20230615_Wirtschaftsinformatik_MPW2

June 15, 2023

[1]:
```
# k -- Means Clustering
```

[2]:
```
"""Der k-means Algorithmus sucht nach einer vorgegebenen Anzahl von Clustern
innerhalb eines unbeschriteten mehrdimensionalen Datensatzes.Er erreicht
durch dies eine "einfache" Vorstellung davon, wie die optimale Clusterbildung
aussieht.Das Clusterzentrum ist das arythmetische Mittel Aller Punkte die
zum Cluster gehören.Jeder Punkt liegt näher an seinem eigenen Clusterzentrum
als an anderen Clusterzentren.Diese Beiden Annahmen sind die Grundlage des
k-means Clusters Modells."""
```

[2]:
```
'Der k-means Algorithmus sucht nach einer vorgegebenen Anzahl von
Clustern\ninnerhalb eines unbeschriteten mehrdimensionalen Datensatzes.Er
erreicht\ndurch dies eine "einfache" Vorstellung davon, wie die optimale
Clusterbildung\naussieht.Das Clusterzentrum ist das arythmetische Mittel Aller
Punkte die\nzum Cluster gehören.Jeder Punkt liegt näher an seinem eigenen
Clusterzentrum\nals an anderen Clusterzentren.Diese Beiden Annahmen sind die
Grundlage des\nk-means Clusters Modells.'
```

[3]:
```
%matplotlib inline
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
```

[4]:
```
# Beispiel 1. "Blobs mit 4 Gruppen"
```

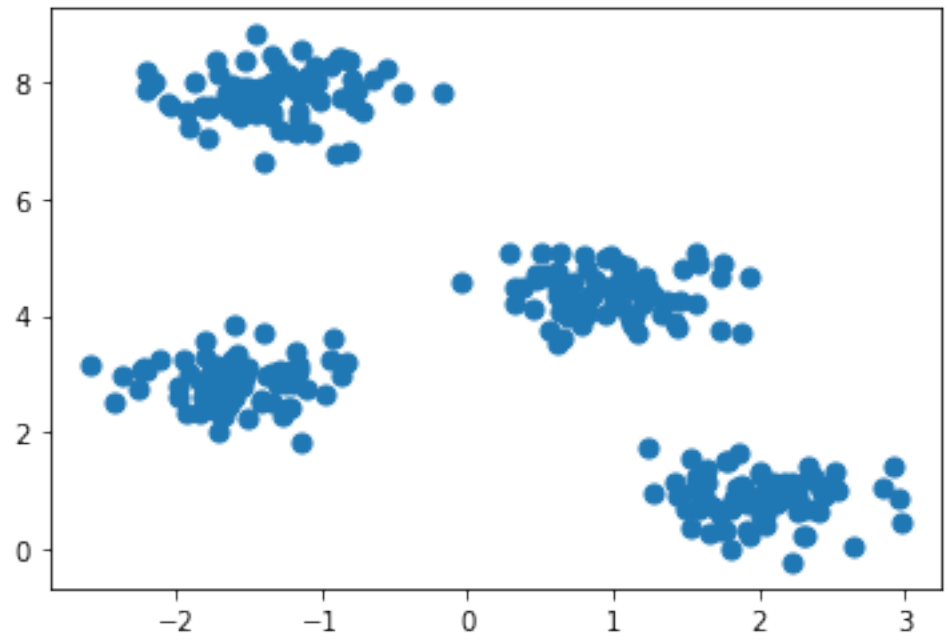
[6]:
```
# Datengenerierung

from sklearn.datasets import make_blobs

X, y_true = make_blobs(n_samples = 300, #anzahl Punkte
                       centers = 4, #anzahl gruppen
                       cluster_std = 0.4, # Standardabweichung der Gruppen
                       random_state = 0)
```

[14]:
```
plt.scatter(X[:,0], # erste Spalte der Daten
            X[:,1], # zweite spalter der Daten
            s = 50) # größe vom Punkt
```

```
plt.show()
```



[10]:
```
X
```

[10]:
```
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       [ 1.53265678e+00,  1.56091593e+00],
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       [ 1.86982913e+00,  1.09025625e+00],
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```

[11]:
```
y_true
```

[11]:
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       1, 2, 3, 2, 1, 0, 3, 0, 0, 1, 0, 2, 2, 0, 1, 0, 0, 3, 1, 0, 2, 3,
       1, 1, 0, 2, 1, 0, 2, 2, 0, 0, 0, 0, 1, 3, 0, 2, 0, 0, 2, 2, 2, 0,
       2, 3, 0, 2, 1, 2, 0, 3, 2, 3, 0, 3, 0, 2, 0, 0, 3, 2, 2, 1, 1, 0,
       3, 1, 1, 2, 1, 2, 0, 3, 3, 0, 0, 3, 0, 1, 2, 0, 1, 2, 3, 2, 1, 0,
       1, 3, 3, 3, 3, 2, 2, 3, 0, 2, 1, 0, 2, 2, 2, 1, 1, 3, 0, 0, 2, 1,
       3, 2, 0, 3, 0, 1, 1, 2, 2, 0, 1, 1, 1, 0, 3, 3, 1, 1, 0, 1, 1, 1,
       3, 2, 3, 0, 1, 1, 3, 3, 3, 1, 1, 0, 3, 2])
```

[16]:
```
# Lösung 1.

from sklearn.cluster import KMeans

kmeans = KMeans(n_clusters=4)
# hier sagen wir KMeans wie viele Clusters wir haben!

kmeans.fit(X) # wir berechnen hier die Clusters

y_means = kmeans.predict(X) # hier geben wir Jedem Punkt einen neuen Label
```

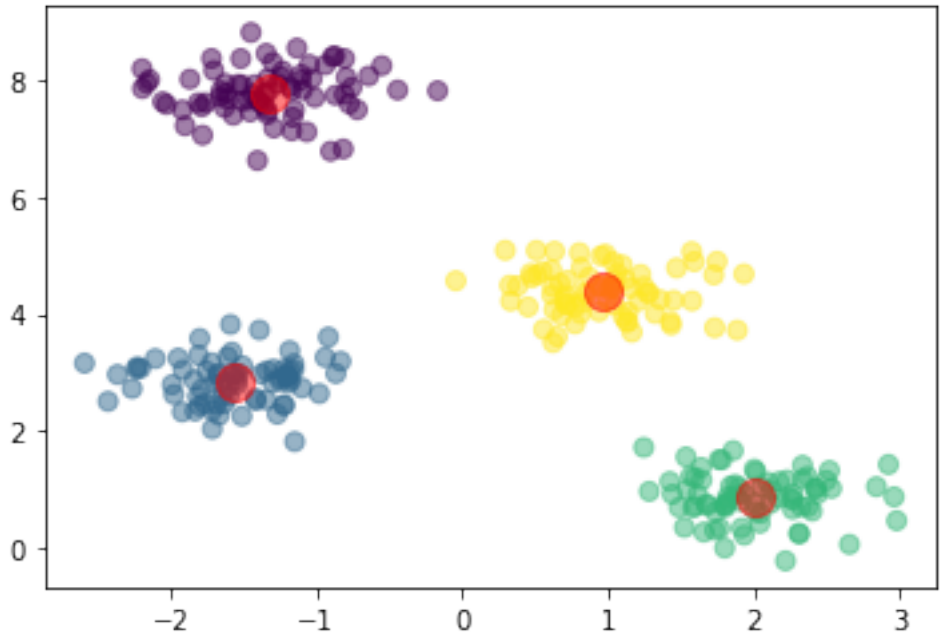
[18]:
```
# graphische Darstellung

plt.scatter(X[:,0], # alle Koordinaten X-Achse
            X[:,1], # alle Koordinaten Y-Achse
            c = y_means, #die neuen Labels als Farbe (c=color)
            s = 50, # size
            alpha=0.5) #transparenz

centroids = kmeans.cluster_centers_
# centroide werden berechnet (roten Punkten)

plt.scatter(centroids[:,0], centroids[:,1], c = 'red', s = 200, alpha=0.5)

plt.show()
```



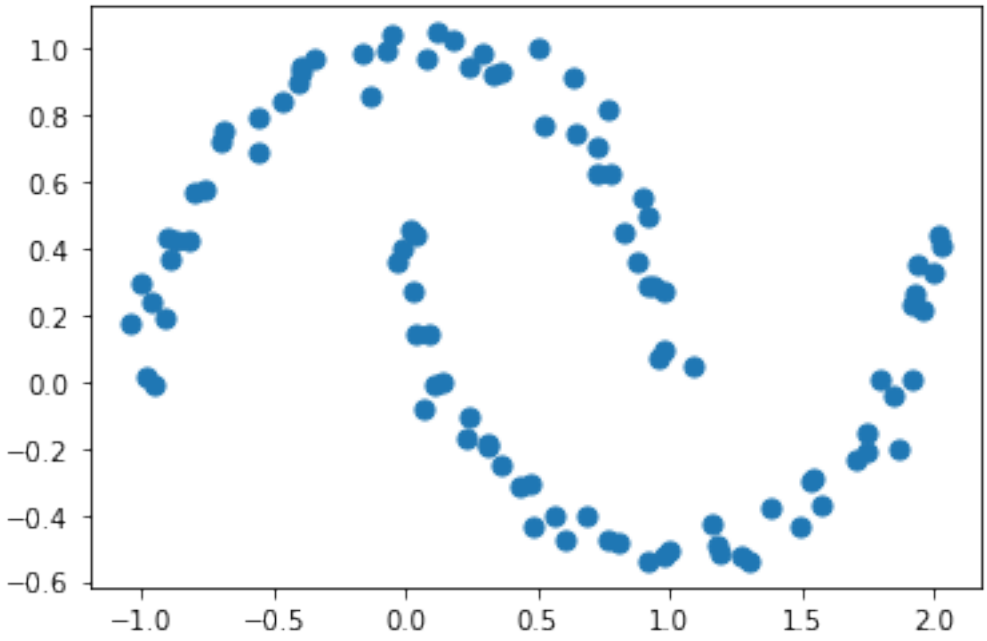
[19]:
```
# K -- means clustering funktioniert NUR wenn:
# 1. ich kenne die Anzahl Clusters
# 2. die Clusters sind LINEAR trennbar (mit dem euklidischen Abstand)
```

[20]:
```
# Beispiel 2. Moons Cluster

from sklearn.datasets import make_moons

X,y = make_moons(100, noise= 0.05, random_state=0)

plt.scatter(X[:,0], X[:,1], s=50)
plt.show()
```



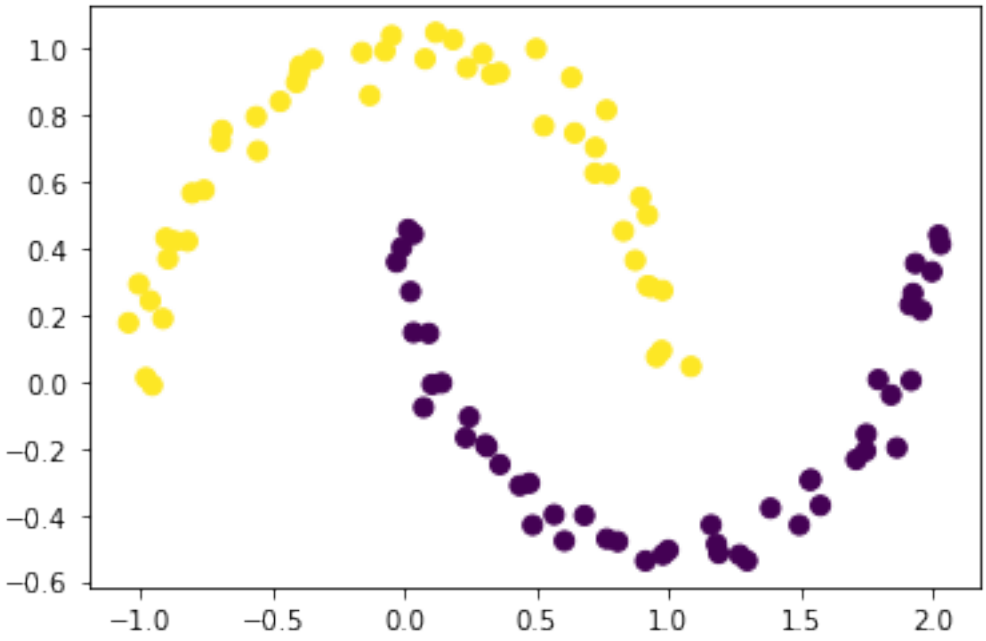
[21]:
```
from sklearn.cluster import SpectralClustering

model = SpectralClustering(n_clusters = 2,
                           affinity='nearest_neighbors', # Abstand nur zu den␣
 ↪Punkten in der nähe)
                           assign_labels='kmeans')

labels = model.fit_predict(X)

plt.scatter(X[:,0], X[:,1], c=labels, s=50)

plt.show()
```


1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0

[ ]: