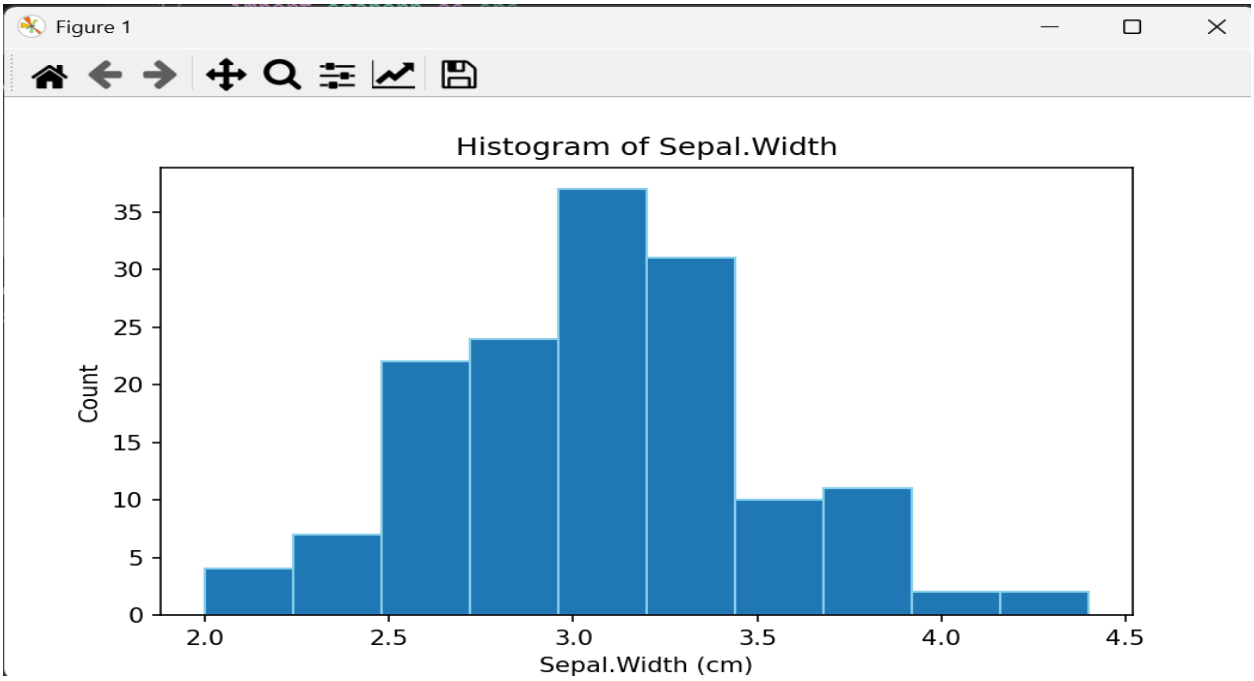
Week 3 - Assignment #1

```
from sklearn import datasets
iris = datasets.load_iris()

import pandas as pd
data = { "weight": [4.17, 5.58, 5.18, 6.11, 4.50, 4.61, 5.17, 4.53, 5.33, 5.14, 4.81, 4.17, 4.41, 3.59,
5.87, 3.83, 6.03, 4.89, 4.32, 4.69, 6.31, 5.12, 5.54, 5.50, 5.37, 5.29, 4.92, 6.15, 5.80, 5.26],
"group": ["ctrl"] * 10 + ["trt1"] * 10 + ["trt2"] * 10}
PlantGrowth = pd.DataFrame(data)

print(iris)       # View/Check datasets
print(iris.keys()) # All Dictionary Keys

# ********************************
# 1. Using the iris dataset...
# 1.a - Make a histogram of the variable Sepal.Width.
# ********************************
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np

# Convert iris to DataFrame
iris_df = pd.DataFrame(iris.data, columns=iris.feature_names)
iris_df["species"] = iris.target

plt.figure(figsize=(7,4))
plt.hist(iris_df["sepal width (cm)"], bins=10, edgecolor="skyblue")
plt.title("Histogram of Sepal.Width")
plt.xlabel("Sepal.Width (cm)")
plt.ylabel("Count")
plt.show()
```



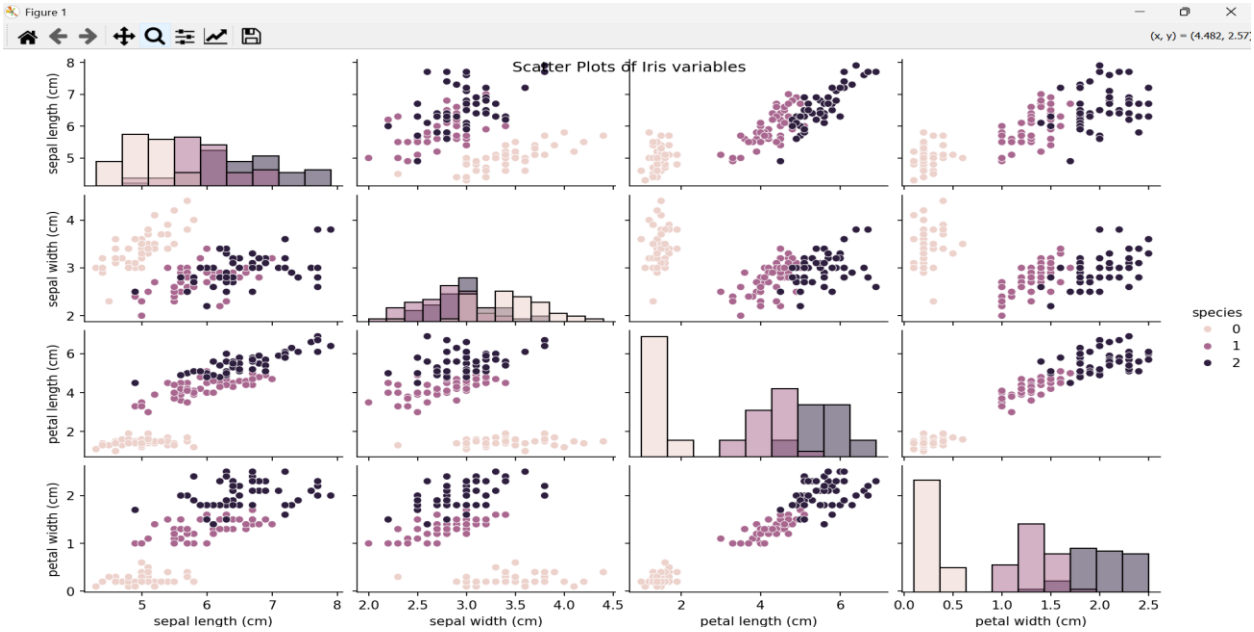

```
# ********************************
# 1.b - Based on the histogram from #1a, which would you expect to be higher, the mean or the median? Why?
# ********************************
"""
If the histogram is left-skewed(tail to the left): Mean < Median.
If right-skewed(tail to the right): Mean > Median.
If symmetric: Mean=Median.
Observation:
Looking at histogram, the Sepal.Width has longer tail on the right (right-skewed), the mean will be greater than Median.
"""

# ********************************
# 1.c - Confirm your answer to #1b by actually finding these values.
# ********************************
mean_val = iris_df["sepal width (cm)"].mean()
median_val = iris_df["sepal width (cm)"].median()
print(f"Mean:{mean_val:.2f},Median:{median_val:.2f}")
```

```
Mean:3.06,Median:3.00
PS C:\Users\13024>
```

```
# ********************************
# 1.d - Only 27% of the flowers have a Sepal.Width higher than _____ cm.
# ********************************
threshold = iris_df["sepal width (cm)"].quantile(1-0.27)
print(f"Only 27% of the flowers have a Sepal.Width higher than {threshold:.2f} cm.")
```

```
Mean:3.06,Median:3.00
Only 27% of the flowers have a Sepal.Width higher than 3.30 cm.
PS C:\Users\13024>
```

```
# ********************************
# 1.e - Make scatterplots of each pair of the numerical variables in iris (There should be 6 pairs/plots).
# ********************************
sns.pairplot(iris_df, vars=iris.feature_names, hue="species", diag_kind="hist")
plt.suptitle("Scatter Plots of Iris variables")
plt.show()
"""
There are 6 pairs:
Sepal.Length vs Sepal.Width
Sepal.Length vs Petal.Length
Sepal.Length vs Petal.Width
Sepal.Width vs Petal.Length
Sepal.Width vs Petal.Width
Petal.Length vs Petal.Width
"""
```



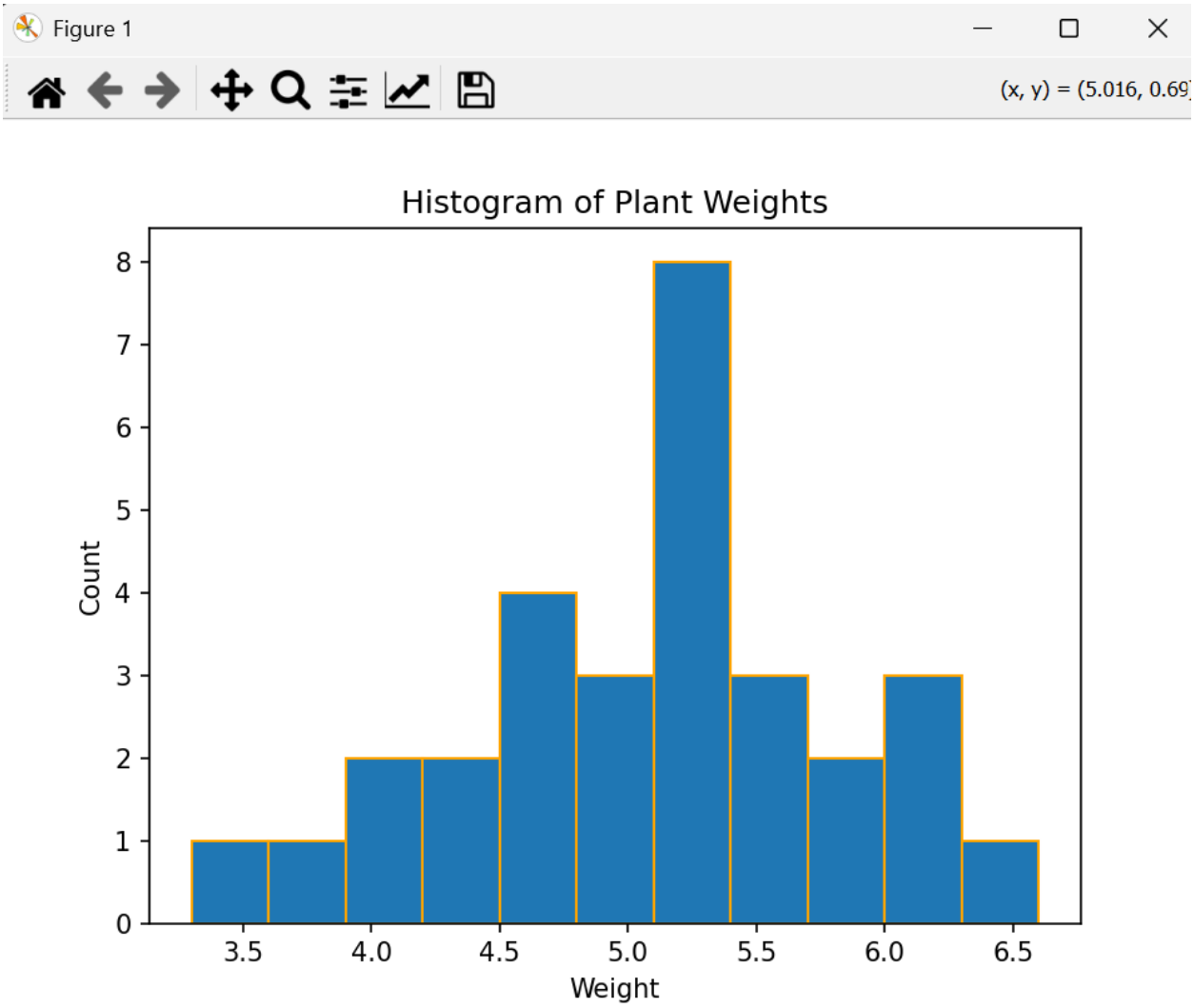
****
1.f - Based on #1e, which two variables appear to have the strongest relationship? And which two appear to have the weakest relationship?
****
"""
Strongest: Petal.Length vs Petal.Width (usually tight linear relationship)
Weakest: Sepal.Width vs Sepal.Length (often more scattered)
"""

```
corr=iris_df.corr()
print(corr)
```

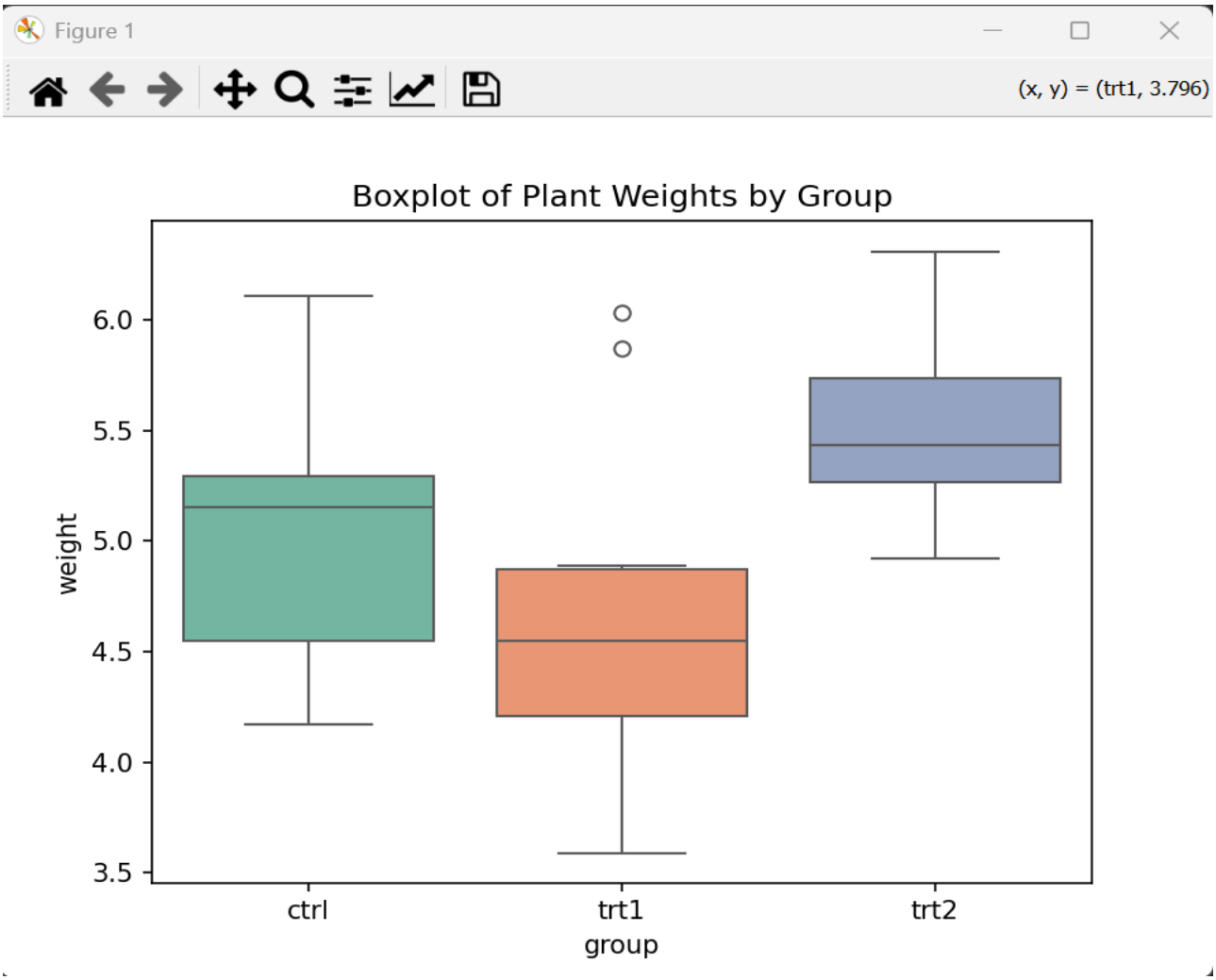
	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	species
sepal length (cm)	1.000000	-0.117570	0.871754	0.817941	0.782561
sepal width (cm)	-0.117570	1.000000	-0.428440	-0.366126	-0.426658
petal length (cm)	0.871754	-0.428440	1.000000	0.962865	0.949035
petal width (cm)	0.817941	-0.366126	0.962865	1.000000	0.956547
species	0.782561	-0.426658	0.949035	0.956547	1.000000

****
#2. Using the PlantGrowth dataset...
2.a - Make a histogram of the variable weight with breakpoints (bin edges) at every 0.3 units, starting at 3.3.
****

```
print(PlantGrowth)       # View/Check datasets
bins = np.arange(3.3, PlantGrowth["weight"].max() + 0.3, 0.3)
plt.hist(PlantGrowth["weight"], bins=bins, edgecolor="orange")
plt.title("Histogram of Plant Weights")
plt.xlabel("Weight")
plt.ylabel("Count")
plt.show()
```




```
# ********************************
# 2.b - Make boxplots of weight separated by group in a single graph.
# ********************************
sns.boxplot(x="group", y="weight", data=PlantGrowth, palette="Set2")
plt.title("Boxplot of Plant Weights by Group")
plt.show()
```




```
# ********************************
# 2.c - Based on the boxplots in #2b, approximately what percentage of the "trt1" weights are below the minimum "trt2" weight?
# ********************************
"""
Look at box plot,
Find minimum value for “trt2” (bottom whisker)
Estimate how many “trt1” values are below this value
"""
min_trt2 = PlantGrowth[PlantGrowth['group']=="trt2"]["weight"].min()
approx_val = min_trt2
print(f"Definately more than 50% as minimum value for trt2 is: {approx_val:.2f}")
```

```
Definately more than 50% as minimum value for trt2 is: 4.92
Percentage: 80.00%
```

```
# ********************************
# 2.d - Find the exact percentage of the "trt1" weights that are below the minimum "trt2" weight.
# ********************************
min_trt2 = PlantGrowth[PlantGrowth['group']=="trt2"]["weight"].min()
approx_val = min_trt2
trt1_weights = PlantGrowth[PlantGrowth['group']=="trt1"]["weight"]
below_min = (trt1_weights < min_trt2).sum()
percent_below = below_min/len(trt1_weights) * 100
print(f"Percentage: {percent_below:.2f}%")
```

```
Percentage: 80.00%
```

```
# ********************************
# 2.e - Only including plants with a weight above 5.5, make a barplot of the variable group. Make the barplot colorful using some color palette (in R, try running ?heat.colors and/or check out https://www.r-bloggers.com/palettes-in-r/).
# ********************************
filtered = PlantGrowth[PlantGrowth["weight"] > 5.5]
sns.countplot(x='group', data=filtered, palette='Spectral')
plt.title("Barplot of Groups ( Weight > 5.5)")
plt.show()
```