Chapter2_DataVisualization

October 19, 2023

[ ]:

```
# step 0:
#    py -m pip install seaborn
#    py -m pip install matplotlib

# import pandas
import pandas as pd # alias with a shorter name for reference
import numpy as np
from sklearn.linear_model import LinearRegression


import scipy.stats as st


import seaborn as sns
import matplotlib.pyplot as plt

import warnings
# Suppress all warnings
warnings.filterwarnings("ignore")
```

Visualizing data is always the first step in an analytics project. There are two main libraries in python that are used for data visualization: matplotlib and seaborn. These packages can be used to visualize the Iris dataset.

[ ]:

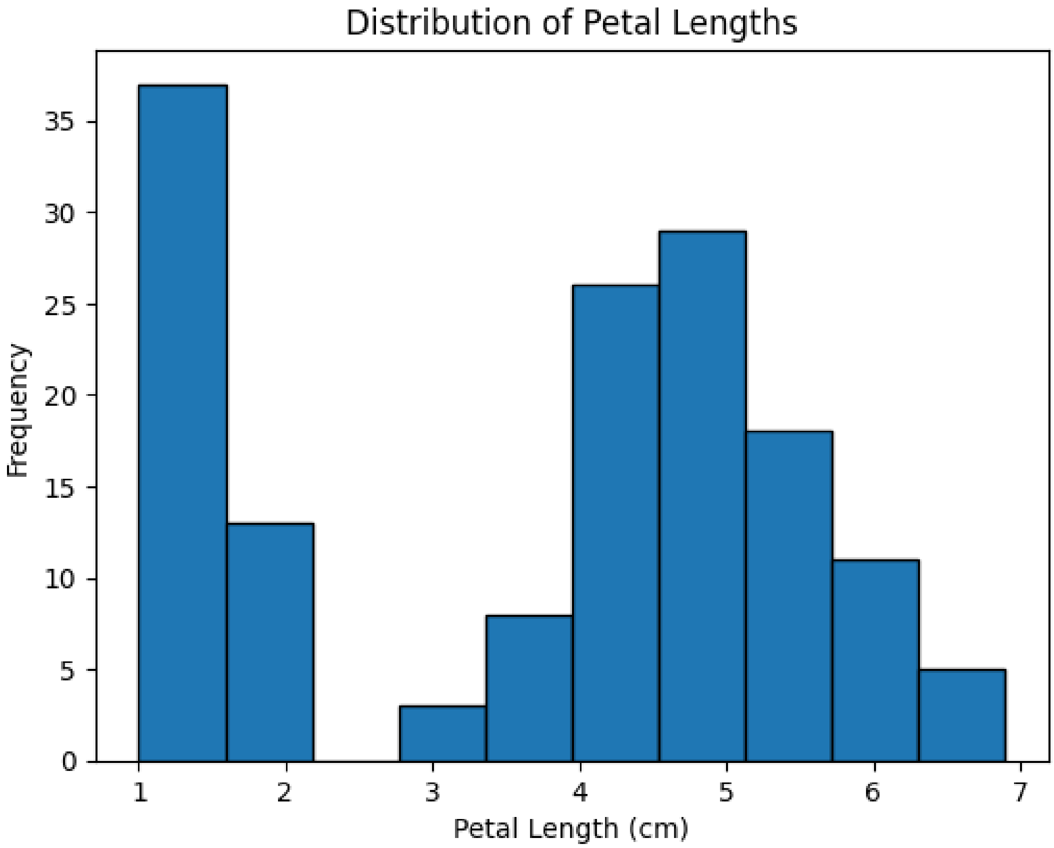
```
# import the iris dataset
path = "/Users/avery/OneDrive/Documents/GitHub/Clinical_TLB_2023-2024/
  ↪Python_for_Data_Science/Iris.csv"

iris_df = pd.read_csv(path)
```

Simple visualizations can be made to easily explore the distribution of each column.

[ ]:

```
plt.hist(iris_df['PetalLengthCm'], edgecolor='black')

# Adding labels and a title
plt.xlabel('Petal Length (cm)')
plt.ylabel('Frequency')
plt.title('Distribution of Petal Lengths')
```

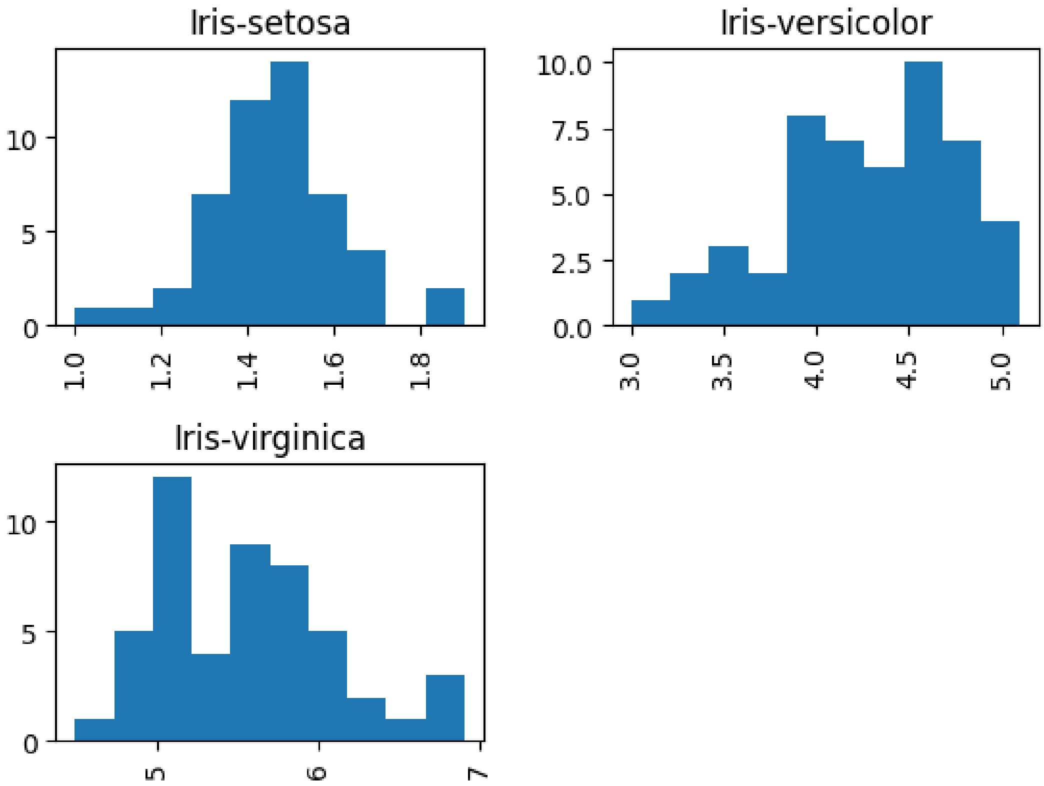
```
[ ]: Text(0.5, 1.0, 'Distribution of Petal Lengths')
```



We can look at petal length for each type like this:

```
[ ]: iris_df.hist(column='PetalLengthCm', by='Species')
```

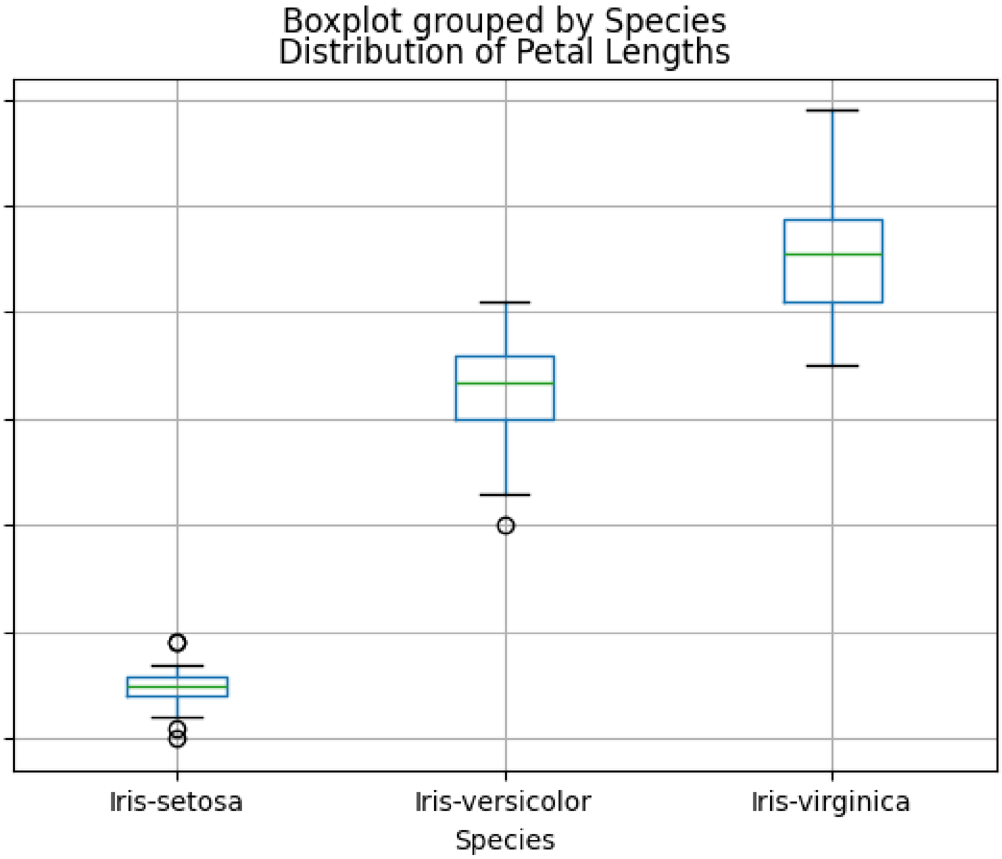
```
[ ]: array([[<Axes: title={'center': 'Iris-setosa'}>,
             <Axes: title={'center': 'Iris-versicolor'}>],
            [<Axes: title={'center': 'Iris-virginica'}>, <Axes: >]],
           dtype=object)
```



Boxplots can be made by using the boxplot method.

```
[ ]: iris_df.boxplot(column='PetalLengthCm', by='Species')
     plt.title('Distribution of Petal Lengths')
```

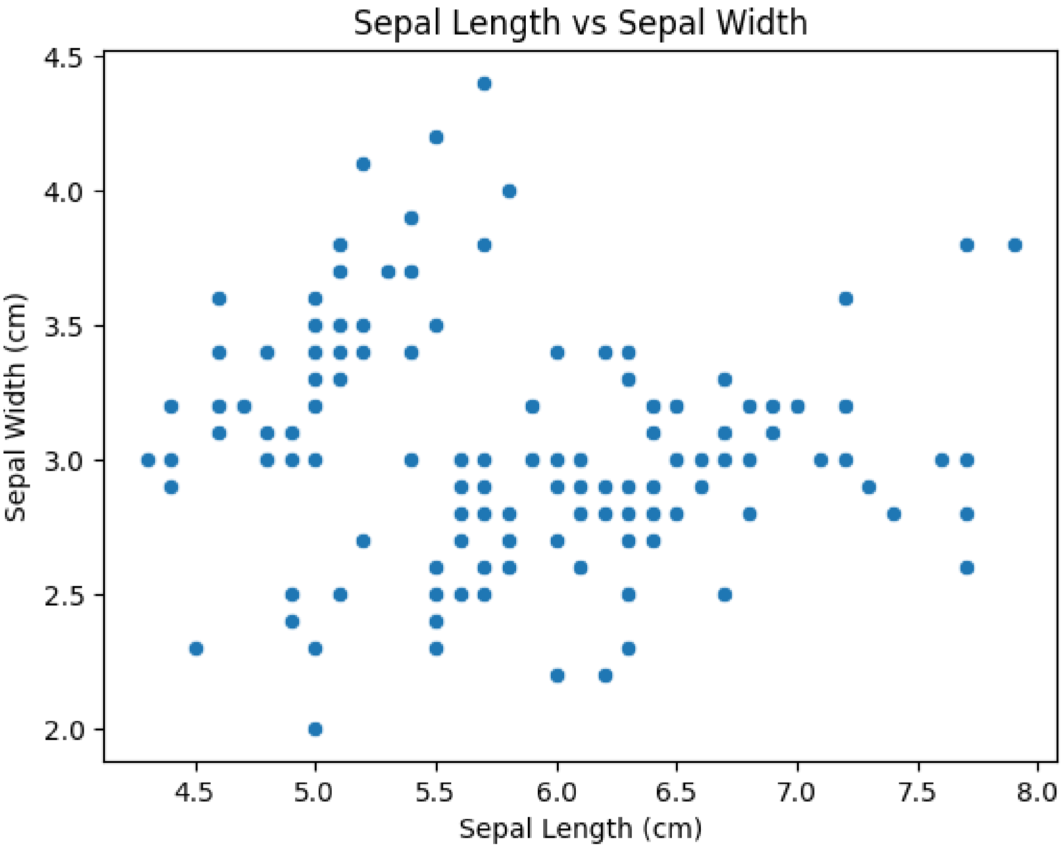
```
[ ]: Text(0.5, 1.0, 'Distribution of Petal Lengths')
```



The seaborn package can also be used. Here is a scatterplot.

```
[ ]: sns.scatterplot(data=iris_df, x='SepalLengthCm', y='SepalWidthCm')

     # Adding labels and a title
     plt.xlabel('Sepal Length (cm)')
     plt.ylabel('Sepal Width (cm)')
     plt.title('Sepal Length vs Sepal Width')
```

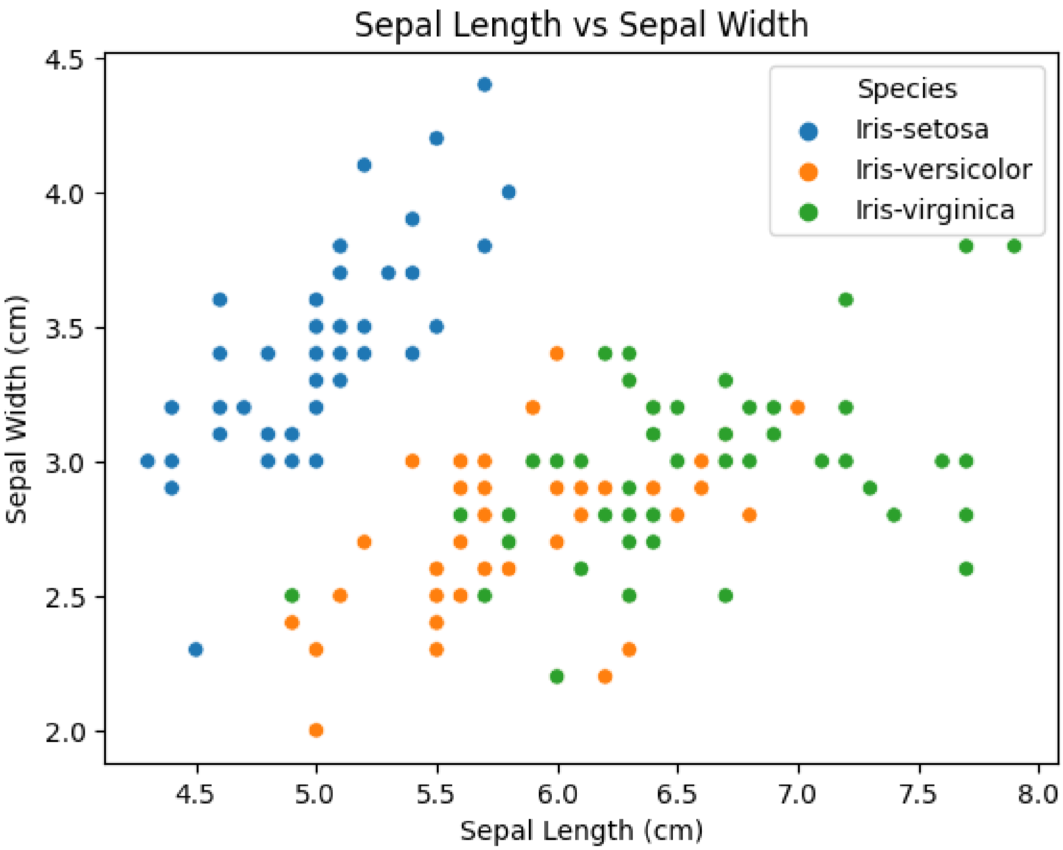
```
[ ]: Text(0.5, 1.0, 'Sepal Length vs Sepal Width')
```



This graph was made my using the scatter function to plot the points, and then the x/y label and title functions to label the axis and include a title. The points on the graph can be colored by the flower type by using the "hue" parameter in the scatterplot function.

```
[ ]: sns.scatterplot(data=iris_df, x='SepalLengthCm', y='SepalWidthCm',␣
      ↪hue='Species')

     # Adding labels and a title
     plt.xlabel('Sepal Length (cm)')
     plt.ylabel('Sepal Width (cm)')
     plt.title('Sepal Length vs Sepal Width')
```

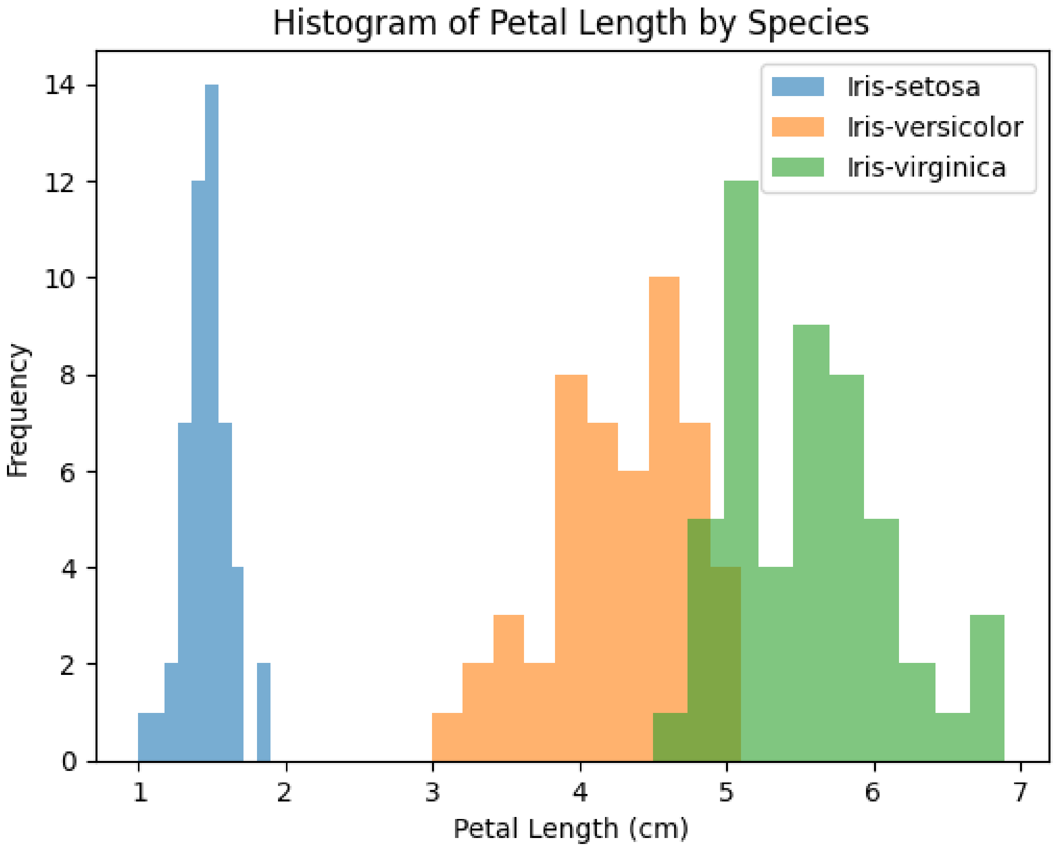
```
[ ]: Text(0.5, 1.0, 'Sepal Length vs Sepal Width')
```



[ ]:

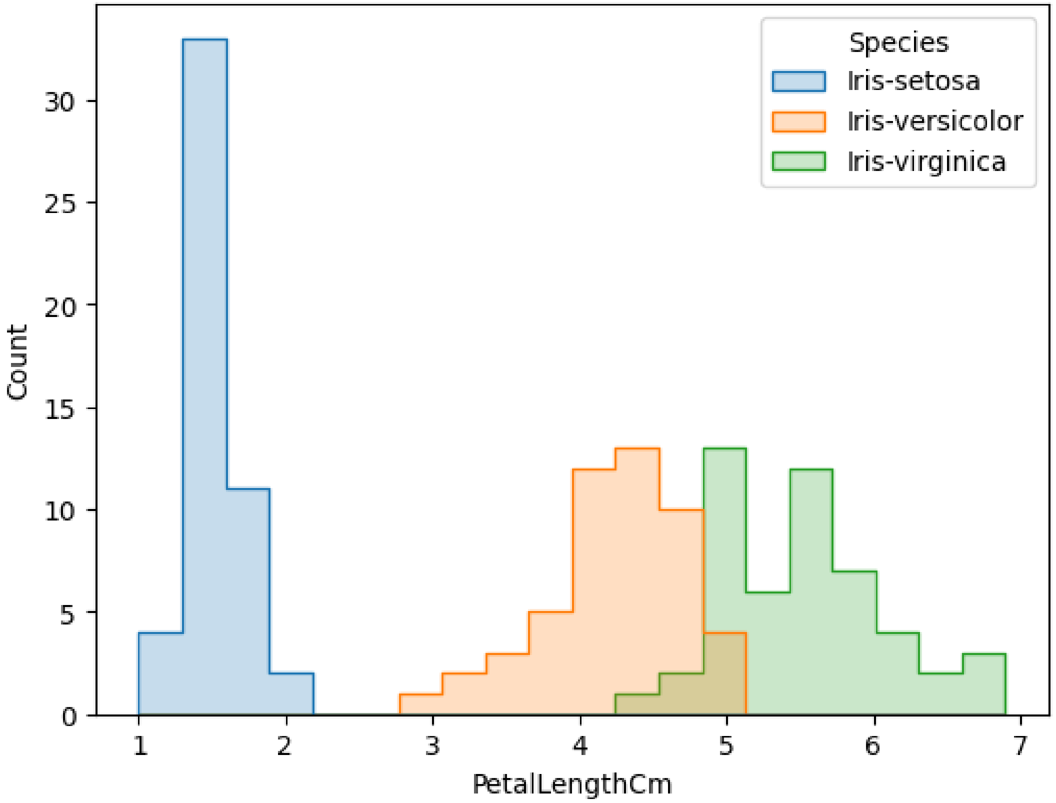
```
# Assuming you have the 'iris_df' DataFrame loaded

# Create a figure and axis
fig, ax = plt.subplots()

# create grouped df for each species type
for species, data in iris_df.groupby('Species'):

    # plot the petal length by species type
    data['PetalLengthCm'].plot(kind='hist', alpha=0.6, ax=ax, label=species)

# Adding labels and a title
ax.set_xlabel('Petal Length (cm)')
ax.set_ylabel('Frequency')
ax.set_title('Histogram of Petal Length by Species')

# Add a legend
ax.legend()
```

```
# Display the plot
plt.show()
```



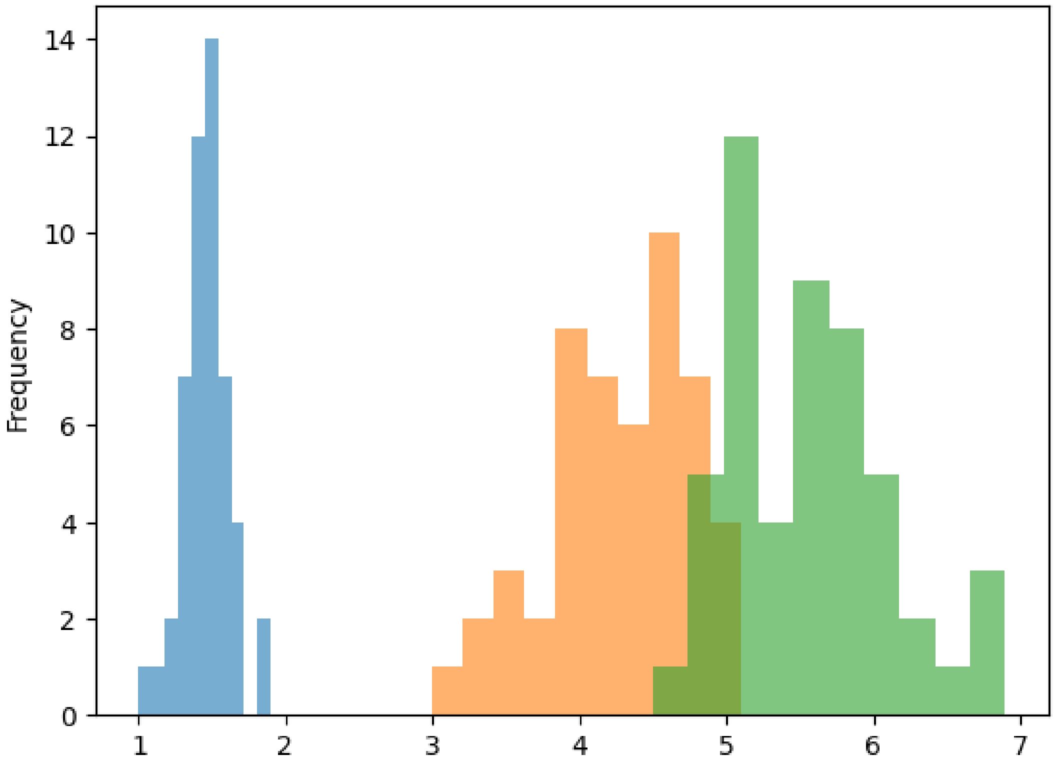
```
[ ]: sns.histplot(data=iris_df, x='PetalLengthCm', hue='Species', bins=20,␣
      ↪element='step', common_norm=False)
```

```
[ ]: <Axes: xlabel='PetalLengthCm', ylabel='Count'>
```



[ ]:

```
fig, ax = plt.subplots()

# Group the data by 'Species' and plot histograms for 'PetalLengthCm'
for species, data in iris_df.groupby('Species'):

    data['PetalLengthCm'].plot(kind='hist', alpha=0.6, ax=ax, label=species)
```



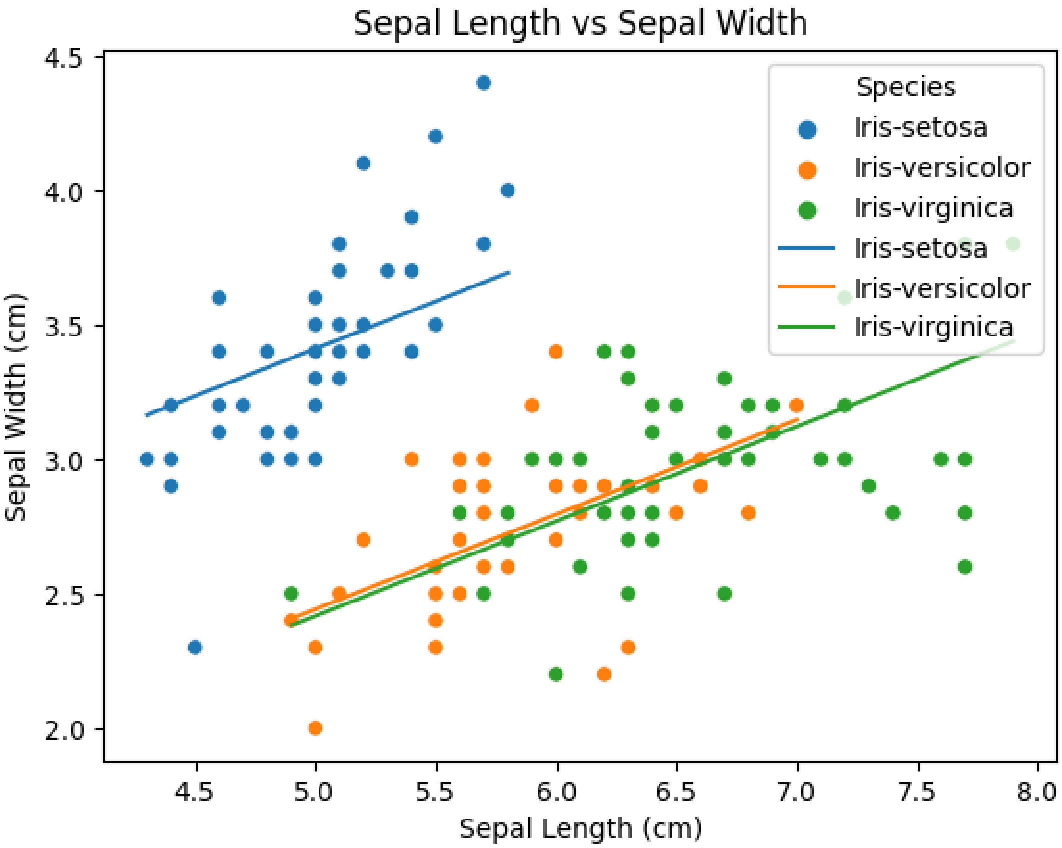
[ ]:

```
# fit a linear model to the sepal widths using sepal length to predict
df = pd.get_dummies(iris_df["Species"])

X = pd.concat([df, iris_df["SepalLengthCm"]], axis=1)

y = iris_df["SepalWidthCm"]  # Dependent variable (PetalLengthCm)

# Create and fit the linear regression model
model = LinearRegression()
model.fit(X, y)

predictions = model.predict(X)
```

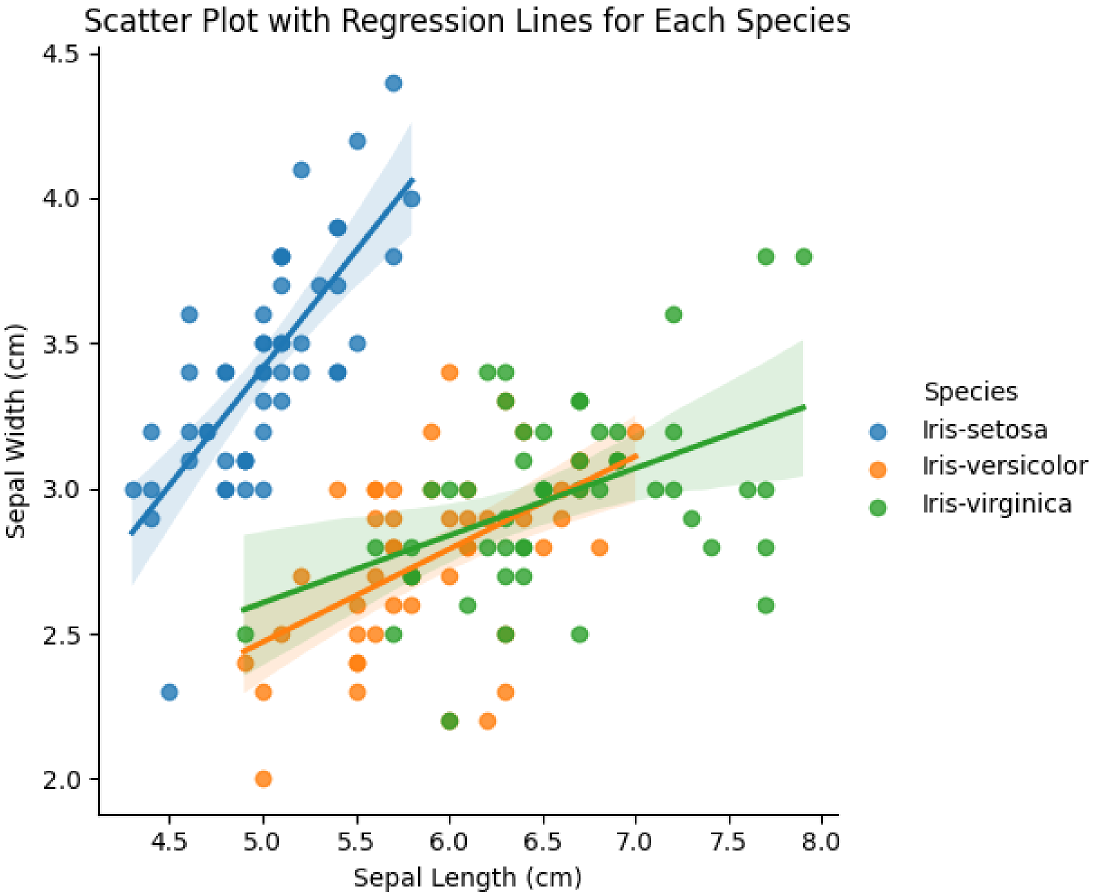
[ ]:

```
sns.scatterplot(data=iris_df, x='SepalLengthCm', y='SepalWidthCm',␣
 ↪hue='Species')
sns.lineplot(data=iris_df, x='SepalLengthCm', y=predictions, hue='Species')

# Adding labels and a title
plt.xlabel('Sepal Length (cm)')
plt.ylabel('Sepal Width (cm)')
plt.title('Sepal Length vs Sepal Width')
```

```
[ ]: Text(0.5, 1.0, 'Sepal Length vs Sepal Width')
```



```
[ ]: # Create a scatter plot with a regression line for each category (species)
     sns.lmplot(x='SepalLengthCm', y='SepalWidthCm', hue='Species', data=iris_df)

     # Customize the plot
     plt.xlabel('Sepal Length (cm)')
     plt.ylabel('Sepal Width (cm)')
     plt.title('Scatter Plot with Regression Lines for Each Species')

     # Show the plot
     plt.show()
```



```
[ ]: iris_df.columns
```

```
[ ]: Index(['Id', 'SepalLengthCm', 'SepalWidthCm', 'PetalLengthCm', 'PetalWidthCm',
            'Species'],
           dtype='object')
```