



## Machine Learning-Based Data Mining Method for Sentiment Analysis of the Sewol Ferry Disaster's Effect on Social Stress

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Lee M-J, Lee T-R, Lee S-J, Jang J-S and Kim EJ (2020) Machine Learning-Based Data Mining Method for Sentiment Analysis of the Sewol Ferry Disaster's Effect on Social Stress. Front. Psychiatry 11:505673. doi: 10.3389/fpsyt.2020.505673 The Sewol Ferry Disaster which took place in 16th of April, 2014, was a national level disaster in South Korea that caused severe social distress nation-wide. No research at the domestic level thus far has examined the influence of the disaster on social stress through a sentiment analysis of social media data. Data extracted from YouTube, Twitter, and Facebook were used in this study. The population was users who were randomly selected from the aforementioned social media platforms who had posted texts related to the disaster from April 2014 to March 2015. ANOVA was used for statistical comparison between negative, neutral, and positive sentiments under a 95% confidence level. For NLP-based data mining results, bar graph and word cloud analysis as well as analyses of phrases, entities, and queries were implemented. Research results showed a significantly negative sentiment on all social media platforms. This was mainly related to fundamental agents such as ex-president Park and her related political parties and politicians. YouTube, Twitter, and Facebook results showed negative sentiment in phrases (63.5, 69.4, and 58.9%, respectively), entity (81.1, 69.9, and 76.0%, respectively), and guery topic (75.0, 85.4, and 75.0%, respectively). All results were statistically significant (p < 0.001). This research provides scientific evidence of the negative psychological impact of the disaster on the Korean population. This study is significant because it is the first research to conduct sentiment analysis of data extracted from the three largest existing social media platforms regarding the issue of the disaster.

Keywords: data mining, sentiment analysis, data crawling, machine learning, natural language processing

## INTRODUCTION

On April 16th, 2014, the citizens of South Korea suffered from a high amount of stress due to the Sewol Ferry Disaster, which led to more than 300 casualties (1), most of whom were students. During that time, the disaster was such an important issue that more than 600 journalistic outlets published stories about the subject within less than a week (2).

This sort of social disaster has been shown to leave physical and psychological damage on the population (3, 4). Many suffer from depression (5), shock, or even severe heart attacks. In fact,

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epidemiological research has examined the influence of stressful social disaster incidents on acute myocardial infarction (AMI) such as the death of a beloved (6), earthquakes (7), war (8), and World Cup football (9).

Recent developments among big data analysis platforms have led to advanced forms of analysis methods such as Natural Language Processing (NLP) and data mining in medical fields (10). These methods can now be used to analyze consumers' responses to products or brands, predict elections via Twitter (11), predict stock sentiment momentum (12), create decision support systems (13), and predict the success of new movies (14).

Recent trends in research by Hussein et al. (15) proposed a novel semi-supervised learning model based on the combined use of random projection scaling as part of a vector space model and support vector machines to perform reasoning on a knowledge base. Additionally, Zhao et al. (16) attempted an unsupervised three-component framework to expand some pseudo contexts from web to help disambiguate a collocation's polarity. Lastly, Akhtar et al. developed a stacked ensemble method for predicting the degree of intensity for emotion and sentiment by combining the outputs obtained from several deep learning and classical feature-based models using a multi-layer perceptron network (17).

However, no research has been conducted at the domestic level thus far to examine the influence of the Sewol Ferry Disaster on social stress using sentiment analysis, despite the disaster's role as a critical domestic issue. Some studies have made minor attempts, using Twitter alone to analyze social media regarding the disaster (4), but the amount of data was not sufficient to deem it as examining effects at the domestic level. Other social science researches focused on the cause and effects of certain factors in a set timeline (18, 19).

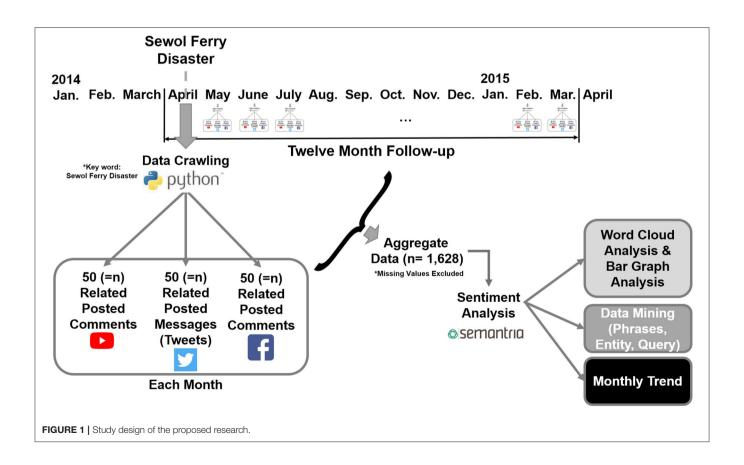
This study analyzed the relationship between the Sewol Ferry Disaster as a social disaster and social stress by conducting sentiment analysis on data from social media. Sentiment analysis, which is an advanced form of NLP and text mining, and the analyses in this study examined data from the top social media platforms used worldwide (YouTube, Twitter, and Facebook). This study provides basic research results for the analysis of the correlation between social disasters and social stress.

## METHODS

#### **Study Design**

The sentiment analysis study design of this article is shown in **Figure 1**. Centered on the keyword "Sewol Ferry Disaster," 50 related posted comments, messages, or tweets were collected for each month. Twelve-month data were aggregated and input to the sentiment analysis machine learning algorithm of Semantria Lexalytics. Analysis of our parameter modified algorithm resulted in word cloud analysis, bar graph analysis, data mining phrases, entity, query topics, and monthly trend analysis.

In this article, "phrases" refers to a small group of words that form a unit, either on their own or within a sentence



	te Data		Word Score			
		<b>*</b>				
1918	PROCESSED	대책위 관계자는 "청와대와 세월호 피해자 유족의 대화에서도 일반인		lorean	1	-0.300000012 negative
1921	PROCESSED	장 대표는 "세월호 참사로 가족을 잃은 유족의 슬픔과 아픔의 무게는 각		orean	1	0.200000003 mixed
1934	PROCESSED	제발 국가는 언론은 단원고 학생들만이 아닌, 일반인 희생자들도 있다는		orean	1	0 neutral
1940 1945	PROCESSED	고등학교 1학년 딸을 둔 직장인 강희숙씨(44)는 하루 종일 세월호 침몰		lorean	0.98666346	0.133333325 mixed
1945	PROCESSED	한국피해자지원협회 안산지역심리지원단은 지난달 21일부터 이달 10일		Corean Corean	1	-0.54139787 negative
1947	PROCESSED PROCESSED	연구를 진행한 공정식 경기대 범죄심리학과 교수는 "40대는 세월호 사 SBS '그것이 알고싶다' 세월호 편, 외압 논란 속 방송 연기애조 '4부작 기		orean		0.15902777 mixed 0 neutral
1963	PROCESSED	SBS 그것이 월고싶다 세월오 편, 되답 온단 속 영종 연기에도 4우석 기 제작본부장의 지시로 아이템 확정 하루 만에 제작이 중단된 SBS <그것		orean		-0.419999987 negative
1964	PROCESSED	지역은 우성의 지지도 아이님 확장 아무 한에 제작이 중한된 383 주그것 SBS <그것이 알고싶다> 제작진은 오는 31일 방송을 목표로 '세월호 침	NG은무영의 지지도 아이봄 특영 N SBS <그것이 알고싶다 > 제작진은 K		1	-0.506250024 negative
1966	PROCESSED	385 < 그것이 물고싶다? 제작전은 오픈 31월 8종을 목표도 제월오 점 김영우 협회장은 20일 <미디어스>와의 통화에서 "처음에 (PD들은) 외		orean	1	-0.449999988 negative
1971	PROCESSED	중격!!!!!!!저들의 진정성 정말 징글징글하다~~~[풀영상] 경찰, 진도가는		orean	1	0.899999976 positive
1977	PROCESSED	중격배배배시골의 신성성 성실 성실성실하다~~~[물성성] 성실, 신도가는 반성한다하고 바로 탄압한 맹바기를 본받을 작정. "@joa2369: 충격!!!!!!!			0.9576875	0.899999976 positive
1978	PROCESSED		RT 주말 이틀동안 '	orean	0.9570875	0 neutral
1995	PROCESSED	성균관대 문과대 휴머니스트회는 스승의 날인 이날 성명을 통해 "우리		a construct	- 1	0.316666692 positive
2001	PROCESSED	세월호 생존 학생들모 중소기업연수원에서 합숙중? 멀쩡한 천안함 생	세월호 생존 학생들 🔘 Serr	nantrio		0 neutral
2007	PROCESSED	세월호"부모들 자결해야"	세월호"부모들 자결		0.9999999	0 neutral
2007	PROCESSED			orean	0.55555555	0.300000012 positive
2018	PROCESSED	양소녀 #딧플? #문재인 대통령님 #세월호 검찰수사 지켜본다!!! 아름			1	0 neutral
2019	PROCESSED	답이 없는 분이네. 소귀에 경읽기도 유분수지 그만하면 소도 알아듣고		orean	1	0 neutral
2032	PROCESSED	박근혜는 세월호 생존자들을 "이명박이가 천안함 생존자들을 집단합숙"		orean	1	0 neutral
2058	PROCESSED	밀양은 세월호 이전의 세월호였습니다.	밀양은 세월호 이전의 세월호였습니 K		0.99999994	0 neutral
2071	PROCESSED	장병수 언딘 기술이사는 7일 오후 <오마이TV>와 한 인터뷰에서 "국가		orean	1	0 neutral
2079	PROCESSED	세월호 참사에 대한 김영하 작가의 뉴욕타임즈 기고문을 소개합니다.'이		orean	0.99473155	0.03964287 mixed
2080	PROCESSED	세궐호 사고 빗댄 한 고등학교 중간고사의 '이상한 시험문제'	세월호 사고 빗댄 한 고등학교 중간 K		0.9888382	-0.333333313 negative
2086	PROCESSED	세월호 추모집회 참가 학생 일당 받았다. 정미홍 주장에 인터넷 '발칵'		orean	1	0 neutral
2115	PROCESSED	#세월호 사태를보듯 박근혜를 비롯 새누리들 정치행위는 비난받고/책임			1	-0.300000012 negative
2122	PROCESSED	세월호 전국 도보 순례단		orean	0.99999999	0 neutral
2129	PROCESSED	[단독] 진도//TS, 세월호 근무일지 위조·영상 삭제 확인 천안함도 동영상			1	-1.149999976 negative
2141	PROCESSED	정미홍, '세월호 알바비' 망언, 이번엔 "김구, 김일성이 세 보이니까"   미	정미홍, '세월호 알바비' 망언 이 K	lorean	0.981118	0 neutral
2143	PROCESSED	세월호 DVR 복원증, 유가족 "아이들 마지막 모습 볼까기도하는 심정"	세월호 DVR 복원중 , 유가족 *아이 K	orean	0.91680664	-0.200000003 negative
2145	PROCESSED	6월 27일 한겨레 1면은 세월호 문책 약속을 내던진 박근혜 대통령, 시국	6월 27일 한겨레 1면은 세월호 문 K	orean	1	-0.450000018 negative
2148	PROCESSED	윤두현 청와대 홍보수석은 이날 "정 총리의 사의를 반려하고 총리로서		Corean	1	0.187500015 mixed
2150	PROCESSED	박 대통령으로서는 세월호 사건으로 드러난 적폐를 뜯어고칠 수 있는 총	박 대통령으로서는 세월호 사건으로 K	orean	1	0.150000006 mixed
2158	PROCESSED	이낙연 전남지사 당선자 "예산 많이 드는 F1 대회 등 재검토" :진도 앞바	이낙연 전남지사 당선자 "예산 많이 K		1	0 neutral
2161	PROCESSED	진도VTS, 세월호 근무일지 위조·영상 삭제 확인 http://durl.me/73yufgw	진도VTS, 세월호 근무일지 위조·영 K	lorean	0.9696101	0 neutral
2167	PROCESSED	세월호 주입 공기에 유해가스 포함됐다   미디어다음	세둴호 주입 공기에 유해가스 포함 K	Corean	1	0 neutral
2169	PROCESSED	김어준의 파파이스(Papa is)#14] 세궐호, 통화삭제, 되다	김어준의 파파이스 (Papa is )# 14 ] Ki	orean	0.8327437	0 neutral
2171	PROCESSED	실종자 아직 11명 남았는데 세월호 잠수사 절반 줄이기로	실종자 아직 11명 남았는데 세월 K	lorean	1	0 neutral
2173	PROCESSED	[단독] 진도//TS, 세월호 근무일지 위조·영상 삭제 확인	[단독] 진도//TS, 세월호 근무일지 K	Corean	1	0 neutral
2175	PROCESSED	김현미 의원. "생존자를 구조한다며 세월호 선체에 주입한 공기가 인체	"생존자를 구조한다며 세월호 선체 K	torean	1	0 neutral

in Korean. The term "entities" is used to describe a larger form of phrases, such as a sentence. The term "query topic" follows the definition provided by the Semantria Lexalytics Korean Pack, which categorizes queries into the following categories: health, science, education, culture, disaster, politics, and religion. "Positive" terms were colored green; "Neutral," gray; and "Negative," red. For example, **Figure 2** shows a screenshot of how Semantria Lexalytics induce entity analysis from raw aggregate data.

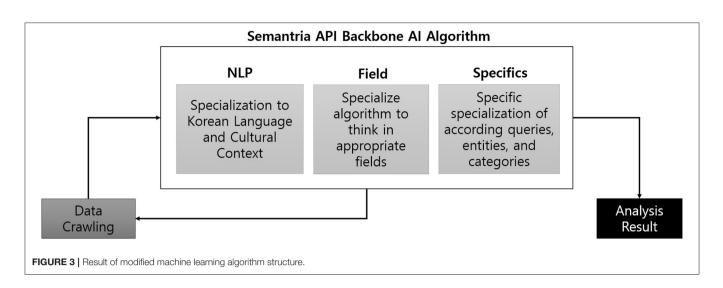
Word score refers to the reliability of the sentiment results (from zero score to one). For example, if a certain data set's sentiment was -0.33 negative, but if the word score was 0.8, the analysis result is considered less credible compared to sentiments with 1.0 score results. Another example, "세월호 참사 (Sewol Ferry Disaster in Korean)" was naturally categorized as "negative" sentiment, because it accompanies negative emotions such as fear, anger, and depression amongst the population. This was the same for "광주 (Gwangju in Korean)" at that time, because 18th of May 1980 (~1 month after the Ferry Disaster) marked the historical Gwungju Democratization Struggle. This was related to the "anger" sentiment of the population, because ex-president Park was related to the president back in 1980 (as daughter and

father), who brutally suppressed uprising Gwangju citizens at that time.

#### **Dataset Collection**

Social media data extracted from YouTube, Twitter, and Facebook were used (**Supplementary Material**), as these platforms were the top-three ranked forms of media worldwide. The population was users who were randomly selected from the entire population of the aforementioned social media platforms who had posted texts related to the Sewol Ferry Disaster from April 2014 to March 2015 (12 months).

April 2014 was set as the starting date because the Sewol Ferry Disaster took place on April 16, 2014. The total number of data sets selected from YouTube, Twitter, and Facebook were 1,628: Equal sets of data that randomly selected in each month to compose a sufficient data set totaling 1,628 (refer to **Figure 1**). The definition of data sets refers to a composition of more than two words that form a sentence or more. All personal identifiers were deleted due to privacy issues. In the case of Facebook, <50 posts were selected for May, June, July, September, and October 2014 due to a lack of posts online. This was the same case for YouTube in January 2015.



# Sentiment Analysis and Applied Al Algorithm

Social data was extracted (data crawling) by using Python for all three platforms (20). Semantria Lexalytics (21) was used for sentiment analysis (data mining). The Semantria Application Programming Interface (API) is a cloud-based text analytics and sentiment analysis service based on advanced machine learning and natural language processing. It performs multilevel analyses of sentences incorporating parts of speech, assignment of a sentiment score from dictionaries, application of intensifiers, and determination of the final sentiment score based on machine learning techniques (22). Mostly used for business purposes, it is a tool that has recently seen increasing use in research for successful data mining (22). This tool provides an API for Excel and conducts its machine learning algorithm based on theme, entity, and category.

Modification of sentiment analysis processing AI algorithms' key parameters was also conducted using Python (**Figure 1**). Main machine learning algorithm provided by Semantria API was used as backbone in our research, and key parameters of the AI was modified and properly trained (specialized) to properly analyze Sewol Ferry Disaster in context. Specific modification and specialization of key parameters are explained in **Figure 3**.

Key parameters of the algorithm were modified in mainly three terms: in terms of NLP, field, and specifics. First, parameters were specialized for the AI to properly understand Korean language in the right grammar and cultural context. Second, algorithm was modified so it may only think in appropriately set fields. For instance, some of the main fields that were set in the algorithm were "Politics," "Disaster," "Health," and "Population culture." On the contrary, fields such as "Religion," "Technology," or "Business" were unrelated, so these inappropriate fields were set as exclusion criteria. Lastly, queries, entities, and categories were specified, because otherwise, the AI would not know the meaning of "ex-President Park" or "Saenuri Party." Overall settings resulted in the final "brain" of the AI to conduct proper analysis. Analysis is divided into three sections: (a) YouTube, (b) Twitter, and (c) Facebook. Each of these three sections was then divided into two sub-sections: (a) bar graph and word cloud analysis, and (b) data mining results by phrases, entity, and query topic. In Lexalytics, phrases are defined as bigrams and noun phrases (23). Entities are the who (and some of the what) of text analytics. An entity in text is most commonly a proper noun such as a person, place, or product (https://www.lexalytics.com/technology/entity-extraction). Query topics are rules that decide whether a document belongs in a given category by looking for the presence or absence of key words and phrases (24).

#### **Statistical Analysis**

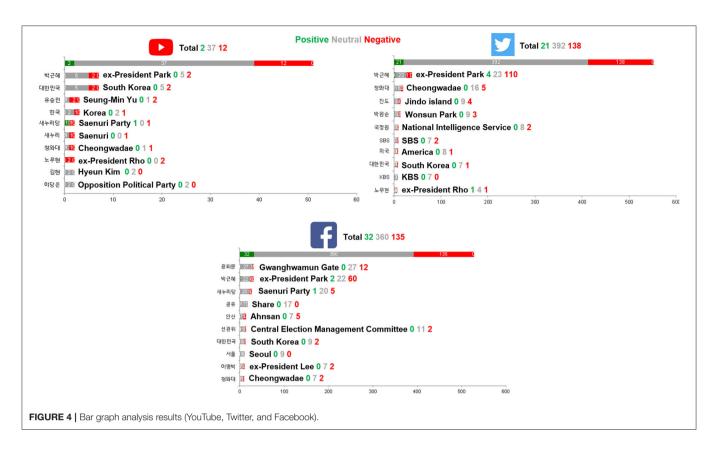
ANOVA was used for statistical comparisons between negative, neutral, and positive sentiment under a 95% confidence level. Age, sex, and political orientation factors were adjusted. A comparison of word score groups was conducted between positive, neutral, and negative word groups. IBM SPSS 21.0 was used for ANOVA statistical analysis. All numbers were rounded up to the first decimal place.

## RESULTS

## **Bar Graph and Word Cloud Analysis**

Bar graph and word cloud analyses are shown in this section (**Figure 4**). The goal of the bar graph analysis is to show the overall sentiment state, whereas the main objective of the word cloud analysis is to show the impact of the most influential words chosen. In the bar graph analysis, the x-axis indicates the number of designated words shown, while the y-axis shows a list of the most impactful words ranked top-to-bottom (top 10 ranked words).

In YouTube, there were more negative opinions (n = 12) than positive opinions (n = 2) regarding the Sewol Ferry Disaster. In the bar graph analysis for Twitter, there were more negative opinions (n = 138) than positive opinions (n = 21) regarding the matter of the Sewol Ferry Disaster. Bar graph analysis for



Facebook also showed much more negative opinions (n = 135) than positive opinions (n = 32) regarding the Sewol Ferry Disaster. Most top ranked words were targeted against the expresident Geun-Hye Park and her policies.

Word cloud analysis results are shown in **Figure 5**. The larger the word, the larger its impact. The brighter the red of the word, the more negative weight the word represents. Also, words that are more centered meant that they were more significant and were more frequently used.

In YouTube, words such as ex-president Geun-Hye Park, South Korea, and Seung-Min Yu (a friendly South Korean politician to the ex-president) were the top three negative sentiment words in the word cloud (**Figure 5a**). Word cloud analysis results from Twitter showed words such as ex-president Geun-Hye Park, South Korea, and Cheongwadae (the Blue House, the Korean presidential residence) to be the top three most negative words chosen (**Figure 5c**). As for Facebook, the word cloud analysis results showed words such as ex-president Geun-Hye Park, South Korea, and Saenuri Party (the expresident's political party at the time) as the top three negative words chosen (**Figure 5e**).

In YouTube, words such as South Korea, and Eojun Kim (Korean celebrity) were two scarcely selected positive sentiment words in the word cloud (Figure 5b). Word cloud analysis results from Twitter showed words such as KBS (Korea Broadcasting System), ex-President Mu-Hyeon, Rho, and Minsu, Choi (Korean celebrity) to be the three positive words chosen (Figure 5d). As for Facebook, the word cloud analysis

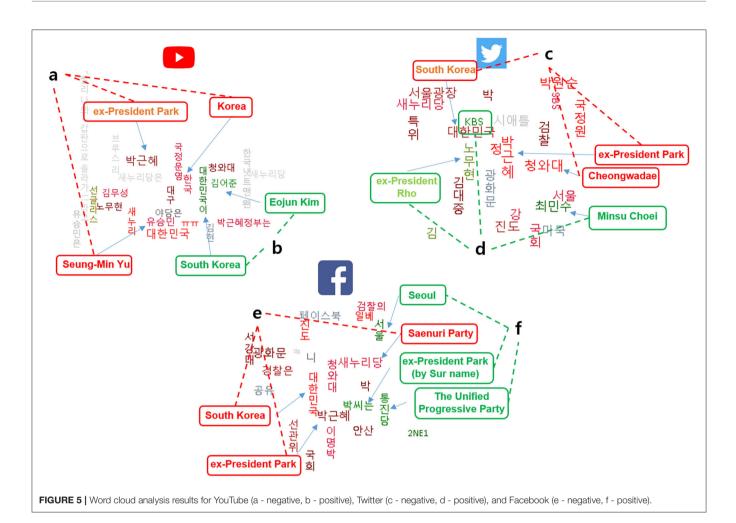
results showed words such as ex-president Geun-Hye Park (by surname), Seoul, and the Unified Progressive Party (minority political party with positive impression at the time) as the three positive words chosen (**Figure 5f**).

## Data Mining Results by Phrases, Entity, and Query Topic

Data mining results by phrases, entity, and query topic are shown in **Table 1**. For YouTube, phrases with negative sentiments (n = 200) were more common than those with positive sentiments (n = 115) by 63.5%. Regarding entities, negative sentiment (n = 43) was larger than positive sentiment (n = 10) by 81.1%. Lastly, in the case of queries, negative sentiment (n = 9) was larger than positive sentiment (n = 3) by 75.0%. All difference results between negative, neutral, and positive identified with ANOVA were statistically significant at under a 95% confidence interval (p < 0.001).

In Twitter's case for phrases, negative sentiment (n = 390) was larger than positive sentiment (n = 172) by 69.4%. In the case of entities, negative sentiment (n = 290) was larger than positive sentiment (n = 125) by 69.9%. Lastly, regarding queries also, negative sentiment (n = 35) was larger than positive sentiment (n = 6) by 85.4%. All difference results between negative, neutral, and positive shown with ANOVA were statistically significant at under a 95% confidence interval (p < 0.001).

Facebook data mining phrases results showed negative sentiment (n = 362) to be larger than positive sentiment (n = 253) by 58.9%. Regarding entities, negative sentiment (n = 260)



Media	Classification	Negative	Neutral	Positive	<i>p</i> -value	Sentiment (percentage
YouTube	Phrases	200	87	115	p < 0.001	Negative (63.5%)
	Entity	43	140	10	<i>p</i> <0.001	Negative (81.1%)
	Query Topic	9	26	3	p < 0.001	Negative (75.0%)
Twitter	Phrases	390	200	172	p < 0.001	Negative (69.4%)
	Entity	290	1,020	125	p < 0.001	Negative (69.9%)
	Query Topic	35	109	6	p < 0.001	Negative (85.4%)
Facebook	Phrases	362	215	253	p < 0.001	Negative (58.9%)
	Entity	260	1,008	82	p < 0.001	Negative (76.0%)
	Query Topic	24	105	8	p < 0.001	Negative (75.0%)

TABLE 1 | Data mining results by phrases, entity, and query topic.

Sentiment cases = n.

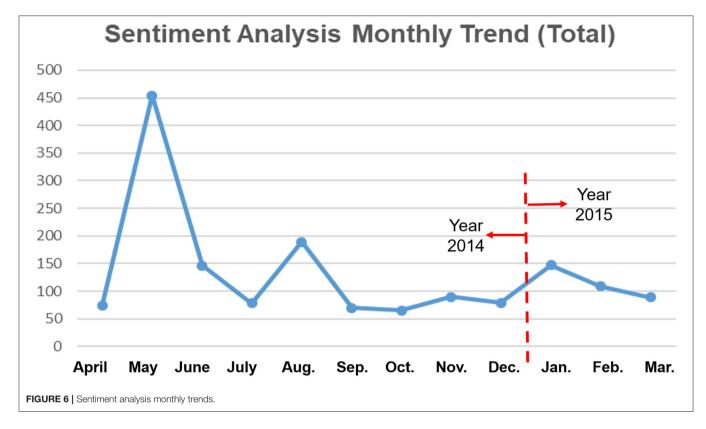
was again larger than positive sentiment (n = 82) by 76.0%. Lastly, in the case of queries, negative sentiment (n = 24) was larger than positive sentiment (n = 8) by 75.0%.

#### Sentiment Analysis by Monthly Trends

A sentiment analysis by monthly trends of all social media (YouTube, Twitter, and Facebook) used in this study is shown in **Figure 6**. Negative sentiment boomed during the time immediately after the Sewol Ferry Disaster and then faltered as time went by. There was a momentary peak of negative sentiment in August. Negative sentiment also started to rise slightly during the period approaching the anniversary of the Sewol Ferry Disaster.

#### DISCUSSION

This research implemented machine learning-based data crawling and mining methods for sentiment analysis of the



Sewol Ferry Disaster and social stress. Overall, the research results showed an undisputable negative sentiment regarding the social issue of the Sewol Ferry Disaster. Fundamental agents that led to negative sentiments were ex-president Geun-Hye Park and her related political parties (Saenuri Party) and politicians (Seung-Min Yu).

Some broadcasting systems or celebrities were positively mentioned (KBS, Eo-jun, Kim, Min-su, Choei, or 2NE1) but were less significant or less frequently used. KBS at the time was aggressive and critical toward the government's incompetent reaction to the disaster. This seems to have gained some positive view and support from the citizens. Also, ex-president Rho was positively mentioned in contrast to president Park at the time. This was because ex-president Rho stood for a symbol of peace for the citizens due to his accomplishment of being selected as the candidate of the Nobel Peace Prize in 2007. Actors and celebrities such as Eo-jun Kim, Min-su Choei, and 2NE1 gained positive view for providing empowerment and entertainment in depressive time. "South Korea" and "ex-President Park" may have been mentioned negative and at the same time positive by some people but were less significant and less frequently used positive (words far away from the center indicate less significance) than they were used negative.

Overall as time passed, the negative sentiment among the population waxed and waned due to the sustained social stress caused by the government's insufficient measures to tackle this issue. The distinct peak seen during August seemed to be due to the following issues. On the 19th of August in 2014, the family members of students who died in the Sewol Ferry Disaster protested against the "Sewol Ferry Special Law" passed by the government because the law did not provide sufficient compensation. In addition, Sewol Ferry Disaster-related investigation disputes were fierce during that month.

In January 2015, nearing the anniversary of the Sewol Ferry Disaster, "Sewol Ferry Disaster d-Day +300 Press Conference" took place. In addition, the Sewol Ferry ship salvage issue added to the triggering of negative memories of the Sewol Ferry Disaster among the devastated population.

This research provided evidence of the disaster's negative psychological impact on the Korean population. The results of this study are especially meaningful considering that the ex-president Geun-Hye Park was eventually impeached by the citizens of South Korea in December 2016 (implemented in March of 2017). Her impeachment was a result of several factors, but the consistent negative sentiment centered on the ex-president over a long period of time may have influenced the events.

This research is limited by the core mechanism of Twitter, which mainly selects samples that are the most-recognized among the data (25); our raw data were chosen from this pool. Although the mechanisms of YouTube and Facebook are not clearly stated, considering that the functions of social media are typically similar, this may have caused some bias in the research results.

Social media usage is ever increasing; this is expected to result in the production of even more social data, which will be useful for future research that uses sentiment analysis (26). In addition, learning models from computational biology and medicine have been successfully applied in other medical fields in recent research (27, 28). The significance of this research is that it is the first study to conduct NLP-based sentiment analysis on data from the three largest social media platforms (YouTube, Twitter, and Facebook) regarding the issue of the Sewol Ferry Disaster. Future research should examine whether the negative sentiment identified in this study had any influence on the incidence rate of depression or cardiovascular diseases such as heart attack and acute stroke.

#### DATA AVAILABILITY STATEMENT

All datasets generated for this study are included in the article/supplementary material.

#### **AUTHOR CONTRIBUTIONS**

M-JL constructed the main idea of this article, and conducted NLP-based sentiment core analysis. S-JL contributed significantly in writing the article. T-RL and J-SJ provided critical professional advice and modifications to the article. EK supervised and managed the entire projected.

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#### SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt. 2020.505673/full#supplementary-material

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**Conflict of Interest:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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