Social Media Study of Public Opinions on Abortion in the aftermath of Texas Heartbeat Act

Abhijeet Sangam Talaulikar
University of Rochester
Rochester, NY, United States
atalauli@ur.rochester.edu

Siddhartha Susarla
University of Rochester
Rochester, NY, United States
ssusarla@ur.rochester.edu

***Abstract*— TX SB8 is the first time a state has successfully imposed a six-week abortion ban since Roe v. Wade, 410 U.S. 113 (1973), making no exceptions for rape or incest. The law is designed to be difficult to challenge in courts by relying on enforcement by private individuals through civil lawsuits, supposedly granting Texas protection under the 11th Amendment. Our study aims to gauge the public opinion on the law and thereby providing commentary into its political feasibility. We study the opinions of Twitter users across 30 states in the United States who actively tweeted during the commencement of the law and make three major contributions. To summarize, (1) using the publicly available self-disclosed information of Twitter users, our study analyzes the participation patterns in the movement; (2) we identify major topics in discussions; (3) Using ensemble methods we predict public opinion on the divisive law and find that the movement varies across user characteristics. We show that the public opinion slants overwhelmingly negatively apropos the law. To our best knowledge, this is the first large-scale social media study to understand public opinion on SB8.**

Keywords — twitter, stance, opinion, Latent Dirichlet Allocation, sentiment analysis, BERT, text classification

I. Introduction

Stance analysis is the field dealing and analysing people's opinions, sentiments, and attitudes, behavioural responses to certain events or incidents based on the written language available. In the last years, Stance Analysis has become a hot-trend topic of scientific and market research in the field of Natural Language Processing (NLP) and Machine Learning with applications in brand research, market analytics, customer feedback analysis currently in the forefront of the industry. In our study, we use sentiment and stance analysis to conduct a social media study of public opinion of 25,000 Twitter users across 30 states in the United States ranging from Aug 30th to Sept 7th , 2021, and by conducting predictive analysis, we find public opinion and its movement across user characteristics.

The main goal of our study is to assess the kinds of demographics the law is looked at favourably upon and uncover any distinctive combination of user characteristics and opinions and sentiment on the provisions of the law.

II. Related Work

In this section, we examine similar studies pertaining to analysis of opinion or stance prediction that make use of microblogging data.

Lyu et al. [1] conducted a first-of-its-kind large-scale social media-based study to describe users in terms of their use of problematic phrases during a significant crisis, which served as a baseline study for our work. The study extracts user information such as geolocation and sentiment using Twitter data. Profile images are used to infer age and gender. To anticipate how likely people are to use contentious terms to describe Covid, a categorization algorithm is used.

Another study by Xiong et al. [2] looks at how different people feel about working from home based on their tweets. The user's profile description is used to infer demographic information such as age, gender, and ethnicity. Based on a topic modelling approach, it extracts textual information to determine the most spoken themes on the subject and how they change among sections of the population.

H. Lyu et al. [3] have a conducted a related study to predict a person's opinion on Covid vaccines based on their demographics and social capital as extracted from Twitter.

III. Methodology

Since our analyses are based on Twitter data, we collected 36,000 tweets using Twitter Developer API based on two popular hashtags - #prochoice and #prolife. To ensure relevance of data we chose a timeframe of 31 August 2021 to 6 September 2021 for our study. This was majorly driven through observing the public interest on the keyword "abortion" on Google Trends as seen in Fig 1.

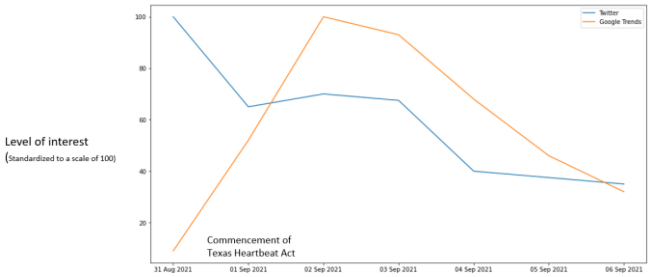

Fig. 1. Level of interest on the subject

A. Preprocessing tweet texts

Texts posted on microblogging platforms are inherently messy. We discard links, emojis, digits and other non-alphabetic characters. The tweets are further lemmatized using the WordNet Lemmatizer and common stop words are filtered out.

We perform another check for domain-specific stop words by identifying the 20 most common words in tweets such as abortion and ban which do not contribute to our models.

B. Predicting stance in tweets

Stance is higher level concept and is harder to predict than sentiment. We hand labelled 1000 tweets randomly sampled from the whole dataset. BERT, a pre-trained language model, was trained and evaluated on this labelled dataset to achieve a F1 score of 70%. This model was then used to

label the remaining 35,000 tweets as in support or against abortion.

C. *Identify sentiment in tweets*

We use VADER (Valence Aware Dictionary for Sentiment Reasoning), a text sentiment analysis model that is sensitive to both emotion polarity (positive/negative) and intensity (strong) which served to provide baseline semantic features for our text data.

The sentimental analysis of VADER is based on a lexicon that maps lexical elements to emotion intensities, which are displayed to as sentiment scores. A text's sentiment score can be calculated by adding the intensity of each word in the text. This helped us identify the polarity of words used in the tweets.

D. *Infer demographic features of Twitter user*

From the tweets we got around 25,000 unique users for whom we extracted the following features.

- M3 Inference, a deep learning model trained on a massive Twitter dataset was used to gender, age and whether the account was an organizational account. The inference was based on profile pictures, name, username and profile descriptions of Twitter users.
- We used DeepFace, a framework for face attribute analysis, to infer ethnicity of the user through profile pictures.
- Since majority of the users do not attach a geo-location to their profiles, we relied on finding words like Texas, TX or names of cities in profile descriptions to infer whether a user was Texan or not.

E. *Predict opinion of Twitter user*

The features age, gender, ethnicity, and location were used to predict the opinion of the Twitter user. We trained a stacking ensemble model with level 0 models being Logistic Regression, K-Nearest Neighbors (K=5), CART (Max-depth=5), SVM (C=1) and Naïve Bayes.

F. *Identify key topics in discussions*

Latent Dirichlet Allocation model was trained separately on tweets in support of abortion (positive) and on tweets against abortion (negative). Number of topics is chosen as 10 based on prior domain knowledge and to achieve an optimal coherence score. For the positive opinion, dominant topics identified were *healthcare, nationalism, unborn* and *religion*. For the negative opinion, topics identified were *healthcare, religion, human rights/choice* and *unborn*.

Further analysis is done to find whether a Twitter user's demographic features are associated with their opinion on abortion and which topics they are likely to speak about.

IV. Results

A. *The Texan Opinion*

Our study would not be complete without understanding how the people in Texas felt about the new law in their state.

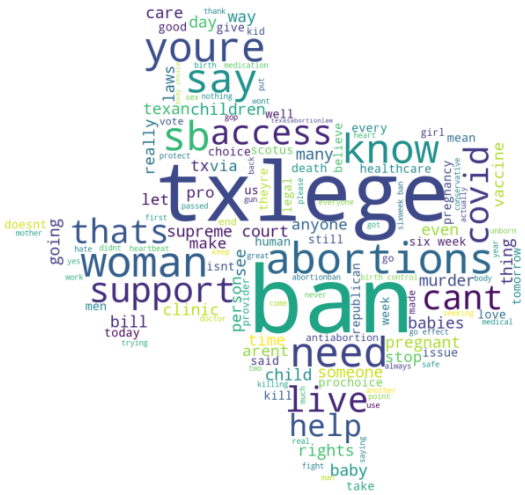

Fig. 2. Word cloud of tweets by Texans

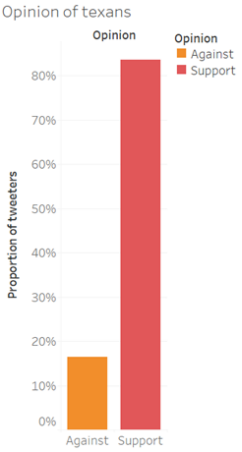

Fig. 3. Opinion distribution in Texas

As seen in Fig. 2. Texans discussed a whole range of topics but mainly referenced the Texas Legislature and called for support to women. Over 80% of Texans were in support of abortion as per Fig. 3.

B. *Dominant groups and demographic make-up*

The FP-Growth algorithm with a threshold of 10%, allowed us to identify the following 4 groups that were tweeting actively when the law commenced.

- White males above the age of 40 years
- White males around the age of 18 years
- White females above the age of 40 years
- White females between ages 19 and 29 years

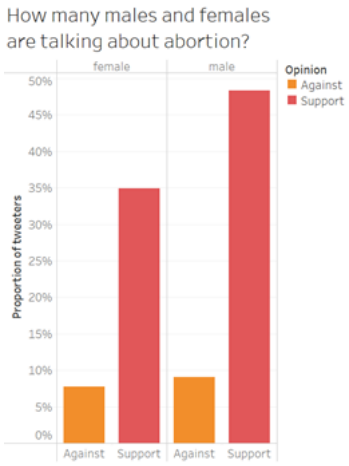

Fig. 4. Gender distribution in Twitter data

According to Fig. 4. a larger number of males were actively tweeting about abortion as compared to females.

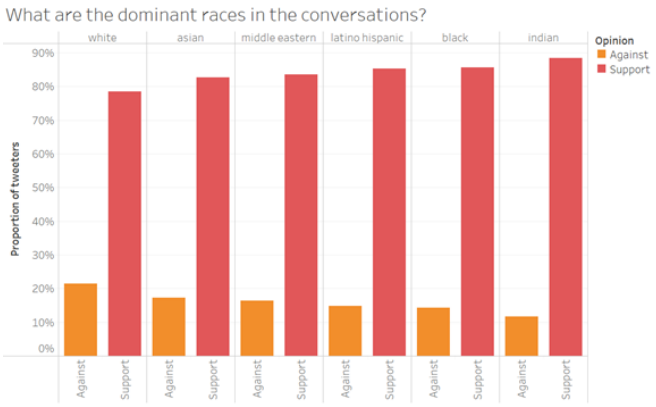

Fig. 5. Ethnic distribution in Twitter data

According to Fig. 5. whites were more likely to be against abortion as compared to other races.

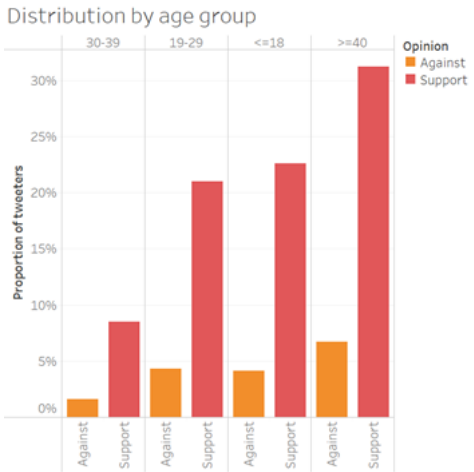

Fig. 6. Age distribution in Twitter data

As seen in Fig. 6. people over the age of 40 years tweeted more actively during the period.

C. Topic Distribution

A majority of the discussions involved human rights and choice. The dominant hashtag here was *#prochoice*.

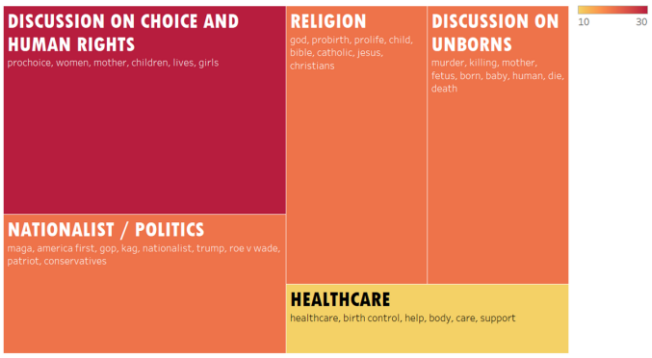

Fig. 7. Topic Distribution (LDA coh. score 36%)

Other popular discussions were on politics and healthcare. Users also discussed the religious perspective on abortion and the dominant hashtag was #prolife while words such as *bible*, *catholic*, *Jesus* and *Christians* were used. There were widespread discussions on whether the fetus had rights with negative words such as *murder, killing* and *death* being used.

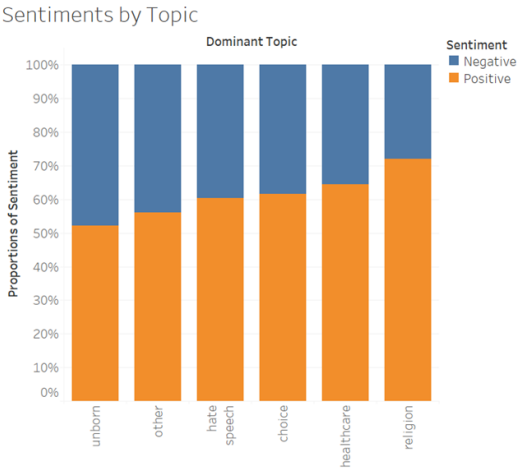

Fig. 8. Sentiments across topics

Clearly, discussions involving religion fetched the most positive sentiments (refer Fig. 8.) while the largest proportion of negative sentiments were in discussions around unborns.

D. Popular topics by demographic features

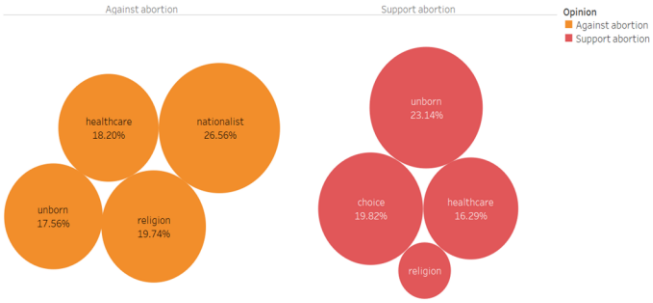

Fig. 9. Topic Distribution by Opinion

Among the users who were against abortion, the dominant topic was politics/nationalism. Also, a greater proportion of these users wrote about religion as compared to those who were in favor of abortion (refer Fig. 9).

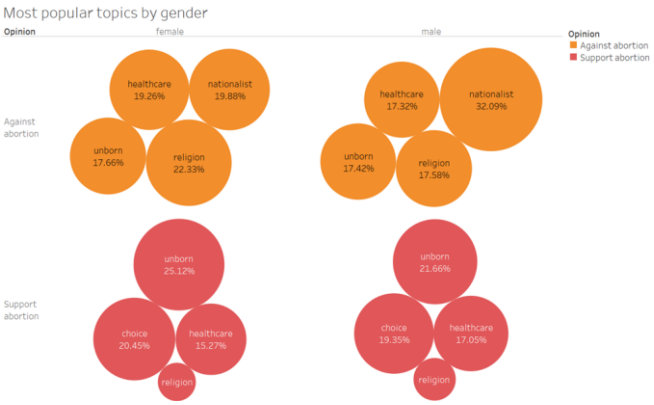

Fig. 10. Topic distribution by gender

Among the users who were against abortion, males were more actively writing about politics while females were writing more about religion (refer Fig. 10).

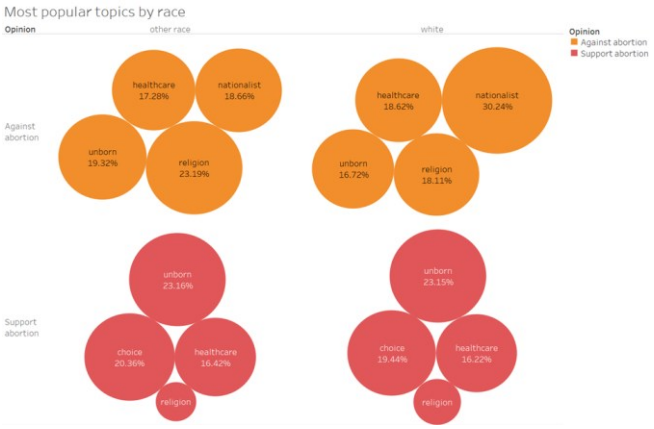

Fig. 11. Topic distribution by ethnicity

Whites were more likely to write about politics than the other ethnicities. The other ethnicities wrote more about religion compared to whites (refer Fig. 11).

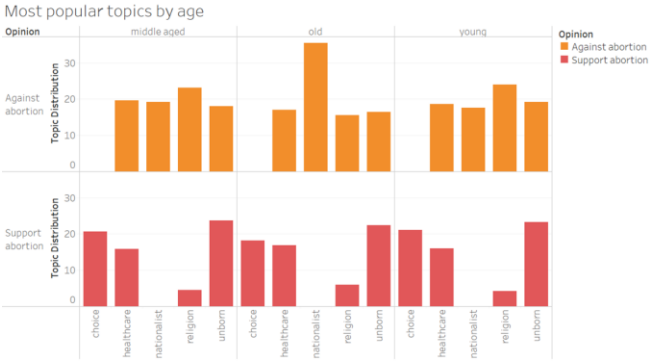

Fig. 11. Topic distribution by age

We did not notice much difference in the topics discussed by different age groups except that the older users who were against abortion were more likely to write about politics (refer Fig. 11).

E. Other interesting learnings

There were some discoveries which highlight the challenges to models but also enable us to understand the prevalent thoughts associated with our subject.

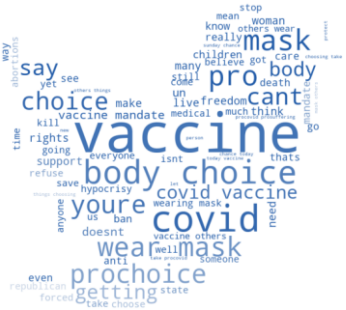

Fig. 12. Word cloud illustration of strawman argument

The most interesting discovery was the heavy usage of strawman arguments (refer Fig. 12) in tweets. In the context of abortion ban, users wrote about the hypocrisy among self-proclaimed "pro-life" lawmakers who refused to wear masks or get vaccinated.

There were extreme comparisons (refer Fig. 13) made such as comparing Texan lawmakers with the Taliban. A popular hashtag here was *#TexasTaliban*.

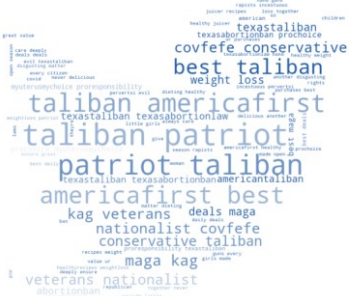

Fig. 13. Word cloud illustration of extreme comparisons

There was an increased focus on the republican party (refer Fig. 14) and hashtags such as *#maga* or *#kag* were used.

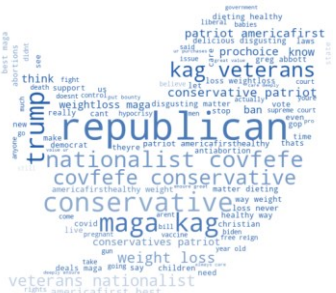

Fig. 14. Word cloud illustration of political focus

A large number of tweeters called people across the country to donate to the abortion funds (refer Fig. 15) that were started to support Texan women who wanted to get an abortion.

Fig. 15. Word cloud illustration of call for funds

F. *Classification results*

The stacked model to predict the likelihood of a Twitter user supporting abortion was trained to achieve an accuracy of 96%. We see that the stacking model performs better than the individual models (refer Fig. 16) through several runs.

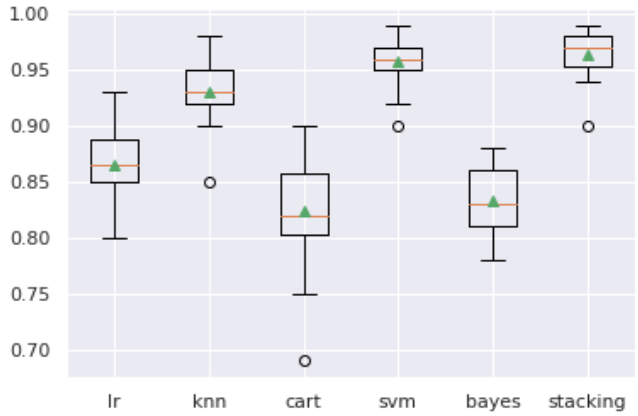

Fig. 16 Model evaluation results

G. *Challenges with Twitter data*

It is easy to clean grammatically noisy data but semantic noise is challenging to deal with for any problem involving social media posts.

- Hashtag manipulation
  Several Twitter accounts misused the hashtags #abortion and #prolife to advertise products or highlight unrelated issues such as Afghanistan.

- Sarcasm
  Tweets where a user stated an opinion by subtly mocking the opposing opinion tended to mislead our classifier.

- News reporting
  It was challenging to filter the tweets where news accounts were simply reporting the law rather than taking a stance.

V. Conclusion

Our findings show that the passing of Texas Heartbeat Act was a universally unpopular move among voting age Texans and the country at large. We established an association between demographic factors and opinions on abortion.

Notwithstanding the various challenges associated with microblogging data, this study serves as a general paradigm for analyzing public response on any controversial law.

References

[1] H. Lyu, Y. Wang, L. Chen and J. Luo, "Sense and Sensibility: Characterizing Social Media Users Regarding the Use of Controversial Terms for COVID-19" IEEE Transactions on Big Data, vol. 7, pp. 952-960, December 2021.

[2] Z. Xiong, P. Li, H. Lyu and J. Luo, "Observational Study of Working from Home during the COVID-19 Pandemic Using Social Media Data" JMIR medical informatics, vol. 9, January 2021.

[3] H. Lyu, J. Wang, W. Wu, V. Duong, X. Zhang, T. Dye, J. Luo, "Social Media Study of Public Opinions on Potential COVID-19 Vaccines: Informing Dissent, Disparities, and Dissemination" Intell Med, August 2021.