**SUICIDE ANALYSIS AND PREDICTION**

**Introduction**

The increasing suicides around the world has become an important concern about studying deep about it and try to understand the reasons behind it.

**Background Problem**

As we it’s been always so heartbreaking listening to each time, we listen to a news about committing suicide.

**3. Technologies and methods**

**3.1 Data Preperation**

**3.2 Data Visualization**

Firstly, I want to talk about python dashboard. It’s always wonderful to see how we are able to make models and interpret them. But it is also important to note, recently there are number of concerns about how well we are able to make modifications to the existing model and maintain them. So, our model has to work dynamic and make prediction based on the available data. In recent years programmers used use VueJS or web-based languages for making dashboards, we now have most advanced packaged like Streamlit has made these process easier and more efficient. I am going to use some of the python packages like plotly to make interactive dashboard and make models that can make great predictions.

**3.3 Modeling and Forecasting**

Secondly, working with time series forecasting is a crucial part in my dissertation. I have number of different targets in my dissertation. I have been looking for ways to predict the number of suicides in upcoming years. My interest in time series and ML made me dive deep into sophisticated time series models like SARIMA and VAR to make models on the suicide data and forecast future suicides in different countries. Dealing with numerical and categorical variables I have used decision tree classifier capable of classifying purposes. I could see the Brunello et al has successfully implemented them in their research which really inspired me to adapt the idea in suicide analysis.

**3.4 Evaluation of models**

**3.5 Data Storage**

Thirdly, we need a database server for data to be stored on the server. I will be using PSQL or MySQL servers for data storage and management. I want the data in my DB to be updated time to time and my model has to be updated based on the new data injected in each time. The reason for choosing these DB’s is the flexibility of usage and its syntax matching with Structured Query Language (SQL) minute differences.

**3.6 Server and Hosting**

Finally, Server and hosting

**3.7 Data Security**

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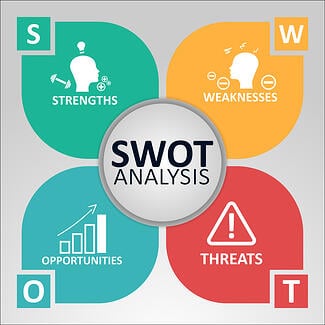
**Ethical Considerations**

**SWOT Analysis**

As I previously stated, the subject dataset did not contain any personal information. I would highly recommend for future studies we need to incorporate more humans in the experimentation to collect data from people in real-time. The most important thing we need to follow is taking consent from each person who is willing to participate in the study. There are some major concerns in this regard, let’s imagine if we have not taken any consent from these human beings who are participating in the study/experiment. They might later go to court and file a complaint against us for doing illegal use of personal information. Also, we need to clearly state what are the acts or dangers involved in the experiments. So that they are aware before they participate in these activities. (Bogod 2004) is one of the real-life examples where in 1942 prisoners were asked to undergo dangerous experiments to understand the survival chance of soldiers sometimes even leading to deaths. Understanding personal, social, and business impacts of data practice.

In addition, even sharing information of individual sharing with any other colleagues or third party would be through proper procedure and getting signs on consent forms.

3) SWOT Analysis as per Machine learning of your project or Guidelines of ACL as per ethics module



**Strength: -** In my study, I am trying to see suicide rates in different countries from time to time. My research strength is its dynamic nature. Similar weather forecast of google or Microsoft, my model will be run from time to time based on the latest data. This research aims at tackling suicide tendencies in every country’s population. My research is going to predict how many people are going to commit suicide in the next 5 years in different countries or continents. When working with a socially responsible research project, it is going to stand out in the world of the internet. Similar to the websites showcasing covid trends live, my website is also going to show the same impact of suicide numbers and create respective visualizations for any general audience to easily understand what the trend in data would be.

**Weakness: -** The data is aggregated and no specific information of individuals available for forecasts. So, I think the data must be having more specific features which could make accurate predictions about the suicides. But the model would have been more accurate if more specific features could have been added to the dataset. Things like diagnostic information of subjects, population happiness index, education index, happiness index each country. So, my prediction would be more of general understanding about the trends in data.

**Opportunity: -** It’s unexplainable how much we can make use of the suicide data analysis. Govt. is trying to find out the reasons behind suicides or how to reduce the number of suicides every year. We can develop new strategies that can mitigate the effect of suicides through analysis and understanding of existing data. We can make use of ML models act as smart applications which can guide mobile users based on user activity data. Suicide analysis creates a new era of AI where we can keep an eye on who is more vulnerable to death.

Now let’s look at my data and its opportunities. Have you ever thought of having a suicide prediction model for each country? The wide range opportunities using AI and Time Series model on big data is possible using current technologies. Internet of things, cloud computing and ML are the best example of state-of-the-art technologies. Suicide prediction model and live dashboard visualization is a great analysis model which any growing business can take inspiration from. Just imagine a burger selling vendor creating a live predicting model of specific kind of burger that are sold at particular season of a year? or may be checking best selling milk shakes in each month? Wouldn’t these analyses make them grow? or even predict how much products are going to be sold in coming months so they can prepare their store for the coming period to avoid lack of materials. Thus, this model is ultimately showing what kind of predictions or analysis our business and health industry need today to go smarter and do smarter businesses.

**Threat**: - Data can be used in many different ways. Some people have used it for good reasons others did differently as well. Suicide dataset could be misused in some way. But in my point of view as long as we are not providing specific information about individuals, they are less likely to occur. In my analysis what I would say is incase more features are added to the model in the future, I will have to alter model statically and make them dynamic using cron jobs. Also, when I comes to storing individual information in future, more storage space might be required as well as my model could perform poor because of the server requirements. Even though we have other options to by clod storage space, it will still be costing more money on the other hand I will have to figure out ways to improve the requirements.

Talking about analysis of suicides in previous years, there could be political impact because of the difference in counts during different political administration periods.

**Related work**

ARIMA Model and FBProphet models used for predicting suicide deaths around the world.(Kumar and Susan 2020). Covid-19 was a very sensitive topic in recent year. Many people have affected by it and lost their life. The dataset is very similar to what I have chosen for my suicide prediction as well. In my view This is an excellent model to take inspiration from. The paper talks about countries including India and to understand the patten in deaths happened around the world. Time series is definitely helped to make predictions about coming years. ARIMA and FBProphet models are used and for analysis data has been split into training and testing.



Another study was done on predicting birth (Włodarczyk et al. 2021), study was trying to figure out the preterm births. This study used machine learning algorithms like support vector machine(svm), random forest, K-Nearest Neighbor, and Convolutional Neural Network (CNNs).

Another study I can point out was done on predicting mortality of predicting attributable to cancer in Qingdao, China: (Qi et al. 2021). They have also used ARIMA Model for prediction of deaths. ARIMA model is combination of autoregressive model and moving average model.Another study was done on prediction o exchange rate (Airiti . 2012). Artificial Nueral Network and ARIMA are used to predict the model.

SVM has been used Time series analysis, like (Huang et al. 2017) has clearly studied classification problem on Breast cancer dataset. This study also checked for different kernel function that used in the SVM Classifier. The outcome of their shows that for large scale datasets RBF kernel based SVM ensembles based onboosting perform better than the other classifiers. SVM is first introduced by (Cortes and Vapnik 1995) shown that it’s better for two-group classification problems.

PCA-KNN model is used in (2018) for financial time series prediction, we could use output from sliding window as input for the KNN Model. Principal Component Analysis (PCA) is used in the transformation of the data as well. Suicide dataset will have to undergo above methods to achieve efficiency and accuracy in modeling or achieve optimum results. Empirically, my assumptions on the previous studies may vary along my research but still this literature review on previous studies has help me improve my preparations for the suicide research in achieving my project goals.

Working with Multivariate time series data, I was looking for models which can making predictions on more than one variable. For example, the (Vector Autoregressive Models for Multivariate Time Series 2006) showed me how relevant is VAR (Vector Autoregressive Models) model for the suicide analysis. It also gave me.

My test includes checking seasonality, tends, stationarity and testing statistical models for finding the best model for prediction. AIC and BIC

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