

# **Sleep Disorder Prediction Using Machine Learning**

## **IEEE BASE PAPER TITLE:**

### **Applying Machine Learning Algorithms for the Classification of Sleep Disorders**

## **IEEE BASE PAPER ABSTRACT:**

Sleep disorder classification is crucial in improving human quality of life. Sleep disorders and apnoea can have a significant influence on human health. Sleep-stage classification by experts in the field is an arduous task and is prone to human error. The development of accurate machine learning algorithms (MLAs) for sleep disorder classification requires analysing, monitoring and diagnosing sleep disorders. This paper compares deep learning algorithms and conventional MLAs to classify sleep disorders. This study proposes an optimised method for the Classification of Sleep Disorders and uses the Sleep Health and Lifestyle Dataset publicly available online to evaluate the proposed model. The optimisations were conducted using a genetic algorithm to tune the parameters of different machine learning algorithms. An evaluation and comparison of the proposed algorithm against state-of-the-art machine learning algorithms to classify sleep disorders. The dataset includes 400 rows and 13 columns with various features representing sleep and daily activities. The k-nearest neighbours, support vector machine, decision tree, random forest and artificial neural network (ANN) deep learning algorithms were assessed. The experimental results reveal significant performance differences between the evaluated algorithms. The proposed algorithms obtained a



classification accuracy of 83.19%, 92.04%, 88.50%, 91.15% and 92.92%, respectively. The ANN achieved the highest classification accuracy of 92.92%, and its precision, recall and F1-score values on the testing data were 92.01%, 93.80% and 91.93%, respectively. The ANN algorithm that achieved high accuracy than other tested algorithms.

## **OUR PROPOSED ABSTRACT:**

The "Sleep Disorder Prediction Using Machine Learning" project aims to enhance the accuracy and efficiency of diagnosing sleep disorders by leveraging advanced machine learning techniques. Developed using Python, with a frontend powered by HTML, CSS, and JavaScript, and utilizing Flask as the web framework, this project integrates modern data analysis with user-friendly web interfaces to provide comprehensive diagnostic insights.

Two sophisticated Machine Learning models, the Gradient Boosting Classifier and Quadratic Discriminant Analysis, were employed to classify sleep disorders into three distinct categories: Healthy, Insomnia, and Sleep Apnea. The project utilizes the extensive Sleep Health and Lifestyle Dataset, comprising 15,000 records with 13 diverse features.

The Gradient Boosting Classifier, an ensemble learning method that builds a predictive model through the sequential addition of decision trees, is one of the two primary models implemented in this project. By optimizing the loss function iteratively, the model significantly reduces prediction errors, achieving a training accuracy of 96% and a test accuracy of 95%. This high performance underscores its effectiveness in categorizing sleep disorders accurately.

The Quadratic Discriminant Analysis (QDA) model, also employed in this project, operates on the assumption that each class follows a Gaussian distribution with



distinct covariance matrices. This probabilistic classifier is particularly useful for its ability to create more flexible decision boundaries compared to Linear Discriminant Analysis. The QDA model achieved both a training and test accuracy of 92%, making it a reliable alternative for sleep disorder prediction.

This project not only demonstrates the potential of machine learning in healthcare but also provides a practical tool for improving sleep health and overall well-being by implementing Gradient Boosting Classifier and Quadratic Discriminant Analysis models separately. Both models show high accuracy in predicting sleep disorders, offering valuable tools for early diagnosis and treatment. The comprehensive dataset further enhances the models' capability to provide accurate predictions, making this project a significant contribution to the field of sleep health diagnostics.

## **SYSTEM REQUIREMENTS:**

### **HARDWARE REQUIREMENTS:**

- System : Pentium i3 Processor.
- Hard Disk : 500 GB.
- Monitor : 15'' LED.
- Input Devices : Keyboard, Mouse.
- Ram : 8 GB.

### **SOFTWARE REQUIREMENTS:**

- Operating System : Windows 10 / 11.
- Coding Language : Python 3.12.0.
- Web Framework : Flask.



➤ Frontend

: HTML, CSS, JavaScript.

## **REFERENCE:**

Talal Sarheed Alshammari, “Applying Machine Learning Algorithms for the Classification of Sleep Disorders”, IEEE Access, Volume: 12, 2024.