In [91]:
```
import sys
print("Python Version:", sys.version)
```

```
Python Version: 3.7.6 (default, Jan  8 2020, 20:23:39) [MSC v.1916 64 bit (AMD64)]
```

In [92]:
```
import numpy as np
print("Numpy Version:", np.__version__)
```

```
Numpy Version: 1.18.1
```

In [93]:
```
import pandas as pd
print("Pandas Version: ",pd.__version__)
```

```
Pandas Version:  1.0.3
```

In [94]:
```
import sklearn
print("Sklearn Version: {a}".format(a=sklearn.__version__))
```

```
Sklearn Version: 0.22.1
```

In [95]:
```
import matplotlib
print("Matplotlib Version: {a}".format(a=matplotlib.__version__))
```

```
Matplotlib Version: 3.1.3
```

In [96]:
```
import scipy as sc
print(f"Scipy Version : {sc.__version__}")
```

```
Scipy Version : 1.4.1
```

In [97]:
```
import matplotlib.pyplot as plt
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score
from sklearn.metrics import classification_report
from sklearn.metrics import confusion_matrix
from pandas.plotting import scatter_matrix
```

Loading the dataset using pandas(iris-flower)

In [128]:
```
iris_dataset = pd.read_csv('iris_flower.csv')
iris_dataset.head(5)
```

Out[128]:

	sepal_length	sepal_width	petal_length	petal_width	species
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 [99]:
```
iris_dataset.tail(5)
```

Out[99]:

	sepal_length	sepal_width	petal_length	petal_width	species
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 [100]:
```
print(f"Shape of data : {iris_dataset.shape}")
```

```
Shape of data : (150, 5)
```

In [101]:
```
print(f"Missing Values : \n{iris_dataset.isna().sum()}")
```

```
Missing Values :
sepal_length    0
sepal_width     0
petal_length    0
petal_width     0
species         0
dtype: int64
```

In [102]:
```
iris_dataset.groupby('species').size()
```

Out[102]:
```
species
Iris-setosa        50
Iris-versicolor    50
Iris-virginica     50
dtype: int64
```

In [103]:
```
iris_dataset.describe()
```

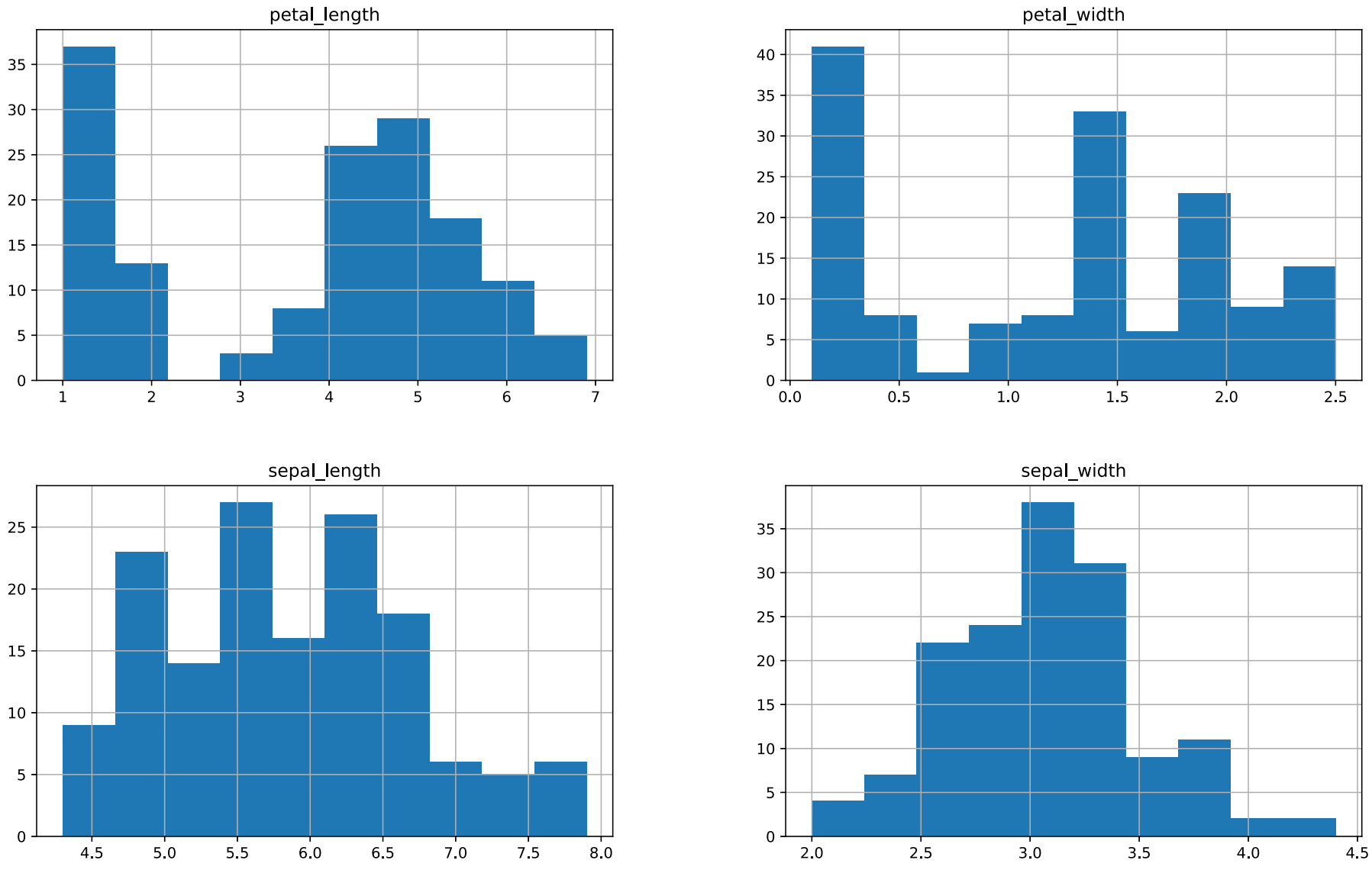
Out[103]:

	sepal_length	sepal_width	petal_length	petal_width
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

Data Visualisation

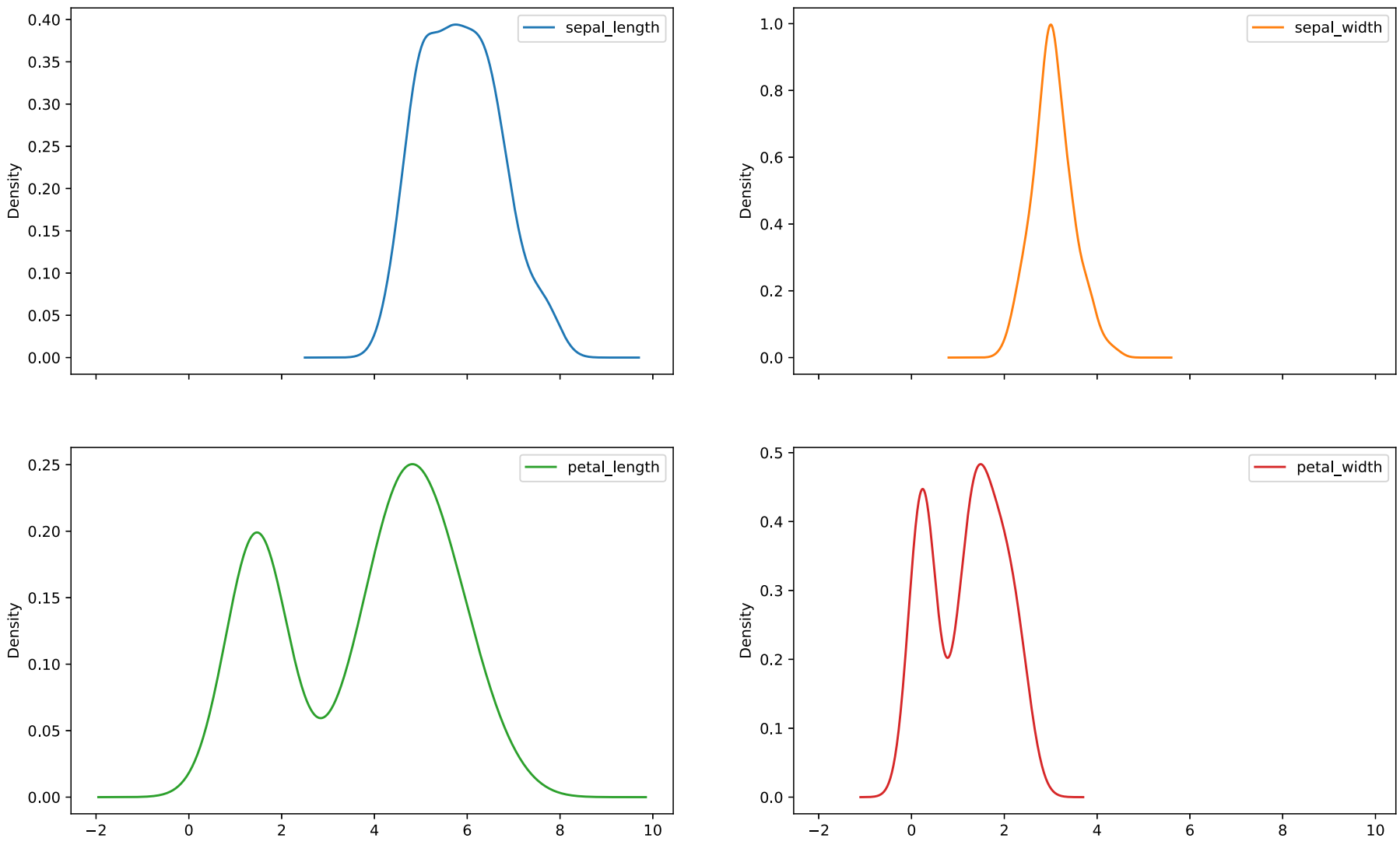
histogram

In [104]:
```
iris_dataset.hist(figsize=(16,10))
plt.show()
```



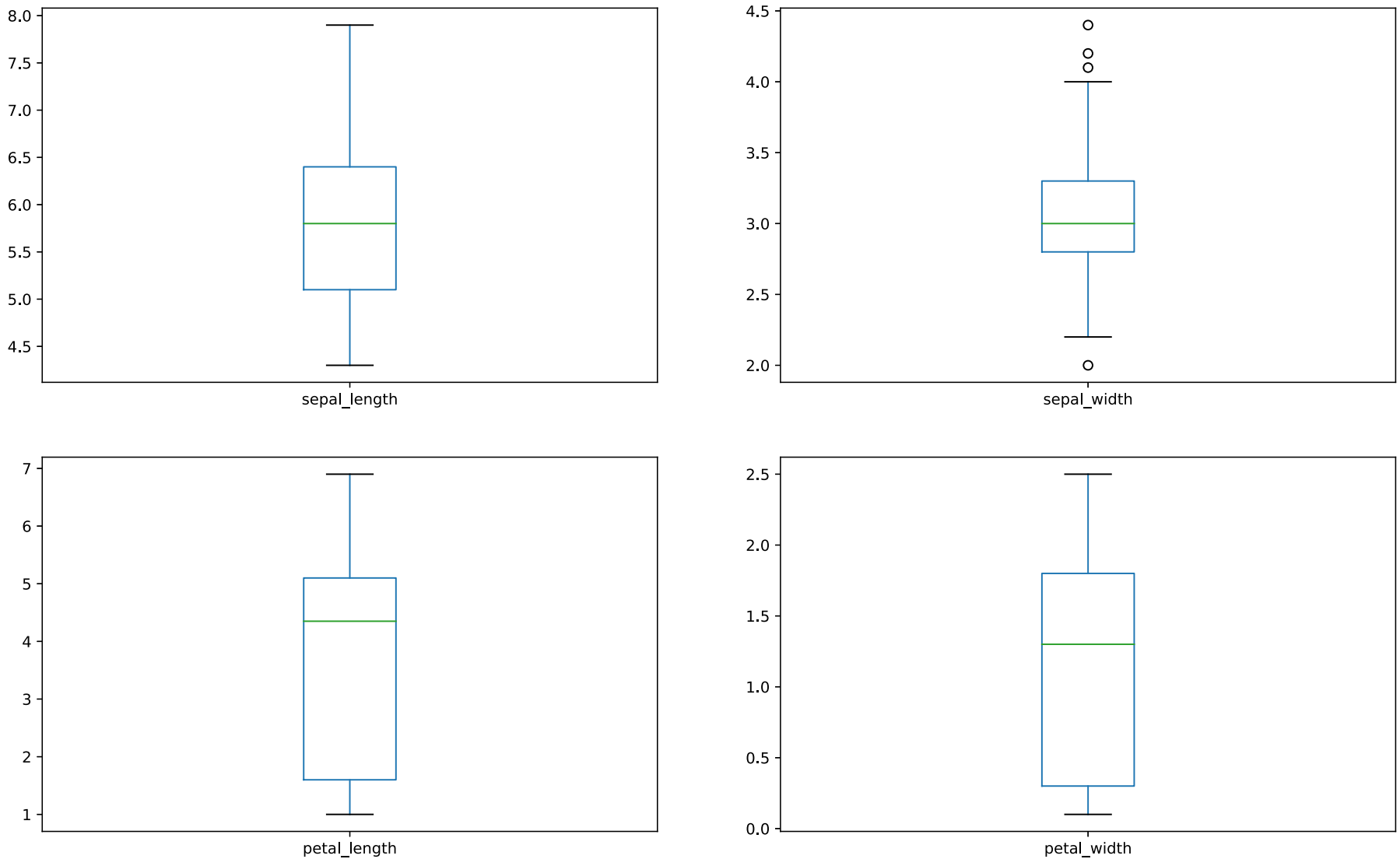
density plot

In [105]:
```
iris_dataset.plot(kind='density', subplots=True, layout=(2,2), sharex=True, figsize=(16,10))
plt.show()
```



Box Whisker plot

In [129]:
```
iris_dataset.plot(kind='box', subplots=True, layout=(2,2) , sharex=True, figsize=(16,10))
plt.show()
```



In [107]:
```
des = iris_dataset.describe()
des
```

Out[107]:

	sepal_length	sepal_width	petal_length	petal_width
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 [108]:
```
q3 =  des.at['75%','sepal_width']
```

In [109]:
```
q1 = des.at['25%', 'sepal_width']
```

In [110]:
```
iqr = q3 - q1
```

In [111]:
```
q4 = q3 + 1.5*iqr
q4
```

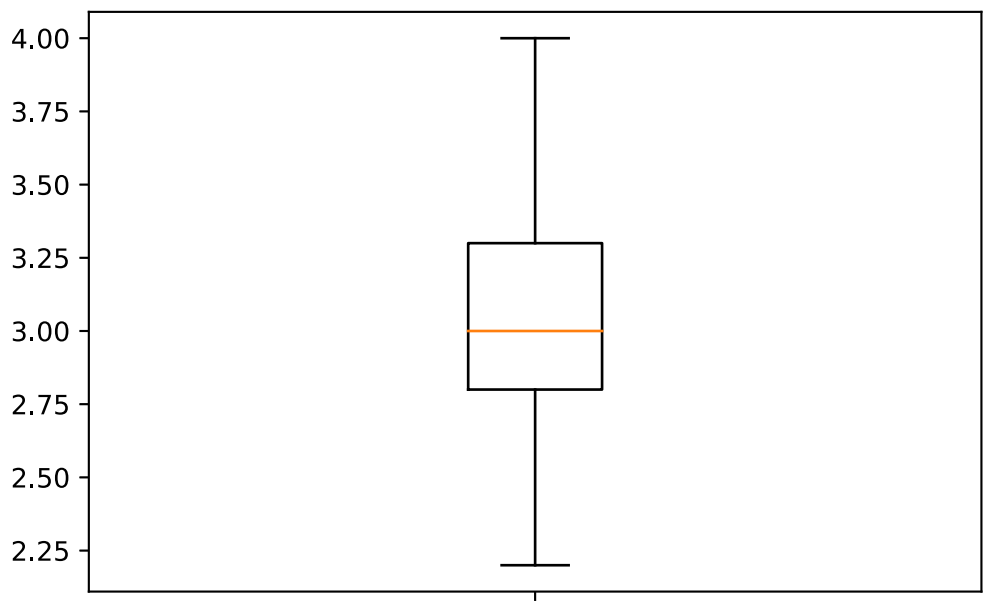
Out[111]: 4.05

In [112]:
```
q5 = q1 - 1.5*iqr
q5
```

Out[112]: 2.05

In [135]:
```
# removing the outliers
for i in range(len(iris_dataset['sepal_width'])):
    if(iris_dataset['sepal_width'][i] > 4.05 or iris_dataset['sepal_width'][i]  < 2.05):
        iris_dataset['sepal_width'][i] = iris_dataset['sepal_width'].mean()
```

In [136]:
```
plt.boxplot(iris_dataset.sepal_width)
plt.show()
```

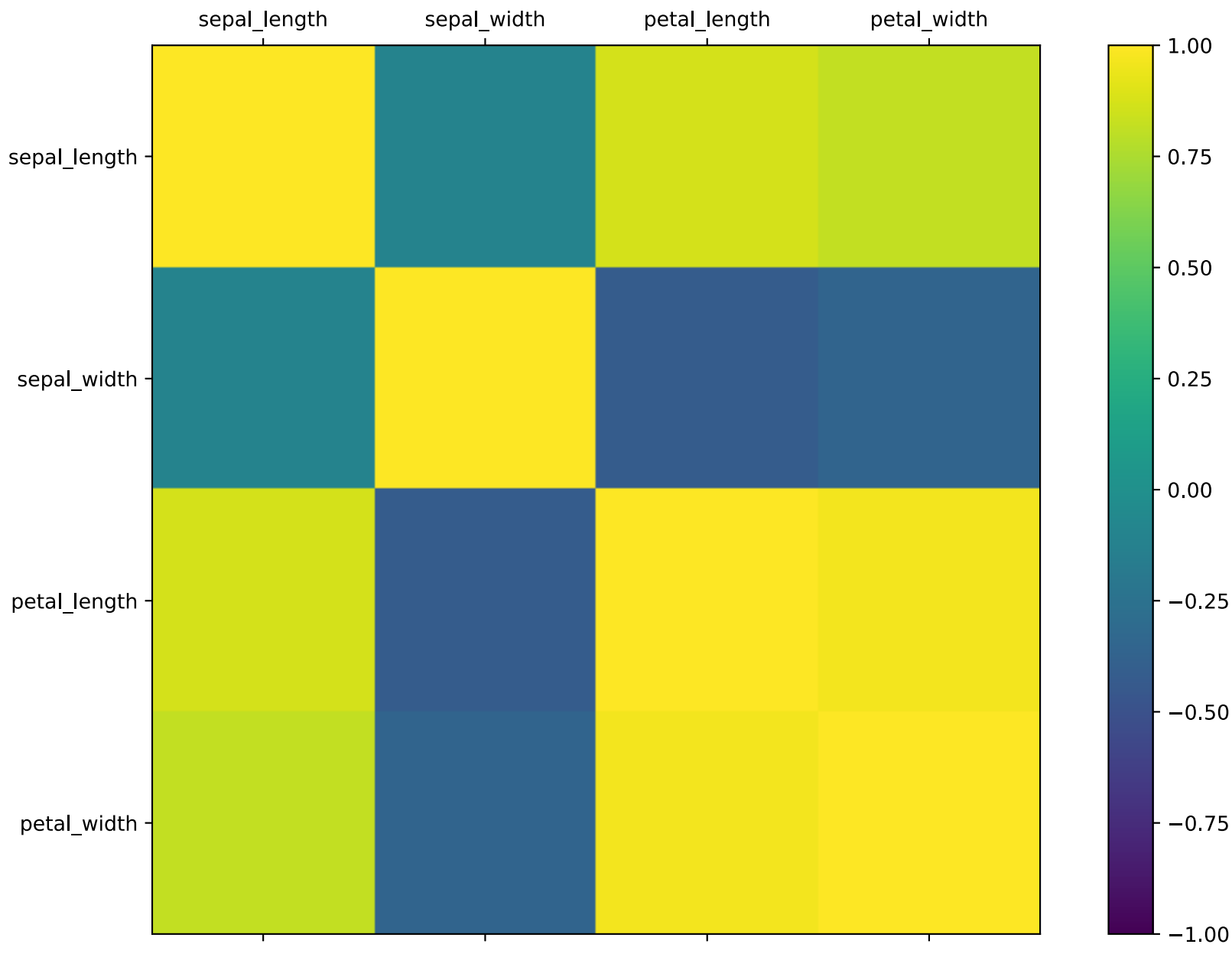


In [114]:
```
correlation = iris_dataset.corr()
correlation
```

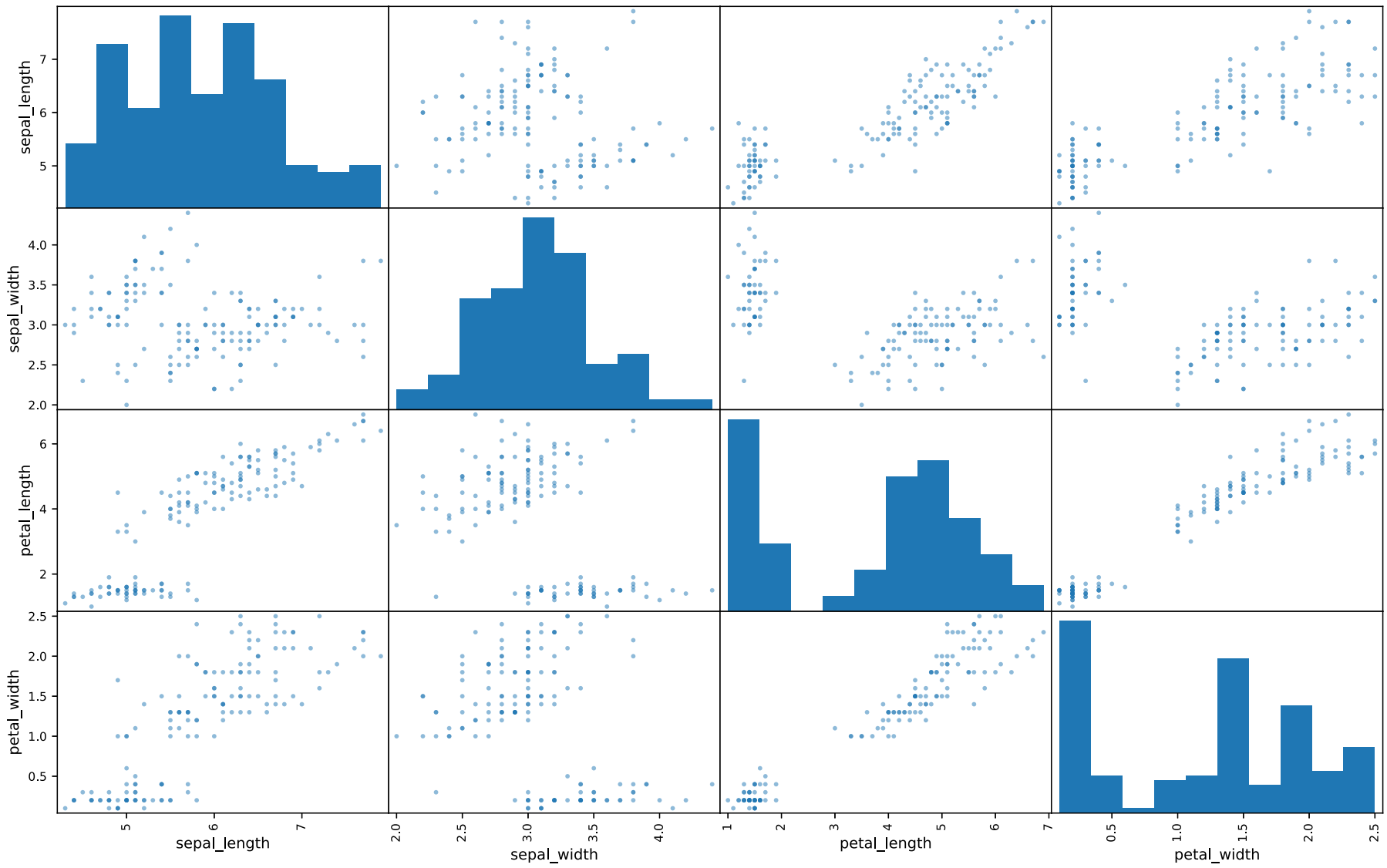
Out[114]:

	sepal_length	sepal_width	petal_length	petal_width
sepal_length	1.000000	-0.109369	0.871754	0.817954
sepal_width	-0.109369	1.000000	-0.420516	-0.356544
petal_length	0.871754	-0.420516	1.000000	0.962757
petal_width	0.817954	-0.356544	0.962757	1.000000

In [115]:
```
fig = plt.figure(figsize=(12,8))
ax = fig.add_subplot(111)
cx = ax.matshow(correlation, vmax=1, vmin=-1)
fig.colorbar(cx)
ticks = np.arange(len(correlation))
labels = correlation.columns
ax.set_xticks(ticks)
ax.set_yticks(ticks)
ax.set_xticklabels(labels)
ax.set_yticklabels(labels)
plt.show()
```



In [116]:
```
scatter_matrix(iris_dataset, figsize=(16,10))
plt.show()
```



In [117]:
```
X = iris_dataset.iloc[:,:-1].values
Y = iris_dataset.iloc[:,-1].values
```

In [118]:
```
X_train, X_test, Y_train, Y_test = train_test_split(X, Y , test_size=0.3, random_state=7)
```

In [119]:
```
model = KNeighborsClassifier(n_neighbors=5)
model.fit(X_train, Y_train)
```

Out[119]:
```
KNeighborsClassifier(algorithm='auto', leaf_size=30, metric='minkowski',
                     metric_params=None, n_jobs=None, n_neighbors=5, p=2,
                     weights='uniform')
```

In [120]:
```
Y_pred = model.predict(X_test)
```

In [121]:
```
print(f"Accuracy : {accuracy_score(Y_pred, Y_test)}")
```

```
Accuracy : 0.9111111111111111
```

In [122]:
```
confusion_matrix(Y_test, Y_pred)
```

Out[122]:
```
array([[12,  0,  0],
       [ 0, 15,  1],
       [ 0,  3, 14]], dtype=int64)
```

In [123]:
```
print(classification_report(Y_test, Y_pred))
```

```
precision    recall  f1-score   support

    Iris-setosa       1.00      1.00      1.00        12
Iris-versicolor       0.83      0.94      0.88        16
 Iris-virginica       0.93      0.82      0.87        17

       accuracy                           0.91        45
      macro avg       0.92      0.92      0.92        45
   weighted avg       0.92      0.91      0.91        45
```

In [124]:
```
X_input  = [[4.9, 3.1, 1.5, 0.1]]
print("Prediction: ", model.predict(X_input))
```

```
Prediction:  ['Iris-setosa']
```

In [125]:
```
df = pd.DataFrame({'sepal_length':      X_test[:,0],
'sepal_width': X_test[:,1],
'petal_length': X_test[:,2],
'petal_width': X_test[:,3] ,
'Actual': Y_test,
'Predicted ': Y_pred})
```

In [126]:
```
df
```

Out[126]:

	sepal_length	sepal_width	petal_length	petal_width	Actual	Predicted
0	5.9	3.0	5.1	1.8	Iris-virginica	Iris-virginica
1	5.4	3.0	4.5	1.5	Iris-versicolor	Iris-versicolor
2	5.0	3.5	1.3	0.3	Iris-setosa	Iris-setosa
3	5.6	3.0	4.5	1.5	Iris-versicolor	Iris-versicolor
4	4.9	2.5	4.5	1.7	Iris-virginica	Iris-versicolor
5	4.5	2.3	1.3	0.3	Iris-setosa	Iris-setosa
6	6.9	3.1	4.9	1.5	Iris-versicolor	Iris-versicolor
7	5.6	2.7	4.2	1.3	Iris-versicolor	Iris-versicolor
8	4.8	3.4	1.6	0.2	Iris-setosa	Iris-setosa
9	6.4	3.2	4.5	1.5	Iris-versicolor	Iris-versicolor
10	6.7	3.0	5.0	1.7	Iris-versicolor	Iris-virginica
11	6.0	3.4	4.5	1.6	Iris-versicolor	Iris-versicolor
12	5.2	4.1	1.5	0.1	Iris-setosa	Iris-setosa
13	7.2	3.6	6.1	2.5	Iris-virginica	Iris-virginica
14	5.2	3.4	1.4	0.2	Iris-setosa	Iris-setosa
15	5.9	3.2	4.8	1.8	Iris-versicolor	Iris-versicolor
16	6.7	2.5	5.8	1.8	Iris-virginica	Iris-virginica
17	6.4	3.1	5.5	1.8	Iris-virginica	Iris-virginica
18	5.1	3.8	1.6	0.2	Iris-setosa	Iris-setosa
19	4.9	3.1	1.5	0.1	Iris-setosa	Iris-setosa
20	5.8	2.7	3.9	1.2	Iris-versicolor	Iris-versicolor
21	6.9	3.2	5.7	2.3	Iris-virginica	Iris-virginica
22	6.1	2.9	4.7	1.4	Iris-versicolor	Iris-versicolor
23	6.0	2.2	5.0	1.5	Iris-virginica	Iris-versicolor
24	7.2	3.0	5.8	1.6	Iris-virginica	Iris-virginica
25	6.0	3.0	4.8	1.8	Iris-virginica	Iris-versicolor
26	6.2	2.9	4.3	1.3	Iris-versicolor	Iris-versicolor
27	5.5	2.4	3.8	1.1	Iris-versicolor	Iris-versicolor
28	5.8	2.7	5.1	1.9	Iris-virginica	Iris-virginica
29	6.7	3.1	5.6	2.4	Iris-virginica	Iris-virginica
30	6.2	2.8	4.8	1.8	Iris-virginica	Iris-virginica
31	5.7	2.6	3.5	1.0	Iris-versicolor	Iris-versicolor
32	4.6	3.6	1.0	0.2	Iris-setosa	Iris-setosa
33	6.9	3.1	5.4	2.1	Iris-virginica	Iris-virginica
34	6.4	2.9	4.3	1.3	Iris-versicolor	Iris-versicolor
35	4.8	3.0	1.4	0.3	Iris-setosa	Iris-setosa
36	5.5	3.5	1.3	0.2	Iris-setosa	Iris-setosa
37	5.4	3.9	1.7	0.4	Iris-setosa	Iris-setosa
38	5.1	3.5	1.4	0.3	Iris-setosa	Iris-setosa
39	7.1	3.0	5.9	2.1	Iris-virginica	Iris-virginica
40	6.7	3.3	5.7	2.1	Iris-virginica	Iris-virginica
41	6.8	2.8	4.8	1.4	Iris-versicolor	Iris-versicolor
42	6.4	2.8	5.6	2.2	Iris-virginica	Iris-virginica
43	6.5	3.0	5.5	1.8	Iris-virginica	Iris-virginica
44	5.7	3.0	4.2	1.2	Iris-versicolor	Iris-versicolor