CS 434
Machine Learning
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Assignment 4

Part I
K Means Clustering

1.

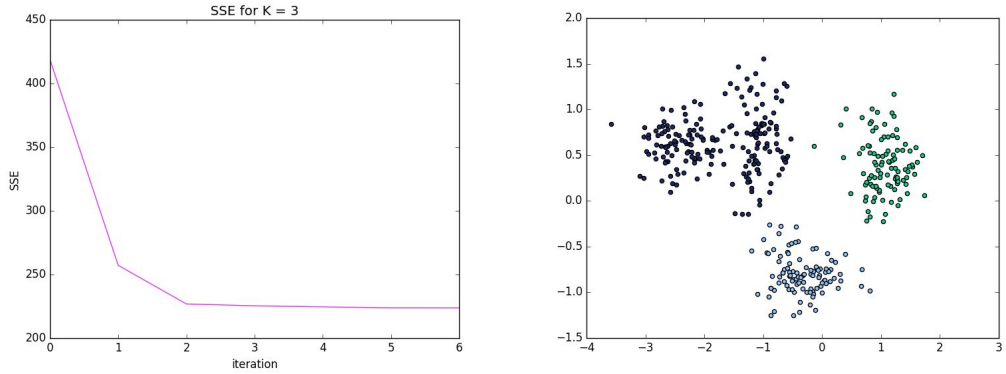

Figure 1: K=3 and its corresponding SSE plot per iteration

Here it is clear that with K=3 the algorithm converges by 6 iterations

2. From the plots above, the data is clustered into three separate groups.

3. With each K value, the SSE decreased. Choosing the K-value should be done using the elbow approach in this instance. By inspecting the SSE graph as K increases. We see a sharp leveling off of the SSE function at K = 2. This means K =2 is the most reasonable choice for K for the computation time. This means distances to only two centers must be computed.

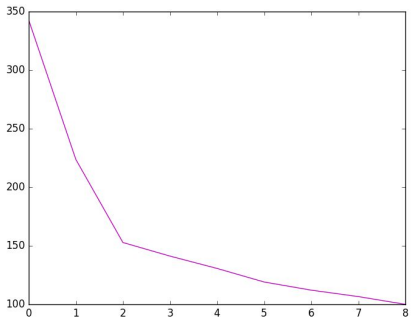

Figure 2: SSE plotted as a function of K

Part II
Reinforcement Learning

Test data was run with a different delta. The delta was larger to stop the oscillation between states 3 and 1

The real trial data showed expected results, with the policy attempting to stay in state 4, though it was much more complicated to stay there. This run was done with the delta described in the assignment

1. Test Data [3x3], 2 actions
    a. Gamma of 0.9
    b. Utility of [-1, -1, -1.045]
    c. Policy of [0, 0, 1]

    d. Gamma of 0.1
    e. Utility of [-1, -1, -1.005]
    f. Policy of [0, 0, 1]

2. Given assignment data [10x10], 4 actions
    a. Gamma of 0.9
    b. Utility of [3.32, 2.92, 2.89, 2.92, 3.69, 2.84, 3.15, 2.90, 2.98, 3.24]
    c. Policy of [3, 3, 2, 0, 0, 0, 1, 2, 1, 3]

    d. Gamma of 0.1
    e. Utility of [0.10, 0.008, 0.0087, 0.0089, 1.001, 0.006, 0.068, 0.0085, 0.01, 0.089]
    f. Policy of [3, 3, 2, 0, 0, 0, 1, 2, 1, 3]