

**Suicide Ideation**

Project Proposal

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# Abstract

Suicide is a critical issue in modern society. Early diagnosis and prevention of suicide attempts should be addressed to save people’s life. As a serious public health problem, it demands our attention, but its prevention and control, unfortunately, are no easy task. The aim of this app-based project is to help in early detection and prevention of suicide among people. Our project uses machine learning techniques to predict if a certain individual might be suffering from depressive behaviors. Through the ‘Suicide Ideation’ application, users can interact with an AI ChatBot that evaluates the risk factors through verbal communication. Early detection of the negative emotions that may lead to suicide can have a considerate impact on a person. Hence, the application helps them to statistically view the degree of severity of the core symptoms including depression, anxiety and stress.

# Introduction

# Suicide is the act of intentionally causing one's own death. Close to 800 000 people die due to suicide every year, which is one person every 40 seconds. Suicide is a global phenomenon and is prevalent in almost every culture. It accounts for 1.4% of all deaths, and is the 15th leading cause of death globally. The increased rate in suicide over the past years has been a major concern in our society. Suicide ideation is a pre requisite of suicide attempts. Not all people that ideate suicide tend to actually go through with the attempt. Nevertheless, both of them do not differ in their acquired capabilities for suicide. The suicidal thoughts still validate enough risk for early diagnosis and prevention. Some of the major reasons behind suicide is anxiety, depression and stress. For this purpose, designing a digital android-based solution could really help these people through diagnosis.

# This project includes a mobile application in which a ChatBot will initiate a conversation with the user and ask a number of questions. The means of communication between the user and the Bot will be through an interactive voice response system. After some questions, Bot will gradually converse throughout the session for the early diagnosis of the suicidal tendencies one may possess. Finally, based on user's responses, our model will predict whether user is experiencing any mental health issues that may lead to potential suicide. Our machine learning model will be trained on the "Depression Anxiety Stress Scale" dataset.

# Goals and Objectives

The primary goals and objectives of this project includes

* Providing a human-type communication bot which will analyze user’s depression, anxiety, stress and suicide risk level.
* Providing on time prevention to users through our diagnosis of the aspects related to emotional disturbance leading to suicidal tendencies
* A measure for each of the three states by an evaluative conversation between user and our AI bot
* Analyzing and predicting the concerned issues using various Machine Learning and Deep learning algorithms
* Based on depression, stress and anxiety level captured, software will analyze the risk of suicide ideation in each individual

# Scope of the Project

An android application which will analyze user’s depression, anxiety, stress and suicide risk level, through interactive communication with a bot. This is achieved with the help of Speech to speech recognition APIs and Urdu NLP web services, provided by Center for Language Engineering (CLE) by Al-Khawarizmi Institute of Computer Science (KICS), UET. In addition to this, our DASS prediction is achieved by exploring and extracting our core dependencies in Studio. We’ll train our model based on this dataset. Based on the user's response, the machine learning techniques are applied providing a follow up to previously asked questions to understand the variability in each domain. Through our application, users will be able to effectively diagnose their mental health issues revolving under the three scales and seek early medical care.

# Initial Study and Work Done so Far

Our direction involves predicting suicidal tendencies based on Depression Anxiety Stress Scale (DASS). For this purpose, several datasets, manuals and scales were studied to direct our focus on a single dependency factor. A meta-analysis conducted by McHugh et al. [1] showed statistical limitations of ideation as a screening tool, but also pointed out that people’s expression of suicidal ideation represents their psychological distress. Considering this, DASS is a suitable instrument to measure the three related negative emotions in individuals [2] and is predominantly aimed at assessing the perceived severity of symptoms related to depression, anxiety and stress [3]. Also, we’ve learned the recommended cut-off scores for conventional severity labels i.e. normal, moderate and severe as shown below:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Depression** | **Anxiety** | **Stress** |
| Normal | 0-9 | 0-7 | 0-14 |
| Mild | 10-13 | 8-9 | 15-18 |
| Moderate | 14-20 | 10-14 | 19-25 |
| Severe | 21-27 | 15-19 | 26-33 |
| Extremely severe | 28+ | 20+ | 34+ |

Source: Adapted from [2]

# References

1. C. M. McHugh, A. Corderoy, C. J. Ryan, I. B. Hickie, and M. M. Large, *Association between suicidal ideation and suicide: meta-analyses of odds ratios, sensitivity, specificity and positive predictive value*, BJPsych open, vol. 5, no. 2, 2019. [Online]. Available: <https://pubmed.ncbi.nlm.nih.gov/31068235/>. [Accessed: Sept. 15, 2020].
2. S. H. Lovibond and P. F. Lovibond, *Manual for the Depression Anxiety Stress Scales*. Sydney Psychology Foundation Australia, 1995. [Online]. Available: <http://bit.ly/DASS_inst>. [Accessed: Sept. 15, 2020].
3. P. F. Lovibond: *Overview of the DASS and Its Uses*, 1995. [Online]. Available: <http://www2.psy.unsw.edu.au/dass/over.htm>. [Accessed: Sept. 17, 2020].