**CHAPTER II**

**AIM OF OBJECTIVE**

# **Aim**

The primary aim of this study is to develop a machine learning-based predictive model for identifying students at risk of depression, with a specific focus on Indian students. By leveraging various machine learning techniques, this research seeks to analyze key psychological, academic, social, and behavioral factors contributing to student depression. The study aims to enhance the accuracy of depression prediction models and demonstrate the role of artificial intelligence in mental health analytics. Additionally, it seeks to provide data-driven insights that can help educational institutions implement proactive and effective mental health support systems.

# **Objectives**

## **Data Collection & Preprocessing:**

* + Gather student mental health data from surveys, academic records, and online sources, ensuring ethical data collection.
  + Clean and preprocess the dataset by handling missing values, normalizing numerical features, and encoding categorical variables.
  + Conduct exploratory data analysis (EDA) to understand feature distributions and identify potential correlations.

## **Feature Selection & Engineering:**

* + Identify the most influential factors contributing to student depression, such as academic pressure, social isolation, financial stress, and lifestyle habits.
  + Apply statistical and machine learning-based feature selection techniques (e.g., correlation analysis, recursive feature elimination) to improve model efficiency.
  + Engineer new features, if necessary, to enhance predictive power.

## **Machine Learning Model Development:**

* + Implement various machine learning algorithms, including Support Vector Machine (SVM), Logistic Regression, Random Forest, and K-Nearest Neighbors (KNN).
  + Train and fine-tune these models using hyperparameter optimization techniques.
  + Compare the performance of different models to determine the most suitable approach for depression prediction.

## **Performance Evaluation & Validation:**

* + Assess model performance using metrics such as accuracy, precision, recall, F1-score, and ROC-AUC.
  + Perform cross-validation to ensure the reliability and generalizability of the predictive model.
  + Identify potential biases in the model and address them through data balancing techniques, if necessary.

## **Insights & Recommendations for Mental Health Interventions:**

* + Analyze the predictions and feature importance to derive meaningful insights into student mental health patterns.
  + Provide data-driven recommendations for educational institutions to design targeted mental health programs.
  + Discuss the ethical implications and limitations of using machine learning in mental health prediction.
  + Suggest future research directions to further improve the accuracy and applicability of AI-based mental health assessments.