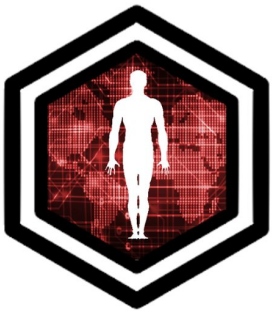

N/LAB

Analysis for TV series 'Killing Eve' using Twitter

Module Name:Analytics Specialization and Applications

Academic Year: 2018/19

Name: Shangrui Zhao

Student ID: 4339853

Word count: 2506

1. Executive summary

Killing Eve is a crime and drama type television series produced by the Company *BBC America* in United Kingdom describing the love and hate relationship in the process of Eve Polastri, an MI5 officer, tracking Villanelle who is a psychopathic assassin. After the first season won massive success, the second season broadcasted on 7th April 2019. The analysis aims to examine the public's view about the TV series *killing Eve* with Twitter data for later TV series production as *killing Eve* season 3 is renewed already and providing insights for *BBC America* in TV series production. Micro-influencers rank is also generated for the next period social media marketing strategy planning. As a comparison, *the chi*, an American drama series produced by Showtime, broadcasts as well on 8 pm Sunday with similar 0.1 audience rating is analysed.

The analysis starts with data collection from twitter and analysis is classified into two parts which are brand analysis (exploratory analysis, text analysis and sentiment analysis) and micro influencer analysis by python code in the document *'Data collection_analysis for 'Killing Eve' using Twitter.ipynb'* and *'Evaluation code_analysis for 'Killing Eve' using Twitter.ipynb'*. Data used is stored in '*BBC America.csv','killing_eve_2.csv', 'villanelle eve.csv' and 'the chi.csv*'. The main data frame combines *'killing_eve_2.csv'* and *'villanelle eve.csv'* removing duplicated. *'Movie_data.tsv'* is used for sentiment analysis as transfer learning reference. Based on all analysis, there is a lack of topicality and heat for *killing eve* compared with *the chi* and also there are potential in the Spanish speaking audience market and Android user market. By weighting engagement most on micro influencer rank, three are recommended for future collaboration.

2. Approach breakdown

In the data collection part (3), data is collected from Twitter with the key search terms and combined with removing duplicated by Tweepy. After data collection and basic description, analysis section (4) starts with an exploratory part by looking at the geospatial location, temporal, retweet, mentioned role, source distribution and official account performance. Text in English is extracted out and is processed with Natural Language Toolkit(NLTK). Part 4.2 is text analysis with word frequent analysis and topic modelling followed by sentiment analysis and dynamic modelling. The micro-influencer analysis presents a rank to select the best match ones. The final part is the insights summarising informative information and providing recommendations.

3. Data collection section

Tweepy is used for fetching twitter. The date for all data is set from 28th April 2019 to 5th May 2019 which is a 7 days period. Tweets not in English and retweets are eliminated for text and sentiment analysis but as informative information, tweets in all languages are fetched, and retweets are kept for the exploratory stage. Keywords used is 'killing eve', which is the name of the product, finding 1,1324 records and 'villanelle eve', which is names of leading roles as many tweets may discuss without mention the name of the drama, seeing 3,458 tweets. The final data combining two and removing duplicated has 14,033 tweets and 8,679 unique users. Tweets about the company *BBC America* are also collected with the search word 'bbc America' obtaining 32,535 tweets and 23,477 unique users. The competitor, searched by keyword 'the chi', has 38,945 tweets with 22,795 unique users.

4. Analysis section

Data collection section finds there are 124,912 more tweets and 14,116 about the *the chi* than *killing eve* which suggests the lack of topicality and heat of *killing eve* on Twitter. The average tweets per user are 1.61 and 1.71 for *killing eve* and *the chi* respectively, suggesting higher loyalty and engagement from the latter. Considering all tweets about *BBC America*, there are 5.1981 % about *killing eve*. In the following analysis section, exploratory analysis evaluates the geospatial location of tweets by plot the distribution of 'lang' , temporal nature of mentions to find the peak day in a week and peak hour in a day, retweet percentage to investigate the engagement, prevalence of role, source to find to most frequent used platforms and official account performance. Text analysis examines original tweets in English to find the most commonly used word and topic to understanding what the audience concern. Finally, the sentiment analysis monitors people's feeling and change over time to find the critical points for further improvement in script design or marketing by evaluating negative tweets.

4.1 Exploratory analysis

- 4.1.1 Geospatial location of mentions using 'lang'

To understanding the geospatial location of the audience, preliminary the 'location' is used. However, since the 'location' is not restricted with entry limitation and end up with unfavorable data quality, 'lang' is used instead of 'location'. Figure 1 displays the top 5 languages used in tweets. The primary language used is English (71.12%) followed by Portuguese (12.66%) and Spanish (6.37%) for *killing eve* compared with *the chi* taking by English (72.69%) followed by Vietnamese (18.77%). Surprisingly, tweets associated with *BBC America* are in Spanish (51.61%) more than English (38.67%) which hints a solid audience basis in Spanish speaking market.

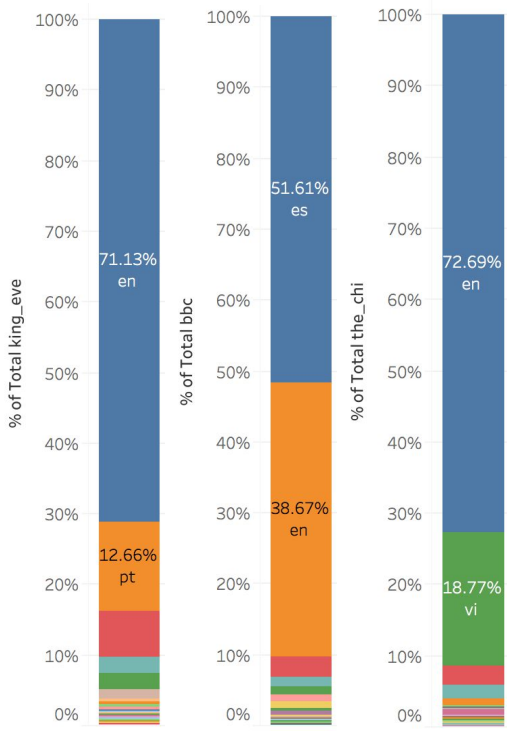

Figure 1 'lang' stacked bar chart (left to right: killing eve, BBC America, the chi)

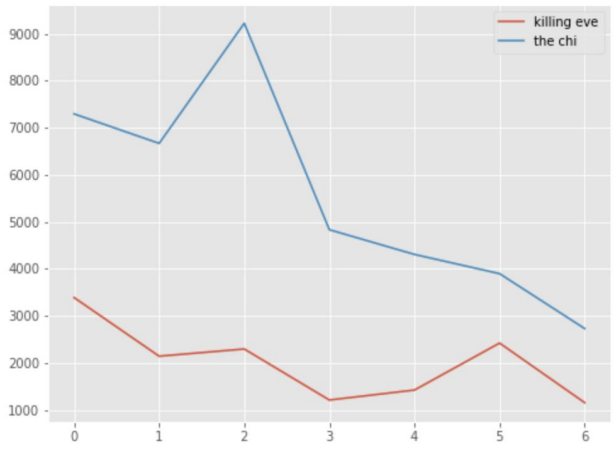

Figure 2 Tweets weekday line chart

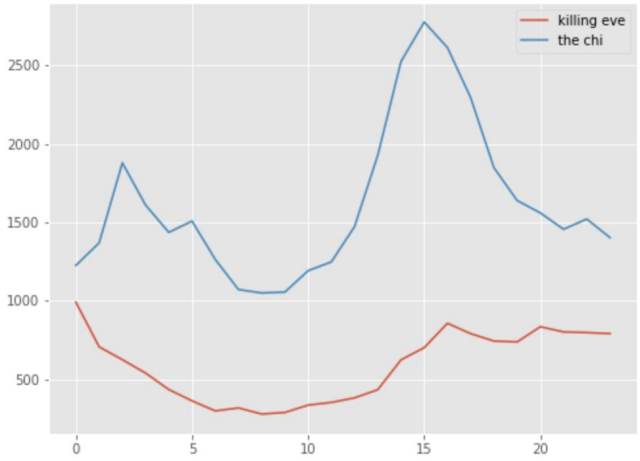

Figure 3 Tweets hour change line chart

- 4.2.2 Temporal nature of mentions

As Figure 2 and 3 suggest tweets about *killing eve* reaches its highest volume on Sunday as it broadcasts on Sunday evening and then decreases in the following weekdays until reach the second peak on Friday. To avoid ambiguity, United Kingdom (GMT+1) is the time zone in discussion. Starting from 7 am as the lowest point, tweets for *killing eve* increase to 4 pm then display a stable high count condition till reaching the highest peak which is midnight then decrease during early morning hours compared with the peak hour for *the chi* is 3 pm.

- 4.3.3 Retweet percentage

The retweets percentage is 30.2% during 7 days for *killing eve* which is similar to *the chi* with a 30.156% percentage. Although an original tweet may suggest a high level of engagement of that particular user, retweet may spread more quickly through the network and go viral.

- 4.3.4 Prevalence of role

As a TV series, it is vital to understand the popularity of characters in audiences. Since all tweets caught with word ‘eve' or ‘villanelle', the popularity only considers supporting roles on their mention times. As figure 4 displays the total number of tweets talking about supporting role is not in a high count with ‘konstantin', ‘carolyn', ‘niko' and ‘hugo' as the top four.

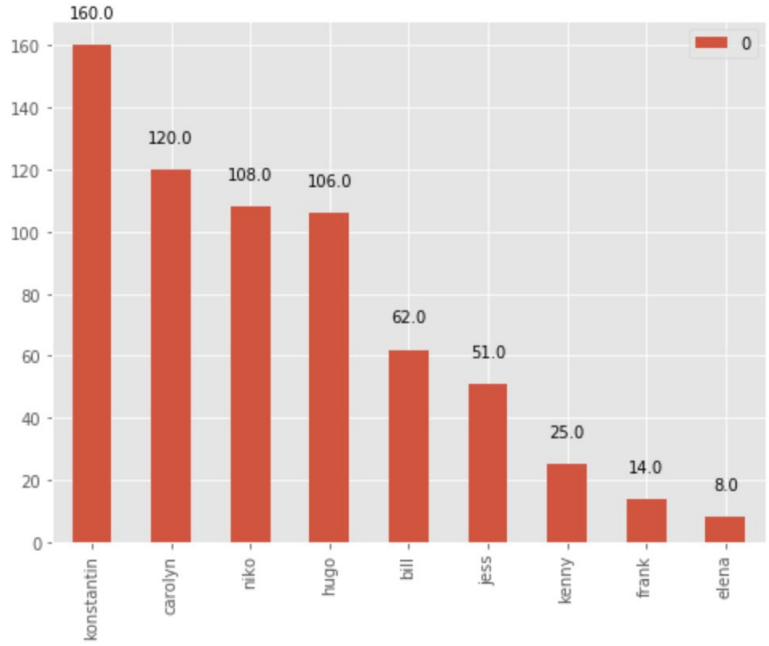

Figure 4 Rank of the count of supporting roles mentioned

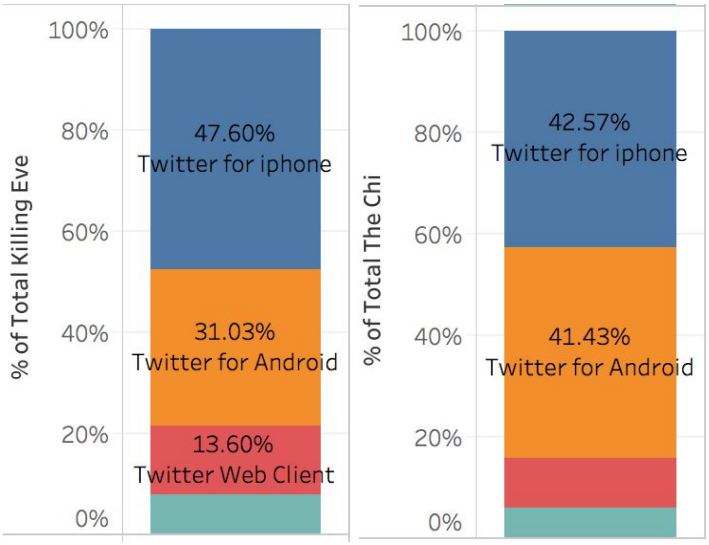

Figure 5 Source stacked bar

- 4.3.5 Source

People tweets via various platforms. Understanding the difference can aid to know how to reach the audience more efficiently. 88.8% of tweets are produced with 'Twitter for iPhone', 'Twitter for Android', 'Twitter Web Client' and 'Twitter Web App'. Among those top four sources of Twitter (figure 5), 'Twitter for iPhone' and 'Twitter for Android' counts for 47.6%, 31.03% and 42.47% and 41.43% for *killing eve* and *the chi* respectively.

- 4.3.6 Official account performance

As figure 6 and 7 displays, '@KillingEve' sent 27 tweets in the seven days and has more followers (72,384), and is listed more (235). The greater retweet count and favourite count represent a higher engagement rate than '@SHOTheChi'.

	id	followers_count	friends_count	listed_count	favourites_count	statuses_count	retweet_count	favorite_count	engagement
count	2.700000e+01	27.000000	27.000000	27.0	27.000000	27.000000	27.000000	27.000000	27.000000
mean	8.471988e+17	72384.370370	2098.333333	235.0	15572.259259	4528.296296	49.333333	289.518519	0.004681

	id	followers_count	friends_count	listed_count	favourites_count	statuses_count	retweet_count	favorite_count	engagement
count	1.500000e+01	15.000000	15.0	15.0	15.00000	15.000000	15.000000	15.000000	15.000000
mean	9.206666e+17	20818.200000	71.0	75.0	17161.60000	4139.466667	23.933333	28.533333	0.002520

Figure 6, 7 Official accounts comparison between killing eve (upper) and the chi (lower)

4.2 Text analysis

To analyse the most common words used and what people mentioned in tweets, only original tweets and those in English are kept. Stripping, stemming, stopping (common English words adding 'kilingeve', 'killing' and 'eve'), tokenization and vectorization are utilised for preprocessing text.

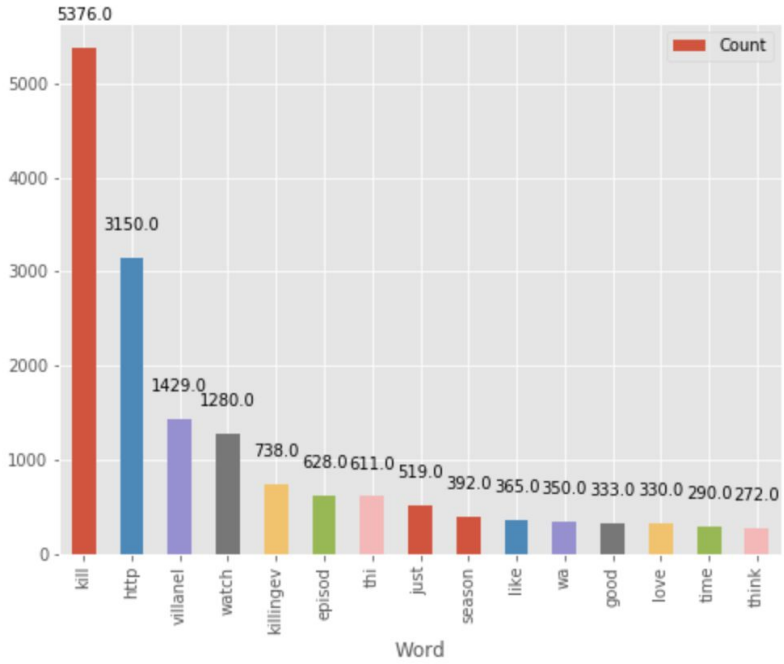

Figure 8 Word frequency

- 4.2.1 Word frequent

As shown in figure 8 indicates the top 15 words frequently used in the tweets in English. 'Kill' is most used followed by' http' as people often put hyperlink in the tweets. 'Villanel' as the primary role is discussed a lot. Other words like 'watch', 'episod' 'time' and 'season' seem expressing the fact that they just finish watching the episode and words such as 'like' 'wa', 'good', 'love' and 'think' representing the comments in a positive way.

```
Topic 0:
kill http time love season episod best new
Topic 1:
bethenni kill amaz bbc amc definit catastroph netflix
Topic 2:
villanel killingev http episod thi just think love
Topic 3:
watch kill just start episod http season final
Topic 4:
good kill fuck realli girl wa morn episod

Topic 0:
http door como bancodeseri dio visto epi com
Topic 1:
http act polastri break london cloth sound skiben
Topic 2:
http game throne onli great got said okay
Topic 3:
http award bafta konstantin que craft carolyn kill
Topic 4:
eve kill http villanel watch killingev thi episod
```

Figure 9 Topic modelling keyword

- 4.2.2 Topic modelling

Non-negative matrix factorization (NMF) and Latent Dirichlet Allocation (LDA) are adopted for topic modelling. Figure 9 shows the results of topic modelling. Topics from NMF are not discriminate enough to be enlightening, but topics from LDA represent a certain level of differences. Since some wrong value in 'lang', topic 0 is in Spanish and it is about the new episode. Topic 1 is associated with the one of the leading role Eve polastri and the place London which perhaps discuss her cloth. Topic 2 links it with another phenomenal drama series 'Game of Throne' and topic 3 is about supporting role Konstantin and Carolyn. The last one is about discussing the episode with another leading role Villanelle.

4.3 Sentiment analysis and dynamic modelling

Monitoring people's sentiment about and trend over time is crucial. The module 'TextBlob' is implemented in python. It is also examined in the second way by building a Naive Bayes model and train with movie reviews with labelled sentiments.

- 4.3.1 Sentiment analysis

TextBlob analysis suggests there are 35.83% positive, 48.45% negative and 15.71% neutral and 39.51% positive, 47.14% negative and 13.35% neutral of all tweets for *killing eve* and *the chi* respectively. As the transfer learning establish the Naive Bayes model with 85.46% accuracy, it indicates 54.44% positive and 45.56% negative tweets for *killing eve*. Majority tweets labelled as positive expressed a praised feeling about it but some tweets marked as negative only have some negative expression but not real negative comments about the drama itself which is worthy for further examination. For example the tweet, '@JHimberg @kristenwarner Times in my TV Criticism class), I need to shift to something else. Maybe I will do Killin…', is actually a positive expression. Another example, 'phoebe waller-bridge..... im begging you please..... come back to the killing eve universe.....', mentions the eager for particular screenwriter and those tweets are informative for the *BBC America* to consult. Hence a CSV file named 'ntweets.csv' is produced and run on a weekly based by the evaluation code.

- 4.3.2 Dynamic modelling

The trend of audience sentiment analysed by TextBlob is shown in figure 10. The percentage of positive tweets are about stable through seven days and approaches peak on Wednesday, and the minimum number of negative tweets is on Sunday as neutral one approaches peak. It may result from the broadcast time is on Sunday and more people tweets about its broadcast before 8 pm and talk over the plot after broadcasting.

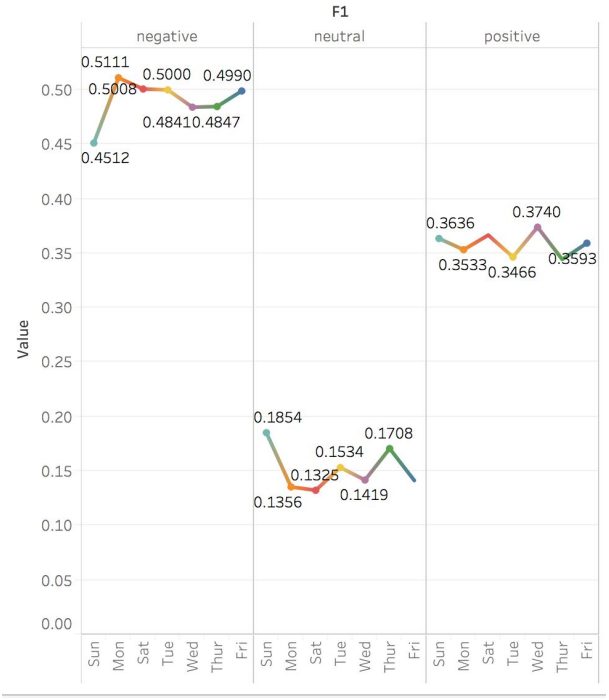

Figure 10 Sentiment change over the seven days

5. Micro-influencer recommendation

In the aiming of identifying potential micro-influencers for next period social network marketing, rank with a weighted matrix is derived. An influential account on twitter should equip with high popularity as a combination of whether it is a verified account and followers counts, actively engage with twitter measured by how many tweets it sends and how many tweets it likes and engagement as the count of retweeted with favourited divided by followers count. The formula (Figure11) calculates the influential index and produce a rank and engagement is assigned most weights as it suggests how efficient the marketing budget being invested.

Index=(popularity: verified* 0.2 + followers count*0.6+listed count*0.2)* 0.35+
(activity=statuses count*0.5 + favourites count*0.5)*0.15+
[engagement= retweet count/(favourite count+followers count)]*0.5

Figure 11 Micro-influencer index formula

Popularity, activity and engagement are normalised before calculate the final index as they are in different units.The rank is filtered by the condition ‘follower count’ over 5,000 as the industry report suggests there is a negative relationship between the number of followers and influencers with less than 5,000 followers have an

average engagement of about 5.3% on Instagram and 1.2% on Twitter. Figure 12 shows the only three micro-influencers ranking as top 20 with a engagement over 5.3%.

screen_name	verified	description	location	followers_count	friends_count	listed_count	retweet_count	hashtags	source	favourite_count	popularity	activity	engagement	index
jillboard	True	columnist @nylonmag. gay writes.	LA	50101	996	312	422	[]	Twitter for iPhone	2984	30123.2	34848.0	0.067983	0.507097
Linds_bluepeter	True	Pickle enthusiast and TV Presenter. Blue Peter...	NaN	10981	1398	38	56	[]	Twitter for iPhone	689	6596.4	18166.5	0.067844	0.501786
chastaen	False	rachel weisz's personal hand holder	NaN	6074	102	108	95	[]	Twitter for iPhone	293	3666.0	35658.5	0.063879	0.474799

Figure 12 Recommended micro-influencer lists

The three listed is the chosen one with the screen name ‘jillboard', ‘Linds_bluepeter' and ‘chastaen'. @jillboard is a columnist for Nylon magazine living in LA followed by 50.8K accounts with a high engagement rate which is 6.798%. The tweets are mostly about TV series, movie and movie which is related to the product *killing eve* and also ‘gay writes' in its description means its audience is right to target. The second @Linds_bluepeter, with 11K followers and 6.784% engagement rate, is a TV presenter for the show Blue Peter which is quite fit for the product. @chastaen, ranking as the third, is a not verified account followed by 6199 accounts and a big fan of film and TV series. At the next stage, those are the influencers recommended taking cost and benefits into consideration. If there are more budget, more influencers can be involved, and a similar rank can also be produced for *the chi* and using influencer from it to take part of its market.

6. Conclusion

From the previous analysis, the count of tweets and unique users of *killing eve* are inadequate compared with *the chi* and also only take a small proportion in tweets talking about *BBC America*. In the language aspect, 71.12% for *killing eve* is in English, and surprisingly 51.61% of *BBC America* is in Spanish which means there are potential to expand the audience speaking Spanish using the impact of *BBC America* for *killing eve*. As Sunday and afternoon and evening are the peak days and time, promotion tweets can be sent during these periods to attain the highest attention. Since Konstantin, Carolyn and Niko attract discussions, screenwriters can consider them more in plot design. The third key point is the potential of the Android user market. The marketing team could promote more precisely on Android users. As topic modelling suggests that most topics are more associated with actors. The content for influencers posts can be adjusted to be more about main characters and also associated with other drama like GoT to attract traffic. Although sentiment analysis is not always accurate, it is worth to monitor the labelled negative ones to see what information obtained and how to adapt it. Three relevant micro-influencers are recommended. For further investigation, influencer rank from competitors can be considered to snatch the market and also for more accurate sentiment analysis, a labelled data can be kept for future transfer learning. A more detailed analysis such as topic modelling and sentiment analysis for each role is also worthy for script justification. Network analysis can be also employed to identify the community to target.