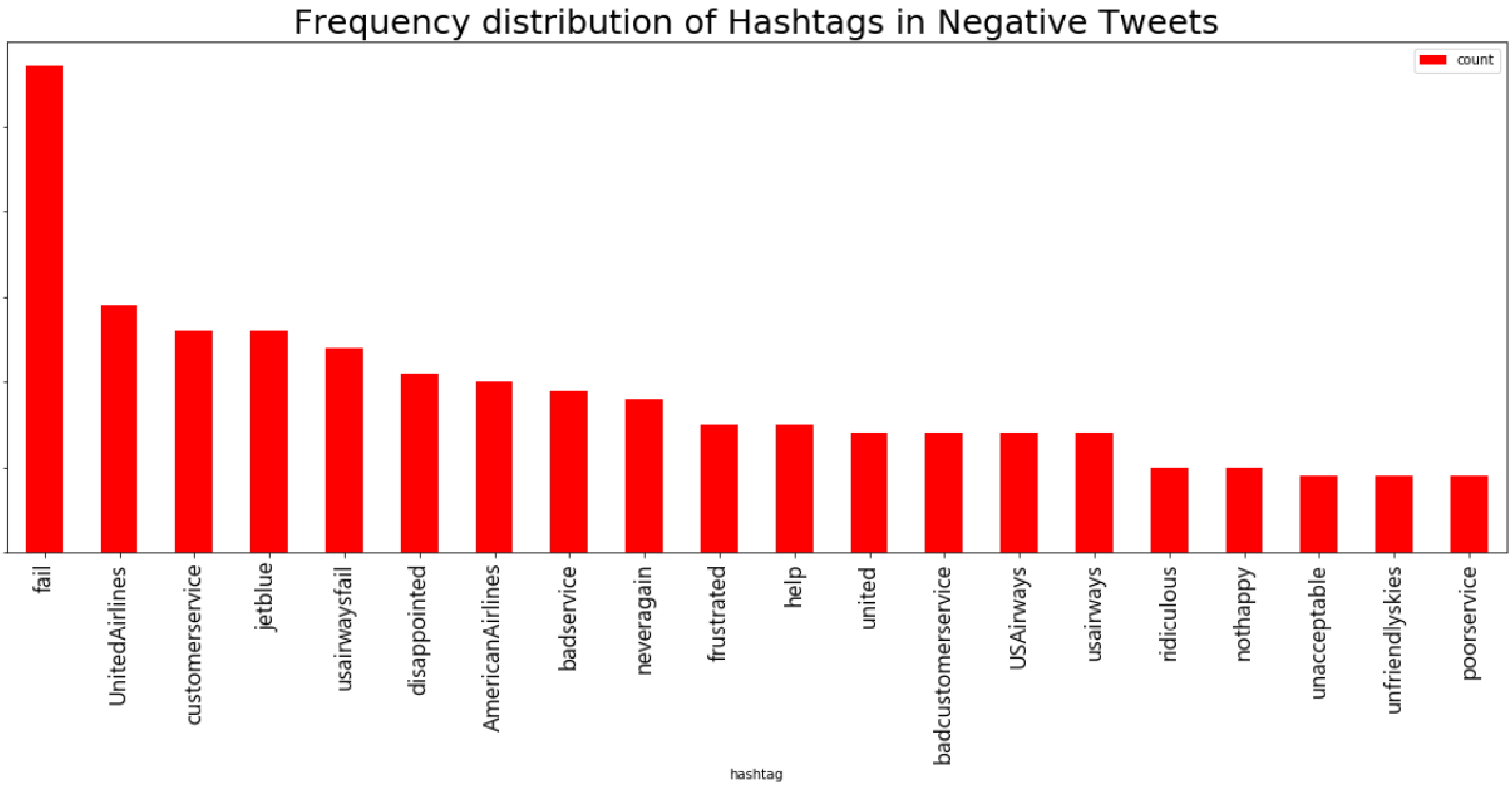
Frequency distribution of Emojis in Negative Tweets



Data Exploration – Emojis & Hashtags



Data Exploration – Emojis & Hashtags



Data Exploration – Emojis & Hashtags

- **Issues with our emoji, emoticon and hashtag extraction**
  - Extraction process confuses non-emoticon string of characters for an emoticon
    - E.g. time of day, airport codes
  - Hashtags could be cleaned further
    - Reduce to lowercase, remove stop words, lemmatize
    - Challenging as hashtags are not pure English

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Thank You!