K_means_with_Iris_Data

July 17, 2020

[1]:
```
import pandas as pd
import numpy as np
from sklearn import datasets
from sklearn.cluster import KMeans
import matplotlib.pyplot as plt
import matplotlib.patches as mpatches
import sklearn.metrics as sm
%matplotlib inline
```

[2]:
```
iris = datasets.load_iris()
print(iris.data)
```

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[[5.1 3.5 1.4 0.2]
 [4.9 3.  1.4 0.2]
 [4.7 3.2 1.3 0.2]
 [4.6 3.1 1.5 0.2]
 [5.  3.6 1.4 0.2]
 [5.4 3.9 1.7 0.4]
 [4.6 3.4 1.4 0.3]
 [5.  3.4 1.5 0.2]
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 [5.  3.  1.6 0.2]
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[5.  3.4 1.6 0.4]
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[4.7 3.2 1.6 0.2]
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[6.7 3.1 4.4 1.4]
[5.6 3.  4.5 1.5]
[5.8 2.7 4.1 1. ]
[6.2 2.2 4.5 1.5]
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[6.4 2.9 4.3 1.3]
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[5.4 3.  4.5 1.5]
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[5.8 2.6 4.  1.2]
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[5.7 2.8 4.1 1.3]
[6.3 3.3 6.  2.5]
[5.8 2.7 5.1 1.9]
[7.1 3.  5.9 2.1]
[6.3 2.9 5.6 1.8]
[6.5 3.  5.8 2.2]
[7.6 3.  6.6 2.1]
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[5.6 2.8 4.9 2. ]
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[7.7 2.8 6.7 2. ]
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[7.2 3.2 6.  1.8]
[6.2 2.8 4.8 1.8]
[6.1 3.  4.9 1.8]
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[7.2 3.  5.8 1.6]
[7.4 2.8 6.1 1.9]
[7.9 3.8 6.4 2. ]
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[7.7 3.  6.1 2.3]
[6.3 3.4 5.6 2.4]
[6.4 3.1 5.5 1.8]
[6.  3.  4.8 1.8]
[6.9 3.1 5.4 2.1]
[6.7 3.1 5.6 2.4]
[6.9 3.1 5.1 2.3]
[5.8 2.7 5.1 1.9]
[6.8 3.2 5.9 2.3]
[6.7 3.3 5.7 2.5]
[6.7 3.  5.2 2.3]
[6.3 2.5 5.  1.9]
[6.5 3.  5.2 2. ]
[6.2 3.4 5.4 2.3]
[5.9 3.  5.1 1.8]]
```

[3]:
```
print(iris.target_names)
```

```
['setosa' 'versicolor' 'virginica']
```

[4]:
```
print(iris.target)
```

```
[0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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 2 2]
```

[5]:
```
x = pd.DataFrame(iris.data, columns=['Sepal Length', 'Sepal Width', 'Petal␣
 ↪Length', 'Petal Width'])
y = pd.DataFrame(iris.target, columns=['Target'])
```

[6]:
```
x.head()
```

[6]:

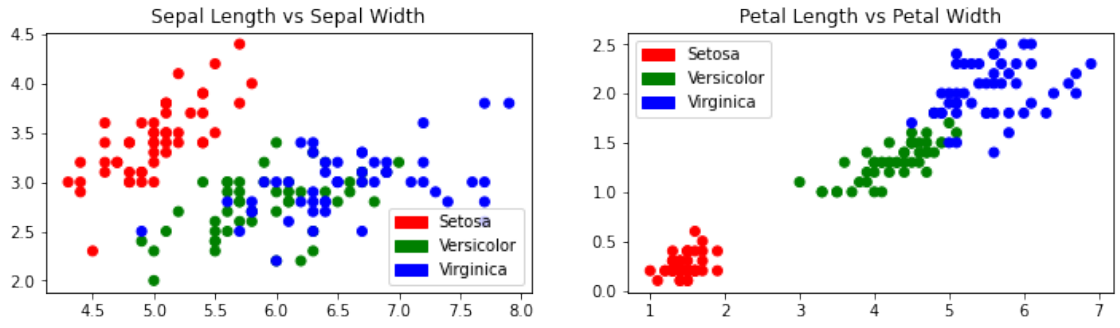
	Sepal Length	Sepal Width	Petal Length	Petal Width
0	5.1	3.5	1.4	0.2
1	4.9	3.0	1.4	0.2
2	4.7	3.2	1.3	0.2
3	4.6	3.1	1.5	0.2
4	5.0	3.6	1.4	0.2

[7]:
```
plt.figure(figsize=(12,3))
colors = np.array(['red', 'green', 'blue'])
iris_targets_legend = np.array(iris.target_names)
red_patch = mpatches.Patch(color='red', label='Setosa')
green_patch = mpatches.Patch(color='green', label='Versicolor')
blue_patch = mpatches.Patch(color='blue', label='Virginica')


plt.subplot(1, 2, 1)
plt.scatter(x['Sepal Length'], x['Sepal Width'], c=colors[y['Target']])
plt.title('Sepal Length vs Sepal Width')
plt.legend(handles=[red_patch, green_patch, blue_patch])

plt.subplot(1,2,2)
plt.scatter(x['Petal Length'], x['Petal Width'], c= colors[y['Target']])
plt.title('Petal Length vs Petal Width')
plt.legend(handles=[red_patch, green_patch, blue_patch])
```

[7]:
```
<matplotlib.legend.Legend at 0x141ff069970>
```



[8]:
```
y.head()
```

[8]:

	Target
0	0
1	0
2	0
3	0
4	0

[9]:
```
iris_k_mean_model = KMeans(n_clusters=3)
iris_k_mean_model.fit(x)
```

[9]:
```
KMeans(algorithm='auto', copy_x=True, init='k-means++', max_iter=300,
       n_clusters=3, n_init=10, n_jobs=None, precompute_distances='auto',
       random_state=None, tol=0.0001, verbose=0)
```

[10]:
```
print(iris_k_mean_model.labels_)
```

```
[1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1 1 1 1 2 2 0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
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 0 0 2 2 0 0 0 0 2 0 2 0 2 0 0 2 2 0 0 0 0 2 0 0 0 0 2 0 0 0 2 0 0 0 2 0
 0 2]
```

[11]:
```
print(iris_k_mean_model.cluster_centers_)
```

```
[[6.85       3.07368421 5.74210526 2.07105263]
 [5.006      3.428      1.462      0.246     ]
 [5.9016129  2.7483871  4.39354839 1.43387097]]
```

[12]:
```
plt.figure(figsize=(12,3))

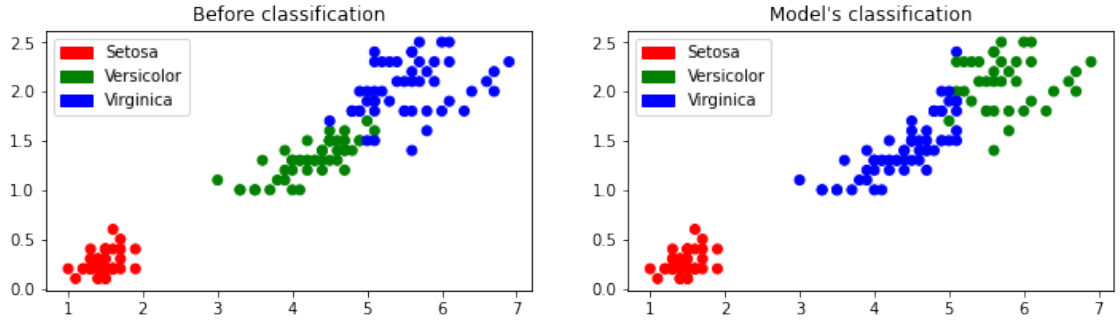
colors = np.array(['red', 'green', 'blue'])

predictedY = np.choose(iris_k_mean_model.labels_, [1, 0, 2]).astype(np.int64)

plt.subplot(1, 2, 1)
plt.scatter(x['Petal Length'], x['Petal Width'], c=colors[y['Target']])
plt.title('Before classification')
plt.legend(handles=[red_patch, green_patch, blue_patch])

plt.subplot(1, 2, 2)
plt.scatter(x['Petal Length'], x['Petal Width'], c=colors[predictedY])
plt.title("Model's classification")
plt.legend(handles=[red_patch, green_patch, blue_patch])
```

[12]:
```
<matplotlib.legend.Legend at 0x141ff153b50>
```



[13]:
```
sm.accuracy_score(predictedY, y['Target'])
```

[13]:
```
0.44
```

0.1 Interpretation of Confusion Matrix

Correctly identifed all 0 classes as 0's correctly classified 48 class 1's but miss-classified 2 class 1's as class 2 correctly classified 36 class 2's but miss-classified 14 class 2's as class 1

[14]:
```
sm.confusion_matrix(predictedY, y['Target'])
```

[14]:
```
array([[50,  0,  0],
       [ 0,  2, 36],
       [ 0, 48, 14]], dtype=int64)
```