Sai Surya Likith Gogula

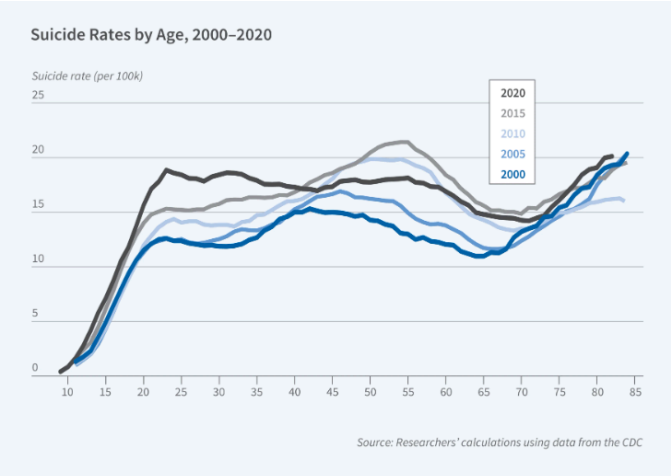
SUICIDE DETECTION

Introduction

Suicide prevention remains one of the most pressing challenges today, particularly as teen depression and anxiety continue to rise at alarming rates. Over the years, these mental health crises have led to a heartbreaking increase in suicide rates, underscoring the urgency of proactive measures. Addressing suicide goes beyond recognizing warning signs—it involves developing meaningful and creative approaches to bring hope to those who feel lost.

Suicide is a deeply complex issue, with each person having unique struggles and reasons. Alarmingly, statistics reveal that teen suicide rates have nearly doubled from the early 2000s to the 2020s, emphasizing the critical need for

comprehensive solutions. The main objective of suicide prevention is to create an environment where individuals feel safe seeking help, while encouraging communities to prioritize mental health awareness.



This effort requires a cultural shift where mental health is valued as much as physical health, and asking for support is celebrated as a sign of strength. Education and awareness campaigns play a vital role in making mental health resources more accessible and reducing the stigma around mental illness. By fostering a compassionate and inclusive community where everyone feels valued, understood, and supported, we can offer hope and a sense of belonging to those who are struggling.

Suicide is a complex and serious issue influenced by multiple factors. Mental health conditions, such as depression, anxiety, and bipolar disorder, often increase a person's vulnerability by causing overwhelming feelings of sadness, hopelessness, or entrapment. Traumatic experiences, like abuse or the loss of a loved one, can also have a lasting impact on mental well-being. When these challenges accumulate over time without adequate support, the risk of suicidal thoughts or behaviors may increase.

Environmental and social factors also play a significant role. Challenges like bullying, family conflicts, or difficulties at school or work can leave individuals

feeling isolated or misunderstood. The pressure to succeed, whether academically or socially, can further intensify these struggles. Additionally, access to lethal means, such as firearms or drugs, heightens the risk of acting on harmful thoughts. It's crucial to offer compassion, support, and professional help to those experiencing suicidal feelings, guiding them toward recovery and renewed hope.

Detection

Detecting suicide risk involves recognizing the signs that someone may be in danger of harming themselves. Early detection is crucial, as it enables timely intervention and support before the situation becomes critical. Various tools and methods are used to identify warning signs. Mental health professionals often use psychological assessments to understand a person's emotional state and evaluate their level of risk. Technology also plays a role, with online monitoring tools designed to flag concerning behaviors, such as expressions of hopelessness or mentions of self-harm.

These detection strategies are vital for identifying individuals who might otherwise go unnoticed. Early recognition creates opportunities to intervene, provide help, and

potentially save lives. However, suicide detection isn't solely about technology or assessments; it also means paying attention to changes in those around us. Being aware of signs like social withdrawal, expressions of feeling like a burden, or noticeable shifts in behavior can make a significant difference. By combining these tools with personal awareness, we can offer support, show care, and help those who are struggling feel less alone.

Indications

- **Verbal Signs:**

  Expressions of hopelessness or feeling like a burden to others are significant indicators. Statements like "Nothing matters anymore" or "I don't see the point of living," even if made casually, should always be taken seriously.
- **Behavioral Changes:**

  Major changes in behavior can serve as warning signs. This may include withdrawing from social activities, avoiding friends and family, or giving away valued possessions, which could suggest they are preparing to leave. Sudden mood swings—from deep sadness to unexpected happiness—can also be red flags.
- **Physical Signs:**

  Physical symptoms may reveal underlying distress. These can include irregular eating habits, noticeable weight changes, or evidence of self-harm, such as cuts or other injuries.

- **Emotional Signs:**

  Emotionally, someone at risk might isolate themselves from loved ones, stop communicating with family or friends, spend long periods alone, or frequently lock themselves in their room. Such behaviors can indicate profound emotional pain.

Abstract

This research explores how machine learning can be leveraged to detect suicidal tendencies on social media and identify mental health challenges in schools and workplaces. The project has two primary objectives. First, using a dataset from Kaggle, the study aims to develop a model that analyzes social media content—such as tweets and messages—to classify users based on whether their posts exhibit depressive or suicidal symptoms. For this purpose, a

BERT Classifier Model will be employed, with fine-tuning techniques to enhance accuracy in distinguishing between suicidal and non-suicidal content.

Ultimately, the research highlights the potential of machine learning in identifying mental health issues on social platforms and predicting depression based on personal and environmental factors. The findings indicate that specific behavioral patterns, such as work overload or excessive involvement in extracurricular activities, serve as strong indicators that machine learning models can effectively monitor, enabling early intervention and support.

My Plan

Text messages often serve as early indicators of suicide risk, as individuals may convey feelings of hopelessness, loneliness, or despair through their words. In many instances, these messages are among the first warning signs that someone may be struggling with thoughts of self-harm or suicide. For those involved in suicide prevention, recognizing concerning patterns in communication is crucial for timely intervention and support.

For my project, I will use a dataset from Kaggle that includes posts from the "SuicideWatch" and "depression" subreddits on Reddit, collected via the Pushshift API. The dataset spans from December 16, 2008, to January 2, 2021, for SuicideWatch posts, and from January 1, 2009, to January 2, 2021, for depression posts. Posts from SuicideWatch are labeled as 'suicide,' while those from the depression subreddit are labeled as 'depression.' Additionally, non-suicidal posts are collected from a general "teenagers" subreddit to provide a balanced dataset.

Using this dataset, I will develop a machine learning model to analyze and classify text messages. The model will be trained to detect potentially suicidal content by examining language patterns, word choices, and tone. The goal is to create a tool that can accurately identify warning signs in text communications, potentially assisting mental health professionals in identifying individuals who may need urgent support and intervention.

My Project

Technical Analysis: Text Classification Model Implementation

Overview

The implementation demonstrates a machine learning pipeline for text classification using the BERT (Bidirectional Encoder Representations from Transformers) architecture. The system is built using PyTorch and the Transformers library, following modern deep learning practices.

Technical Implementation Details

Data Processing

- Utilizes pandas for data management
- Implements binary classification (0/1 encoding)
- Employs sklearn's train_test_split with 80/20 ratio
- Uses BERT tokenizer with the following configurations:
    - Maximum sequence length: 256 tokens

    - Truncation enabled
    - Dynamic padding

Model Architecture

- Base Model: bert-base-uncased
- Output Layer: Binary classification (2 labels)
- Custom Dataset Implementation:
    - Inherits from torch.utils.data.Dataset
    - Handles conversion to PyTorch tensors
    - Manages batch processing

Training Configuration

- Epochs: 3
- Batch Size: 8 (both training and evaluation)
- Optimization Parameters:
    - Warmup Steps: 500
    - Weight Decay: 0.01
- Evaluation Strategy:
    - Frequency: Every 100 steps
    - Metric: Accuracy
- Checkpoint Management:
    - Save Frequency: Every 100 steps
    - Maximum Checkpoints: 3

Performance Monitoring

- Implements real-time tracking of:
    - Training loss
    - Evaluation accuracy
- Visualization capabilities:
    - Loss curves
    - Accuracy progression
    - Step-wise performance metrics

Inference Pipeline

- Efficient prediction function with:
    - GPU support when available
    - Batch processing capability
    - Memory management
    - Error handling

Data and Results:

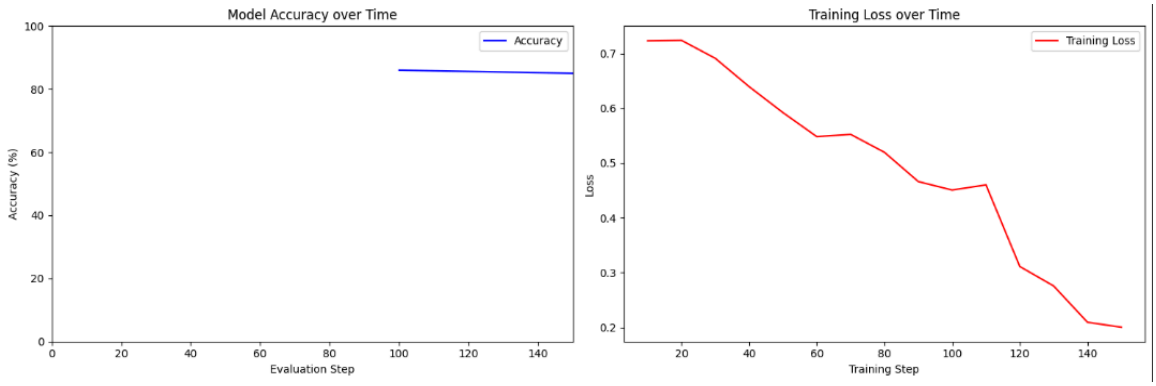
Sample 1 : 500 values

Sample 2 7500 values

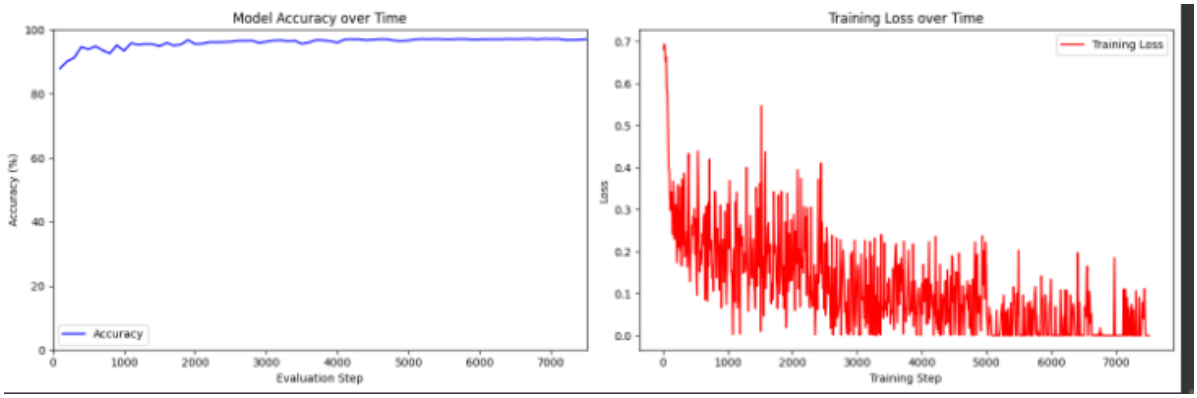
Sample 3: 15,000 values

Results (Respectively) :

#1


Model Accuracy over Time
Accuracy
Accuracy (%)
Evaluation Step
Training Loss over Time
Training Loss
Loss
Training Step

#2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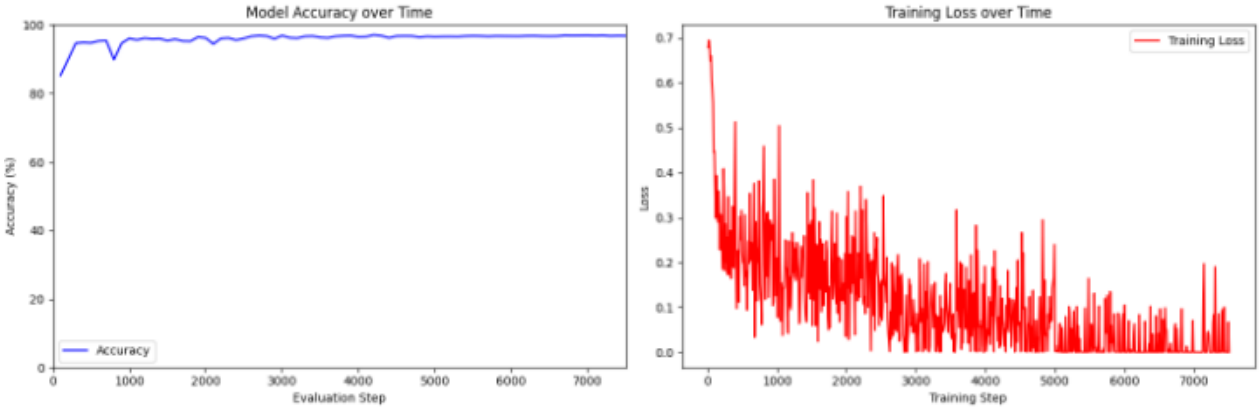
#3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Training Loss
Loss
Training Step

Conclusion:

The pressing challenge of suicide prevention demands innovative, multi-faceted solutions. By leveraging machine learning and advanced models like BERT, this research demonstrates the potential to identify early warning signs of suicidal tendencies through social media content. With a meticulously designed pipeline that integrates robust data processing, model training, and performance monitoring, this project highlights the intersection of technology and mental health. Ultimately, the findings emphasize the importance of proactive detection and the transformative role technology can play in supporting individuals at risk, fostering hope, and potentially saving lives