

Chapter 7

Classifying Sleep Health and Lifestyle Patterns: A Machine Learning Approach Using IoT and Cloud

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ABSTRACT

Sleep is essential in today's hectic world, particularly for those who are under a lot of stress. With the advent of emerging technologies IoT, Cloud computing, ML etc. it becomes convenient for an individual to keep the track of their sleep patterns and can be helpful in the treatment of severe disorders. By leveraging cloud computing, this data can be processed, stored, and used for advanced analytics, enabling insights into an individual's sleep patterns and their impact on overall health. Individuals can use this real time data and healthcare professionals to understand, monitor, and improve sleep quality and overall well-being. This chapter provides an insight for the classification of sleep patterns for an individual. We have also presented a case study based on sleep apnea and insomnia disorders. These two common sleep disorders can have serious consequences for a person's overall health and sleep quality. This study will be beneficial for persons with sleep disorders from early detection and personalized intervention if sleep health patterns are accurately classified.

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1. INTRODUCTION

Sleep is an essential physiological process that is essential for maintaining physical and mental well-being. Our bodies go through necessary processes that aid in our recovery and rejuvenation while we sleep. Our brains actively consolidate memories while we sleep, which facilitates learning and information retention. It also aids in stress management and emotion regulation. Lack of restful sleep can affect our ability to think clearly, make poor decisions, and raise the chance of mishaps (Dickinson et. al, 2023). Furthermore, getting too little sleep can be detrimental to our physical health. It impairs our immune system, increasing our vulnerability to different diseases. Sleep disorders, such as sleep apnea and insomnia, can have a negative impact on a person's health and quality of life (Şenol, 2024). Sleep apnea and insomnia are two common sleep disorders that can have serious consequences for a person's overall health and sleep quality. Breathing pauses or shallow breathing during sleep are symptoms of sleep apnea. These breathing pauses may occur many times during the night, disrupting sleep patterns and providing insufficient oxygen to the body. Insomnia is a sleep disorder defined by difficulty falling, remaining asleep, or experiencing non-restorative sleep despite adequate sleep opportunities. It can be acute or chronic, and it can have a significant impact on day-to-day functioning as well as overall quality of life. Sleep apnea and insomnia both necessitate proper diagnosis and management for optimal sleep health (Sarber, 2023). The detection and classification of sleep disorders at an early stage are critical for effective treatment and intervention.

Machine learning algorithm advancements have opened up new avenues for analyzing complex datasets and solving classification problems across a wide range of domains (Mehriş, et al. 2013) Researchers have begun to investigate the use of machine learning techniques to classify sleep health patterns and disorders as more sleep health and lifestyle datasets become available. Through the use of a comprehensive Sleep Health and Lifestyle dataset, this study seeks to advance the field of sleep health. The dataset contains a wealth of data on lifestyle factors, sleep patterns, and the existence or absence of sleep disorders. The use of a family of Bayes classification algorithms—Bayes classification, Naive Bayes classification, Naive Bayes Updateable, Naive Bayes Multinomial Text, and J48 algorithm—is our main focus (Jain, 2023)

Based on a logical framework for drawing probabilistic conclusions, the Bayes theorem forms the basis of Bayes classification algorithms. Since naive Bayes classification relies on the independence of predictor variables, it is effective on large datasets and has low computational overhead. A text classification tool that considers the multinomial distribution of word occurrences is called Naive Bayes Multinomial Text (Devadath, et al, 2024). Because it can be updated incrementally

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