COVID-19 Pandemic: A Sentiment and Emotional Analysis of Modified Cancellation Policy of Airbnb

Neha Singh, Yash Teotia, Tushar Singh, and Piyush Bhardwaj

Abstract  COVID-19 has brought the world to a standstill. Almost every country in the world is facing economic crisis. The most affected sector from COVID-19 is the hospitality and tourism industry. The industry has suffered a loss of billions of dollars. For homestays, Airbnb leads the sector with more than 75% market share in homestays. Forced lockdown in almost all countries leads Airbnb modify its cancellation policy. In this paper, we analyse people’s sentiments and emotions for the modified cancellation policy. We have used VADER analysis for sentiment analysis and modified BERT for emotional analysis. The results yield that even though maximum people are positive towards Airbnb, still they are angry with the modified policy. The density of anger is more in European and American continent as compared to other continents.

Keywords  COVID-19 · Airbnb · Sentiment analysis · Emotional analysis · VADER · BERT

N. Singh
Maharaja Agrasen College (affiliated to Guru Gobind Singh Indraprastha University, Delhi 110078), Rohini, Delhi 110096, India
e-mail: join7neha@gmail.com

Y. Teotia · P. Bhardwaj
Bhagwan Parshuram Institute of Technology, Guru Gobind Singh Indraprastha University (affiliated to Delhi 110078), Rohini, Delhi 110089, India
e-mail: yashteotia@gmail.com

P. Bhardwaj
e-mail: piyushb88@gmail.com

T. Singh
Vellore Institute of Technology, Vellore, Tamil Nadu 632014, India
e-mail: tushar12.research@gmail.com

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A. Abraham et al. (eds.), Proceedings of 3rd International Conference on Computing Informatics and Networks, Lecture Notes in Networks and Systems 167,
https://doi.org/10.1007/978-981-15-9712-1_54
1 Introduction

Due to COVID-19, the world has come to standstill economy around the world is, and one of the worst hit sectors is tourism industry thus in this paper we will see how is Airbnb one of the world’s most popular company which is being talked about on the Internet. In this paper, we have extracted tweets from top countries with tourism business from every continent of the world for tweets related to Airbnb. After tweets extraction, they are pre-processed for sentiment as well as emotional analysis. Top 39 countries from around the world that have a booming tourism industry are considered for our research.

A total of 43 thousand tweets were extracted from around the world. All the tweets have been extracted for the month of May. The hashtags used are #airbnb, #airbnbHelpline and #airbnbcutomercare. We have used Valence Aware Dictionary and Sentiment Reasoner (VADER) for sentiment analysis, and an emotion analyst is created by modifying Bidirectional Encoder Representations from Transformers to extract emotion features from the tweets. The created model used here undergoes three main stages, training stage, validation stage and testing stage. The model is trained on the ISEAR data set and undergoes validation to reduce overfitting of data.

Rest of the paper is as follows: Sect. 2 contains a brief literature survey. Section 3 describes the experimental set-up used for analysis. Section 4 provides the analysis of results. Section 5 concludes the paper.

2 Literature Survey

In paper [1], the researcher has tried to mine tweets related to different travel websites from twitter and do the sentiment analysis to tell which is the most popular and loved website of all. Paper [2] tries to mine tweets related to cyber security from different parts of world and used VADER to predict the sentiments of those tweets which tells what are the sentiments of people related to cyber security. In paper [3], the paper author has shown the characteristic feature of people depending on sex, age, etc., and how they react to different social media sites that are Facebook, Instagram, WhatsApp, etc. In paper [4], researcher shows advantages of using different face-APIs such as Face++, IBM Bluemix Visual Recognition, etc., to predict data such as age, race and gender with three data sets. In paper [5], the researcher creates a model to capture emotions from real-time facial features. In paper [6], the author shows how VADER predicts sentiments of tweets from text and how it is best in predicting social media sentiment analysis with respect to different predictors of text. In paper [7], author predicts the emotion from the facial expression just like any other classification algorithm. In paper [8], the author shows the different ways in which machines and humans with the library known as OpenCV can interact with each other and what they can achieve. In paper [9], the author extracts a data set consisting of 400,000 Instagram posts that are from Amsterdam and shows how the city is reassembled on
the platform. In paper [10], the author shows how Microsoft and Google face apps operate differently with respect to different images. In paper [8], the author shows the different ways of interaction between machines and humans with the library known as OpenCV. In paper [6], the author shows how VADER predicts sentiments from text and how it is best in social media sentiment analysis. Report [11] is WHO report on coronavirus on 1 April 2020. Report [12] is WHO report on coronavirus 27 March. Report [13] is WHO report on coronavirus 15 March 2020. Report [14] is WHO report on coronavirus 4 March 2020. Report [15] is WHO report on 11 March 2020 declaring coronavirus as a pandemic.

3 Experimental Set-up

3.1 Data Extraction and Cleaning

- Extracting tweets from tweepy with the hashtags of Airbnb and Airbnb Helpline.
- Tweets extracted are for the month of May. All the tweets are extracted with filter of timestamp of tweet being from the month of May.
- Deleting all the tweets that are not in English or does not have a proper place mentioned.
- Cleaning the tweets by removing stopwords and further stemming of tweets as well as lemmatisation.

3.2 Data Set

- Our data set consists of 43 thousand tweets from 39 most popular country in terms of tourism industry
- The data set consists of well-defined information related to date of tweets as well as country from where the tweet has originated

3.3 Sentiment Analysis

- We have used VADER in our data set to predict sentiments from the tweets as shown in paper [6], and we know VADER is best in terms of predicting sentiments from social media. The sentiments that VADER can predict are positive, negative and neutral.
- Vader uses features that are called as lexicals that helps in describing percentage of negativity or positivity present in a sentence
3.4 Emotional Analysis

- The main endeavour of the model is to predict the emotion labels: joy, anger, sadness, fear for the tweets related to Airbnb’s recent cancellation policies (Fig. 1).

We have used modified Bidirectional Encoder Representations from Transformers (BERT) to extract emotion features from the tweets. The created model used here undergoes three main stages: training stage, validation stage and testing stage. The model is trained on the ISEAR data set and undergoes validation to reduce overfitting of data. The model consists of 12-layer, 768-hidden, 12-heads, 125 million parameters. The model uses a transformer (an attention contraption that identifies and learns contextual relation between the words of the input source). Transformer is basically an encoder–decoder mechanism which reads an input and a decoder that classifies the input and produces predictions. After obtaining a satisfactory training and validation result, the pre-trained model was made to run on the Airbnb data set via transfer learning. The model finally classified all the tweets of the data set, and results were obtained.

3.5 Graphical Analysis

- We have used Tableau as well as Python libraries such as matplotlib, seaborn and word cloud to represent the graphs shown in the results section.
4 Results Analysis

- We have used VADER analysis for sentiment analysis and modified BERT for emotional analysis. The tweets are extracted for the month of May 2020. Firstly, analysis of sentiments is done followed by analysis of emotions.

Figure 2 shows the composition of tweets related to different sentiments. There are 19,659 positive tweets, 12,407 neutral tweets and 11,036 negative tweets. Therefore, more than 45% tweets are positive in sentiment.

Figure 3 shows top five countries with positive tweets. USA has the most positive tweets followed by Canada, UK, Netherland and Switzerland.

Figure 4 shows top five countries with neutral tweets. USA has the most neutral tweets followed by Canada, Netherland, UK and Switzerland.

Figure 5 shows top five countries with negative tweets. Once again, USA has the most negative tweets followed by Canada, UK, Netherland and Switzerland.

Figure 6 shows the composition of tweets with respect to sentiments of total number of tweets that is gathered from all the 40 countries. Here the USA is at top with most tweets followed by Canada, Netherland, UK and Switzerland, respectively.

![Fig. 2 Sentiment analysis of tweets for the month of May 2020](image1)

![Fig. 3 Top five countries with positive tweets](image2)
Figure 7 depicts the composition of emotions with respect to 43 thousand Airbnb tweets. More than 39.53% of the tweets contains anger emotion followed by joy, sadness and fear as an emotion.

Figure 8 depicts the composition of emotions of tweets with respect to different countries. Almost all the countries have high percentage of anger emotion followed by joy, sadness and fear.

Figure 9 provides the word cloud of emotion “Fear” in tweets. As it can be seen, Airbnb and coronavirus are most frequently used words associated with fear. A word “return” can be seen used many times. This is because of the modified cancellation policy of Airbnb that people fear whether their money will be returned or not. Another interesting word is “host”. Many host fear that they might be a big amount of money because of modified cancellation policy of Airbnb.
Figure 7 provides the word cloud of emotion “Joy” in tweets. As it can be seen, Airbnb, Thank, Founder are most frequently used words associated with joy. A word “new” can be seen used many times. This is because of the new modified cancellation policy of Airbnb that people are happy with after receiving their money. Another interesting word is “experience”. Many people seem to have a joyful experience while using the new cancellation policy.

Figure 11 provides the word cloud of emotion “Sadness” in tweets. As it can be seen, Airbnb, host, job are most frequently used words associated with sadness. A word “host” can be seen used many times. This is because of the new modified
cancellation policy of Airbnb that many hosts are feeling sad after receiving cancellations at their property. Another interesting word is “decline”. Many people seem to be sad after seeing a decline in their income.

Figure 12 provides the word cloud of emotion “Anger” in tweets. As it can be seen “owner”, rental, hotels, refund are most frequently used words associated with anger. Almost every owner is angry with the modified cancellation policy as they are the ones who have suffered the most by the new policy.

Figure 13 depicts the density plot of emotion “Anger” across the globe. As it can be seen, the Europeans are very angry with the modified policy followed by Africans and Americans. Asians are least angry with the policy.
Figure 14 depicts the density plot of emotion “Fear” across the globe. As it can be seen, fear emotion has similar density as that of anger. The Europeans are very angry with the modified policy followed by Americans and Africans.

Figure 15 depicts the density plot of emotion “Joy” across the globe. Many Europeans are also happy with the modified policy.

Figure 16 depicts the density plot of emotion “Sadness” across the globe. Many Americans and Europeans are sad with the modified policy of Airbnb.
Fig. 13  Density plot of emotion “Anger”

Fig. 14  Density plot of emotion “Fear”

Fig. 15  Density plot of emotion “Joy”
5 Conclusion

In this research, we have studied the sentiments and emotions of modified cancellation policy of Airbnb due to COVID-19. VADER analysis is used for sentiment analysis, and modified BERT is used for emotional analysis. The analysis yields few points. Firstly, almost half of tweets retrieves positive sentiment, concluding a more satisfied cliental as compared to unsatisfied one. Secondly, that even though maximum people are positive towards Airbnb, still they are angry with the modified policy. The density of anger is more in European and American continent as compared to other continents. Thirdly, few word cloud suggest that owners of rental properties are angry with new cancellation policy, and clients that received full refund are happy with the policy. Lastly, COVID word can be seen in every word cloud indicating the gravity of situation that has arisen due to coronavirus.

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