

A Study on Suicidal Rate Detection with social media using Deep Learning

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Abstract - Social media platforms, such as Twitter and Reddit, can be used to identify individuals at risk of suicide with high accuracy using machine learning techniques. Researchers have developed systems that track words related to suicide and alert relevant organizations or individuals. The use of online data for suicide detection and prevention is an active area of research with the potential to save lives. Depression is also a major cause of suicide and some studies have focused on using machine learning to classify individuals at risk based on data from social media platforms.

Keywords: Algorithms, Artificial neural network (ANN), Support vector deep, Deep learning, Deep learning natural language processing, LSTM, CNN and Suicide detection.

INTRODUCTION

Suicide is a major public health concern and a leading cause of death worldwide. Online platforms, such as social media, have been studied as potential sources of data for detecting people with suicidal thoughts. These studies have shown that data from online platforms can be used to identify individuals at risk of suicide with high accuracy using machine learning techniques. Some researchers have developed systems that can track words related to suicide on social media platforms in order to identify individuals who may be at risk and alert relevant organizations or individuals. Depression is also a major cause of suicide and some studies have focused on using machine learning to classify individuals at risk based on data from social media platforms. In general, the use of online data for suicide detection and prevention is an active area of research with the potential to save lives.

LITERATURE REVIEW

According to Kasturi Dewi Varathan, Nur Hafizah Talib (2014) social networks such as Twitter are communication channels that allow users to disseminate information and activities and opinions through short texts. Suicide is a mental health problem which requires attention, controlling & preventing it is no easy task. It should be a weapon for quick detection. Twitter Suicide Detection is a system capable of identifying all words related to suicide on Twitter. The system also aims to detect suicides in time by listening to the coming tweets.

This system can be used by “NGOs” and psychologists to track suicidal individuals with the history of suicide attempts. This system is designed to help & prevent people from committing suicide.

Rohith Kumar Thiruvalluru, Manas Gaur, Krishnaprasad Thirunarayan say that suicide is 10th leading cause of death in US and the second leading cause of death among adolescents. Clinical and psychosocial factors contribute to suicide risk, but the documentation and self-report of these factors in EHRs and social networks varies. This study examines the degree of difference between EPA and social media. Using more than 13.8 million clinical records of 123,703 psychiatric patients, subjective analyzes of SRF, including “self-harm, bullying, impulsivity” and domestic violence/discord, were obtained. We grouped clinical notes using semantic integration according to a set of its SRFs. Similarly, we aggregated 2,180 suicidal users (~30,000 posts) on Suicide Watch for comparative analysis.

Mark Larsen, Jennifer Nicholas, Helen Christensen, (2016) suggest that the use of mobile health (mHealth) applications has increased rapidly to help, identify & support the people at risk of suicide. 123 suicide-related apps were identified and downloaded, and only 49 of them contained

minimum one interactive feature of suicide prevention. 27 apps had focused on getting support from family & friends, 14 focused on safety planning, 13 were found to facilitate access to crisis assistance. Potentially dangerous content, such as inciting behavior during a crisis or listing lethal access to vehicles, has also been identified in the apps.

Xuening Wang et al. Says that depression is a usual mental illness which affects people of all ages and backgrounds. Depressed and depression-prone people often flock to online depression communities to meet the needs that otherwise could not meet. Such a community's impact is not clear entirely due to the exposure of members to depression. Therefore, this study examined behavior when depressed people gather in the online community “Depression Super Topic” on Sina Weibo. Through website crawls, depression super topic posts were compared to the members normal timeline posts in terms of topics, published sentiments and number of likes & comments. The extracted posts topics were then coded to cover support, regulation, sharing emotions and life, and initiating discussion. A comparative analysis showed that posts in depression super-topic communities received more comments and revealed many emotions than regular timelines, and the members were more active now in the communities at night.

Scottye J. Cash, Jeffrey A Bridge, Jeffrey A Bridge considers this review "a review of recent research on adolescent suicidal tendencies and suicidal behavior with a focus on epidemiological, psychiatric, psychological and environmental factors." Informed clinicians can make the most of this data to develop a more comprehensive understanding and assessment of suicide risk factors in adolescents, which can help guide targeted interventions that reduce the risk of deteriorating mental health and suicidal behavior. can be.

Marcel Adam Just¹, *Lisa Pan², Vladimir L. Cherkassky¹, Dana McMakin³, Kristin Cha,⁴ Matthew K. Knock⁵, and David Brent² suggest that clinical assessments of suicide risk may be substantially complemented by biological measures assessing changes in neural expression. said it would Concepts related to death and survival. from people with suicidal thoughts nearby. This study used machine learning algorithms (Gaussian Naïve Bayes) to identify these individuals (17 suicidal versus 17 controls) with high accuracy (91%), based on their fMRI-adjusted neural ratings of concepts related to life and death. The most discriminatory concepts are death, cruelty, trouble, recklessness, good, and praise. A similar classification correctly distinguishes (94%) 9 people with suicidal ideation and 8 people with no suicidal ideation. In addition, an important aspect of structural change is elicited emotion, where neural signatures serve as surrogate bases for accurate cluster classification (85%). The study established a biological and neurocognitive basis for altered conceptual representations in participants with suicidal ideation, allowing for group membership classification with high accuracy.

According to “S. Kumar, A.K Verma, S. Bhattacharya and S. Rathore” (2021), Lucknow County Suicide Rates were collected for 5 years from January 2008 to October 2012 and disaggregated by sex and age group. The data show

that the rate in men is 56.61% and in women it is 43.38%. Suicides are concentrated among all ages of adolescents. The data also show that “the suicide tendency of men is higher than that of women of the same age. It is shown that suicide by poison is the most common method among men and women is suicide by poison”.

“Shaoxiong Ji” (2020) investigated “some factors such as prolonged exposure to negative emotions and life events that may lead to suicidal intentions and attempts. This study examines online social content for timely detection of suicidal ideation”. For the first time, it performed comprehensive content analysis to uncover knowledge of suicide texts and standard binary classifications of suicidal ideation, including the use of quote-based classifiers. feature export and deep neural networks. He considered the sentimental themes and signals contained in people's messages and proposed to establish a relationship between these factors and the message by using an attention relationship network to perform the detection. good idea of suicide. Finally, it tests the detection of suicidal ideation in another private chat situation. To address the challenge of sealed data in private chat rooms, he developed a knowledge transfer framework to shape a global knowledge sharing model using dispersion agent.

According to “Mitchell Weiss” et al. (2008) “Accurate information on preferred suicide methods is important for the development of suicide prevention strategies and programs. The aim of this study was to provide the first comprehensive look at international patterns of suicide methods”. An analysis of correspondence shows “a polarization between pesticide suicide and gun suicide, at the expense of traditional methods such as hanging from above and jumping between the two”. He shows “how suicide with drugs and guns is replacing traditional methods in many countries”. They observed that “suicide patterns depended on the availability of the methods used. Available evidence indicates that limiting access to suicide drugs is more urgent and technically feasible than ever”.

According to “Benjamin Macharia et al. (2015)” “more than 400,000 people die by suicide each year. National, cultural, religious and social values play a role in suicide”. His 7-year retrospective study of all autopsies performed at “Moi Teaching and Referral Hospital in Eldoret, Kenya” was analyzed, and cases where identified as apparent suicide was investigated further. Data on age, sex, and method of suicide were collected and entered a data collection form. In summary, this study shows a marked difference in suicide patterns across the life cycle of the population of West Kenya. “Restricting access to means of suicide is an essential part of a comprehensive suicide prevention strategy”.

“Mojtaba Davoudi et al.” (2022) suggested that “natural disasters can affect the mental health of survivors and cause them to die by suicide”. A literature search was performed on some of the databases. Natural hazards include earthquakes, geomagnetic disturbances, droughts, dust storms, hurricanes, floods, and other natural disasters. Evidence supports increased suicide rates after disasters due to droughts, dust storms, hurricanes, and geomagnetic disturbances, but not floods. Based on these findings, they call for continued psychological research to pave the way for interventions to protect people's mental health and livelihoods following emergencies such as natural disasters.

According to “Manas Gaur et al.” (2019) “Mental illness, such as depression, is an important risk factor for suicidal thoughts, behavior, and intentions”. Their interdisciplinary study used Reddit as a separate data source to gather information about suicide and other related mental illnesses affecting users with depression. They provide detailed learning frameworks, including domainspecific knowledge to predict the severity of an individual's risk of suicide. They also used “language modeling, medical entity detection and normalization, and negativity detection to create a Redditor dataset of 2,181 people who discussed or suggested suicidal thoughts, behaviors, or attempts”. Due to the importance of knowledge, the benchmark “dataset of 500 Redditors (out of 2181)” had a pairwise annotation agreement of 0 as directed by the Columbia University, C-SSRS (Columbia Suicide Severity Rating Scale).

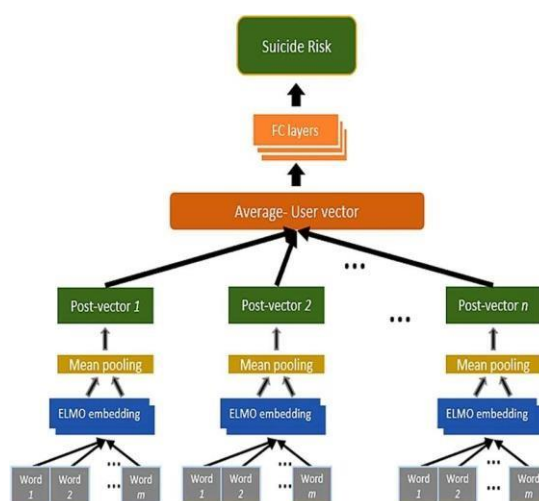


Fig.1: Suicidal Rate in Society Using DL-Deep Learning Flow.

According to “Shivangini Singh” (2021), suicide is a preventable tragedy and a major problem in developing countries like India, but it has been overlooked. The leading causes of suicide in India are hanging (53.6%), poisoning (25.8%), drowning (5.2%) and self-immolation (3.8%). A study by Jhansi concluded that the most common method of suicide among women was men's self-immolation by running onto trains.

“Yujiro Kuroda et al.” (2021), “the suicide mortality rate in twelve cities Prefecture (Japan) designated as evacuation 2011 nuclear disaster the evolution of series model.” Whereas there in this study. First, some evacuees may have changed addresses after the disaster and the resulting data may make them untraceable, leading to an underestimation of suicide rates in affected areas. Second, due to the descriptive design of the published data, it was not possible to adjust for related factors such as presuicide economic and psychological variables. Third, because the study uses a two-year moving average model, the results of the age stratification analysis should be interpreted with caution.

Table 1: Details of the Techniques Used by Various Authors

S. No	Author Name	Title	Year	Database Used
1	Kasturi Dewi Varathan, Nur Hafizah Talib	Suicide detection system based on Twitter	2014	Twitter
2	<u>Rohith Kumar</u> Thiruvalluru, Manas Gaur, Krishnaprasad <u>Thirunaravan</u>	Comparing Suicide Risk Insights derived from Clinical and Social Media data	2021	Twitter, Reddit
3	Mark Larsen Mark Larsen Jennifer Nicholas Helen Christensen	A Systematic Assessment of Smartphone Tools for Suicide Prevention	2016	123 Apps Downloaded and reviewed by two reviewers

4	<u>Xuening Wang, Xianyun Tian, X. Pan, Dongxu Wei, Qi Qi</u>	What Happens When People with Depression Gather Online	2021	Postings from Depression Super Topic community
5	<u>Scottye J. CashJeffrey A BridgeJeffrey a Bridge.</u>	Epidemiology of Youth Suicide and Suicidal Behavior	2009	PubMed search for all English-language articles published between January 2007 and May 2009
6	S. Kumar, A. K. Verma, S. Bhattacharya, and S. Rathore	“Trends in Rates and Methods of Suicide in India,” Egyptian Journal of Forensic Sciences,	2021	Distribution of suicidal cases according to sex, age per year group cases per year in Lucknow (2008–October 2012) NCRB Forensic Medicine & Toxicology Department, King George’s Medical University in the Lucknow
7	<u>Isabel De la Torre Díez, Gema Castillo Jon, Arambarri Basañez.</u>	Mobile Apps for Suicide Prevention: Review of Virtual Stores and Literature	2017	Science Direct, Medline, PsycINFO, Embase, The Cochrane Library, IEEEExplore , and Google Scholar
8	<u>Shaoyong Ji</u>	Suicidal Ideation Detection in Online Social Content	2020	Reddit, Twitter
9	Mitchell Weiss, Mariann Ring, <u>Urs Hepp</u>	Methods of suicide: International suicide patterns derived from the WHO mortality database	2008	WHO Mortality Database
10	<u>Benjamin Macharia, Iddah Maulid Ali, F. M. Ndiangui</u>	Pattern of Suicide: A Review of Autopsies Conducted at Moi Teaching and Referral Hospital in Eldoret Kenya	2015	MTRH autopsy record books
11	<u>Mojtaba Davoudi, Boroumand Alipour, Zahra Karimi Balouchi</u>	SUICIDES AFTER NATURAL DISASTERS: A REVIEW	2022	Web of Knowledge, PubMed and Scopus

12	Manas Gaur, Amanuel Alambo, Joy Prakash Sain	Knowledge-aware Assessment of Severity of Suicide Risk for Early Intervention	2019	Reddit
13	Shivangini Singh	Suicide in Uttar Pradesh: An Overview	2021	NCRB 2019
14	Yujiro Kuroda, Masatsugu Onji, Arinobu Hori	Trends in Suicide mortality in 10 years around The Great East Japan Earthquake: Analysis of evacuation and non-evacuation areas in Fukushima Prefecture	2021	Suicide rate numbers in Evacuation areas of Fukushima Prefecture (from March 2009 to December 2018)

III- CONCLUSION

In conclusion, the use of AI and machine learning in detecting and preventing suicides is a promising approach that has the potential to save lives. By analyzing data from social media platforms, AI can help identify individuals who may be at risk of suicide and provide them with appropriate support. For example, AI can be used to track words related to suicide on social media and alert relevant organizations or individuals. This can help identify individuals who may be at risk and provide them with the support they need before it is too late.

Additionally, AI can also help in detecting the causes of depression and other mental health issues, which can be used to prevent suicides from occurring. By analyzing data and patterns on social media, AI can identify common triggers or patterns that may lead to depression or suicidal thoughts. This information can be used to provide targeted interventions and support to individuals who may be at risk.

However, it is important to use AI and machine learning in this context with care and sensitivity. These technologies can have significant consequences if not used properly, and it is important to ensure that they are used ethically and in a way that respects the privacy and dignity of individuals. Additionally, it is important to recognize that AI and machine learning are not a panacea for preventing suicides, and that they should be used in conjunction with other interventions, such as education and awareness campaigns, to address this complex issue.

Overall, the use of AI and machine learning in the context of suicide detection and prevention is an important step towards addressing this global issue and providing support to those who may be at risk. By leveraging the power of these technologies, it is possible to identify individuals who may be at risk and provide them with the help and support they need, ultimately

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