

Tweeting in Support of LGBT? A Deep Learning Approach

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ABSTRACT

This paper explores the Twitter deliberation as a response to the Supreme Court of India's verdict regarding the decriminalization of homosexuality. We have collected 0.58 million tweets to gauge the societal perception about the LGBT community whether social media users are supportive or skeptic about sexual minorities. Our deep learning algorithms (accuracy in the range of 85%) have outperformed machine learning algorithms (accuracy in the range of 60%). Furthermore, we note that dominant aspects of *supporting* tweets are revolving around equality, justice, human rights of the LGBT community. On the contrary, *opposing* tweets are perceiving this verdict as a threat to the Indian culture, tradition and the family system.

KEYWORDS

LGBT rights; Twitter; India; Article 377; Deep Learning

1 LGBT: Social Discrimination or Acceptance?

Social oppression and discrimination towards the lesbian, gay, bisexual, transgender, and intersex community, popularly known as LGBTI community, is a perennial problem in the society [2]. A survey of LGBT Americans reveals that 'they feel they have been stigmatized by society' [14]. Alarming, a whopping 58% of the respondents feel that they are subject of slurs or jokes [14]. 39% of the respondent got rejected by either a friend or family member. Shockingly, around 30% of the respondents faced physical attack and got discriminated at a place of worship.

Receiving poor service at public places, such as hotels and restaurants, or getting unfair treatment from the employer is also common [14]. Consequently, these sexual minorities have a higher propensity of mental health disorders due to anti-gay stigma [4]. A global attitudes survey on LGBTI community reveal some disturbing facts and a few positive insights [15]. For instance, 53% of the respondents felt that 'LGBTI should be a crime,' and 68% of the population will not be comfortable if their child is 'in love with someone of the same sex.'

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However, perceptions about the LGBT community are not homogenous. For instance, only 15% of Americans think that LGBTI should be a crime [15]. Interestingly, respondents from Asian and African countries believe that 'same-sex desire is a Western world phenomenon.' This survey also reveals that 81% (52%) of American (Asian) respondents are fine if their neighbors are gay or lesbian [15]. In other words, social acceptance of the LGBT community are not uniform – there is a stark difference between developed and developing countries. Anecdotal evidences, from the Western world, also confirm the same. For instance, in 2015 Katherine Brown became the first openly bisexual governor in the US history [2].

In the same year, the US Supreme court said that same-sex marriage is constitutional, and states must license this marriage. Interestingly, 62% of the Irish population voted in favor of gay marriage, and Ireland is the first country which legalized gay marriage by popular vote [2]. In brief, social acceptance of sexual minorities is higher in western countries in comparison to Asian and African countries. However, prior research on LGBT issues is mostly from the western world. Moreover, the existing literature has mostly considered survey data. Rarely any study has considered the developing economy context, and only a handful of studies have considered social media data to probe this issue. Hence, this study is addressing this research gap by exploring the perception of social media users regarding the Indian LGBT community on the Twitter platform. The following section elucidates the research context, and subsequent sections narrate the methodology, findings, and our concluding observations.

2 Research Context: #377Scrapped

Indian constitution drew heavily from the British constitution due to its colonial past. The British Buggery Act of 1533, which criminalized sexual activities 'against the order of nature,' influenced the Section 377 of the Indian Penal Code. Section 377 says that 'whoever voluntarily has carnal intercourse against the nature with any man, woman or animal shall be *punished* (emphasis added).' In other words, a consequence of homosexual activities can be 'imprisonment for life.' This law has essentially denied the right of choosing a partner for the LGBT community. Nearly two decades back some social activists raised their voice. Some of the earlier court verdicts went against the LGBT community, and some in favor. However, the recent verdict of Supreme Court (SC) of India says that a section of the society 'can not live in a state of fear' and the law cannot deny 'their rights to choice, privacy and dignity.'

Finally, on September 6, 2018, in a historic judgment, the SC said that consensual homosexual activity is not a crime because sexual orientation is natural. Immediately after the verdict, LGBT community, activists and many others in India erupted in joy. The abolition of this archaic law became the trending topic on the Twitter platform. Multiple hashtags, related to this discussion, immediately emerged on Twitter platform. Some of the popular hashtags were as follows: #Section377, #377verdict, #LovesLove, #LoveWins, #LGBT, #IndiaRejects377, #377Scrapped, #IndiaForGayRights and so on. During the period September 6, 2018, to September 17, 2018, we have extracted 0.58 million tweets for this study.

3 Methodology

In this study, we are trying to classify our corpus into *supporting* tweets (which supported the movements by LGBT activists and the Supreme Court verdict) and *opposing* tweets (where users were expressing their displeasure against the verdict because they think that this verdict is in dissonance with Indian culture and value system). Homosexual activities and relationships, in the Indian context, have gained legal sanctity but the intriguing question is whether this historical verdict will enhance the social acceptance of the LGBT community or still they have miles to go.

Deliberation on the Twitter platform allows us to gauge the public opinion about the same. Understanding this public opinion, whether Twitter users are supporting or opposing, is important for policymakers and regulators. From the perspective of natural language processing, this is a binary classification task. However, identifying and manually labeling *supporting* vis-à-vis *opposing* tweets, from a voluminous Twitter corpus, is a herculean task. Hence, we need to develop an automated framework for this task. For the training purpose, we have prepared our gold standard which comprises of 301 tweets where two annotators have unanimously agreed about the classification. Table 1 reports a few sample tweets.

Developing an automated framework for ‘classifying a tweet ... is quite challenging due to the inherent complexity of the natural language constructs’ [1]. Prior literature has mostly considered *machine learning* (ML) based algorithm for text-classification task [6].

Following this stream of research, we have considered Naïve Bayes Classifiers (NB), support vector machine (SVM) with radial basis function kernel (SVM-R), Boosted Linear Model (BLM), and SVM with polynomial kernel (SVM-P) from ‘*caret*’ package, for our classification task [9]. For the construction of training and test corpora, we have considered 5-fold cross validation for all methods. This k-fold cross validation nullifies the potential bias in splitting the training and validation data.

It is worth noting that most of these ML algorithms employ a simplistic approach. However, researchers cautioned that these sort of simplistic approaches ‘do not consider how each sentence is composed (e.g., word ordering) and therefore fail to recognize many sophisticated linguistic phenomena’ [10]. For instance, two sentences with resembling lexical pattern might look similar, such as “iPhone XS is expensive but nice” and “iPhone XS is nice but expensive,” however, in reality, they bear opposite polarity [3]. Similarly, in our context, a tweet “LGBT rights are legally accepted but not socially” might look similar to “LGBG rights are socially accepted but not legally”. However, the opinions regarding social acceptance of the LGBT community in these two tweets are diametrically opposite.

Recent research suggests that *deep learning* (DL) based algorithms perform better, in comparison to ML-based algorithms, in complex situations. Hence, we have considered Multi-Layer Perceptron (MLP), long short-term memory (LSTM), Bi-LSTM (Bi-directional LSTM), and convolution neural network (CNN) for our classification task [5], [8], [11], [16], [17], [18]. Following prior studies [7], we have considered *rmsprop* as our optimizer for the above DL algorithms. Next, we have considered a batch-size of 32 for all four models during the training purpose. We have divided the annotated tweets in 80:20 ratios for training and testing purpose. We have considered dropout value of 0.2 as well as recurrent dropout value of 0.2 for LSTM. Our dropout value for CNN and Bi-LSTM are 0.2 and 0.5, respectively. We have also employed softmax activation in our final classification layer.

Public opinions for complex issues, such as LGBT rights, are mostly fractured in nature. Binary classification of the Twitter deliberation, into *supporting* and *opposing* tweets, fails to capture the various latent sub-themes of the discussion. Understanding the latent sub-themes of the discussion is important for policymakers. Aspect-based opinion mining is an effective tool in natural language processing to address this issue [12], [13]. Aspect-based opinion analysis consists of two subtasks as follows: *aspect extraction* and *grouping* of different aspects into a broad category for that particular domain. A tweet like “*LGBT population deserves legal acceptance but the social consequence would be a concern*” contains two aspects namely legal acceptance and social consequence. Aspects can be *explicit* as well as it can be *implicit* [13]. In the above tweet, both *legal acceptance* and *social consequence* are explicit aspects. Many a time implicit aspects are not clear or directly observable as an entity. For instance, a tweet like “*Legal acceptance of LGBT rights can have a detrimental effect on our family systems*” is talking about the social consequence but not explicitly. Understanding the latent sub-theme from these implicit aspects is a challenging task.

Types (#)	Tweet(s) from our Gold Standard
Supporting (179)	#indiarejects377 this is a real time to understand that ALL HUMAN BEINGS are to be respected. I personally congratulate all LGBTQ community. At least as a father now I know, if any of my kid come and say "dad I'm in love with same sex person", I just hug, kiss and support.
Opposing (122)	#IndiaRejects377 So it is legal ... fine. Ask the person on the street does he consider this normal! Does making it legal mean it is normal behaviour? Ask the pseudo liberals whether they will accept their son/daughter being part of LGBT community? That will be the litmus tst

Table 1: Sample Tweets from Gold Standard

Hence, to have a nuanced understanding of the underlying sub-themes within our Twitter corpus, we have employed SenticNet aspect extraction algorithm (refer <http://sentic.net/demos/#aspect>) on our annotated gold standard data to extract the various explicit and implicit aspects [12], [13].

4 Classification Output

Predicted Label	Actual Label						
	NB	Opp.	Sup.	SVM-R	Opp.	Sup.	
NB	Opp.	0.0%	0.0%	Opp.	0.0%	0.0%	
	Sup.	41.0%	59.0%	Sup.	41.0%	59.0%	
	BLM	Opp.	26.2%	3.3%	Opp.	39.3%	47.5%
		Sup.	14.8%	55.7%	Sup.	1.6%	11.5%
		MLP	Opp.	36.1%	11.5%	Opp.	31.1%
	Sup.	4.9%	47.5%	Sup.	9.8%	52.5%	
Bi-LSTM	Opp.	34.4%	3.3%	Opp.	31.1%	4.9%	
	Sup.	6.6%	55.7%	Sup.	9.8%	54.1%	

Table 2: Confusion Matrix for ML & DL methods

The following section reports the classification accuracy of both ML and DL-based algorithms (see Table 2). It is interesting to note that DL-based methods have significantly outperformed the ML-based methods.

The classification accuracy of NB, SVM-R, BLM and SVM-P are 59%, 59%, 82% and 51%, respectively. This low accuracy (except for BLM) is a serious concern for our binary classification task. Instead, the performance of DL models is significantly better. The classification accuracy of MLP, LSTM, Bi-LSTM and CNN are 84%, 84%, 90% and 85% respectively. We probe why ML-based methods failed miserably, and note both NB and SVM-R have labeled all tweets as supporting tweets (see Table 2).

A fine-grained understanding of the research context reveals a complex pattern. For instance, some of the hashtags were clear in their ideological orientation, such as #IndiaForGayRights or #Homosexuality_not_accpeted. However, some of the prominent hashtags, such as #IndiaRejects377 were generic. Let's assume that in our gold standard #IndiaRejects377 hashtag was used by 60 supporting and 20 opposing tweets. Now, a simplistic approach will associate this hashtag with the former class, and a probabilistic model, which ignores the word order, will classify all tweets with the above hashtag as supporting tweets. Implicitly this low accuracy of ML-based algorithms confirms the argument of [3]: a probabilistic approach ignores sentence composition and, subsequently, fails to decipher the complex linguistic context [10].

Table 3 reports some of the wrongly classified tweets and it elucidates the complexity of our classification task. For instance, some algorithms wrongly classified the supporting tweets # 1 (issue was American context), #3 (role of Shikhandi, a transgender, in Mahabharat – an ancient Indian epic), and #5 (sexual assaults).

	NB	SVM-R	BLM	SVM-P	MLP	LSTM	Bi-LSTM	CNN
Wrongly Classified 'Supporting' Tweets								
1. "The days of discriminating against gay and lesbian Americans [...] are over." And denial ain't just a river in Egypt. #LGBTequality #KavanaughConfirmation				×		×		×
2. In a landmark case that sees an end to over 150 years of anti-LGBTQ legislation, India have overturned a British imposed, colonial-era law which categorised consensual homosexual intercourse as an unnatural offence. #LoveWins #Section377			×					
3. #IndiaRejects377 Those opposing this kindly tell me in Mahabharat who was Shikhandi? If Lord Krishna was on his side then who are these to oppose?				×			×	
4. #indiarejects377 Finally a decision in 'Right' direction... and happy that the right is supporting is more than left and fundamentalists are as usual opposing any change...				×		×	×	
5. #IndiaRejects377 Our Supreme Court is very bright and dignified We need similar freedom in other walks of life and tightening the noose around rapes, molestation, lynchings and traffic violations #SupremeCourt				×		×		
Wrongly Classified 'Opposing' Tweets								
1. #indiarejects377 Shamelessness died a million times. Sexual perverts having a rave party in TV studios. Disgusting.	×	×	×					
2. #Homosexuality is found in 473 species. #Homophobia is found in only one. Who is unnatural? #Section377 #IndiaForGayRights #Sec377 #Section377IPC #Section377Verdict	×	×						
3. #IndiaRejects377 When I sit in thw train or plane, I will be helpless when the LGBT sitting next to me puts his hands on my thighs and winks at me, since this Homo has been given special rights by Supreme court.	×	×	×		×	×	×	×
4. Congrats, India! Adults Can Now Love And Fuck Whoever They Want!!! With consent and in private, of course!!! #PyarKiyaTohDarnaKya #Section377 #Section377Scrapped #IndiaRejects377	×	×	×		×		×	×
5. #indiarejects377 Resp verdict of Supreme Courts at D outset. Definitely it will hv it's effects inD society *Moral values will be affected*Y ounger generations will be carried away in wrong way*Disbalanced Society*Fail to understand the psychology behind? Overall shameful	×	×	×		×			×
6. #IndiaRejects377 We still respectfully disagree. But, as citizens of India, we accept Supreme Court's verdict: XYZ (Masked Identity)	×	×	×				×	×

Table 3: Sample of Wrongly Classified Tweets

It is worth noting that the context and issues mentioned in these tweets were not so common on the Twitter platform. Consequently, these issues/contexts were scant in our gold standard. Similarly, the #3 opposing tweet was sarcastic. Therefore, most algorithms failed to classify it correctly. # 5 is also a complex sentence – this tweet respects the verdict but is also concerned about the consequence. In brief, Table 3 portrays why classifying a tweet by using an automated framework is a challenging task.

5 Aspect Extraction

The following section reports the various aspects of supporting and opposing tweets (see Table 4). We have extracted the aspects by employing SenticNet aspect extraction algorithm [12], [13]. For brevity, we have not reported all the aspects, but just reported a few aspects and their corresponding tweet. The dominant aspects of the supporting tweets revolve around the theme of ‘equality’ and ‘LGBT rights.’ Twitter users perceived this historical judgment by ‘Supreme Court’ against the ‘archaic’ ‘IPC’ ‘law’ as a ‘win for human rights.’ This verdict was the end of ‘discrimination’ and beginning of ‘dignity’ for the ‘LGBT community’ in one of the ‘largest democracy.’

On the contrary, the skeptical camp viewed the LGBT community as ‘pervert’ and their sexual orientation as ‘abnormal.’ Furthermore, these users felt that this is against the ‘Indian culture’ and ‘tradition,’ and it will have a negative consequence on the ‘family system’ and ‘marriage institutions.’ A significant portion of opposing tweets linked LGBT movement with ‘animal sex,’ and this was a misinformation. Sex with animals is still a legal offense in India, but some of the users have propagated this misinformation regarding the LGBT community and the court verdict on the Twitter platform.

Sample Tweets	Aspect(s)
1. A win for human rights. A win for equality. A win for love. Love is Love #section377 #377scrapped #LoveisLove #LoveWins [Supporting]	Win for human rights, equality
2. Yesterday was black day for Indian culture ... #SupremeCourt have given unnatural decision on #Section377. Nature not allowed unnatural things why should we allowed. [Opposing]	Indian Culture
3. "Laws almost always play an important role in changing mindsets, and by recognising the community's right to love, the Supreme Court has restored the dignity denied to them for a very long time." #loveislove #LGBTQ #Section377 [Supporting]	Dignity, community
4. #LGBT must not be allowed in #Indian Society, it will ruin the family system as well as destroy the composite cultural values [Opposing]	Family system, culture
5. #indiarejects377 Shamelessness died a million times. Sexual perverts having a rave party in TV studios. Disgusting. Friends take care of your children. Keep them away from these perverts, journos & judges. [Opposing]	Pervert

Table 4: Extracted Aspect(s) and Corresponding Tweet

6 Conclusion

We explored LGBT- related Twitter deliberation to understand the societal acceptance of sexual minorities in the Indian context. We juxtapose ML-based and DL-based algorithms for our classification task and observe DL-based algorithms are better suited when the linguistic content is ambiguous and complex. Our aspect extraction algorithm helps us to understand the underlying issues - why a certain section of the society is apprehensive about the LGBT community. Our findings broadly confirm the prior survey-based reports [14], [15]. However, in contrary to these reports, we observe that the Twitter deliberation in the Indian context is mostly supportive of the LGBT rights. Hence, the unanswered question remains whether this is a biased sample or these active social media users, mostly from the younger generation, will be the voice of India in the coming days.

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