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**Assessment Cover Page**

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I further confirm that this work has not previously been submitted for assessment by myself or someone else in CCT College Dublin or any other higher education institution.

**Influence of Lifestyle Factors on Sleep Disorders and Quality**

Contents

[Introduction 3](#_Toc165238715)

[Problem Statement 3](#_Toc165238716)

[Goals 3](#_Toc165238717)

[Objectives 4](#_Toc165238718)

[Pre-processing 4](#_Toc165238719)

[Conclusion 5](#_Toc165238720)

[References 6](#_Toc165238721)

# Introduction

Sleep is a crucial component of overall health, influencing not only physical well-being but also mental and emotional health. Adequate sleep has been linked to improved attention, behaviour, learning, memory, emotional regulation, quality of life, and mental and physical health. In contrast, insufficient sleep can lead to a wide range of health consequences including obesity, diabetes, cardiovascular disease, and depression.

Recent studies have shown that various lifestyle factors such as stress levels, physical activity, diet, and occupational pressures significantly affect sleep quality and duration (Knutson et al.). However, the complex interplay between these factors and sleep health is not fully understood. By leveraging data-driven approaches, this CA aims to uncover deeper insights into how different lifestyle choices impact sleep. This understanding can inform targeted interventions to improve sleep health, thereby enhancing overall well-being.

In order to understand the sleep health that factor that might impact, we will exploring the application of machine learning techniques to the Sleep Health and Lifestyle Dataset. The dataset contains information on various aspects of individual lifestyles and their sleep patterns, including age, gender, occupation, sleep duration, and health-related metrics.

The goal is to uncover insights into sleep patterns and disorders, which can inform health interventions and lifestyle adjustments.

# Problem Statement

Sleep health is a critical component of overall well-being, influencing physical health, mental health, and quality of life. Sleep deficiency poses significant challenges across various aspects of life, including work, school, driving, and social interactions. It can impact cognitive functions such as learning, focusing, and emotional recognition, leading to frustration and difficulty in social situations.

Furthermore, sleep deficiency is associated with numerous chronic health conditions like heart disease, high blood pressure, diabetes, and obesity, as well as mental health issues like depression. It also increases the risk of accidents and injuries, including car crashes and falls, across all age groups. Tragic accidents, such as nuclear reactor meltdowns and plane crashes, have been linked to sleep deficiency (National Heart, Lung, and Blood Institute).

This research aims to examine how the sleep quality is affected by the new pace of life and other factors that may cause people to sleep less.

## Goals

1. **Identify Key Predictors**: Determine which factors most significantly impact sleep quality and duration.
2. **Develop Predictive Models:** Utilize machine learning models to predict sleep quality based on observable lifestyle factors.
3. **Provide Recommendations:** Based on the model findings, offer actionable recommendations to improve sleep health.

# Objectives

The primary objective is to use prediction and classification algorithms to:

* Impact of Age on sleep Duration and quality
* Identify the influence of Stress levels and Sleep quality,

These goals are pursued to enhance the understanding and management of sleep health.

# Pre-processing

* The dataset includes 374 entries across 13 attributes such as age, sleep duration, physical activity, and more.
* During this study we used RandomForestClassifier this model only accept numeric values therefore we had to apply one-hot encoding to all categorical columns.
* We employed GridSearchCV to explore a range of hyperparameters.
* The effectiveness of the model was evaluated using accuracy metrics
* The model provided valuable insights into the relationships between features like BMI, blood pressure, and heart rate and the target variable – Stress Level.
* During preprocessing we found some limitations, such as sample size, biased data (as there was no kid or teen), or the exclusion of potentially relevant features ( such as weight)

Results

The data suggests that the typical participant is a middle-aged adult with a moderate variability in age distribution. Most participants sleep around 7 to 8 hours, which is in line with general sleep recommendations for adults. The quality of sleep, while generally rated as good, shows some variation, indicating that while many participants are satisfied with their sleep, there are a few who find their sleep quality lacking.

Additionally primary findings from the RandomForestClassifier, were:

1. **Model Accuracy:** 97.33%,
2. **Feature Importance:** Heart rate had the highest importance score.
3. **Average age** of participants is approximately 42.18 years. (. Age from 27 to 59 years.)
4. **Sleep Duration**: 7.13 hours per night.
5. **Quality of Sleep**: The average sleep quality rating is about 7.31/10

**Percentiles (25%, 50%, 75%):**

25% (First Quartile): At least 25% of the observations fall below these values:

* Age: 35.25 years or younger.
* Sleep Duration: 6.4 hours or less.
* Quality of Sleep: 6 or lower.

50% (Median): Half of the observations fall below these values (also the median):

* Age: 43 years.
* Sleep Duration: 7.2 hours.
* Quality of Sleep: 7.

75% (Third Quartile): At least 75% of observations fall below these values:

* Age: 50 years or younger.
* Sleep Duration: 7.8 hours or less.
* Quality of Sleep: 8 or lower.

Conclusion

The data suggests that the typical participant is a middle-aged adult with a moderate variability in age distribution, teenagers and kids were excluded from this study. Most participants sleep around 7 to 8 hours. The quality of sleep, while generally rated as good, shows some variation, indicating that while many participants are satisfied with their sleep, there are a few who find their sleep quality lacking this could be caused to many other factors such as health or Stress.

In conclusion, this CA successfully leveraged RandomForestClassifier, optimized via GridSearchCV, to investigate the influence of factor such as age, quality of sleep and stress levels have on the sleep health. The model achieved an accuracy of 97.33%, highlighting its efficacy in this predictive context. Additionally, other factors like blood pressure emerged as a critical predictor of stress, therefore individuals with high blood pressure are more likely to have high level of stress impacting their sleep quality.

# References

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