In [1]:
```
import pandas as pd

# Reading the CSV file
df = pd.read_csv("iris_csv.csv")

# Printing top 5 rows
df.head()
```

Out[1]:

	sepallength	sepalwidth	petallength	petalwidth	class
0	5.1	3.5	1.4	0.2	Iris-setosa
1	4.9	3.0	1.4	0.2	Iris-setosa
2	4.7	3.2	1.3	0.2	Iris-setosa
3	4.6	3.1	1.5	0.2	Iris-setosa
4	5.0	3.6	1.4	0.2	Iris-setosa

In [2]:
```
df.shape
```

Out[2]:
```
(150, 5)
```

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 5 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   sepallength  150 non-null    float64
 1   sepalwidth   150 non-null    float64
 2   petallength  150 non-null    float64
 3   petalwidth   150 non-null    float64
 4   class        150 non-null    object 
dtypes: float64(4), object(1)
memory usage: 6.0+ KB
```

In [4]:
```
df.describe()
```

Out[4]:

	sepallength	sepalwidth	petallength	petalwidth
count	150.000000	150.000000	150.000000	150.000000
mean	5.843333	3.054000	3.758667	1.198667
std	0.828066	0.433594	1.764420	0.763161
min	4.300000	2.000000	1.000000	0.100000
25%	5.100000	2.800000	1.600000	0.300000
50%	5.800000	3.000000	4.350000	1.300000
75%	6.400000	3.300000	5.100000	1.800000
max	7.900000	4.400000	6.900000	2.500000

In [5]:
```
df.tail()
```

Out[5]:

	sepallength	sepalwidth	petallength	petalwidth	class
145	6.7	3.0	5.2	2.3	Iris-virginica
146	6.3	2.5	5.0	1.9	Iris-virginica
147	6.5	3.0	5.2	2.0	Iris-virginica
148	6.2	3.4	5.4	2.3	Iris-virginica
149	5.9	3.0	5.1	1.8	Iris-virginica

In [6]:
```
# Checking Missing Values
df.isnull().sum()
```

Out[6]:
```
sepallength    0
sepalwidth     0
petallength    0
petalwidth     0
class          0
dtype: int64
```

In [7]:
```
# Checking Duplicates
data = df.drop_duplicates(subset ="class",)
data
```

Out[7]:

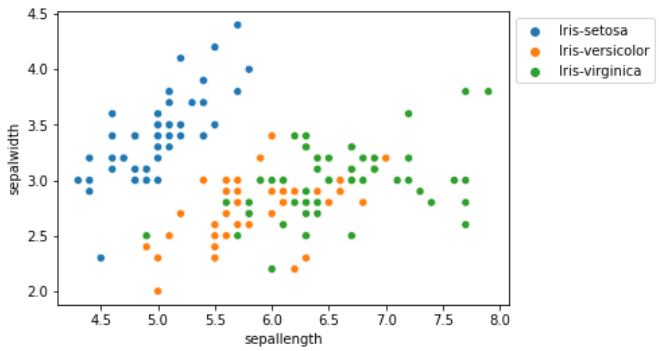
	sepallength	sepalwidth	petallength	petalwidth	class
0	5.1	3.5	1.4	0.2	Iris-setosa
50	7.0	3.2	4.7	1.4	Iris-versicolor
100	6.3	3.3	6.0	2.5	Iris-virginica

In [8]:
```
df.value_counts("class")
```

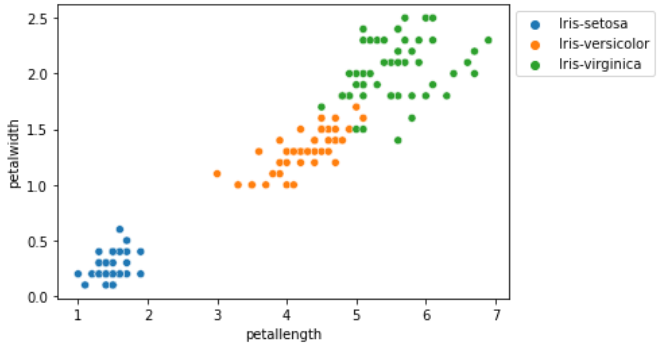
Out[8]:
```
class
Iris-setosa        50
Iris-versicolor    50
Iris-virginica     50
dtype: int64
```

In [9]:
```
# Data Visualization
# importing packages
import seaborn as sns
import matplotlib.pyplot as plt

# countplot for class
sns.countplot(x='class', data=df, )
plt.show()
```

In [10]:
```
# Relation between variables
# importing packages
import seaborn as sns
import matplotlib.pyplot as plt


sns.scatterplot(x='sepallength', y='sepalwidth',
                hue='class', data=df, )

# Placing Legend outside the Figure
plt.legend(bbox_to_anchor=(1, 1), loc=2)

plt.show()
```

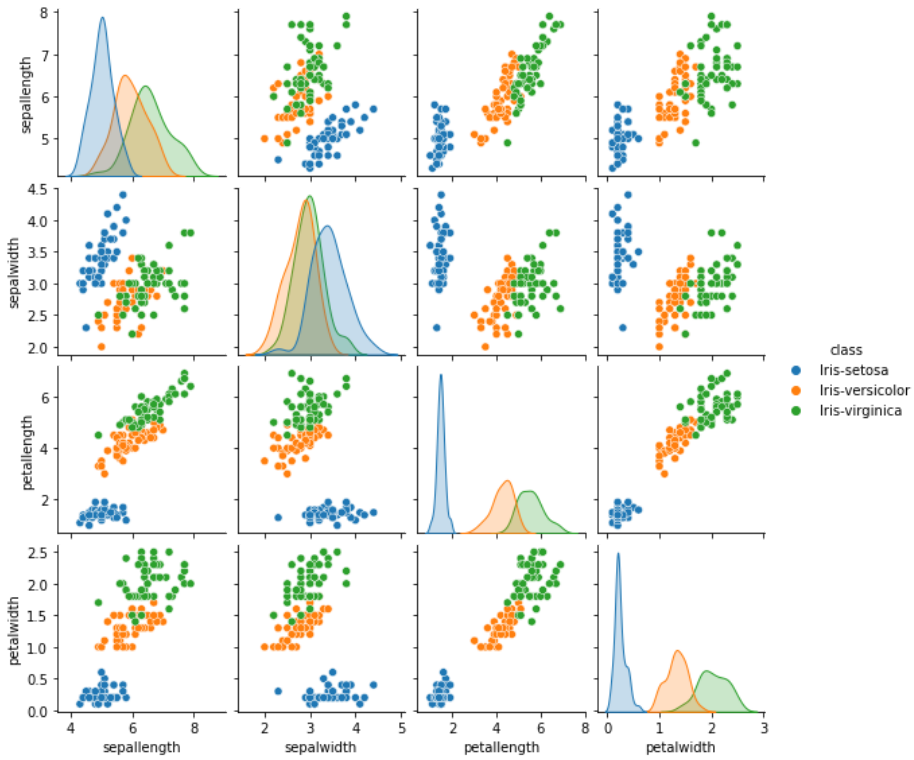


In [11]:
```
# Comparing Petal Length and Petal Width
# importing packages
import seaborn as sns
import matplotlib.pyplot as plt


sns.scatterplot(x='petallength', y='petalwidth',
                hue='class', data=df, )

# Placing Legend outside the Figure
plt.legend(bbox_to_anchor=(1, 1), loc=2)

plt.show()
```

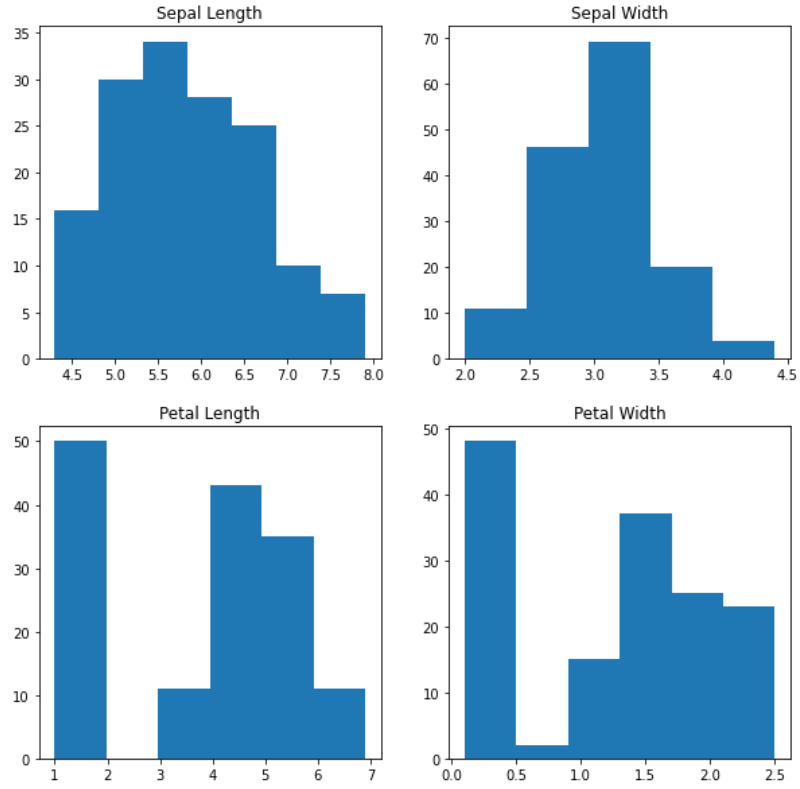


In [12]:
```
# multivariate analysis using a pairplot
# importing packages
import seaborn as sns
import matplotlib.pyplot as plt


sns.pairplot(df, hue='class', height=2)
```

Out[12]: <seaborn.axisgrid.PairGrid at 0x1da93100910>

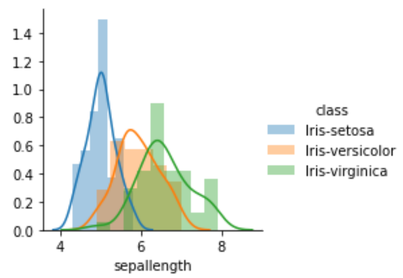


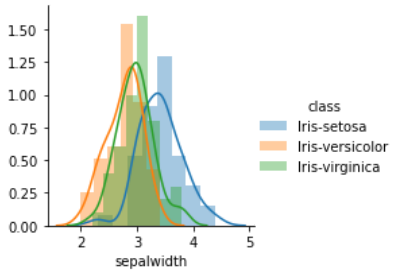
In [13]:
```
# Histogram is used for uni as well as bi-variate analysis
# importing packages
import seaborn as sns
import matplotlib.pyplot as plt


fig, axes = plt.subplots(2, 2, figsize=(10,10))

axes[0,0].set_title("Sepal Length")
axes[0,0].hist(df['sepallength'], bins=7)

axes[0,1].set_title("Sepal Width")
axes[0,1].hist(df['sepalwidth'], bins=5);

axes[1,0].set_title("Petal Length")
axes[1,0].hist(df['petallength'], bins=6);

axes[1,1].set_title("Petal Width")
axes[1,1].hist(df['petalwidth'], bins=6);
```

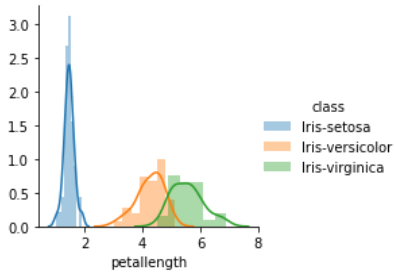


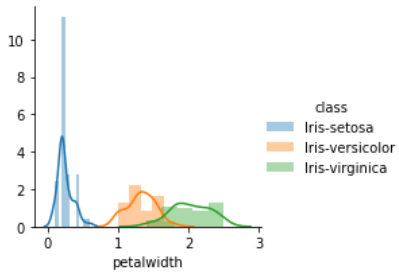
In [14]:
```
# Histograms with Distplot Plot
# importing packages


plot = sns.FacetGrid(df, hue="class")
plot.map(sns.distplot, "sepallength").add_legend()

plot = sns.FacetGrid(df, hue="class")
plot.map(sns.distplot, "sepalwidth").add_legend()

plot = sns.FacetGrid(df, hue="class")
plot.map(sns.distplot, "petallength").add_legend()

plot = sns.FacetGrid(df, hue="class")
plot.map(sns.distplot, "petalwidth").add_legend()

plt.show()
```

```
C:\Users\Chiranjeevi\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
C:\Users\Chiranjeevi\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
C:\Users\Chiranjeevi\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
C:\Users\Chiranjeevi\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
C:\Users\Chiranjeevi\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
C:\Users\Chiranjeevi\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
C:\Users\Chiranjeevi\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
C:\Users\Chiranjeevi\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
C:\Users\Chiranjeevi\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
C:\Users\Chiranjeevi\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
C:\Users\Chiranjeevi\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
C:\Users\Chiranjeevi\anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```







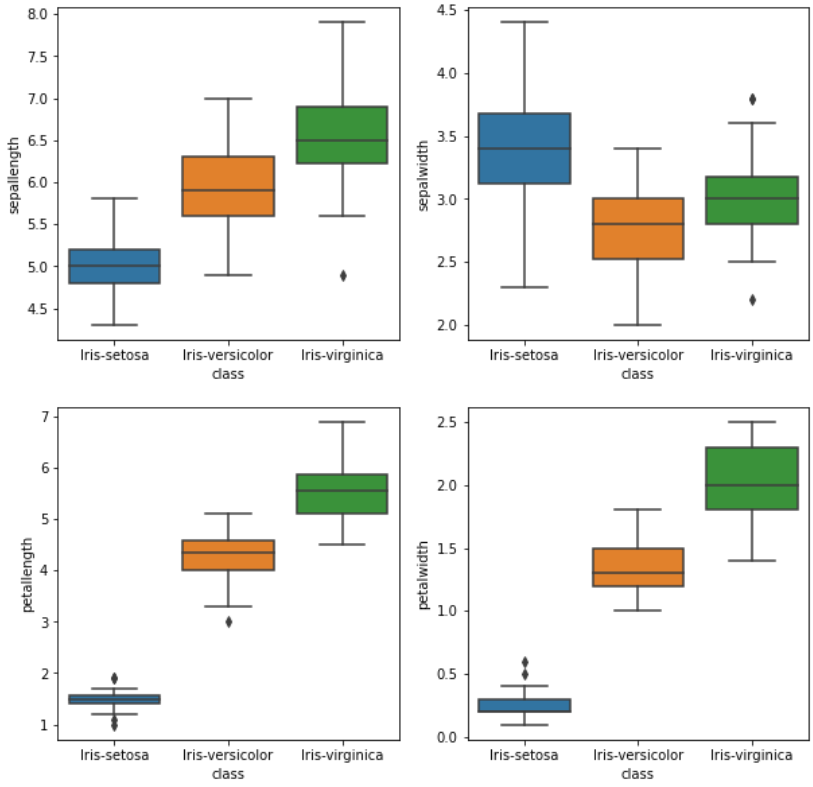


In [15]:
```
# Handling Correlation
data.corr(method='pearson')
```

Out[15]:

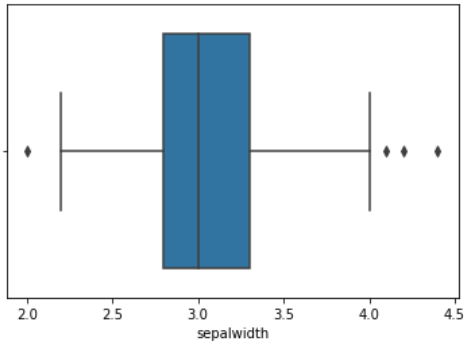
	sepallength	sepalwidth	petallength	petalwidth
sepallength	1.000000	-0.999226	0.795795	0.643817
sepalwidth	-0.999226	1.000000	-0.818999	-0.673417
petallength	0.795795	-0.818999	1.000000	0.975713
petalwidth	0.643817	-0.673417	0.975713	1.000000

In [16]:
```
# Box plots
# importing packages
import seaborn as sns
import matplotlib.pyplot as plt

def graph(y):
    sns.boxplot(x="class", y=y, data=df)

plt.figure(figsize=(10,10))

# Adding the subplot at the specified
# grid position
plt.subplot(221)
graph('sepallength')

plt.subplot(222)
graph('sepalwidth')

plt.subplot(223)
graph('petallength')

plt.subplot(224)
graph('petalwidth')

plt.show()
```



In [17]:
```
# Handling Outliers

sns.boxplot(x='sepalwidth', data=df)
```

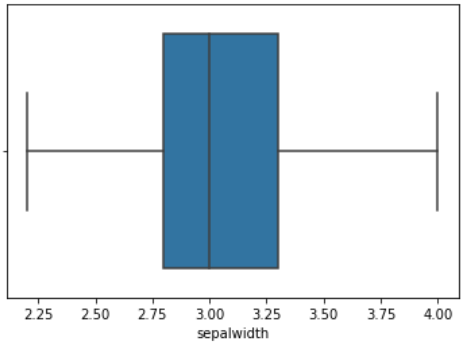
Out[17]: <AxesSubplot:xlabel='sepalwidth'>



In [18]:
```
# Removing Outliers
import numpy as np
Q1 = np.percentile(df['sepalwidth'], 25,
                   interpolation = 'midpoint')

Q3 = np.percentile(df['sepalwidth'], 75,
                   interpolation = 'midpoint')
IQR = Q3 - Q1

print("Old Shape: ", df.shape)

# Upper bound
upper = np.where(df['sepalwidth'] >= (Q3+1.5*IQR))

# Lower bound
lower = np.where(df['sepalwidth'] <= (Q1-1.5*IQR))

# Removing the Outliers
df.drop(upper[0], inplace = True)
df.drop(lower[0], inplace = True)

print("New Shape: ", df.shape)

sns.boxplot(x='sepalwidth', data=df)
```

```
Old Shape:  (150, 5)
New Shape:  (146, 5)

<ipython-input-18-dfcb10346225>:3: DeprecationWarning: the `interpolation=` argument to percentile was renamed to `method=
`, which has additional options.
Users of the modes 'nearest', 'lower', 'higher', or 'midpoint' are encouraged to review the method they. (Deprecated NumPy
1.22)
  Q1 = np.percentile(df['sepalwidth'], 25,
<ipython-input-18-dfcb10346225>:6: DeprecationWarning: the `interpolation=` argument to percentile was renamed to `method=
`, which has additional options.
Users of the modes 'nearest', 'lower', 'higher', or 'midpoint' are encouraged to review the method they. (Deprecated NumPy
1.22)
  Q3 = np.percentile(df['sepalwidth'], 75,
```

Out[18]:
```
<AxesSubplot:xlabel='sepalwidth'>
```



In [30]:
```
X = df.iloc[:, :-1]
y = df.iloc[:, -1]

X
```

Out[30]:

	sepallength	sepalwidth	petallength	petalwidth
0	5.1	3.5	1.4	0.2
1	4.9	3.0	1.4	0.2
2	4.7	3.2	1.3	0.2
3	4.6	3.1	1.5	0.2
4	5.0	3.6	1.4	0.2
...	...	...	...	...
145	6.7	3.0	5.2	2.3
146	6.3	2.5	5.0	1.9
147	6.5	3.0	5.2	2.0
148	6.2	3.4	5.4	2.3
149	5.9	3.0	5.1	1.8

146 rows × 4 columns

In [20]:
```
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X,y, test_size=0.2, random_state=42)
```

In [23]:
```
from sklearn.ensemble import RandomForestClassifier
model = RandomForestClassifier(n_estimators=100, random_state=42)
model.fit(X_train, y_train)
```

Out[23]:
```
RandomForestClassifier
RandomForestClassifier(random_state=42)
```

In [24]:
```
y_pred = model.predict(X_test)
```

In [26]:
```
from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score, confusion_matrix, classification_repor
accuracy = accuracy_score(y_test, y_pred)
precision = precision_score(y_test, y_pred, average='weighted')  # Use weighted average for multiclass classification
recall = recall_score(y_test, y_pred, average='weighted')
f1 = f1_score(y_test, y_pred, average='weighted')
```

In [27]:
```
conf_matrix = confusion_matrix(y_test, y_pred)
```

In [32]:
```
from sklearn.datasets import load_iris
iris = load_iris()
class_report = classification_report(y_test, y_pred, target_names=iris.target_names)
```

In [33]:
```
print(f"Accuracy: {accuracy}")
print(f"Precision: {precision}")
print(f"Recall: {recall}")
print(f"F1 Score: {f1}")
```

```
Accuracy: 0.9333333333333333
Precision: 0.9333333333333333
Recall: 0.9333333333333333
F1 Score: 0.9333333333333333
```

In [34]:
```
print("Confusion Matrix:")
print(conf_matrix)
```

```
Confusion Matrix:
[[12  0  0]
 [ 0  7  1]
 [ 0  1  9]]
```

In [35]:
```
print("Classification Report:")
print(class_report)
```

```
Classification Report:
              precision    recall  f1-score   support

      setosa       1.00      1.00      1.00        12
  versicolor       0.88      0.88      0.88         8
   virginica       0.90      0.90      0.90        10

    accuracy                           0.93        30
   macro avg       0.92      0.92      0.92        30
weighted avg       0.93      0.93      0.93        30
```