# Study of Social Media Activity of Local Traffic Police Department: Their Posting Nature, Interaction and Reviews of the Public

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**Abstract.** With the increasing social media buzz, connectivity, interaction and power, it is highly important to utilize the insights generated from these sites for better performance, expansion and opportunities. Police departments are leveraging these online platforms to spread awareness, connect to the mass, know their concerns and opinions to use their potential accordingly for better satisfaction. We have considered the official Facebook page maintained by Kolkata Traffic Police Department for analysis. The empirical study consists of 773 page owner posts and 595 visitors' posts, 301 reviews, and comments on page owner posts. We analyze the user engagement statistics, popular post types, trends in traffic updates of Kolkata, and extracting sentiments of the public. Our results provide practical useful insights for the users, as well as the community who are working on the policing frameworks.

**Keywords:** Social Media Analysis · User Engagement · Kolkata Police Department · Sentiment Analysis

## 1 Introduction

According to the report generated in 2017 by statistia.com, social media users comprised of 71% of the overall internet users and it's estimated that the number of social media users will reach 2.77billion (bn) from 2.46bn users [1]. Internet penetration, ease of use and increase worldwide usage of smartphones has been responsible for this virtual connectivity among people. Online connectivity and user engagement provides opportunities to extract meaningful information about personality [2, 3], sentiments [4-6], and opinions [6].

Facebook (FB) has the current lead in social media market with approximately 1.86 bn monthly active users [1]. Apart from the marketing campaigns [7], publicity of movies [8], and current news updates [10], Facebook has been widely used by government bodies, police departments for community outreach, and safety concerns [9]. It is important to harness this powerful tool that supports quick two way interactions between the authority and the public quickly, establishing a mutual beneficial net. The interactions have been proved very effective at the times of emergencies [11, 24], and political elections as well [12].

In our research work, data was mined from the official Facebook page maintained by Police Department of Kolkata, Kolkata Traffic Police (KTP), which is mainly a forum for Traffic Alerts and Public Grievances. With approximately 1,35,000 followers, the officials have been quite active in the last 2 years to increase the public engagement, effective problem solving via complaints on Facebook. Our research work aims to convert the unstructured data (data from Facebook posts) to structured data for better understanding, visualization of data and summarize the results in an effective manner. We also intend to highlight the views of the public via the reviews made on the KTP. This will help the viewers to get the crunch of the matter quickly, and more importantly, this will be of a great help to the Kolkata Police Department and other concerned authorities in analyzing the information that was being generated directly or indirectly via the page. It will help in increasing the quality of their content, and this brief overview will help in highlighting the shortcomings and positive results from the page. Besides the work of extracting information from preprocessed data after applying various techniques, there were other challenges that needed to be overcome to produce approximately accurate results.

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## 2 Related Works

Social Networking websites have played a crucial role at the time of crisis [15, 28], helped improve efficiency of the organization, enhance the communication between government and citizens, and it increases transparency, and credibility in government [25-27]. Bertot et. al. [23] in their study reveal that the social network websites like Facebook, Twitter puts more emphasis on the much needed digital interaction between the government and the common mass, which in turn increase the engagement. It has been depicted how the posts on Facebook, shares, likes and comments, content sharing on government fan pages indirectly and directly helping the government know about the engagement and interests of the public [25].

Missy Graham et. al. have examined the use of social media tools by local governments and they conclude that 70% of the government bodies use social media tools and Facebook and Twitter are the most commonly used platforms, and they also discuss about the fact that most of the tweets and posts talk about special events and activities [19]. Sara Hofmann and co-authors analyze the Facebook sites of German local governments using a multi-method approach and depict the success of communication between the government and users in terms of frequency and polarity of citizen's reactions (sentiment analysis). Social Media offers the benefit of attaching multimedia features to a normal post to make it more attractive and gain popularity [20]. They conclude that posts that contain photos or videos are more liked or commented than those containing textual updates or a link. This shows the multimedia feature of Social media helps to capture the attention better.

Mossberger et. al. [21] have studied the use of various interactive social network tools used in US and the work also suggests that "push" strategies are more dominant than networking and pull strategies in Facebook and Twitter. Magnusson's work [22] investigated the citizen-government interaction during flood by conducting analysis on two Facebook pages maintained by Local Government. The work also lists the type of posts and topics that catch user' attention and there is notable pattern that people tend to like and buzz about posts that are related to daily operations. Table 1 lists a few related works that have been carried out in this domain, along with their objective.

**Table 1.** Related Works

| Reference | Year | Objective |
|---|---|---|
| [13] | 2016 | User engagement, Topic extraction, and classification from 4 Police Departments (USA) Facebook Pages and applying statistical methods to compare the posts and examine user and police interactions |
| [14] | 2016 | Analytic Generalization to identify categories in government-citizen communication Karlstad Municipality's FB page |
| [15] | 2014 | Content analysis of posts on The City of Calgary's Facebook page during Alberta flood to extract the main themes, checking comments on user postings to highlight significantly different themes |
| [16] | 2015 | Measure the impact of media and content types on stakeholders' engagement on Western European governments' FB pages |
| [17] | 2015 | Perform iterative content and Web analysis on 31 'Information World Cities' websites and social media services and compare different social media services and types |
| [18] | 2013 | Examines the presence, usage and effectiveness of Egyptian Government Social Media Websites |

## 3 Proposed Methodology

This section lists the steps followed from collecting the data to the findings in a sequential manner.

**Data Collection**: Data from the Kolkata Traffic Police's Official Page on Facebook has been collected. The extracted data includes Page owner posts (posts made by KTP). Visitors posts, reviews by users, and comments on Page owner posts. Page Owner Posts were mined for a period of November 2016 to October 2017 for analysis purpose, visitor posts and reviews for the period of January 2017 to November 2017 were taken into consideration while developing algorithms.

**Data Preprocessing**: Posts that were posted in vernacular languages like Hindi or Bengali had to be removed manually from the database. Standard techniques for whitespace and punctuation removal, removal of stop words, link removal, and email id removal were applied on the messages posted by the users and KTP on the Facebook page. All the types of text cleaning, along with stemming was performed for the reviews.

**User Engagement Statistics**: Statistics such as like, comment and share count, average number of posts, posts on weekdays, increase in followers were determined to see if users are actually getting engaged from KTP's content.

**Post Categorization**: The types of posts are categorized into 4 types- Photo, Status, Video and Link. The status updates have been further classified into Traffic Updates and other updates. The traffic updates are further divided on the basis of reasons due to which the congestion takes place.

**Complaint Count**: Visitors' posts have been analyzed mostly to get quick information about the trend in the number of complaints posted by the visitors on a major issue that KTP is levying wrong cases on vehicles.

**Sentiment Analysis**: Sentiment Analysis was performed on the reviews extracted on a bimester basis. The 'sentiment' package was used for classifying the polarity of the reviews as well as classifying emotions into six categories namely anger, joy, disgust, fear, sadness and surprise.

**Visualization**: Visualization of congested places in Kolkata over a month has been depicted using Google maps for quick reference for users, and simple graphs and Word Cloud have been used for depicting the results obtained.

# 4 Method Overview

Data was extracted from the official Facebook page, KTP using the package Rfacebook developed in R (Version 3.3.2). It provides an interface to the Facebook API [29]. The data was a combination of unstructured (status, comments) as well as structured data (like count, comment count and share count). The reviews were extracted manually in our study. Attributes of page owner posts and visitors' posts that were used in developing the further algorithms are id of the post, textual status, like, comment and share count, and type of the post.

Removal of whitespaces, redundant words and punctuation errors was removed using R package "tm". Page followers on start and end of every month were obtained from getInsights function in Rfacebook package [29].

The textual updates from Page Owner posts were further divided into two categories- traffic updates and other updates not related directly to the primary concern of KTP (like Diwali Posts, Durga Puja Posts). Traffic updates were filtered on the basis of keywords like "Traffic", "update", "alert" and the top congested places of a month were further stored in another csv file, along with a count of their recurrence. All the traffic update posts were firstly checked whether they contain words like "Road", "Street", "flyover", etc., and two and three word strings were generated and checked if the location existed. Else, the strings were compared with a database of locations of Kolkata. The locations extracted were mapped on a Google Map. Traffic update posts were then classified on the basis of reasons of congestion, if mentioned in the post. This required typical text mining approach, along with a combination of pattern matching. Sentiment Analysis techniques are used to understand the feelings, and views of the users towards KTP, its initiatives and work. Based on the opinion words available in the 'sentiment' package, a score was assigned to each feature. The package was used to determine the polarity and emotion of the reviews as mentioned in Section 3.

Complaints from visitors post were filtered similarly on the basis of keywords like "case", "prosecuted", and the relative percentage of complaints was noted for every month. Two kinds of complaints were considered in the analysis. Firstly, complaints for wrong cases made by KTP for violating the traffic rules, and secondly, complaints made by users regarding other vehicles, that do not comply the rules or refuse to operate or provide service. R Packages "ggmap2", "WordCloud" has been used for visualization purpose.

# 5 Results

## 5.1 User engagement Statistics

One of the primary objectives of the work is to deduce the citizen outreach and interaction of the common public with the local departments via social networking sites. The number of views a post gets, and the relative increase of the views would have accurately measured the citizen outreach. However, Facebook API does not allow the users to extract the view count of a post. Therefore, like, comment and share count are considered as surrogated indicators.

**Frequency of posts**

**Table 2.** No. Of Page owner posts, posts on weekend and average posts per day arranged month-wise

| | Nov'16 | Dec'16 | Jan'17 | Feb'17 | Mar'17 | Apr'17 | May'17 | Jun'17 | Jul'17 | Aug'17 | Sep'17 | Oct'17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Posts | 83 | 60 | 70 | 55 | 72 | 54 | 54 | 59 | 88 | 36 | 39 | 103 |
| Posts on weekend | 25 | 9 | 6 | 10 | 3 | 5 | 1 | 3 | 3 | 5 | 7 | 6 |
| Avg. posts/day | 2.76 | 1.93 | 2.25 | 1.96 | 2.32 | 1.8 | 1.74 | 1.97 | 2.84 | 1.16 | 1.3 | 3.32 |

Table 2 shows the no. of posts, posts on weekend and average posts per day made by KTP from November 2016 to October 2017. This table gives a clear indication about the fluctuating frequency in posts by KTP. Along with irregular posting nature, it can be deduced that very few posts are made during the weekend relative to the total number of posts made in that particular month, hence lesser activity and interaction is observed during weekends compared to weekdays.

**Like, Comment and Share Count**

Table 3 shows the distribution of like count, comment count and share count per month. Highest number of likes, comments and shares is recorded for the month of October, when the number of posts is 103. However, better engagement statistics are observed for the month of June, July and August owing to a large number of comments, like and share count out of lesser number of posts. Thus, we define a parameter - Interaction using likes as indicator for measuring the engagement is given by:

$$Interaction = \frac{Total\ Like\ Count\ of\ a\ particular\ month}{Total\ Page\ owner\ posts\ of\ a\ particular\ month}$$

Thus, highest interaction using likes as surrogated indicator is recorded for August 2017, whereas lowest interaction of the public with the official page is noted for December 2016. Similarly, we can obtain the interaction using comments and shares as surrogated indicators for measuring engagement.

Video updates also get a high amount of outreach, however, the frequency of video posts is the least. The multimedia features of social networking website are indeed successful in catching users' attention and expanding the online community. Based on the statistics obtained, KTP is focused on increasing the reach of its posts by increasing the number of updates, maintaining a ratio between status and photo updates, and attempt to post videos in a month to create a much-needed buzz. Fig.1. highlights the percentage breakup of likes obtained from various types of posts and videos and photos are more popular than the other two types. Statuses, which are mainly composed of traffic updates, do not generate a high number of likes, comments or shares.

**Table 3.** Likes, Comment and Share Count from Nov'16 to Oct'17

| | Nov'16 | Dec'16 | Jan'17 | Feb'17 | Mar'17 | Apr'17 | May'17 | Jun'17 | Jul'17 | Aug'17 | Sep'17 | Oct'17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Likes | 1551 | 972 | 1190 | 1270 | 1000 | 1287 | 2279 | 12493 | 12669 | 16061 | 3674 | 19447 |
| Comments | 35 | 22 | 40 | 114 | 29 | 55 | 142 | 1061 | 988 | 491 | 179 | 2903 |
| Shares | 103 | 96 | 66 | 339 | 112 | 163 | 642 | 1899 | 1880 | 15435 | 1622 | 5094 |

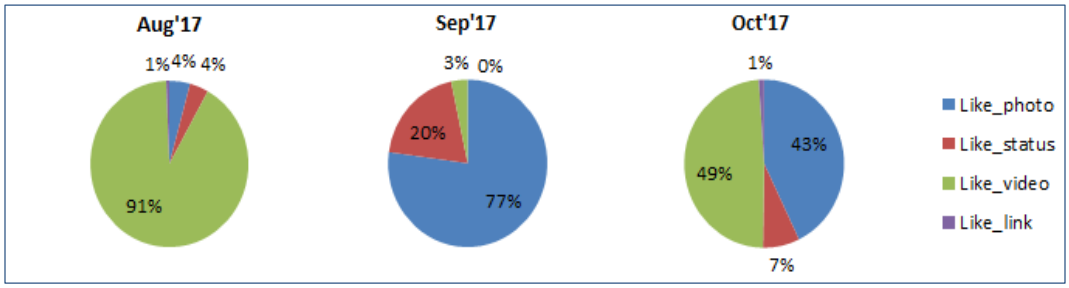



**Fig. 1.** Percentage of Likes on different kinds of posts for the months of August, September and October, 2017

**"No Engagement" Posts**

Fig. 2. shows the percentage of post updates by KTP that do not generate a substantial user engagement. Any post that had likes less than 10 was taken in the category of generating no substantial user engagement. Moreover, months with higher percentage of posts that do not cross threshold have lesser likes, comments and shares compared to other months. February, March, April, May and September have not gained significant user engagement as depicted by Fig. 2. In August, KTP posted a video that got viral, due to which the users seemed interested in KTP's posts, and it saw lesser percentage of "No Engagement" posts, and high increase in number of followers.

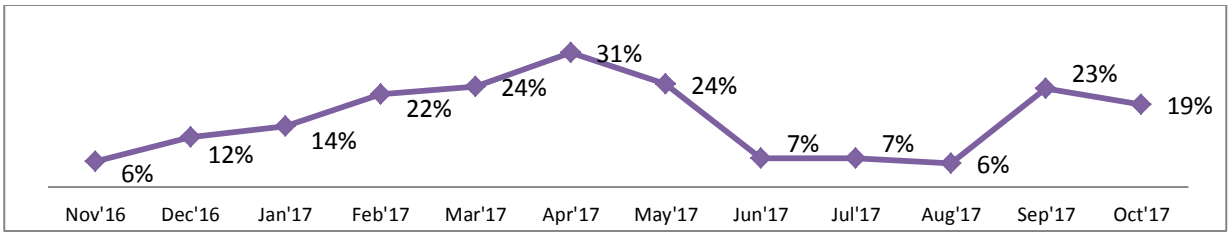



**Fig. 2.** Percentage of posts that do not generate significant user engagement

**Trend in the Increase of Followers**

The number of followers in November 2016 was 95,839, and had a count of 1,34,355 at the end of October. This increase and the trend in increase give knowledge about the reach and popularity of the page. Fig. 3. shows the increase in number of followers every month. The increase pattern definitely shows the fact that the engagement has increased till August, and September and October show lesser engagement.

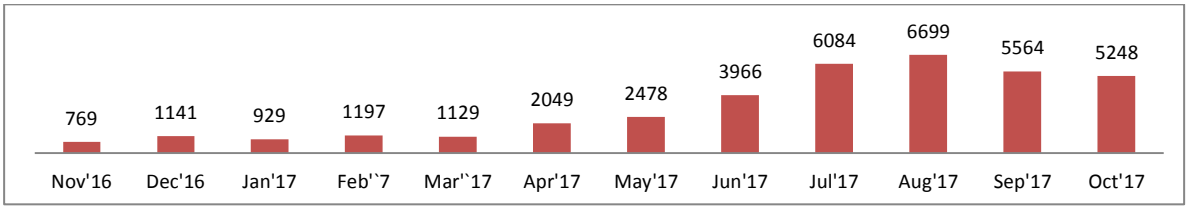



**Fig. 3.** Increase in the number of followers per month

## 5.2 Complains from Visitors' Post

In our study, we have extracted two types of complaints as mentioned in Section 4. Type 1 refers to complaints made for KTP imposing wrong cases on individuals for violation of traffic rules. Type 2 refers to complaint made on specific vehicles for violation of rules, bad behavior, and denial of service. Fig. 4. shows the percentage of Type 1 and Type 2 complaints in visitors' posts. The graph of Type 1 decreases from January to October 2017, showing that KTP is making an effort to reduce the mistake of lodging wrong complaints.

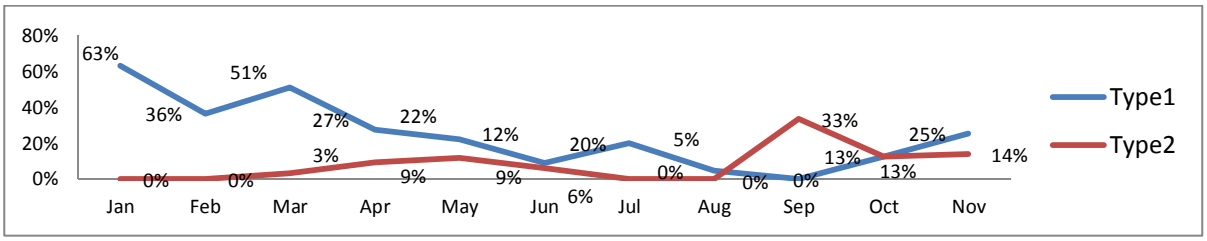



**Fig. 4.** Percentage of Type 1 and Type 2 complaints

## 5.3 Traffic Updates

KTP makes updates on the current Traffic situation in Kolkata. In our study, we extracted the number of posts that concentrate on traffic. The number of status updates have increased from June to October (depicted by Table 3), indicating that KTP is focusing more on the primary objective of informing people about the congestion as fast as possible through this media tool. From the congested places, certain locations like Chingrighata, R.R. Avenue occurred in the top congested locations' list in almost all the months. The list is quite useful for finding out the trend in traffic control of locations and if KTP is paying attention to frequently congested places. In our work, a google map is also produced that shows the top congested places in a month. Fig. 5. shows the congested places in the month of October, 2017. Places with a bigger spot were more frequently jammed than the ones with a smaller mark. In our study, we are able to find out the reason for congestion, if mentioned by KTP.

The reasons for congestion are religious, cultural and political procession, dispersal of School, and construction work, where political gatherings and dispersal of School are the most frequent reasons for Congestion.

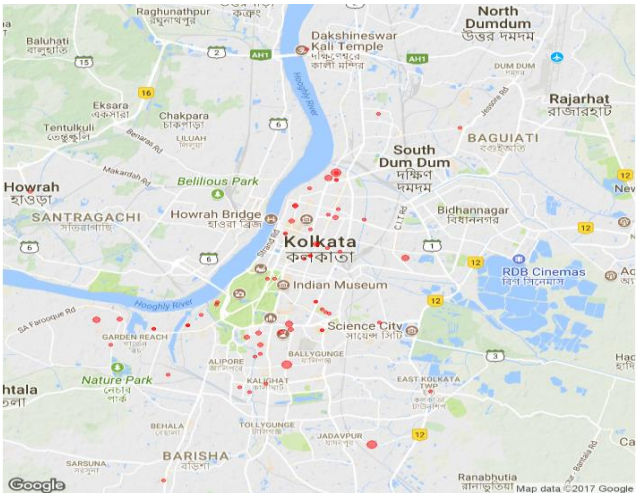



**Fig. 5.** Google map representing the congested places of Kolkata in Oct'17

### 5.4 Sentiment Analysis

We have applied sentiment analysis on user reviews of the Kolkata Traffic Police using Emotion Categorization, Polarity Categorization and Word Cloud as mentioned in Section III. The algorithm was applied on a bimester for better results. The user reviews frequency shows a progressive trend with the frequency of reviews increasing, culminating during the period of September-October and then sharply falling back for the next bimester. Positive sentiment for the Police force is highest during the time of September-October due to a number of festivals like Durga Puja, Diwali as seen in Fig. 6. The positive reviews are mainly on accounts of excellent traffic and crowd management as the streets are very busy during this time. Many reviews also empathize with the police force for their dedication as these holidays are usually categorized as a family event. Positive sentiments for other months can be generalized to factors like effective traffic control, manual clearing up of water- logged areas, empathy for police force during extreme weather conditions and individual experiences like car breakdown or lost items.

Fig. 9. and Fig. 10. delineate the polarity of sentiment expressed in the reviews. The months of March and April show a low sentiment score mainly due to harassment, bad traffic management, corruption and false cases. Cases of harassment include unprofessional behavior such as public humiliation and the use of profane language. False cases include wrong traffic violation cases imposed on individuals. Complaints about bad traffic management deals with violations committed by buses, auto-rickshaws as well as space encroachment by hawkers and peddlers leading to congested roads. Corruption reviews talk about the bribery and extortions made by some police officers.

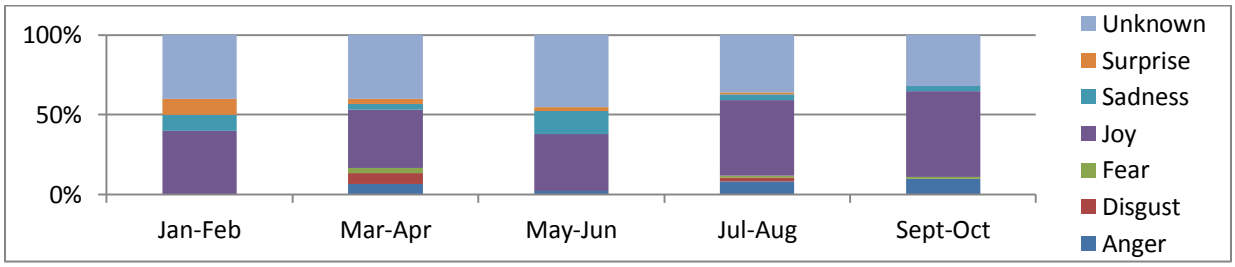



**Fig. 6.** Emotion Categorization from January to October, 2017

The word cloud displayed in Fig. 8. is used for visually portraying keywords or tags more frequently used by the users. The size of the words in the word cloud represents the frequency of words. Reviews on bikes are greater than that of taxis, followed by autos. The word 'good' is most often characterized with the KTP. However it should also

be noted that words like ‘money’ and ‘fine’ are also used which indicates bribery and fines charged due to violation of traffic rules. ‘Drivers’ is a common word when it comes to roads and traffic so it occupies a large space; users most often use it to describe the unprofessional and rash driving of bus and auto-rickshaw drivers. ‘Drivers’ is also used in the case of absenting Uber or Ola drivers frequently.

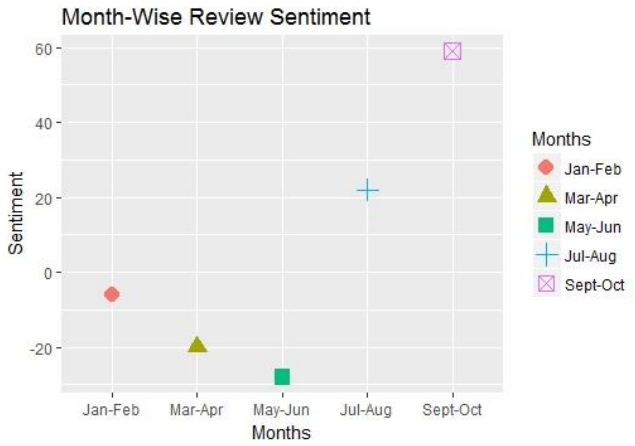



**Fig. 7.** Sentiment Polarity of Reviews from January to October 2017

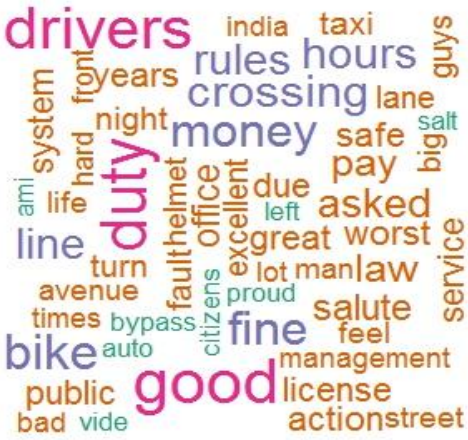
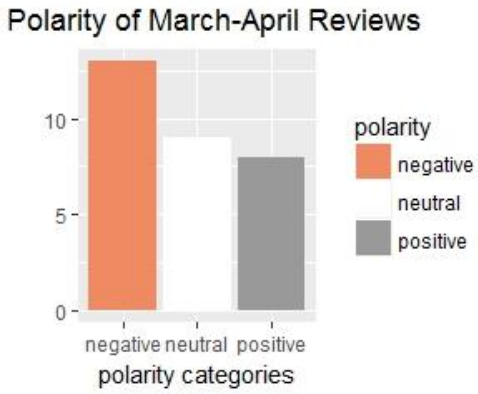



**Fig. 8.** Word Cloud for the Reviews from Jan-Nov’17



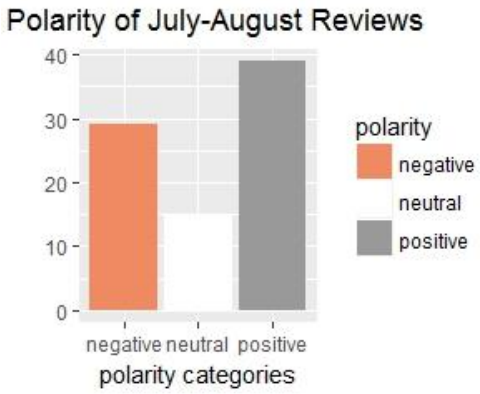




**Fig. 9.** Polarity Graph for Reviews of Mar’17-Apr’17

**Fig. 10.** Polarity Graph for Reviews of Jul’17-Aug’17

## 6 Conclusion

The local police department plays an important role in dispersing information about the city, and this role has only become bigger with the advent of social media. In this paper, we have analyzed the interaction of Kolkata Traffic Police and the users on the Facebook platform and have proposed a methodology to visually represent large amounts of information that will simplify the understanding of both the concerned authorities as well as the civilians. Our proposed method, firstly analyzes the user interaction, which will help the concerned authorities to effectively utilize it to increase interaction and awareness. It has been established that the type of posts- like photo and video updates is enhancing the user engagement, and the multimedia features of Facebook are attracting audience. Secondly, it tracks the complaints from users, which will help the police to serve better; thirdly it plots the traffic updates that are helpful for the public in knowing the congested places, without scrolling through the textual updates all the time. Lastly, it analyzes the sentiments of the users that will help the police force to rectify their flaws, and know the major concerns of the public.

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