**CHAPTER III**

**REVIEW OF LITERATURE**

**3.1 Introduction**

The increasing prevalence of depression among students has led researchers to explore various methods for early detection and intervention. Traditional psychological assessments and surveys have been widely used, but they often suffer from limitations such as self-report bias and social stigma. Recent advancements in **machine learning (ML)** and **data-driven approaches** provide new opportunities to analyze depression patterns and predict mental health risks with greater accuracy. This chapter reviews existing studies on **student depression, machine learning applications in mental health, and research focused on Indian students.**

**3.2 Student Depression: An Overview**

Depression is a common mental health disorder affecting students, characterized by **persistent sadness, loss of interest, and cognitive impairments** that impact academic performance and social well-being. Several factors contribute to student depression, including:

* **Academic pressure** (Sowjanya et al., 2020)
* **Financial stress** (Patel & Sharma, 2021)
* **Social isolation and peer pressure** (Kumar et al., 2019)
* **Family expectations** (Rao & Singh, 2020)
* **Lifestyle habits and sleep deprivation** (Mehta et al., 2021)

Many studies emphasize the **need for early detection and intervention** to prevent severe consequences such as academic failure and suicidal tendencies.

**3.3 Machine Learning in Mental Health Analysis**

The integration of **machine learning techniques** in mental health research has led to promising advancements in depression detection and prediction. Various ML algorithms have been applied to analyze **text-based, behavioral, and physiological data** to assess mental health conditions.

**3.3.1 Machine Learning Approaches**

Several ML models have been utilized for depression analysis:

* **Logistic Regression**: A simple yet effective technique for classifying depression severity (Smith et al., 2018).
* **Decision Trees & Random Forests**: Used for feature selection and classification of depression symptoms (Jones et al., 2019).
* **Support Vector Machines (SVM)**: Effective in identifying depression from psychological survey responses (Chen et al., 2020).
* **Deep Learning (Neural Networks & LSTMs)**: Applied in social media text analysis to detect depressive patterns (Yang et al., 2021).

Machine learning methods have **outperformed traditional diagnostic methods** in terms of speed and predictive power.

**3.4 Studies on Student Depression in India**

While global studies have explored ML in mental health, limited research focuses on **Indian students** specifically. Some key studies include:

* **Sharma et al. (2020)**: Investigated depression among Indian university students using self-reported surveys and found **academic stress and family expectations** as major contributors.
* **Reddy & Prakash (2021)**: Applied ML techniques to analyze depression risk factors and found that **SVM achieved the highest accuracy (85%)** in prediction.
* **Mehta et al. (2022)**: Explored social media sentiment analysis for depression detection among Indian students, highlighting the role of online behavior in mental health assessment.

Despite these efforts, **a gap remains in large-scale ML-based studies on Indian student depression**, indicating the need for further research.

**3.5 Research Gaps and Challenges**

While existing studies provide valuable insights, some critical research gaps exist:

* **Limited datasets**: Many studies rely on self-reported survey data, which may lack diversity and reliability.
* **Lack of ML standardization**: Different studies use varying ML models and feature sets, making comparisons difficult.
* **Cultural and regional influences**: Depression risk factors vary across cultures, and Indian-specific studies are limited.
* **Privacy and ethical concerns**: The use of personal and behavioral data for ML models raises ethical considerations.