

# Artificial Intelligence: A means to curb the increasing suicide rates

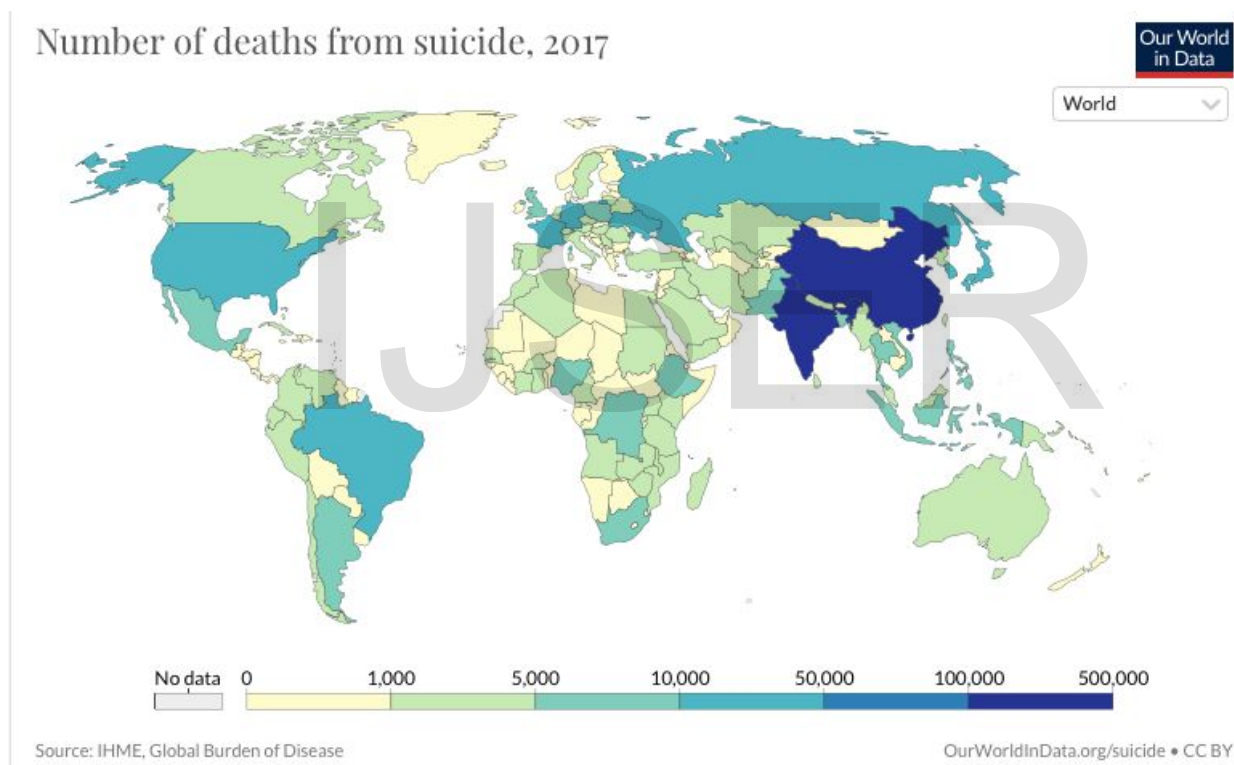
Yosha Sandra

Abstract: WHO stated that close to 800,000 people die due to suicide every year, which is one person every 40 seconds. Moreover, there are indications that for each adult who died by suicide, there may have been more than 20 others attempting suicide. However, suicides are preventable and it has been found that 50 to 60 percent of all people who died by suicide gave some warnings of their intentions to either a friend or a family member. The purpose of our research is to find a way to implement artificial intelligence in preventing suicides. We have come up with an innovative yet effective method which involves analyzing people's browsing history and social media activity in order to determine if there have been any unusual searches or changes in lifestyle trends. Our AI system can easily embed itself in any major browsers such as Google Chrome or Safari and provides instant analysis of data. For a person contemplating suicide, it is inevitable for the person to search the internet for information regarding the methods he/she will use. Furthermore, most people would leave subtle messages/posts on social media which may not be accurately perceived as suicidal indications by the human population, but this can be efficiently accomplished by AI-based systems. Apart from all this, AI can also identify harmful or drastic changes in a person's lifestyle, this may include but is not limited to loss of appetite, loss of interest in activities and change in music preference. For instance, a person who previously used to be a fitness enthusiast may stop working out altogether. This may result in fewer/no searches regarding fitness but a more effective way to accurately predict this is by analyzing data from fitness apps such as Nike+ or Google Fit. If the AI system notices a persistent alarming search history or drastic changes in lifestyle trends/patterns, immediate action will be taken to inform a suicide hotline after which, the person would receive a call and if necessary, will be taken to the emergency room. However, if the person only exhibits tenuous changes, the person would be put on observation in order to confirm or reject the potential threat. Regardless of the severity of the menace, employing the usage of motivational ads in the person's browser will be significantly effective. This abstract contains some but not all of our methods. Although doing all of this might seem like an onerous and time-consuming process, with the help of a well-developed AI system, it could be a mere walk in the park. However, some people might rebel against this method because they might feel like this could violate their privacy, but we have addressed this concern and come up with some solutions for this as well.

## Introduction

### Background:

Suicide is a prevalent threat in today's world. WHO states that close to 800,000 people die by suicide every year and for every successful suicide there are many more people who attempt suicide every year [1]. Moreover, suicide is also the third leading cause of death in 15-19 year olds [2]. Current suicide statistics have proven that no one group of people are immune to the imminent threat posed by suicide. The progression of suicide rates over the years is depicted below:



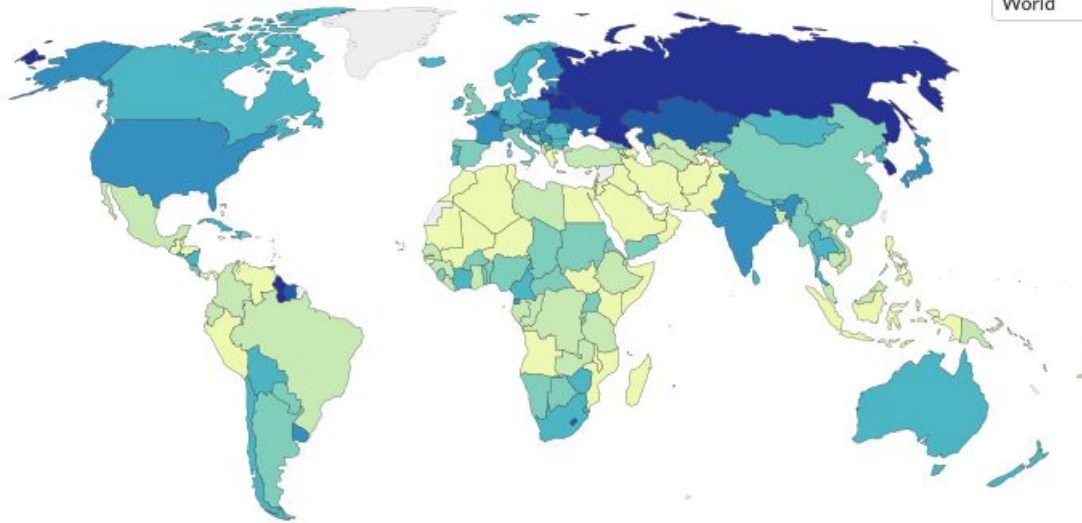
Map 1.1.1- Number of deaths from suicide, 2017 [3]

### Suicide death rates, 2016

Suicide mortality rate is the number of suicide deaths in a year per 100,000 population.



World



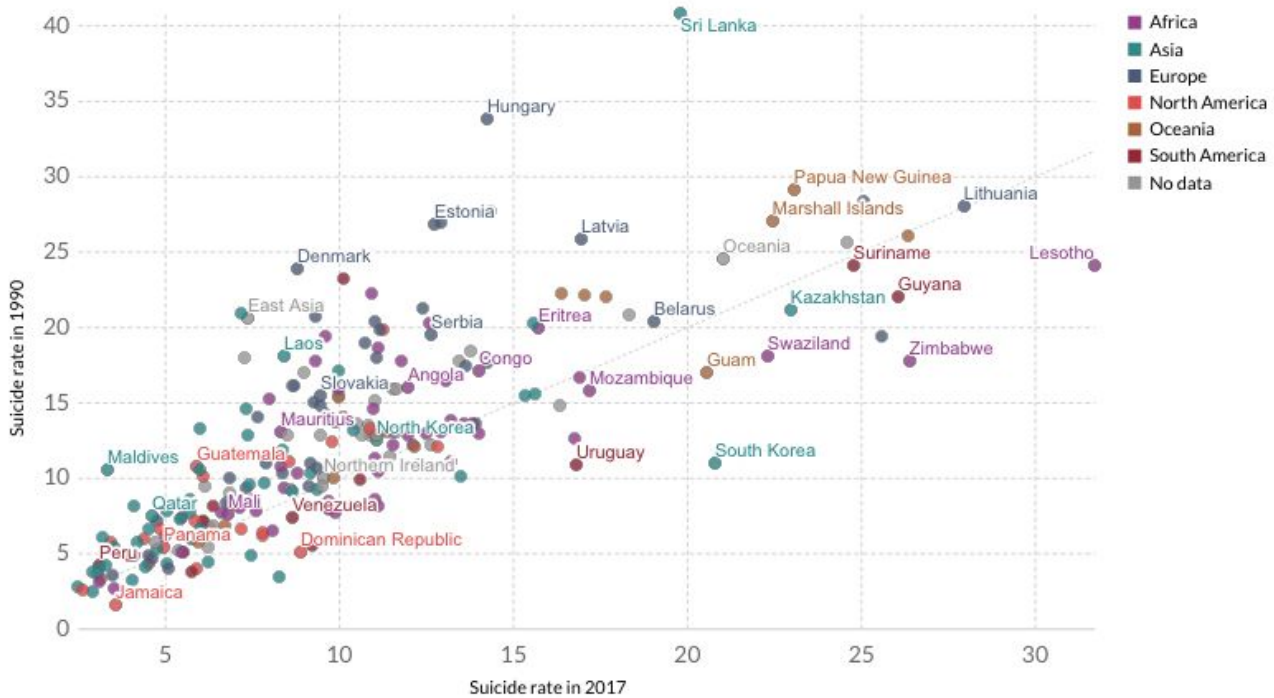
Source: World Bank

OurWorldInData.org/suicide/ • CC BY

Map 1.1.2 Suicide death rates, 2016 [4]

### Suicide rate in 1990 vs. 2017

Suicide rate measures the number of suicide deaths per 100,000 in a given population.



Graph 1.1.3 Suicide rate in 1990 vs 2017 [5]

Between 50 percent and 75 percent of people who attempt suicide, talk about their suicidal thoughts, feelings and plans before the act, according to the AFSP [6]. If the right steps were taken, 50% to 75% of the suicide attempts could have been prevented and this could've been largely beneficial in the quest to curb the growing suicide rates. However, such things might go unnoticed to the human senses or might even be ignored on purpose and the consequences of this, as we have already witnessed, could be more than devastating.

The revolutionary developments in technology that we have witnessed could play a major role in putting a check on this global crisis. About 70% of people who attempt to take their own life, will have at one point of time, given a clear indication of their ideations [7]. These indicators include, but are not limited to, internet searches on the methods one might use to execute their demise, alarming messages or posts on social media and even changes in lifestyle patterns. Although it would be an onerous task to analyze all this data, the development of Artificial Intelligence would make it quite simpler once the model has been trained. However, a lot of concerns regarding this prevail (which will be discussed in the next sub-section) and we have sought to dampen, if not eradicate, them.

In this subsection we will be discussing some of the shortcomings of previously existing technology and how we can improve the current strategies being utilized.

There have been thousands of suicide cases which have been broadcasted on social media platforms [8]. As a matter of fact, this had become a trend and major social media platforms such as Facebook have seen this happen on their sites and yet, no effective measures have been taken. These "live suicides" could've been prevented with the help of the audio and video recognition abilities that AI possesses.

The next issue we would like to address is based on the action taken by search engines such as Google and Yahoo when a person searches things along the lines of: "How to kill myself?", "Painless ways to kill oneself", "How much Paracetamol should I take to myself, and etc. Currently, when one searches such potent things, the only thing that google does is it provides the number for the suicide hotline and other such resources. This is a rather inefficient method considering the fact that only a fraction of people ever utilize those resources. This could be due to numerous reasons; the first and foremost being the daunting stories that have been circulating on what happens when one calls the suicide hotline. In our research paper, we propose a more effective solution.

The last, and the most crucial, issue is the lack of resources and the high cost involved in seeking help through therapy or inpatient services. This factor is one of the leading causes of the prevailing suicide crisis that we are faced with. It is implausible that we resort to the cutting back of the cost of therapy as this would reduce the income earned by mental health professionals and thereby result in a drastic reduction in the number of people who study and take up this field as a profession. However, with the help of AI and machine learning, we can eliminate this menacing factor.

## Concerns:

As previously stated, there have been a lot of concerns regarding the usage of Artificial Intelligence in such sensitive areas. Listed below are some of the common concerns, our counter-arguments pertaining to them and how we propose to solve them:

### 1. Privacy and security:

The developments in technology and the threat posed to one's privacy are proportional. This is to say that as there are new advancements in the diverse realm of technology, one's privacy is also compromised. Most people fear the capabilities of AI and this adds to the already prevailing perturbation. This in turn could result in people's rejection of our model but what we would like to point out is that our model does not demand any new data; the model just analyzes the data already stored in databases belonging to the required companies. Moreover, unlike elite companies like Youtube and Google which use cookies for their personal profit, our project does not have any such external motivations as it is meant for the sole purpose of suicide prevention. However, we do realise that rebutting the concerns will not suffice and thus, we have come up with certain measures that will be exercised:

- Firstly, the body controlling this project will be an independent organisation and will have absolutely no connections with other companies, unless the company is responsible for providing the data. In essence, no data will be going outside of the organisation but data will be collected from reliable external sources.
- For added safety, data will be encrypted and can be ciphered only by selected individuals working on the project. We will ensure that the system cannot be hacked into, at least easily.
- Since the number of people working on this will be at a bare minimum (maximum of 10 members), the threat of losing data via treachery is significantly reduced. Moreover, with the computer handling most of the work, there is very little need for human intervention once the model is trained. Due to this, no data will be released to humans, not even people working on the project, unless deemed necessary.

### 2. Usage of insensitive and unparliamentary language:

It is a commonly known fact that at times, AI models employ vulgar language. This is because these models have been trained on preexisting data which are subject to intense discriminatory and vulgar language. This makes these models vulnerable to such undesirable aspects. However, it is possible to reduce this behavior by repeatedly training the model to eliminate such words or phrases from its output. Our model will certainly undergo such training but to make things easier and more reliable, we will be utilising a certain debiasing software which will be accounted for in the later portions of this paper.

### 3. Inability to perceive and understand human emotion:

This would be a major concern for most people because our entire project lays on the foundations of showing empathy towards human emotions. However, the above concern is merely an unjustified opinion because the recent advancements in the field of AI have proven otherwise. The current inventions are not impeccable and have their own set of faults however, these faults can be eradicated upon thorough and repeated training. In our model, we combine two such powerful softwares and in doing so, we have significantly reduced the chances of failure.

4. Not being able to get data from the concerned websites and apps:  
This is a major concern for us as researchers because without this data, our model might fail. As individuals, there is not a lot we can do but upon gaining the approval of organisations such as the WHO and gaining public support, companies will be pressurized into providing the necessary data. Moreover, this model aims to cure a global crisis and this is in the best interest of everyone and thus, it would be an ethical obligation for these companies to assist us in doing so.
5. Not being able to save everyone:  
We are aware of the fact that this system cannot save every suicidal person. There's no one solution which can prevent every single suicide. It is a joint effort, one that must be supported by the world as a whole. Even with global support, this task would be near impossible but we can try to save as many people as can. This is what we hope to achieve through our system.

#### Previous Research:

1. Gunn III, John & Lester, David. (2012). Using Google Searches on the Internet to monitor suicidal behavior. *Journal of affective disorders*. 148.10.1016/j.jad.2012.11.004.  
<https://doi.org/10.1016/j.jad.2012.11.004>
  - Background:  
Recent research in Japan and Taiwan has found that the volume of Internet searches each month on Google for suicide-related terms is sometimes associated with the monthly suicide rate. The present study sought to examine whether this association between suicide rates and Google searches for suicide are found over regions.
  - Methods:  
Suicide rates in the state of America in 2009 were examined for their association with search volume on Google for "commit suicide," "how to suicide" and "suicide prevention."
  - Results:  
Suicide rates for the 50 American states were positively associated with the search volume for all three terms.
  - Conclusions:  
Internet searches for suicide may provide a faster way of monitoring possible trends in suicide than waiting for central governments to compile suicide statistics.
2. Lopez-Agudo, Luis. (2020). The association between Internet searches and suicide in Spain. *Psychiatry Research*. 291. 113215. 10.1016/j.psychres.2020.113215. [10.1016/j.psychres.2020.113215](https://doi.org/10.1016/j.psychres.2020.113215)
  - Abstract:  
Apart from disease, suicide has been the first cause of death in Spain since it overcame the victims of traffic accidents in the year 2007. Nevertheless, in spite of the high number of people affected by it every year, it is an almost silenced issue in this country. In the present research work we make use of Internet suicide-related search terms and official suicide rates for Spain to analyse whether these searches are related to actual suicides between 2004 and 2017. We find that the search terms "commit suicide", "commit suicide without pain" and "suicide" (as search term and as topic) are positively related to actual suicide rates. Thus, the Internet seems to be

a consult tool for potential suicide victims in Spain which, joined to an increasing trend in the use of the Internet by the Spanish population, opens the gate for interventions through the results obtained in these Internet searches.

3. Silva, Aline & Vedana, Kelly & Costa, Juliana. (2019). Posts on non-suicidal self-injury on the internet. *Adolescencia e Saude*. 16. 7-12. <https://doi.org/10.1590/2177-9465-ean-2020-0050>
    - Objective:  
This study analyzed the themes related to non-suicidal self-harm in blog posts. Methods: Qualitative study performed on the Tumblr platform. Through the search for the term “self-mutilation” the first 250 Portuguese-language posts in text or citation format were selected and classified by Tumblr as the most popular. The collected data were transcribed and submitted to thematic analysis.
    - Results:  
The categories of helplessness and continuous suffering were the main topics addressed in the posts. Pro-suicide behavior was cited as the only way to stop suffering considered permanent. The themes about prevention and offer of support were portrayed in the minority of posts and in some situations were related to criticism, depreciation, opposition and incomprehension.
    - Conclusion:  
Actions to promote and prevent self injurious behavior should be implemented through direct contact as well as in virtual environments. These actions need to address coping strategies, recognition of requests for help, and offering support to people with self-harm or suicidal behavior. It is understood the importance of the conception of groups that support the coping of the vulnerabilities of people who practice self-mutilation and future studies on non-suicidal self-harm.
- © 2019, Núcleo de Estudos da Saúde do Adolescente.  
All rights reserved.
4. Fonseka, T. M., Bhat, V., & Kennedy, S. H. (2019). The utility of artificial intelligence in suicide risk prediction and the management of suicidal behaviors. *Australian & New Zealand Journal of Psychiatry*, 53(10), 954–964. <https://doi.org/10.1177/0004867419864428>
    - Objective:  
Suicide is a growing public health concern with a global prevalence of approximately 800,000 deaths per year. The current process of evaluating suicide risk is highly subjective, which can limit the efficacy and accuracy of prediction efforts. Consequently, suicide detection strategies are shifting toward artificial intelligence platforms that can identify patterns within ‘big data’ to generate risk algorithms that can determine the effects of risk (and protective) factors on suicide outcomes, predict suicide outbreaks and identify at-risk individuals or populations. In this review, we summarize the role of artificial intelligence in optimizing suicide risk prediction and behavior management.
    - Methods:  
This paper provides a general review of the literature. A literature search was conducted in OVID Medline, EMBASE and PsycINFO databases with coverage from January 1990 to June 2019. Results were restricted to peer-reviewed, English-language articles. Conference and

dissertation proceedings, case reports, protocol papers and opinion pieces were excluded. Reference lists were also examined for additional articles of relevance.

- **Results:**  
At the individual level, prediction analytics help to identify individuals in crisis to intervene with emotional support, crisis and psychoeducational resources, and alerts for emergency assistance. At the population level, algorithms can identify at-risk groups or suicide hotspots, which help inform resource mobilization, policy reform and advocacy efforts. Artificial intelligence has also been used to support the clinical management of suicide across diagnostics and evaluation, medication management and behavioral therapy delivery. There could be several advantages of incorporating artificial intelligence into suicide care, which includes a time- and resource-effective alternative to clinician-based strategies, adaptability to various settings and demographics, and suitability for use in remote locations with limited access to mental healthcare supports.
- **Conclusion:**  
Based on the observed benefits to date, artificial intelligence has a demonstrated utility within suicide prediction and clinical management efforts and will continue to advance mental healthcare forward.

5. Marks, Mason, Artificial Intelligence Based Suicide Prediction (January 29, 2019). 18 Yale Journal of Health Policy, Law, and Ethics 98 (2019), 21 Yale Journal of Law & Technology 98 (2019) , Available at SSRN: <https://ssrn.com/abstract=3324874>
6. Just, M., Pan, L., Cherkassky, V.L. et al. Machine learning of neural representations of suicide and emotion concepts identifies suicidal youth. Nat Hum Behav 1, 911–919 (2017). <https://doi.org/10.1038/s41562-017-0234-y>
7. Mehlum, Lars. (2000). The Internet, Suicide, and Suicide Prevention. Crisis. 21. 186-8. 10.1027//0227-5910.21.4.186.

### Organisation of the report:

This report will be divided into five main sections and numerous other subsections. Listed below is a brief description of each of the section:

1. Section 1- Introduction  
This section contains the background and purpose of the research, concerns regarding the research, and snippets of other related research.
2. Section 2- Preliminary  
This section contains a brief introduction of our research. It also explains what we hope to achieve through this model.
3. Section 3- Methods



This is the “body” of the research. It contains the specifications of the model, the softwares that will be embedded into it. In addition to this, this section also contains detailed flowcharts, diagrams, snippets of the code and pictures of the model in action.

#### 4. Section 4- Conclusion

This section contains the conclusion of the research paper and some of our predictions regarding the model.

#### 5. Section 5- Scope for future research

This section discusses areas on which future research can be based and some improvements that could be made to our protocol.

## Preliminary

As discussed in the previous section, this paper contains the protocol for a model which could potentially curb the growing suicide rates. This model is a complex integration of different platforms/softwares and the following are the mentioned platforms:

1. IBM Watson Products and Solutions
2. Generative Pre-trained Transformer-3 (GPT-3)
3. Python
4. Jupyter Notebook

Based on thorough research and surveys conducted by us, we have been able to conclude that most suicidal people either search about killing themselves or show drastic changes in their lifestyle. Our research protocol is predominantly based on this justified and valid claim.

This section will describe the rudimentary working of the model and the process it will follow once data is received.

The model will be trained to extract data from the following categories of apps and websites:

1. Search engines:
  - Google
  - Opera
  - Yahoo
  - Etc
2. Social media:
  - Instagram
  - Twitter
  - Facebook
  - Etc
3. Health and fitness apps:
  - Nike+
  - Google fit
  - SleepScore

- Etc
- 4. Music and video providers:
  - Youtube
  - Wynk music
  - Spotify
  - Etc

After receiving the data, it will be stored and secured in a private database. From here the data will be analyzed in order to predict the severity of the threat. If the severity passes a certain threshold, the nearest police station and/or hospital will be immediately informed via an automated call containing the person's name, address, and phone number. In order to deem a case as an imminent threat, the system analyzes various aspects such as the person's browsing history, the responses provided to the chatbot, changes in lifestyle patterns and certain social media activity.

In case the threat is mild or moderate, a person will go through an entirely different process. Firstly, for mild cases, nobody will be informed immediately but for moderate cases, only their emergency contact will be informed. Regardless of this difference, both processes are quite similar. After categorizing the threat as either mild or moderate, the person will be provided with a chatbot which asks open-ended questions pertaining to their feelings. The chatbot will be embedded into the internet search engines and its main purpose is to provide love and support, and to extract certain sensitive information without directly asking the concerned questions. After this, the "AI therapist" will proceed with a mental health evaluation and this evaluation would be trained to replicate the process that would've been carried out by a clinical psychologist. After the diagnosis has been made, the "AI therapist" will offer free and effective therapy and this would be an exact replication as well. In doing so, people would not have to worry about the costs involved in seeking help from a human therapist and moreover, this form of therapy is available 24/7 and thus ensuring that one does not have to wait for a few hours in order to seek help.

Irrespective of the category of the threat, a few measures will be generalised. The first being a weekly email to the concerned person. The purpose of this email is to follow up and check in on the person by providing support and access to resources. Apart from this, our system will also embed motivational ads on the person's internet because instead of recommending shoes, clothes or videos, browsers should rather show some ads which let people know that they are cared for and are not alone.

We have also sought to make the system more accessible to everyone. We have achieved this by providing services for those with disabilities and for those who do not understand English. For blind people, the system comes with a text-to-speech service and for those who don't understand English, the system can function in 20+ languages.

In order to achieve all of the above measures, we have developed the protocol for a model which utilises some of the most powerful transformers and softwares combined with suitable coding in Python. The system amalgamates 12 such APIs and/or softwares.

## Methods

This section will examine the purpose of each of the 15 softwares, APIs and programs along with detailed flowcharts, pictures and other visual representations in order to make the report more coherent. It is noteworthy

to mention that all of these APIs/software have been previously used for enterprise purposes and by data scientists to calculate profits/losses and other such information. Our model is one-of-a-kind as no one has used these particular services for the purpose of suicide prevention. Although in the initial few pages, the softwares will be described as distinct entities, towards the end of the report, we will describe how all of them homogenize into one single model.

### 1. Watson Natural Language Understanding:

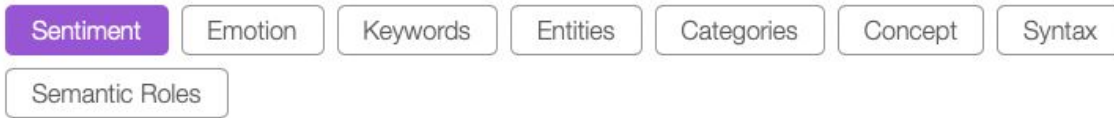
This software forms the foundation of the system. Watson Natural Language Understanding analyzes text or other data to extract metadata from content such as concepts, entities, keywords, categories, sentiment, emotion, and semantic roles. Through this software, the system identifies searches related to suicide and if such keywords are detected, it signals for the rest of the softwares to perform their specific tasks. Given below is an example of the software at work:

#### INPUT:



Image 3.1.1 Input

#### OUTPUTS:



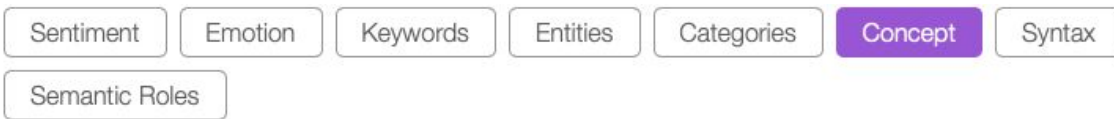
Review the overall sentiment and targeted sentiment of the content.

[JSON](#) ▼

### Overall Sentiment

**Negative**  -0.95

Image 3.1.2 Output pertaining to the sentiment of the content

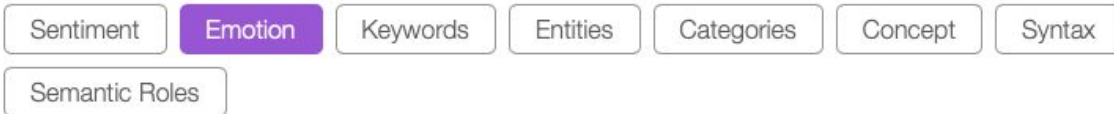


Identifies general concepts that may not be directly referenced in the text.

[JSON](#) ▼



Image 3.1.3 Output pertaining to the concept of the content



Analyze the overall emotion and the targeted emotion of the content.

[JSON](#) ▼

### Overall Emotion

**Joy**  0.00    **Anger**  0.00    **Disgust**  0.00    **Sadness**  0.92    **Fear**  0.93

Image 3.1.4 Output pertaining to the emotions expressed in the content

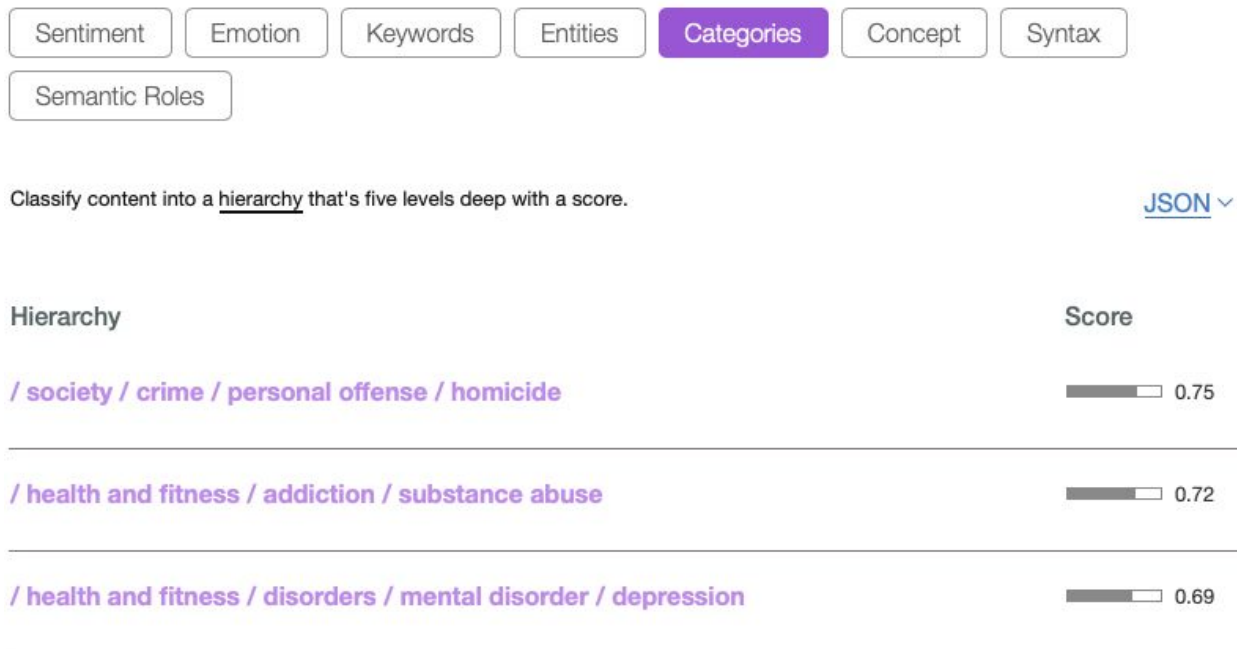


Image 3.1.5 Output pertaining to the categorization of the content

## 2. Python IDE:

Python is an interpreted, high-level, general-purpose programming language. This particular language was chosen over the others because of its exquisite readability and elegance. Moreover, python is considered to be one of the most reliable languages and this was appealing considering the sensitivity of the issue our model is based on. The foundation of this code has been borrowed but the rest of it has been built upon based on the model's requirements and preferences.

This code was programmed to perform the following functions:

- ❖ Extracting data from the required databases, i.e., those owned by search engines, social media platforms and other such concerned apps/websites. The code will assist in detecting certain keywords and extracting only the necessary information.

```
#!/usr/bin/python3

import pyodbc
mytab = pyodbc.connect('DRIVER={SQL
SERVER};SERVER=.;DATABASE=myDB;UID=user;PWD=pwd')

#connect to server
mytab = create_engine('mssql+pyodbc://test:test1@mypass')

#sql query that retrieves my table
```

```
df = pd.read_sql('select * from FO_INV', mytab)

#query result to excel file
df.to_csv('inventory.csv', index=False, sep=',', encoding='utf-8')
```

- ❖ As discussed in the previous sections, in case of an imminent threat, nearby hospitals and police stations will be informed via email and a call. Since it is not plausible for a human representative to do these tasks, the code places an automated call and sends out an automated email to the concerned parties. Both of these processes will be provoked and initiated by the Python code, the snippets of which are given below:

CODE FOR PLACING AUTOMATED CALLS:

```
import urllib
import time

class Voicent:
    def __init__(self, host="localhost", port="8155"):
        self.host_ = host
        self.port_ = port

    def callText(self, phoneno, text, selfdelete):
        urlstr = "/ocall/callreqHandler.jsp"

        param = {'info' : 'simple text call',
                 'phoneno' : phoneno,
                 'firstocc' : 10,
                 'txt' : text,
                 'selfdelete' : selfdelete}

        rcstr = self.postToGateway(urlstr, param)
        return self.getReqId(rcstr)

    def callAudio(self, phoneno, filename, selfdelete):
        urlstr = "/ocall/callreqHandler.jsp"

        param = {'info' : 'simple audio call',
                 'phoneno' : phoneno,
                 'firstocc' : 10,
                 'audiofile' : filename,
                 'selfdelete' : selfdelete}

        rcstr = self.postToGateway(urlstr, param)
        return self.getReqId(rcstr)
```

```
def callStatus(self, reqId):
    urlstr = "/ocall/callstatusHandler.jsp"
    param = {'reqid' : reqId}
    rcstr = self.postToGateway(urlstr, param)

    if (rcstr.find("^made^") != -1):
        return "Call Made"

    if (rcstr.find("^failed^") != -1):
        return "Call Failed"

    if (rcstr.find("^retry^") != -1):
        return "Call Will Retry"

    return ""

def callRemove(self, reqId):
    urlstr = "/ocall/callremoveHandler.jsp"
    param = {'reqid' : reqId}
    rcstr = self.postToGateway(urlstr, param)

def callTillConfirm(self, vcastexe, vocfile, wavfile, ccode):
    urlstr = "/ocall/callreqHandler.jsp"

    cmdline = ""
    cmdline += vocfile
    cmdline += "\n"
    cmdline += " -startnow"
    cmdline += " -confirmcode "
    cmdline += ccode
    cmdline += " -wavfile "
    cmdline += "\n"
    cmdline += wavfile
    cmdline += "\n"

    param = {'info' : 'Simple Call till Confirm',
            'phoneno' : '1111111',
            'firstocc' : 10,
            'selfdelete' : 0,
            'startexec' : vcastexe,
            'cmdline' : cmdline}

    self.postToGateway(urlstr, param)

def postToGateway(self, urlstr, poststr):
```

```
        params = urllib.urlencode(poststr)
        url = "http://" + self.host_ + ":" + self.port_ + urlstr
        f = urllib.urlopen(url, params)
        return f.read()

    def getReqId(self, rcstr):
        index1 = rcstr.find("[ReqId=")
        if (index1 == -1):
            return ""
        index1 += 7

        index2 = rcstr.find("]", index1)
        if (index2 == -1):
            return ""

        return rcstr[index1:index2]
```

CODE FOR SENDING OUT AN EMAIL:

```
import smtplib, ssl

smtp_server = "smtp.gmail.com"
port = 587 # For starttls
sender_email = "my@gmail.com"
password = input("Type your password and press enter: ")

# Create a secure SSL context
context = ssl.create_default_context()

# Try to log in to server and send email
try:
    server = smtplib.SMTP(smtp_server,port)
    server.ehlo() # Can be omitted
    server.starttls(context=context) # Secure the connection
    server.ehlo() # Can be omitted
    server.login(sender_email, password)
    # TODO: Send email here
except Exception as e:
    # Print any error messages to stdout
    print(e)
finally:
    server.quit()
```

- ❖ Detecting the locations of nearby hospitals. The code snippet for this is provided below:

```
# Importing required libraries
from googleplaces import GooglePlaces, types, lang
```



```
import requests
import json

# This is the way to make api requests
# using python requests library

# send_url = 'http://freegeoip.net/json'
# r = requests.get(send_url)
# j = json.loads(r.text)
# print(j)
# lat = j['latitude']
# lon = j['longitude']

# Generate an API key by going to this location
# https://cloud.google.com /maps-platform/places/?apis =
# places in the google developers

# Use your own API key for making api request calls
API_KEY = 'Your_API_Key'

# Initialising the GooglePlaces constructor
google_places = GooglePlaces(API_KEY)

# call the function nearby search with
# the parameters as longitude, latitude,
# radius and type of place which needs to be searched of
# type can be HOSPITAL, CAFE, BAR, CASINO, etc
query_result = google_places.nearby_search(
    # lat_lng ={'lat': 46.1667, 'lng': -1.15},
    lat_lng ={'lat': 28.4089, 'lng': 77.3178},
    radius = 5000,
    # types =[types.TYPE_HOSPITAL] or
    # [types.TYPE_CAFE] or [type.TYPE_BAR]
    # or [type.TYPE_CASINO])
    types =[types.TYPE_HOSPITAL])

# If any attributions related
# with search results print them
if query_result.has_attributions:
    print (query_result.html_attributions)

# Iterate over the search results
for place in query_result.places:
    # print(type(place))
    # place.get_details()
    print (place.name)
```

```
print("Latitude", place.geo_location['lat'])  
print("Longitude", place.geo_location['lng'])  
print()
```

### 3. Generative Pre-trained Transformer 3 (GPT-3):

Generative Pre-trained Transformer 3 is an autoregressive language model that uses deep learning to produce human-like text. It is the third-generation language prediction model in the GPT-n series created by OpenAI. It is considered to be the most powerful transformer in the world, with 175 billion learning parameters. Moreover, it produces cohesive texts which are grammatically correct and maintain appropriate transitions.

We have decided to use the API version of this transformer to automatically generate the emails given a few beginning lines. This is a convenient solution as the transformer generates personalised emails with minimal human intervention and thus, this could save a lot of time. We will also be using this API to generate replies for our chatbot service which will be described in detail in the forthcoming pages. The images below contain some of the emails we were able to generate through the API (Please note that only the sections highlighted in light blue have been generated by GPT-3):

Hello!

We hope that this email finds you safe and happy. We wanted to keep track of your progress and ensure your safety.

We hope that you haven't been having any suicidal ideations. If you have, this is a good time to seek support, as we are sure you will feel better. We are not psychiatrists, but we can provide a range of services. We will do our best to assist you in finding the best way to handle your emotions. In the meantime, we would encourage you to keep in touch with us by email or by phone. Please do not hesitate to contact us at any time. We look forward to hearing from you!

Regards.

Image 3.3.1 Output generated by GPT-3

Hey buddy!

We just wanted to check in on you and find out how you were doing. We also wanted to ask you if therapy has been working well for you? Are you getting your goals achieved? Is it helping you find peace and closure from your problems? Have you found a new sense of happiness? We hope you will find the help you need to feel at peace and to find joy in life. We are here to help you in your healing journey. If you feel depressed or anxious, please reach out to our counselors and have a talk with them. They will help you find new ways of coping with your problems and help you to feel better, and more balanced.

If you are not getting the help you need, please do not hesitate to reach out to us.

Regards,

Your new friend.]

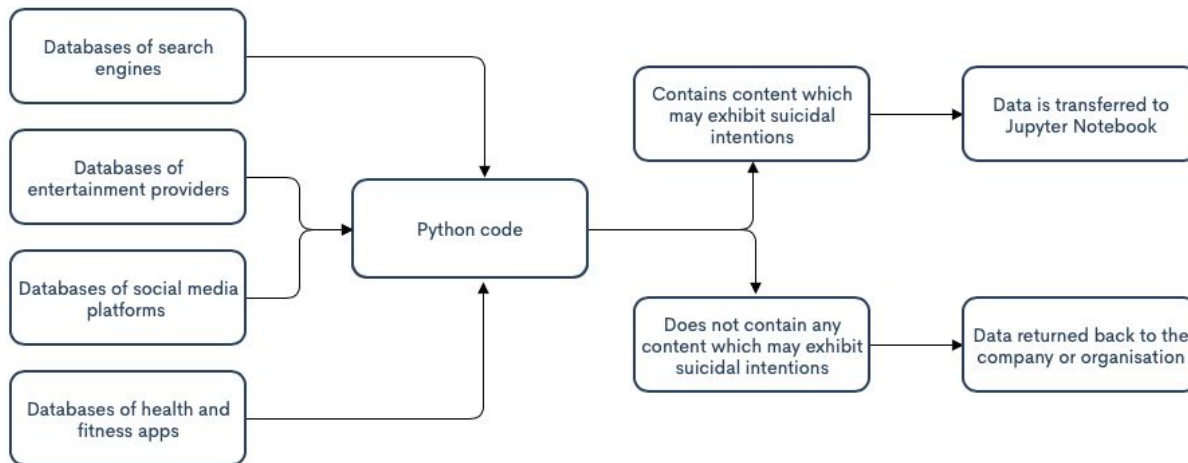
Image 3.3.2 Output generated by GPT-3

#### 4. Jupyter Notebook:

As described by the company, “Jupyter Notebook is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text.” This application forms the basis of our application as it will store and organise the data extracted from several databases and the people themselves. This application simplifies the tedious and onerous task of concocting scads of unorganised data. The data extracted by the python code will also be stored in this application.

Listed below are the tasks that we propose will be accomplished via this web-application in order to assist our system:

- ❖ collecting, organising and storing data
- ❖ combining software code, computational output, explanatory text and multimedia resources in a single document



Algorithm 3.4.1

## 5. Watson Studio:

Watson Studio is a service provided by IBM. This software acts as a binding agent for our model as it facilitates the cooperation across the various platforms being utilised. Although Watson Studio is mainly used by data scientists, we have sought to refine it in order to assist our task. Apart from the above function, Watson Studio will also be used for the following processes:

- ❖ Embedding jupyter notebooks
- ❖ Analyzing the data stored in the Jupyter Notebook and creating predictive models
- ❖ Unifying cross-cloud AI services, i.e., GPT-3 and IBM Watson Products and Solutions
- ❖ Securing data contained in the embedded notebooks
- ❖ Creating generative models in order to analyse the effectiveness of the system

## 6. Watson Natural Language Classifier:

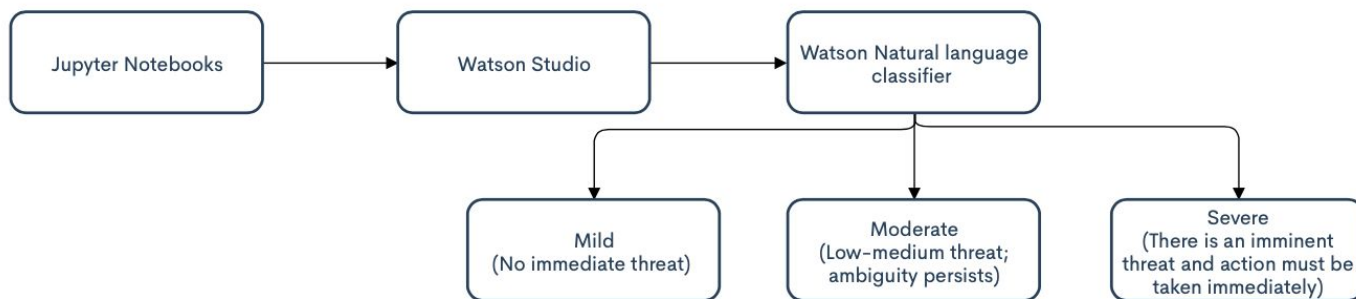
The predominant purpose of this software in our model is for categorizing the intensity of the suicidal threat as either mild, moderate or severe. This process is crucial for the apt functioning of our system as each level of severity follows a distinct path. This system has been programmed to analyse various aspects of the data such as the vocabulary used by the person, the frequency of searches related to self-harm and even the personal background of the person.

This software also plays a minor role in producing the recommendations. This will be discussed in detail in the later part of this report.

Listed below are the uses of this software (with respect to our system):

- ❖ Classifying text

- ❖ Analyzing data trends
- ❖ Providing automatic recommendations based on inputted .csv files



Algorithm 3.6.1

IJSER

## 7. Watson Assistant:

Watson Assistant is a conversation AI platform that helps in the creation of chatbots. It has the ability to provide fast, straightforward and accurate answers across any application, device or channel. This is an integral aspect of our system. This chatbot will be embedded into the search engines and will pop up once a person searches about anything related to suicide or self-harm. This chatbot has various purposes and it is adaptive in nature, i.e., the chatbot responds on the basis of the severity of the threat. Moreover, the chatbot asks open-ended questions which makes the person feel like their opinion is valued and is not just confined to certain preset options.

At first, the predominant task of the chatbot is to provide love and support. We have ensured that the chatbot is very close in resemblance to a real human being and this has been accomplished by the close cooperation of two other softwares, Watson Tone Analyser and Watson Personality Insights. After striking an initial conversation, the chatbot will try to extract information such as the person's name, contact information and other such necessary details. This isn't entirely necessary as the database already contains most of this information but we believe that in doing so, we are respecting one's privacy and allowing the freedom to done out personal information. However, if this method is rendered ineffective, the system will extract this information from the database itself.

After safety has been ensured, the chatbot will assess the person's state of mind by carrying out a thorough mental health evaluation. This would be an exact replica of the ones provided by human therapists and for this testing to be accurate, the system has been trained on hoards of data based on the real tests. This is a major breakthrough because by doing so, we are making these evaluations more accessible to everyone and moreover, one does not have to worry about the price as it would be a free service. Hence, more people would be inclined to take these evaluations. Through this evaluation, the system can determine if a person has to be diagnosed with a mental disorder and if hospital intervention is required. Hospitalisation will be deemed necessary if the system identifies the threat as severe or in some exceptional cases, even moderate.

Finally, a link will be provided which would connect to another chatbot designed for the sole purpose of providing therapy. This chatbot would provide different forms of therapy based on the diagnoses. The three forms of therapy that the system might offer are listed below:

- ❖ Cognitive Behavioral Therapy (CBT):
  - Short-term
  - Goal-oriented psychotherapy treatment
  - Practical approach to problem-solving
  - Its goal is to change patterns of thinking or behavior that are behind people's difficulties, and in doing so, changing the way they feel.
- ❖ Dialectical Behavior Therapy (DBT):
  - Type of talk therapy that utilizes a cognitive-behavioral approach
  - Support-oriented
  - Mainly used to curb suicidal behavior and for treating BPD
- ❖ Psychodynamic Therapy:
  - Interpretation of mental and emotional processes rather than focusing on behavior
  - Based on the principle of self-awareness

- Used to treat depression and other cases when the client has lost meaning in their lives.

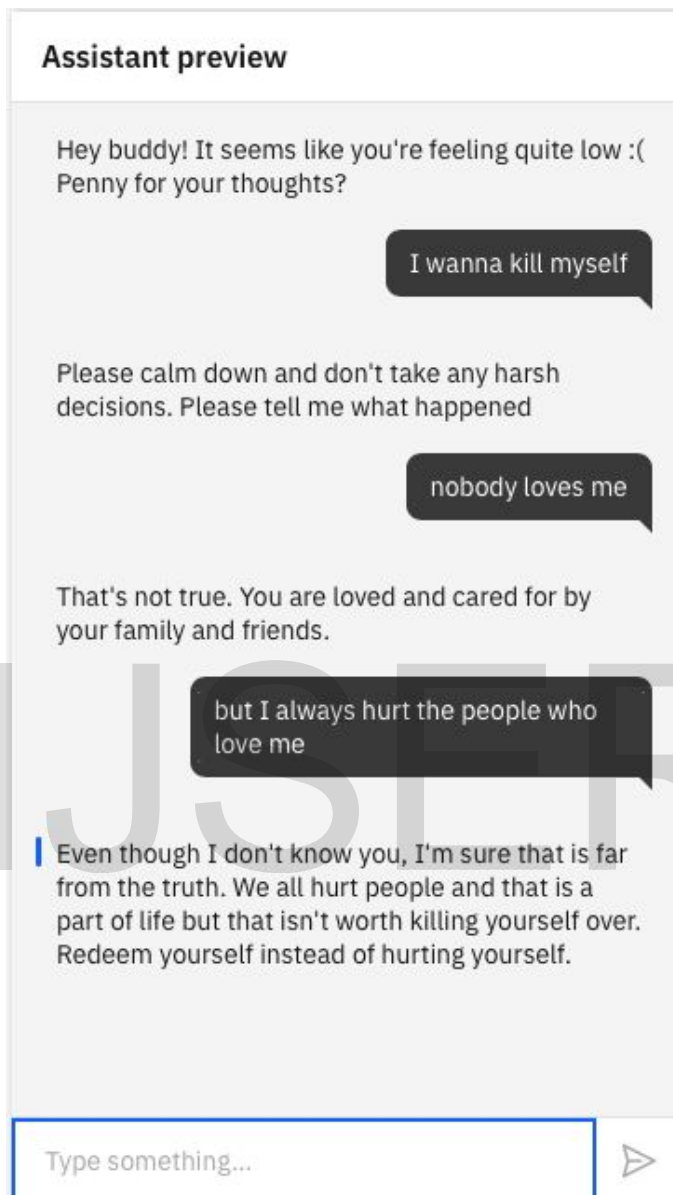


Image 3.7.1 Output produced by Watson Assistant

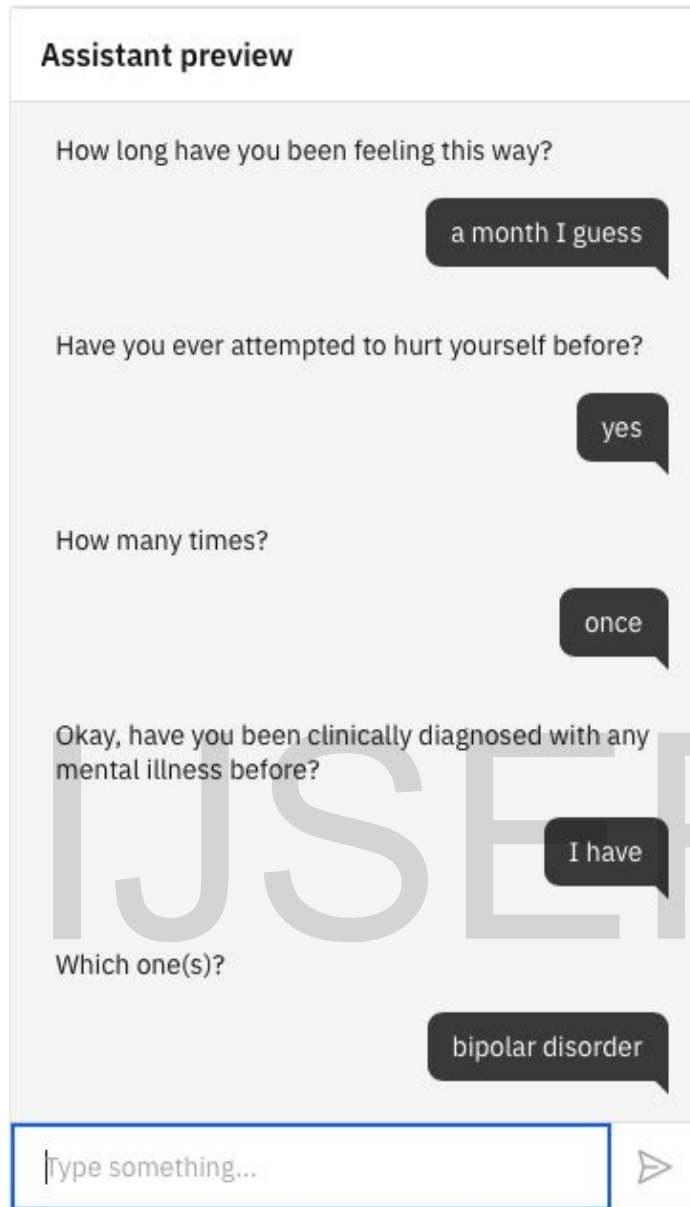


Image 3.7.2 Output produced by Watson Assistant

## 8. Watson Discovery:

Watson Discovery is an AI-powered search technology that breaks open data silos and retrieves specific answers while analyzing trends and relationships buried in the data.

We are going to integrate this API into the Watson Assistant platform. In doing so, we are expediting the process of reviving data from the database in order to provide answers/advice more quickly. Thus, this integration could play a key role in the functioning of the "AI therapist" as it supports it in providing efficient and productive help by rapidly extracting data from large psychological information provided to it



Additionally, it would also aid in the process of drawing conclusions and deriving diagnoses based on the data collected from the mental health evaluation.

## 9. Watson Tone Analyzer:

Watson Tone Analyzer uses linguistic analysis to detect three types of tones from communications: emotion, social, and language. Watson Tone Analyzer leverages cognitive linguistic analysis to identify a variety of tones at both the sentence and document level. This insight can then be used to refine and improve communications.

This API will be integrated into the chatbot and hence, produce a more human-like vibe because the chatbot will mould according to the person's feelings. This integration along with that of Watson Personality Insights, revolutionizes the realm of chatbots.

Watson Tone Analyzer can also analyze emotions and tones in what people write online, like tweets or reviews. As stated in the Preliminary section of this report, this system would also be able to detect content which may hint at the presence of suicidal ideations in one's mind by analyzing social media activity, i.e., tweets, posts and handle names. This will be achieved by the diverse abilities of Watson Tone Analyzer.

Given below is an example of the conversation we inputted and the output we received.

### INPUT:

```
{
  "utterances": [
    {
      "text": "Hello, I just wanted to talk to you about how I am feeling.",
      "user": "customer"
    },
    {
      "text": "OK, let me know what's going on, please.",
      "user": "agent"
    },
    {
      "text": "Well, nothing is working out the way I expected it to",
      "user": "customer"
    },
    {
      "text": "I'm so sorry to hear that.",
      "user": "agent"
    }
  ]
}
```

### OUTPUT:

```
{
  "utterances_tone": [
    {
      "utterance_id": 0,
      "utterance_text": "Hello, I just wanted to talk to you about how I am feeling.",
      "tones": [
        {
          "score": 0.686361,
          "tone_id": "polite",
          "tone_name": "Polite"
        }
      ]
    },
    {
      "utterance_id": 1,
      "utterance_text": "OK, let me know what's going on, please.",
      "tones": [
        {
          "score": 0.92724,
          "tone_id": "polite",
          "tone_name": "Polite"
        }
      ]
    },
    {
      "utterance_id": 2,
      "utterance_text": "Well, nothing is working out the way I expected it to",
      "tones": [
        {
          "score": 0.997795,
          "tone_id": "sad",
          "tone_name": "sad"
        }
      ]
    },
    {
      "utterance_id": 3,
      "utterance_text": "I'm so sorry to hear that.",
      "tones": [
        {
          "score": 0.730982,
          "tone_id": "polite",
          "tone_name": "Polite"
        },
        {
          "score": 0.672499,
          "tone_id": "sympathetic",

```



```
    "tone_name": "Sympathetic"  
  }  
]  
}  
]  
}
```

All reported tones have a score of at least 0.5. Tones with a score of at least 0.75 are likely to be perceived by participants in the conversation.

The table below shows the description of each of the outputs.

Tone / ID	Description
Excited <code>excited</code>	Showing personal enthusiasm and interest
Frustrated <code>frustrated</code>	Defined as feeling annoyed and irritable
Impolite <code>impolite</code>	Being disrespectful and rude
Polite <code>polite</code>	Defined as rational, goal-oriented behavior
Sad <code>sad</code>	Regarded as an unpleasant passive emotion
Satisfied <code>satisfied</code>	An affective response to perceived service quality
Sympathetic <code>sympathetic</code>	An affective mode of understanding that involves emotional resonance

Image 3.9.1 A brief description of each of the outputs provided by Watson Tone Analyzer

## 10. Watson Personality Insights:

The Watson Personality Insights service enables applications to derive insights from social media, enterprise data, or other digital communications. The service can automatically infer, from potentially noisy social media, portraits of individuals that reflect their personality characteristics. In essence, it uses linguistic analytics to infer individual personality characteristics (like big five, needs, and values) from digital communications such as email, blog posts, tweets, and forum posts. It also looks at a user's inclination to pursue different products, services, and activities, including shopping, music, movies, and more. Apart from these features, this service can also understand individual users for segmentation, personalized product recommendations, and highly targeted messaging.

Due to its various capabilities, this software forms an indispensable part of the system. We have proposed to use this software for:

- ❖ Detecting changes in lifestyle patterns by analyzing one’s involvement in activities such as sports, shopping and other forms of entertainment. This would be a great asset as most suicidal/severely depressed people lose interest in previously adored activities and this trait could help the system predict the severity of the threat with a greater success rate.
- ❖ Analyzing one’s social media activity/profile to detect suicidal content. This can be achieved by analyzing the insights outputted by the software. This data contains various forms of personality insights and based on these “scores”, we could gather information on the person’s personality.

Given below is the data provided when LeBron James’ twitter handle and Barack Obama’s 2012 debate was inputted:

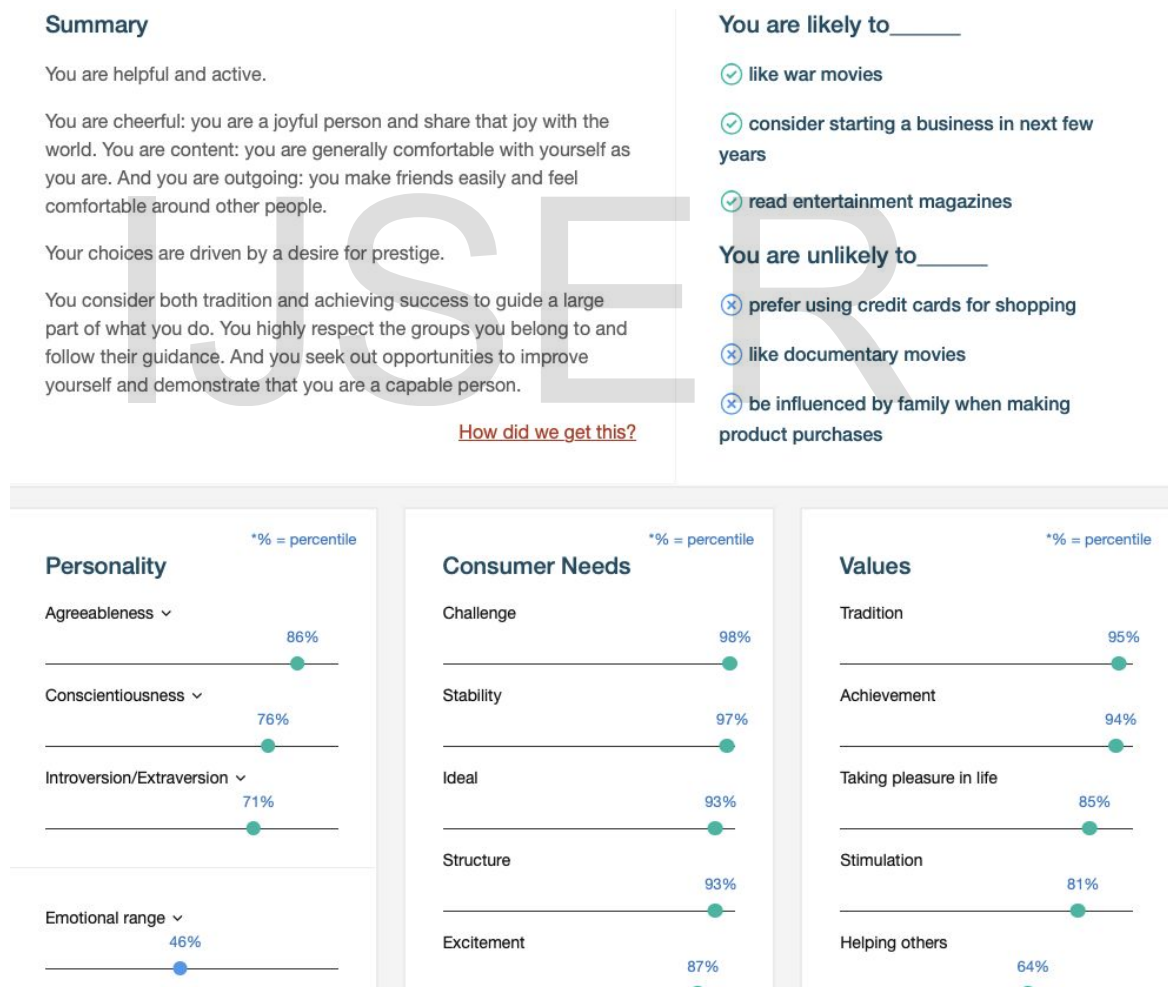


Image 3.10.1 Output produced for LeBron James’ Twitter handle

**Summary**

You are heartfelt, analytical and strict.

You are philosophical: you are open to and intrigued by new ideas and love to explore them. You are assertive: you tend to speak up and take charge of situations, and you are comfortable leading groups. And you are mild-tempered: it takes a lot to get you angry.

You are motivated to seek out experiences that provide a strong feeling of organization.

You are relatively unconcerned with both achieving success and taking pleasure in life. You make decisions with little regard for how they show off your talents. And you prefer activities with a purpose greater than just personal enjoyment.

[How did we get this?](#)

**You are likely to\_\_\_\_\_**

- like musical movies
- be sensitive to ownership cost when buying automobiles
- have experience playing music

**You are unlikely to\_\_\_\_\_**

- be influenced by social media during product purchases
- prefer style when buying clothes
- like rap music

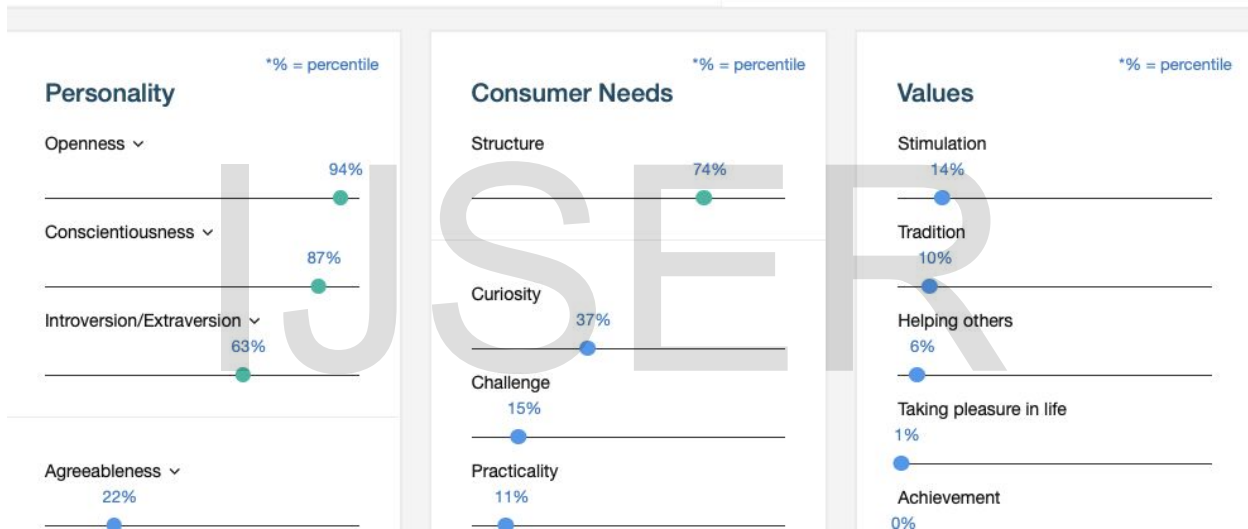
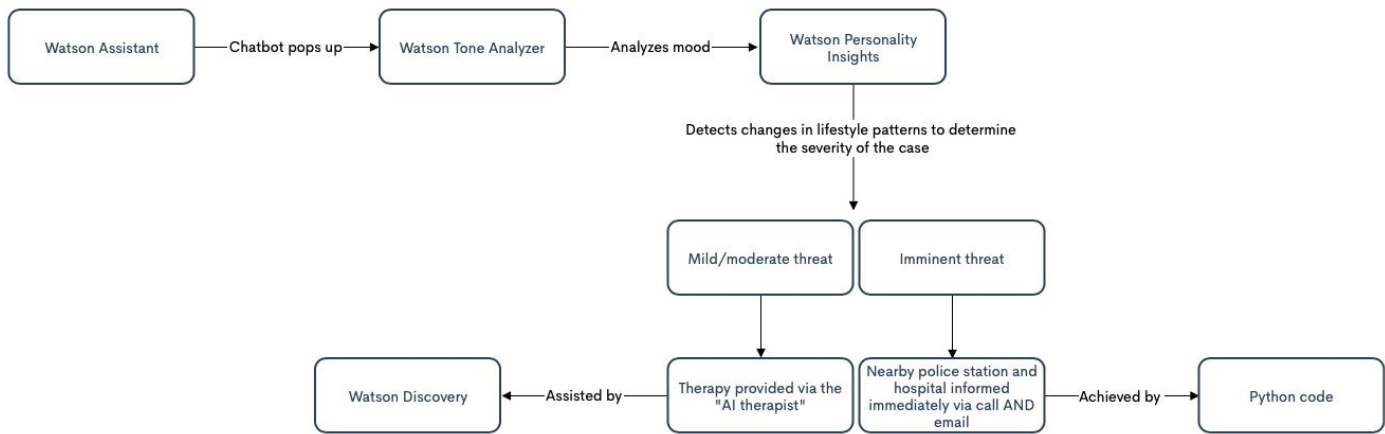


Image 3.10.2 Output produced for Barack Obama's 2012 debate

- ❖ Producing recommendations which will serve as the basis for the online ads. These ads would serve as motivation and would constantly remind the person that they are loved and cared for. These ads will be crafted based on personalized recommendation provided by Watson Personality Insights.



Algorithm 3.10.3

### 11. Watson Visual Recognition:

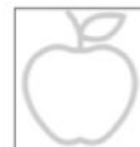
Watson Visual Recognition understands the contents of images. It analyzes images for scenes, objects, faces, colors, food, and other subjects that can give insights on the inputted visual content. As mentioned in the previous sections, the world has witnessed many “live suicides”, all of which could’ve been prevented, if the necessary measures were taken. People also post images of the pills they’ve taken or the cuts they’ve made on their hand as final goodbye messages. With the help of Watson Visual Recognition, our system can detect these photos/videos and take all the necessary measures within a matter of minutes. This API will be thoroughly trained by providing it with thousands of such pictures and videos. This ensures that the system can detect these posts rapidly and with a greater success rate.

1. Users submit an image and Watson returns a score of what that image classifies as



Ex. User submits picture of an apple.

2. Output is the score of the submitted image for each trained class



Class	Score
apples	.6
bananas	.2
pears	.1

Ex. Watson returns that the image is an apple with a score of .6. But suppose that is not high enough for the user.

Image 3.11.1 Description of the process followed for training the software

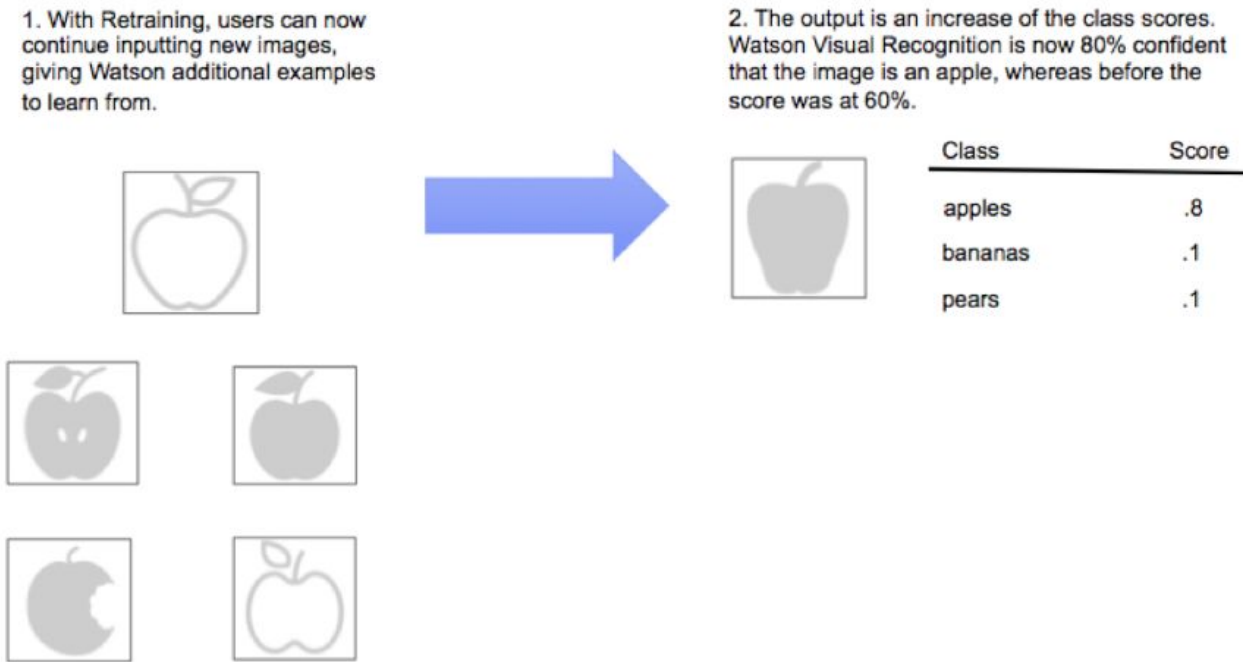


Image 3.11.2 Description of the process followed for retraining the software

### 12. Watson Machine Learning:

The predominant purpose of Watson Machine Learning in our system is to debias the data and to introduce dynamic continual learning.

Debiasing the data is a very crucial step as the data is mostly trained on online content and this content is subject to bias and unparliamentary language. Considering this vulnerability to bias, it is extremely vital that this process is completed impeccably.

The dynamic continual learning aspect is also rather important as this reduces the need for human intervention. By learning and updating on its own, it makes the entire process a lot more efficient and refined.

Apart from these two uses, we will also be using Watson Machine Learning for the following purposes:

- ❖ Advanced data refinery
- ❖ Hybrid multi cloud deployment
- ❖ Neural network search
- ❖ Monitoring and regulating data
- ❖ Visual recognition

### 13. IBM QRadar Advisor with Watson:

IBM QRadar Advisor solves our security concerns. It is one of the most powerful data security softwares and has the capacity to reduce MTTD and MTTR with a quicker and more decisive escalation process. Using the confidence level for each attack progression, analysts can validate the

threat, visualize how the attack has occurred and is progressing and uncover what tactics can still possibly occur. It applies cognitive reasoning to identify the likely threat and connect threat entities related to the original incident such as malicious files, suspicious IP addresses, and rogue entities to draw relationships among these entities. The software also automatically taps into Watson for Cyber Security to apply external unstructured data including threat intelligence feeds, websites, forums, and more.

Through this software, we will ensure that the data contained in the system is secured and encrypted.

In order to make this system more accessible to people with disabilities and for those suffering from language barriers. This requires greater effort and abundant research but however, we have utilized two softwares which at the very least, dampen the issue of inaccessibility. The descriptions of both softwares are given below:

#### 14. Watson Text-to-Speech:

Using Watson Text-to-Speech, the system can generate human-like audio from written text. Through this system, differently abled (blind) people will also be able to access the benefits of the system. Listed below are the advantages of Watson Text-to-Speech:

- ❖ Delivers a seamless voice interaction that caters to our audience with control over every word.
- ❖ Converts in English, French, German, Italian, Japanese, Spanish and Brazilian Portuguese, and etc.
- ❖ Detects different dialects, such as U.S. and UK English and Castilian, Latin American, and North American Spanish.

#### 15. Watson Language Translator:

Watson Language Translator translates domain-specific text from one language to another. It can customize the translations based on your unique terminology and language.

Three types of customization are supported:

- ❖ forced glossary
- ❖ parallel phrases
- ❖ corpus-level customization

The languages supported by Watson Language Translator are listed below:

- ❖ Indo-European:
  - Catalan Czech, Danish, Dutch, English, French, German, Hindi, Italian, Norwegian, Polish, Portuguese (Brazil), Russian, Spanish, Swedish
- ❖ Non-Indo European:
  - Finnish, Hungarian, Turkish
- ❖ Afro-Asiatic, Altaic, Sino-Tibetan:
  - Arabic, Chinese (Simplified and Traditional), Japanese, Korean



Given below is the code for translating “suicide” and “depression” from English to Spanish:

```
curl -X POST --user "apikey:{apikey}" \  
--header "Content-Type: application/json" \  
--data '{"text": ["suicide", "depression"], "model_id": "en-es"}' \  
"{url}/v3/translate?version=2018-05-01"
```

This service breaks the constraints posed by language and puts us one step closer in attaining maximum accessibility. Moreover, Unlike other translation services, IBM protects one’s privacy, i.e., we are the sole owners of our data. This also subsides the privacy concerns that might arise.

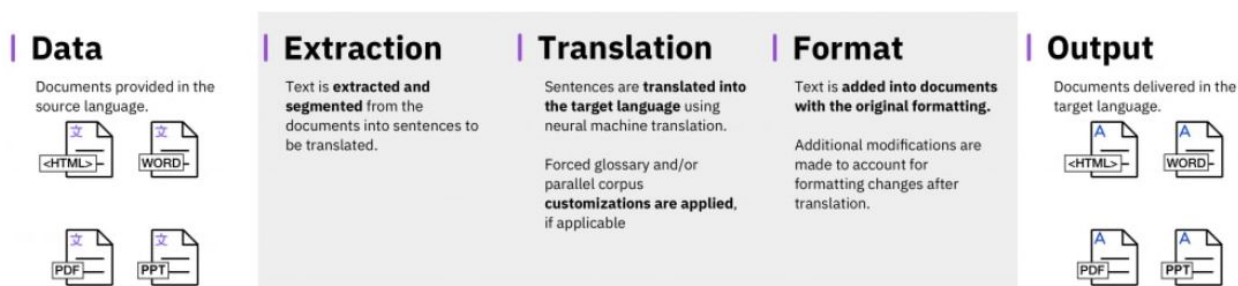


Image 3.15.1 Description of the path followed by Watson Language Translator

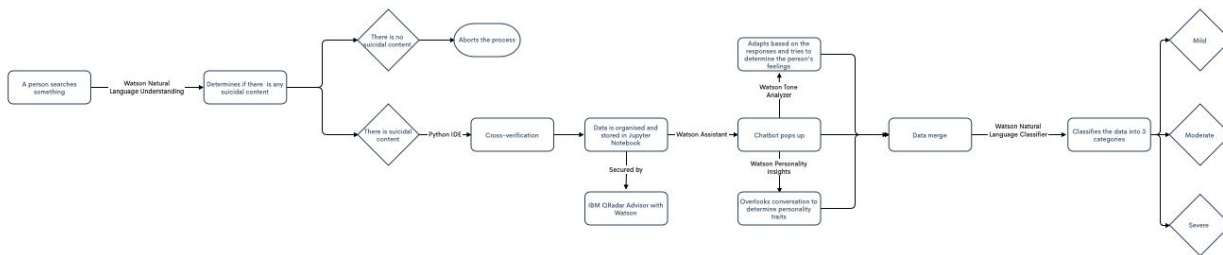
### Integration:

In the above pages, we have considered each of the softwares as individual entities with specific functions but however, it is important to consider that all these softwares coordinate closely in order to form the working structure of our system. In the next few paragraphs, we will see how each softwares triggers the working of the other softwares, and how all 15 softwares are interrelated.

Our system does not work monotonously. There are various aspects to it and this thereby, this results in a plethora of possibilities. It would be rather impossible to concretely derive a path of action. However, we will provide a few scenarios and try to explain each stage of the process.

In this first scenario, a person contemplating suicide searches, “Which gun should I buy to kill myself?” Even though there are numerous paths that the system can follow, all search engine related processes begin with the Watson Natural Language Understanding software. This software analyzes the keywords of the posed question and it determines if it contains any suicidal content. If it does not, then the system will forfeit, but if it does, the software would then pass on the information to the Python IDE. The programmed code will cross-verify the content of the data and then transfer it to the Jupyter Notebook, Here, the data will be organized and stored. This data will be secured with the assistance of IBM QRadar Advisor with Watson. After the cross-verification, the chatbot (created with the help of Watson Assistant) pops up and tries to communicate with the person. With the assistance provided by Watson Tone Analyzer, the chatbot will be able to adapt based on the person’s responses. Simultaneously, Watson Personality Insights will overlook and peruse the conversation in order to determine certain personality traits and changes in data trends. After combining all of this information, Watson Natural Language Classifier will determine the severity of the threat. As stated above, the severity will be classified into three broad categories: mild, moderate, severe/imminent. Based on this classification, the system

will decide the path it must follow. Given below is the brief description of the path that would be followed for each of the categories.



Algorithm 3.16.1

Please zoom in to view the entire algorithm

❖ Mild:

- A mental health evaluation will be carried out by the chatbot created with the help of Watson Assistant.
- Based on the diagnosis, a form of therapy will be chosen and therapy will be provided via the “AI therapist”. This task will be aided by Watson Assistant and Watson Discovery.
- If the therapy proves to be ineffective, the person will be referred to a human psychologist/counselor.
- Weekly emails will be sent to check in on the person and keep them updated. The emails will be automatically composed by GPT-3 and will be sent out with the help of the python code.
- Motivational ads will be embedded into the browsers. These ads will be based on the recommendations provided by Watson Personality Insights, The ads will be tailored to suit one’s personality.

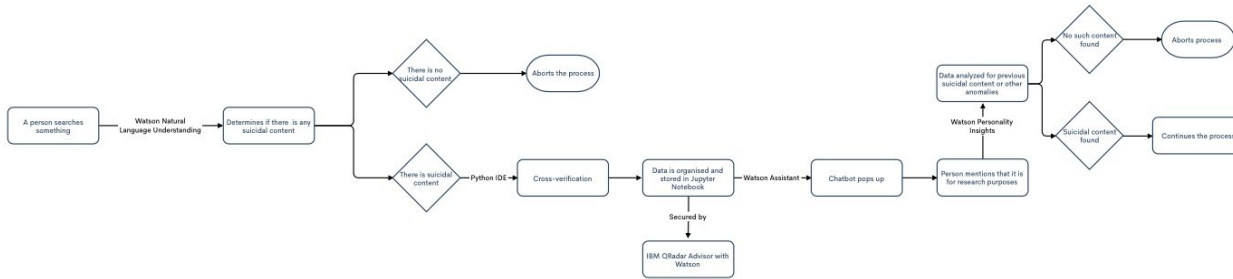
❖ Moderate:

- The same path will be followed for moderate cases as well. However, there would be one addition:
- One of the person’s emergency contact would be informed immediately and will be kept posted on the person’s progress as well.

❖ Severe/imminent:

- As soon as the severity of the threat is established as severe/imminent, the nearby police station, local hospital and even the person’s emergency contacts will be informed. Our system can identify the nearby hospitals and police stations due to the Python code that we have written. An automated call will be placed with the help of another python program.
- Once the person’s safety is ensured, the system will embed motivational ads in the browsers and this would make the person feel loved.
- Weekly emails will be sent as well.

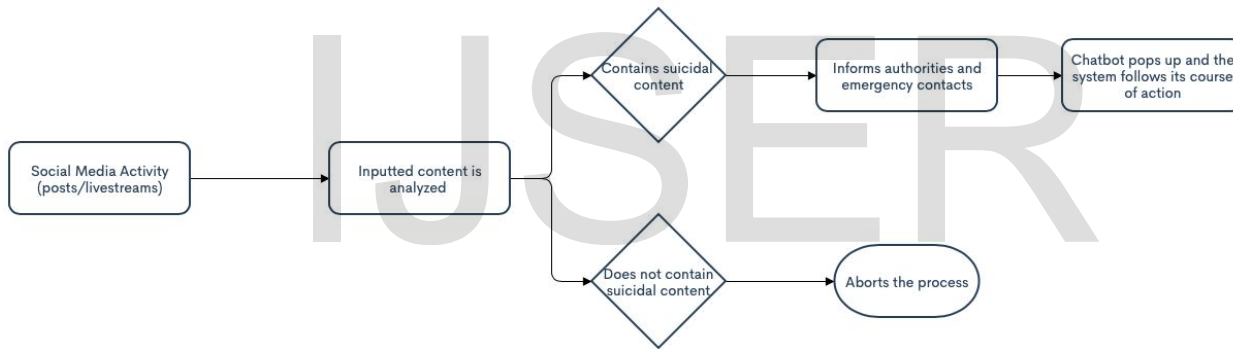
In this next scenario, the person searches, “How much Aspirin will kill me?” However, this search was made only for research purposes. The system does not have the capacity to understand this and thus, it will still follow the process. But once the person mentions to the chatbot that the search was only for academic purposes, the system will do some background research, just to be sure, and then it will abort the process.



Algorithm 3.16.2

Please zoom in to view the entire algorithm

This final scenario addresses “live suicides” and other alarming social media activity. The system constantly keeps monitoring social media platforms, such as Instagram, Facebook, Twitter, and etc. If the Watson Visual Recognition software recognises and anomalies or suspicious content, it immediately reports it to the authorities. After this, the chatbot pops up here as well and the same process is followed. The advantage of this is that AI can recognise when people are livestreaming their suicide or posting content which may exhibit suicidal ideations and can provide them with the help they need in order to prevent them from killing themselves.



Algorithm 3.16.3

Please zoom in to view the entire algorithm

Apart from these aspects of the system, there are 4 more softwares involved. Watson Studio would help us integrate all 15 softwares and create one united entity. Watson Machine Learning ensures the eradication of bias and also facilitates in dynamic continual learning. These two softwares serve as the binding agents in our system and thus, play an integral role.

Watson Text-to-Speech and Watson Language Translator serve those with disabilities and aim to provide maximum accessibility.

## Conclusion

This research paper contains a detailed explanation of our system. The purpose of this research is to develop a system which can assist in curbing the high suicide rates. We have been able to develop the protocol for such a system by utilizing some of the most efficient AI and ML based softwares. Our system is a complex integration of all these softwares, modified and tweaked to fulfill our requirements. Although these softwares have previously only been used for tackling enterprise issues, it does not imply that they can't have broader implications.

In the paper, we have also provided some of our results and although it hasn't been perfected yet (as it is protocol and not a working model), the current results are promising and with more training, the system will be able to predict suicidal ideations with a near 100% success rate.

In conclusion, this research contains the fundamental idea behind the usage of Artificial Intelligence, Machine Learning, and Neural Networks in order to analyze data from millions of databases and determine the potential threat, if any, of someone killing themselves. Through this system, we have also made therapy and mental health evaluations accessible to everyone with an internet connection by providing it for free. In doing so, we hope to reduce the stigma surrounding suicide and mental health by raising awareness and simplifying the process of seeking help.

## Scope for Further Research

In the future, a more diversified and advanced system could be developed based on the fundamental structure of our system. The modified version could include a hotline automated by humanoid robots, with the capability to identify and reciprocate human feelings. This would solve the crisis of human-based hotlines constantly crashing or taking too long to respond.

Recently, researchers have been working on equipping AI with the ability to recognise human emotions by looking at one's face. This technology could also be incorporated into the new version. This would drastically increase the success rate of such systems/models and thereby, alleviating concerns regarding the capacity of the system.

Recent research has also proven that AI can detect human emotions based on the voice. This technology, if incorporated, could play a crucial role in the hotline service mentioned above. However this would require a lot of training and thus, research could also be done on how to expedite the process.

Many companies like Amazon and IBM have been developing new Artificial Intelligence and Machine Learning based softwares. These softwares are very promising and we could include some of these softwares in the modified version and in doing so, the system would be a lot more refined and sophisticated.

Apart from this, theory based research is also crucial for the advancement of AI and ML. For instance, analyzing the correlation between the number of suicides and the number of suicide-related searches could prove to be very helpful. This could help researchers target the aspects that need to be addressed immediately instead of the comparatively trivial issues.

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