Impacts of a Documentary: *The Social Dilemma*

Analyzing changes in social media usage behavior

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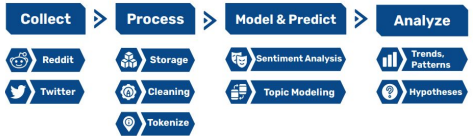
Introduction

- In 2020, the documentary *The Social Dilemma* became the most popular movie on Netflix. It reveals the downsides of the major social media platforms. The popularity of *The Social Dilemma* reflects the public's general concerns about the social media
- **Goal** - Analyze the impact of the documentary, *The Social Dilemma*, on its audience's attitudes towards social media
- **Research Question** - Does knowing this movie increase/decrease/not change people's social media usage?

- **General Pipeline:**



Sentiment Analysis

- Utilized standard NLP preprocessing steps on BrandWatch twitter sentiment data
  - Remove stop words, duplicates (retweets), and URLS; convert to lowercase, lemmatize, tokenize
- Model Pipeline
  - Ordinal encoding for three sentiment categories (Positive, Negative, Neutral)
  - Create a count matrix of tokens using TF-IDF vectorizer
  - Train with Multilayer Perceptron (ANN) Grid Search for hyperparameter tuning

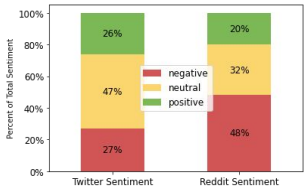
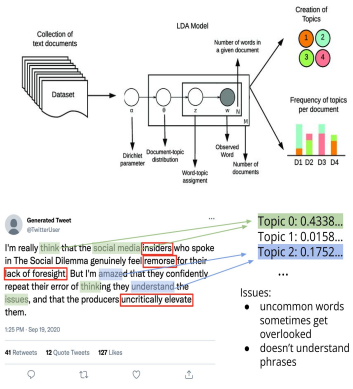


Figure 2. Reddit vs. Twitter Sentiment Distribution

Topic Modeling

- Latent Dirichlet Allocation (LDA)
- Create topic groupings for keywords
- Figure out what posts/comments are talking about



Comparison | Twitter v.s. Reddit

Twitter	Reddit
Sentiment distribution: 50% neutral, 25% negative and 25% positive	Sentiment distribution: 32% neutral, 48% negative and 20% positive

- Differing sentiment distributions between platforms align with a 2018 study[3] : Reddit users gives longer comments with more in-depth description and more negative sentiment while Twitter users write shorter posts in more neutral sentiment, use hashtags and make many retweets

Topic groups:	Topic groups:
1 [discussing users/movie details] - product, pay, user, datum, customer 2 [actions to limit social media use] - phone, delete, notification, app, account 3 [praise for the movie] - recommend, highly, ironic, good, watch 4 [movie commentary] - technology, problem, society, spread, fake 5 [movie information/reviews] - trailer, youtube, podcast, review, unplug	1 [political news] - question, state, vote, qanon, government 2 [actions to limit social media usage] - explain, delete, phone, facebook, recommend 3 [political news] - trump, right, believe, political, propaganda 4 [movie details] - company, tech, google, manipulate, algorithm 5 [details of the main character in the movie] - life, kid, year, feel, maybe

- Twitter topics focus on recommendations and advertisements of the movie with some discussion of big tech companies and fake news. Reddit topics focus on political issues. Both mentioned deleting social media.

Data

- Created pipeline for web scraping Twitter data using Twitter API v2 for academic research[1] and collecting Reddit data by querying the Pushshift Reddit API[2] (Baumgartner et al., 2020)
- Collected user generated posts/comments about the movie "The Social Dilemma" from Reddit and Twitter
- Cleaned Twitter data:
  - Removed retweeted tweets, verified accounts of public interests, URL and foreign language
  - Many tweets with duplicated contents may be posted by bots. We removed bots using ML-based bot detector, Botometer
- Calculated user tweets counts in 30-day period before/after

Tweets	m1	m2	Sentiment	Topic
"There is so much to learn from the movie the social dilemma. It's such a good movie. "	30	14	1	1
"Go watch the social dilemma on Netflix. "	22	20	0	2
"I just watched the social dilemma and I'm now so worried about our future. SO TERRIFYING"	57	89	-1	4

Figure 1. An example of Twitter data edited for anonymization purpose

m1 = number of tweets a user posted within a 30-day period **before** their first tweet on The Social Dilemma
m2 = number of tweets a user posted within a 30-day period **after** their first tweet on The Social Dilemma
Sentiment = 1 (Positive), 0 (Neutral), -1 (Negative)
Topic = groups with different focus of discussion

Statistical Analysis

Data Analysis Procedure
Step 1: Separate the group with m1=0
Step 2: Transform variable
- Normalization: log ratio
- Standardization: minus mean (μ) and divide by standard deviation (σ)

Step 3: Remove outliers 3 standard deviations (σ) away from the mean (μ)
Step 4: Perform one-way ANOVA test

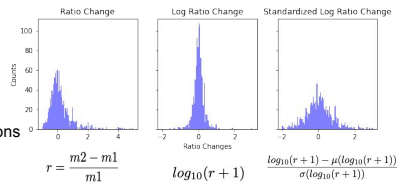


Figure 3. Distribution of 3 ratio changes in Twitter data

Hypothesis Test on Sentiment:
H0: Mean standardized ratio changes for different sentiment groups are equal
H1: At least one standardized ratio change group mean is different from the other groups

Test on 2000 randomly sampled Twitter data

A one-way ANOVA revealed that there was no statistically significant difference in the mean standardized ratio changes for different sentiment groups. We fail to reject the null hypothesis. This means that there are no significant effects among the different sentiments. We can conclude that there is no correlation between users in different sentiment groups and their tweeting behavior.

Test on 2000 randomly sampled Reddit data

A one-way ANOVA revealed that there was no statistically significant difference in the mean standardized ratio changes for different sentiment groups. We fail to reject the null hypothesis. This means that there are no significant effects among the different sentiments. We can conclude that there is no correlation between users in different sentiment groups and their Reddit commenting behavior.

Conclusions

- The statistical results suggest that based on the social media data, the movie did not change people's social media usage
- Our study reveals an interesting pattern: the difference in sentiment distribution and topic groups between Twitter and Reddit shows a difference in user behavior pattern. This may give insights into the different formation of user groups and characteristics of each platform.
- We were able to query Reddit comments using Pushshift Reddit API, a search engine and real-time analytics tracker for Reddit.
- We found that topic modelling is unsupervised, so it should learn directly from the actual data. No training data is required.

References / Acknowledgements

[1]https://developer.twitter.com/en/products/twitter-api/academic-research
[2] https://github.com/pushshift/api
[3] https://arxiv.org/abs/1803.08022

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