



**Smt. Indira Gandhi College of Engineering
Computer Engineering Department**

Ghansoli – Navi Mumbai
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Student Name: Khyati Garude **Roll No.:** 13 **Class:** BE **Sem:**VIII

Course Name: Applied Data Science Lab

Course Code: CSL8023

Experiment No. 04

Experiment Title: Implementing Data Imputation On The Selected Dataset

Date of Performance	Date of Submission	Marks (10)					Sign / Remark
		A	B	C	D	E	
1/2/24	8/2/24	2	3	2	2	1	
		2	3	2	2	1	
Total Marks					(10)		
						10	20/3/24

A: Prerequisite Knowledge

B: Implementation

C: Oral

D: Content

E: Punctuality & Discipline



<u>DATE</u>	<u>EXPERIMENT-4</u>	<u>SIGN</u>
8/2/24	Implementation of Data Imputation on the selected dataset.	A 20/3/24

AIM - Implementing Data Imputation on the Selected dataset.

THEORY -

Data imputation is a technique used to fill in missing values in a dataset. There are various methods for imputing missing data, but the choice of method depends on the nature of the data and the problem at hand.

Missing data is a common problem in real-world datasets and can arise due to various reasons such as sensor malfunctions, human error, or data entry problems. Imputation techniques aim to fill in these missing values to allow for further analysis or modelling.



Here are some common data imputation techniques:

(i) Next or Previous value Imputation:

This method fills in missing values by using the value of the next or previous observation in the dataset. It's a simple technique suitable for time-series or sequential data where there's a natural ordering.

(ii) K Nearest Neighbours (KNN) Imputation:

KNN imputation estimates missing values by averaging or interpolating the values of the K-nearest neighbors in the feature space. It's useful when there's no clear linear relationship between variables and can handle both numerical and categorical data.

(iii) Missing value Prediction:

This technique involves using predictive models, such as regression or machine learning algorithms, to predict missing values based on the observed data. The model is trained on the non-missing data and then used to impute missing values.

(iv) Maximum or Minimum value imputation:

Missing values are replaced with either the maximum or minimum observed value of that variable. This method assumes that missing values are either at the extreme ends of the distribution or the most common



Value in the dataset.

(v) Most frequent value imputation:

Missing values are replaced with the most frequent value (mode) of the variable. This method is suitable for categorical or ordinal data and is often used when dealing with missing categorical variables.

(vi) Average or linear interpolation:

In linear interpolation, missing values are estimated by fitting a linear function between neighbouring observed values. Average interpolation replaces missing values with the average of neighbouring values. Both methods are useful for filling in missing values in time-series data.

(vii) (Rounded) Mean or Moving Average or Median Value Imputation:

Missing values are replaced with the mean, median, or rounded mean of the variable.

Moving average replaces missing values with the average of neighbouring values with a defined window. These methods are simple and commonly used for imputation when dealing with numerical data.



(viii) Fixed value imputation:

All missing values are replaced with a predefined fixed value. This method is straightforward but may introduce bias if the fixed value is not representative of the data.

ALGORITHM:

(i) Data Loading:

Load the sleep efficiency dataset from a csv file.

(ii) Initial Check for Missing Values:

Check for missing values in the dataset before performing imputation and print the count of missing values for each column.

(iii) Data Imputation:

Perform data imputation using various techniques for handling missing values, including:

- Filling missing values with the mean of each column.
- Filling missing values with the previous or next values.
- Using K Nearest Neighbours (KNN) imputation.
- Filling missing values with the maximum or minimum value of each column.
- Filling missing values with most frequent value in each column.
- Performing linear Interpolation to estimate missing values.
- Filling missing values with the rounded mean or median of each column.



Date: _____

→ Filling missing values with a fixed value (eg., 0).

(iv) Encoding Categorical variables:

Encode categorical variables using ordinal encoding.

(v) Applying imputation methods:

For each imputation method defined, apply the method to the encoded dataset.

(vi) Decoding categorical variables:

Decode categorical variables back to their original values after imputation.

(vii) Saving imputed data:

Save the imputed data for each method into separate CSV files.

CONCLUSION:

In conclusion, data imputation is a critical step in data preprocessing, allowing researchers and analysts to handle missing values effectively and derive meaningful insights from the incomplete datasets.

✓ ✓ ✓ ✓ ✓

```
import pandas as pd

# Load the data
data = pd.read_csv("/content/Sleep_Efficiency.csv")

# Check for missing values
missing_values = data.isnull().sum()
print("Missing values before imputation:\n", missing_values)

# Perform data imputation
# For example, you can fill missing values with the mean of each column
data_imputed = data.fillna(data.mean())

# Check again for missing values after imputation
missing_values_imputed = data_imputed.isnull().sum()
print("\nMissing values after imputation:\n", missing_values_imputed)

# Save the imputed data to a new CSV file
data_imputed.to_csv("/content/Sleep_Efficiency_Imputed.csv", index=False)

Missing values before imputation:
ID          0
Age         0
Gender      0
Bedtime     0
Wakeup time 0
Sleep duration 0
Sleep efficiency 0
REM sleep percentage 0
Deep sleep percentage 0
Light sleep percentage 0
Awakenings   20
Caffeine consumption 25
Alcohol consumption 14
Smoking status 0
Exercise frequency 6
dtype: int64

Missing values after imputation:
ID          0
Age         0
Gender      0
Bedtime     0
Wakeup time 0
Sleep duration 0
Sleep efficiency 0
REM sleep percentage 0
Deep sleep percentage 0
Light sleep percentage 0
Awakenings   0
Caffeine consumption 0
Alcohol consumption 0
Smoking status 0
Exercise frequency 0
dtype: int64
<ipython-input-2-d9535acf87a3>:12: FutureWarning: The default value of numeric_only in DataFrame.n
    data_imputed = data.fillna(data.mean())

import pandas as pd
from sklearn.impute import KNNImputer
from sklearn.preprocessing import OrdinalEncoder

# Load the data
data = pd.read_csv("/content/Sleep_Efficiency.csv")

# Encode categorical variables
encoder = OrdinalEncoder()
```



```
data_encoded = pd.DataFrame(encoder.fit_transform(data), columns=data.columns)

# Define imputation methods
imputation_methods = {
    'Next Value': lambda df: df.fillna(method='bfill'),
    'Previous Value': lambda df: df.fillna(method='ffill'),
    'K Nearest Neighbors': lambda df: pd.DataFrame(KNNImputer().fit_transform(df), columns=df.columns),
    'Maximum Value': lambda df: df.fillna(df.max()),
    'Minimum Value': lambda df: df.fillna(df.min()),
    'Most Frequent Value': lambda df: df.apply(lambda x: x.fillna(x.value_counts().index[0])),
    'Average Value': lambda df: df.fillna(df.mean().round()),
    'Linear Interpolation': lambda df: df.interpolate(method='linear', axis=0, limit_direction='both'),
    'Mean': lambda df: df.fillna(df.mean().round()),
    'Median Value': lambda df: df.fillna(df.median()),
    'Fixed Value': lambda df: df.fillna(0) # Replace 0 with your desired fixed value
}

# Perform data imputation for each method
imputed_data = {}
for method_name, imputation_method in imputation_methods.items():
    imputed_data[method_name] = imputation_method(data_encoded.copy())

# Decode categorical variables
for method_name, imputed_df in imputed_data.items():
    imputed_data[method_name] = pd.DataFrame(encoder.inverse_transform(imputed_df), columns=imputed_df.columns)

# Save imputed data to new CSV files
for method_name, imputed_df in imputed_data.items():
    imputed_df.to_csv(f"/content/Sleep_Efficiency_Imputed_{method_name}.csv", index=False)
```

Sleep_Efficiency.csv												
ID	Age	Gender	Bedtime	Wakeup time	Sleep duration	Sleep efficiency	REM sleep percentage	Deep sleep percentage	Light sleep percentage	Awakenings	Caffeine consumption	Alcohol
1	65	Female	2021-03-06 01:00:00	2021-03-06 07:00:00	6.0	0.88	18	70	12	0.0	0.0	0.0
2	69	Male	2021-12-05 02:00:00	2021-12-05 09:00:00	7.0	0.66	19	28	53	3.0	0.0	3.0
3	40	Female	2021-05-25 21:30:00	2021-05-26 05:30:00	8.0	0.89	20	70	10	1.0	0.0	0.0
4	40	Female	2021-03-13 02:30:00	2021-11-03 08:30:00	6.0	0.51	23	25	52	3.0	50.0	5.0
5	57	Male	2021-03-13 01:00:00	2021-03-13 09:00:00	8.0	0.76	27	55	18	3.0	0.0	3.0
6	36	Female	2021-07-01 21:00:00	2021-07-01 04:30:00	7.5	0.9	23	60	17	0.0	0.0	0.0
7	27	Female	2021-07-21 21:00:00	2021-07-21 03:00:00	6.0	0.54	28	25	47	2.0	50.0	0.0
8	53	Male	2021-08-16 00:30:00	2021-08-16 10:30:00	10.0	0.9	28	52	20	0.0	50.0	0.0
9	41	Female	2021-04-05 02:30:00	2021-04-05 08:30:00	6.0	0.79	28	55	17	3.0	50.0	0.0
10	11	Female	2021-09-16 01:00:00	2021-09-16 10:00:00	9.0	0.55	18	37	45	4.0	0.0	0.0

Sleep_Efficiency_Imputed_Fixed Value.csv												
ID	Age	Gender	Bedtime	Wakeup time	Sleep duration	Sleep efficiency	REM sleep percentage	Deep sleep percentage	Light sleep percentage	Awakenings	Caffeine consumption	Alcohol
1	65	Female	2021-03-06 01:00:00	2021-03-06 07:00:00	6.0	0.88	18	70	12	0.0	0.0	0.0
2	69	Male	2021-12-05 02:00:00	2021-12-05 09:00:00	7.0	0.66	19	28	53	3.0	0.0	3.0
3	40	Female	2021-05-25 21:30:00	2021-05-26 05:30:00	8.0	0.89	20	70	10	1.0	0.0	0.0
4	40	Female	2021-03-13 02:30:00	2021-11-03 08:30:00	6.0	0.51	23	25	52	3.0	50.0	5.0
5	57	Male	2021-03-13 01:00:00	2021-03-13 09:00:00	8.0	0.76	27	55	18	3.0	0.0	3.0
6	36	Female	2021-07-01 21:00:00	2021-07-01 04:30:00	7.5	0.9	23	60	17	0.0	0.0	0.0
7	27	Female	2021-07-21 21:00:00	2021-07-21 03:00:00	6.0	0.54	28	25	47	2.0	50.0	0.0
8	53	Male	2021-08-16 00:30:00	2021-08-16 10:30:00	10.0	0.9	28	52	20	0.0	50.0	0.0
9	41	Female	2021-04-05 02:30:00	2021-04-05 08:30:00	6.0	0.79	28	55	17	3.0	50.0	0.0
10	11	Female	2021-09-16 01:00:00	2021-09-16 10:00:00	9.0	0.55	18	37	45	4.0	0.0	0.0

Sleep_Efficiency_Imputed_Average Value.csv X

ID	Age	Gender	Bedtime	Wakeup time	Sleep duration	Sleep efficiency	REM sleep percentage	Deep sleep percentage	Light sleep percentage	Awakenings	Caffeine consumption	Alcohol
1	65	Female	2021-03-06 01:00:00	2021-03-06 07:00:00	6.0	0.88	18	70	12	0.0	0.0	0.0
2	69	Male	2021-12-05 02:00:00	2021-12-05 09:00:00	7.0	0.66	19	28	53	3.0	0.0	3.0
3	40	Female	2021-05-25 21:30:00	2021-05-25 05:30:00	8.0	0.89	20	70	10	1.0	0.0	0.0
4	40	Female	2021-11-03 02:30:00	2021-11-03 08:30:00	6.0	0.51	23	25	52	3.0	50.0	5.0
5	57	Male	2021-03-13 01:00:00	2021-03-13 09:00:00	8.0	0.76	27	55	18	3.0	0.0	3.0
6	36	Female	2021-07-01 21:00:00	2021-07-01 04:30:00	7.5	0.9	23	60	17	0.0	25.0	0.0
7	27	Female	2021-07-21 21:00:00	2021-07-21 03:00:00	6.0	0.54	28	25	47	2.0	50.0	0.0
8	53	Male	2021-08-16 00:30:00	2021-08-16 10:30:00	10.0	0.9	28	52	20	0.0	50.0	0.0
9	41	Female	2021-04-05 02:30:00	2021-04-05 08:30:00	6.0	0.79	28	55	17	3.0	50.0	0.0
10	11	Female	2021-09-16 01:00:00	2021-09-16 10:00:00	9.0	0.55	18	37	45	4.0	0.0	0.0

Sleep_Efficiency_Imputed_K Nearest Neighbors.csv X

ID	Age	Gender	Bedtime	Wakeup time	Sleep duration	Sleep efficiency	REM sleep percentage	Deep sleep percentage	Light sleep percentage	Awakenings	Caffeine consumption	Alcohol
1	65	Female	2021-03-06 01:00:00	2021-03-06 07:00:00	6.0	0.88	18	70	12	0.0	0.0	0.0
2	69	Male	2021-12-05 02:00:00	2021-12-05 09:00:00	7.0	0.66	19	28	53	3.0	0.0	3.0
3	40	Female	2021-05-25 21:30:00	2021-05-25 05:30:00	8.0	0.89	20	70	10	1.0	0.0	0.0
4	40	Female	2021-11-03 02:30:00	2021-11-03 08:30:00	6.0	0.51	23	25	52	3.0	50.0	5.0
5	57	Male	2021-03-13 01:00:00	2021-03-13 09:00:00	8.0	0.76	27	55	18	3.0	0.0	3.0
6	36	Female	2021-07-01 21:00:00	2021-07-01 04:30:00	7.5	0.9	23	60	17	0.0	25.0	0.0
7	27	Female	2021-07-21 21:00:00	2021-07-21 03:00:00	6.0	0.54	28	25	47	2.0	50.0	0.0
8	53	Male	2021-08-16 00:30:00	2021-08-16 10:30:00	10.0	0.9	28	52	20	0.0	50.0	0.0
9	41	Female	2021-04-05 02:30:00	2021-04-05 08:30:00	6.0	0.79	28	55	17	3.0	50.0	0.0
10	11	Female	2021-09-16 01:00:00	2021-09-16 10:00:00	9.0	0.55	18	37	45	4.0	0.0	0.0

Sleep_Efficiency_Imputed_Linear Interpolation.csv

ID	Age	Gender	Bedtime	Wakeup time	Sleep duration	Sleep efficiency	REM sleep percentage	Deep sleep percentage	Light sleep percentage	Awakenings	Caffeine consumption	Alcohol
1	65	Female	2021-03-06 01:00:00	2021-03-06 07:00:00	6.0	0.88	18	70	12	0.0	0.0	0.0
2	69	Male	2021-12-05 02:00:00	2021-12-05 09:00:00	7.0	0.66	19	28	53	3.0	0.0	3.0
3	40	Female	2021-05-25 21:30:00	2021-05-25 05:30:00	8.0	0.89	20	70	10	1.0	0.0	0.0
4	40	Female	2021-11-03 02:30:00	2021-11-03 08:30:00	6.0	0.51	23	25	52	3.0	50.0	5.0
5	57	Male	2021-03-13 01:00:00	2021-03-13 09:00:00	8.0	0.76	27	55	18	3.0	0.0	3.0
6	36	Female	2021-07-01 21:00:00	2021-07-01 04:30:00	7.5	0.9	23	60	17	0.0	25.0	0.0
7	27	Female	2021-07-21 21:00:00	2021-07-21 03:00:00	6.0	0.54	28	25	47	2.0	50.0	0.0
8	53	Male	2021-08-16 00:30:00	2021-08-16 10:30:00	10.0	0.9	28	52	20	0.0	50.0	0.0
9	41	Female	2021-04-05 02:30:00	2021-04-05 08:30:00	6.0	0.79	28	55	17	3.0	50.0	0.0
10	11	Female	2021-09-16 01:00:00	2021-09-16 10:00:00	9.0	0.55	18	37	45	4.0	0.0	0.0

Sleep_Efficiency_Imputed_Maximum Value.csv

ID	Age	Gender	Bedtime	Wakeup time	Sleep duration	Sleep efficiency	REM sleep percentage	Deep sleep percentage	Light sleep percentage	Awakenings	Caffeine consumption	Alcohol
1	65	Female	2021-03-06 01:00:00	2021-03-06 07:00:00	6.0	0.88	18	70	12	0.0	0.0	0.0
2	69	Male	2021-12-05 02:00:00	2021-12-05 09:00:00	7.0	0.66	19	28	53	3.0	0.0	3.0
3	40	Female	2021-05-25 21:30:00	2021-05-25 05:30:00	8.0	0.89	20	70	10	1.0	0.0	0.0
4	40	Female	2021-11-03 02:30:00	2021-11-03 08:30:00	6.0	0.51	23	25	52	3.0	50.0	5.0
5	57	Male	2021-03-13 01:00:00	2021-03-13 09:00:00	8.0	0.76	27	55	18	3.0	0.0	3.0
6	36	Female	2021-07-01 21:00:00	2021-07-01 04:30:00	7.5	0.9	23	60	17	0.0	200.0	0.0
7	27	Female	2021-07-21 21:00:00	2021-07-21 03:00:00	6.0	0.54	28	25	47	2.0	50.0	0.0
8	53	Male	2021-08-16 00:30:00	2021-08-16 10:30:00	10.0	0.9	28	52	20	0.0	50.0	0.0
9	41	Female	2021-04-05 02:30:00	2021-04-05 08:30:00	6.0	0.79	28	55	17	3.0	50.0	0.0
10	11	Female	2021-09-16 01:00:00	2021-09-16 10:00:00	9.0	0.55	18	37	45	4.0	0.0	0.0

Sleep_Efficiency_Imputed_Most Frequent Value.csv X

1 to 10 of 452 entries Filter

ID	Age	Gender	Bedtime	Wakeup time	Sleep duration	Sleep efficiency	REM sleep percentage	Deep sleep percentage	Light sleep percentage	Awakenings	Caffeine cons
1	65	Female	2021-03-06 01:00:00	2021-03-06 07:00:00	6.0	0.88	18	70	12	0.0	0.0
2	69	Male	2021-12-05 02:00:00	2021-12-05 09:00:00	7.0	0.66	19	28	53	3.0	0.0
3	40	Female	2021-05-25 21:30:00	2021-05-25 05:30:00	8.0	0.89	20	70	10	1.0	0.0
4	40	Female	2021-11-03 02:30:00	2021-11-03 08:30:00	6.0	0.51	23	25	52	3.0	50.0
5	57	Male	2021-03-13 01:00:00	2021-03-13 09:00:00	8.0	0.76	27	55	18	3.0	0.0
6	36	Female	2021-07-01 21:00:00	2021-07-01 04:30:00	7.5	0.9	23	60	17	0.0	0.0
7	27	Female	2021-07-21 21:00:00	2021-07-21 03:00:00	6.0	0.54	28	25	47	2.0	50.0
8	53	Male	2021-08-16 00:30:00	2021-08-16 10:30:00	10.0	0.9	28	52	20	0.0	50.0
9	41	Female	2021-04-05 02:30:00	2021-04-05 08:30:00	6.0	0.79	28	55	17	3.0	50.0
10	11	Female	2021-09-16 01:00:00	2021-09-16 10:00:00	9.0	0.55	18	37	45	4.0	0.0

Sleep_Efficiency_Imputed_Mean.csv X

1 to 10 of 452 entries Filter

ID	Age	Gender	Bedtime	Wakeup time	Sleep duration	Sleep efficiency	REM sleep percentage	Deep sleep percentage	Light sleep percentage	Awakenings	Caffeine consumpti
1	65	Female	2021-03-06 01:00:00	2021-03-06 07:00:00	6.0	0.88	18	70	12	0.0	0.0
2	69	Male	2021-12-05 02:00:00	2021-12-05 09:00:00	7.0	0.66	19	28	53	3.0	0.0
3	40	Female	2021-05-25 21:30:00	2021-05-25 05:30:00	8.0	0.89	20	70	10	1.0	0.0
4	40	Female	2021-11-03 02:30:00	2021-11-03 08:30:00	6.0	0.51	23	25	52	3.0	50.0
5	57	Male	2021-03-13 01:00:00	2021-03-13 09:00:00	8.0	0.76	27	55	18	3.0	0.0
6	36	Female	2021-07-01 21:00:00	2021-07-01 04:30:00	7.5	0.9	23	60	17	0.0	25.0
7	27	Female	2021-07-21 21:00:00	2021-07-21 03:00:00	6.0	0.54	28	25	47	2.0	50.0
8	53	Male	2021-08-16 00:30:00	2021-08-16 10:30:00	10.0	0.9	28	52	20	0.0	50.0
9	41	Female	2021-04-05 02:30:00	2021-04-05 08:30:00	6.0	0.79	28	55	17	3.0	50.0
10	11	Female	2021-09-16 01:00:00	2021-09-16 10:00:00	9.0	0.55	18	37	45	4.0	0.0

Sleep_Efficiency_Imputed_Median Value.csv X

ID	Age	Gender	Bedtime	Wakeup time	Sleep duration	Sleep efficiency	REM sleep percentage	Deep sleep percentage	Light sleep percentage	Awakenings	Caffeine consumpt
1	65	Female	2021-03-06 01:00:00	2021-03-06 07:00:00	6.0	0.88	18	70	12	0.0	0.0
2	69	Male	2021-12-05 02:00:00	2021-12-05 09:00:00	7.0	0.66	19	28	53	3.0	0.0
3	40	Female	2021-05-25 21:30:00	2021-05-25 05:30:00	8.0	0.89	20	70	10	1.0	0.0
4	40	Female	2021-11-03 02:30:00	2021-11-03 08:30:00	6.0	0.51	23	25	52	3.0	50.0
5	57	Male	2021-03-13 01:00:00	2021-03-13 09:00:00	8.0	0.76	27	55	18	3.0	0.0
6	36	Female	2021-07-01 21:00:00	2021-07-01 04:30:00	7.5	0.9	23	60	17	0.0	25.0
7	27	Female	2021-07-21 21:00:00	2021-07-21 03:00:00	6.0	0.54	28	25	47	2.0	50.0
8	53	Male	2021-08-16 00:30:00	2021-08-16 10:30:00	10.0	0.9	28	52	20	0.0	50.0
9	41	Female	2021-04-05 02:30:00	2021-04-05 08:30:00	6.0	0.79	28	55	17	3.0	50.0
10	11	Female	2021-09-16 01:00:00	2021-09-16 10:00:00	9.0	0.55	18	37	45	4.0	0.0

Sleep_Efficiency_Imputed_Minimum Value.csv X

ID	Age	Gender	Bedtime	Wakeup time	Sleep duration	Sleep efficiency	REM sleep percentage	Deep sleep percentage	Light sleep percentage	Awakenings	Caffeine consumpt
1	65	Female	2021-03-06 01:00:00	2021-03-06 07:00:00	6.0	0.88	18	70	12	0.0	0.0
2	69	Male	2021-12-05 02:00:00	2021-12-05 09:00:00	7.0	0.66	19	28	53	3.0	0.0
3	40	Female	2021-05-25 21:30:00	2021-05-25 05:30:00	8.0	0.89	20	70	10	1.0	0.0
4	40	Female	2021-11-03 02:30:00	2021-11-03 08:30:00	6.0	0.51	23	25	52	3.0	50.0
5	57	Male	2021-03-13 01:00:00	2021-03-13 09:00:00	8.0	0.76	27	55	18	3.0	0.0
6	36	Female	2021-07-01 21:00:00	2021-07-01 04:30:00	7.5	0.9	23	60	17	0.0	0.0
7	27	Female	2021-07-21 21:00:00	2021-07-21 03:00:00	6.0	0.54	28	25	47	2.0	50.0
8	53	Male	2021-08-16 00:30:00	2021-08-16 10:30:00	10.0	0.9	28	52	20	0.0	50.0
9	41	Female	2021-04-05 02:30:00	2021-04-05 08:30:00	6.0	0.79	28	55	17	3.0	50.0
10	11	Female	2021-09-16 01:00:00	2021-09-16 10:00:00	9.0	0.55	18	37	45	4.0	0.0

Sleep_Efficiency_Imputed_Next Value.csv X

ID	Age	Gender	Bedtime	Wakeup time	Sleep duration	Sleep efficiency	REM sleep percentage	Deep sleep percentage	Light sleep percentage	Awakenings	Caffeine consumpt
1	65	Female	2021-03-06 01:00:00	2021-03-06 07:00:00	6.0	0.88	18	70	12	0.0	0.0
2	69	Male	2021-12-05 02:00:00	2021-12-05 09:00:00	7.0	0.66	19	28	53	3.0	0.0
3	40	Female	2021-05-25 21:30:00	2021-05-25 05:30:00	8.0	0.89	20	70	10	1.0	0.0
4	40	Female	2021-11-03 02:30:00	2021-11-03 08:30:00	6.0	0.51	23	25	52	3.0	50.0
5	57	Male	2021-03-13 01:00:00	2021-03-13 09:00:00	8.0	0.76	27	55	18	3.0	0.0
6	36	Female	2021-07-01 21:00:00	2021-07-01 04:30:00	7.5	0.9	23	60	17	0.0	50.0
7	27	Female	2021-07-21 21:00:00	2021-07-21 03:00:00	6.0	0.54	28	25	47	2.0	50.0
8	53	Male	2021-08-16 00:30:00	2021-08-16 10:30:00	10.0	0.9	28	52	20	0.0	50.0
9	41	Female	2021-04-05 02:30:00	2021-04-05 08:30:00	6.0	0.79	28	55	17	3.0	50.0
10	11	Female	2021-09-16 01:00:00	2021-09-16 10:00:00	9.0	0.55	18	37	45	4.0	0.0

Sleep_Efficiency_Imputed_Previous Value.csv X

ID	Age	Gender	Bedtime	Wakeup time	Sleep duration	Sleep efficiency	REM sleep percentage	Deep sleep percentage	Light sleep percentage	Awakenings	Caffeine consumpt
1	65	Female	2021-03-06 01:00:00	2021-03-06 07:00:00	6.0	0.88	18	70	12	0.0	0.0
2	69	Male	2021-12-05 02:00:00	2021-12-05 09:00:00	7.0	0.66	19	28	53	3.0	0.0
3	40	Female	2021-05-25 21:30:00	2021-05-25 05:30:00	8.0	0.89	20	70	10	1.0	0.0
4	40	Female	2021-11-03 02:30:00	2021-11-03 08:30:00	6.0	0.51	23	25	52	3.0	50.0
5	57	Male	2021-03-13 01:00:00	2021-03-13 09:00:00	8.0	0.76	27	55	18	3.0	0.0
6	36	Female	2021-07-01 21:00:00	2021-07-01 04:30:00	7.5	0.9	23	60	17	0.0	0.0
7	27	Female	2021-07-21 21:00:00	2021-07-21 03:00:00	6.0	0.54	28	25	47	2.0	50.0
8	53	Male	2021-08-16 00:30:00	2021-08-16 10:30:00	10.0	0.9	28	52	20	0.0	50.0
9	41	Female	2021-04-05 02:30:00	2021-04-05 08:30:00	6.0	0.79	28	55	17	3.0	50.0
10	11	Female	2021-09-16 01:00:00	2021-09-16 10:00:00	9.0	0.55	18	37	45	4.0	0.0

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