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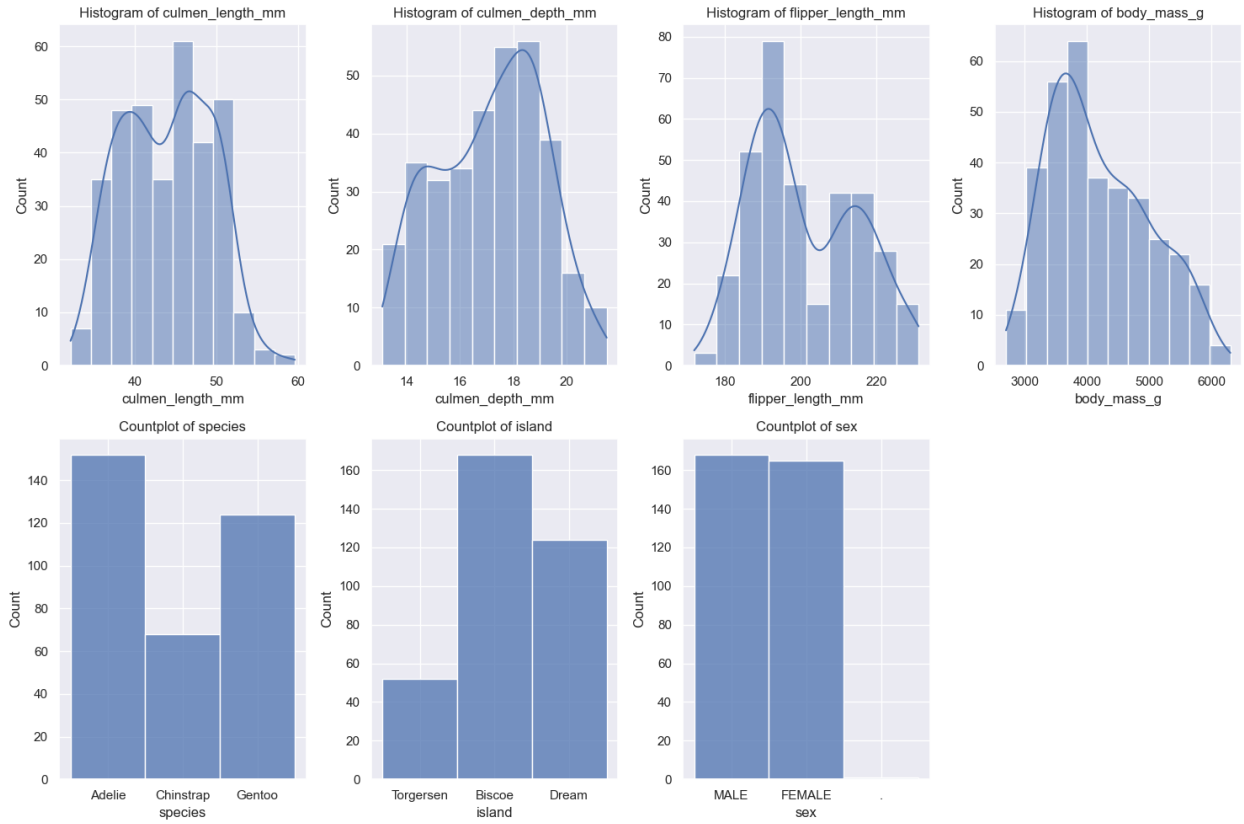
Assignment 3

```
# import necessary libraries
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler, LabelEncoder
from sklearn.metrics import classification_report
from sklearn.cluster import KMeans
from sklearn.ensemble import RandomForestClassifier
from sklearn.svm import SVC

# Task 1: Load the dataset
print("Task 1: Load the dataset")
missing_values = ["", "NA", "N/A", "NaN"]
penguins_data = pd.read_csv('A:\\VIT Bhopal\\AI and ML with
smartbridge google\\penguins_size.csv', na_values=missing_values)
print(penguins_data)

# Task 2: Univariate Analysis
print("\n\n\n\nTask 2: Univariate Analysis")
sns.set(style="darkgrid")
plt.figure(figsize=(15, 10))

# Histograms for numeric attributes
numeric_attributes = ["culmen_length_mm", "culmen_depth_mm",
"flipper_length_mm", "body_mass_g"]
for i, col in enumerate(numeric_attributes, 1):
    plt.subplot(2, 4, i)
    sns.histplot(data=penguins_data, x=col, kde=True)
    plt.title(f'Histogram of {col}')

# Countplots for categorical attributes
categorical_attributes = ["species", "island", "sex"]
for i, col in enumerate(categorical_attributes, 1):
    plt.subplot(2, 4, i + 4)
    sns.histplot(data=penguins_data, x=col)
    plt.title(f'Countplot of {col}')

plt.tight_layout()
plt.show()
```

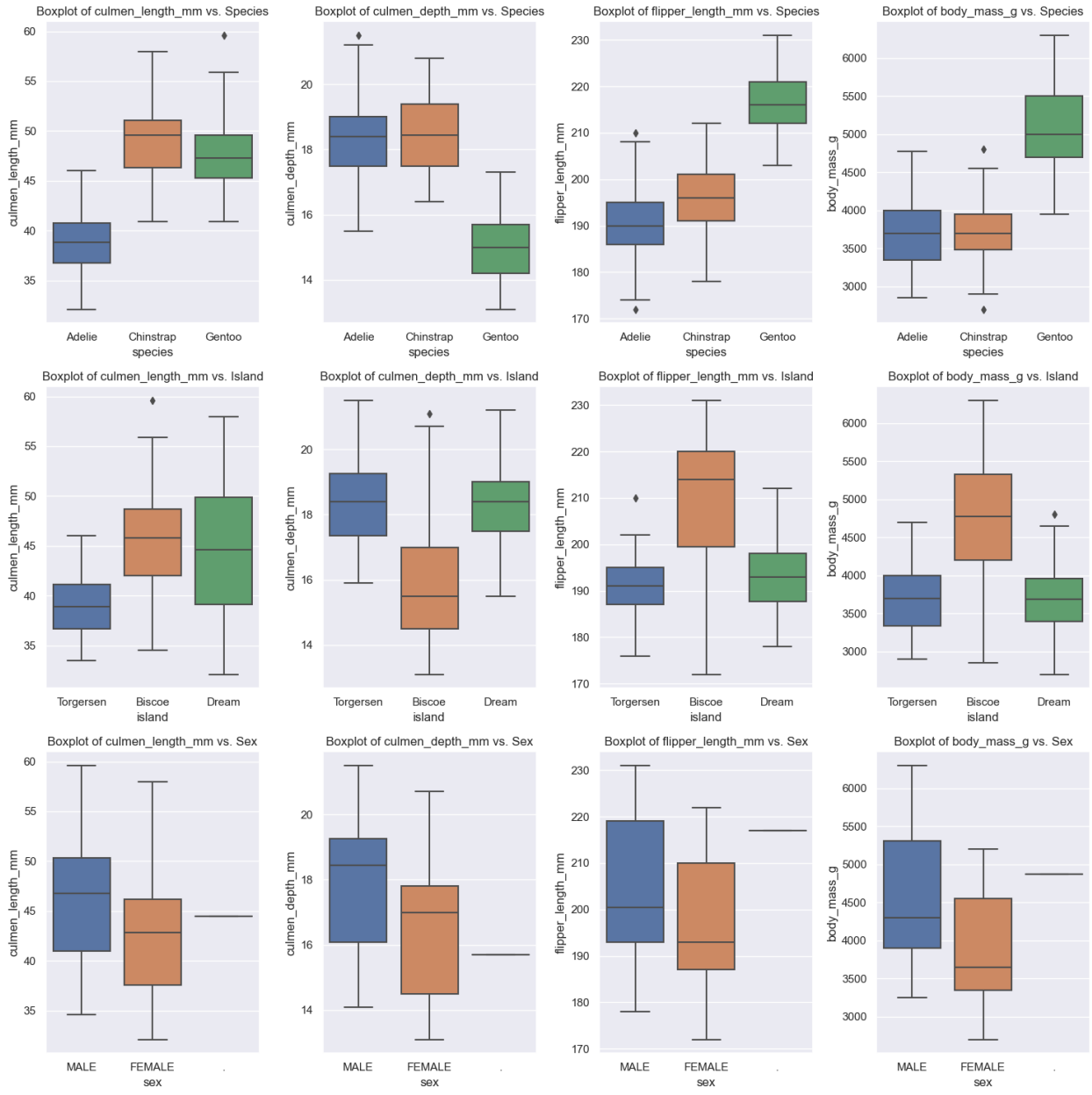
```
Task 1: Load the dataset
    species     island  culmen_length_mm  culmen_depth_mm
flipper_length_mm  \
0    Adelie  Torgersen              39.1              18.7
181.0
```

```
1    Adelie  Torgersen              39.5              17.4
186.0
2    Adelie  Torgersen              40.3              18.0
195.0
3    Adelie  Torgersen               NaN               NaN
NaN
4    Adelie  Torgersen              36.7              19.3
193.0
..      ...        ...               ...               ...
...
339  Gentoo     Biscoe               NaN               NaN
NaN
340  Gentoo     Biscoe              46.8              14.3
215.0
341  Gentoo     Biscoe              50.4              15.7
222.0
342  Gentoo     Biscoe              45.2              14.8
212.0
343  Gentoo     Biscoe              49.9              16.1
213.0

     body_mass_g     sex
0         3750.0    MALE
1         3800.0  FEMALE
2         3250.0  FEMALE
3            NaN     NaN
4         3450.0  FEMALE
..           ...     ...
339          NaN     NaN
340       4850.0  FEMALE
341       5750.0    MALE
342       5200.0  FEMALE
343       5400.0    MALE

[344 rows x 7 columns]



Task 2: Univariate Analysis
```




```
# Task 3: Bivariate Analysis
print("Task 3: Bivariate Analysis\n\n\n\n")
# numeric_attributes are "culmen_length_mm", "culmen_depth_mm",
"flipper_length_mm", "body_mass_g"
# (species vs. numeric_attributes)
plt.figure(figsize=(15, 15))
for i, col in enumerate(numeric_attributes, 1):
    plt.subplot(3, 4, i)
    sns.boxplot(data=penguins_data, x="species", y=col)
    plt.title(f'Boxplot of {col} vs. Species')

# (island vs. numeric_attributes)
for i, col in enumerate(numeric_attributes, 1):
    plt.subplot(3, 4, i + 4)
    sns.boxplot(data=penguins_data, x="island", y=col)
    plt.title(f'Boxplot of {col} vs. Island')

# (sex vs. numeric_attributes)
for i, col in enumerate(numeric_attributes, 1):
    plt.subplot(3, 4, i + 8)
    sns.boxplot(data=penguins_data, x="sex", y=col)
    plt.title(f'Boxplot of {col} vs. Sex')

plt.tight_layout()
plt.show()
```

## Task 3: Bivariate Analysis

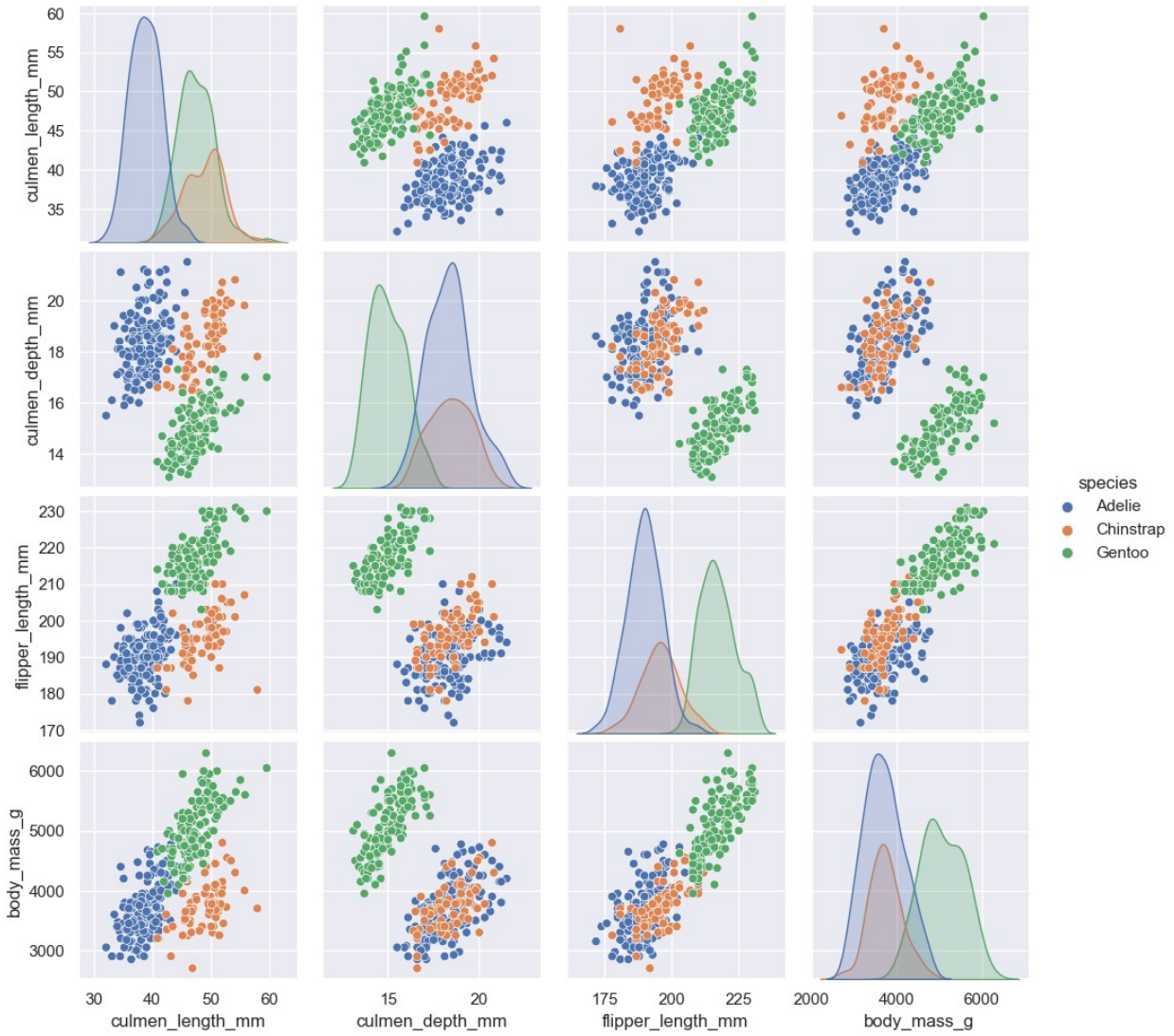


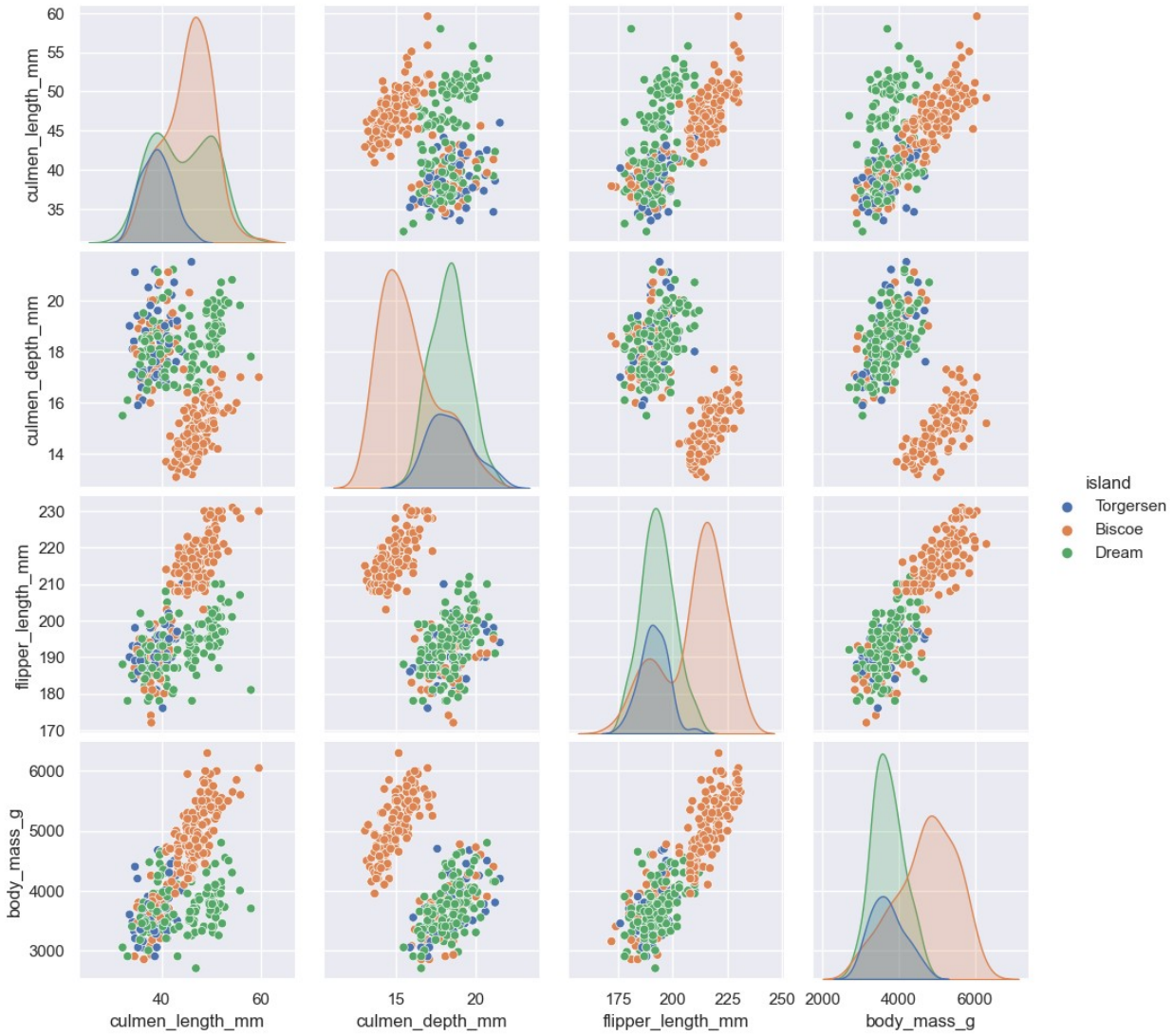

```
# Task 4: Multivariate Analysis
print("Task 4: Multivariate Analysis\n\n\n\n")

plt.figure(figsize=(5, 5))
sns.pairplot(data=penguins_data, hue="species", diag_kind="kde")
plt.show()
```

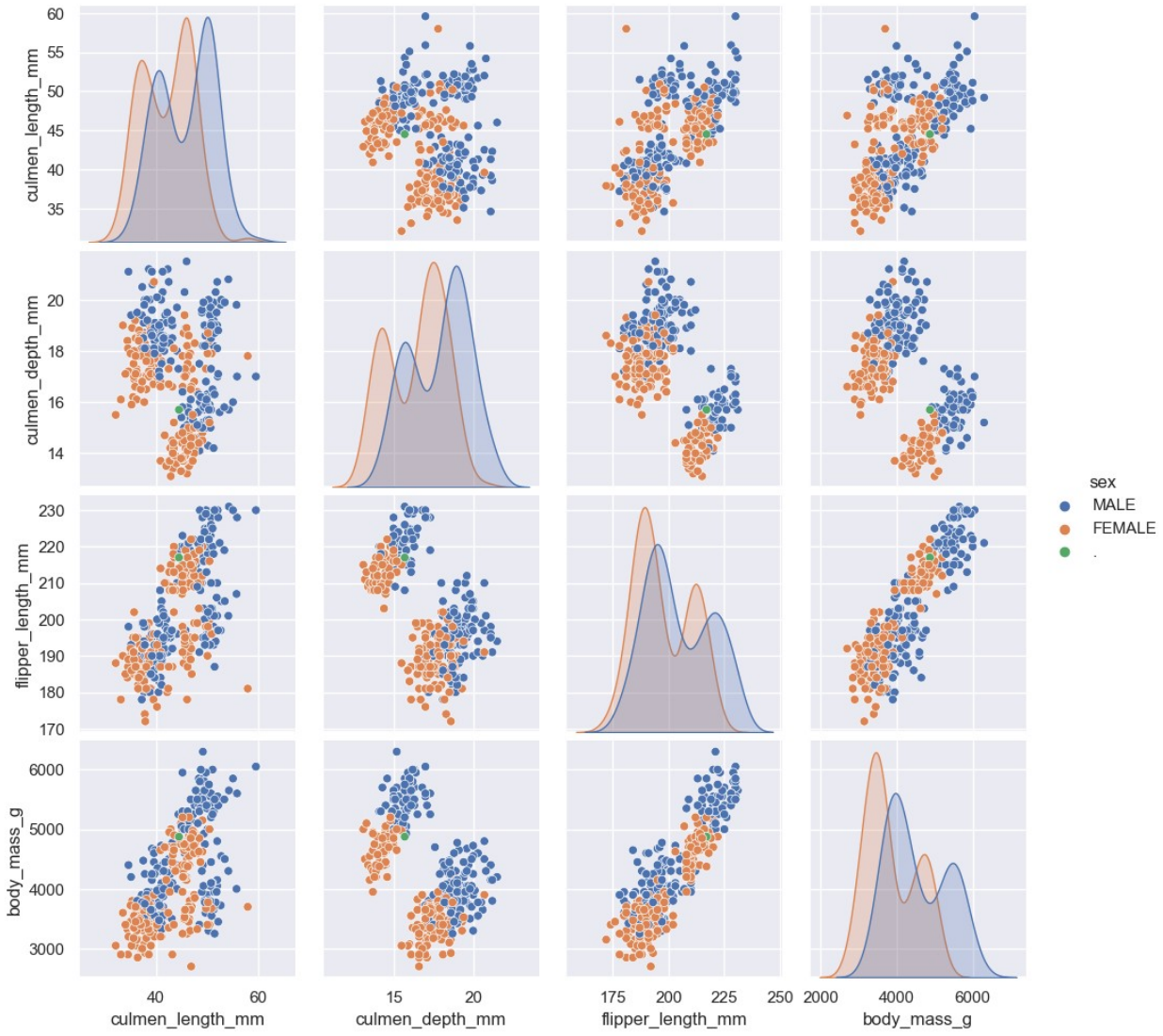
```
sns.pairplot(data=penguins_data, hue="island", diag_kind="kde")
plt.show()

sns.pairplot(data=penguins_data, hue="sex", diag_kind="kde")
plt.show()
```

Task 4: Multivariate Analysis

```
<Figure size 500x500 with 0 Axes>
```




culmen_length_mm
culmen_depth_mm
flipper_length_mm
body_mass_g
island
Torgersen
Biscoe
Dream




```
# Task 5: Descriptive Statistics
missing_values = ["", "NA", "N/A", "NaN"]
penguins_data = pd.read_csv('A:\\VIT Bhopal\\AI and ML with
smartbridge google\\penguins_size.csv', na_values=missing_values)

print("Task 5: Descriptive statistics of dataset:\n\n\n\n")
descriptive_stats = penguins_data.describe()
print(descriptive_stats)
```

```
Task 5: Descriptive statistics of dataset:



       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
```

```
# Task 6: Handle Missing Values
missing_values = ["", "NA", "N/A", "NaN"]
penguins_data = pd.read_csv('A:\\VIT Bhopal\\AI and ML with
smartbridge google\\penguins_size.csv', na_values=missing_values)

print("Task 6: Handle Missing Values\n\n\n\n")
missing_values = penguins_data.isnull().sum()
# drop rows with missing value
print("Dataset after dropping rows with missing values")
penguins_data.dropna()
```

```
Task 6: Handle Missing Values
```

```
Dataset after dropping rows with missing values
```

```
    species     island  culmen_length_mm  culmen_depth_mm
flipper_length_mm  \
0    Adelie  Torgersen              39.1             18.7
181.0
1    Adelie  Torgersen              39.5             17.4
186.0
2    Adelie  Torgersen              40.3             18.0
195.0
4    Adelie  Torgersen              36.7             19.3
193.0
5    Adelie  Torgersen              39.3             20.6
190.0
..      ...        ...               ...              ...
...
338  Gentoo     Biscoe              47.2             13.7
214.0
```

```
340  Gentoo     Biscoe              46.8              14.3
215.0
341  Gentoo     Biscoe              50.4              15.7
222.0
342  Gentoo     Biscoe              45.2              14.8
212.0
343  Gentoo     Biscoe              49.9              16.1
213.0

     body_mass_g     sex
0         3750.0    MALE
1         3800.0  FEMALE
2         3250.0  FEMALE
4         3450.0  FEMALE
5         3650.0    MALE
..           ...     ...
338       4925.0  FEMALE
340       4850.0  FEMALE
341       5750.0    MALE
342       5200.0  FEMALE
343       5400.0    MALE

[334 rows x 7 columns]
```

```python
# Task 7: Find the outliers and replace them
missing_values = ["", "NA", "N/A", "NaN"]
penguins_data = pd.read_csv('A:\\VIT Bhopal\\AI and ML with
smartbridge google\\penguins_size.csv', na_values=missing_values)

print("Task 7: Find the outliers and replace them\n\n\n\n")
i = 1
def replace_outliers_with_mean(data, column, z_threshold=3):
        z_scores = (data[column] - data[column].mean()) /
data[column].std()
        data.loc[np.abs(z_scores) > z_threshold, column] =
data[column].mean()
        if i == 4:
            print(data)

columns_to_check = ['culmen_length_mm', 'culmen_depth_mm',
'flipper_length_mm', 'body_mass_g']

for col in columns_to_check:
    replace_outliers_with_mean(penguins_data, col)
    i = i + 1
```

```
Task 7: Find the outliers and replace them
```

```
    species     island  culmen_length_mm  culmen_depth_mm
flipper_length_mm  \
0    Adelie  Torgersen              39.1             18.7
181.0
1    Adelie  Torgersen              39.5             17.4
186.0
2    Adelie  Torgersen              40.3             18.0
195.0
3    Adelie  Torgersen               NaN              NaN
NaN
4    Adelie  Torgersen              36.7             19.3
193.0
..      ...        ...               ...              ...
...
339  Gentoo     Biscoe               NaN              NaN
NaN
340  Gentoo     Biscoe              46.8             14.3
215.0
341  Gentoo     Biscoe              50.4             15.7
222.0
342  Gentoo     Biscoe              45.2             14.8
212.0
343  Gentoo     Biscoe              49.9             16.1
213.0

     body_mass_g     sex
0         3750.0    MALE
1         3800.0  FEMALE
2         3250.0  FEMALE
3            NaN     NaN
4         3450.0  FEMALE
..           ...     ...
339          NaN     NaN
340       4850.0  FEMALE
341       5750.0    MALE
342       5200.0  FEMALE
343       5400.0    MALE

[344 rows x 7 columns]
```

```python
# Task 8: Check the correlation of independent variables with the
target
missing_values = ["", "NA", "N/A", "NaN"]
penguins_data = pd.read_csv('A:\\VIT Bhopal\\AI and ML with
smartbridge google\\penguins_size.csv', na_values=missing_values)

print("Task 8: Check the correlation of independent variables with the
target\n\n\n\n")
target_variable = 'body_mass_g'
numerical_features = ['culmen_length_mm',
```

```
'culmen_depth_mm','flipper_length_mm']

correlations =
penguins_data[numerical_features].corrwith(penguins_data[target_variab
le])
# Print the correlations
print("Correlation with the target variable:")
print(correlations)
```

```
Task 8: Check the correlation of independent variables with the target
```

```
Correlation with the target variable:
culmen_length_mm     0.595110
culmen_depth_mm     -0.471916
flipper_length_mm    0.871202
dtype: float64
```

```
# Task 9: Check for Categorical columns and perform encoding
missing_values = ["", "NA", "N/A", "NaN"]
penguins_data = pd.read_csv('A:\\VIT Bhopal\\AI and ML with
smartbridge google\\penguins_size.csv', na_values=missing_values)

print("Task 9: Check for Categorical columns and perform encoding\n\n\
n\n")

# Identify categorical columns
categorical_columns = penguins_data.select_dtypes(include=['object',
'category']).columns.tolist()

# Perform encoding based on the type of categorical variable
for column in categorical_columns: unique_values =
penguins_data[column].nunique()
# If the number of unique values is low (indicating ordinal
categorical),use label encoding
if unique_values <= 10:
    label_encoder = LabelEncoder()
    penguins_data[column] =
label_encoder.fit_transform(penguins_data[column])
else:
# Use one-hot encoding for nominal categorical variables
    penguins_data = pd.get_dummies(penguins_data, columns=[column],
drop_first=True)
# Display the data after encoding
print(penguins_data)
```

```
Task 9: Check for Categorical columns and perform encoding
```

```
    species     island  culmen_length_mm  culmen_depth_mm
flipper_length_mm  \
0    Adelie  Torgersen              39.1             18.7
181.0
1    Adelie  Torgersen              39.5             17.4
186.0
2    Adelie  Torgersen              40.3             18.0
195.0
3    Adelie  Torgersen               NaN              NaN
NaN
4    Adelie  Torgersen              36.7             19.3
193.0
..      ...        ...               ...              ...
...
339  Gentoo     Biscoe               NaN              NaN
NaN
340  Gentoo     Biscoe              46.8             14.3
215.0
341  Gentoo     Biscoe              50.4             15.7
222.0
342  Gentoo     Biscoe              45.2             14.8
212.0
343  Gentoo     Biscoe              49.9             16.1
213.0

     body_mass_g  sex
0         3750.0    2
1         3800.0    1
2         3250.0    1
3            NaN    3
4         3450.0    1
..           ...  ...
339          NaN    3
340       4850.0    1
341       5750.0    2
342       5200.0    1
343       5400.0    2

[344 rows x 7 columns]
```

```
#Task 10: Split the data into dependent and independent variables.
missing_values = ["", "NA", "N/A", "NaN"]
penguins_data = pd.read_csv('A:\\VIT Bhopal\\AI and ML with
smartbridge google\\penguins_size.csv', na_values=missing_values)

print("Task 10: Split the data into dependent and independent
variables.\n\n\n\n")
# Define the dependent variable (target) and independent variables
```

```
(features)
target_column = 'species'
# Create a DataFrame for the dependent variable (target)
y = penguins_data[target_column]
# Create a DataFrame for the independent variables (features) by
dropping the target column
X = penguins_data.drop(columns=[target_column])
# Display the data after splitting
print("Dependent Variable (Target - y):")
print(y.head())
print("\nIndependent Variables (Features - X):")
print(X.head())
```

```
Task 10: Split the data into dependent and independent variables.
```

```
Dependent Variable (Target - y):
0    Adelie
1    Adelie
2    Adelie
3    Adelie
4    Adelie
Name: species, dtype: object

Independent Variables (Features - X):
      island  culmen_length_mm  culmen_depth_mm  flipper_length_mm  \
0  Torgersen              39.1             18.7              181.0
1  Torgersen              39.5             17.4              186.0
2  Torgersen              40.3             18.0              195.0
3  Torgersen               NaN              NaN                NaN
4  Torgersen              36.7             19.3              193.0

   body_mass_g     sex
0       3750.0    MALE
1       3800.0  FEMALE
2       3250.0  FEMALE
3          NaN     NaN
4       3450.0  FEMALE
```

```
# Task 11: Scaling the Data
missing_values = ["", "NA", "N/A", "NaN"]
penguins_data = pd.read_csv('A:\\VIT Bhopal\\AI and ML with
smartbridge google\\penguins_size.csv', na_values=missing_values)

print("Task 11: Scaling the Data\n\n\n\n")
# Identify categorical columns
categorical_columns = penguins_data.select_dtypes(include=['object',
'category']).columns.tolist()
```

```
# Perform encoding for categorical columns
label_encoders = {}
for column in categorical_columns:
    le = LabelEncoder()
    penguins_data[column] = le.fit_transform(penguins_data[column])
    label_encoders[column] = le

target_column = 'species'

# DataFrame for the dependent variable (target)
y = penguins_data[target_column]

# DataFrame for the independent variables (features) by dropping the
target column
X = penguins_data.drop(columns=[target_column])

# Scale only the numeric columns using StandardScaler
numeric_columns =
X.select_dtypes(include=[np.number]).columns.tolist()
scaler = StandardScaler()
X[numeric_columns] = scaler.fit_transform(X[numeric_columns])

# Display the data after all tasks, including scaling print("Data
After All Tasks:")
print(penguins_data)
```

```
Task 11: Scaling the Data
```

```
     species  island  culmen_length_mm  culmen_depth_mm
flipper_length_mm  \
0          0       2              39.1             18.7
181.0
1          0       2              39.5             17.4
186.0
2          0       2              40.3             18.0
195.0
3          0       2               NaN              NaN
NaN
4          0       2              36.7             19.3
193.0
..       ...     ...               ...              ...
...
339        2       0               NaN              NaN
NaN
340        2       0              46.8             14.3
215.0
341        2       0              50.4             15.7
```

```
222.0
342         2       0               45.2              14.8
212.0
343         2       0               49.9              16.1
213.0

     body_mass_g  sex
0         3750.0    2
1         3800.0    1
2         3250.0    1
3            NaN    3
4         3450.0    1
..           ...  ...
339          NaN    3
340       4850.0    1
341       5750.0    2
342       5200.0    1
343       5400.0    2

[344 rows x 7 columns]
```

```
#Task 12: Split the data into training and testing
missing_values = ["", "NA", "N/A", "NaN"]
penguins_data = pd.read_csv('A:\\VIT Bhopal\\AI and ML with
smartbridge google\\penguins_size.csv', na_values=missing_values)

print("Task 12: Split the data into training and testing\n\n\n\n")
X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.2, random_state=42)

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

```
Task 12: Split the data into training and testing



X_train shape: (275, 6)
X_test shape: (69, 6)
y_train shape: (275,)
y_test shape: (69,)
```

```
#Task 13: check the training and testing data shape.
missing_values = ["", "NA", "N/A", "NaN"]
penguins_data = pd.read_csv('A:\\VIT Bhopal\\AI and ML with
smartbridge google\\penguins_size.csv', na_values=missing_values)

print("Task 13: check the training and testing data shape.\n\n\n\n")
```

```python
print("Training Data Shapes:")
print("X_train shape:", X_train.shape)
print("y_train shape:", y_train.shape)

print("\nTesting Data Shapes:")
print("X_test shape:", X_test.shape)
print("y_test shape:", y_test.shape)
```

Task 13: check the training and testing data shape.

```
Training Data Shapes:
X_train shape: (275, 6)
y_train shape: (275,)

Testing Data Shapes:
X_test shape: (69, 6)
y_test shape: (69,)
```