ASSESMENT -3

21BCE0516

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1. Download the dataset

2. Load the dataset into the tool

In [15]:
```
import pandas as pd
df = pd.read_csv("penguins_size.csv")
```

In [3]:
```
df.head()
```

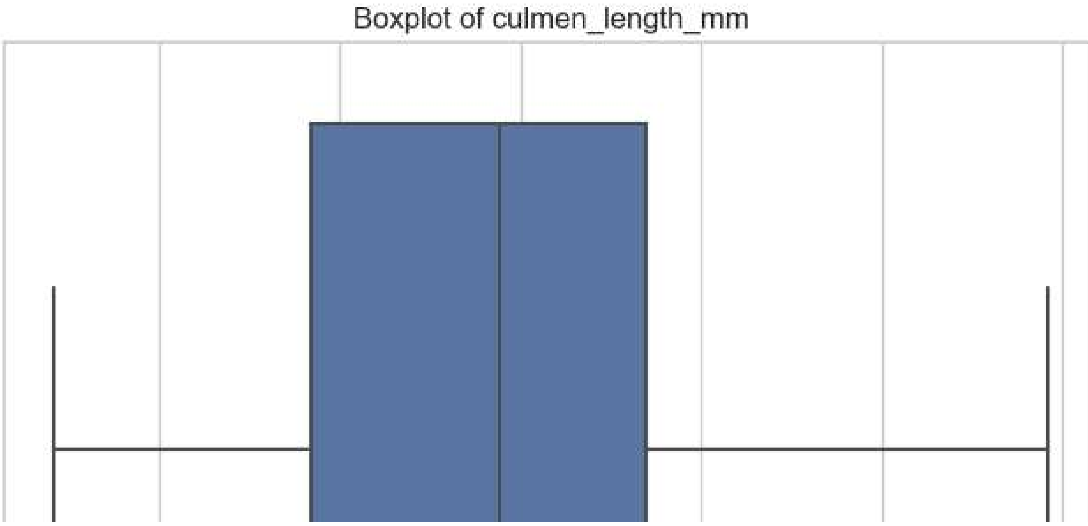
Out[3]:

	species	island	culmen_length_mm	culmen_depth_mm	flipper_length_mm	body_mass_g
0	Adelie	Torgersen	39.1	18.7	181.0	3750.0
1	Adelie	Torgersen	39.5	17.4	186.0	3800.0
2	Adelie	Torgersen	40.3	18.0	195.0	3250.0
3	Adelie	Torgersen	NaN	NaN	NaN	NaN
4	Adelie	Torgersen	36.7	19.3	193.0	3450.0

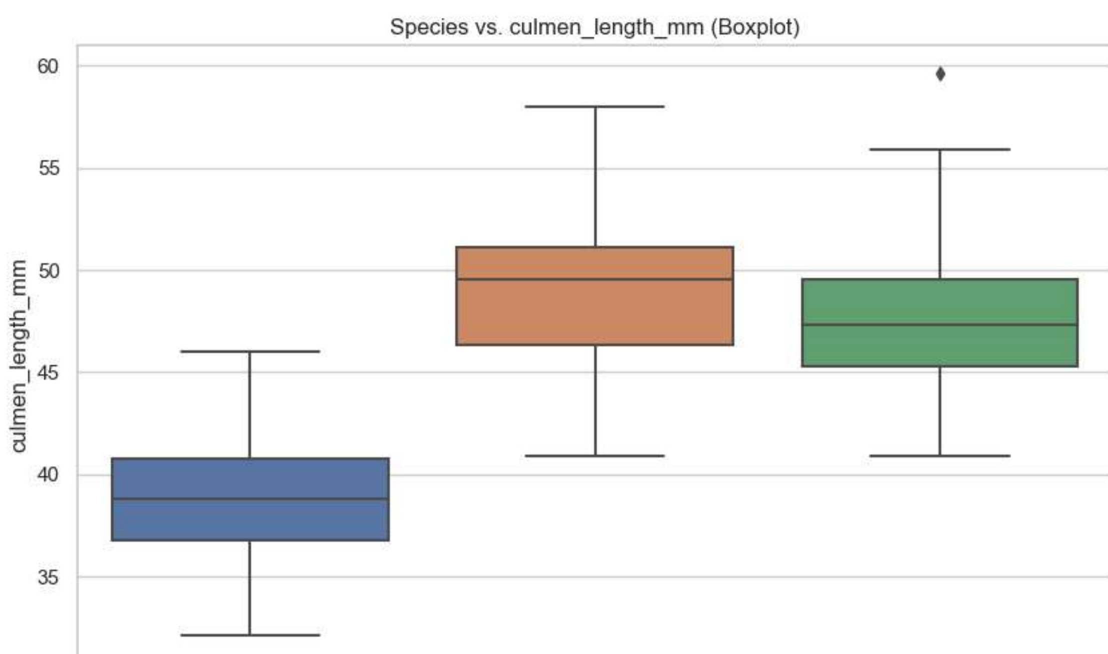
3. Perform the Below Visualizations. □ Univariate Analysis □ Bi - Variate Analysis □ Multivariate Analysis

In [4]:
```
# Univariate Analysis
import seaborn as sns
import matplotlib.pyplot as plt

sns.set(style="whitegrid")

# Univariate Analysis for Categorical Variables
categorical_variables = ['species', 'island', 'sex']

for var in categorical_variables:
    plt.figure(figsize=(8, 6))
    sns.countplot(data=df, x=var)
    plt.title(f'Countplot of {var}')
    plt.xticks(rotation=45)
    plt.show()

# Univariate Analysis for Numerical Variables
numerical_variables = ['culmen_length_mm', 'culmen_depth_mm', 'flipper_length_

for var in numerical_variables:
    plt.figure(figsize=(8, 6))
    sns.histplot(data=df, x=var, kde=True)
    plt.title(f'Histogram of {var}')
    plt.xlabel(var)
    plt.ylabel('Frequency')
    plt.show()

    plt.figure(figsize=(8, 6))
    sns.boxplot(data=df, x=var)
    plt.title(f'Boxplot of {var}')
    plt.xlabel(var)
    plt.show()

    plt.figure(figsize=(8, 6))
    sns.kdeplot(data=df, x=var, fill=True)
    plt.title(f'Density Plot of {var}')
    plt.xlabel(var)
    plt.ylabel('Density')
    plt.show()
```

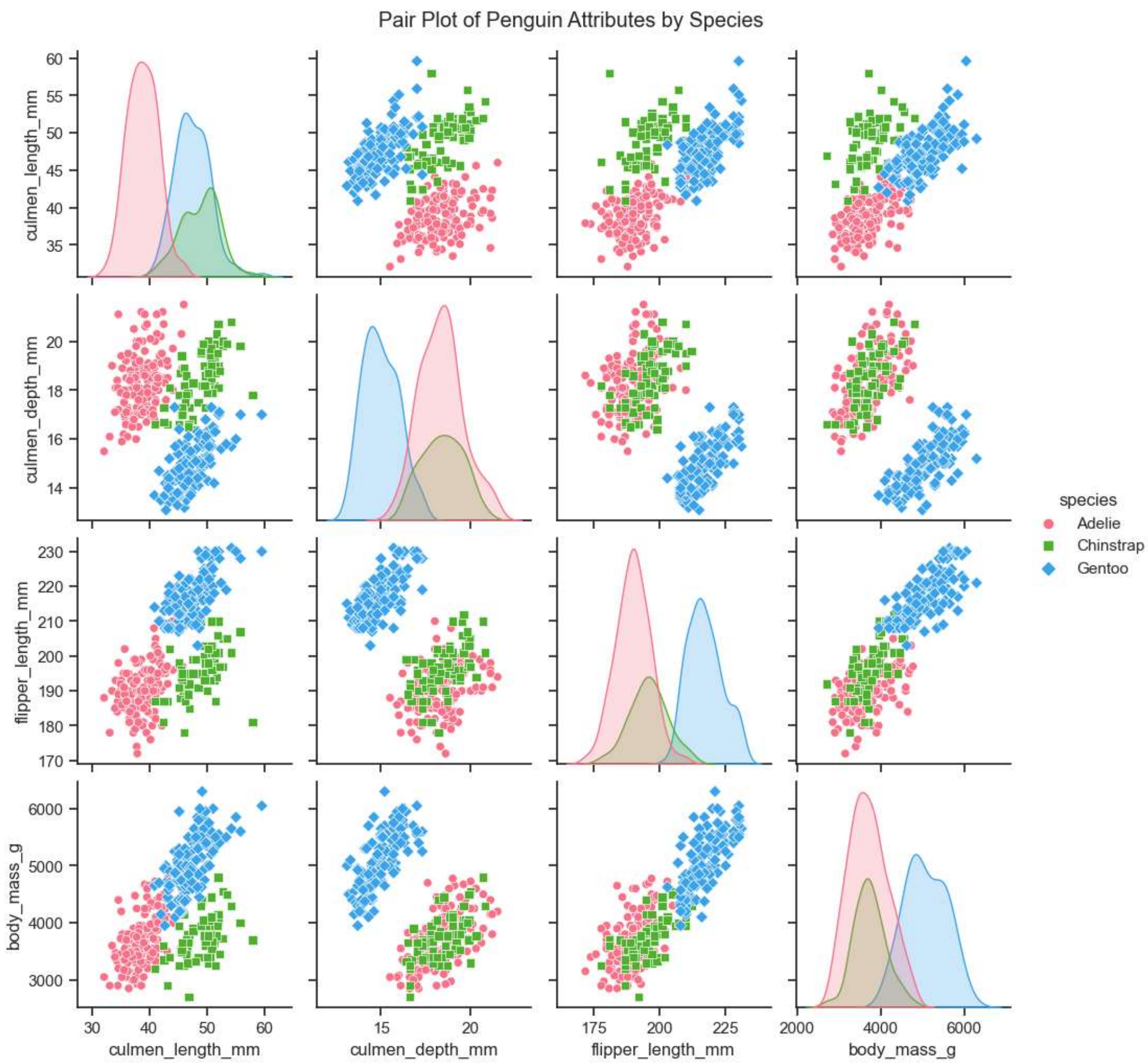

0
35
40
45
50
55
60
culmen_length_mm


Boxplot of culmen_length_mm

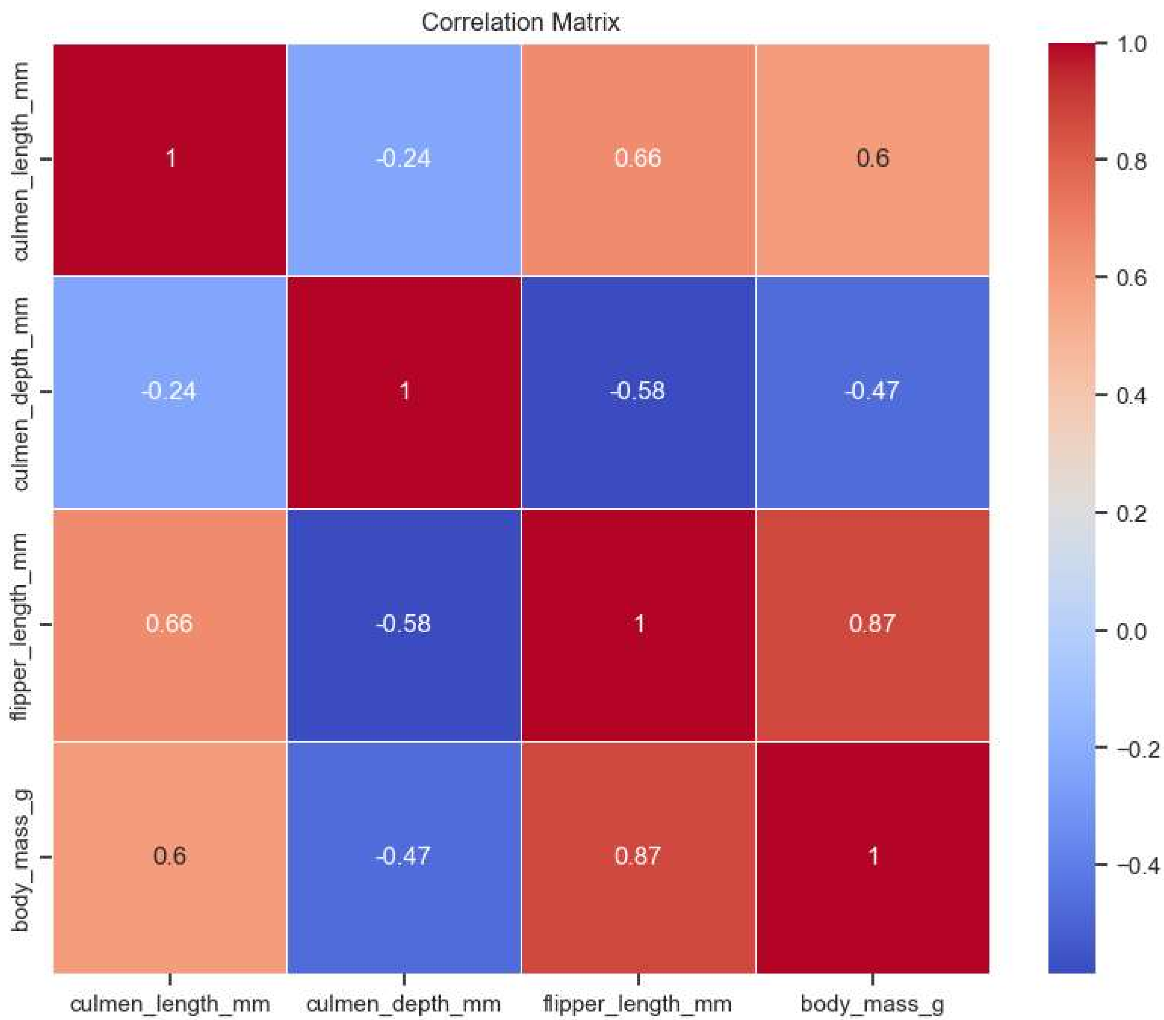
In [5]:
```
#bivariate analysis
import seaborn as sns
import matplotlib.pyplot as plt

sns.set(style="whitegrid")

# Bivariate Analysis: Species vs. Island (Countplot)
plt.figure(figsize=(10, 6))
sns.countplot(data=df, x='species', hue='island')
plt.title('Species vs. Island (Countplot)')
plt.xlabel('Species')
plt.ylabel('Count')
plt.show()

# Bivariate Analysis: Species vs. Numerical Attributes (Boxplots)
numerical_variables = ['culmen_length_mm', 'culmen_depth_mm', 'flipper_length_

for var in numerical_variables:
    plt.figure(figsize=(10, 6))
    sns.boxplot(data=df, x='species', y=var)
    plt.title(f'Species vs. {var} (Boxplot)')
    plt.xlabel('Species')
    plt.ylabel(var)
    plt.show()

# Bivariate Analysis: Species vs. Sex (Countplot)
plt.figure(figsize=(10, 6))
sns.countplot(data=df, x='species', hue='sex')
plt.title('Species vs. Sex (Countplot)')
plt.xlabel('Species')
plt.ylabel('Count')
plt.show()
```



In [6]:
```
#multivariate analysis
import seaborn as sns
import matplotlib.pyplot as plt

sns.set(style="ticks")

# Multivariate Analysis: Pair Plot
sns.pairplot(df, hue='species', markers=["o", "s", "D"], palette="husl")
plt.suptitle("Pair Plot of Penguin Attributes by Species", y=1.02)
plt.show()

# Multivariate Analysis: Correlation Matrix
correlation_matrix = df.corr()
plt.figure(figsize=(10, 8))
sns.heatmap(correlation_matrix, annot=True, cmap="coolwarm", linewidths=0.5)
plt.title("Correlation Matrix")
plt.show()
```



```
C:\Users\dell\AppData\Local\Temp\ipykernel_5992\2211997196.py:13: FutureWarn
ing: The default value of numeric_only in DataFrame.corr is deprecated. In a
future version, it will default to False. Select only valid columns or speci
fy the value of numeric_only to silence this warning.
  correlation_matrix = df.corr()
```



4. Perform descriptive statistics on the dataset

In [7]:
```
df.describe()
```

Out[7]:

	culmen_length_mm	culmen_depth_mm	flipper_length_mm	body_mass_g
count	342.000000	342.000000	342.000000	342.000000
mean	43.921930	17.151170	200.915205	4201.754386
std	5.459584	1.974793	14.061714	801.954536
min	32.100000	13.100000	172.000000	2700.000000
25%	39.225000	15.600000	190.000000	3550.000000
50%	44.450000	17.300000	197.000000	4050.000000
75%	48.500000	18.700000	213.000000	4750.000000
max	59.600000	21.500000	231.000000	6300.000000

5. Check for Missing values and deal with them.

In [16]:
```
#checking missing values
missing_values = df.isnull().sum()
missing_values
```

Out[16]:
```
species               0
island                0
culmen_length_mm      2
culmen_depth_mm       2
flipper_length_mm     2
body_mass_g           2
sex                  10
dtype: int64
```

In [18]:

```
#since study is on species
df.dropna(subset=['species'], inplace=True)

#for other missing values:
num_cols_with_missing = ['culmen_length_mm', 'culmen_depth_mm', 'flipper_leng
for col in num_cols_with_missing:
    df[col].fillna(df[col].mean(), inplace=True)

# Impute missing values in the 'sex' column with the mode (most frequent valu
df['sex'].fillna(df['sex'].mode()[0], inplace=True)

# Verify that missing values have been handled
df.isnull().sum()
```

Out[18]:

```
species              0
island               0
culmen_length_mm     0
culmen_depth_mm      0
flipper_length_mm    0
body_mass_g          0
sex                  0
dtype: int64
```

6. Find the outliers and replace them outliers

In [19]:

```
numerical_columns = ['culmen_length_mm', 'culmen_depth_mm', 'flipper_length_m

# Define a function to replace outliers with the median of the column
def replace_outliers_with_median(column):
    Q1 = column.quantile(0.25)
    Q3 = column.quantile(0.75)
    IQR = Q3 - Q1
    lower_bound = Q1 - 1.5 * IQR
    upper_bound = Q3 + 1.5 * IQR
    column = column.apply(lambda x: np.median(column) if x < lower_bound or x
    return column

# Replace outliers in the selected numerical columns
for col in numerical_columns:
    df[col] = replace_outliers_with_median(df[col])
```

7.Check the correlation of independent variables with the target

In [22]:
```
# Define the target variable
target_variable = 'species'

# Convert the 'species' column to numerical labels
df[target_variable] = pd.Categorical(df[target_variable])
df[target_variable] = df[target_variable].cat.codes

# Select numerical independent variables
numerical_independent_vars = ['culmen_length_mm', 'culmen_depth_mm', 'flipper_

# Calculate the correlation between each numerical independent variable and th
correlations = df[numerical_independent_vars].apply(lambda x: x.corr(df[targe
correlations
```

Out[22]:
```
culmen_length_mm     0.728674
culmen_depth_mm     -0.741335
flipper_length_mm    0.851160
body_mass_g          0.747726
dtype: float64
```

8. Check for Categorical columns and perform encoding.

In [23]:
```
# Check for categorical columns
categorical_columns = df.select_dtypes(include=['object']).columns.tolist()

# Perform one-hot encoding for categorical columns
df_encoded = pd.get_dummies(df, columns=categorical_columns, drop_first=True)
df_encoded.head()
```

Out[23]:

	species	culmen_length_mm	culmen_depth_mm	flipper_length_mm	body_mass_g	island_Dr
0	0	39.10000	18.70000	181.000000	3750.000000	
1	0	39.50000	17.40000	186.000000	3800.000000	
2	0	40.30000	18.00000	195.000000	3250.000000	
3	0	43.92193	17.15117	200.915205	4201.754386	
4	0	36.70000	19.30000	193.000000	3450.000000	

9. Split the data into dependent and independent variables.

In [25]:
```
# Define the target variable (dependent variable)
target_variable = 'species'

# Create a DataFrame containing only the independent variables (features)
X = df.drop(columns=[target_variable])

# Create a Series containing the target variable
y = df[target_variable]

X.head()

#y.head()
```

Out[25]:

	island	culmen_length_mm	culmen_depth_mm	flipper_length_mm	body_mass_g	sex
0	Torgersen	39.10000	18.70000	181.000000	3750.000000	MALE
1	Torgersen	39.50000	17.40000	186.000000	3800.000000	FEMALE
2	Torgersen	40.30000	18.00000	195.000000	3250.000000	FEMALE
3	Torgersen	43.92193	17.15117	200.915205	4201.754386	MALE
4	Torgersen	36.70000	19.30000	193.000000	3450.000000	FEMALE

In [26]:
```
y.head()
```

Out[26]:
```
0    0
1    0
2    0
3    0
4    0
Name: species, dtype: int8
```

10.Scaling the data

In [30]:

```
from sklearn.preprocessing import MinMaxScaler, StandardScaler

# Define the target variable (dependent variable)
target_variable = 'species'

# Create a DataFrame containing only the independent variables (features)
X = df.drop(columns=[target_variable, 'island', 'sex'])  # Exclude non-numeri

# Create a Series containing the target variable
y = df[target_variable]

# Apply Min-Max Scaling (Normalization) to the independent variables
scaler_minmax = MinMaxScaler()
X_minmax = scaler_minmax.fit_transform(X)

# Apply Standardization (Z-score Scaling) to the independent variables
scaler_standard = StandardScaler()
X_standard = scaler_standard.fit_transform(X)

# Display the first few rows of the scaled data
print("Min-Max Scaled Data (Normalization):")
print(X_minmax[:5])

print("\nStandardized Data (Z-score Scaling):")
print(X_standard[:5])
```

```
Min-Max Scaled Data (Normalization):
[[0.25454545 0.66666667 0.15254237 0.29166667]
 [0.26909091 0.51190476 0.23728814 0.30555556]
 [0.29818182 0.58333333 0.38983051 0.15277778]
 [0.42988836 0.48228209 0.49008821 0.417154  ]
 [0.16727273 0.73809524 0.3559322  0.20833333]]

Standardized Data (Z-score Scaling):
[[-8.87081226e-01  7.87742515e-01 -1.42248782e+00 -5.65789211e-01]
 [-8.13493989e-01  1.26556330e-01 -1.06535169e+00 -5.03167881e-01]
 [-6.66319516e-01  4.31719184e-01 -4.22506659e-01 -1.19200251e+00]
 [-1.30717191e-15  1.80692708e-15  0.00000000e+00  0.00000000e+00]
 [-1.32860464e+00  1.09290537e+00 -5.65361110e-01 -9.41517191e-01]]
```

11. Split the data into training and testing

In [32]:

```
from sklearn.model_selection import train_test_split
# Define the target variable (dependent variable)
target_variable = 'species'

# Create a DataFrame containing only the independent variables (features)
X = df.drop(columns=[target_variable, 'island', 'sex'])  # Exclude non-numeri

# Create a Series containing the target variable
y = df[target_variable]

# Split the data into training and testing sets (e.g., 80% training, 20% testi
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, rand
```

12.check the training and testing data shape

In [33]:

```
print("Shape of X_train:", X_train.shape)
print("Shape of X_test:", X_test.shape)
print("Shape of y_train:", y_train.shape)
print("Shape of y_test:", y_test.shape)
```

```
Shape of X_train: (275, 4)
Shape of X_test: (69, 4)
Shape of y_train: (275,)
Shape of y_test: (69,)
```

In [ ]: