Task

On

Machine Learning

**Course**: Artificial Intelligence

(Machine Learning & Deep Learning)

Name: Abbas Shafi

Father Name: Dr Muhammad Shafi

Week: 11

Submitted to: Sir Syed Nazir Afridi



National Vocational & Technical Training Commission

National Center For Big Data & Cloud Computing

University of Engineering & Technology

Peshawar

[1]:

# Support Vector Machine (SVM)

[2]:

**import pandas as pd import numpy as np**

**import matplotlib.pyplot as plt**

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[400 rows x 3 columns]

[3]:

[3]: Age EstimatedSalary Purchased

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# Spliting the dataset into Training set and test set

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[12]:

# Feature Scaling

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| [ 1.07681071 | -0.13288524] |
| [ 0.68068169 | 1.78066227] |
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| [ 0.77971394 | 0.35999821] |
| [ 0.8787462 | -0.53878926] |
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| [ 0.97777845 | 1.78066227] |
| [ 0.28455268 | 0.04107362] |
| [-0.80480212 | -0.21986468] |
| [-0.11157634 | 0.07006676] |
| [ 0.28455268 | -0.19087153] |
| [ 1.96810099 | -0.65476184] |
| [-0.80480212 | 1.3457651 ] |
| [-1.79512465 | -0.59677555] |
| [-0.11157634 | 0.12805305] |
| [ 0.28455268 | -0.30684411] |
| [ 1.07681071 | 0.56295021] |
| [-1.00286662 | 0.27301877] |
| [ 1.47293972 | 0.35999821] |
| [ 0.18552042 | -0.3648304 ] |
| [ 2.1661655 | -1.03167271] |
| [-0.30964085 | 1.11381995] |
| [-1.6960924 | 0.07006676] |
| [-0.01254409 | 0.04107362] |
| [ 0.08648817 | 1.05583366] |
| [-0.11157634 | -0.3648304 ] |
| [-1.20093113 | 0.07006676] |
| [-0.30964085 | -1.3505973 ] |
| [ 1.57197197 | 1.11381995] |
| [-0.80480212 | -1.52455616] |
| [ 0.08648817 | 1.8676417 ] |
| [-0.90383437 | -0.77073441] |
| [-0.50770535 | -0.77073441] |
| [-0.30964085 | -0.91570013] |
| [ 0.28455268 | -0.71274813] |
| [ 0.28455268 | 0.07006676] |
| [ 0.08648817 | 1.8676417 ] |
| [-1.10189888 | 1.95462113] |
| [-1.6960924 | -1.5535493 ] |
| [-1.20093113 | -1.089659 ] |
| [-0.70576986 | -0.1038921 ] |
| [ 0.08648817 | 0.09905991] |
| [ 0.28455268 | 0.27301877] |
| [ 0.8787462 | -0.5677824 ] |
| [ 0.28455268 | -1.14764529] |
| [-0.11157634 | 0.67892279] |

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| [ 2.1661655 | -0.68375498] |
| [-1.29996338 | -1.37959044] |
| [-1.00286662 | -0.94469328] |
| [-0.01254409 | -0.42281668] |
| [-0.21060859 | -0.45180983] |
| [-1.79512465 | -0.97368642] |
| [ 1.77003648 | 0.99784738] |
| [ 0.18552042 | -0.3648304 ] |
| [ 0.38358493 | 1.11381995] |
| [-1.79512465 | -1.3505973 ] |
| [ 0.18552042 | -0.13288524] |
| [ 0.8787462 | -1.43757673] |
| [-1.99318916 | 0.47597078] |
| [-0.30964085 | 0.27301877] |
| [ 1.86906873 | -1.06066585] |
| [-0.4086731 | 0.07006676] |
| [ 1.07681071 | -0.88670699] |
| [-1.10189888 | -1.11865214] |
| [-1.89415691 | 0.01208048] |
| [ 0.08648817 | 0.27301877] |
| [-1.20093113 | 0.33100506] |
| [-1.29996338 | 0.30201192] |
| [-1.00286662 | 0.44697764] |
| [ 1.67100423 | -0.88670699] |
| [ 1.17584296 | 0.53395707] |
| [ 1.07681071 | 0.53395707] |
| [ 1.37390747 | 2.331532 ] |
| [-0.30964085 | -0.13288524] |
| [ 0.38358493 | -0.45180983] |
| [-0.4086731 | -0.77073441] |
| [-0.11157634 | -0.50979612] |
| [ 0.97777845 | -1.14764529] |
| [-0.90383437 | -0.77073441] |
| [-0.21060859 | -0.50979612] |
| [-1.10189888 | -0.45180983] |
| [-1.20093113 | 1.40375139]] |

[14]:

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| [[-0.80480212 | 0.50496393] |
| [-0.01254409 | -0.5677824 ] |
| [-0.30964085 | 0.1570462 ] |
| [-0.80480212 | 0.27301877] |
| [-0.30964085 | -0.5677824 ] |
| [-1.10189888 | -1.43757673] |
| [-0.70576986 | -1.58254245] |
| [-0.21060859 | 2.15757314] |
| [-1.99318916 | -0.04590581] |

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| [ 0.8787462 | -0.77073441] |
| [-0.80480212 | -0.59677555] |
| [-1.00286662 | -0.42281668] |
| [-0.11157634 | -0.42281668] |
| [ 0.08648817 | 0.21503249] |
| [-1.79512465 | 0.47597078] |
| [-0.60673761 | 1.37475825] |
| [-0.11157634 | 0.21503249] |
| [-1.89415691 | 0.44697764] |
| [ 1.67100423 | 1.75166912] |
| [-0.30964085 | -1.37959044] |
| [-0.30964085 | -0.65476184] |
| [ 0.8787462 | 2.15757314] |
| [ 0.28455268 | -0.53878926] |
| [ 0.8787462 | 1.02684052] |
| [-1.49802789 | -1.20563157] |
| [ 1.07681071 | 2.07059371] |
| [-1.00286662 | 0.50496393] |
| [-0.90383437 | 0.30201192] |
| [-0.11157634 | -0.21986468] |
| [-0.60673761 | 0.47597078] |
| [-1.6960924 | 0.53395707] |
| [-0.11157634 | 0.27301877] |
| [ 1.86906873 | -0.27785096] |
| [-0.11157634 | -0.48080297] |
| [-1.39899564 | -0.33583725] |
| [-1.99318916 | -0.50979612] |
| [-1.59706014 | 0.33100506] |
| [-0.4086731 | -0.77073441] |
| [-0.70576986 | -1.03167271] |
| [ 1.07681071 | -0.97368642] |
| [-1.10189888 | 0.53395707] |
| [ 0.28455268 | -0.50979612] |
| [-1.10189888 | 0.41798449] |
| [-0.30964085 | -1.43757673] |
| [ 0.48261718 | 1.22979253] |
| [-1.10189888 | -0.33583725] |
| [-0.11157634 | 0.30201192] |
| [ 1.37390747 | 0.59194336] |
| [-1.20093113 | -1.14764529] |
| [ 1.07681071 | 0.47597078] |
| [ 1.86906873 | 1.51972397] |
| [-0.4086731 | -1.29261101] |
| [-0.30964085 | -0.3648304 ] |
| [-0.4086731 | 1.31677196] |
| [ 2.06713324 | 0.53395707] |
| [ 0.68068169 | -1.089659 ] |
| [-0.90383437 | 0.38899135] |

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| [-1.20093113 | 0.30201192] |
| [ 1.07681071 | -1.20563157] |
| [-1.49802789 | -1.43757673] |
| [-0.60673761 | -1.49556302] |
| [ 2.1661655 | -0.79972756] |
| [-1.89415691 | 0.18603934] |
| [-0.21060859 | 0.85288166] |
| [-1.89415691 | -1.26361786] |
| [ 2.1661655 | 0.38899135] |
| [-1.39899564 | 0.56295021] |
| [-1.10189888 | -0.33583725] |
| [ 0.18552042 | -0.65476184] |
| [ 0.38358493 | 0.01208048] |
| [-0.60673761 | 2.331532 ] |
| [-0.30964085 | 0.21503249] |
| [-1.59706014 | -0.19087153] |
| [ 0.68068169 | -1.37959044] |
| [-1.10189888 | 0.56295021] |
| [-1.99318916 | 0.35999821] |
| [ 0.38358493 | 0.27301877] |
| [ 0.18552042 | -0.27785096] |
| [ 1.47293972 | -1.03167271] |
| [ 0.8787462 | 1.08482681] |
| [ 1.96810099 | 2.15757314] |
| [ 2.06713324 | 0.38899135] |
| [-1.39899564 | -0.42281668] |
| [-1.20093113 | -1.00267957] |
| [ 1.96810099 | -0.91570013] |
| [ 0.38358493 | 0.30201192] |
| [ 0.18552042 | 0.1570462 ] |
| [ 2.06713324 | 1.75166912] |
| [ 0.77971394 | -0.8287207 ] |
| [ 0.28455268 | -0.27785096] |
| [ 0.38358493 | -0.16187839] |
| [-0.11157634 | 2.21555943] |
| [-1.49802789 | -0.62576869] |
| [-1.29996338 | -1.06066585] |
| [-1.39899564 | 0.41798449] |
| [-1.10189888 | 0.76590222] |
| [-1.49802789 | -0.19087153] |
| [ 0.97777845 | -1.06066585] |
| [ 0.97777845 | 0.59194336] |
| [ 0.38358493 | 0.99784738]] |

[15]:

# Training the SVM model on the Training set

[15]: SVC(kernel='linear', random\_state=0)

# Predicting a new result

[16]:

[17]:

[0]

# Predicting the Test set results

|  |  |
| --- | --- |
| [[0 | 0] |
| [0 | 0] |
| [0 | 0] |
| [0 | 0] |
| [0 | 0] |
| [0 | 0] |
| [0 | 0] |
| [1 | 1] |
| [0 | 0] |
| [0 | 0] |
| [0 | 0] |
| [0 | 0] |
| [0 | 0] |
| [0 | 0] |
| [0 | 0] |
| [0 | 0] |
| [0 | 0] |
| [0 | 0] |
| [1 | 1] |
| [0 | 0] |
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| [1 | 1] |
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| [1 | 1] |
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| [1 | 1] |
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| [0 | 0] |
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| [0 | 0] |
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| [1 | 1] |
| [0 | 0] |
| [0 | 0] |
| [0 | 1] |
| [0 | 0] |

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| [0 | 0] |
| [1 | 0] |
| [0 | 0] |
| [1 | 1] |
| [1 | 1] |
| [1 | 1] |
| [1 | 0] |
| [0 | 0] |
| [0 | 0] |
| [1 | 1] |
| [1 | 1] |
| [0 | 0] |
| [1 | 1] |
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| [0 | 0] |
| [0 | 0] |
| [1 | 1] |
| [0 | 0] |
| [0 | 0] |
| [0 | 0] |
| [0 | 1] |
| [0 | 0] |
| [0 | 1] |
| [1 | 1] |
| [1 | 1]] |

[18]:

# Making the Confusion Matrix

[[66 2]

[ 8 24]]

[18]: 0.9

# K-Means Clustering

[19]:

[19]: CustomerID Genre Age Annual Income (k$) Spending Score (1-100)

|  |  |  |  |
| --- | --- | --- | --- |
| 0 | 1 Male 19 | 15 | 39 |
| 1 | 2 Male 21 | 15 | 81 |
| 2 | 3 Female 20 | 16 | 6 |
| 3 | 4 Female 23 | 16 | 77 |
| 4 | 5 Female 31 | 17 | 40 |

[20]:

**from sklearn.cluster import** KMeans wcss = []

**for** i **in** range(1, 11):

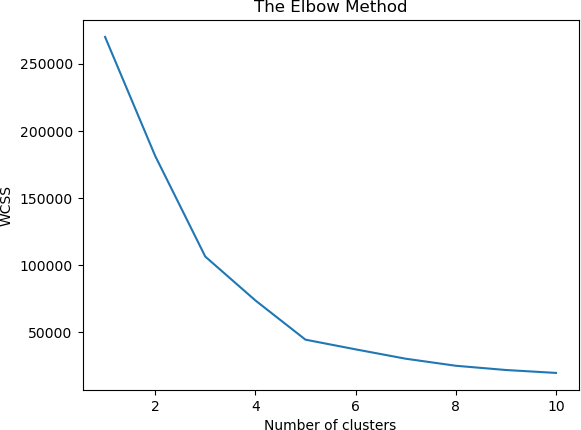
kmeans = KMeans(n\_clusters = i, init = 'k-means++', random\_state = 42) kmeans.fit(X)

wcss.append(kmeans.inertia\_) plt.plot(range(1, 11), wcss) plt.title('The Elbow Method') plt.xlabel('Number of clusters') plt.ylabel('WCSS')

plt.show()

C:\Users\Furqan Khalil\anaconda3\lib\site- packages\sklearn\cluster\\_kmeans.py:881: UserWarning: KMeans is known to have a memory leak on Windows with MKL, when there are less chunks than available threads. You can avoid it by setting the environment variable OMP\_NUM\_THREADS=1.

warnings.warn(



[22]:

[2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2

3 2 3 2 3 2 0 2 3 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 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 4 1 4 0 4 1 4 1 4 0 4 1 4 1 4 1 4 1 4 0 4 1 4 1 4

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4 1 4 1 4 1 4 1 4 1 4 1 4 1 4]

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| [23]: | plt.scatter(X[y\_kmeans == | 0, | 0], | X[y\_kmeans | == | 0, | 1], | s | = | 100, | c | = | 'red', label␣ |
|  | *‹→*= 'Cluster 1') |  |  |  |  |  |  |  |  |  |  |  |  |
|  | plt.scatter(X[y\_kmeans == | 1, | 0], | X[y\_kmeans | == | 1, | 1], | s | = | 100, | c | = | 'blue',␣ |
|  | *‹→*label = 'Cluster 2') |  |  |  |  |  |  |  |  |  |  |  |  |
|  | plt.scatter(X[y\_kmeans == | 2, | 0], | X[y\_kmeans | == | 2, | 1], | s | = | 100, | c | = | 'green',␣ |
|  | *‹→*label = 'Cluster 3') |  |  |  |  |  |  |  |  |  |  |  |  |
|  | plt.scatter(X[y\_kmeans == | 3, | 0], | X[y\_kmeans | == | 3, | 1], | s | = | 100, | c | = | 'cyan',␣ |
|  | *‹→*label = 'Cluster 4') |  |  |  |  |  |  |  |  |  |  |  |  |

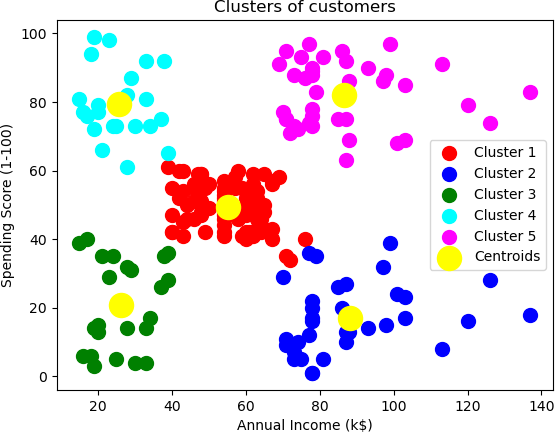
plt.scatter(X[y\_kmeans == 4, 0], X[y\_kmeans == 4, 1], s = 100, c = 'magenta',␣

*‹→*label = 'Cluster 5')

plt.scatter(kmeans.cluster\_centers\_[:, 0], kmeans.cluster\_centers\_[:, 1], s =␣

*‹→*300, c = 'yellow', label = 'Centroids') plt.title('Clusters of customers') plt.xlabel('Annual Income (k$)') plt.ylabel('Spending Score (1-100)') plt.legend()

plt.show()



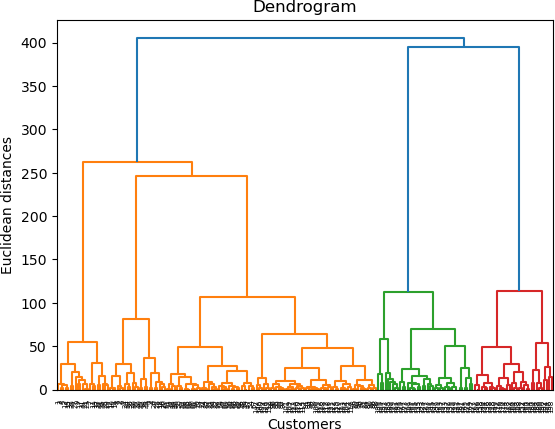
[24]:

# Hierarchichal Clustering

[24]: CustomerID Genre Age Annual Income (k$) Spending Score (1-100)

|  |  |  |  |
| --- | --- | --- | --- |
| 0 | 1 Male 19 | 15 | 39 |
| 1 | 2 Male 21 | 15 | 81 |
| 2 | 3 Female 20 | 16 | 6 |
| 3 | 4 Female 23 | 16 | 77 |
| 4 | 5 Female 31 | 17 | 40 |

[25]:



[26]:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [27]: | plt.scatter(X[y\_hc | == | 0, | 0], | X[y\_hc | == | 0, | 1], | s | = | 100, | c | = | 'red', label =␣ |
|  | *‹→*'Cluster 1') |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | plt.scatter(X[y\_hc | == | 1, | 0], | X[y\_hc | == | 1, | 1], | s | = | 100, | c | = | 'blue', label =␣ |
|  | *‹→*'Cluster 2') |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | plt.scatter(X[y\_hc | == | 2, | 0], | X[y\_hc | == | 2, | 1], | s | = | 100, | c | = | 'green', label =␣ |
|  | *‹→*'Cluster 3') |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | plt.scatter(X[y\_hc | == | 3, | 0], | X[y\_hc | == | 3, | 1], | s | = | 100, | c | = | 'cyan', label =␣ |
|  | *‹→*'Cluster 4') |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | plt.scatter(X[y\_hc | == | 4, | 0], | X[y\_hc | == | 4, | 1], | s | = | 100, | c | = | 'magenta', label =␣ |
|  | *‹→*'Cluster 5')  plt.title('Clusters of customers') plt.xlabel('Annual Income (k$)') plt.ylabel('Spending Score (1-100)') plt.legend()  plt.show() | | | | | | | | | | | | | |

