A Mini Project Report

On

DETECTION AND PREDICTION OF FUTURE MENTAL HEALTH DISORDER FROM SOCIAL MEDIA DATA

Submitted in partial fulfillment of the requirement for the award of the degree of

BACHELOR OF TECHNOLOGY

In

COMPUTER SCIENCE AND ENGINEERING(AI&ML)

Under the Guidance of

Dr. Lipika Goel

Professor

By

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Department of Computer Science and Engineering(AI&ML)

SRIDEVI WOMEN'S ENGINEERING COLLEGE

(An UGC Autonomous Institution)

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CERTIFICATE

This is to certify that the **MINI PROJECT REPORT** entitled **"DETECTION AND PREDICTION OF FUTURE MENTAL HEALTH DISORDER FROM SOCIAL MEDIA DATA"** is being submitted by **G. Ashwitha (22D21A6612), N. Sharvani (22D21A6624) , P.Preethi (22D21A6627)** in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Engineering (AI&ML) is a record of Bonafide work carried out by them.

Internal Guide	**Coordinator**	**Head of the Department**
Dr. Lipika Goel	**Dr. A. Ravi Kumar**	**Dr. Lipika Goel**
Professor	**Professor**	**Professor**

EXTERNAL EXAMINAR

DECLARATION

We hereby declare that Mini Project entitled **"Detection and Prediction of Future Mental Health Disorder From Social Media Data"** is the work done during the period from **30th January 2025 to 5th June 2025** and the same is submitted in partial fulfillment of the requirements for the award of degree of Bachelor of Technology in Computer Science and Engineering (AI&ML) from Jawaharlal Nehru Technological University, Hyderabad.

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ABSTRACT

The Purpose of this study is to detect and predict mental disorders from social media data. Mental health analysis is a great thing constantly express their emotions when social media data is used. Using Machine Learning project classifies conditions such as Depression, Anxiety, Bipolar disorder, ADHD (Attention deficit hyperactivity disorder). To this end, six machine learning models like Logistic Regression, Decision Tree, Support Vector Machine (SVM), Naive Bayes, K-Nearest Neighbors (KNN), and Random Forest were used, among which a hybrid model that combines Support Vector Machine with Random Forest and Naive Bayes achieved highest accuracy, that is 32%. Linguistic patterns and emotional cues are analyzed by the system to help mental health professionals in early diagnosis, risk assessment and digital healthcare.

1. INTRODUCTION

We are seeing more and more mental health disorders as Depression, Anxiety, Attention Deficit Hyperactivity Disorder (ADHD), Bipolar Disorder recognized as major public health problems. Diagnosis and prediction of these disorders are currently based on manual surveys, face to face consultations, and self-reporting of questionnaires by mental health professionals. These methods are good at evaluating symptoms in depth, but have some limitations. The diagnostic methods that are used do not represent the emotional ups and downs that are experienced in everyday life that may lead to a missed or delayed diagnosis. Additionally, the approaches in traditional are time expending, geographically limited and socially stigmatized making it a unthinkable for many people to seek help. The approaches in traditional are also time consuming, geographically limited, and socially stigmatized, and so it is a taboo for many people to seek help. These challenges are addressed by the system that uses machine learning algorithms to automatically analyze social media data to infer Mental Health disorders from social media data on platforms like Twitter, Facebook, Instagram, etc. and the behavioral patterns. Using six machine learning model namely Logistic Regression, Decision Tree, Support Vector Machine (SVM), Naïve Bayes, k- Nearest Neighbors and Random Forest and a hybrid model for better accuracy in real-time monitoring, early detection and global availability provided by this system. In this approach, it provides a scalable and cheap solution to mental health detection and prediction and as a way to receive timely insights for proactive care.

1.1 PURPOSE

This project aims to develop machine learning models to detect and predict existing mental health Disorders, such as Depression, Anxiety, Attention Deficit Hyperactivity Disorder (ADHD), and Bipolar Disorder, as well as identify new potential mental health conditions from social media posts. Using six models—Logistic Regression, Decision Tree, Support Vector Machine (SVM), Naïve Bayes, k-Nearest Neighbors, and Random Forest—the goal is to evaluate their effectiveness in accurate prediction and detection. A hybrid multimodal approach will be created by combining these models to enhance performance. The project seeks to improve early detection methods for both existing and potential mental health disorders, enabling timely support and improved mental health outcomes.

1.2 SCOPE

The scope of this project focuses on developing machine learning models to detect and predict mental health disorders from social media data. The project begins with collecting and analyzing social media posts, such as those from Twitter, Facebook, and Instagram, to identify emotional expressions and behaviors indicative of mental health conditions. It involves preprocessing the data, including sentiment analysis and feature extraction, to build a dataset for training models. Six machine learning models— Logistic Regression, Decision Tree, Support Vector Machine (SVM), Naïve Bayes, k-Nearest Neighbors, and Random Forest—will be implemented to classify and detect disorders such as Depression, Anxiety, Attention Deficit Hyperactivity Disorder(ADHD), and Bipolar Disorder. The project also explores a hybrid approach, combining the strengths of multiple models to improve prediction accuracy. Additionally, it aims to predict future mental health issues based on current online behavior. Ethical and privacy considerations will be prioritized throughout the process, ensuring user data is respected. Ultimately, the project seeks to enable early detection and intervention in mental health care.

1.3 ABBREVATIONS AND MODEL DAGRAM

1.3.1 Abbreviations

ADHD - Attention Deficit Hyperactivity Disorder

SVM - Support Vector Machine

k-NN – k- Nearest Neighbors

1.3.2 Model Diagram

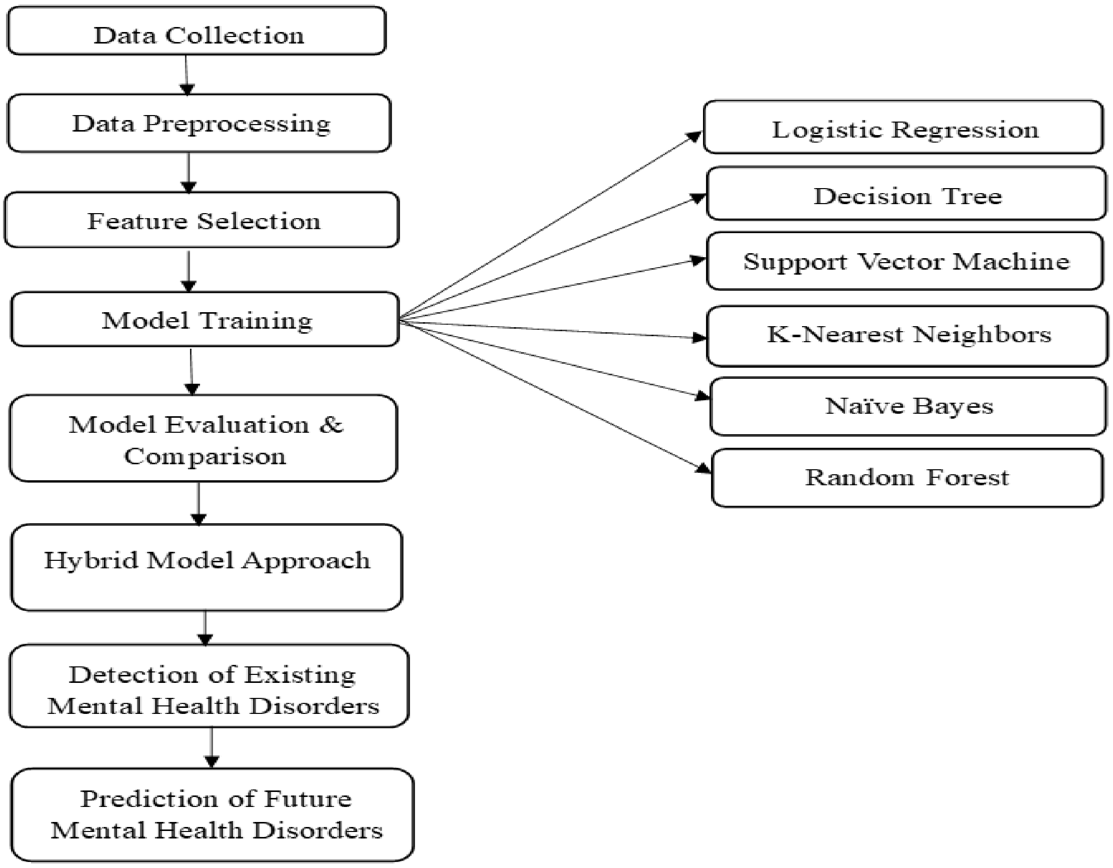


Figure 1.1 Model Diagram

- **Data Collection:** It Collected from social media using mental health-related keywords, keywords, hash tags, and user demographics (age, gender, location).
- **Data Preprocessing:** It Removed duplicates and handled missing values, Integrated data from various sources for a unified dataset and applied normalization to standardize data.
- **Feature Selection:** Applied techniques to retain the most relevant attributes, enhancing model performance and reducing over fitting.
- **Model Training and Evaluation:** Trained six machine learning models on 80% of the data and tested on 20%, evaluating performance using accuracy, precision, recall, F1-score, and confusion matrix.
- **Hybrid Model:** Combined multiple classifiers to leverage their strengths and maximize predictive accuracy.
- **Detection and Prediction:** The best-performing model detected symptoms like Depression, Anxiety, and ADHD, and analyzed behavioral patterns over time to predict future mental health issues, enabling early detection and better management.

1.4 OVERVIEW

The study focuses on detecting and predicting mental disorders using social media data through machine learning techniques. It highlights how individuals often express their emotions online, making social media a valuable source for mental health analysis. The project classifies conditions such as depression, anxiety, bipolar disorder, and ADHD using six machine learning models: Logistic Regression, Decision Tree, SVM, Naïve Bayes, KNN, and Random Forest. Among these, a hybrid model combining SVM, Random Forest, and Naïve Bayes achieved the highest accuracy (32%). The system analyzes linguistic and emotional cues to support mental health professionals in early diagnosis, risk evaluation, and digital healthcare efforts.

2. LITERATURE SURVEY

"Detection and Expectation of Future Mental Clutter from Social Media"

Information gathered from Reddit social media is used to identify and anticipate mental disorders, such as ADHD, uncertainty, bipolar disorder, and misery. Reddit's social media information is used to identify and anticipate mental disorders such as ADHD, uneasiness, and bipolar disorder. Reddit social media helps identify depression, ADHD, anxiety, bipolar disorder, and misery by identifying and anticipating them. Reddit social media information is utilized to identify and anticipate mental disarranges, such as ADHD, uneasiness, bipolar clutter, and misery.

"RST Fusion X: Leveraging Illustrative Structure Speculation and Equip Models for Hopelessness Figure in Social Media Posts"

We present RST FusionX, a new model combining Rhetorical Structure Theory and ensemble machine learning, as a method for detecting depression from Reddit posts. The purpose of this study is to develop RST FusionX, a novel model that combines Rhetorical Structure Theory and ensemble machine learning, as a method of detecting depression from Reddit. In this study, RST FusionX, a novel model combining Rhetorical Structure Theory and ensemble machine learning, is presented as a method for predicting depression from Reddit posts.

"Mental Weakness Forecast Demonstrate Based on Multimodal Fusion".

An integrated model of mental fatigue prediction based on multimodal fusion is presented in this paper. The aim of this study is to present a multimodal fusion model for predicting mental fatigue using physiological inputs and real-time monitoring. Physiological data and real-time monitoring are integrated to create a mental fatigue prediction model based on multimodal fusion. Our model incorporates physiological data and real-time monitoring to predict mental fatigue based on multimodal fusion.

"An feeling and cognitive based examination of mental prosperity disarranges from social media data".

Through the use of deep learning and social media analysis, this study examines early detection of mental health disorders such as depression, anorexia, and self-harm. Through social media analysis using deep learning, this study investigates early detection of mental health disorders, including depression, anorexia, and self-harm. By analyzing social media and deep learning, this study examines early signs of depression, anxiety, and self-harm. Deep learning and social media analysis are used in this study in order to detect mental health disorders such as depression, anxiety, and self-harm at an early stage.

“Predicting Wretchedness through Social Media”.

It is being investigated whether social media-specifically Twitter-can detect and predict major depressive disorder (MDD). Twitter has been investigated for its potential to detect and predict major depressive disorder (MDD). An investigation is being conducted to determine whether social media can be used to detect and predict major depressive disorder (MDD) before a clinical diagnosis is made. Through the use of social media, specifically Twitter, this author has conducted a study that attempts to detect and predict major depressive disorder (MDD).

“Mental prosperity desire Appear on social media data utilizing CNN BiLSTM”.

It is based on a CNN-BiLSTM deep learning architecture, this paper presents a mental health prediction model based on social media data. On the basis of social media data, this paper presents a model that predicts mental health using CNN-BiLSTM deep learning architecture. Using CNN-BiLSTM deep learning architecture, this paper presents a social media-based mental health prediction model. An analysis of social media data using a CNN-BiLSTM deep learning architecture is presented in this paper as a mental health prediction model.

“Automatic Disclosure and Classification of Mental Ailments from Common Social Media Texts”.

Using Reddit posts rather than support group data, this study analyzes the automatic detection and classification of nine mental illnesses, including depression, anxiety, OCD, PTSD, and eating disorders. Rather than using support group data, this study uses Reddit posts to detect and classify nine mental illnesses, including depression, anxiety, OCD, PTSD, and eating disorders. A study using general Reddit posts instead of support group data investigates the automatic detection and classification of nine mental illnesses, including depression, anxiety, OCD, PTSD, and eating disorders.

“Using Social Media to anticipate long Term: A Successful Composing Review”.

Using social media data to predict real-world events is examined in this systematic literature review. Social media data are examined in a systematic literature review to predict real world events. A systematic literature review examines social media data to predict real world events. To predict real world events, social media data are analyzed in a systematic literature review. On the basis of a systematic literature review, social media data is analyzed in order to predict what will happen in real life.

“Predicting Mental Ailment utilizing Social Media Posts and Comments”.

The author proposes an approach that uses machine learning to detect mental illnesses like schizophrenia, autism, OCD, and post-traumatic stress disorder. An approach based on machine learning is proposed to detect schizophrenia, autism, OCD, and post-traumatic stress disorder (PTSD) by analyzing Reddit posts and comments. By analyzing Reddit posts and comments, this paper proposes a machine learning approach to detecting mental illnesses like Schizophrenia, Autism, OCD, and PTSD.

“Predicting future mental illness from social media: A big-data approach”.

Using Reddit language as a predictor of mental illness in the future could be useful, according to the paper. The purpose of the paper is to determine whether language used on Reddit can predict future mental illness. According to the study, Reddit language could predict mental illness in the future. It has been suggested that Reddit language may be able to predict future mental illnesses. According to the paper, Reddit language may predict mental illnesses in the future.

“Pattern Recognition and Machine Learning”.

The book Pattern is a foundational resource that provides comprehensive theoretical and practical knowledge of core machine learning techniques. It is especially relevant to this project, which applies supervised algorithms such as Support Vector Machines, Naive Bayes, Decision Trees, Logistic Regression, and Ensemble Methods for mental health disorder prediction. The textbook supports concepts like data preprocessing, dimensionality reduction, and evaluation metrics key to analyzing unstructured social media data. Its rigorous treatment of probabilistic models, classification methods, and hybrid approaches aligns well with the project's methodology, bridging the gap between theoretical foundations and practical mental health analytics.

“Understanding Supervised Learning and Model Evaluation Through Traditional Machine Learning Principles”.

This foundational textbook provides in-depth explanations of core supervised learning algorithms such as Decision Trees, Naive Bayes, and K-Nearest Neighbors, all of which are utilized in this project for mental disorder prediction. It introduces key principles like the bias-variance tradeoff, concept learning, and performance evaluation metrics such as accuracy and F1-score, which are critical to validating classification outcomes. Mitchell's work supports the theoretical backbone of model selection and performance interpretation, directly aligning with the analytical methods applied in predicting mental health conditions from social media behavior.

2.1 TECHNOLOGIES USED

The following are the technologies used in the model "Detection and Prediction of Mental Health Disorders from Social Media Data Using Machine Learning Approach".

2.1.1 Python

Python is a general-purpose programming language that is widely used in various fields such as web development, data analysis (like Pandas and Matplotlib), and machine learning (like scikit-learn). Python's simplicity and clean syntax make it particularly suitable for tasks that involve data preprocessing, feature engineering, and model training.

In this project, Python is used to clean and analyze social media text data, extract important features, apply machine learning algorithms, and evaluate the models. The availability of rich libraries and community support makes Python an efficient and powerful tool for building mental health disorder prediction systems.

- **History of Python**

Python is a fairly old language created by Guido Van Rossum. The design began in the late 1980s and was first released in February 1991. Over time, it has grown into one of the most preferred languages in the domains of automation, analytics, and artificial intelligence.

A high-level, interpreted language Unlike low-level languages like C/C++, Python simplifies development by handling tasks like memory management and garbage collection internally. When Python code is executed, it is automatically interpreted into a language your machine understands, allowing you to focus on problem-solving rather than system-level operations.

- **Large standard libraries to solve common tasks**

Python offers a wide collection of standard libraries that ease the development process. In this project, libraries such as Pandas, NumPy, and scikit-learn are used for data manipulation, feature extraction, and machine learning model implementation. These libraries are well-tested and widely used in research and industry, ensuring both reliability and performance.

- **Object-oriented**

Python is fully object-oriented. Object-Oriented Programming (OOP) helps break down complex mental health detection problems into manageable components. Using classes and objects, we can design modular code that is easy to debug, maintain, and scale.

2.1.1.2 Applications of Python

- **Simple Elegant Syntax**

Python programming is enjoyable due to its simplicity and readability. This makes it ideal for beginners and researchers working with text data.

- **Not overly strict**

In Python, you don't need to declare data types explicitly, nor is there a requirement to end statements with a semicolon. Python encourages good coding practices like indentation and structure, making it easier for beginners to adopt and use effectively in mental health-related text analysis tasks.

- **Expressiveness of the language**

Python allows the implementation of complex logic in fewer lines of code. In this project, sentiment analysis, text vectorization, and machine learning pipelines are implemented efficiently using expressive syntax. This helps in building powerful mental health prediction tools with minimal code complexity.

- **Why Python was created?**

In the late 1980s, Guido Van Rossum was working on the Amoeba distributed operating system. He wanted a language that was interpreted, had a simple and readable syntax (like ABC), and could support extensibility for a wide variety of applications. This led to the creation of a new language, which was eventually named Python. It was designed to be intuitive and productive, making it ideal for research and real-world software development, like the one used in this mental health detection project.

- **Why the name Python?**

The name "Python" wasn't inspired by the snake. Instead, it was named after "Monty Python's Flying Circus," a British comedy show. Guido Van Rossum, being a fan of the show, wanted a name that was short, unique, and a bit mysterious — just like the language he created.

2.1.1.3 Features of Python

- **A simple language which is easier to learn**

Python's syntax is clear and straightforward, making it much easier to read, write, and understand programs. For this project, Python made tasks such as text cleaning, feature extraction, and machine learning model development easier and more efficient compared to traditional languages like C++, Java, or C#.

- **Free and open-source**

Python is completely free to use, even for commercial projects. You can download, use, and modify the language to fit your needs. This was especially beneficial for our project as it allowed integration of open-source libraries like scikit-learn, NLTK, and Pandas without licensing issue.

- **Portability**

Python code runs on all major platforms including Windows, macOS, and Linux. For a cross-platform project like ours—dealing with social media data collection, processing, and prediction—this means the code can be executed on multiple systems with no or minimal modifications.

- **Extensible and Embeddable**

Python supports integration with other languages like C/C++, making it ideal for applications where performance is critical. Although our mental health disorder detection project focuses on text data and model evaluation in Python, it retains the flexibility to be extended further with high-performance modules if needed.

- **Great Community and Support**

Python has a vast and active global community. From forums to dedicated websites like Stack Overflow and GitHub, developers can find help quickly when they are stuck. This makes Python a reliable choice for real-time projects like mental health disorder prediction using social media data, where support and resources are crucial for solving unexpected challenges.

2.1.1.4 Libraries Used

For the project “Detection and Prediction of Mental Health Disorders from Social Media Data Using Machine Learning Approach,” the following Python libraries were utilized:

- **Pandas**

Pandas is an essential Python library used for data manipulation and analysis. It provides powerful data structures like Data Frames that make it easy to handle and preprocess social media text data. In this project, Pandas was extensively used for reading, cleaning, and organizing datasets, which is a crucial step before feeding the data into machine learning models.

- **Scikit-learn**

Scikit-learn (also known as sklearn) is a comprehensive library for machine learning in Python. It supports various classification, regression, and clustering algorithms, including:

- Support Vector Machines
- Random Forest
- k-Nearest Neighbors

- Naïve Bayes
- Logistic Regression
- Decision Trees

In this project, multiple models were implemented using Scikit-learn to classify the presence of mental health disorders like depression, anxiety, bipolar disorder, and ADHD based on user-generated social media content.

- **NumPy**

NumPy is a core package for scientific computing in Python. It provides a high-performance multidimensional array object and a suite of functions to perform operations on these arrays. In our project, NumPy played a key role in numerical computations during data transformation, feature vector handling, and model evaluation processes.

3. SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

The existing systems for detecting and predicting mental health disorders primarily rely on traditional methods such as manual surveys, face-to-face consultations, and self-reporting questionnaires. These methods are commonly used by mental health professi onals to diagnose conditions such as Depression, Anxiety, and other Disorders. In these systems, individuals typically provide information about their mental state through structured interviews or questionnaires, and mental health experts analyze this data to assess the presence of mental health issues. The diagnostic process often involves personal interactions between the patient and the clinician, allowing for an in-depth evaluation of symptoms and behavior.

3.1.1 Disadvantages of Existing System

- Traditional methods often miss real-time changes in mental states, leading to delayed or incorrect diagnoses.
- Diagnosis heavily depends on in-person consultations and manual surveys, making it slow and less scalable.
- Individuals in underserved or rural regions face difficulties in accessing timely mental health care due to geographical and infrastructural constraints.
- Social stigma prevents many from seeking help, while current systems lack continuous monitoring, relying instead on static, periodic data.

3.2 PROBLEM STATEMENT

Traditional methods for detecting mental health issues are slow and limited, making early support difficult. Social media provides real-time insights into people's emotions and behavior, offering a valuable source for monitoring mental health. An automated system can analyze this data to detect and predict mental health concerns early. This approach can help overcome barriers like stigma, distance, and inaccurate self-reporting, making mental health support more accessible and effective.

3.3 PROPOSED SYSTEM

The proposed system aims to use machine learning algorithms to automatically analyze social media data and predict mental health disorders like Depression, Anxiety, Attention Deficit Hyperactivity Disorder (ADHD), and Bipolar Disorder etc. By processing data from platforms such as Twitter, Facebook, and Instagram, helps to understand the emotional content of data. Key components include data collection from public posts, preprocessing for tokenization and sentiment analysis, and feature extraction to identify emotional tone and behavioral patterns. Six machine learning models—Logistic Regression, Decision Tree, Support Vector Machine (SVM), Naïve Bayes, k-Nearest Neighbors, and Random Forest— are used for prediction, and their performance is evaluated based on accuracy, precision, recall, and F1-score. A hybrid model will combine the strengths of individual models for better results. The system offers real-time monitoring, early detection of mental health issues, and can reach users globally.

3.3.1 Advantages of Proposed System

- Analyzing social media behavior enables early detection of mental health disorders like depression, anxiety, and bipolar disorder through continuous monitoring.
- Predictive analytics helps assess the likelihood of future mental health issues based on users ongoing online activity, enabling proactive intervention.
- This approach increases accessibility and preserves privacy, as it does not require in-person consultations and allows users to share emotions anonymously.
- The system is scalable and cost-effective, capable of processing large volumes of data across platforms, making it suitable for global mental health support.

4. SYSTEM REQUIREMENT SPECIFICATIONS

4.1 FUNCTIONAL REQUIREMENTS

- Data Collection
- Data Preprocessing and Feature Extraction
- Model Development and Training
- Model Evaluation
- Real-Time Monitoring
- Hybrid Approach
- Data Privacy

4.2 NON- FUNCTIONAL REQUIREMENTS

- **Performance:** The system should provide real-time predictions and handle large volumes of data with minimal delay, ensuring quick analysis and response.
- **Scalability:** The system should be scalable to handle increasing amounts of social media data and a growing number of users across different platforms.
- **Reliability:** The system should be reliable, with minimal downtime, to ensure continuous monitoring and accurate predictions.
- **Security:** The system must implement robust security measures to prevent unauthorized access to sensitive data and ensure data integrity.
- **Usability:** The system should be easy to use for both developers and mental health professionals, with user-friendly interfaces and clear instructions.
- **Maintainability:** The system should be easy to maintain and update as new machine learning models or social media platforms become relevant.
- **Compatibility:** The system must be compatible with various devices and operating systems to reach a wide audience.

4.3 HARDWARE REQUIREMENTS

Processor	:	i7 or higher
RAM	:	16 GB
Hard Disk	:	500 GB
Networking	:	High-speed internet

4.4 SOFTWARE REQUIREMENTS

Operating System	:	Windows 10/11
Programming Languages	:	Python

5. SYSTEM DESIGN

5.1 SYSTEM SPECIFICATIONS

To successfully implement and run a hybrid machine learning model for detecting and predicting mental health disorders from social media data, a well-defined set of system requirements was established to ensure efficient model training, smooth processing of textual data, and accurate evaluation output generation. The project was developed on a machine equipped with at least an Intel Core i7 processor, 16 GB of RAM, and 500 GB of storage to accommodate datasets, libraries, and outputs. While GPU acceleration was not required, it remains a beneficial option for future deep learning applications. High-speed internet connectivity was also necessary. On the software side, the model was developed using Python 3.12 on a Windows 10/11 operating system, with Spyder serving as the integrated development environment for step-by-step code execution and visualization. Key Python libraries used included Pandas for data handling, NumPy for numerical computations, Scikit-learn for implementing machine learning algorithms such as Support Vector Machine (SVM), Random Forest, and Naive Bayes, and Matplotlib and Seaborn for visualizing confusion matrices and performance metrics. The dataset comprised labeled social media posts and comments related to various mental health conditions, which were preprocessed and transformed through feature extraction techniques to prepare them for training. Model development and evaluation were performed entirely in Spyder, where hybrid classifiers—SVM, Random Forest, and Naive Bayes—were implemented. Output analysis included classification reports presenting metrics like accuracy, precision, recall, and F1-score, along with confusion matrices for visual performance assessment. The results demonstrated that the hybrid model outperformed individual classifiers, confirming the effectiveness of combining models for enhanced mental health prediction using social media data.

5.2 SYSTEM COMPONENTS

The System has the following Components:

1. Data Collection:

- **Purpose:** To gather relevant user data for analyzing mental health conditions.
- **Functionality:** It collects data from social media platforms and open datasets to build a comprehensive dataset for model training.

2. Data Pre-processing:

- **Purpose:** To clean and standardize raw data for accurate analysis.
- **Functionality:** It removes missing values, duplicates, and normalizes text to prepare data for feature extraction.

3. Feature Selection:

- **Purpose:** To identify the most relevant features that impact mental health prediction.
- **Functionality:** It selects features to enhance model performance.

4. Model Training:

- **Purpose:** To develop machine learning models that can classify mental health conditions.
- **Functionality:** It trains six machine learning algorithms on the processed dataset to learn patterns.

5. Model Evaluation & Comparison:

- **Purpose:** To evaluate and compare the effectiveness of different trained models.
- **Functionality**: It evaluates models using accuracy, precision, recall, and F1-score to determine the best-performing one.

6. Hybrid Model Approach:

- **Purpose**: To improve prediction accuracy by combining multiple models.
- **Functionality**: It evaluates best model with highest accuracy from different combinations models for more reliable results.

7. Detection and Prediction:

- **Purpose:** To detect current and predict future mental disorders based on user behavior.
- **Functionality:** It analyses user activity patterns to classify mental health conditions and forecast potential future disorders.

5.3 UML DIAGRAMS

- **Class Diagram**

This diagram represents the structure of the system by showcasing its classes and their functions. It includes stages like Data Collection, Preprocessing, Feature Extraction, Model Training, Evaluation, and Hybrid Model Generation. Each class outlines relevant attributes and methods, such as get Text(), Data Cleaning(), Train the six models(), and Best Hybrid Model(). It provides a blueprint for how components interact and function in the mental health detection and prediction system. The relationships among the classes demonstrate a clear data flow and dependency.

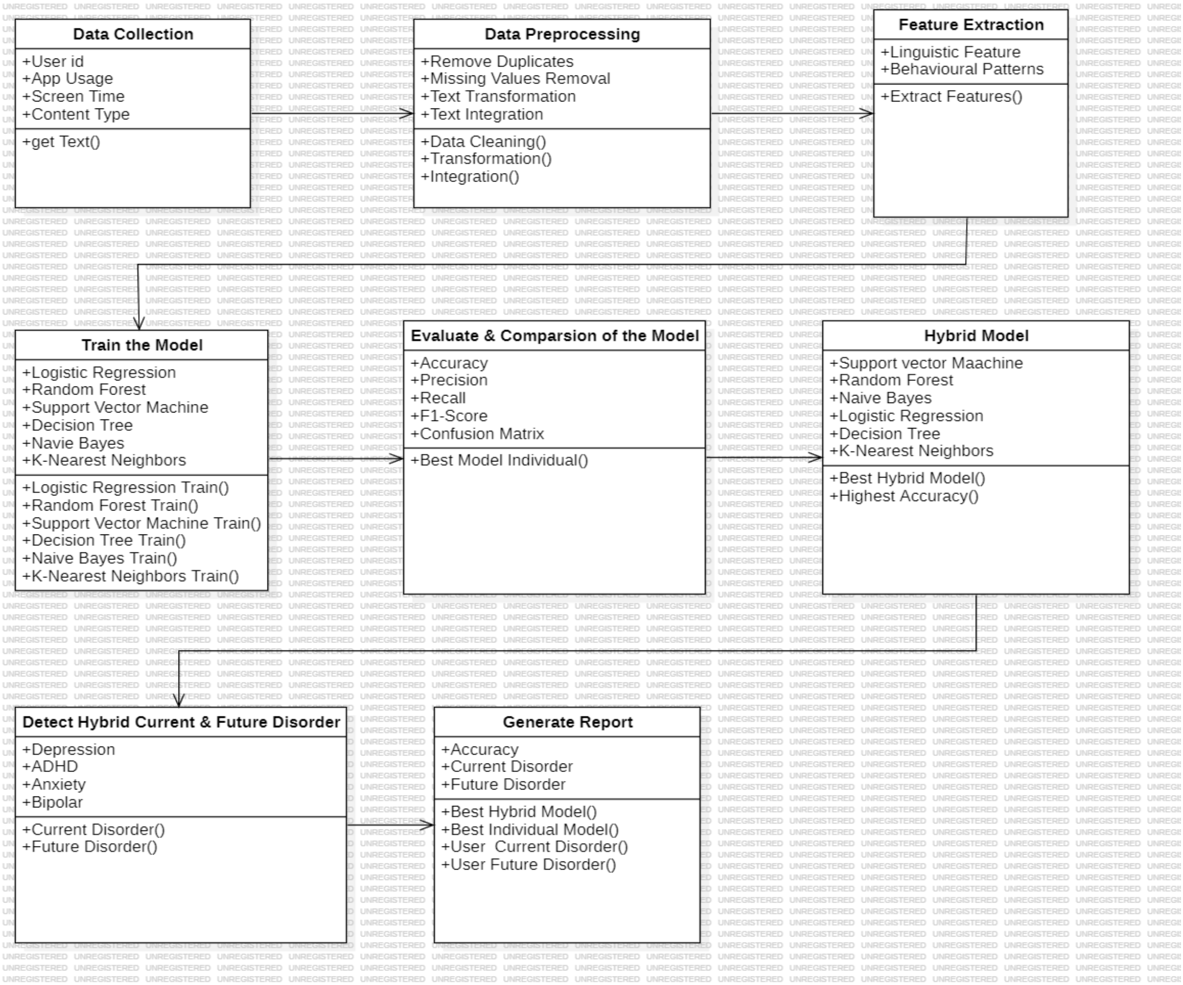


Figure 5.1 Class diagram

- **Usecase Diagram**

This diagram highlights interactions between different actors (Machine Learning Analyst, User, and Mental Health Professional) and the system. Each use case, Collection of the Data Generate the Report,” is shown as a system functionality used by one or more actors. It illustrates the flow of operations from data input to disorder detection and prediction and reporting, defining roles and responsibilities. This high-level overview improves understanding of system requirements and user interactions. It aids in communication between users. Moreover, it helps in identifying and organizing system functionalities during the design phase.

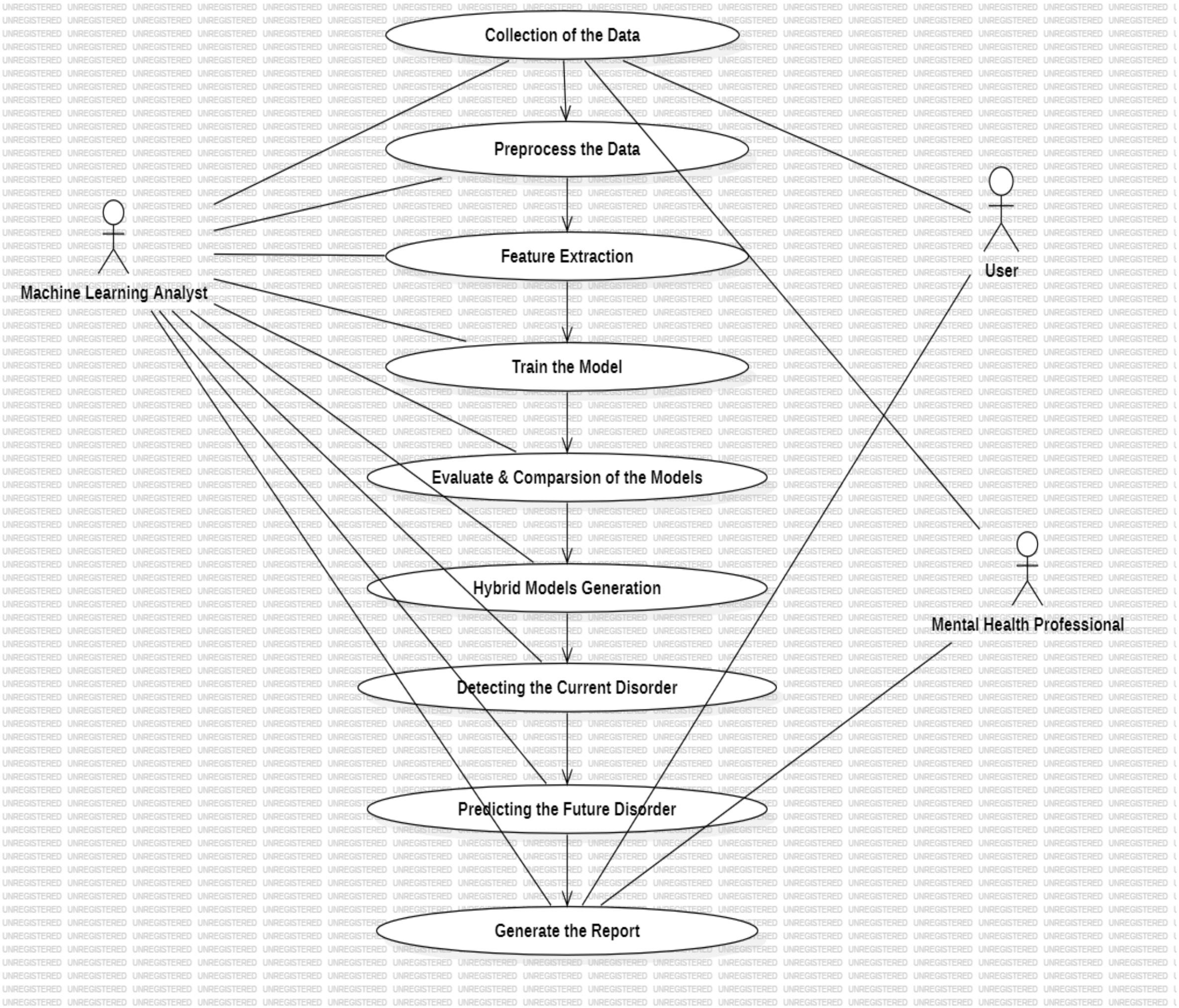


Figure 5.2 Usecase diagram

- **Activity diagram**

This Activity diagram illustrates the workflow of the mental health disorder prediction system. Starting from uploading social media data, it continues through preprocessing, training, comparison, hybrid model generation, disorder detection, and finally report generation. Each step is connected with control flows indicating logical progress. The diagram effectively captures decision-making points and alternate flows within the system. It helps developers and analysts visualize and validate the logic of operations.

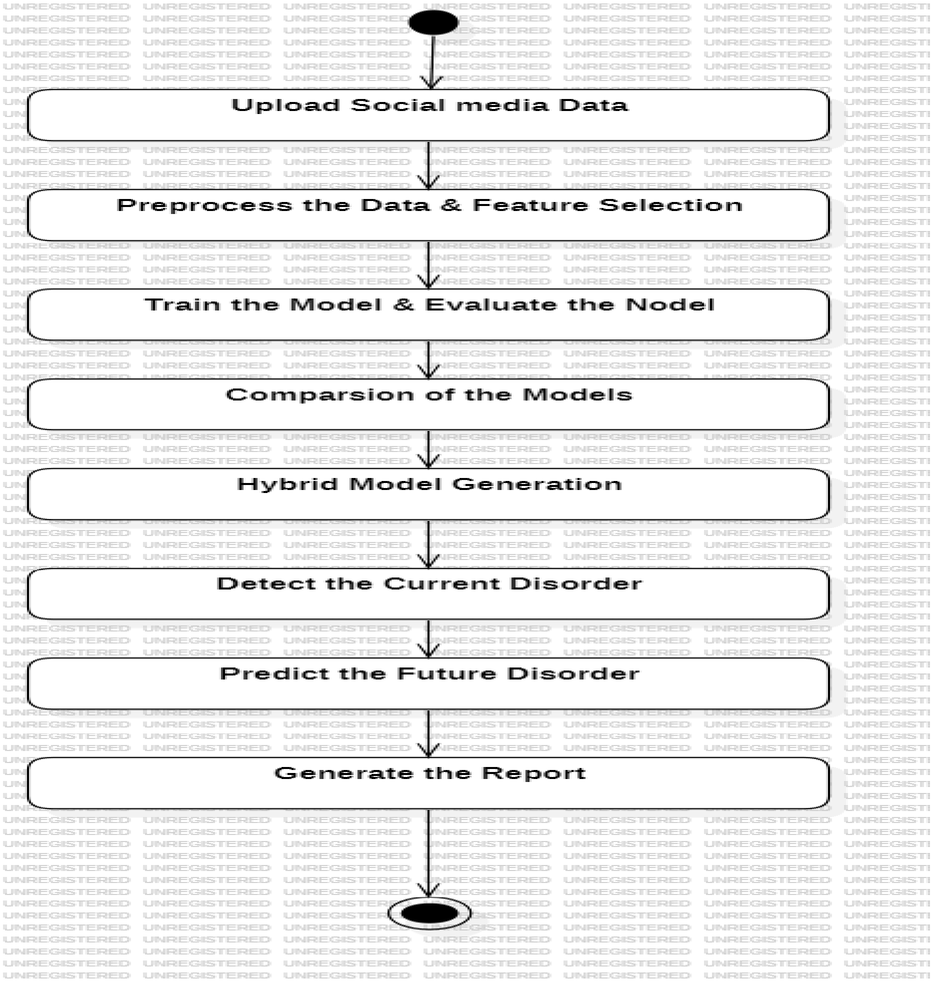

Upload Social media Data
Preprocess the Data & Feature Selection
Train the Model & Evaluate the Nodel
Comparsion of the Models
Hybrid Model Generation
Detect the Current Disorder
Predict the Future Disorder
Generate the Report

Figure 5.3 Activity diagram

- **Sequence diagram**

The sequence diagram represents the chronological interaction among different system entities involved in the mental health disorder prediction process. It begins with the User Mental Health Professional uploading social media data in the form of a CSV file. The CSV File Dataset component acknowledges successful upload, triggering Data Preprocessing, where the data is cleaned and structured. After preprocessing, features are extracted and saved to a file for training purposes. The Train the Model component uses this refined data to train six machine learning models.

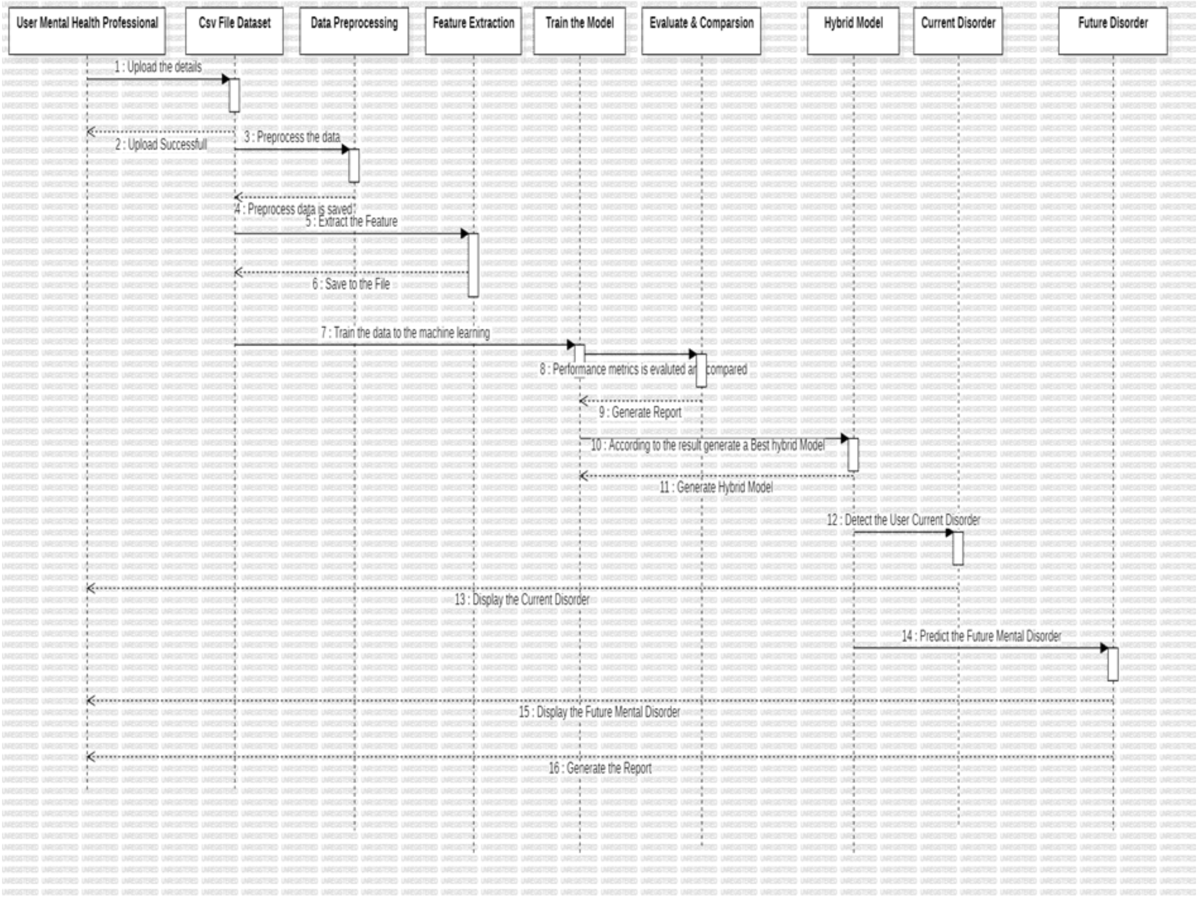

User Mental Health Professional
Csv File Dataset
Data Preprocessing
Feature Extraction
Train the Model
Evaluate & Comparsion
Hybrid Model
Current Disorder
Future Disorder
1 : Upload the details
2 : Upload Successfull
3 : Preprocess the data
4 : Preprocess data is saved
5 : Extract the Feature
6 : Save to the File
7 : Train the data to the machine learning
8 : Performance metrics is evaluted ar compared
9 : Generate Report
10 : According to the result generate a Best hybrid Model
11 : Generate Hybrid Model
12 : Detect the User Current Disorder
13 : Display the Current Disorder
14 : Predict the Future Mental Disorder
15 : Display the Future Mental Disorder
16 : Generate the Report

Figure 5.4 Sequence diagram

- ## Component diagram

This diagram shows the high-level components involved in the project and how they interact. Key components include Social Media Data Collection, Data Preprocessing & Feature Selection, Train the Model & Evaluate, and Hybrid Model Generation. The arrows represent data and control flow between these modules, helping understand system modularity and deployment. This structure ensures a design, making the system easier to maintain and scale. It also aids in identifying reusable components and interfaces.

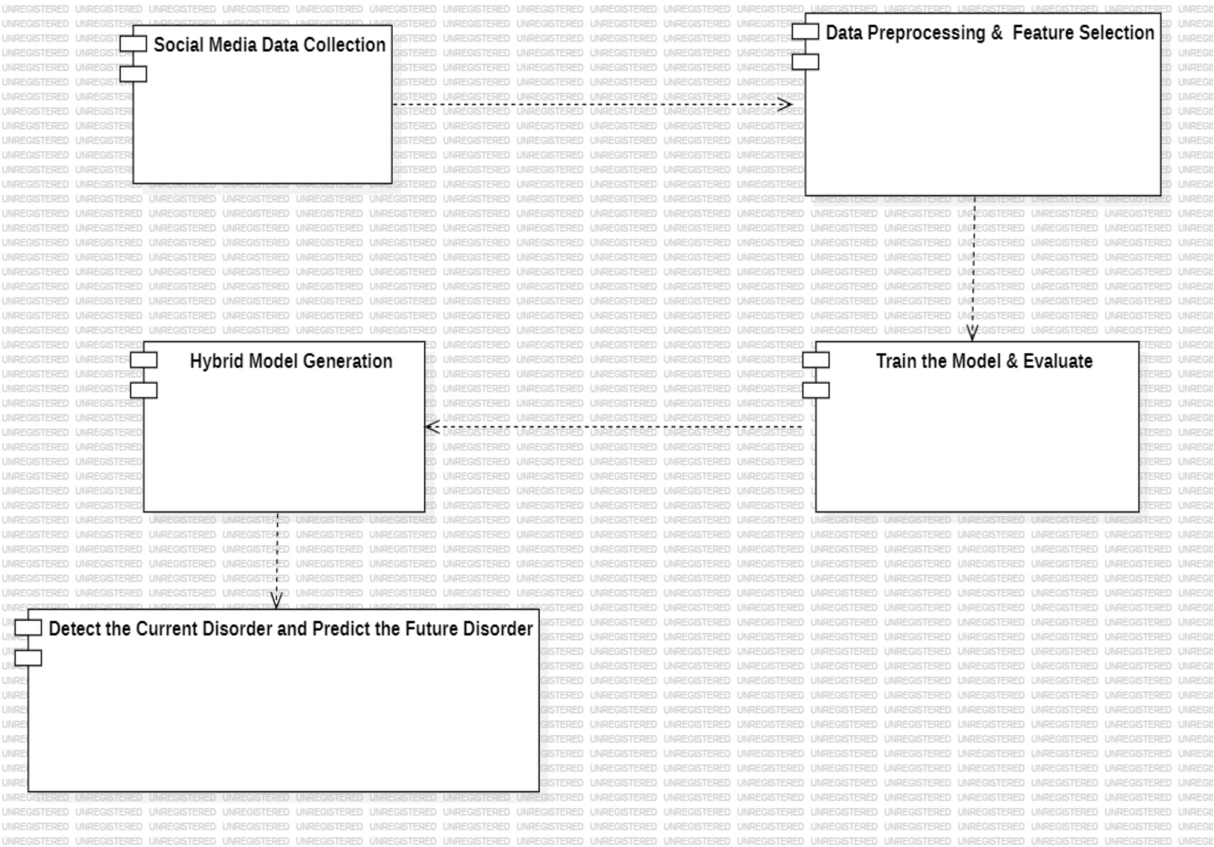

Social Media Data Collection
Data Preprocessing & Feature Selection
Hybrid Model Generation
Train the Model & Evaluate
Detect the Current Disorder and Predict the Future Disorder

Figure 5.5 Component diagram

- **Deployment diagram**

The deployment diagram focuses on the physical deployment of software components. It shows how elements like Social Media Data Collection, Training Module, and Hybrid Model Generation are deployed across nodes. The diagram helps visualize system architecture for implementation and execution environments. It provides clarity on how different components are distributed. This helps in identifying system dependencies, communication paths, and resource requirements. This diagram helps visualize the system's deployment environment and network setup.

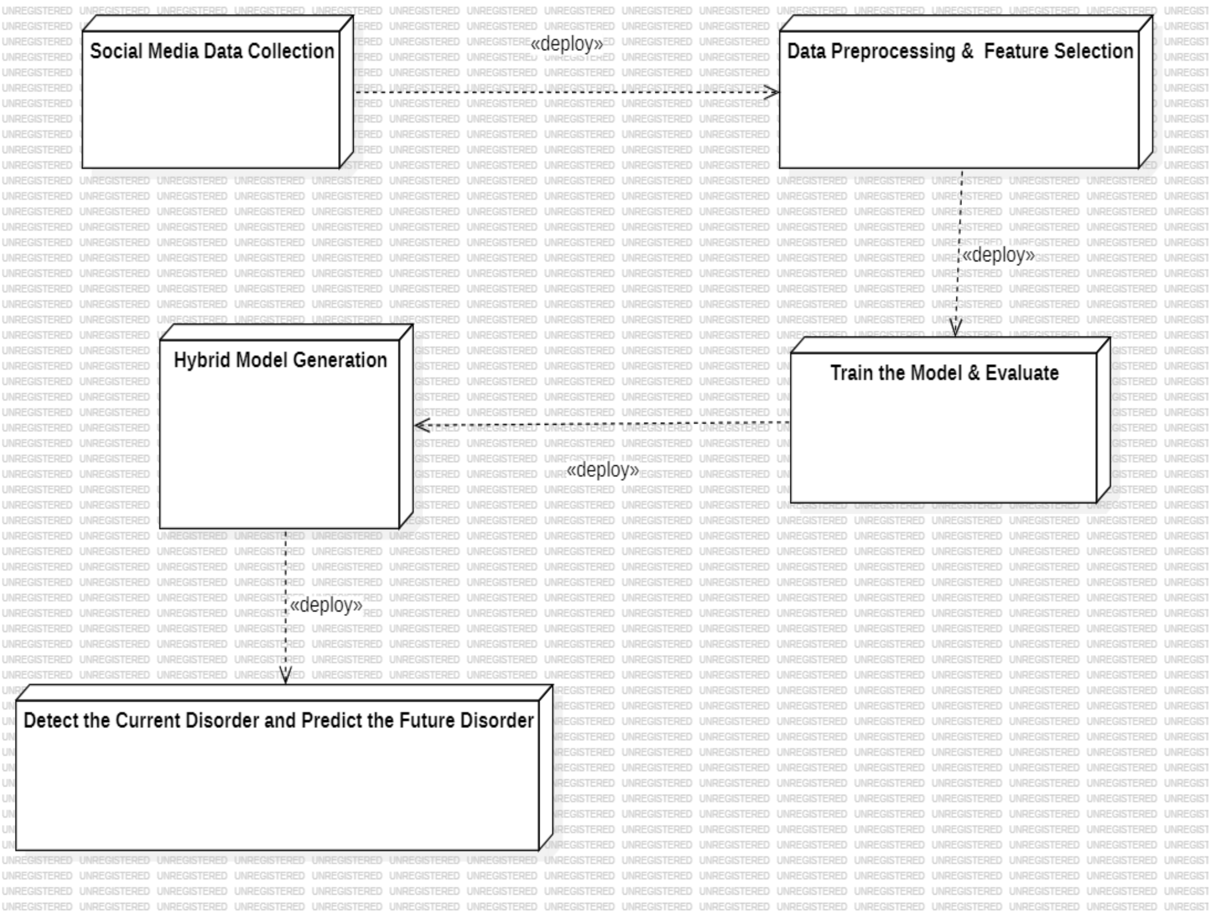

Social Media Data Collection
«deploy»
Data Preprocessing & Feature Selection
«deploy»
Train the Model & Evaluate
«deploy»
Hybrid Model Generation
«deploy»
Detect the Current Disorder and Predict the Future Disorder

Figure 5.6 Deployment diagram

6. IMPLEMENTATION

6.1 SAMPLE CODE

```
import pandas as pd, numpy as np
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report
from sklearn.ensemble import RandomForestClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.naive_bayes import GaussianNB
from sklearn.linear_model import LogisticRegression
from sklearn.svm import SVC
from scipy.stats import mode
from itertools import combinations
# Data Loading & Preprocessing
df = pd.read_csv(“social_media_mental_health.csv")
le = {c: LabelEncoder().fit(df[c])  for c in df if df[c].dtype == 'object' and c != ‘Predicted
Disorder’}
for c in le: df[c] = le[c].transform(df[c])
target_enc = LabelEncoder().fit(df[' Predicted Disorder’])
df['Target'] = target_enc.transform(df[' Predicted Disorder’])
X, y = df.drop('Target', axis=1), df[' Predicted Disorder’]
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2)
# Model Training models = {'SVM': SVC(probability=True), 'RF': RandomForestClassifier(),
'DT': DecisionTreeClassifier(), 'KNN': KNeighborsClassifier(), ‘  NB': GaussianNB(), 'LR':
LogisticRegression(max_iter=1000)}  results = {}
for n, m in models.items():
m.fit(X_train, y_train)
p = m.predict(X_test)
results[n] = {'model': m, 'Acc': accuracy_score(y_test, p),
'CM': confusion_matrix(y_test, p),
'CR': classification_report(y_test, p, target_names=target_enc.classes_)}
```

```
# Hybrid Model
def hybrid_pred(m_list, Xd): return mode(np.vstack([results[m]['model'].predict(Xd)  for m in
m_list]), axis=0).mode.flatten()
best_hybrid, best_acc = None, 0
for combo in combinations(models.keys(), 3):
acc = accuracy_score(y_test, hybrid_pred(combo, X_test))
if acc > best_acc: best_acc, best_hybrid = acc, combo
# User Prediction user_df = pd.read_csv("mental_health_input.csv")
for c in user_df:
if c in le: 9user_df[c]=user_df[c].apply(lambda v: le[c].transform([v])[0] if v in
le[c].classes_else - 1)
user_df = user_df.reindex(columns=X.columns, fill_value=-1)  user_preds =
hybrid_pred(best_hybrid, user_df)   decoded_preds =
target_enc.inverse_transform(user_preds)
# Future Prediction
 def suggest_future(u_row, Xtr, ytr, curr_lbl):  sims = cosine_similarity([u_row], Xtr)[0]
top_labels = target_enc.inverse_transform(ytr.iloc[sims.argsort()[-10:]])
 return [l for l in pd.Series(top_labels).value_counts().index[:2] if l != curr_lbl] or ["None"]
future_preds=[suggest_future(user_df.iloc[i],X_train,y_train,decoded_preds[i])
for i in range(len(user_df))]
for i, d in enumerate(decoded_preds):
print(f"\nUser {i+1}: Current: {d}, Future: {', '.join(future_preds[i])}")
```

7. SYSTEM TESTING

7.1 TESTING STRATEGIES

System testing is a black-box testing approach that validates the complete integration of components (Data Upload and Preprocessing, ML models, and predictions) to ensure that the final application meets the end-user requirements. This project deals with multiple software modules—ranging from social media data processing to mental disorder prediction using individual models and hybrid machine learning models.

The testing approach involves the following 3 levels of the software testing hierarchy:

Unit Testing:

Focus: Verifies individual Python functions used for preprocessing, training, and prediction.

Example: Function to upload CSV data returns standardized and valid data format.

Integration Testing:

Focus: Ensures modules such as data preprocessing, model training, prediction, and visualization interact correctly.

Approach: Data collected from social media flows seamlessly through each module, from preprocessing to detection and prediction of Disorders.

System Testing:

Focus: Validates the complete system including hybrid model execution. Basis Functional and non-functional requirements.

Example: Prediction accuracy and hybrid model evaluation.

The system testing conducted for the "Detection and Prediction of Future Mental Health Disorders from Social Media Data" project will involve several types of tests to ensure the robustness and reliability of the application. Functional testing was performed to validate that individual modules such as data preprocessing, model training, and prediction functionalities operated as expected. Usability testing was carried out to confirm that the interface was user friendly and that visual outputs like charts or graphs prediction results, and reports were clear and easy to interpret.

In addition, security testing was implemented to protect user data. To assess the system’s performance under data-intensive scenarios, load testing was performed using large social media datasets (e.g., from Reddit or Twitter). And to ensure the system could gracefully handle unexpected inputs or failures, such as invalid data formats or missing values, without crashing and displaying with limited attributes.

Additional testing strategies were incorporated to ensure the overall robustness, scalability, and adaptability of the system. Regression testing was essential each time the system was updated or enhanced, verifying that existing functionalities continued to work as expected without introducing new bugs. Cross-platform testing ensured that the interface and outputs functioned seamlessly across various devices which is critical for a system expected to be accessed from different user environments.

Data validation testing was carried out to ensure the correct flow of data between modules. The focus remained on verifying that the input data, after being uploaded from CSV files or collected datasets, retained its structure and could be accurately passed through preprocessing, model training, and prediction phases. Only functional testing and basic integration testing were conducted to confirm that each module such as preprocessing scripts, individual machine learning models, and the hybrid model performed correctly when working together. As the system was still under development, advanced testing techniques such as edge case handling, stress testing, and user evaluation were not performed in this phase.

To further evaluate the system's resilience, stress testing was conducted by simulating high-volume data loads to observe performance under pressure. Metrics such as processing time, memory usage, and model responsiveness were monitored to ensure scalability. These comprehensive testing efforts contributed to a more reliable, secure, and efficient system capable of handling real-world social media data in mental health prediction scenarios.

7.2 TEST CASES

Table 7.1 Test case for Uploading Data

Test case #1	Priority (h, l): High	
Test Objective	Verify that data is uploaded or not	
Test Description	Make sure that the csv file is uploaded and if not shows any error	
Requirements Verified	CSV dataset must be provided and must be proper	
Test Environment	Spyder (Python IDE)	
Action	Expected Results	Actual Results
Upload CSV file	Upload should be successful and process should be continued	Uploaded successful process continued
Failed to upload the CSV file	Error Message should be shown as file not found	Error Message shown as file not found
Pass: **Yes**	Conditional pass: No	Fail: No

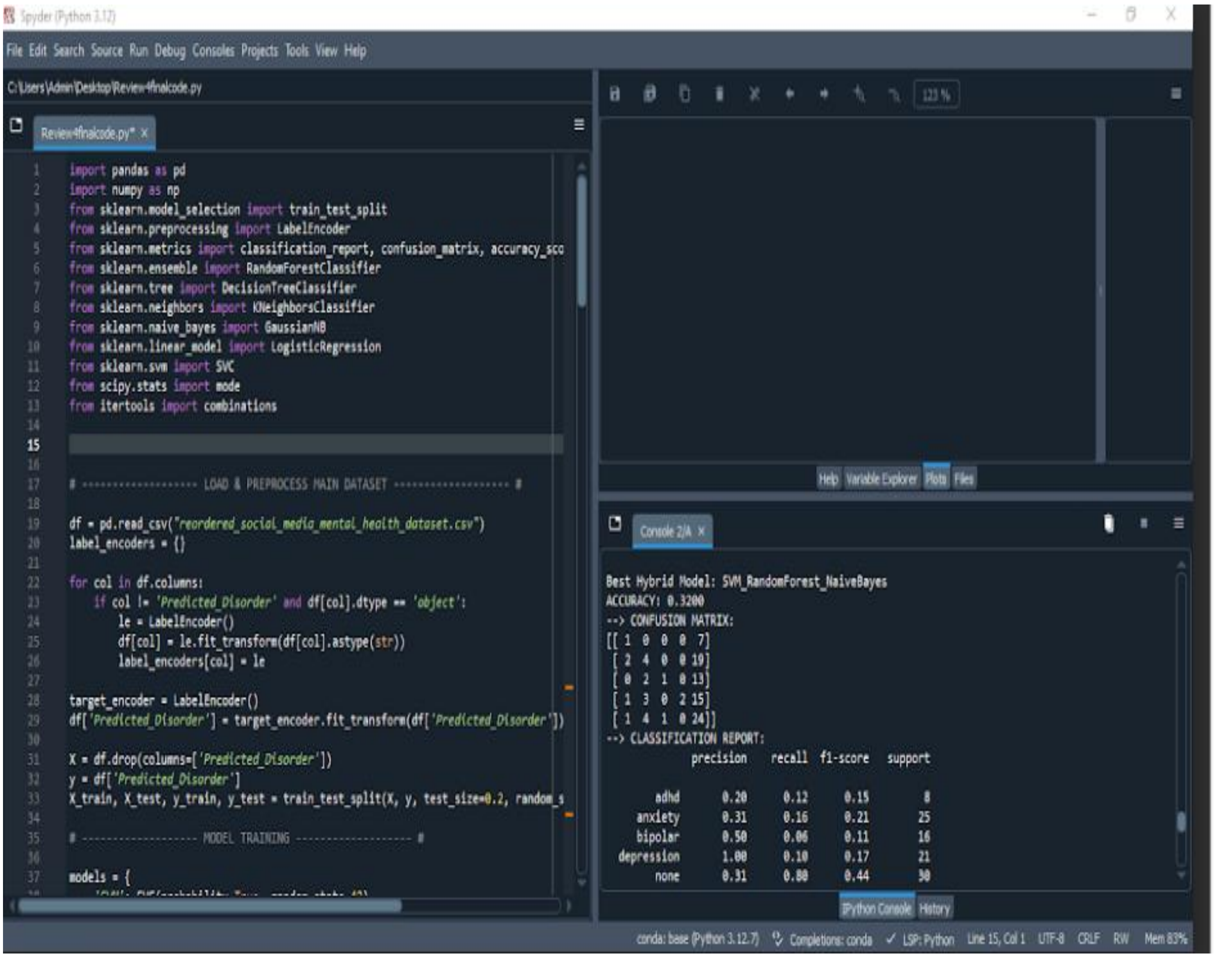
Table 7.2 Test case for Validating Model Training

Test case #2	Priority (h, l): High	
Test Objective	Verify that all machine learning models are trained correctly or not	
Test Description	Validating training of models and ensure evaluation metrics are produced	
Requirements Verified	CSV file must be provided and proper model training is processed	
Test Environment	Spyder (Python IDE)	
Action	Expected Result	Actual Result
Training of the models	Models should be trained and metrics and should be displayed	Models trained metrics generated
No Training of the models	An error should occur during Predictions message should be displayed	An error occurred during Prediction
Pass: **Yes**	Conditional pass: No	Fail: No

Table 7.3 Test case for Mental Health Prediction

Test case #3	Priority (h, l): High	
Test Objective	Detect both current and future mental health disorder based on user input	
Test Description	Display the disorders of the users based on the user input	
Requirements Verified	User input csv data file must be provided and disorder must be predicted	
Test Environment	Spyder (Python IDE)	
Action	Expected Result	Actual Result
Predict the current and future disorder of the user	Current and future disorder Should be displayed	Current and future disorder Should be displayed
In the absence of Disorder Of the user	None should be displayed	None is displayed
Pass: **Yes**	Conditional pass: No	Fail: No

7.3 DISCUSSION OF RESULTS

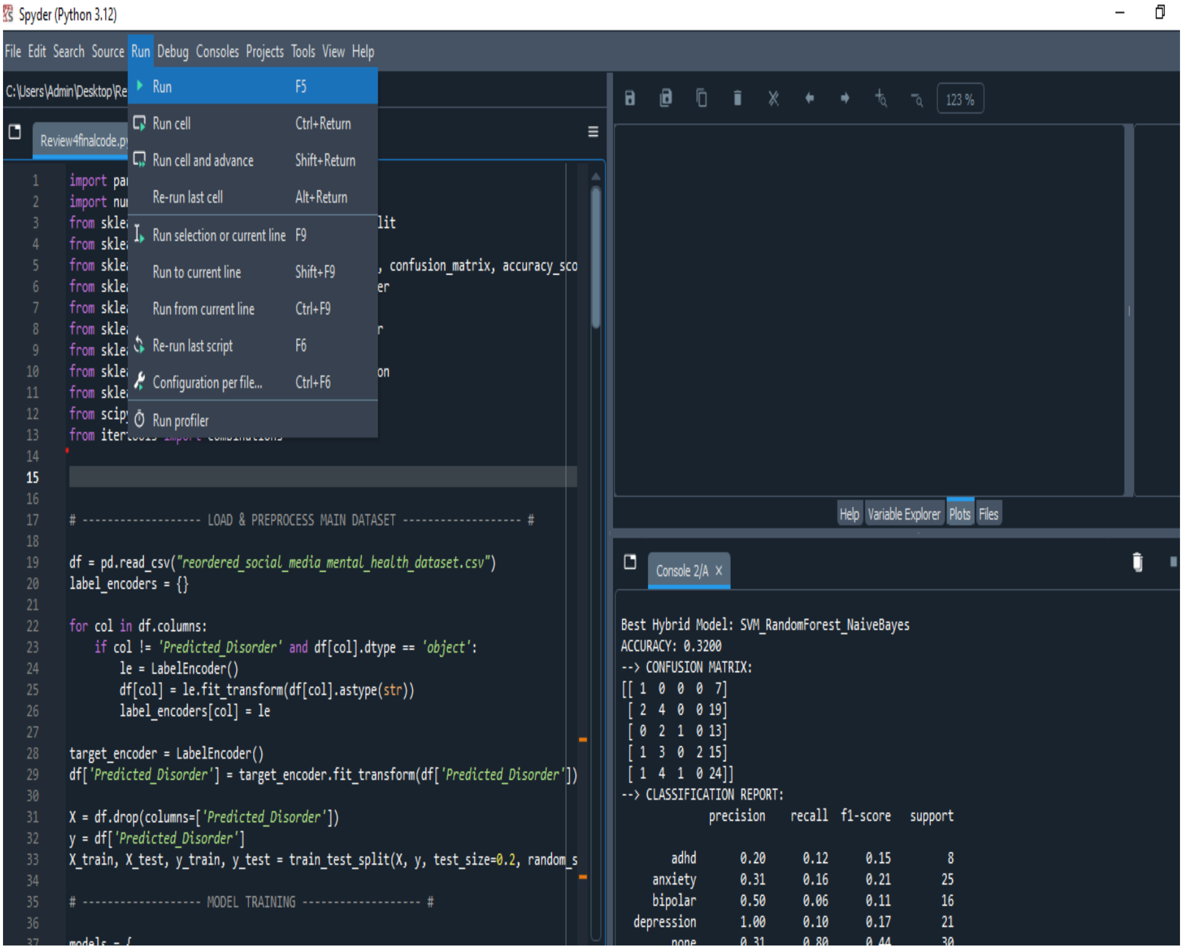

Spyder (Python 3.12)
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\Admin\Desktop\Review4finalcode.py
Review4finalcode.py* ×
123 %
Help Variable Explorer Plots Files
Console 2/A ×
IPython Console History
conda: base (Python 3.12.7) Completions: conda ✓ LSP: Python Line 15, Col 1 UTF-8 CRLF RW Mem 83%

```python
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.metrics import classification_report, confusion_matrix, accuracy_sco
from sklearn.ensemble import RandomForestClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.naive_bayes import GaussianNB
from sklearn.linear_model import LogisticRegression
from sklearn.svm import SVC
from scipy.stats import mode
from itertools import combinations



# ------------------- LOAD & PREPROCESS MAIN DATASET ------------------- #

df = pd.read_csv("reordered_social_media_mental_health_dataset.csv")
label_encoders = {}

for col in df.columns:
    if col != 'Predicted_Disorder' and df[col].dtype == 'object':
        le = LabelEncoder()
        df[col] = le.fit_transform(df[col].astype(str))
        label_encoders[col] = le

target_encoder = LabelEncoder()
df['Predicted_Disorder'] = target_encoder.fit_transform(df['Predicted_Disorder'])

X = df.drop(columns=['Predicted_Disorder'])
y = df['Predicted_Disorder']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_s

# ------------------- MODEL TRAINING ------------------- #

models = {
```

```
Best Hybrid Model: SVM_RandomForest_NaiveBayes
ACCURACY: 0.3200
--> CONFUSION MATRIX:
[[ 1  0  0  0  7]
 [ 2  4  0  0 19]
 [ 0  2  1  0 13]
 [ 1  3  0  2 15]
 [ 1  4  1  0 24]]
--> CLASSIFICATION REPORT:
              precision    recall  f1-score   support

        adhd       0.20      0.12      0.15         8
     anxiety       0.31      0.16      0.21        25
     bipolar       0.50      0.06      0.11        16
  depression       1.00      0.10      0.17        21
        none       0.31      0.80      0.44        30
```

Figure 7.1 Implementation and Evaluation of Machine Learning Model for Mental Health Disorder Detection and Prediction in Spyder

- The code loads and preprocesses a social media dataset, trains multiple ML models, and evaluates a hybrid model (SVM, Random Forest, Naive Bayes).
- The confusion matrix and classification report display the hybrid model’s performance in identifying disorders like ADHD, anxiety, bipolar, and depression.

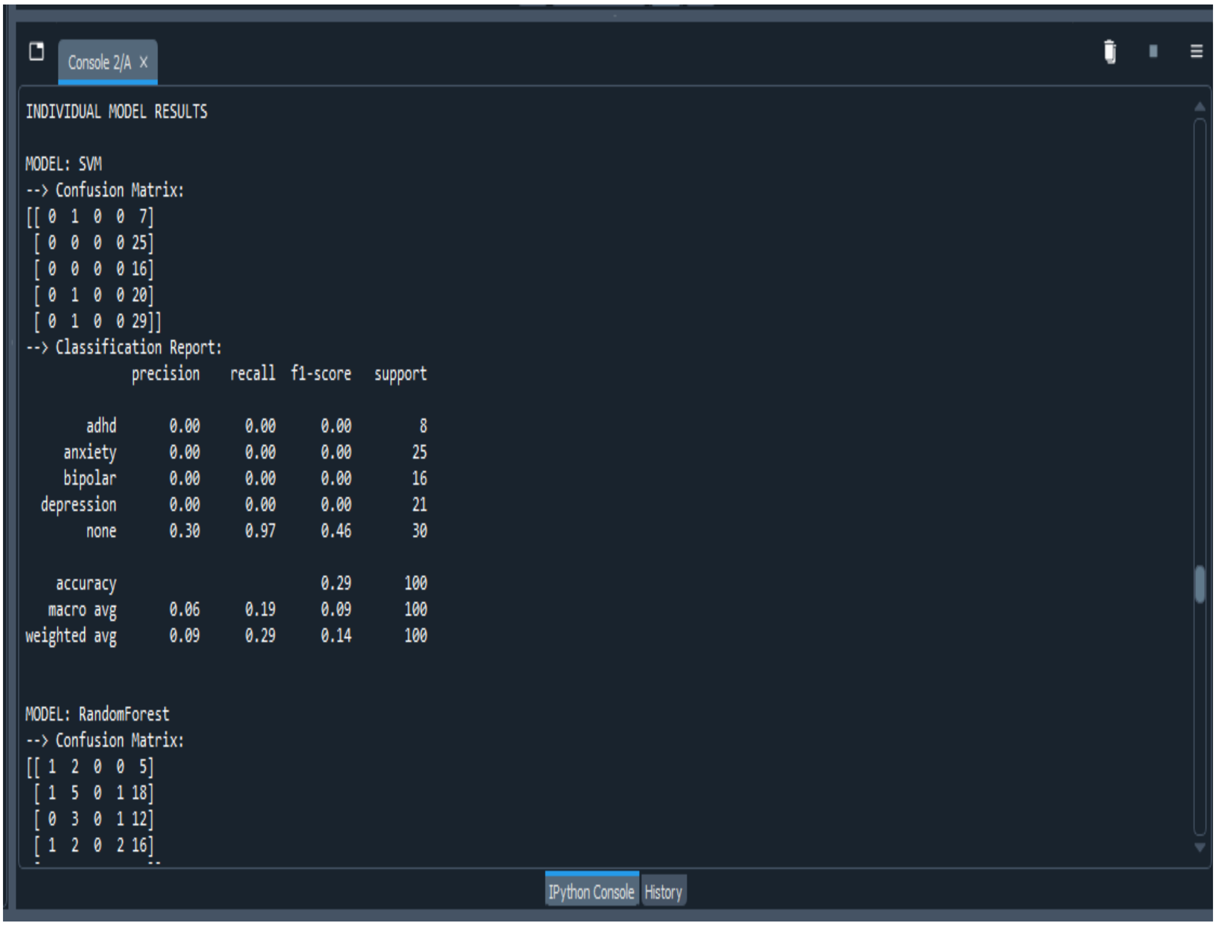

Spyder (Python 3.12)
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\Admin\Desktop\Re
Review4finalcode.py
Run F5
Run cell Ctrl+Return
Run cell and advance Shift+Return
Re-run last cell Alt+Return
Run selection or current line F9
Run to current line Shift+F9
Run from current line Ctrl+F9
Re-run last script F6
Configuration per file... Ctrl+F6
Run profiler
123 %
Help Variable Explorer Plots Files
Console 2/A

```
import pa
import nu
from skle                                    lit
from skle
from skle                                    , confusion_matrix, accuracy_sco
from skle                                    er
from skle
from skle                                    r
from skle
from skle                                    on
from skle
from scip
from iter


# ------------------ LOAD & PREPROCESS MAIN DATASET ------------------ #

df = pd.read_csv("reordered_social_media_mental_health_dataset.csv")
label_encoders = {}

for col in df.columns:
    if col != 'Predicted_Disorder' and df[col].dtype == 'object':
        le = LabelEncoder()
        df[col] = le.fit_transform(df[col].astype(str))
        label_encoders[col] = le

target_encoder = LabelEncoder()
df['Predicted_Disorder'] = target_encoder.fit_transform(df['Predicted_Disorder'])

X = df.drop(columns=['Predicted_Disorder'])
y = df['Predicted_Disorder']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_s

# ------------------ MODEL TRAINING ------------------ #

models = {
```

```
Best Hybrid Model: SVM_RandomForest_NaiveBayes
ACCURACY: 0.3200
--> CONFUSION MATRIX:
[[ 1  0  0  0  7]
 [ 2  4  0  0 19]
 [ 0  2  1  0 13]
 [ 1  3  0  2 15]
 [ 1  4  1  0 24]]
--> CLASSIFICATION REPORT:
              precision    recall  f1-score   support

        adhd       0.20      0.12      0.15         8
     anxiety       0.31      0.16      0.21        25
     bipolar       0.50      0.06      0.11        16
  depression       1.00      0.10      0.17        21
        none       0.31      0.80      0.44        30
```

Figure 7.2 Execution and Evaluation of Machine Learning Model in Spyder

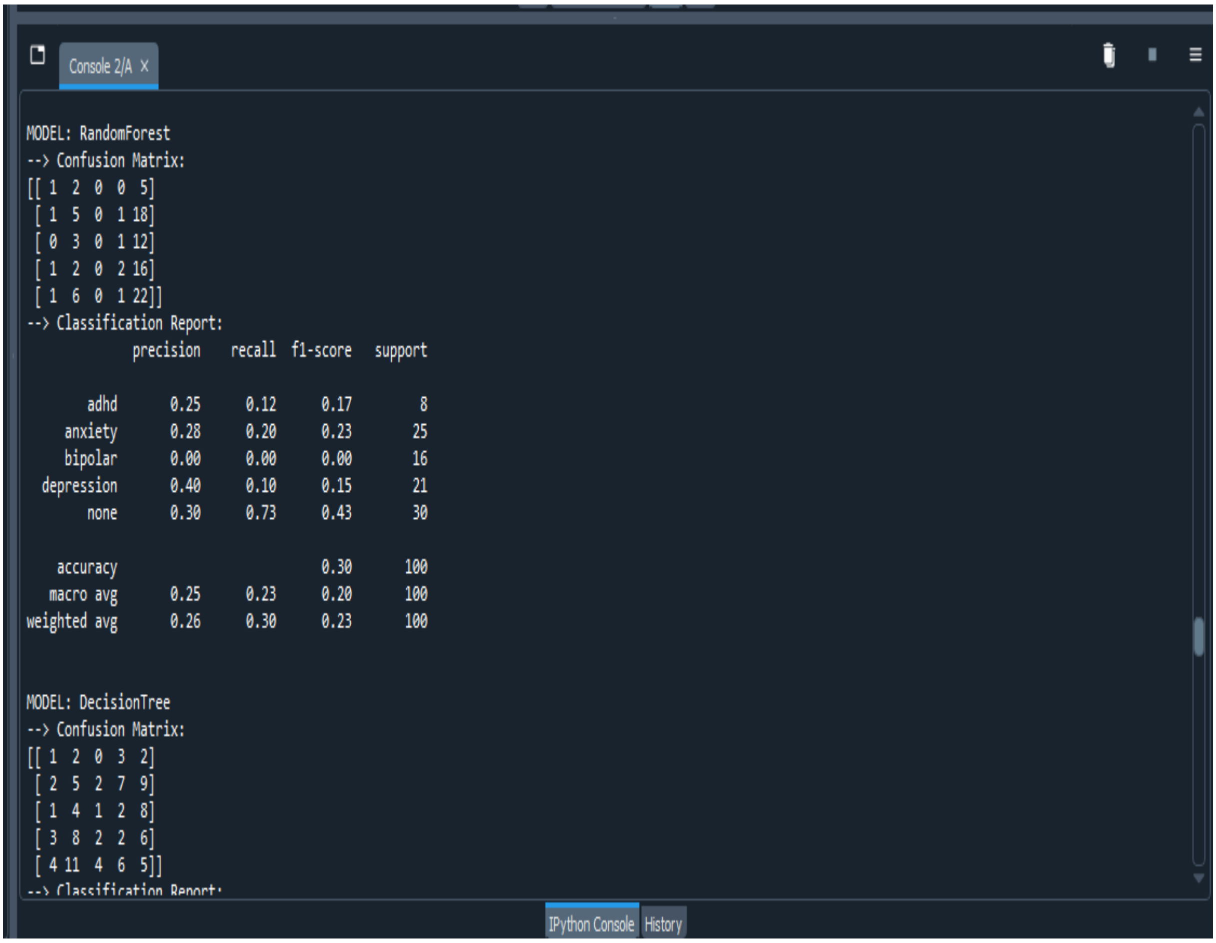
- When you run the program using **Run** in Spyder, the script starts executing the mental health disorder prediction process.
- After successful execution, the output is generated in the console, displaying the best hybrid model used, its accuracy, the confusion matrix, and a detailed classification report for each disorder.



```
INDIVIDUAL MODEL RESULTS

MODEL: SVM
--> Confusion Matrix:
[[ 0  1  0  0  7]
 [ 0  0  0  0 25]
 [ 0  0  0  0 16]
 [ 0  1  0  0 20]
 [ 0  1  0  0 29]]
--> Classification Report:
              precision    recall  f1-score   support

        adhd       0.00      0.00      0.00         8
     anxiety       0.00      0.00      0.00        25
     bipolar       0.00      0.00      0.00        16
  depression       0.00      0.00      0.00        21
        none       0.30      0.97      0.46        30

    accuracy                           0.29       100
   macro avg       0.06      0.19      0.09       100
weighted avg       0.09      0.29      0.14       100


MODEL: RandomForest
--> Confusion Matrix:
[[ 1  2  0  0  5]
 [ 1  5  0  1 18]
 [ 0  3  0  1 12]
 [ 1  2  0  2 16]
```

Figure 7.3 Performance Evaluation of Individual Machine Learning and Support Vector Machine Performance Metrics

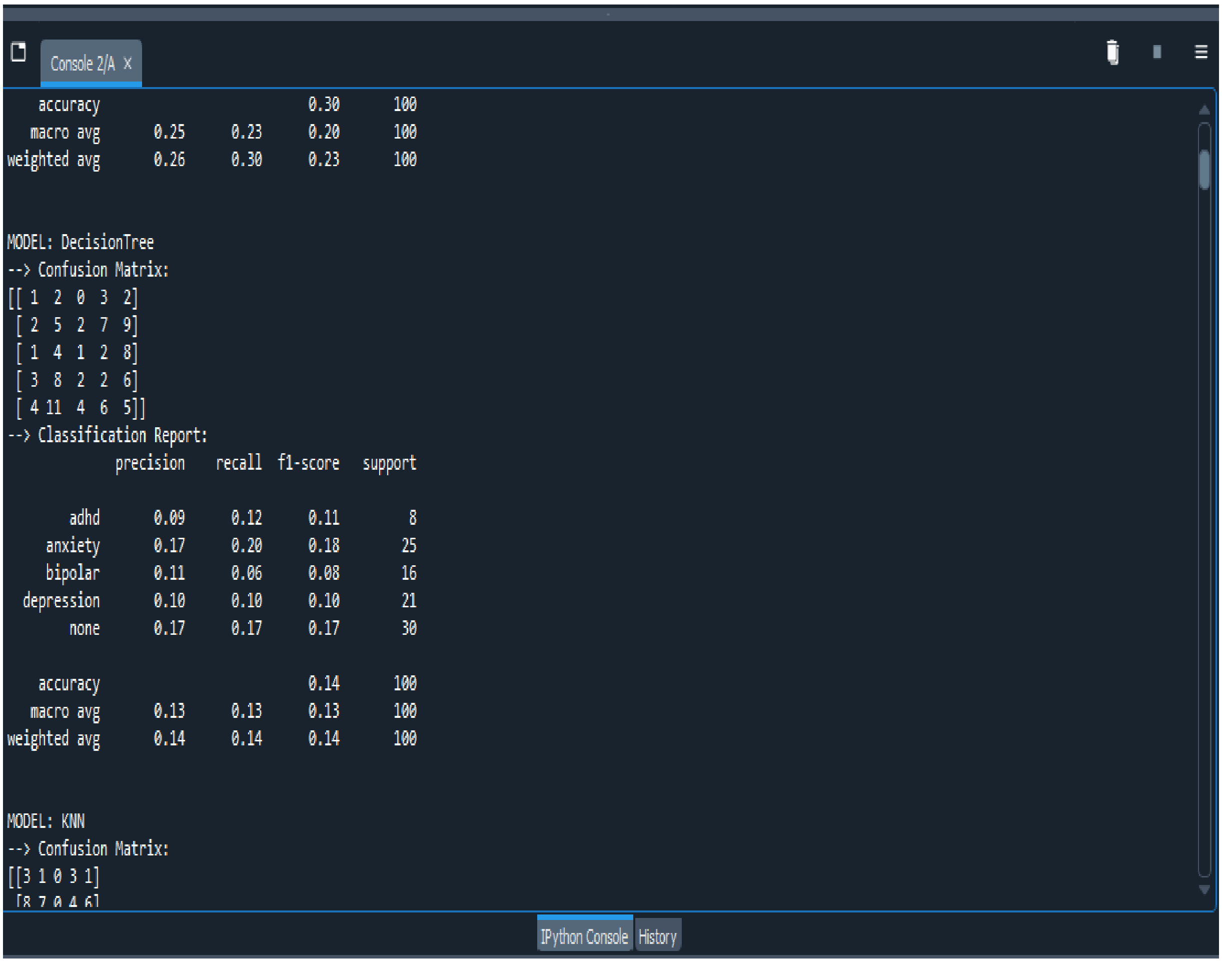
- Individual machine learning models are evaluated separately.
- The console displays each model’s confusion matrix and classification report, showing how accurately the model predicted each mental health disorder.
- Metrics such as precision, recall, F1-score, and accuracy help assess the performance of each model on the test dataset.
- The SVM model performed poorly overall, accurately identifying only the "none" class with a recall of 0.97, but failed completely on all mental disorder categories.



```
MODEL: RandomForest
--> Confusion Matrix:
[[ 1  2  0  0  5]
 [ 1  5  0  1 18]
 [ 0  3  0  1 12]
 [ 1  2  0  2 16]
 [ 1  6  0  1 22]]
--> Classification Report:
              precision    recall  f1-score   support

        adhd       0.25      0.12      0.17         8
     anxiety       0.28      0.20      0.23        25
     bipolar       0.00      0.00      0.00        16
  depression       0.40      0.10      0.15        21
        none       0.30      0.73      0.43        30

    accuracy                           0.30       100
   macro avg       0.25      0.23      0.20       100
weighted avg       0.26      0.30      0.23       100


MODEL: DecisionTree
--> Confusion Matrix:
[[ 1  2  0  3  2]
 [ 2  5  2  7  9]
 [ 1  4  1  2  8]
 [ 3  8  2  2  6]
 [ 4 11  4  6  5]]
--> Classification Report:
```

Figure 7.4 Random Forest Performance Metrics

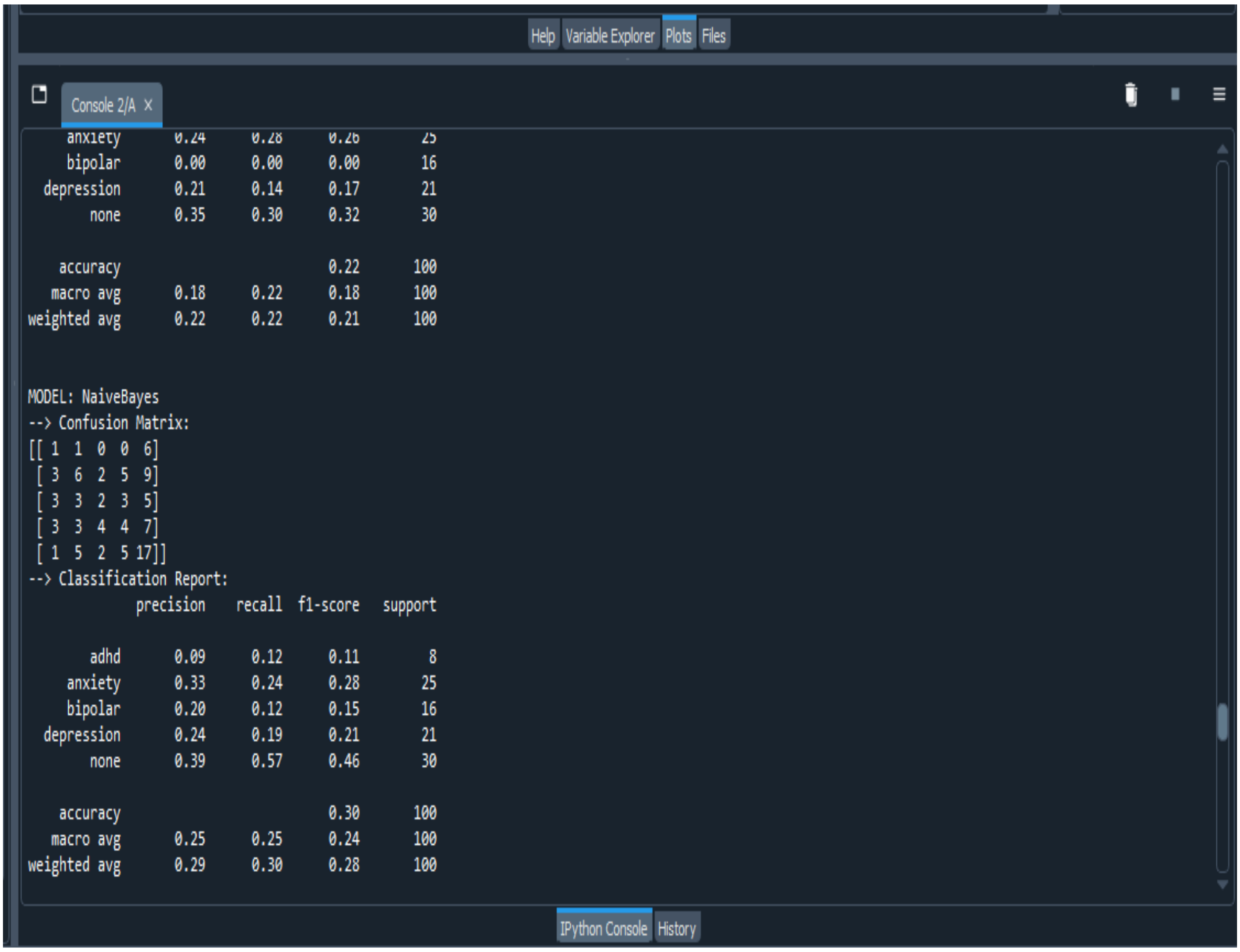
- The Random Forest model achieved an overall accuracy of 30%, with the highest recall of 73% for the "none" class.
- However, its performance on other disorders was relatively low, indicating challenges in correctly identifying mental health conditions like ADHD, anxiety, and depression.



```
    accuracy                           0.30       100
   macro avg       0.25      0.23      0.20       100
weighted avg       0.26      0.30      0.23       100


MODEL: DecisionTree
--> Confusion Matrix:
[[ 1  2  0  3  2]
 [ 2  5  2  7  9]
 [ 1  4  1  2  8]
 [ 3  8  2  2  6]
 [ 4 11  4  6  5]]
--> Classification Report:
              precision    recall  f1-score   support

        adhd       0.09      0.12      0.11         8
     anxiety       0.17      0.20      0.18        25
     bipolar       0.11      0.06      0.08        16
  depression       0.10      0.10      0.10        21
        none       0.17      0.17      0.17        30

    accuracy                           0.14       100
   macro avg       0.13      0.13      0.13       100
weighted avg       0.14      0.14      0.14       100


MODEL: KNN
--> Confusion Matrix:
[[3 1 0 3 1]
 [8 7 0 4 6]
```

Figure 7.5 Decision Tree Performance Metrics

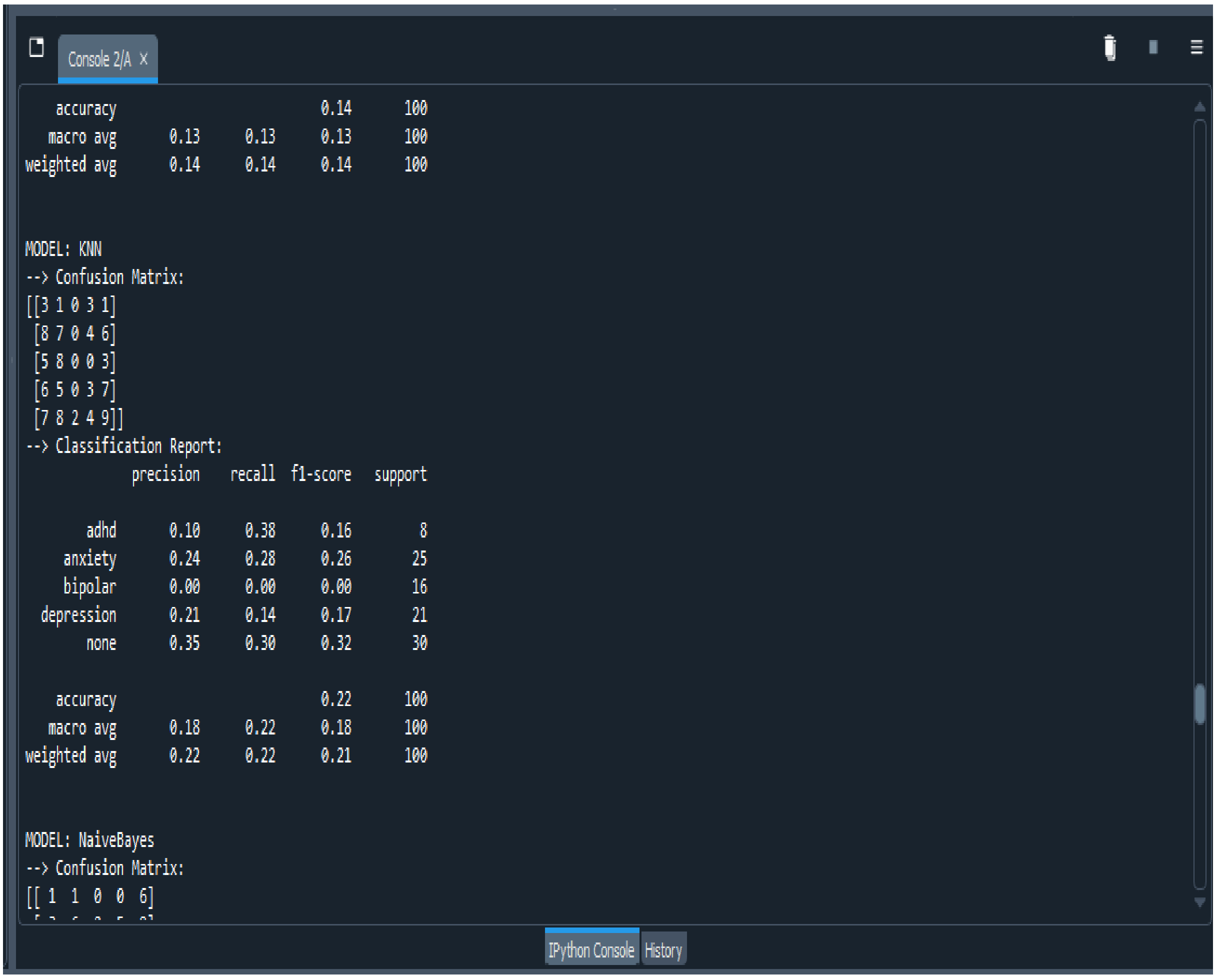
- The Decision Tree model achieved a low overall accuracy of 14%, with nearly uniform and low precision, recall, and F1-scores across all mental health classes.
- This indicates poor predictive performance and difficulty in distinguishing between different disorders.



```
     anxiety       0.24      0.28      0.26        25
     bipolar       0.00      0.00      0.00        16
  depression       0.21      0.14      0.17        21
        none       0.35      0.30      0.32        30

    accuracy                           0.22       100
   macro avg       0.18      0.22      0.18       100
weighted avg       0.22      0.22      0.21       100


MODEL: NaiveBayes
--> Confusion Matrix:
[[ 1  1  0  0  6]
 [ 3  6  2  5  9]
 [ 3  3  2  3  5]
 [ 3  3  4  4  7]
 [ 1  5  2  5 17]]
--> Classification Report:
              precision    recall  f1-score   support

        adhd       0.09      0.12      0.11         8
     anxiety       0.33      0.24      0.28        25
     bipolar       0.20      0.12      0.15        16
  depression       0.24      0.19      0.21        21
        none       0.39      0.57      0.46        30

    accuracy                           0.30       100
   macro avg       0.25      0.25      0.24       100
weighted avg       0.29      0.30      0.28       100
```

Figure 7.6 Naïve Bayes Performance Metrics

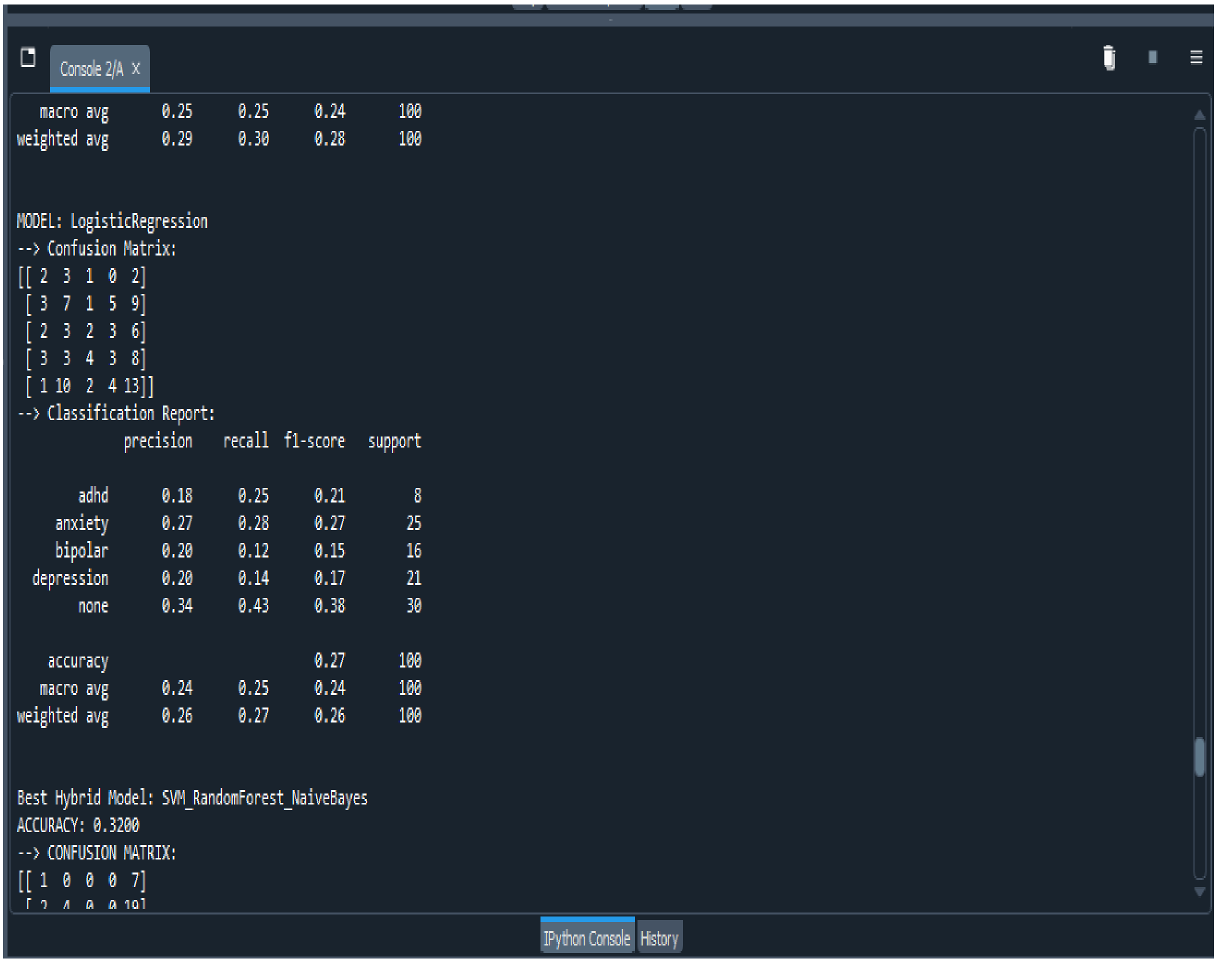
- Naive Bayes reached 30% accuracy and demonstrated more balanced performance across classes, particularly improving predictions for the “none” category.
- However, it still underperformed on ADHD and bipolar.



```
    accuracy                        0.14       100
   macro avg       0.13      0.13      0.13       100
weighted avg       0.14      0.14      0.14       100


MODEL: KNN
--> Confusion Matrix:
[[3 1 0 3 1]
 [8 7 0 4 6]
 [5 8 0 0 3]
 [6 5 0 3 7]
 [7 8 2 4 9]]
--> Classification Report:
              precision    recall  f1-score   support

        adhd       0.10      0.38      0.16         8
     anxiety       0.24      0.28      0.26        25
     bipolar       0.00      0.00      0.00        16
  depression       0.21      0.14      0.17        21
        none       0.35      0.30      0.32        30

    accuracy                           0.22       100
   macro avg       0.18      0.22      0.18       100
weighted avg       0.22      0.22      0.21       100


MODEL: NaiveBayes
--> Confusion Matrix:
[[ 1  1  0  0  6]
```

Figure 7.7 K-Nearest Neighbors Performance Metrics

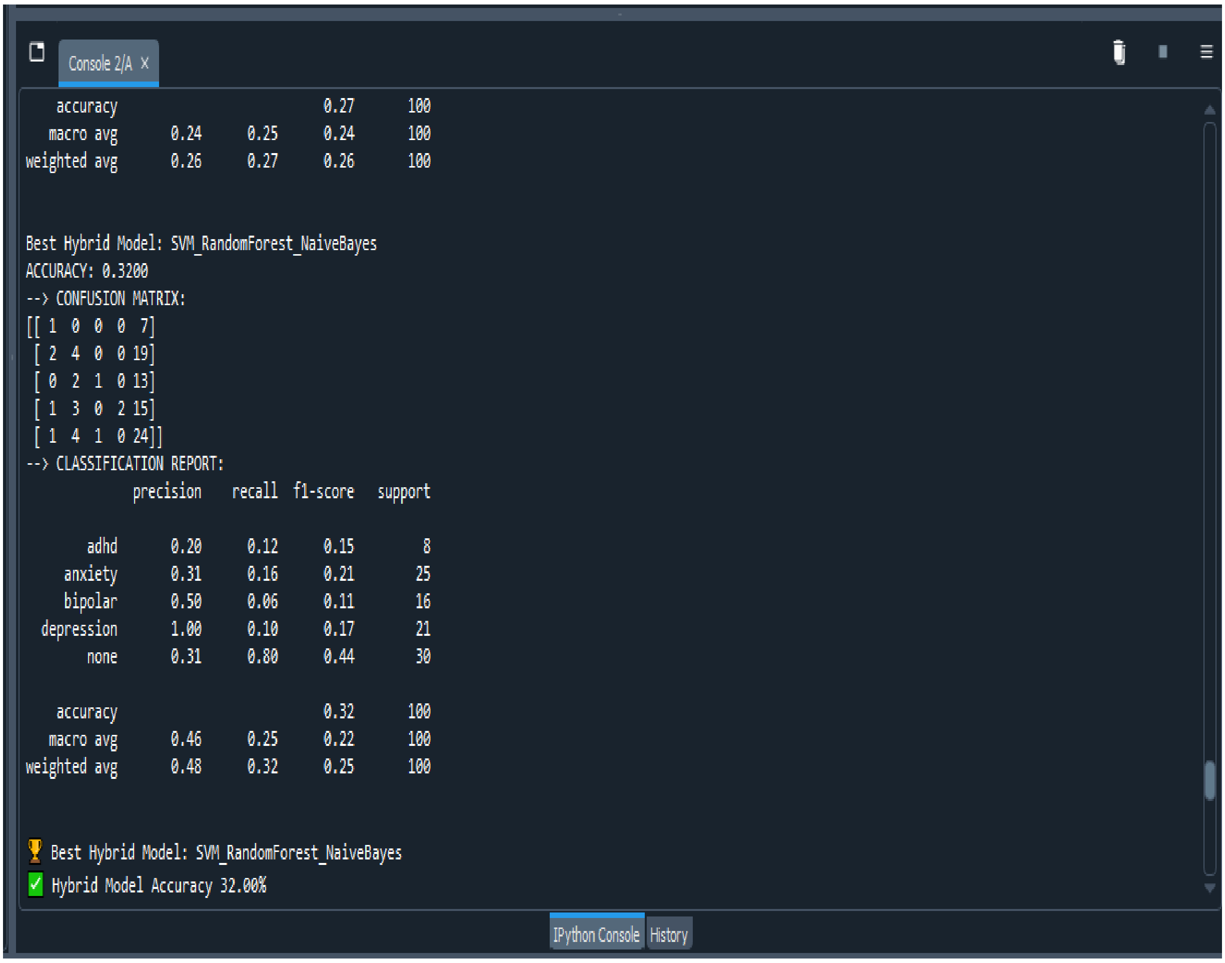
- K-Nearest Neighbors achieved 22% accuracy but struggled with class imbalances, especially in predicting bipolar disorder.
- It showed relatively better recall for ADHD but poor overall precision and F1 scores.



```
   macro avg       0.25      0.25      0.24       100
weighted avg       0.29      0.30      0.28       100


MODEL: LogisticRegression
--> Confusion Matrix:
[[ 2  3  1  0  2]
 [ 3  7  1  5  9]
 [ 2  3  2  3  6]
 [ 3  3  4  3  8]
 [ 1 10  2  4 13]]
--> Classification Report:
              precision    recall  f1-score   support

        adhd       0.18      0.25      0.21         8
     anxiety       0.27      0.28      0.27        25
     bipolar       0.20      0.12      0.15        16
  depression       0.20      0.14      0.17        21
        none       0.34      0.43      0.38        30

    accuracy                           0.27       100
   macro avg       0.24      0.25      0.24       100
weighted avg       0.26      0.27      0.26       100


Best Hybrid Model: SVM_RandomForest_NaiveBayes
ACCURACY: 0.3200
--> CONFUSION MATRIX:
[[ 1  0  0  0  7]
 [ 2  4  0  0 19]
```

Figure 7.8 Logistic Regression Performance Metrics

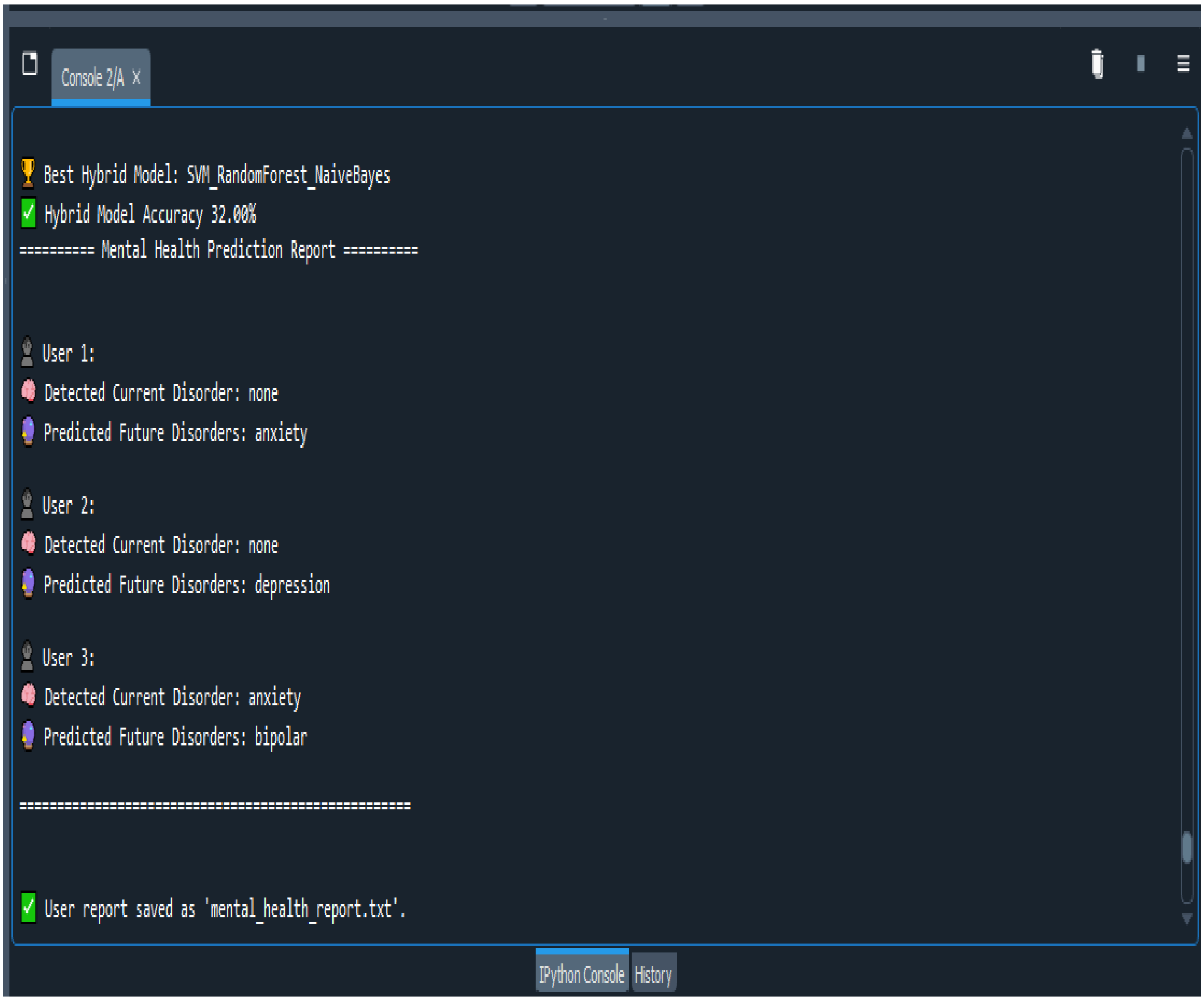
- Logistic Regression attained 27% accuracy with slightly better F1 scores for anxiety and none, indicating moderate success.
- It outperformed KNN in handling bipolar and depression.



```
    accuracy                           0.27       100
   macro avg       0.24      0.25      0.24       100
weighted avg       0.26      0.27      0.26       100


Best Hybrid Model: SVM_RandomForest_NaiveBayes
ACCURACY: 0.3200
--> CONFUSION MATRIX:
[[ 1  0  0  0  7]
 [ 2  4  0  0 19]
 [ 0  2  1  0 13]
 [ 1  3  0  2 15]
 [ 1  4  1  0 24]]
--> CLASSIFICATION REPORT:
              precision    recall  f1-score   support

        adhd       0.20      0.12      0.15         8
     anxiety       0.31      0.16      0.21        25
     bipolar       0.50      0.06      0.11        16
  depression       1.00      0.10      0.17        21
        none       0.31      0.80      0.44        30

    accuracy                           0.32       100
   macro avg       0.46      0.25      0.22       100
weighted avg       0.48      0.32      0.25       100


🏆 Best Hybrid Model: SVM_RandomForest_NaiveBayes
✅ Hybrid Model Accuracy 32.00%
```

Figure 7.9 Performance Evaluation of Hybrid Machine Learning Model

- The image displays the performance of a hybrid machine learning model (SVM + Random Forest + Naive Bayes) used for mental health disorder classification.
- It shows a confusion matrix and classification report with an overall accuracy of *32% and highlights that the model performs relatively better in identifying the "none" category.
- Metrics like precision, recall, and F1-score vary across disorders.



```
🏆 Best Hybrid Model: SVM_RandomForest_NaiveBayes
✅ Hybrid Model Accuracy 32.00%
========= Mental Health Prediction Report =========


👤 User 1:
🧠 Detected Current Disorder: none
🔮 Predicted Future Disorders: anxiety

👤 User 2:
🧠 Detected Current Disorder: none
🔮 Predicted Future Disorders: depression

👤 User 3:
🧠 Detected Current Disorder: anxiety
🔮 Predicted Future Disorders: bipolar

==================================================


✅ User report saved as 'mental_health_report.txt'.
```

Figure 7.10 Mental Health Disorder Detection and Prediction of the User Using a Hybrid Machine Learning Model

- This image shows the personalized mental health prediction report generated by the hybrid model (SVM + Random Forest + Naive Bayes).
- It displays current and predicted future mental health conditions for three users, such as anxiety, depression, and bipolar disorder.
- The system successfully saves the prediction results in a text file.

8. CONCLUSION AND FUTURE ENHANCEMENTS

8.1 CONCLUSION

In this study, hybrid machine learning model was introduced to detect and predict mental health disorders from social media information. Combining multiple classifiers for more accurate and robust predictions. Model performance was evaluated using evaluation metrics. Results showed that the hybrid model is built by employing Support Vector Machine, Random Forest, Naive bayes outperformed single classifiers, indicating the effectiveness of models. Social media is employed in early mental health prediction and detection. The hybrid approach benefits from each and every individual classifier, supplementing their weak points. Support Vector Machine contributed with its ability to handle high dimensional data, while Random Forest improved stability and accuracy. Naive Bayes, due to its computational efficiency, contributed to the model's speed and performance. The blend delivered enhanced performance across various mental health categories. Confusion matrices also showed how the hybrid model can reduce false negatives and false positives. These results underscore the promise of combining machine learning with behavioral analytics to support proactive mental health care. Future research would do well to investigate adding deep learning methods and diverse data sets to improve the predictive capabilities.

8.2 FUTURE ENHANCEMENTS

To further enhance the detective and predictive power of the current hybrid machine learning model, future work can integrate deep learning techniques to capture contextual and sequential patterns in social media text. Additionally, data like images, videos, and user interaction patterns could offer richer behavioral insights. Expanding the dataset across multiple platforms will also improve generalizability. Moreover, implementing real-time monitoring with automated alerts could aid in timely mental health interventions. These advancements can make the system more adaptive, scalable, and effective in early mental health disorder detection and prediction.

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