

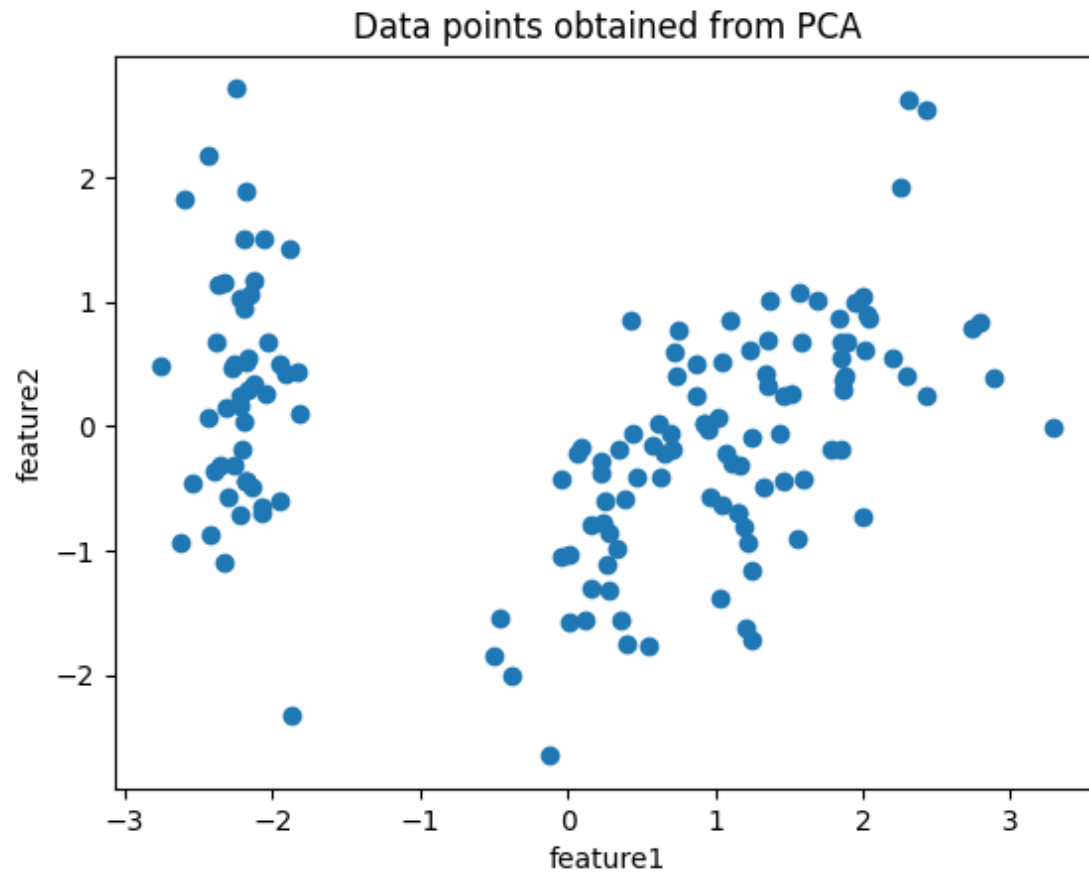
UNSUPERVISED LEARNING

Question 1

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- **Graph obtained from PCA**



Preserving 95% of the total variance, we reduced four features to two features. The data points are plotted as shown in the graph above.

• Results obtained from K-means clustering

K-centers for k= 2

[[1.1063901304813952, -0.14562455401450308], [-2.2127802609627896, 0.2912491080290065]]

K-centers for k= 3

[[-2.2127802609627896, 0.2912491080290065],
[0.6099405582177714, -0.7965839946014094],
[1.7131618299147127, 0.6499925400361605]]

K-centers for k= 4

[[-2.2040599712716893, 1.0472117782411063], [-2.2208297591391895, -0.4065625875513932],
[0.5244735778396262, -0.862211711942572], [1.66548642615682, 0.5428611467399164]]

K-centers for k= 5

[[0.1489538507928341, -1.4774019547745196],
[2.2776654608974285, 0.27309835142638783],
[1.5516042147531062, 0.893359426415404], [-2.219868475140016, 0.3445382665436524], [0.8346300082505422, -0.32430561812591735]]

K-centers for k= 6

[[1.3515858714485556, -0.48140739422991985],
[1.0584307388527932, -1.5315449564082457],
[0.5421106605350149, -0.09172234253404823], [-2.219868475140016, 0.3445382665436524], [1.94926985775327, 0.7814680921885154], [-0.0957579480257021, -1.5730729299105826]]

K-centers for k= 7

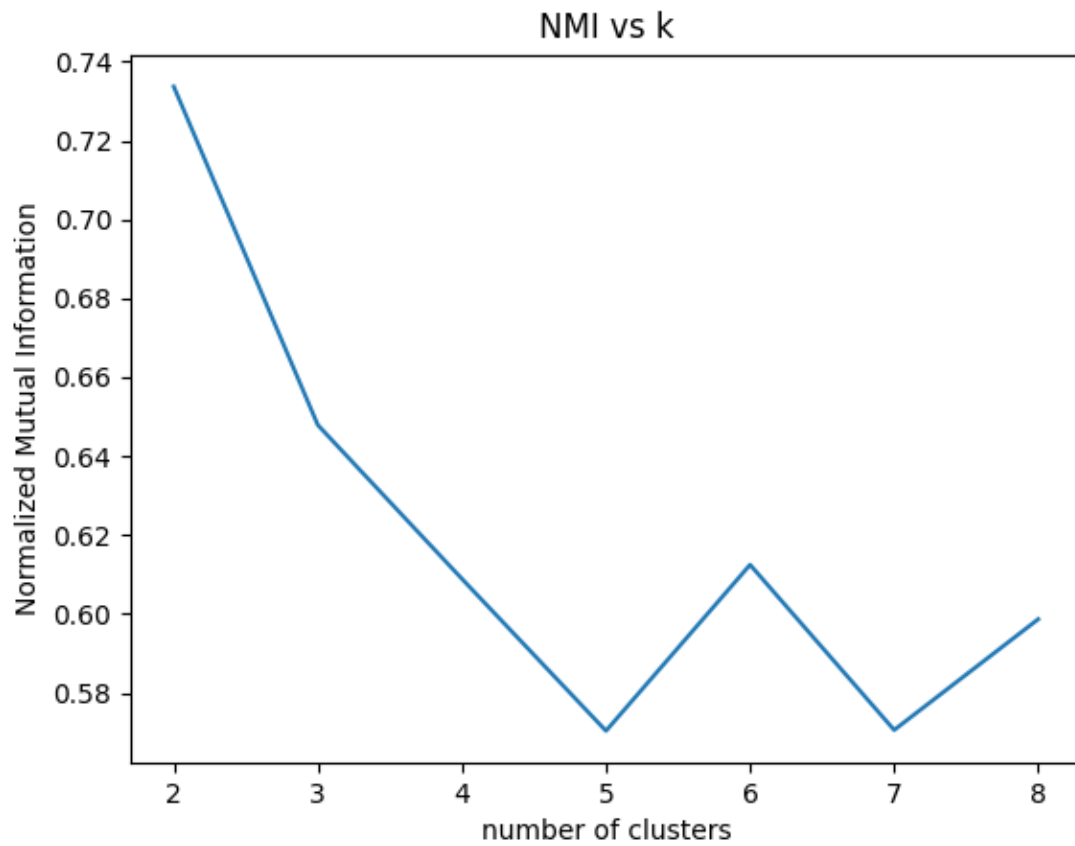
[[0.09161019391586318, -1.4141863981327458], [-2.2397681619642906, -0.6614906110311244], [-2.174400295378887, 0.36402791721945044], [0.5775265554833727, -0.012561202892734121], [1.94926985775327,

0.7814680921885154], [1.3214048751702263, -
0.6616543090535489], [-2.23150619389103, 1.5040581517570004]]

K-centers for k= 8

[-2.219868475140016, 0.3445382665436524], [2.740960032051406,
0.44596956085208816], [1.0347686367978841,
0.41270694567535077], [1.8532098364037215,
0.7412068130202385], [2.3325243240248974,
2.3602211067983223], [0.13720431049699808, -
1.583701326690622], [1.3461814873952354, -
0.5173066641956163], [0.369236277700004, -
0.3552076190951736]]

- **NMI vs k Graph**



Maximum NMI is for k= 2

Maximum NMI= 0.733680436651211