SCHOOL OF COMPUTING
Faculty of Engineering

Project Proposal Form MCST1043
Sem: 2 Session: 2024/25

SECTION A: Project Information.

Program Name:	**Masters of Science (Data Science)**
Subject Name:	**Project 1 (MCST1043)**
Student Name:	Mira Edora Binti Yunos
Metric Number:	MCS241057
Student Email & Phone:	miraedora@graduate.utm.my
Project Title:	Leveraging Natural Language Processing Models for Depression Detection in X(Twitter) Posts.
Supervisor 1:	
Supervisor 2 / Industry Advisor(if any):	

SECTION B: Project Proposal

Introduction:

Psychiatric disorders such as depression require patients to be monitored and treated continuously. In accordance with World Health Organization statistics, more than 280 million people worldwide are facing this disorder (Yan et al., 2025) . Psychiatrists use specialized questionnaires and structured diagnostic interviews to identify signs of depression and make diagnosis decisions (Yan et al., 2025). More than 75 % of persons in the early stages of depression did not seek help from a psychologist, and their illnesses worsened (Helmy et al., 2024). The depression sufferers often share their emotions, experiences, and thoughts on social media, automated depression detection can benefit from their posts (Kurniadi et al., 2024). Due to the anonymity and public nature of most social media postings, depression detection from those posts does not violate user privacy, because it does not require the identification of individual identities (Kurniadi et al., 2024).

NLP models, particularly transformer-based architectures such as BERT (Bidirectional Encoder Representations from Transformers), have revolutionized text analysis by capturing the contextual relationships between words in a sentence (Kurniadi et al., 2024).By leveraging NLP approached, this research aims to overcome challenges such as imbalanced datasets and suboptimal model performance, ultimately enhancing classification accuracy and providing a more reliable tool for early detection and proactive mental health management.

Problem Background:

The growing need for early depression detection is widely recognized, especially as mental health issues continue to affect millions globally. Social media platforms, particularly Twitter, present a unique opportunity for detecting early signs of depression due to their real-time and spontaneous nature. Unlike other platforms such as Reddit, Twitter posts are brief, time-stamped, and often published in rapid succession (burst posting), providing richer insights into users' immediate emotional states. However, identifying symptoms of depression through such posts remains a significant challenge due to the complexity and nuance of human language in informal settings. While previous studies using transformer-based models like BERT have demonstrated potential in sentiment and emotion analysis, these models often struggle with the informal, ambiguous, and context-dependent language common in social media—such as sarcasm, slang, and abbreviations. Additionally, limitations such as BERT's difficulty in capturing long-term dependencies and its sensitivity to imbalanced datasets further hinder its effectiveness in real-world mental health detection. This project seeks to address these challenges by tailoring and enhancing BERT-based models specifically for

Twitter data, thereby improving the reliability and accuracy of automated depression detection systems for timely intervention.

Problem Statement:

Despite the advancements in Natural Language Processing (NLP) and the proven effectiveness of transformer-based models like BERT in sentiment and emotion classification tasks, accurately detecting depression through social media posts—particularly on Twitter—remains a significant challenge. Most existing studies rely on data from platforms like Reddit, which lack the brevity, immediacy, and linguistic variability inherent to Twitter posts. These models often underperform when applied to Twitter due to issues such as informal language, slang, abbreviations, sarcasm, and highly imbalanced datasets. Furthermore, many approaches fail to leverage the real-time nature and burst-like posting behaviour of Twitter users, which can offer critical temporal cues for early depression detection. To overcome these challenges, there is a need for a platform-specific, robust, and context-aware NLP approach that integrates advanced preprocessing tools such as spaCy, to effectively manage noise in social media text and enhance model interpretation. Such improvements are essential for accurately capturing subtle emotional cues in Twitter content and enabling timely, automated mental health interventions.

Aim of the Project:

This project aims to develop a reliable automated system for detecting signs of depression in Twitter posts by leveraging BERT-based NLP models with integrated preprocessing tools like spaCy. By addressing challenges in short, informal, and noisy text—common on Twitter—the system seeks to improve the detection of subtle emotional cues, enabling earlier identification of depressive behavior and supporting timely mental health intervention.

Objectives of the Project:

- To develop and optimized BERT-based NLP models focusing on enhancing the model's ability to interpret informal, noisy language.
- Train a machine learning model capable of classifying Twitter posts into two categories: "Normal" and "Depressed," ensuring robust performance with diverse real-world data.
- To develop a dashboard that summarizes the analysis.

Scopes of the Project:

- This project aims to develop an automated system for detecting depression in Twitter posts using BERT-based NLP models, incorporating preprocessing techniques to handle noise like slang, abbreviations, emojis, and informal language.
- The study will be limited to textual posts from Twitter users (excluding images, videos, or other media).
- Python will be used as the core programming language for implementing the model and visualizing the analysis results.

Expected Contribution of the Project:

- Improved accuracy in depression detection by leveraging BERT's contextual understanding.
- Development of a fine-tuned BERT-based NLP model that can identify depressive content from Twitter post.
- Support tool for mental health awareness.

Project Requirements:

Software:
- Python
- PyCharm
- Hugging Face Transformers
- Scikit-learn

- spaCy

Hardware: Personal Laptop with minimum 8 GB RAM.

Technology/Technique/ Methodology/Algorithm:

- Natural Language Processing (NLP)
- Binary Classification
- Transformer-Based Models (BERT)
- Fine-Tuning Pretrained Language Models
- Text Preprocessing
- Model Evaluation

Type of Project (Focusing on Data Science):

[ ] Data Preparation and Modeling

[ ] Data Analysis and Visualization

[ ] Business Intelligence and Analytics

[X] Machine Learning and Prediction

[ ] Data Science Application in Business Domain

Status of Project:

[X] New

[ ] Continued

If continued, what is the previous title?

SECTION C: Declaration

I declare that this project is proposed by:

[X] Myself

[ ] Supervisor/Industry Advisor ( )

Student Name:

Signature **Date**

SECTION D: Supervisor Acknowledgement

The Supervisor(s) shall complete this section.

I/We agree to become the supervisor(s) for this student under aforesaid proposed title.

Name of Supervisor 1:

Signature **Date**

Name of Supervisor 2 (if any):

Signature **Date**

SECTION E: Evaluation Panel Approval

The Evaluator(s) shall complete this section.

Result:

[ ] FULL APPROVAL
[ ] CONDITIONAL APPROVAL (Minor)
[ ] CONDITIONAL APPROVAL (Major)*
[ ] FAIL*

***** Student has to submit new proposal form considering the evaluators' comments.

Comments:

Name of Evaluator 1: .....

Signature ..... **Date** .....

Name of Evaluator 2: .....

Signature ..... **Date** .....