In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
df=pd.read_csv("Sleep_health_and_lifestyle_dataset.csv")
df
```

Out[2]:

	Person ID	Gender	Age	Occupation	Sleep Duration	Quality of Sleep	Physical Activity Level	Stress Level	BMI Category
0	1	Male	27	Software Engineer	6.1	6	42	6	Overweight
1	2	Male	28	Doctor	6.2	6	60	8	Normal
2	3	Male	28	Doctor	6.2	6	60	8	Normal
3	4	Male	28	Sales Representative	5.9	4	30	8	Obese
4	5	Male	28	Sales Representative	5.9	4	30	8	Obese
...	...	...	...	...	...	...	...	...	...
369	370	Female	59	Nurse	8.1	9	75	3	Overweight
370	371	Female	59	Nurse	8.0	9	75	3	Overweight
371	372	Female	59	Nurse	8.1	9	75	3	Overweight
372	373	Female	59	Nurse	8.1	9	75	3	Overweight
373	374	Female	59	Nurse	8.1	9	75	3	Overweight

374 rows × 13 columns

DATA PREPROCESSING

CHECK NULL VALUES

In [5]:
```
df.isnull().sum()
```

Out[5]:
```
Person ID                    0
Gender                       0
Age                          0
Occupation                   0
Sleep Duration               0
Quality of Sleep             0
Physical Activity Level      0
Stress Level                 0
BMI Category                 0
Blood Pressure               0
Heart Rate                   0
Daily Steps                  0
Sleep Disorder             219
dtype: int64
```

In [6]:
```
df.describe()
```

Out[6]:

	Person ID	Age	Sleep Duration	Quality of Sleep	Physical Activity Level	Stress Level	Heart Rate
count	374.000000	374.000000	374.000000	374.000000	374.000000	374.000000	374.000000
mean	187.500000	42.184492	7.132086	7.312834	59.171123	5.385027	70.165775
std	108.108742	8.673133	0.795657	1.196956	20.830804	1.774526	4.135676
min	1.000000	27.000000	5.800000	4.000000	30.000000	3.000000	65.000000
25%	94.250000	35.250000	6.400000	6.000000	45.000000	4.000000	68.000000
50%	187.500000	43.000000	7.200000	7.000000	60.000000	5.000000	70.000000
75%	280.750000	50.000000	7.800000	8.000000	75.000000	7.000000	72.000000
max	374.000000	59.000000	8.500000	9.000000	90.000000	8.000000	86.000000

In [7]:
```
df.drop_duplicates(inplace=True)
```

In [8]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 374 entries, 0 to 373
Data columns (total 13 columns):
 #   Column                   Non-Null Count  Dtype  
---  ------                   --------------  -----  
 0   Person ID                374 non-null    int64  
 1   Gender                   374 non-null    object 
 2   Age                      374 non-null    int64  
 3   Occupation               374 non-null    object 
 4   Sleep Duration           374 non-null    float64
 5   Quality of Sleep         374 non-null    int64  
 6   Physical Activity Level  374 non-null    int64  
 7   Stress Level             374 non-null    int64  
 8   BMI Category             374 non-null    object 
 9   Blood Pressure           374 non-null    object 
 10  Heart Rate               374 non-null    int64  
 11  Daily Steps              374 non-null    int64  
 12  Sleep Disorder           155 non-null    object 
dtypes: float64(1), int64(7), object(5)
memory usage: 38.1+ KB
```

ENCODING

In [11]:
```
from sklearn.preprocessing import LabelEncoder
```

In [12]:
```
le=LabelEncoder()
```

In [13]:
```
df['Gender']=pd.DataFrame(le.fit_transform(df['Gender']))
df['Occupation']=pd.DataFrame(le.fit_transform(df['Occupation']))
df['BMI Category']=pd.DataFrame(le.fit_transform(df['BMI Category']))
df['Sleep Disorder']=pd.DataFrame(le.fit_transform(df['Sleep Disorder']))
```

In [14]:
```
df.head()
```

Out[14]:

	Person ID	Gender	Age	Occupation	Sleep Duration	Quality of Sleep	Physical Activity Level	Stress Level	BMI Category	Blo Pressu
0	1	1	27	9	6.1	6	42	6	3	126/
1	2	1	28	1	6.2	6	60	8	0	125/
2	3	1	28	1	6.2	6	60	8	0	125/
3	4	1	28	6	5.9	4	30	8	2	140/
4	5	1	28	6	5.9	4	30	8	2	140/

In [15]:
```
df.describe()
```

Out[15]:

	Person ID	Gender	Age	Occupation	Sleep Duration	Quality of Sleep	Physical Activity Level
count	374.000000	374.000000	374.000000	374.000000	374.000000	374.000000	374.000000
mean	187.500000	0.505348	42.184492	3.772727	7.132086	7.312834	59.171123
std	108.108742	0.500641	8.673133	3.056081	0.795657	1.196956	20.830804
min	1.000000	0.000000	27.000000	0.000000	5.800000	4.000000	30.000000
25%	94.250000	0.000000	35.250000	1.000000	6.400000	6.000000	45.000000
50%	187.500000	1.000000	43.000000	3.000000	7.200000	7.000000	60.000000
75%	280.750000	1.000000	50.000000	5.000000	7.800000	8.000000	75.000000
max	374.000000	1.000000	59.000000	10.000000	8.500000	9.000000	90.000000

SCALING

In [17]:
```
from sklearn.preprocessing import MinMaxScaler
```

In [18]:
```
scaler = MinMaxScaler()
df[['Age', 'Physical Activity Level', 'Daily Steps']] = scaler.fit_transform(df[['A
```

In [19]:
```
df.head()
```

Out[19]:

	Person ID	Gender	Age	Occupation	Sleep Duration	Quality of Sleep	Physical Activity Level	Stress Level	BMI Category	Pr
0	1	1	0.00000	9	6.1	6	0.2	6	3	
1	2	1	0.03125	1	6.2	6	0.5	8	0	
2	3	1	0.03125	1	6.2	6	0.5	8	0	
3	4	1	0.03125	6	5.9	4	0.0	8	2	
4	5	1	0.03125	6	5.9	4	0.0	8	2	

CATEGORIZING SLEEP QUALITY AS GOOD AND BAD

In [20]:
```
X = df[['Age', 'Occupation', 'Sleep Duration', 'Physical Activity Level',
        'Stress Level', 'BMI Category', 'Heart Rate', 'Daily Steps', 'Sleep Disorde
y = df['Quality of Sleep']
y = y.apply(lambda x: "Bad" if x <= 5 else "Good")
y = le.fit_transform(y)
```

MODEL TRAINING AND EVALUATION

SPLITTING DATA INTO TRAINING AND TESTING

In [23]:
```
from sklearn.model_selection import train_test_split
```

In [24]:
```
X_train,X_test,y_train,y_test=train_test_split(X,y,random_state=42,test_size=0.2)
```

MODEL SELECTION

In [26]:
```
from sklearn.linear_model import LogisticRegression
```

In [42]:
```
model=LogisticRegression()
model.fit(X_train,y_train)
```

```
C:\Users\parek\anaconda3\Lib\site-packages\sklearn\linear_model\_logistic.py:469: Co
nvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(
```

Out[42]:

LogisticRegression

LogisticRegression()

In [44]:
```
y_pred=model.predict(X_test)
```

MODEL EVALUATION

In [66]:
```
from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score


accuracy = accuracy_score(y_test, y_pred)
print(f"Accuracy: {accuracy:.4f}")


precision = precision_score(y_test, y_pred)
print(f"Precision: {precision:.4f}")


recall = recall_score(y_test, y_pred)
print(f"Recall: {recall:.4f}")


f1 = f1_score(y_test, y_pred)
print(f"F1-Score: {f1:.4f}")
```

```
Accuracy: 0.9733
Precision: 0.9861
Recall: 0.9861
F1-Score: 0.9861
```

In [49]:
```
new_data = np.array([[35, 2, 7, 60, 5, 1, 72, 5000, 1]])
new_data[:, [0, 3, 7]] = scaler.transform(new_data[:, [0, 3, 7]])
prediction = model.predict(new_data)
print("Predicted Sleep Quality:", prediction[0])
```

```
Predicted Sleep Quality: 1
C:\Users\parek\anaconda3\Lib\site-packages\sklearn\base.py:493: UserWarning: X does not have valid feature names, but MinMaxScaler was fitted with feature names
  warnings.warn(
C:\Users\parek\anaconda3\Lib\site-packages\sklearn\base.py:493: UserWarning: X does not have valid feature names, but LogisticRegression was fitted with feature names
  warnings.warn(
```

SAVING MODEL USING JOBLIB

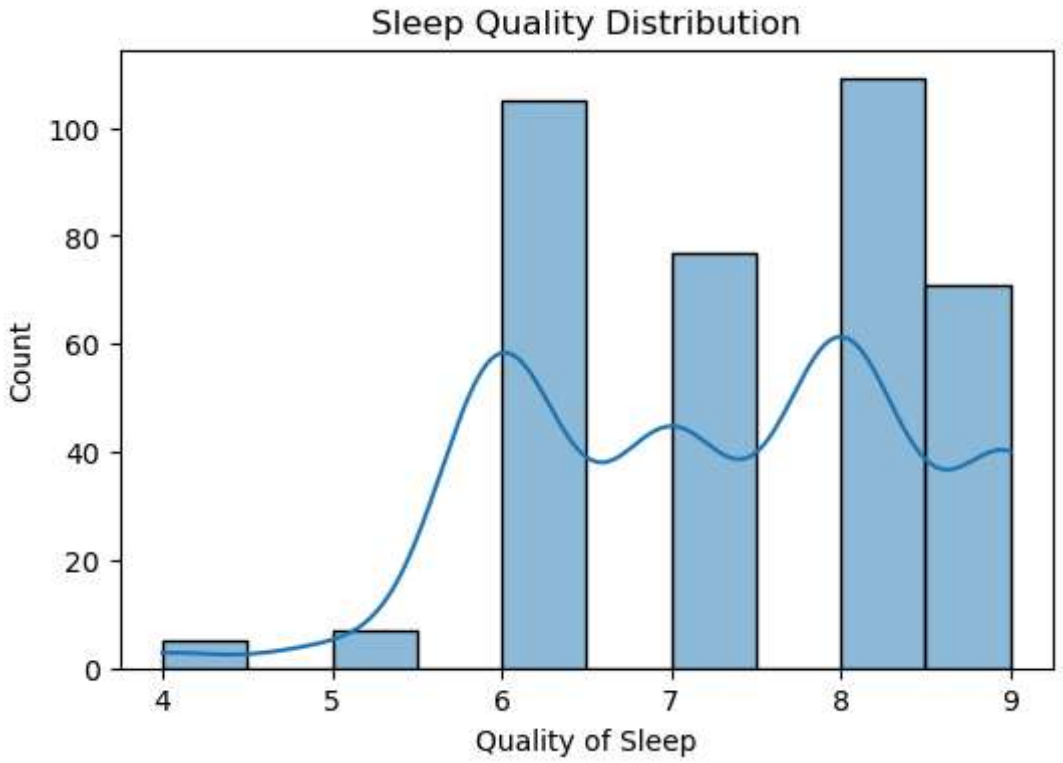
In [52]:
```
import joblib

joblib.dump(model, "sleep_quality_model.pkl")
joblib.dump(scaler, "scaler.pkl")
joblib.dump(le, "label_encoder.pkl")
```

Out[52]:
```
['label_encoder.pkl']
```

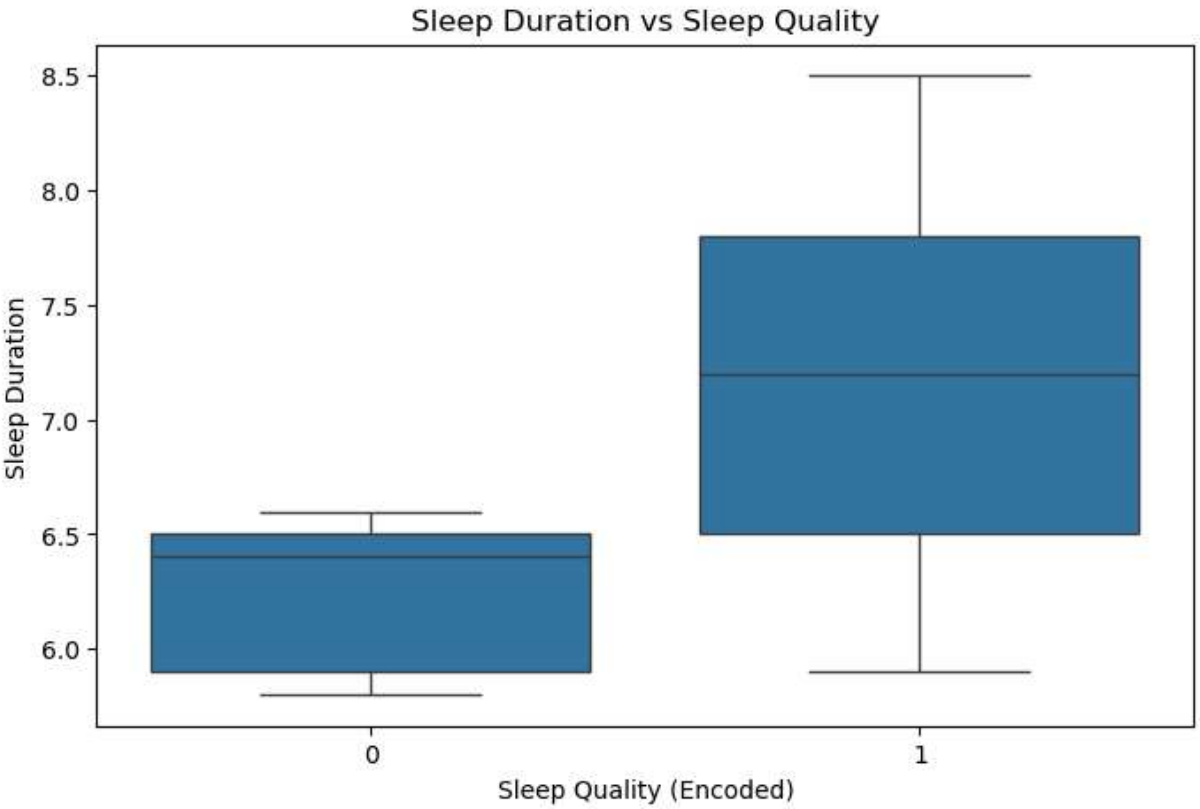
DATA VISUALIZATION

HISTOGRAM

In [38]:
```
plt.figure(figsize=(6, 4))
sns.histplot(df['Quality of Sleep'], bins=10, kde=True)
plt.title("Sleep Quality Distribution")
plt.xlabel("Quality of Sleep")
plt.ylabel("Count")
plt.show()
```

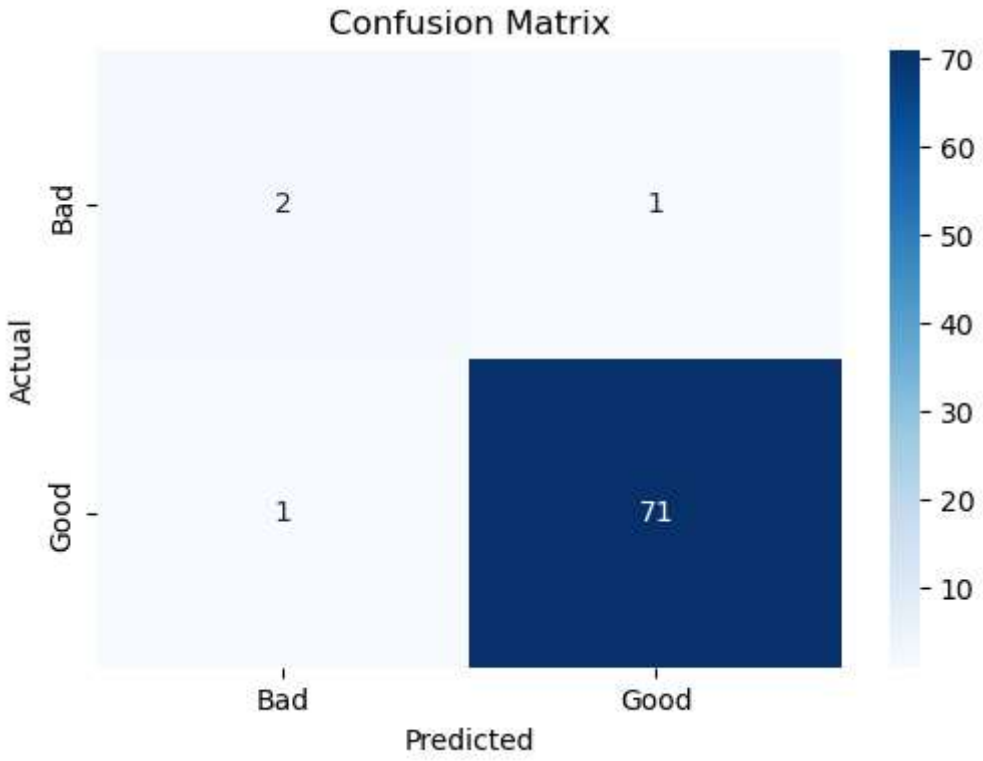


In [40]:
```
plt.figure(figsize=(8, 5))
sns.boxplot(x=y, y=df["Sleep Duration"])
plt.title("Sleep Duration vs Sleep Quality")
plt.xlabel("Sleep Quality (Encoded)")
plt.ylabel("Sleep Duration")
plt.show()
```



CONFUSION MATRIX

In [61]:
```
from sklearn.metrics import accuracy_score, classification_report, confusion_matrix
cm = confusion_matrix(y_test, y_pred)
plt.figure(figsize=(6, 4))
sns.heatmap(cm, annot=True, fmt='d', cmap='Blues', xticklabels=["Bad", "Good"], yti
plt.xlabel("Predicted")
plt.ylabel("Actual")
plt.title("Confusion Matrix")
plt.show()
```



In [ ]: