SupervisedLearningIrisClass

May 19, 2019

In [2]:
```
import sys
print(sys.version)
```

```
3.6.3 |Anaconda, Inc.| (default, Oct 15 2017, 03:27:45) [MSC v.1900 64 bit (AMD64)]
```

In [6]:
```
import sys
import scipy
import numpy
import matplotlib
import pandas
import sklearn

print('Python: {}'.format(sys.version))
print('scipy: {}'.format(scipy.__version__))
print('numpy: {}'.format(numpy.__version__))
print('matplotlib: {}'.format(matplotlib.__version__))
print('pandas: {}'.format(pandas.__version__))
print('sklearn: {}'.format(sklearn.__version__))
```

```
Python: 3.6.3 |Anaconda, Inc.| (default, Oct 15 2017, 03:27:45) [MSC v.1900 64 bit (AMD64)]
scipy: 0.19.1
numpy: 1.13.3
matplotlib: 2.1.0
pandas: 0.20.3
sklearn: 0.19.1
```

In [7]:
```
print('scipy: {}'.format(scipy.__version__))
```

```
scipy: 0.19.1
```

In [11]:
```
from pandas.plotting import scatter_matrix
import matplotlib.pyplot as plt
from sklearn import model_selection
from sklearn.metrics import classification_report
from sklearn.metrics import confusion_matrix
```

```
from sklearn.metrics import accuracy_score
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from sklearn.svm import SVC
```

In [14]:
```
print('scipy: {}'.format(scipy.__version__))
```

```
scipy: 0.19.1
```

In [15]:
```
#loading dataset lets see ...
url = 'https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data'
names = ['sepal-lenght' , 'sepal-width' , 'petal-length' , 'petal-width' , 'class']
dataset = pandas.read_csv(url, names=names)
```

In [17]:
```
print(dataset.shape) #rows anfd columns
```

```
(150, 5)
```

In [18]:
```
print(dataset.head)
```

```
<bound method NDFrame.head of      sepal-lenght  sepal-width  petal-length  petal-width
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
5             5.4          3.9           1.7          0.4     Iris-setosa
6             4.6          3.4           1.4          0.3     Iris-setosa
7             5.0          3.4           1.5          0.2     Iris-setosa
8             4.4          2.9           1.4          0.2     Iris-setosa
9             4.9          3.1           1.5          0.1     Iris-setosa
10            5.4          3.7           1.5          0.2     Iris-setosa
11            4.8          3.4           1.6          0.2     Iris-setosa
12            4.8          3.0           1.4          0.1     Iris-setosa
13            4.3          3.0           1.1          0.1     Iris-setosa
14            5.8          4.0           1.2          0.2     Iris-setosa
15            5.7          4.4           1.5          0.4     Iris-setosa
16            5.4          3.9           1.3          0.4     Iris-setosa
17            5.1          3.5           1.4          0.3     Iris-setosa
18            5.7          3.8           1.7          0.3     Iris-setosa
19            5.1          3.8           1.5          0.3     Iris-setosa
20            5.4          3.4           1.7          0.2     Iris-setosa
21            5.1          3.7           1.5          0.4     Iris-setosa
22            4.6          3.6           1.0          0.2     Iris-setosa
23            5.1          3.3           1.7          0.5     Iris-setosa
24            4.8          3.4           1.9          0.2     Iris-setosa
25            5.0          3.0           1.6          0.2     Iris-setosa
```

```
26            5.0          3.4           1.6          0.4     Iris-setosa
27            5.2          3.5           1.5          0.2     Iris-setosa
28            5.2          3.4           1.4          0.2     Iris-setosa
29            4.7          3.2           1.6          0.2     Iris-setosa
..            ...          ...           ...          ...             ...
120           6.9          3.2           5.7          2.3  Iris-virginica
121           5.6          2.8           4.9          2.0  Iris-virginica
122           7.7          2.8           6.7          2.0  Iris-virginica
123           6.3          2.7           4.9          1.8  Iris-virginica
124           6.7          3.3           5.7          2.1  Iris-virginica
125           7.2          3.2           6.0          1.8  Iris-virginica
126           6.2          2.8           4.8          1.8  Iris-virginica
127           6.1          3.0           4.9          1.8  Iris-virginica
128           6.4          2.8           5.6          2.1  Iris-virginica
129           7.2          3.0           5.8          1.6  Iris-virginica
130           7.4          2.8           6.1          1.9  Iris-virginica
131           7.9          3.8           6.4          2.0  Iris-virginica
132           6.4          2.8           5.6          2.2  Iris-virginica
133           6.3          2.8           5.1          1.5  Iris-virginica
134           6.1          2.6           5.6          1.4  Iris-virginica
135           7.7          3.0           6.1          2.3  Iris-virginica
136           6.3          3.4           5.6          2.4  Iris-virginica
137           6.4          3.1           5.5          1.8  Iris-virginica
138           6.0          3.0           4.8          1.8  Iris-virginica
139           6.9          3.1           5.4          2.1  Iris-virginica
140           6.7          3.1           5.6          2.4  Iris-virginica
141           6.9          3.1           5.1          2.3  Iris-virginica
142           5.8          2.7           5.1          1.9  Iris-virginica
143           6.8          3.2           5.9          2.3  Iris-virginica
144           6.7          3.3           5.7          2.5  Iris-virginica
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

[150 rows x 5 columns]>
```

```
In [20]: print(dataset.describe())
```

```
       sepal-lenght  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
```

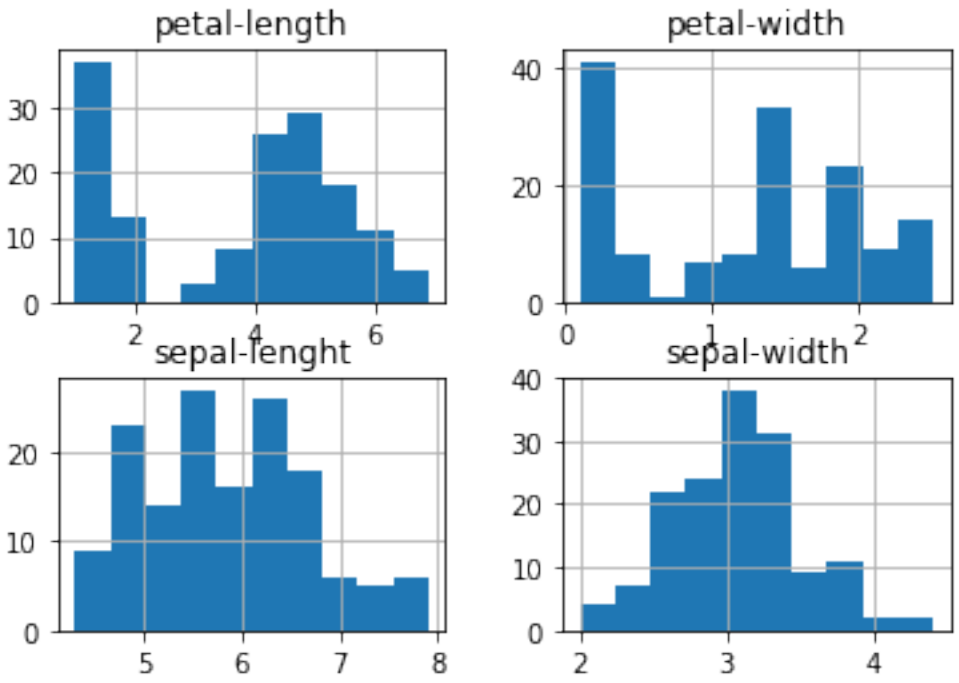
```
In [21]: print(dataset.groupby('class').size())
```

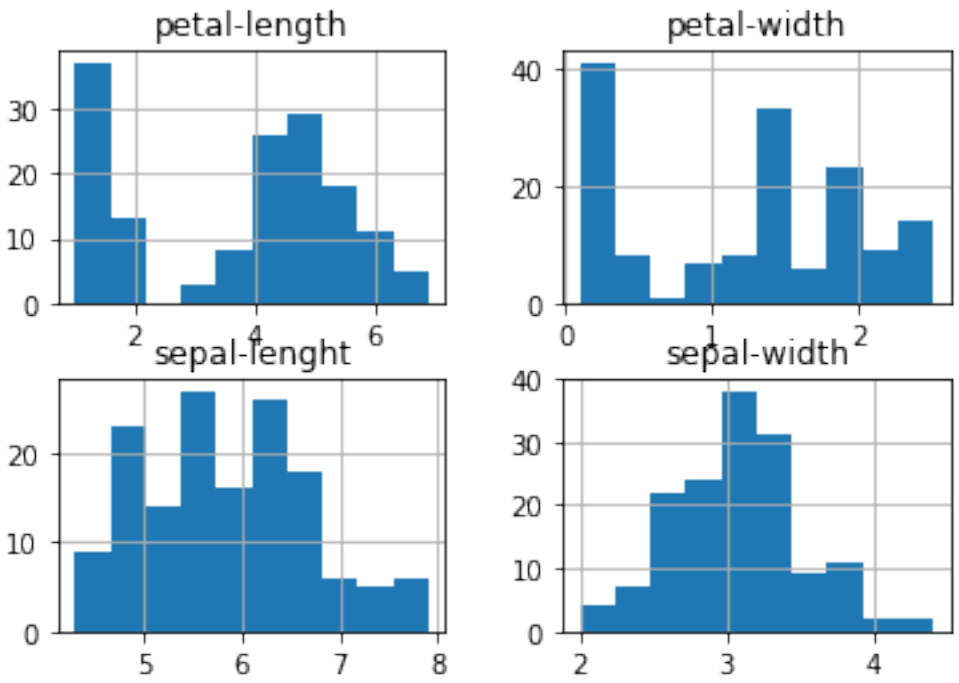
```
class
Iris-setosa        50
Iris-versicolor    50
Iris-virginica     50
dtype: int64
```

```
In [22]: dataset.hist()
```

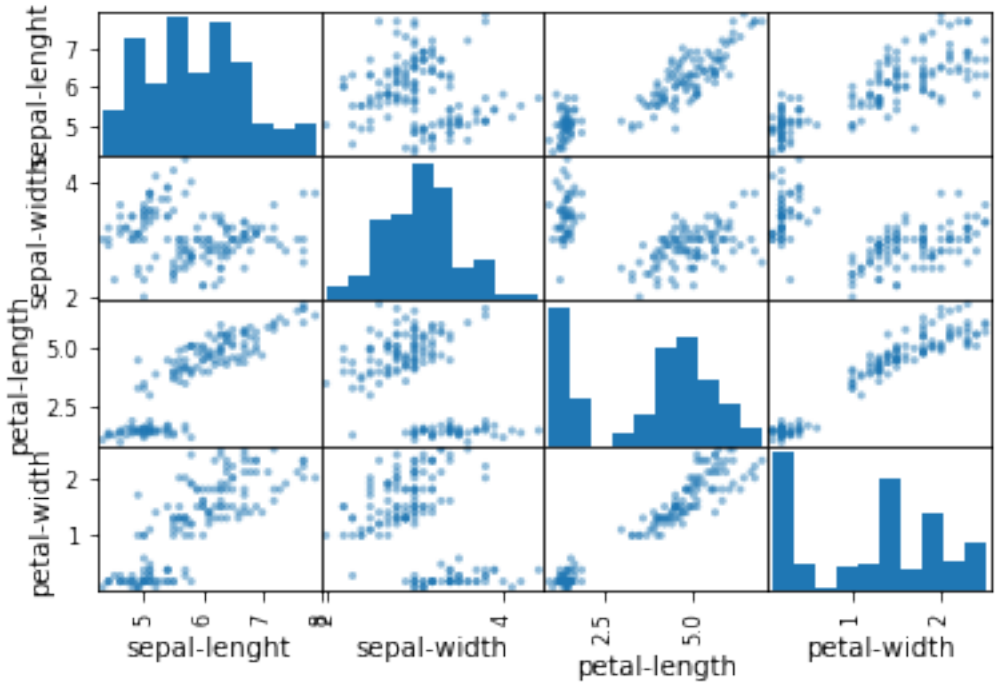
```
Out[22]: array([[<matplotlib.axes._subplots.AxesSubplot object at 0x0000022E1AADE4E0>,
                 <matplotlib.axes._subplots.AxesSubplot object at 0x0000022E1A85E0F0>],
                [<matplotlib.axes._subplots.AxesSubplot object at 0x0000022E1B0000F0>,
                 <matplotlib.axes._subplots.AxesSubplot object at 0x0000022E1B08BE10>]], dtype=o
```

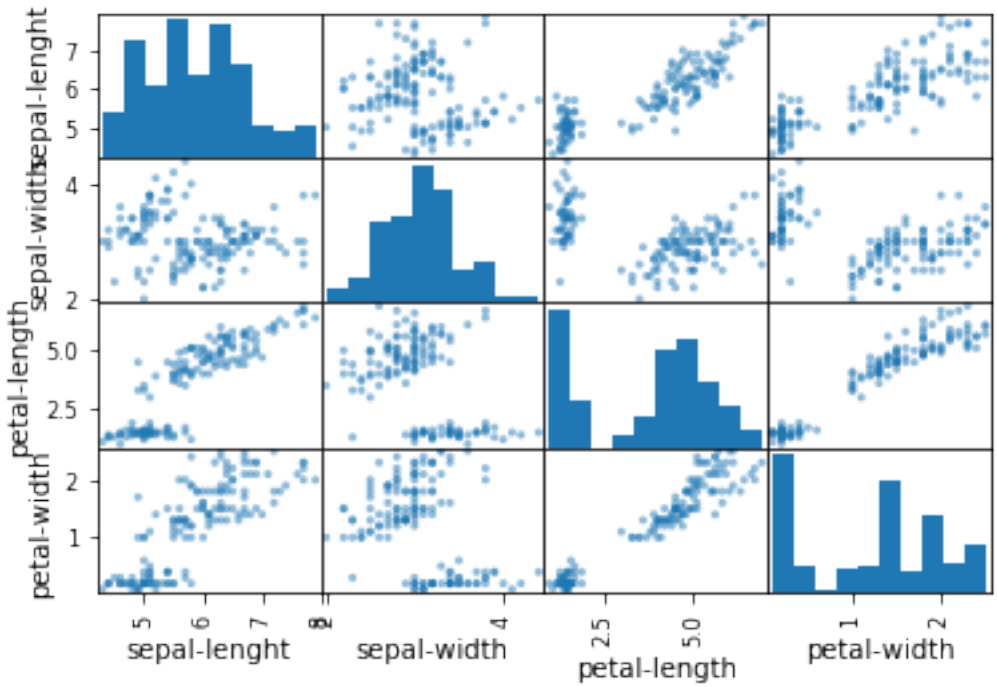
```
In [23]: dataset.hist()
         plt.show()
```

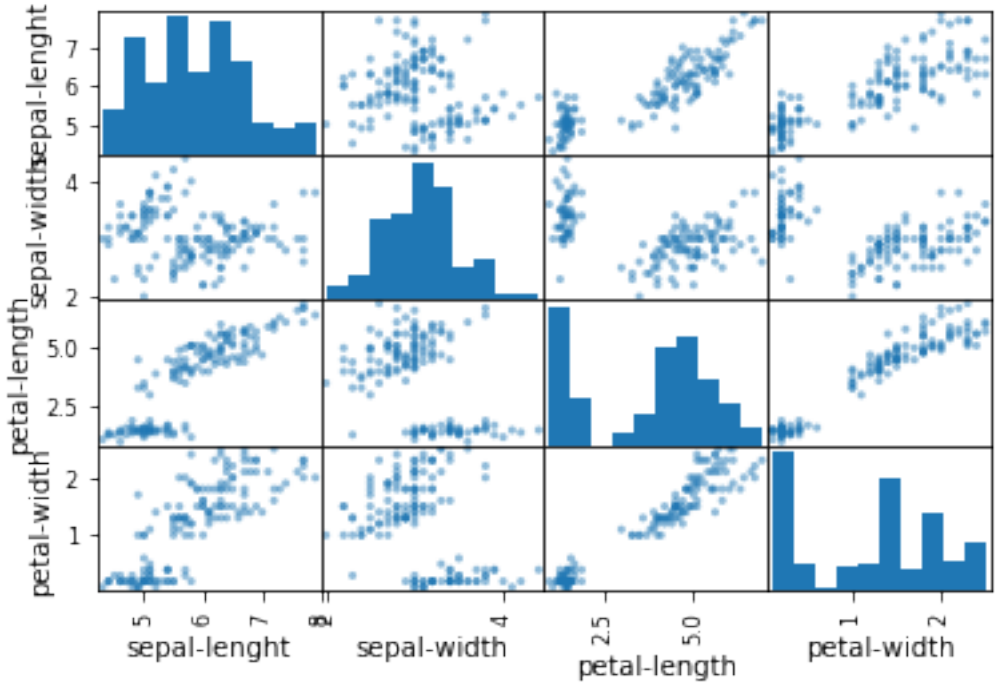




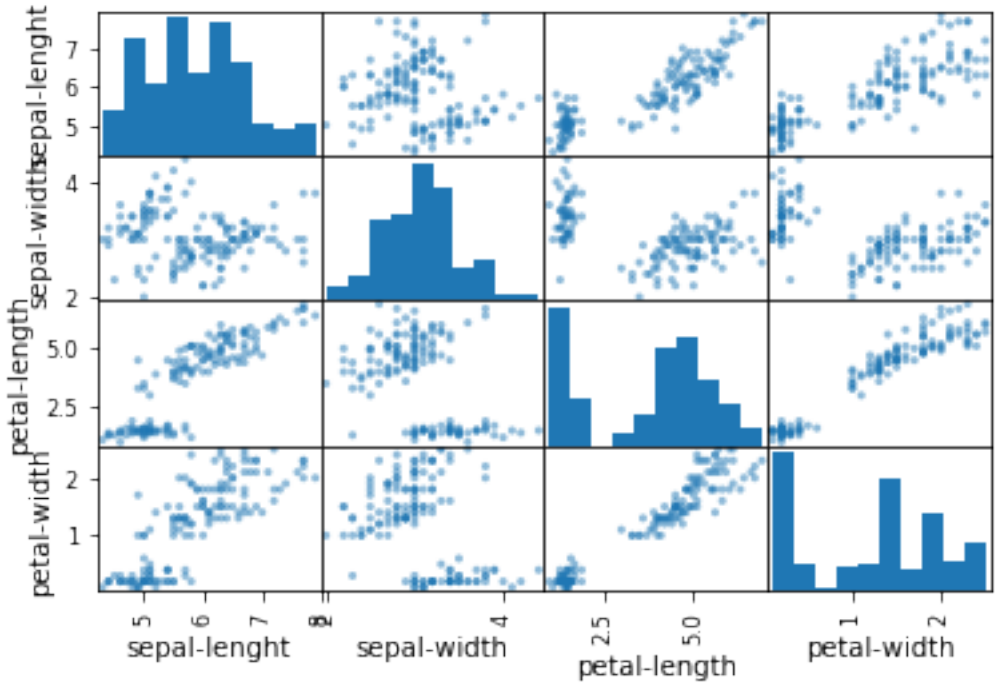
In [26]:
```
#scatter plotting matrix
scatter_matrix(dataset)
plt.show()
```




sepal-lenght
sepal-width
petal-length
petal-width


sepal-lenght
sepal-width
petal-length
petal-width

In [27]:
```
#scatter plotting matrix
scatter_matrix(dataset)
plt.show()
```



In [35]:
```
#splitting dataset in 80-20 ratio for training and cross validation
array = dataset.values
X = array[:,0:4]
Y = array[:,4]
validation_size = 0.20
seed = 7
X_train, X_validation, Y_train, Y_validation=model_selection.train_test_split(X,Y,test_
```

In [36]:
```
#test option and evaluation matrix
scoring = 'accuracy'
```

In [37]:
```
models = []
models.append(('LR', LogisticRegression()))
```

In [38]:
```
models.append(('KNN',KNeighborsClassifier()))
```

In [39]:
```
models.append((('SVM',SVC())))
```

In [40]:
```
print(models)
```

```
[('LR', LogisticRegression(C=1.0, class_weight=None, dual=False, fit_intercept=True,
          intercept_scaling=1, max_iter=100, multi_class='ovr', n_jobs=1,
          penalty='l2', random_state=None, solver='liblinear', tol=0.0001,
          verbose=0, warm_start=False)), ('KNN', KNeighborsClassifier(algorithm='auto', leaf_siz
           metric_params=None, n_jobs=1, n_neighbors=5, p=2,
           weights='uniform')), ('SVM', SVC(C=1.0, cache_size=200, class_weight=None, coef0=0.0,
  decision_function_shape='ovr', degree=3, gamma='auto', kernel='rbf',
  max_iter=-1, probability=False, random_state=None, shrinking=True,
  tol=0.001, verbose=False))]
```

In [42]:
```
#evaluating each model...
results = [] #results list...
names = []
for name, model in models:
    kfold = model_selection.KFold(n_splits = 10, random_state = seed)
    cv_results = model_selection.cross_val_score(model, X_train, Y_train, cv = kfold, s
    results.append(cv_results)
    names.append(name)
    message = "%s: %f (%f)" % (name, cv_results.mean(), cv_results.std())
    print(message)
```

```
LR: 0.966667 (0.040825)
KNN: 0.983333 (0.033333)
SVM: 0.991667 (0.025000)
```

In [44]:
```
#make predictions on validation data set

for name, model in models:
    model.fit(X_train, Y_train)
    predictions = model.predict(X_validation)
    print(name)
    print(accuracy_score(Y_validation, predictions))
    print(classification_report(Y_validation, predictions))
```

```
LR
0.8
                precision    recall  f1-score   support

    Iris-setosa       1.00      1.00      1.00         7
Iris-versicolor       0.88      0.58      0.70        12
 Iris-virginica       0.67      0.91      0.77        11

    avg / total       0.83      0.80      0.80        30

KNN
0.9
                precision    recall  f1-score   support
```

```
    Iris-setosa       1.00      1.00      1.00         7
Iris-versicolor       0.85      0.92      0.88        12
 Iris-virginica       0.90      0.82      0.86        11

    avg / total       0.90      0.90      0.90        30

SVM
0.933333333333
                precision    recall  f1-score   support

    Iris-setosa       1.00      1.00      1.00         7
Iris-versicolor       1.00      0.83      0.91        12
 Iris-virginica       0.85      1.00      0.92        11

    avg / total       0.94      0.93      0.93        30
```