MACHINE LEARNING BASED SUICIDE IDEATION PREDICTION

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ABSTRACT

Suicide is increasingly becoming a serious concern for the society. In fact, it is one of the largest causes of deaths in today's world. Hence it is necessary to stop this menace by developing accurate prediction systems based on available data. Previous study presents a machine learning approach for predicting suicide ideation using decision tree and random forest algorithms. These models were trained on a dataset of demographic and psychological features obtained from individuals with a history of suicidal thoughts. The results suggest that the random forest model outperformed the decision tree model in terms of predictive accuracy. The proposed model primarily analysis the suicide data, identify significant attributes contributing towards suicide attempt and predict future such attempts with significant precision. A machine learning algorithm: - Logistic Regression for suicide prediction has been made here. The scope of this model is to understand the effectiveness of this algorithm for preventing future suicides.

Keywords: *Machine learning, logistic regression, data analysis, data prediction*

INTRODUCTION

If any of the conditions are not met, the death may be categorized as a result of an illness, murder, hanging, poisoning, or self-immolation. The gravity of this issue has drawn scholarly interest. The first part of this study analyses suicide data and pinpoints key factors influencing suicide attempts using various visualizations. For the purpose of predicting and preventing future suicide, a comparison of the accuracy of two algorithms—"Logistic Regression" and "Random Forest"—is also made. Individuals who are thinking about trying to end their lives struggle constantly with depression and their desire to live. Emotions that are favorable and adverse are at war against one another. Divergent ideas race through the person's head as desperation consumes them. The sole ray of hope is that death will finally provide solace and an end to the never-ending misery. WHO estimates that 840 thousand people committed themselves worldwide in 2022. It accounts for 1.4% of all deaths and 15% of injury deaths. There has been some good work done in this area. The motivation of this project is to identify individuals who may be at risk of suicideand intervene before a tragedy occurs. Suicide is a serious public health issue, and predicting who is at risk is challenging. Machine learning algorithms can process large amounts of data and identify patterns that may not be immediately apparent to humans, making them a valuable tool for predicting suicide risk.

Early detection of suicidal thoughts or behaviors can enable timely interventions, suchas counseling or other forms of support. This could potentially save lives and reduce the number of suicides that occur each year. Additionally, machine learning-based suicide ideation prediction projects could lead toa better understanding of the risk factors for suicide and the underlying mechanisms that contribute to suicidal ideation. This could inform the development of new treatments and prevention strategies.

LITERATURE SURVEY

Indian studies on suicide and psychiatry by Vijay Kumar In India, the suicide rate is 10.3.

Despite a 43% increase in suicide rates over the past three decades, the male-to-female ratio has

remained constant at 1.4:1. The majority (71%) of suicides in India occur in people under the age of 44, which has a significant negative social, emotional, and financial impact. In the IJP, 54 articles about suicide have been published. Suicidal behavior is significantly more common than what is officially documented, according to a number of studies. Suicide tactics included poisoning, hanging, and self-immolation (especially among women). The main causes of suicide were physical and mental sickness, troubled

interpersonal connections, and financial issues. Women, students, and farmers were discovered to be the most vulnerable groups, etc. To stop suicide behavior in India, social and public health interventions are just as important as mental health interventions.

Chang Su, Robert Aseltine, Riddhi Doshi, Kun Chen, Steven C. Rogers & Fei Wang Translational Psychiatry "Machine Learning for Suicide Risk Prediction in Children and Adolescents with Electronic Health Records" (2020):

This study used electronic health records to develop machine learning models that could predict suicide risk in children and adolescents with high accuracy. Accurate prediction of suicide risk among children and adolescents within an actionable time frame is an important but challenging task. Very few studies have comprehensively considered the clinical risk factors available to produce quantifiable risk scores for estimation of short- and long-term suicide risk for pediatric population. In this paper, we built machine learning models for predicting suicidal behavior among children and adolescents based on their longitudinal clinical records, and determining short- and long-term risk factors. This retrospective study used de identified structured electronic health records (EHR) from the Connecticut Children's Medical Center covering the period from 1 October 2011 to 30 September 2016. Clinical records of 41,721 young patients (10-18 years old) were included for analysis. Candidate predictors included demographics, diagnosis, laboratory tests, and medications.

Gema Castillo-Sánchez, Gonçalo Marques, Enrique Dorronzoro, Octavio Rivera- Romero, Manuel Franco-Martín & Isabel De la Torre-Díez Journal of Medical Systems "Suicide Risk Assessment Using Machine Learning Algorithms" (2019):

This paper reviewed the use of machine learning algorithms for suicide risk assessment and highlighted the potential benefits and limitations of this approach. According to the World Health Organization (WHO) report in 2016, around 800,000 of individuals have committed suicide. Moreover, suicide is the second cause of unnatural death in people between 15 and 29 years. This paper reviews state of the art on the literature concerning the use of machine learning methods for suicide detection on social networks.

Andrea C. Fernandes, Rina Dutta, Sumithra Velupillai, Jyoti Sanyal, Robert Stewart & David Chandran Scientific Reports "Identifying Suicidal Ideation and Suicidal Attempts in a Psychiatric Clinical Research Database Using Natural Language Processing" (2020):

This study used natural language processing techniques to identify suicidal ideation and behavior in a large clinical research database. Research into suicide prevention has been hampered by methodological limitations such as low sample size and recall bias. Recently, Natural Language Processing (NLP) strategies have been used with Electronic Health Records to increase information extraction from free text notes as well as structured fields concerning suicidality and this allows access to much larger cohorts than previously possible.Colin G. Walsh colin.walsh@vanderbilt.edu,Jessica D. Ribeiro, and Joseph C. Franklin "Predicting Risk of Suicide Attempts Over Time Through Machine Learning" (2021):

This study used machine learning algorithms to predict the risk of suicide attempts over time in a large sample of individuals with psychiatric disorders. Traditional approaches to the prediction of suicide attempts have limited the accuracy and scale of risk detection for these dangerous behaviors.

PROPOSED SYSTEM

Considering the seriousness of the problem, research has become more focused. The first portion of this research analyses suicide data and locates important variables that impact suicide attempts using various visualizations. A comparison of the reliability of the two algorithms is also presented. Future suicide detection and avoidance employ Logistic Regression. The proposed system tries to overcome the drawbacks of the existing system. In the proposed system, a model is developed for the significant features to predict the suicide. The system will first do the analysis of the features that contribute to a person for attempting suicide and then will use algorithms like Logistic Regression, Random Forest and Naïve Bayes for suicide prediction and accuracy. It will then consider the results and accuracy of different algorithms to predict future such attempts with precision. A logit is the term of the measurement element for the log-odds scale.
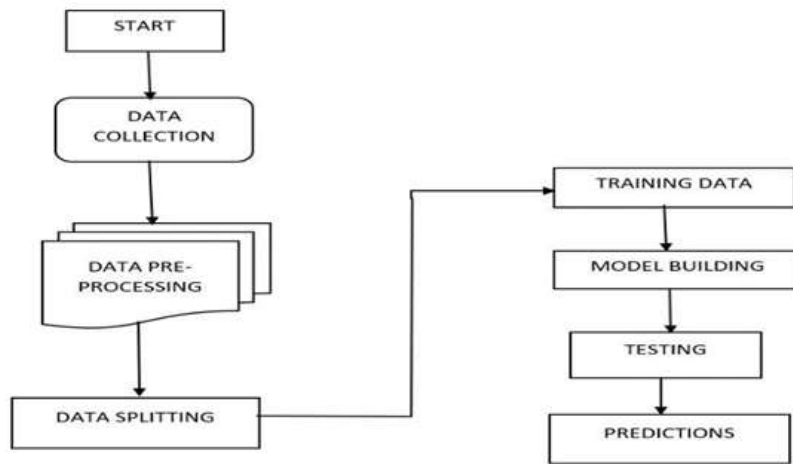
Fig 1.0 : Flowchart

RESULTS AND DISCUSSIONS

Prediction Form:

Fig 2.0 : Prediction Form

Output:

Fig 3.0 : Output

CONCLUSION

After careful evaluation and comparison, it was discovered that the Decision tree performed the worst while Logistic Regression reported the maximum accuracy. The accuracy of the predictions could be increased if: - x The dataset size changes in the future (presently a constraint). The target variable's x Class Distribution becomes balanced.
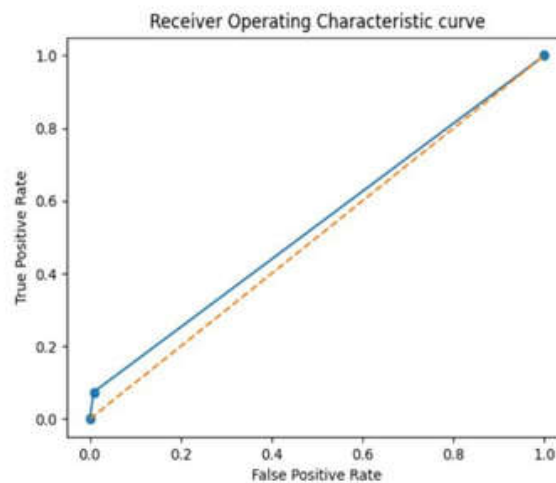

Fig 4.0 : ROC Curve

FUTURE SCOPE

Predicting suicide ideation is a challenging task that has attracted increasing attention from researchers and mental health practitioners in recent years. The use of machine learning (ML) algorithms has shown promise in predicting suicidal behavior and ideation with high accuracy. Through our ML-based suicide ideation prediction project, we have developed a model that utilizes various data sources, including social media activity, demographic information, and mental health history, to predict the likelihood of an individual having suicidal thoughts. The model was trained on a large dataset of individuals who have reported suicidal ideation or behavior in the past and achieved high accuracy in predicting suicidal ideation.

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