**Introduction:**

This chapter provides an overview of how previous researches have looked into EEG signal and how Machine Learning techniques were utilized in order to detect depression among individuals. Brief about those works are highlighted and the analysis processes is described. What were the challenges and how accurate results were found will be discussed in this chapter.

**Challenges:**

Even though EEG is one of the effective ways to predict and analyze depression and related mental health conditions, EEG signal is non-stationary, complex and hard to generalize because of the variation among people’s age, variation etc. Also very few researches were done on depression, most of the analysis were made only upon other mental health issues [2]. Large number of layers makes the system more complex additionally small amount of data is not sufficient for analyzing depressive status. The larger the data amount is the better the prediction becomes[8].

**Related Works:**

EEG-based mental health condition analysis was a major discussion in the previous researches we've gone through so far. A research that focuses on higher depression detection model accuracy rate based on several machine learning techniques include 76% accuracy with random forest model when the rate is of 81% for XGboost model. This includes data preprocessing, feature details, and comprehensive model training for getting better analytical accuracy in detecting depressive patients[2]. Another research compares various EEG signal analysis techniques, compares their accuracy and methodology used. Also describes the major reason behind the wrong diagnosis of depression as the absence of any accepted biomarkers for Major Depressive Disorder or any other psychiatric disorder[4]. They also achieved great accuracy outcomes using ML technique models. Another research tried to establish novel classifiers for discriminating patients with major psychiatric disorders. They applied random forest for efficient accuracy achievement. They have obtained higher accuracy in the specific categories than in the large grouping categories of mental health conditions. The research also highlights the fact of EEG-based ML to be promising approach for the classification of psychiatric disorders[6].

**Conclusion:**

According to our study on the previous papers that provides us the idea of EEG-based depression analysis using different Machine Learning techniques have given powerful accuracies for different datasets and different categorical models. Though very few of the analysis were made using EEG data and ML or DL models for depression detection. Most of the studies were done focusing upon other different mental health issues. A high/better amount of data is essential to ensure better accuracy also important to make the model more thoughtful and predictive. However, more research, data training, model evaluation is necessary in order to achieve better outcome in depression detection and prediction.