Sleep Health in Relation to Lifestyle

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Our Motivation

Why does this matter?

Why This Matters

Everybody Sleeps!

It would be beneficial to see the impacts of lifestyle habits of sleep health

Maximize Time

Since sleeping takes up roughly ⅓ of our lives, let's maximize this time.

Health

The results of this study could help someone trying to get more rest and become a healthier individual

The Dataset

The Sleep Health and Lifestyle Dataset

Data Cleaning ...

Duplicates

Dropping duplicate rows

BMI Categories

Simplifying BMI Categories

Missing Values

Filling missing values

Drop Columns

Dropping irrelevant columns

Original Size

374 x 13

Cleaned Size

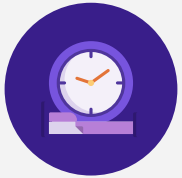
132 x 12

	Person ID	Gender	Age	Occupation	Sleep Duration	Quality of Sleep	Physical Activity Level	Stress Level	BMI Category	Blood Pressure	Heart Rate	Daily Steps	Sleep Disorder
0	1	Male	27	Software Engineer	6.1	6	42	6	Overweight	126/83	77	4200	NaN
1	2	Male	28	Doctor	6.2	6	60	8	Normal	125/80	75	10000	NaN
2	3	Male	28	Doctor	6.2	6	60	8	Normal	125/80	75	10000	NaN
3	4	Male	28	Sales Representative	5.9	4	30	8	Obese	140/90	85	3000	Sleep Apnea
4	5	Male	28	Sales Representative	5.9	4	30	8	Obese	140/90	85	3000	Sleep Apnea
...	...	...	...	...	...	...	...	...	...	...	...	...	...
369	370	Female	59	Nurse	8.1	9	75	3	Overweight	140/95	68	7000	Sleep Apnea
370	371	Female	59	Nurse	8.0	9	75	3	Overweight	140/95	68	7000	Sleep Apnea
371	372	Female	59	Nurse	8.1	9	75	3	Overweight	140/95	68	7000	Sleep Apnea
372	373	Female	59	Nurse	8.1	9	75	3	Overweight	140/95	68	7000	Sleep Apnea
373	374	Female	59	Nurse	8.1	9	75	3	Overweight	140/95	68	7000	Sleep Apnea

	Gender	Age	Occupation	Sleep Duration	Quality of Sleep	Physical Activity Level	Stress Level	BMI Category	Blood Pressure	Heart Rate	Daily Steps	Sleep Disorder
0	Male	27	Software Engineer	6.1	6	42	6	Overweight	126/83	77	4200	No Disorder
1	Male	28	Doctor	6.2	6	60	8	Normal	125/80	75	10000	No Disorder
3	Male	28	Salesperson	5.9	4	30	8	Obese	140/90	85	3000	Sleep Apnea
5	Male	28	Software Engineer	5.9	4	30	8	Obese	140/90	85	3000	Insomnia
6	Male	29	Teacher	6.3	6	40	7	Obese	140/90	82	3500	Insomnia
...	...	...	...	...	...	...	...	...	...	...	...	...
358	Female	59	Nurse	8.0	9	75	3	Overweight	140/95	68	7000	No Disorder
359	Female	59	Nurse	8.1	9	75	3	Overweight	140/95	68	7000	No Disorder
360	Female	59	Nurse	8.2	9	75	3	Overweight	140/95	68	7000	Sleep Apnea
364	Female	59	Nurse	8.0	9	75	3	Overweight	140/95	68	7000	Sleep Apnea
366	Female	59	Nurse	8.1	9	75	3	Overweight	140/95	68	7000	Sleep Apnea

Research Questions

What variables affect sleep health?



Question #1

What factors are most significant to sleep health?

Question #2

Is there any correlation between factors and different sleeping disorders?

Research Methods

Visualization and Regression Techniques

Our Model and Analysis

We compared the **decision tree** and **k-nearest neighbor** models to determine which model would have the best predictive accuracy. The variables **sleep duration, stress level, gender, and BMI** were used as the predictors for the models.

Visualizations

- Box Plots
- Bar Charts
- Pie Charts

Decision Tree

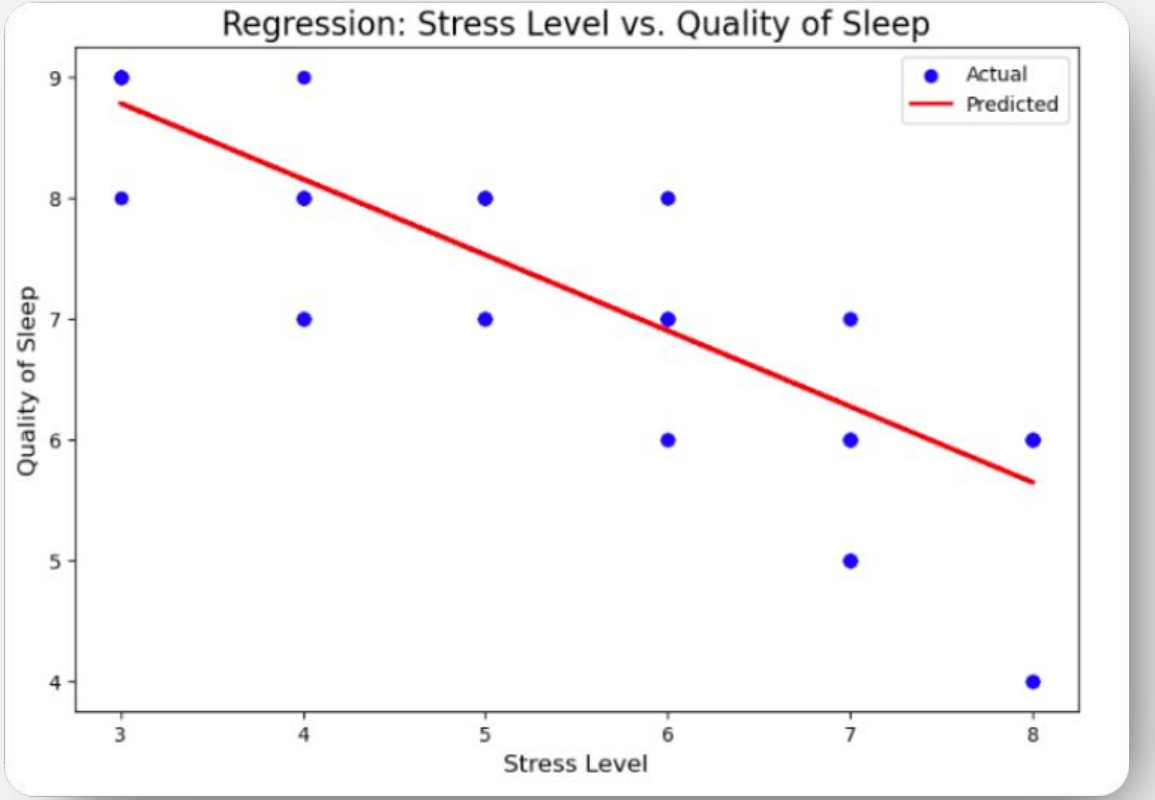
Hyperparameters:

- max_leaf_nodes=6
- max_depth=6
- random_state=0

KNN

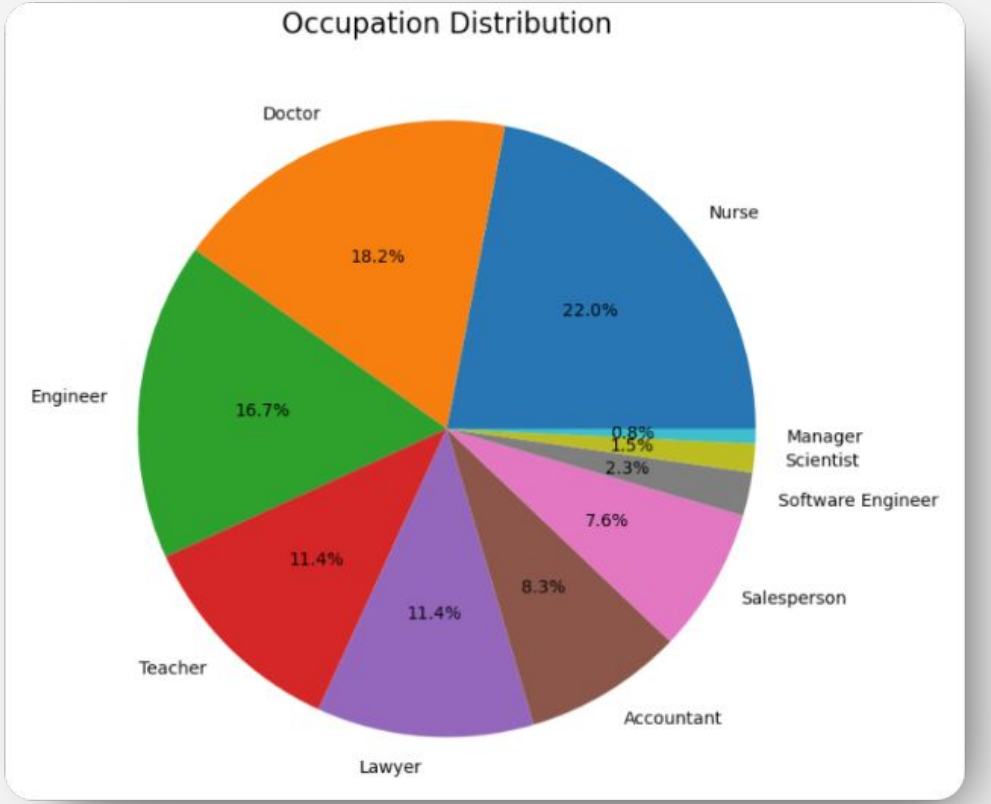
Hyperparameters:
KNN = 1

Results

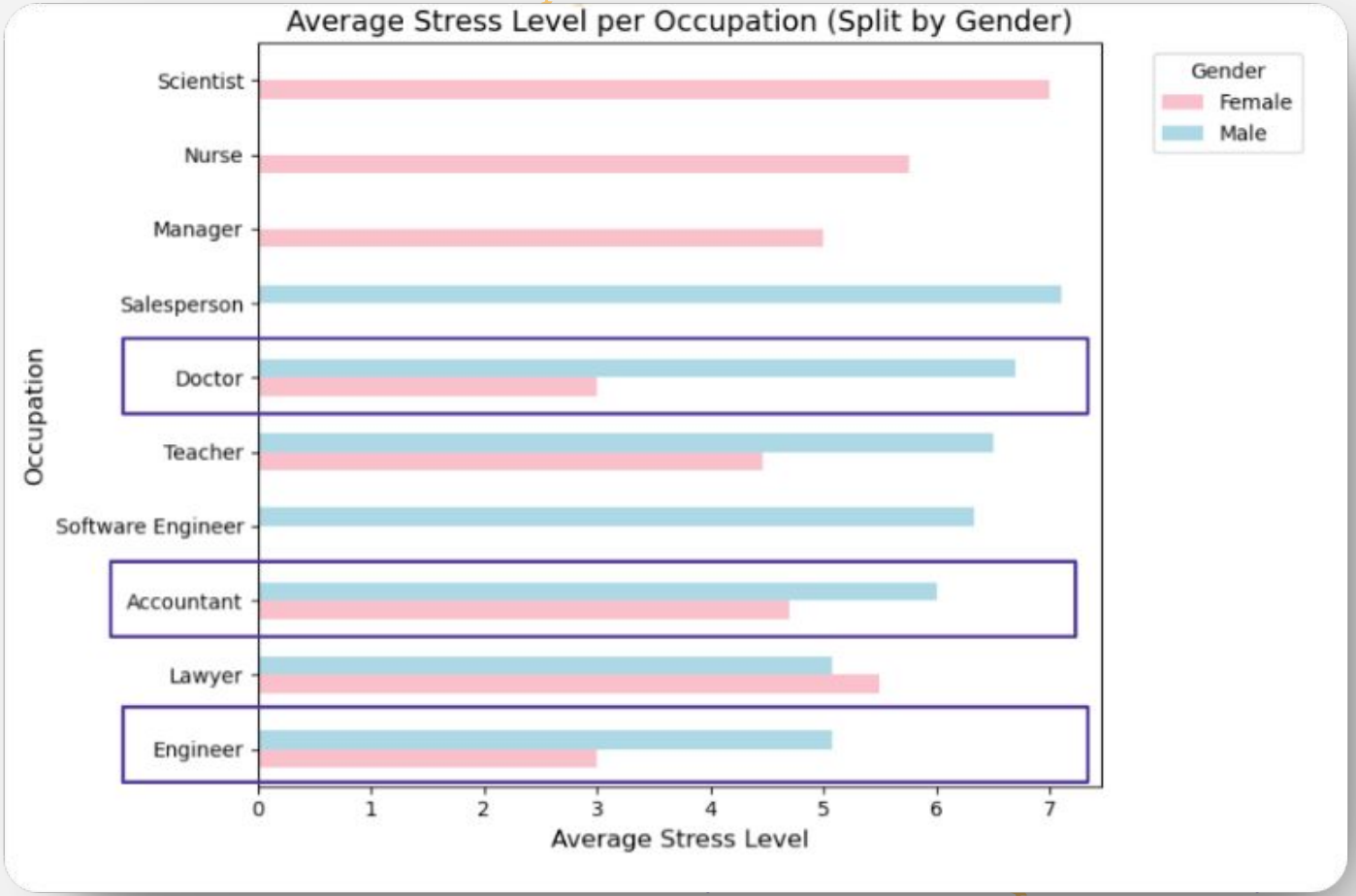


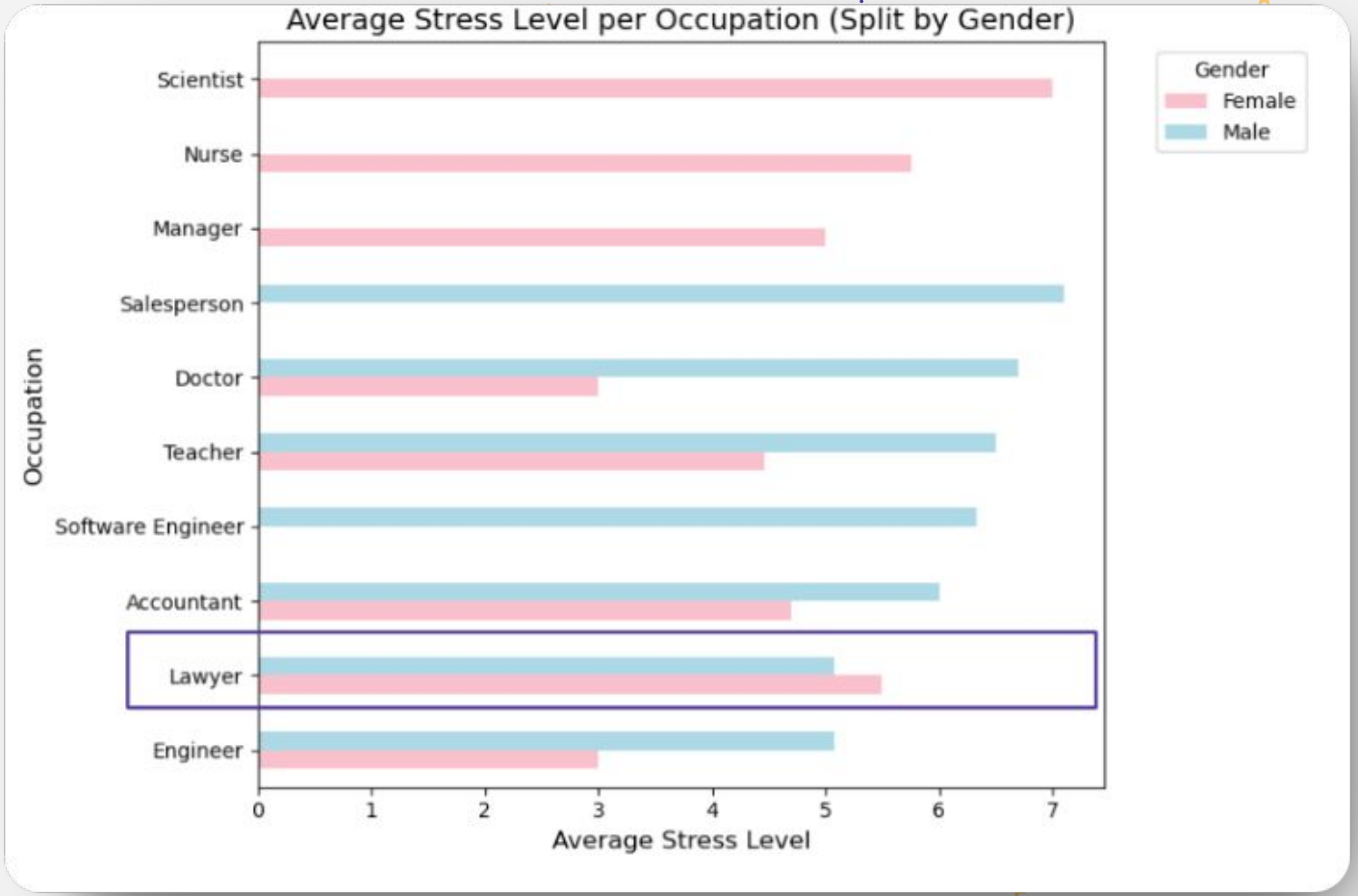
- **Negative linear relationship** between stress levels and quality of sleep. As we are more stressed, we tend to have poorer sleep

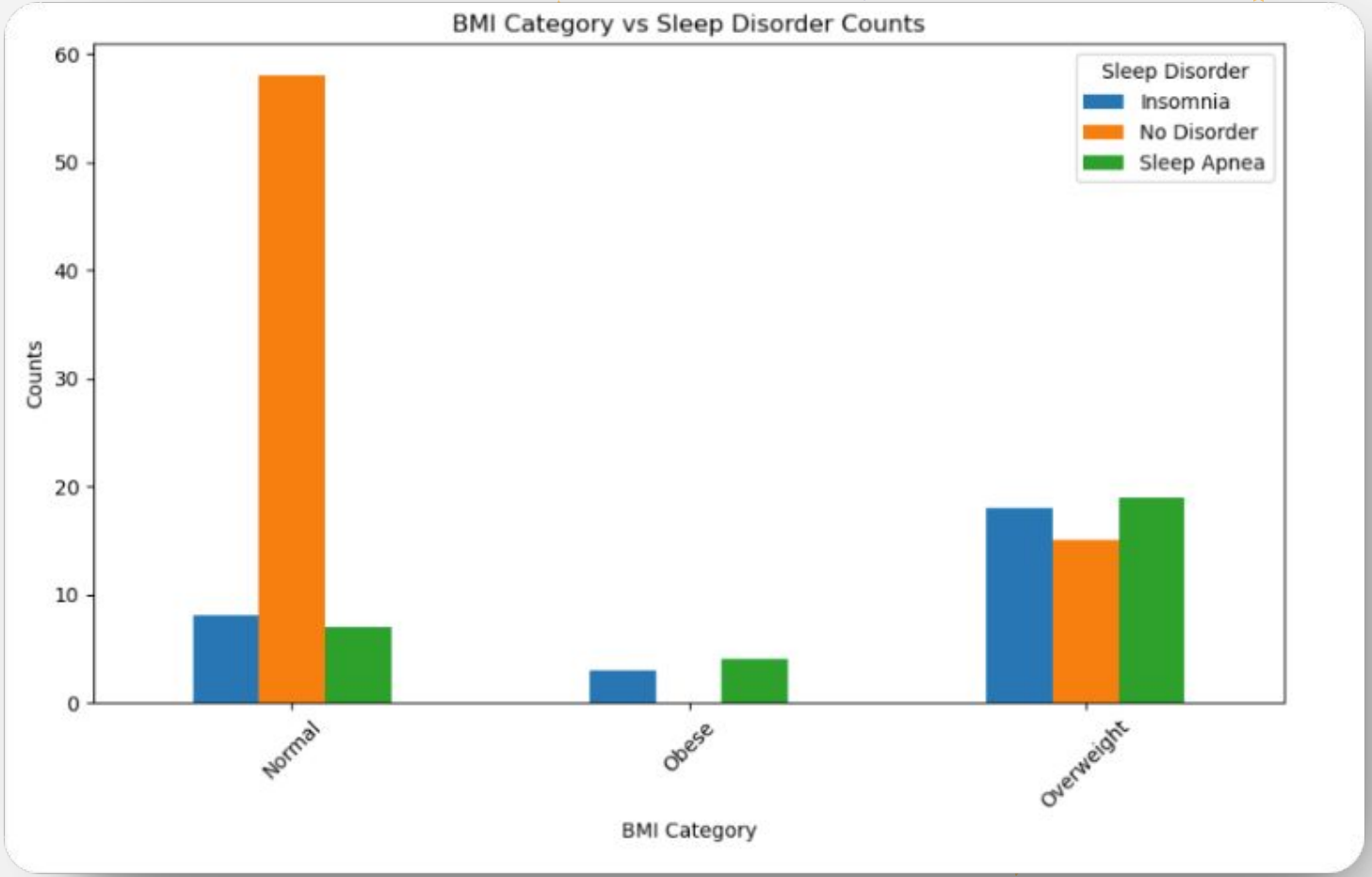

Stress Levels by Gender
Stress Level
8
7
6
5
4
3
Male
Female
Gender


Occupation Distribution
Doctor
18.2%
Nurse
22.0%
Engineer
16.7%
0.8%
Manager
1.5%
Scientist
2.3%
Software Engineer
7.6%
Salesperson
8.3%
Accountant
11.4%
Lawyer
11.4%
Teacher


Average Stress Level per Occupation (Split by Gender)
Occupation
Scientist
Nurse
Manager
Salesperson
Doctor
Teacher
Software Engineer
Accountant
Lawyer
Engineer
0
1
2
3
4
5
6
7
Average Stress Level
Gender
Female
Male


Average Stress Level per Occupation (Split by Gender)
Scientist
Nurse
Manager
Salesperson
Doctor
Teacher
Software Engineer
Accountant
Lawyer
Engineer
Occupation
0
1
2
3
4
5
6
7
Average Stress Level
Gender
Female
Male


Average Stress Level per Occupation (Split by Gender)
Gender
Female
Male
Occupation
Scientist
Nurse
Manager
Salesperson
Doctor
Teacher
Software Engineer
Accountant
Lawyer
Engineer
0
1
2
3
4
5
6
7
Average Stress Level


BMI Category vs Sleep Disorder Counts
Sleep Disorder
Insomnia
No Disorder
Sleep Apnea
Counts
0
10
20
30
40
50
60
Normal
Obese
Overweight
BMI Category

Metrics

Metric	Decision Tree	KNN
Accuracy	0.83	0.91
Weighted Avg Precision	0.84	0.91
Weighted Avg Recall	0.83	0.91
Weighted Avg F1-Score	0.82	0.90

Since the KNN metric exhibits **higher values** for all **accuracy** measures than the decision tree model, we determined that the **KNN model** would predict more accurately based on our data.

Feature Importance

Feature	Decision Tree	KNN
Sleep Duration	0.791246	0.402532
Stress Level	0.085437	0.369620
is_Male	0.067310	0.260759
BMI	0.056007	0.331646

The variable **sleep duration** displays the greatest importance to the decision tree model, but all variables share **equally strong importance** in the KNN model. This means that depending on the model variables exhibit differences in their importance to create accurate predictions.

Conclusion

What we Found: Significant Factors

Sleep Duration

Strongest feature in our regression

Occupation

Different occupations contribute different average stress levels, impacting sleep health

Stress Levels

Negatively correlated to sleep health

BMI

Higher BMI indicates higher likelihood of having a sleep disorder

Sleep Health!

Future Implementations

Larger Dataset

- 132 rows after cleaning
- underweight individuals included
- Data that is not synthetic

Alzheimer's & Dementia

Investigating whether there is a correlation in sleep.

References

References

dataset

- https://www.kaggle.com/datasets/informateur234/sleep-health-and-lifestyle-dataset

Coding references

- https://www.kaggle.com/code/ibrahimelgmmal/sleep-health-and-lifestyle/notebook

Questions?