

Sentiment Analysis on Twitter

Grand Text Auto
November 18, 2020

Problem Statement

- Social Media is very important in understanding how customers feel about a brand
- We explore the effect of news and communications from brands on the overall sentiment about the respective products
- Focus on Sony Playstation and Microsoft Xbox brands with both release their computing products around November 2020.

Training Dataset: Sentiment 140

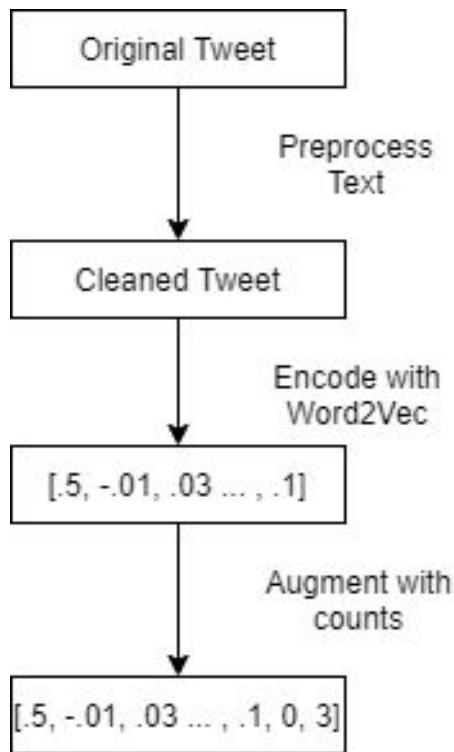
- For training, Sentiment140 [2] was used. It has 1.6m tweets labeled for sentiment
- Each tweet contains the following data:
 - target sentiment
 - tweet id
 - date published
 - user
 - content
- We focus on the target sentiment and content (text) of the tweet for this project

Analysis Dataset: Mining Live Tweets

- Performed using the snsrape [4] and Tweepy [3] libraries
- Snsrape uses twitter search to generate a list of tweet ids
- Restricted to 300 tweets per search
- Tweepy uses the tweet ids and Twitter API to get the content of the tweet
- More than 49,000 tweets for both playstation and xbox were collected over a six month period

Preprocessing

- Clean tweets (urls, @s, and non-alphanumeric data)
- Stop-word removal
- Vectorize tweets using word2vec
- Augment word vectors with counts of known sentiment words



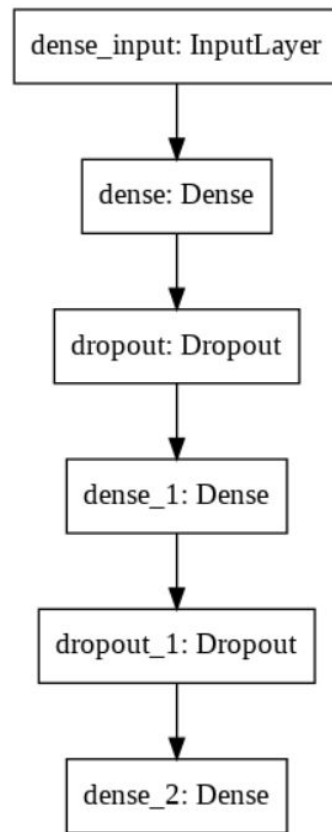
Non ML Models

We trained the following models using sentiment140

- Naive Bayes
- Decision Trees
- Random Forest

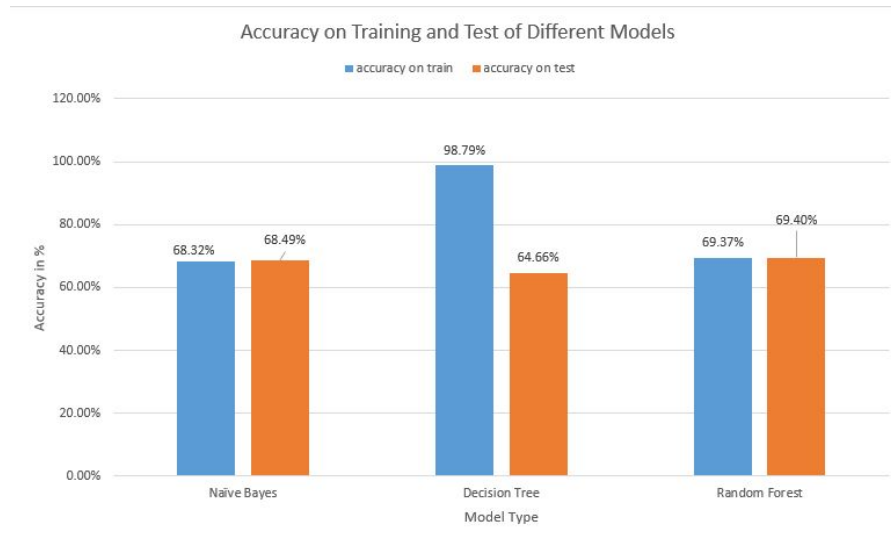
Neural Net Architecture

- To achieve better results, we trained a Neural Net
- relu activation for first layer
- sigmoid activation for final layer
- alternating dense and dropout layers



Overall Accuracy of Model Training and Test

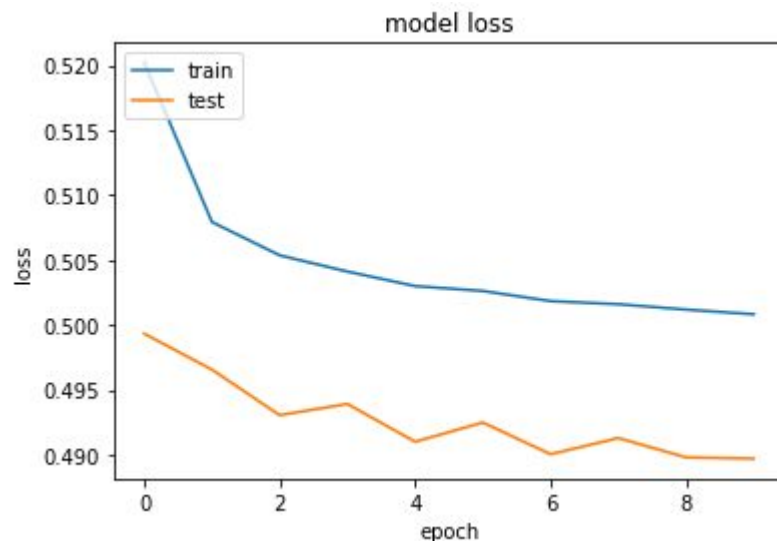
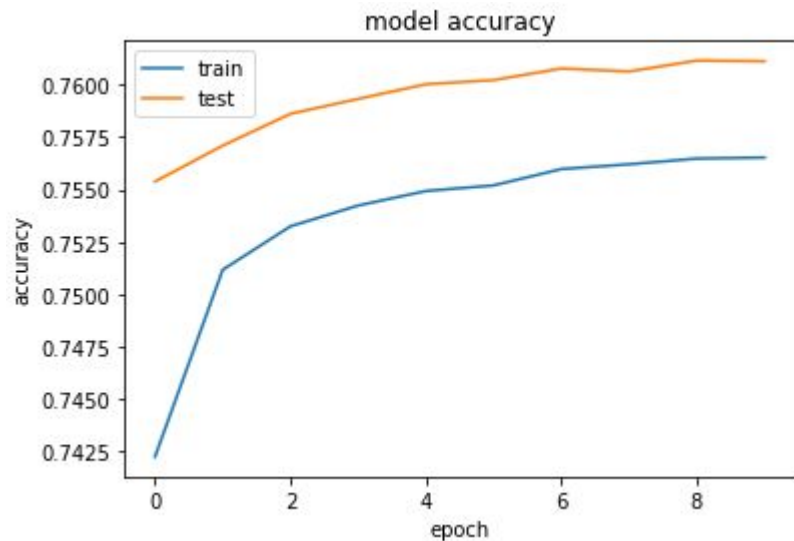
- Both **Naive Bayes** and **Random Forest** models have accuracy of training and test of between 68%~69% with minor differences between them;
 - The low accuracy might be caused by many factors such as the model designed is not as specific as we thought, the preprocessing of the tweets is not clean, and the training dataset we chosen to use is not accurate as well.
- The accuracy of training of the **Decision Tree** model is as high as 98.79%, which has the highest accuracy of training. But it also has the lowest accuracy of test, which is 64.66%;
 - It might has been trained to overfit the training set thus cannot be accurate with new data from the test set



Model Evaluation Results

Epoch Accuracy of Model Training and Test

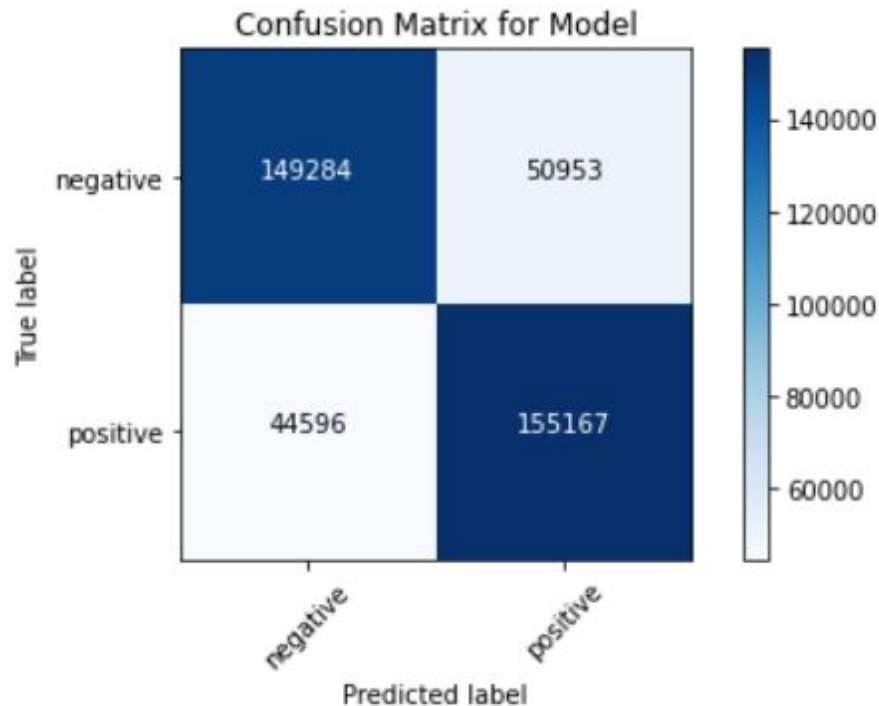
- As the training and testing epoch increases, the accuracy increases while the loss decreases;
- The test data has lower loss and higher accuracy than the training data
 - This can be attributed to the augmenting of the word vectors to include the sentiment counts (perhaps the test split had a higher frequency of sentiment counts, which could lead to better recognition)



Model Evaluation Results

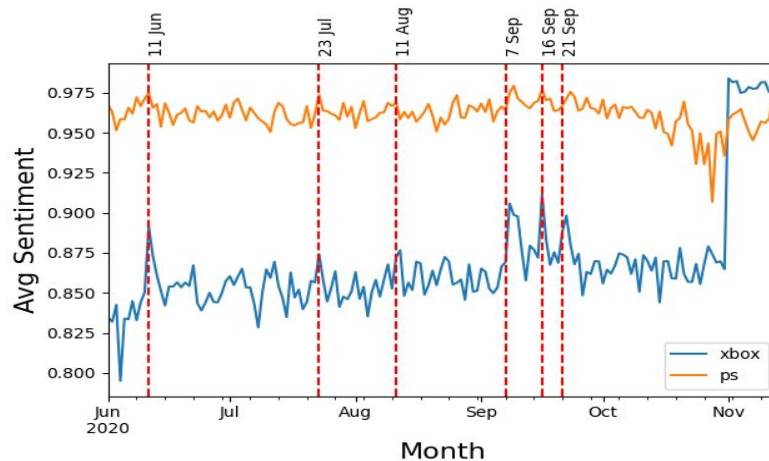
Confusion Matrix of the Model

- The Kappa Statistic is 0.522
 - True Positive Rate is 0.777
 - False Positive Rate is 0.746
- F-score is 76.46%



Analysis of Twitter Sentiment Over Time

- Playstation brand carried a much more positive sentiment compared to Xbox brand
- Positive sentiment for playstation remained at a consistently high level
- Sentiment for Xbox was more reactive to the news cycle
- Important news days show a substantial positive bump for Xbox but all of them were temporary



Important Dates

- 11 June - PS5 Future of Gaming event
- 23 July - Xbox Games Showcase
- 11 Aug - PS5 State of Play
- 7 Sept - Xbox Series S leak
- 16 Sept - PS5 Showcase
- 21 Sept - Bethesda acquisition

Accomplishments

- Developed a preprocessing pipeline for twitter data
- Analyzed sentiment of twitter data related to gaming consoles
- We showed that Playstation sentiment was more stable than Xbox sentiment overtime during the most recent release cycle

References

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Thanks