k means

April 19, 2022

0.1 using make_blobs with KMeans clustering

[16]:
```
import numpy as np
```

[2]:
```
import matplotlib.pyplot as plt
```

[3]:
```
from sklearn.datasets import make_blobs
```

[4]:
```
from sklearn.cluster import KMeans
```

[17]:
```
#generate data of 4 clusters with labels, store in single variable
alldata=make_blobs(n_samples=200,centers=4,
                   n_features=2, cluster_std=1.5, random_state=30)
```

[24]:
```
print(alldata)
```

```
(array([[ 8.51407976e+00, -6.18828280e+00],
       [ 7.73736837e+00, -4.52365640e+00],
       [ 2.40291137e+00, -7.94945122e+00],
       [ 8.29380054e+00, -4.70170347e+00],
       [ 4.79290982e+00, -5.61888606e+00],
       [ 9.52726545e+00, -2.44630131e+00],
       [ 1.17045705e+00, -6.60717108e+00],
       [ 2.95325152e+00, -6.79538648e+00],
       [ 2.62599755e+00, -6.98512507e+00],
       [ 7.79170204e+00, -7.21614623e+00],
       [ 2.32604509e+00, -6.17461717e+00],
       [ 7.30854066e+00, -1.84532049e+00],
       [ 6.53588267e+00, -8.83979147e+00],
       [ 1.83076709e+00, -1.11139843e+00],
       [ 5.43995650e+00, -1.06889091e+00],
       [ 8.94242794e+00, -2.95956947e+00],
       [ 1.29690251e+00, -4.31120603e+00],
       [ 1.28195103e+01, -5.18434427e+00],
       [ 6.79975761e-01, -4.22162853e+00],
       [ 1.99357986e+00, -8.94157251e+00],
       [ 2.51593805e+00, -7.01253425e+00],
       [ 1.16606001e+01, -5.17682713e+00],
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[ 3.56541409e+00, -2.95495312e+00],
[ 4.16042453e+00, -7.28593521e+00],
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[ 3.91750418e+00, -5.95582351e+00],
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[ 7.51363963e+00, -2.93319000e+00],
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[ 9.64579253e+00, -3.98841217e+00],
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[ 4.38671116e+00, -3.95067701e+00],
[ 2.65506864e+00, -5.18199247e+00],
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[ 6.14958803e+00, -6.03258461e+00],
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[ 1.06391812e+01, -8.32643716e+00],
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[ 7.70197094e+00, -3.06626134e+00],
[ 7.78541796e+00, -3.04762079e+00],
[ 5.25020905e+00, -2.22378329e+00],
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[ 1.03252767e+01, -3.76100877e-01],
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```
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       [ 7.90605862e+00, -7.32071602e+00],
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       1, 1]))
```

[25]:
```
#extract only the first array i.e. data values
data=alldata[0]
```

[26]:
```
data
```

[26]:
```
array([[ 8.51407976e+00, -6.18828280e+00],
       [ 7.73736837e+00, -4.52365640e+00],
       [ 2.40291137e+00, -7.94945122e+00],
       [ 8.29380054e+00, -4.70170347e+00],
       [ 4.79290982e+00, -5.61888606e+00],
       [ 9.52726545e+00, -2.44630131e+00],
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       [ 2.95325152e+00, -6.79538648e+00],
       [ 2.62599755e+00, -6.98512507e+00],
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       [ 2.32604509e+00, -6.17461717e+00],
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       [ 1.83076709e+00, -1.11139843e+00],
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       [ 1.28195103e+01, -5.18434427e+00],
       [ 6.79975761e-01, -4.22162853e+00],
       [ 1.99357986e+00, -8.94157251e+00],
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       [ 1.16606001e+01, -5.17682713e+00],
       [ 7.70804283e+00, -2.39028868e+00],
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       [ 9.47018622e+00, -1.82328932e+00],
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```
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[ 7.70197094e+00, -3.06626134e+00],
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[ 1.03252767e+01, -3.76100877e-01],
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[ 9.62781325e+00, -8.08729657e+00],
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[ 6.53023454e+00, -3.37616225e+00],
[ 9.68630443e+00, -3.10734333e+00],
[ 3.38039131e+00, -1.72943809e+00],
[ 4.39824846e+00, -6.12025368e+00],
[ 1.00923124e+01, -2.11624452e+00],
[ 3.91380893e+00, -5.84861336e+00],
[ 8.82112687e+00, -2.48353401e+00],
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[ 4.05703548e+00, -5.07488706e+00],
[ 6.53896941e+00, -7.85987808e+00],
[ 9.86349781e+00,  1.20092107e+00],
[ 3.74551729e+00, -3.13270027e+00],
[ 9.31078888e+00, -2.02089834e+00],
[ 1.00949325e+01, -7.80651828e+00],
[ 1.12469972e+01, -7.37881029e+00],
[ 9.95716257e+00, -4.46815707e+00],
[ 7.81698527e+00, -3.89182534e+00],
[ 1.06782543e+01, -8.53619278e+00],
[ 2.26118214e+00, -6.71884614e+00],
[ 5.53635321e+00, -4.86936724e+00],
[ 4.36039751e+00, -4.93572810e+00],
[ 9.83204078e+00, -4.98202557e+00],
[ 4.74565397e+00,  1.76590107e-01],
[ 2.27312883e+00, -5.67154132e+00],
[ 4.09862209e+00, -3.95219777e+00],
[ 4.13114378e+00, -7.63582293e+00],
[ 3.97080523e+00, -6.15681193e+00],
```
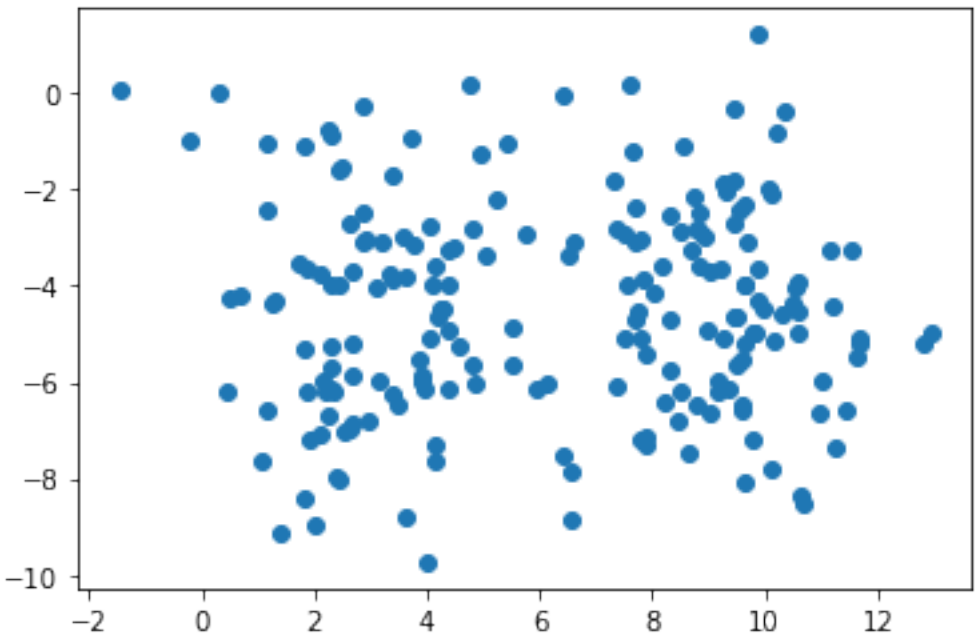

```
[ 3.49809272e+00, -6.49502765e+00],
[ 8.81566294e+00, -3.60780881e+00],
[ 1.01458593e+01, -5.14326955e+00],
[ 2.42913016e+00, -3.98072680e+00],
[ 2.87420373e+00, -3.08624866e+00],
[ 2.92791237e+00, -3.06004185e+00],
[ 8.76225814e+00, -6.45849196e+00],
[ 1.14199720e+01, -6.58286059e+00],
[-1.47218067e+00,  4.03053551e-02],
[ 7.35443885e+00, -2.82145981e+00],
[ 3.70900561e+00, -9.53496488e-01],
[ 8.21166727e+00, -6.42624299e+00],
[ 4.25255978e+00, -4.46664822e+00],
[ 1.16858605e+01, -5.07693818e+00],
[ 3.60488873e+00, -8.77922417e+00],
[ 1.05822400e+01, -4.53427559e+00],
[ 8.79804399e+00, -2.79332723e+00],
[ 9.61418661e+00, -3.98566427e+00],
[-2.42974227e-01, -9.78357642e-01],
[ 4.20131268e+00, -4.62743423e+00],
[ 9.24370105e+00, -1.85841930e+00],
[ 8.46488213e+00, -6.79770211e+00],
[ 7.55404041e+00, -3.96743736e+00],
[ 2.30251796e+00, -6.12990171e+00],
[ 2.85811724e+00, -2.48416625e+00],
[ 8.51612927e+00, -2.89717046e+00],
[ 1.02017747e+01, -8.12406086e-01],
[ 5.73119267e+00, -2.91730467e+00],
[ 9.62465764e+00, -5.17260135e+00],
[ 9.25878479e+00, -5.08945604e+00],
[ 4.34679774e-01, -6.18033568e+00],
[ 9.48849046e+00, -5.62869566e+00],
[ 2.08348853e+00, -3.77344748e+00],
[ 8.30437901e+00, -5.75240504e+00],
[ 8.03662624e+00, -4.17095602e+00],
[ 9.45131238e+00, -4.66232094e+00],
[ 8.95659239e+00, -4.92396488e+00],
[ 9.22954414e+00, -3.65522852e+00],
[ 3.08431561e+00, -4.04531341e+00],
[ 8.54479643e+00, -1.10839939e+00],
[ 8.69921332e+00, -3.28326445e+00],
[ 1.84902666e+00, -3.66416550e+00],
[ 9.89522310e+00, -3.65950103e+00],
[ 9.59679253e+00, -5.54854538e+00],
[ 7.90605862e+00, -7.32071602e+00],
[ 8.72838810e+00, -2.15611699e+00],
[ 1.14992058e+00, -1.03377218e+00],
```

```
[ 1.29347117e+01, -4.96780409e+00],
[ 2.26761719e+00, -3.96764321e+00],
[ 4.06176206e+00, -2.77282947e+00],
[ 1.05043642e+01, -4.35583605e+00],
[ 3.83809909e+00, -5.50742952e+00],
[ 4.15338949e+00, -3.61536655e+00],
[ 1.09443512e+01, -6.66145213e+00],
[ 9.00918761e+00, -6.63829873e+00],
[ 4.55307888e+00, -5.26678478e+00],
[ 4.45892040e+00, -3.19034189e+00],
[ 9.17846209e+00, -6.19029679e+00],
[ 2.45440245e+00, -1.57747899e+00],
[ 2.21445498e+00, -6.18120362e+00],
[ 3.16448595e+00, -5.97242090e+00]])
```

[27]:
```
%matplotlib inline
#plot datapoints without labels
plt.scatter(data[:,0], data[:,1])
```

[27]:
```
<matplotlib.collections.PathCollection at 0x7fb5f19851d0>
```



[10]:
```
#create kmeans object
kmeans=KMeans(n_clusters=4)
```

[11]:
```
#compute cluster centre and predict cluster label for each sample
y_pred=kmeans.fit_predict(data)
print(y_pred)
```

```
[0 1 3 0 3 1 3 3 3 0 3 1 3 2 2 1 2 0 2 3 3 0 1 3 1 3 1 2 3 3 0 3 2 1 0 1 3
 2 3 0 1 3 0 3 2 1 0 1 0 2 2 3 0 2 0 3 0 1 0 1 1 0 2 2 1 1 1 2 3 1 1 0 0 0
 1 1 2 3 1 3 1 1 0 3 2 0 2 1 0 3 3 2 2 0 2 2 2 0 1 1 0 3 3 0 2 3 3 2 0 1 3
 0 3 2 2 0 3 3 2 3 3 3 1 2 1 0 0 0 1 0 3 3 3 0 2 3 2 3 3 3 1 0 2 2 2 0 0 2
 1 2 0 3 0 3 0 1 1 2 3 1 0 1 3 2 1 1 2 0 0 3 0 2 0 1 0 0 1 2 1 1 2 1 0 0 1
 2 0 2 2 0 3 2 0 0 3 2 0 2 3 3]
```

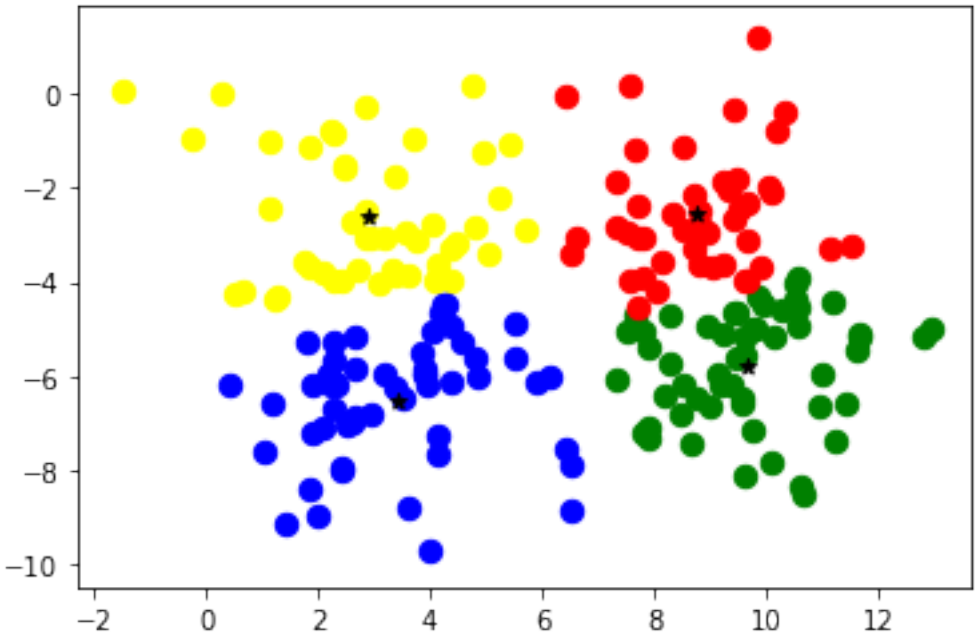
[12]:
```
clusters = kmeans.cluster_centers_
```

[22]:
```
clusters
```

[22]:
```
array([[ 9.68112656, -5.78684846],
       [ 8.75957261, -2.53447398],
       [ 2.88368772, -2.62249863],
       [ 3.40024824, -6.49923365]])
```

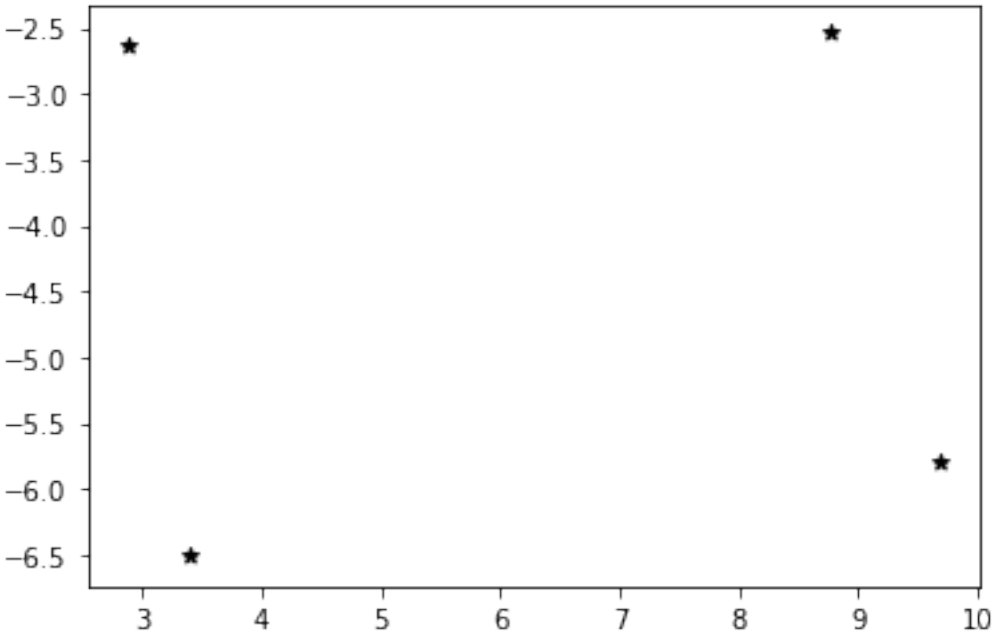
[23]:
```
plt.scatter(data[y_pred==0,0], data[y_pred==0,1], s=70, color='green')
plt.scatter(data[y_pred==1,0], data[y_pred==1,1], s=70, color='red')
plt.scatter(data[y_pred==2,0], data[y_pred==2,1], s=70, color='yellow')
plt.scatter(data[y_pred==3,0], data[y_pred==3,1], s=70, color='blue')

plt.scatter(clusters[0][0],clusters[0][1], marker='*', color='black')
plt.scatter(clusters[1][0],clusters[1][1], marker='*', color='black')
plt.scatter(clusters[2][0],clusters[2][1], marker='*', color='black')
plt.scatter(clusters[3][0],clusters[3][1], marker='*', color='black')
```

[23]:
```
<matplotlib.collections.PathCollection at 0x7fb5f1985f10>
```



[15]:
```
plt.scatter(clusters[0][0],clusters[0][1], marker='*', color='black')
plt.scatter(clusters[1][0],clusters[1][1], marker='*', color='black')
plt.scatter(clusters[2][0],clusters[2][1], marker='*', color='black')
plt.scatter(clusters[3][0],clusters[3][1], marker='*', color='black')
```

[15]: <matplotlib.collections.PathCollection at 0x7fb5f1a75d50>



[ ]:
```
On the iris dataset, performs the kmeans clustering technique.
Use any 2 features to perform the clustering.
Plot the clusters and cluster centers.

Next, perform the Decision Tree clssification on the iris dataset.
Determine the r2 score and mean squared error for the classifier.
```