In [1]:
```
import numpy as np
import matplotlib.pyplot as plt
import pandas
from sklearn.model_selection import train_test_split
import seaborn
%matplotlib inline
```

In [2]:
```
df = pandas.read_csv('iris.csv')
df.head()
```

Out[2]:

	sepal.length	sepal.width	petal.length	petal.width	variety
0	5.1	3.5	1.4	0.2	Setosa
1	4.9	3.0	1.4	0.2	Setosa
2	4.7	3.2	1.3	0.2	Setosa
3	4.6	3.1	1.5	0.2	Setosa
4	5.0	3.6	1.4	0.2	Setosa

In [3]:
```
df.describe(include = 'all')
```

Out[3]:

	sepal.length	sepal.width	petal.length	petal.width	variety
count	150.000000	150.000000	150.000000	150.000000	150
unique	NaN	NaN	NaN	NaN	3
top	NaN	NaN	NaN	NaN	Setosa
freq	NaN	NaN	NaN	NaN	50
mean	5.843333	3.057333	3.758000	1.199333	NaN
std	0.828066	0.435866	1.765298	0.762238	NaN
min	4.300000	2.000000	1.000000	0.100000	NaN
25%	5.100000	2.800000	1.600000	0.300000	NaN
50%	5.800000	3.000000	4.350000	1.300000	NaN
75%	6.400000	3.300000	5.100000	1.800000	NaN
max	7.900000	4.400000	6.900000	2.500000	NaN

In [4]:
```
df.shape
```

Out[4]:
```
(150, 5)
```

In [5]:
```
df.columns
```

Out[5]:
```
Index(['sepal.length', 'sepal.width', 'petal.length', 'petal.width',
       'variety'],
      dtype='object')
```

In [6]:
```
df.values
```

Out[6]:
```
array([[5.1, 3.5, 1.4, 0.2, 'Setosa'],
       [4.9, 3.0, 1.4, 0.2, 'Setosa'],
       [4.7, 3.2, 1.3, 0.2, 'Setosa'],
       [4.6, 3.1, 1.5, 0.2, 'Setosa'],
       [5.0, 3.6, 1.4, 0.2, 'Setosa'],
       [5.4, 3.9, 1.7, 0.4, 'Setosa'],
       [4.6, 3.4, 1.4, 0.3, 'Setosa'],
       [5.0, 3.4, 1.5, 0.2, 'Setosa'],
       [4.4, 2.9, 1.4, 0.2, 'Setosa'],
       [4.9, 3.1, 1.5, 0.1, 'Setosa'],
       [5.4, 3.7, 1.5, 0.2, 'Setosa'],
       [4.8, 3.4, 1.6, 0.2, 'Setosa'],
       [4.8, 3.0, 1.4, 0.1, 'Setosa'],
       [4.3, 3.0, 1.1, 0.1, 'Setosa'],
       [5.8, 4.0, 1.2, 0.2, 'Setosa'],
       [5.7, 4.4, 1.5, 0.4, 'Setosa'],
       [5.4, 3.9, 1.3, 0.4, 'Setosa'],
       [5.1, 3.5, 1.4, 0.3, 'Setosa'],
       [5.7, 3.8, 1.7, 0.3, 'Setosa'],
       [5.1, 3.8, 1.5, 0.3, 'Setosa'],
       [5.4, 3.4, 1.7, 0.2, 'Setosa'],
       [5.1, 3.7, 1.5, 0.4, 'Setosa'],
       [4.6, 3.6, 1.0, 0.2, 'Setosa'],
       [5.1, 3.3, 1.7, 0.5, 'Setosa'],
       [4.8, 3.4, 1.9, 0.2, 'Setosa'],
       [5.0, 3.0, 1.6, 0.2, 'Setosa'],
       [5.0, 3.4, 1.6, 0.4, 'Setosa'],
       [5.2, 3.5, 1.5, 0.2, 'Setosa'],
       [5.2, 3.4, 1.4, 0.2, 'Setosa'],
       [4.7, 3.2, 1.6, 0.2, 'Setosa'],
       [4.8, 3.1, 1.6, 0.2, 'Setosa'],
       [5.4, 3.4, 1.5, 0.4, 'Setosa'],
       [5.2, 4.1, 1.5, 0.1, 'Setosa'],
       [5.5, 4.2, 1.4, 0.2, 'Setosa'],
       [4.9, 3.1, 1.5, 0.2, 'Setosa'],
       [5.0, 3.2, 1.2, 0.2, 'Setosa'],
       [5.5, 3.5, 1.3, 0.2, 'Setosa'],
       [4.9, 3.6, 1.4, 0.1, 'Setosa'],
       [4.4, 3.0, 1.3, 0.2, 'Setosa'],
       [5.1, 3.4, 1.5, 0.2, 'Setosa'],
       [5.0, 3.5, 1.3, 0.3, 'Setosa'],
       [4.5, 2.3, 1.3, 0.3, 'Setosa'],
       [4.4, 3.2, 1.3, 0.2, 'Setosa'],
       [5.0, 3.5, 1.6, 0.6, 'Setosa'],
       [5.1, 3.8, 1.9, 0.4, 'Setosa'],
       [4.8, 3.0, 1.4, 0.3, 'Setosa'],
       [5.1, 3.8, 1.6, 0.2, 'Setosa'],
       [4.6, 3.2, 1.4, 0.2, 'Setosa'],
       [5.3, 3.7, 1.5, 0.2, 'Setosa'],
       [5.0, 3.3, 1.4, 0.2, 'Setosa'],
       [7.0, 3.2, 4.7, 1.4, 'Versicolor'],
       [6.4, 3.2, 4.5, 1.5, 'Versicolor'],
       [6.9, 3.1, 4.9, 1.5, 'Versicolor'],
       [5.5, 2.3, 4.0, 1.3, 'Versicolor'],
       [6.5, 2.8, 4.6, 1.5, 'Versicolor'],
       [5.7, 2.8, 4.5, 1.3, 'Versicolor'],
       [6.3, 3.3, 4.7, 1.6, 'Versicolor'],
       [4.9, 2.4, 3.3, 1.0, 'Versicolor'],
       [6.6, 2.9, 4.6, 1.3, 'Versicolor'],
       [5.2, 2.7, 3.9, 1.4, 'Versicolor'],
```

```
[5.0, 2.0, 3.5, 1.0, 'Versicolor'],
[5.9, 3.0, 4.2, 1.5, 'Versicolor'],
[6.0, 2.2, 4.0, 1.0, 'Versicolor'],
[6.1, 2.9, 4.7, 1.4, 'Versicolor'],
[5.6, 2.9, 3.6, 1.3, 'Versicolor'],
[6.7, 3.1, 4.4, 1.4, 'Versicolor'],
[5.6, 3.0, 4.5, 1.5, 'Versicolor'],
[5.8, 2.7, 4.1, 1.0, 'Versicolor'],
[6.2, 2.2, 4.5, 1.5, 'Versicolor'],
[5.6, 2.5, 3.9, 1.1, 'Versicolor'],
[5.9, 3.2, 4.8, 1.8, 'Versicolor'],
[6.1, 2.8, 4.0, 1.3, 'Versicolor'],
[6.3, 2.5, 4.9, 1.5, 'Versicolor'],
[6.1, 2.8, 4.7, 1.2, 'Versicolor'],
[6.4, 2.9, 4.3, 1.3, 'Versicolor'],
[6.6, 3.0, 4.4, 1.4, 'Versicolor'],
[6.8, 2.8, 4.8, 1.4, 'Versicolor'],
[6.7, 3.0, 5.0, 1.7, 'Versicolor'],
[6.0, 2.9, 4.5, 1.5, 'Versicolor'],
[5.7, 2.6, 3.5, 1.0, 'Versicolor'],
[5.5, 2.4, 3.8, 1.1, 'Versicolor'],
[5.5, 2.4, 3.7, 1.0, 'Versicolor'],
[5.8, 2.7, 3.9, 1.2, 'Versicolor'],
[6.0, 2.7, 5.1, 1.6, 'Versicolor'],
[5.4, 3.0, 4.5, 1.5, 'Versicolor'],
[6.0, 3.4, 4.5, 1.6, 'Versicolor'],
[6.7, 3.1, 4.7, 1.5, 'Versicolor'],
[6.3, 2.3, 4.4, 1.3, 'Versicolor'],
[5.6, 3.0, 4.1, 1.3, 'Versicolor'],
[5.5, 2.5, 4.0, 1.3, 'Versicolor'],
[5.5, 2.6, 4.4, 1.2, 'Versicolor'],
[6.1, 3.0, 4.6, 1.4, 'Versicolor'],
[5.8, 2.6, 4.0, 1.2, 'Versicolor'],
[5.0, 2.3, 3.3, 1.0, 'Versicolor'],
[5.6, 2.7, 4.2, 1.3, 'Versicolor'],
[5.7, 3.0, 4.2, 1.2, 'Versicolor'],
[5.7, 2.9, 4.2, 1.3, 'Versicolor'],
[6.2, 2.9, 4.3, 1.3, 'Versicolor'],
[5.1, 2.5, 3.0, 1.1, 'Versicolor'],
[5.7, 2.8, 4.1, 1.3, 'Versicolor'],
[6.3, 3.3, 6.0, 2.5, 'Virginica'],
[5.8, 2.7, 5.1, 1.9, 'Virginica'],
[7.1, 3.0, 5.9, 2.1, 'Virginica'],
[6.3, 2.9, 5.6, 1.8, 'Virginica'],
[6.5, 3.0, 5.8, 2.2, 'Virginica'],
[7.6, 3.0, 6.6, 2.1, 'Virginica'],
[4.9, 2.5, 4.5, 1.7, 'Virginica'],
[7.3, 2.9, 6.3, 1.8, 'Virginica'],
[6.7, 2.5, 5.8, 1.8, 'Virginica'],
[7.2, 3.6, 6.1, 2.5, 'Virginica'],
[6.5, 3.2, 5.1, 2.0, 'Virginica'],
[6.4, 2.7, 5.3, 1.9, 'Virginica'],
[6.8, 3.0, 5.5, 2.1, 'Virginica'],
[5.7, 2.5, 5.0, 2.0, 'Virginica'],
[5.8, 2.8, 5.1, 2.4, 'Virginica'],
[6.4, 3.2, 5.3, 2.3, 'Virginica'],
[6.5, 3.0, 5.5, 1.8, 'Virginica'],
[7.7, 3.8, 6.7, 2.2, 'Virginica'],
[7.7, 2.6, 6.9, 2.3, 'Virginica'],
[6.0, 2.2, 5.0, 1.5, 'Virginica'],
```

```
       [6.9, 3.2, 5.7, 2.3, 'Virginica'],
       [5.6, 2.8, 4.9, 2.0, 'Virginica'],
       [7.7, 2.8, 6.7, 2.0, 'Virginica'],
       [6.3, 2.7, 4.9, 1.8, 'Virginica'],
       [6.7, 3.3, 5.7, 2.1, 'Virginica'],
       [7.2, 3.2, 6.0, 1.8, 'Virginica'],
       [6.2, 2.8, 4.8, 1.8, 'Virginica'],
       [6.1, 3.0, 4.9, 1.8, 'Virginica'],
       [6.4, 2.8, 5.6, 2.1, 'Virginica'],
       [7.2, 3.0, 5.8, 1.6, 'Virginica'],
       [7.4, 2.8, 6.1, 1.9, 'Virginica'],
       [7.9, 3.8, 6.4, 2.0, 'Virginica'],
       [6.4, 2.8, 5.6, 2.2, 'Virginica'],
       [6.3, 2.8, 5.1, 1.5, 'Virginica'],
       [6.1, 2.6, 5.6, 1.4, 'Virginica'],
       [7.7, 3.0, 6.1, 2.3, 'Virginica'],
       [6.3, 3.4, 5.6, 2.4, 'Virginica'],
       [6.4, 3.1, 5.5, 1.8, 'Virginica'],
       [6.0, 3.0, 4.8, 1.8, 'Virginica'],
       [6.9, 3.1, 5.4, 2.1, 'Virginica'],
       [6.7, 3.1, 5.6, 2.4, 'Virginica'],
       [6.9, 3.1, 5.1, 2.3, 'Virginica'],
       [5.8, 2.7, 5.1, 1.9, 'Virginica'],
       [6.8, 3.2, 5.9, 2.3, 'Virginica'],
       [6.7, 3.3, 5.7, 2.5, 'Virginica'],
       [6.7, 3.0, 5.2, 2.3, 'Virginica'],
       [6.3, 2.5, 5.0, 1.9, 'Virginica'],
       [6.5, 3.0, 5.2, 2.0, 'Virginica'],
       [6.2, 3.4, 5.4, 2.3, 'Virginica'],
       [5.9, 3.0, 5.1, 1.8, 'Virginica']], dtype=object)
```

In [7]:
```
X=df.iloc[:,:4]
X.head()
```

Out[7]:

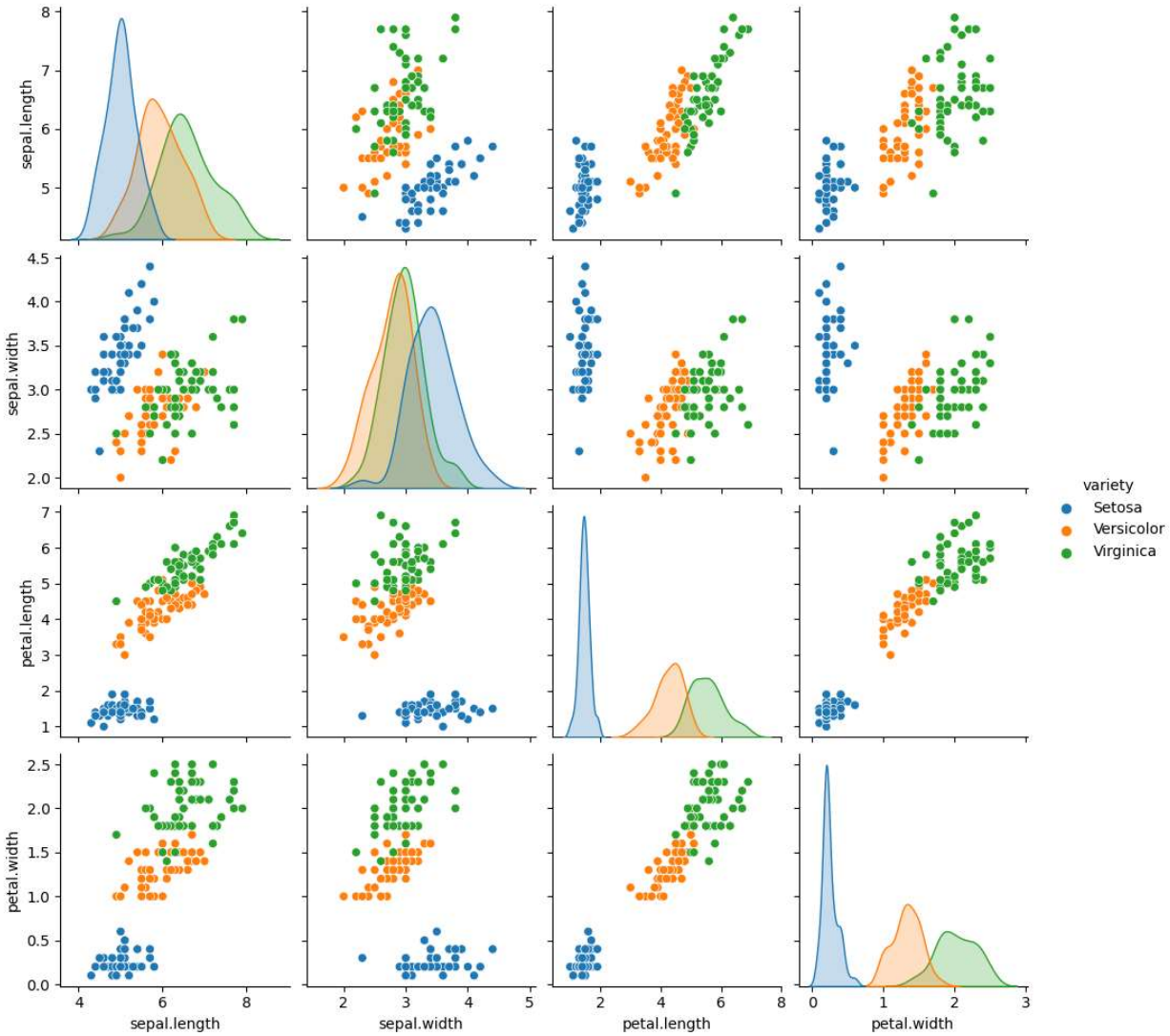
	sepal.length	sepal.width	petal.length	petal.width
0	5.1	3.5	1.4	0.2
1	4.9	3.0	1.4	0.2
2	4.7	3.2	1.3	0.2
3	4.6	3.1	1.5	0.2
4	5.0	3.6	1.4	0.2

In [8]:
```
Y=df.iloc[:,-1]
Y.head()
```

Out[8]:
```
0    Setosa
1    Setosa
2    Setosa
3    Setosa
4    Setosa
Name: variety, dtype: object
```

In [9]:
```
seaborn.pairplot(df, hue='variety')
```

Out[9]:
```
<seaborn.axisgrid.PairGrid at 0x1c7765ccd00>
```



In [10]:
```
X_train, X_test, y_train, y_test = train_test_split(X, Y, test_size=0.2)
y_test.shape
```

Out[10]:
```
(30,)
```

In [11]:
```
from sklearn.svm import SVC
svn = SVC()
svn.fit(X_train, y_train)
```

Out[11]:
```
SVC()
```

In [12]:
```
pred = svn.predict(X_test)
from sklearn.metrics import accuracy_score
accuracy_score(y_test, pred)
```

Out[12]:
```
1.0
```

In [13]:
```
X_new = np.array([[ 4.4,2.9,1.4,.2], [5.6,3,4.5,1.5], [6,3,4.8,1.8]])
prediction = svn.predict(X_new)
print("Prediction of Species: {}".format(prediction))
#Following error was troubleshooted quite a few times, but no fix was found.
#As the model is giving the correct output, this was left in.
```

```
Prediction of Species: ['Setosa' 'Versicolor' 'Virginica']
```

```
C:\Users\manis\anaconda3.1\lib\site-packages\sklearn\base.py:450: UserWarning: X does
not have valid feature names, but SVC was fitted with feature names
  warnings.warn(
```

In [14]:
```
from sklearn.metrics import confusion_matrix
con=confusion_matrix(y_test.values,pred)
con
```

Out[14]:
```
array([[ 9,  0,  0],
       [ 0, 13,  0],
       [ 0,  0,  8]], dtype=int64)
```

In [15]:
```
con1=pandas.DataFrame(data=con,index=['setosa','versicolor','virginica'],columns=['set
con1
```

Out[15]:

	setosa	versicolor	virginica
setosa	9	0	0
versicolor	0	13	0
virginica	0	0	8

In [16]:
```
pred_output=pandas.DataFrame(data=[y_test.values,pred],index=['y_test','predicted outp
pred_output
```

Out[16]:

	0	1	2	3	4	5	6	7	8	
y_test	Setosa	Virginica	Versicolor	Virginica	Versicolor	Versicolor	Setosa	Versicolor	Versicolor	Virg
predicted output	Setosa	Virginica	Versicolor	Virginica	Versicolor	Versicolor	Setosa	Versicolor	Versicolor	Virg

2 rows × 30 columns

In [17]:
```
pred_output.transpose()
```

Out[17]:

	y_test	predicted output
0	Setosa	Setosa
1	Virginica	Virginica
2	Versicolor	Versicolor
3	Virginica	Virginica
4	Versicolor	Versicolor
5	Versicolor	Versicolor
6	Setosa	Setosa
7	Versicolor	Versicolor
8	Versicolor	Versicolor
9	Virginica	Virginica
10	Virginica	Virginica
11	Virginica	Virginica
12	Versicolor	Versicolor
13	Versicolor	Versicolor
14	Setosa	Setosa
15	Setosa	Setosa
16	Virginica	Virginica
17	Setosa	Setosa
18	Versicolor	Versicolor
19	Versicolor	Versicolor
20	Setosa	Setosa
21	Virginica	Virginica
22	Setosa	Setosa
23	Versicolor	Versicolor
24	Versicolor	Versicolor
25	Virginica	Virginica
26	Versicolor	Versicolor
27	Versicolor	Versicolor
28	Setosa	Setosa
29	Setosa	Setosa

In [19]:
```
pred_output.iloc[0,: ].value_counts()
```

Out[19]:
```
Versicolor    13
Setosa         9
Virginica      8
Name: y_test, dtype: int64
```