

Suicide Detection: Analyzing Text Data for Suicidal Intent

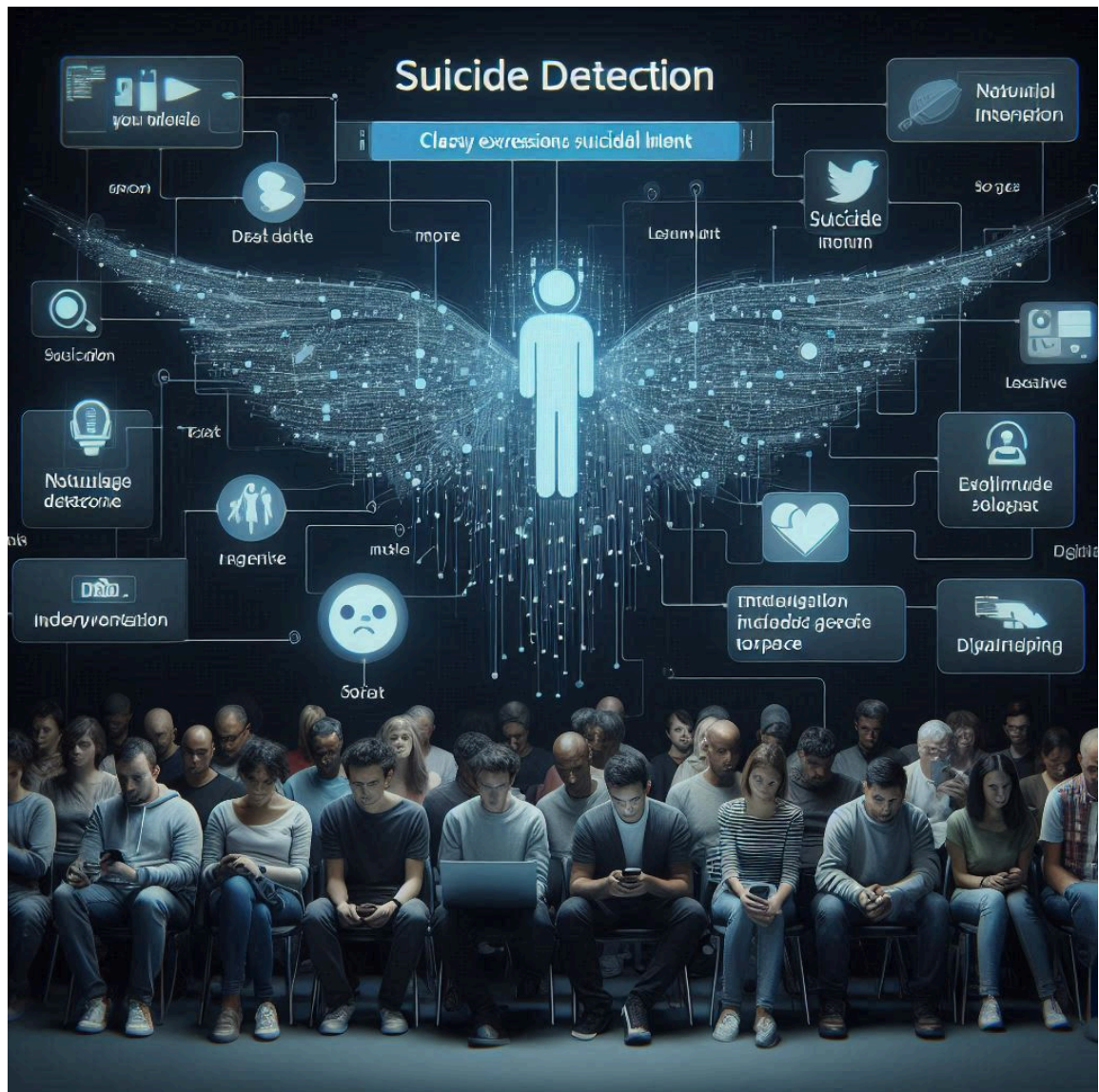


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Introduction

The purpose of this project is to develop a machine learning model to classify text data and identify expressions of suicidal intent. By leveraging natural language processing techniques, the project aims to assist in early detection and intervention for individuals at risk of self-harm based on their digital communications.

Libraries and Tools

Imported necessary libraries for data manipulation, visualization, text preprocessing, and machine learning

```
In [ ]: import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import classification_report, confusion_matrix
from sklearn.metrics import roc_curve, roc_auc_score, precision_recall_curve
from sklearn.model_selection import GridSearchCV, train_test_split
from sklearn.metrics import roc_curve, roc_auc_score
```

Data Loading and Initial Inspection

```
In [ ]: # Checking the Initial rows of dataset
pd.set_option('display.max_colwidth', None)
df = pd.read_csv('Suicide_Detection.csv')
df.head()
```

Out[]:

Unnamed:
0

text class

0	2	<p>Ex Wife Threatening Suicide Recently I left my wife for good because she has cheated on me twice and lied to me so much that I have decided to refuse to go back to her. As of a few days ago, she began threatening suicide. I have tirelessly spent these past few days talking her out of it and she keeps hesitating because she wants to believe I'll come back. I know a lot of people will threaten this in order to get their way, but what happens if she really does? What do I do and how am I supposed to handle her death on my hands? I still love my wife but I cannot deal with getting cheated on again and constantly feeling insecure. I'm worried today may be the day she does it and I hope so much it doesn't happen.</p>	suicide
1	3	<p>Am I weird I don't get affected by compliments if it's coming from someone I know irl but I feel really good when internet strangers do it</p>	non-suicide
2	4	<p>Finally 2020 is almost over... So I can never hear "2020 has been a bad year" ever again. I swear to fucking God it's so annoying</p>	non-suicide
3	8	<p>i need help just help me im crying so hard</p>	suicide
4	9	<p>I'm so lost Hello, my name is Adam (16) and I've been struggling for years and I'm afraid. Through these past years thoughts of suicide, fear, anxiety I'm so close to my limit. I've been quiet for so long and I'm too scared to come out to my family about these feelings. About 3 years ago losing my aunt triggered it all. Everyday feeling hopeless, lost, guilty, and remorseful over her and all the things I've done in my life, but thoughts like these with the little I've experienced in life? Only time I've revealed these feelings to my family is when I broke down where they saw my cuts. Watching them get so worried over something I portrayed as an average day made me feel absolutely dreadful. They later found out I was an attempt survivor from attempt OD (overdose from pills) and attempt hanging. All that happened was a blackout from the pills and I never went through with the noose because I'm still so afraid. During my first therapy I was diagnosed with severe depression, social anxiety, and an eating disorder. \n I was later transferred to a fucken group therapy for some reason which made me feel more anxious. Eventually before my last session with a 1 on 1 therapy she showed me my results from a daily check up on my feelings (which was a 2 - step survey for me and my mom/dad) \n Come to find out as I've been putting feeling horrible and afraid/anxious everyday, my mom has been doing I've been doing absolutely amazing with me described as "happiest she's ever seen me, therapy has helped him" \n I eventually was put on Sertaline (anti anxiety or anti depression I'm sorry I forgot) but I never finished my first prescription nor ever found the right type of anti depressant because my mom thought I only wanted the drugs so she took me off my recommended pill schedule after ~3 week and stopped me from taking them. All this time I've been feeling worse afraid of the damage/ worry I've caused them even more. \n Now here with everything going on, I'm as afraid as I've ever been. I've relapsed on cutting and have developed severe insomnia. Day after day feeling more hopeless, worthless questioning why am I still here? What's my motivation to move out of bed and keep going? I ask these to myself nearly every night almost having a break down everytime. \n Please Please Please someone..</p>	suicide

Unnamed:
0

text class

anyone help me.\nI'm so scared I might do something drastic, I've been
shaped by fear and anxiety. Idk what to do anymore

In []: df.info()

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 232074 entries, 0 to 232073
Data columns (total 3 columns):
#   Column      Non-Null Count  Dtype
---  -
0   Unnamed: 0   232074 non-null int64
1   text         232074 non-null object
2   class        232074 non-null object
dtypes: int64(1), object(2)
memory usage: 5.3+ MB
```

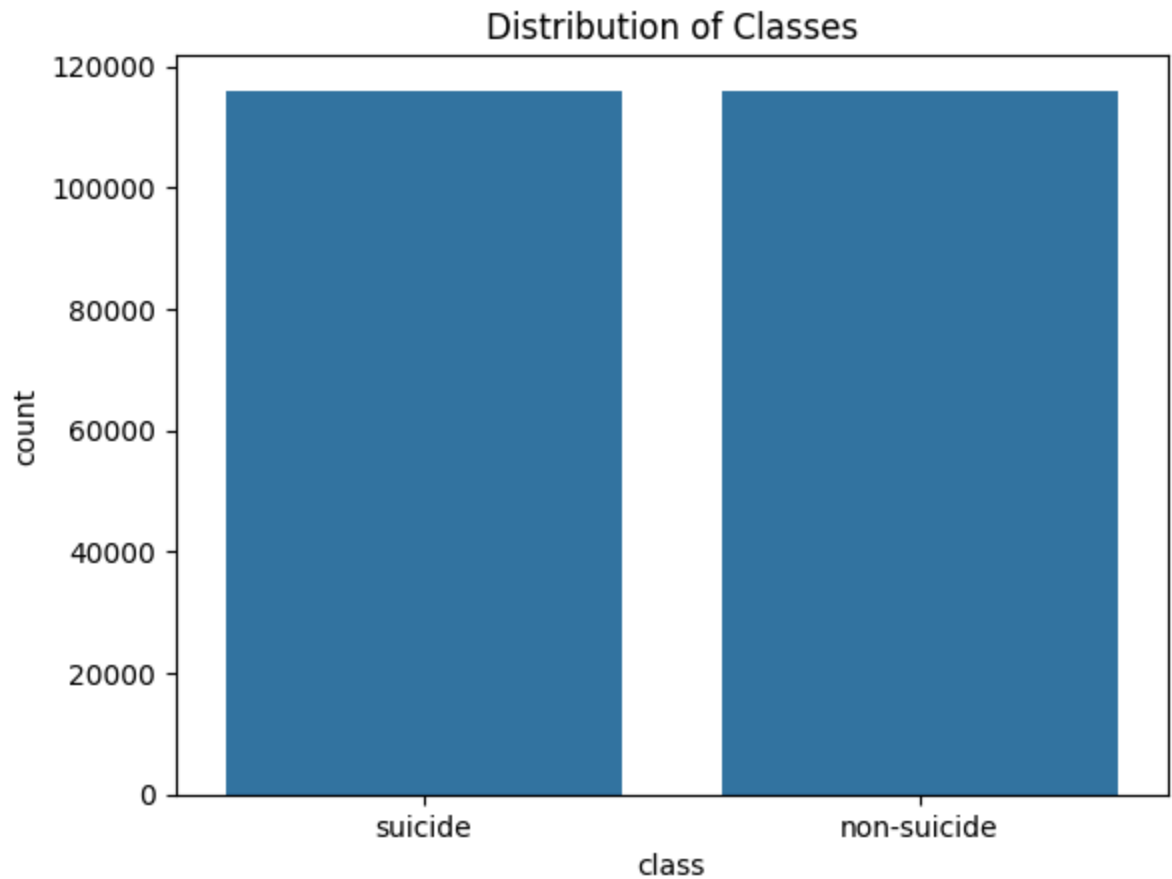
In []: *# Check for missing values*
print(df.isnull().sum())

```
Unnamed: 0    0
text          0
class         0
dtype: int64
```

In []: *# Check for duplicates*
print(df.duplicated().sum())

```
0
```

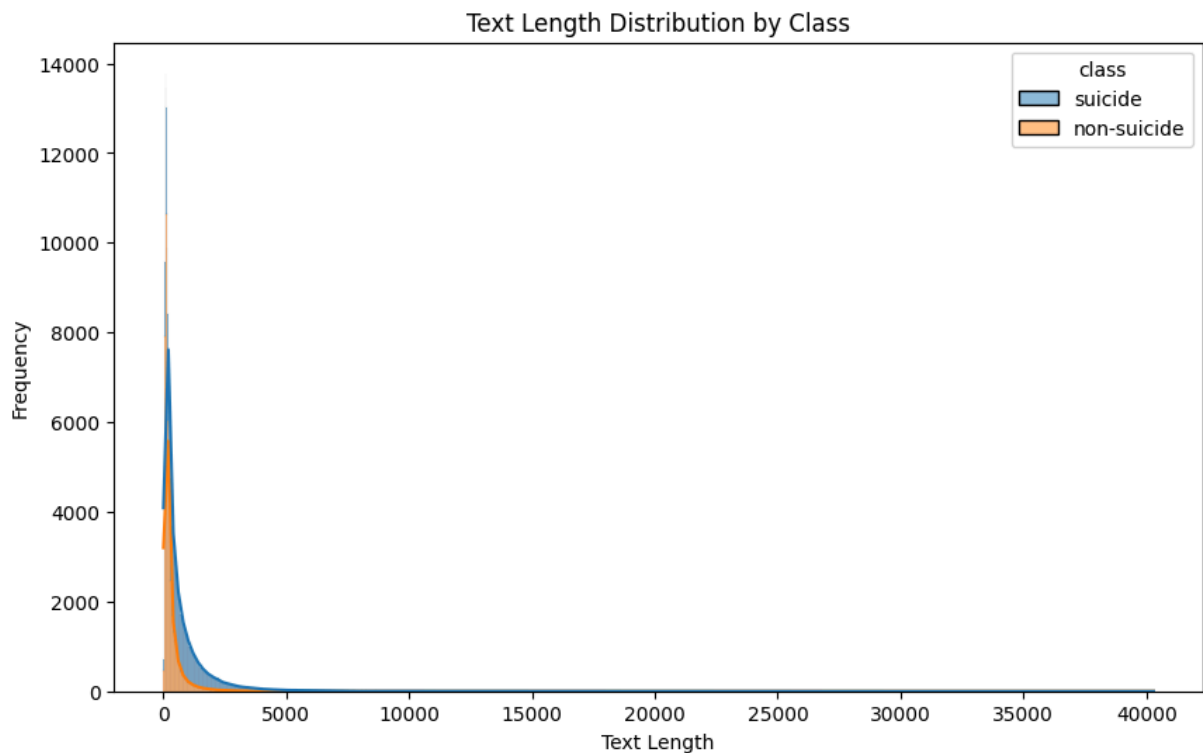
In []: *# Display the distribution of classes*
sns.countplot(x='class', data=df)
plt.title('Distribution of Classes')
plt.show()



```
In [ ]: # Display basic statistics for text length
df['text_length'] = df['text'].apply(len)
print(df['text_length'].describe())
```

```
count    232074.000000
mean       689.639736
std       1156.334007
min         3.000000
25%       138.000000
50%       315.000000
75%       801.000000
max      40297.000000
Name: text_length, dtype: float64
```

```
In [ ]: # Exploratory Data Analysis (EDA)
# Distribution of text length by class
plt.figure(figsize=(10, 6))
sns.histplot(data=df, x='text_length', hue='class', multiple='stack', kde=True)
plt.title('Text Length Distribution by Class')
plt.xlabel('Text Length')
plt.ylabel('Frequency')
plt.show()
```



```
In [ ]: # Word cloud for each class
from wordcloud import WordCloud

def plot_wordcloud(class_label):
    text = ' '.join(df[df['class'] == class_label]['text'])
    wordcloud = WordCloud(width=800, height=400, background_color='white').generate(text)
    plt.figure(figsize=(10, 6))
    plt.imshow(wordcloud, interpolation='bilinear')
    plt.title(f'Word Cloud for {class_label} Class')
    plt.axis('off')
    plt.show()

plot_wordcloud('suicide')
plot_wordcloud('non-suicide')
```

[illegible][illegible]

```
In [ ]: # Import necessary libraries for data preprocessing
import nltk
from nltk.corpus import stopwords
from nltk.tokenize import word_tokenize
import string
```

```
In [ ]: # Define a function for text preprocessing
def preprocess text(text):
```



```
# Tokenize the text
tokens = word_tokenize(text)

# Convert to Lowercase
tokens = [token.lower() for token in tokens]

# Remove punctuation
tokens = [token for token in tokens if token.isalnum()]

# Remove stop words
stop_words = set(stopwords.words('english'))
tokens = [token for token in tokens if token not in stop_words]

return ' '.join(tokens)
```

```
In [ ]: # Apply the preprocessing function to the text column
df['processed_text'] = df['text'].apply(preprocess_text)
```

```
In [ ]: # Display the first few rows of the processed text
print(df[['text', 'processed_text']].head())
```


text \

0

Ex Wife Threatening Suicide Recently I left my wife for good because she has cheated on me twice and lied to me so much that I have decided to refuse to go back to her. As of a few days ago, she began threatening suicide. I have tirelessly spent these past few days talking her out of it and she keeps hesitating because she wants to believe I'll come back. I know a lot of people will threaten this in order to get their way, but what happens if she really does? What do I do and how am I supposed to handle her death on my hands? I still love my wife but I cannot deal with getting cheated on again and constantly feeling insecure. I'm worried today may be the day she does it and I hope so much it doesn't happen.

1

Am I weird I don't get affected by compliments if it's coming from someone I know in real life but I feel really good when internet strangers do it

2

Finally 2020 is almost over... So I can never hear "2020 has been a bad year" ever again. I swear to fucking God it's so annoying

3

i need help just help me im crying so hard

4 I'm so lost Hello, my name is Adam (16) and I've been struggling for years and I'm afraid. Through these past years thoughts of suicide, fear, anxiety I'm so close to my limit. I've been quiet for so long and I'm too scared to come out to my family about these feelings. About 3 years ago losing my aunt triggered it all. Everyday feeling hopeless, lost, guilty, and remorseful over her and all the things I've done in my life, but thoughts like these with the little I've experienced in life? Only time I've revealed these feelings to my family is when I broke down where they saw my cuts. Watching them get so worried over something I portrayed as an average day made me feel absolutely dreadful. They later found out I was an attempt survivor from attempted OD (overdose from pills) and attempted hanging. All that happened was a blackout from the pills and I never went through with the noose because I'm still so afraid. During my first therapy I was diagnosed with severe depression, social anxiety, and an eating disorder. I was later transferred to a fucken group therapy for some reason which made me feel more anxious. Eventually before my last session with a 1 on 1 therapist she showed me my results from a daily check up on my feelings (which was a 2 - step survey for me and my mom/dad) Come to find out as I've been putting feeling horrible and afraid/anxious everyday, my mom has been doing I've been doing absolutely amazing with me described as "happiest she's ever seen me, therapy has helped him" I eventually was put on Sertaline (anti anxiety or anti depression I'm sorry I forgot) but I never finished my first prescription nor ever found the right type of anti depressant because my mom thought I only wanted the drugs so she took me off my recommended pill schedule after ~3 weeks and stopped me from taking them. All this time I've been feeling worse afraid of the damage/worry I've caused them even more. Now here with everything going on, I'm as afraid as I've ever been. I've relapsed on cutting and have developed severe insomnia. Day after day feeling more hopeless, worthless questioning why am I still here? What's my motivation to move out of bed and keep going? I ask these to myself nearly every night almost having a breakdown everytime. Please Please Please someone.. anyone help me. I'm so scared I might do something drastic, I've been shaped by fear and anxiety. Idk what to do anymore

processed_text

0

ex wife threatening suiciderecently left wife good cheated twice lied much decided refuse go back days ago began threatening suicide tirelessly spent past days talking keeps hesitating wants believe come back know lot people threaten order get way happy

ens really supposed handle death hands still love wife deal getting cheated constantly feeling insecure worried today may day hope much happen

1

weird get affected compliments coming someone know irl feel really good internet strangers

2

finally 2020 almost never hear 2020 bad year ever swear fucking god annoying

3

need helpjust help im crying hard

4 losthello name adam 16 struggling years afraid past years thoughts suicide fear anxiety close limit quiet long scared come family feelings 3 years ago losing aunt triggered everyday feeling hopeless lost guilty remorseful things done life thoughts like little experienced life time revealed feelings family broke saw cuts watching get worried something portrayed average day made feel absolutely dreadful later found attempt survivor attempt od overdose pills attempt hanging happened blackout pills never went noose still afraid first therapy diagnosed severe depression social anxiety eating disorder later transferred fucken group therapy reason made feel anxious eventually last session 1 1 therapy showed results daily check feelings 2 step survey come find putting feeling horrible everyday mom absolutely amazing described happiest ever seen therapy helped eventually put sertaline anti anxiety anti depression sorry forgot never finished first prescription ever found right type anti depressant mom thought wanted drugs took recommended pill schedule week stopped taking time feeling worse afraid worry caused even everything going afraid ever relapsed cutting developed severe insomnia day day feeling hopeless worthless questioning still motivation move bed keep going ask nearly every night almost break everytime please please please someone anyone help scared might something drastic shaped fear anxiety idk anymore

Feature Engineering

Purpose:

Generate TF-IDF features from processed text and integrate them into the dataset.

```
In [ ]: from sklearn.feature_extraction.text import TfidfVectorizer

# Initialize TF-IDF Vectorizer
tfidf_vectorizer = TfidfVectorizer(max_features=1000) # You can adjust max_feature

In [ ]: # Fit TF-IDF Vectorizer and transform the processed text
tfidf_features = tfidf_vectorizer.fit_transform(df['processed_text'])

In [ ]: # Convert TF-IDF features into a DataFrame
tfidf_df = pd.DataFrame(tfidf_features.toarray(), columns=tfidf_vectorizer.get_feature_names())

In [ ]: # Concatenate TF-IDF features with the original DataFrame
df = pd.concat([df, tfidf_df], axis=1)

In [ ]: # Display the updated DataFrame with TF-IDF features
print(df.head())
```

Unnamed: 0 \

0	2
1	3
2	4
3	8
4	9

text \

0

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	class	text_length	\
0	suicide	715	
1	non-suicide	138	
2	non-suicide	129	
3	suicide	41	
4	suicide	2426	

processed_text \

0

ex wife threatening suiciderecently left wife good cheated twice lied much decided r
efuse go back days ago began threatening suicide tirelessly spent paat days talking
keeps hesitating wants believe come back know lot people threaten order get way happ
ens really supposed handle death hands still love wife deal getting cheated constant
ly feeling insecure worried today may day hope much happen

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iggered everyday feeling hopeless lost guilty remorseful things done life thoughts l
ike little experienced life time revealed feelings family broke saw cuts watching ge
t worried something portrayed average day made feel absolutely dreadful later found
attempt survivor attempt od overdose pills attempt hanging happened blackout pills n
ever went noose still afraid first therapy diagnosed severe depression social anxiet
y eating disorder later transferred fucken group therapy reason made feel anxious ev
entually last session 1 1 therapy showed results daily check feelings 2 step survey
come find putting feeling horrible everyday mom absolutely amazing described happies
t ever seen therapy helped eventually put sertaline anti anxiety anti depression sor
ry forgot never finished first prescription ever found right type anti depressant mo
m thought wanted drugs took recommended pill schedule week stopped taking time feeli
ng worse afraid worry caused even everything going afraid ever relapsed cutting deve
loped severe insomnia day day feeling hopeless worthless questioning still motivatio
n move bed keep going ask nearly every night almost break everytime please please pl
ease someone anyone help scared might something drastic shaped fear anxiety idk anym
ore

	10	100	12	13	14	...	wrote	x200b	yeah	year	years	yes	\
0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.000000	0.000000	0.0	
1	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.000000	0.000000	0.0	
2	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.262694	0.000000	0.0	
3	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.000000	0.000000	0.0	
4	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.000000	0.127857	0.0	

	yesterday	yet	young	younger
0		0.0	0.0	0.0
1		0.0	0.0	0.0
2		0.0	0.0	0.0
3		0.0	0.0	0.0
4		0.0	0.0	0.0

[5 rows x 1005 columns]

Data Cleaning

Purpose:

Ensure data integrity by managing columns, dropping duplicates, and confirming correct formatting.

```
In [ ]: # Inspect the shape and content of the dataframe
print("Shape of the dataframe:", df.shape)
print(df.head())
```

Shape of the dataframe: (232074, 1005)

```
Unnamed: 0 \
0          2
1          3
2          4
3          8
4          9
```

```
text \
0
```

Ex Wife Threatening Suicide Recently I left my wife for good because she has cheated on me twice and lied to me so much that I have decided to refuse to go back to her. As of a few days ago, she began threatening suicide. I have tirelessly spent these past few days talking her out of it and she keeps hesitating because she wants to believe I'll come back. I know a lot of people will threaten this in order to get their way, but what happens if she really does? What do I do and how am I supposed to handle her death on my hands? I still love my wife but I cannot deal with getting cheated on again and constantly feeling insecure. I'm worried today may be the day she does it and I hope so much it doesn't happen.

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processed_text \

0

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ng worse afraid worry caused even everything going afraid ever relapsed cutting deve
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n move bed keep going ask nearly every night almost break everytime please please pl
ease someone anyone help scared might something drastic shaped fear anxiety idk anym
ore

	10	100	12	13	14	...	wrote	x200b	yeah	year	years	yes	\
0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.000000	0.000000	0.0	
1	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.000000	0.000000	0.0	
2	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.262694	0.000000	0.0	
3	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.000000	0.000000	0.0	
4	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.000000	0.127857	0.0	

	yesterday	yet	young	younger
0		0.0	0.0	0.0
1		0.0	0.0	0.0
2		0.0	0.0	0.0
3		0.0	0.0	0.0
4		0.0	0.0	0.0

[5 rows x 1005 columns]

```
In [ ]: # Check the columns of the dataframe
        print("Columns of the dataframe:", df.columns)
```

```
Columns of the dataframe: Index(['Unnamed: 0', 'text', 'class', 'text_length', 'processed_text', '10',
                                '100', '12', '13', '14',
                                ...,
                                'wrote', 'x200b', 'yeah', 'year', 'years', 'yes', 'yesterday', 'yet',
                                'young', 'younger'],
                                dtype='object', length=1005)
```

```
In [ ]: # Drop the unnecessary duplicated 'class' column
        df = df.loc[:, ~df.columns.duplicated()]
```

```
In [ ]: # Check the shape and content of the dataframe after dropping duplicates
        print("Shape of the dataframe after dropping duplicates:", df.shape)
        print(df.head())
```

Shape of the dataframe after dropping duplicates: (232074, 1003)

```
Unnamed: 0 \
0          2
1          3
2          4
3          8
4          9
```

```
text \
0
```

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3

i need help just help me im crying so hard

4 I'm so lost Hello, my name is Adam (16) and I've been struggling for years and I'm afraid. Through these past years thoughts of suicide, fear, anxiety I'm so close to my limit. I've been quiet for so long and I'm too scared to come out to my family about these feelings. About 3 years ago losing my aunt triggered it all. Everyday feeling hopeless, lost, guilty, and remorseful over her and all the things I've done in my life, but thoughts like these with the little I've experienced in life? Only time I've revealed these feelings to my family is when I broke down where they saw my cuts. Watching them get so worried over something I portrayed as an average day made me feel absolutely dreadful. They later found out I was an attempt survivor from attempted OD (overdose from pills) and attempted hanging. All that happened was a blackout from the pills and I never went through with the noose because I'm still so afraid. During my first therapy I was diagnosed with severe depression, social anxiety, and an eating disorder. I was later transferred to a fucken group therapy for some reason which made me feel more anxious. Eventually before my last session with a 1 on 1 therapist she showed me my results from a daily check up on my feelings (which was a 2 - step survey for me and my mom/dad) Come to find out as I've been putting feeling horrible and afraid/anxious everyday, my mom has been doing I've been doing absolutely amazing with me described as "happiest she's ever seen me, therapy has helped him" I eventually was put on Sertaline (anti anxiety or anti depression I'm sorry I forgot) but I never finished my first prescription nor ever found the right type of anti depressant because my mom thought I only wanted the drugs so she took me off my recommended pill schedule after ~3 week and stopped me from taking them. All this time I've been feeling worse afraid of the damage/worry I've caused them even more. Now here with everything going on, I'm as afraid as I've ever been. I've relapsed on cutting and have developed severe insomnia. Day after day feeling more hopeless, worthless questioning why am I still here? What's my motivation to move out of bed and keep going? I ask these to myself nearly every night almost having a break down everytime. Please Please Please someone.. anyone help me. I'm so scared I might do so

mething drastic, I've been shaped by fear and anxiety. Idk what to do anymore

	class	text_length	\
0	suicide	715	
1	non-suicide	138	
2	non-suicide	129	
3	suicide	41	
4	suicide	2426	

processed_text \

0

ex wife threatening suiciderecently left wife good cheated twice lied much decided r
efuse go back days ago began threatening suicide tirelessly spent paat days talking
keeps hesitating wants believe come back know lot people threaten order get way happ
ens really supposed handle death hands still love wife deal getting cheated constant
ly feeling insecure worried today may day hope much happen

1

weird get affected compliments coming someone know irl feel really good internet str
angers

2

finally 2020 almost never hear 2020 bad year ever swear fucking god annoying

3

need helpjust help im crying hard

4 losthello name adam 16 struggling years afraid past years thoughts suicide fear a
nxiety close limit quiet long scared come family feelings 3 years ago losing aunt tr
iggered everyday feeling hopeless lost guilty remorseful things done life thoughts l
ike little experienced life time revealed feelings family broke saw cuts watching ge
t worried something portrayed average day made feel absolutely dreadful later found
attempt survivor attempt od overdose pills attempt hanging happened blackout pills n
ever went noose still afraid first therapy diagnosed severe depression social anxiet
y eating disorder later transferred fucken group therapy reason made feel anxious ev
entually last session 1 1 therapy showed results daily check feelings 2 step survey
come find putting feeling horrible everyday mom absolutely amazing described happies
t ever seen therapy helped eventually put sertaline anti anxiety anti depression sor
ry forgot never finished first prescription ever found right type anti depressant mo
m thought wanted drugs took recommended pill schedule week stopped taking time feeli
ng worse afraid worry caused even everything going afraid ever relapsed cutting deve
loped severe insomnia day day feeling hopeless worthless questioning still motivatio
n move bed keep going ask nearly every night almost break everytime please please pl
ease someone anyone help scared might something drastic shaped fear anxiety idk anym
ore

	10	100	12	13	14	...	wrote	x200b	yeah	year	years	yes	\
0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.000000	0.000000	0.0	
1	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.000000	0.000000	0.0	
2	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.262694	0.000000	0.0	
3	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.000000	0.000000	0.0	
4	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.000000	0.127857	0.0	

	yesterday	yet	young	younger
0		0.0	0.0	0.0
1		0.0	0.0	0.0
2		0.0	0.0	0.0
3		0.0	0.0	0.0
4		0.0	0.0	0.0

[5 rows x 1003 columns]

```
In [ ]: # Check if the 'class' column has extra dimensions or is correctly formatted
print("Shape of 'class' column:", df['class'].shape)
print(df['class'].head())
```

Shape of 'class' column: (232074,)

0 suicide

1 non-suicide

2 non-suicide

3 suicide

4 suicide

Name: class, dtype: object

Model Training and Evaluation

Purpose:

Train a Logistic Regression classifier on the dataset and evaluate its performance.

Logistic Regression Model

```
In [ ]: # Split data into training and testing sets
X = df.drop(['Unnamed: 0', 'text', 'processed_text', 'class'], axis=1) # Features
y = df['class'] # Target variable
# Check the shape of y before splitting
print("Shape of y before splitting:", y.shape)
```

Shape of y before splitting: (232074,)

```
In [ ]: # Inspect the shape and content of y
print("Shape of y:", y.shape)
print(y.head())
```

Shape of y: (232074,)

0 suicide

1 non-suicide

2 non-suicide

3 suicide

4 suicide

Name: class, dtype: object

```
In [ ]: # Split the data
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_sta
# Check the shape of y_train to diagnose the issue
print("Shape of y_train after splitting:", y_train.shape)
```

Shape of y_train after splitting: (185659,)

```
In [ ]: # Fit Logistic Regression classifier on the training data
classifier = LogisticRegression(max_iter=1000)
classifier.fit(X_train, y_train)
```

Out[]:

LogisticRegression
LogisticRegression(max_iter=1000)

```
In [ ]: # Predict on the test data
y_pred = classifier.predict(X_test)
```

```
In [ ]: # Print classification report and confusion matrix
print(classification_report(y_test, y_pred))
print(confusion_matrix(y_test, y_pred))
```

	precision	recall	f1-score	support
non-suicide	0.91	0.93	0.92	23287
suicide	0.92	0.91	0.92	23128
accuracy			0.92	46415
macro avg	0.92	0.92	0.92	46415
weighted avg	0.92	0.92	0.92	46415

```
[[21587 1700]
 [ 2166 20962]]
```

Naive Bayes Model

```
In [ ]: from sklearn.naive_bayes import MultinomialNB
from sklearn.metrics import classification_report , confusion_matrix , accuracy_score
# Naive Bayes Model
nb_classifier = MultinomialNB()
nb_classifier.fit(X_train, y_train)
nb_y_pred = nb_classifier.predict(X_test)

# Print classification report and confusion matrix for Naive Bayes
print("Naive Bayes Model:")
print(classification_report(y_test, nb_y_pred))
print(confusion_matrix(y_test, nb_y_pred))
print(f"Accuracy: {accuracy_score(y_test, nb_y_pred):.2f}")
```

Naive Bayes Model:

	precision	recall	f1-score	support
non-suicide	0.84	0.87	0.86	23287
suicide	0.87	0.83	0.85	23128
accuracy			0.85	46415
macro avg	0.85	0.85	0.85	46415
weighted avg	0.85	0.85	0.85	46415

```
[[20366 2921]
 [ 3905 19223]]
```

Accuracy: 0.85

SVM Model

```
In [ ]: from sklearn import svm
from sklearn.datasets import make_classification
from sklearn.model_selection import train_test_split
from sklearn.metrics import classification_report, confusion_matrix, accuracy_score
import matplotlib.pyplot as plt

# Generate some data for example
X, y = make_classification(random_state=0)
X_train, X_test, y_train, y_test = train_test_split(X, y, random_state=0)

# SVM Model
svm_classifier = svm.SVC(kernel='linear', probability=True) # Set probability=True
svm_classifier.fit(X_train, y_train)
svm_y_pred = svm_classifier.predict(X_test)

# Print classification report and confusion matrix for SVM
print("SVM Model:")
print(classification_report(y_test, svm_y_pred))
print(confusion_matrix(y_test, svm_y_pred))
print(f"Accuracy: {accuracy_score(y_test, svm_y_pred):.2f}")
```

SVM Model:

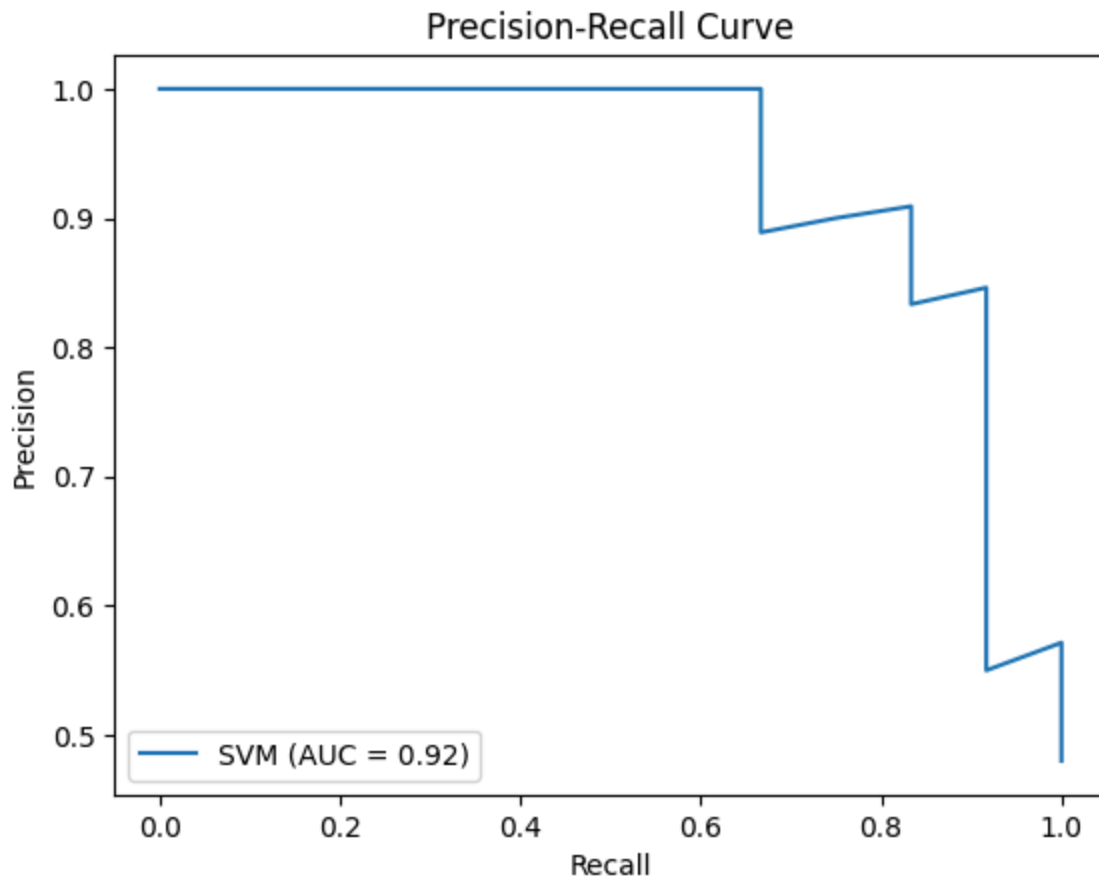
	precision	recall	f1-score	support
0	0.91	0.77	0.83	13
1	0.79	0.92	0.85	12
accuracy			0.84	25
macro avg	0.85	0.84	0.84	25
weighted avg	0.85	0.84	0.84	25

```
[[10  3]
 [ 1 11]]
```

Accuracy: 0.84

```
In [ ]: # Precision-Recall Curve for SVM
y_proba_svm = svm_classifier.decision_function(X_test)
precision, recall, _ = precision_recall_curve(y_test, y_proba_svm)

# Plot Precision-Recall curve
plt.figure()
plt.plot(recall, precision, label=f'SVM (AUC = {roc_auc_score(y_test, y_proba_svm):.2f})')
plt.xlabel('Recall')
plt.ylabel('Precision')
plt.title('Precision-Recall Curve')
plt.legend()
plt.show()
```



Models testing

```
In [ ]: # Assuming models are correctly defined and imported
try:
    for i, user_text in enumerate(new_texts):
        print(f"Testing on text: {user_text}")
        for model_name, model in models.items():
            prediction = model.predict(X_new[i])
            print(f"{model_name} Prediction: {prediction[0]}")
        print("\n")
except Exception as e:
    print(f"Error occurred during prediction: {str(e)}")
```

```
In [ ]: from sklearn.feature_extraction.text import TfidfVectorizer

# Function to preprocess the input text
def preprocess_text(text):
    processed_text = text.lower() # Example: converting text to lowercase
    return processed_text

# Example new data
new_texts = [
    "I am feeling very low and have thoughts of ending it all.",
    "Life is good and I am happy.",
    "I need help, everything seems hopeless."
]
```



```

# Preprocess the new texts
preprocessed_texts = [preprocess_text(text) for text in new_texts]

# Load or fit the vectorizer used in your project
vectorizer = TfidfVectorizer()
vectorizer.fit(df['processed_text']) # Fit on the processed text column of your or
X_new = vectorizer.transform(preprocessed_texts)

# Define model names and corresponding models
models = {
    "SVM": svm_classifier,
    "Naive Bayes": nb_classifier,
    "Logistic Regression": classifier
}

# Iterate through each new text and make predictions
try:
    for i, user_text in enumerate(new_texts):
        print(f"Testing on text: {user_text}")
        for model_name, model in models.items():
            prediction = model.predict(X_new[i])
            print(f"{model_name} Prediction: {prediction[0]}")
        print("\n")
except Exception as e:
    print(f"Error occurred during prediction: {str(e)}")

```

Conclusion

This project underscores the potential of machine learning and natural language processing in detecting and mitigating risks associated with suicidal behavior through digital communication analysis. By leveraging these technologies, we can augment existing support systems and provide proactive assistance to individuals in distress, ultimately contributing to mental health advocacy and suicide prevention efforts.