

Problem 1. Sum of first 1000 integers = 500,500

Problem 1a. Sum of first 100000 integers = 5,000,050,000

Problem 2. Average of first 1000 integers = 500.5

Problem 2. Standard deviation of first 1000 integers = 288.82

Problem 2a. Average of first 100000 integers = 50,000.50

Problem 2a. Standard deviation of first 100000 integers = 28,867.66

Problem 3. Sum of first 1000 integers = 500,500.00

Sum of first 10^5 integers = 705,082,704.00

Average of first 1000 integers = 500.50

Standard deviation of first 1000 integers = 288.82

Average of first 10^5 integers = 50,000.50

Standard deviation of first 10^5 integers = 28,867.66

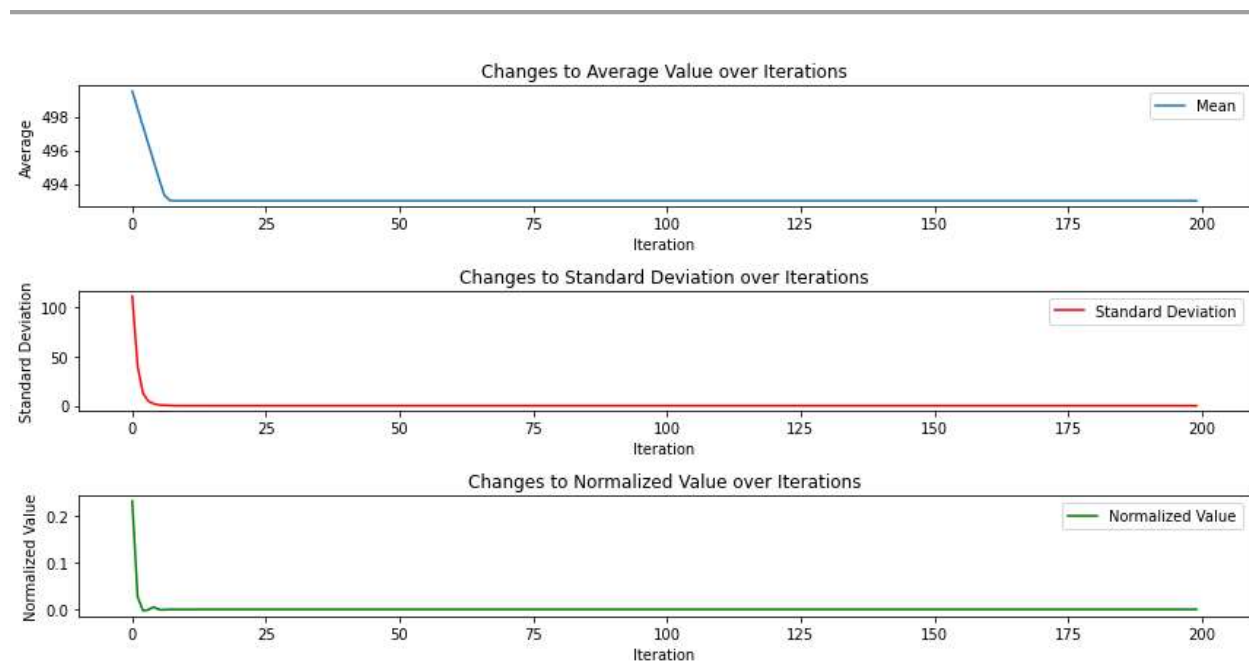
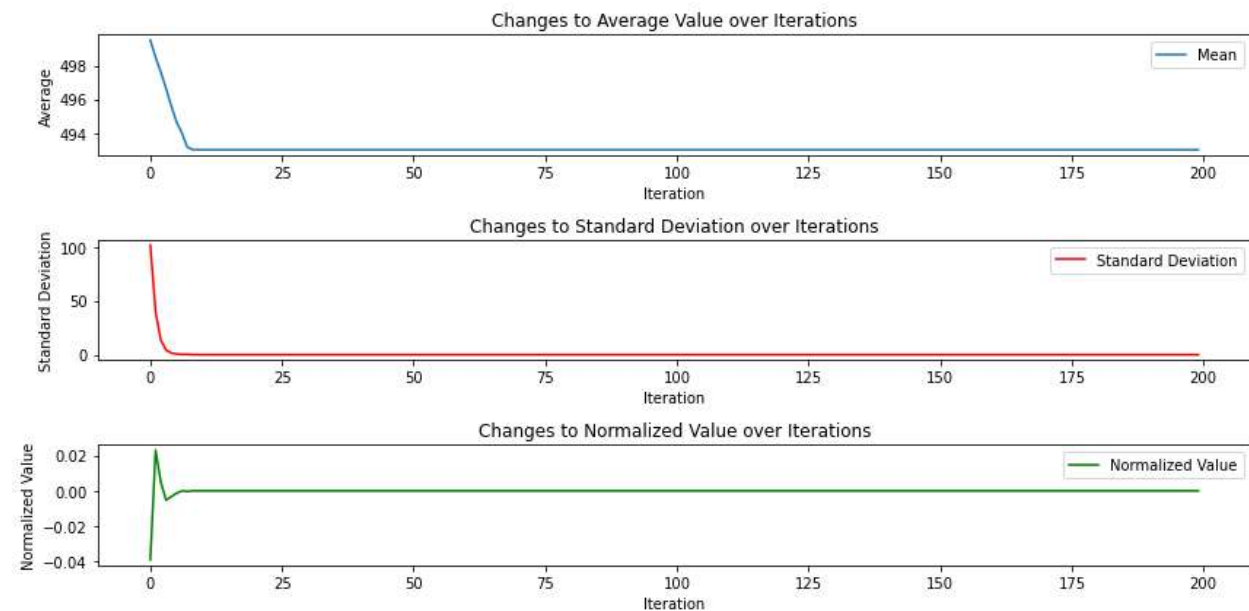
Responses to Problem 4: For a sequence of numbers from 1...1000 describe how the average and standard deviation change over time and why.

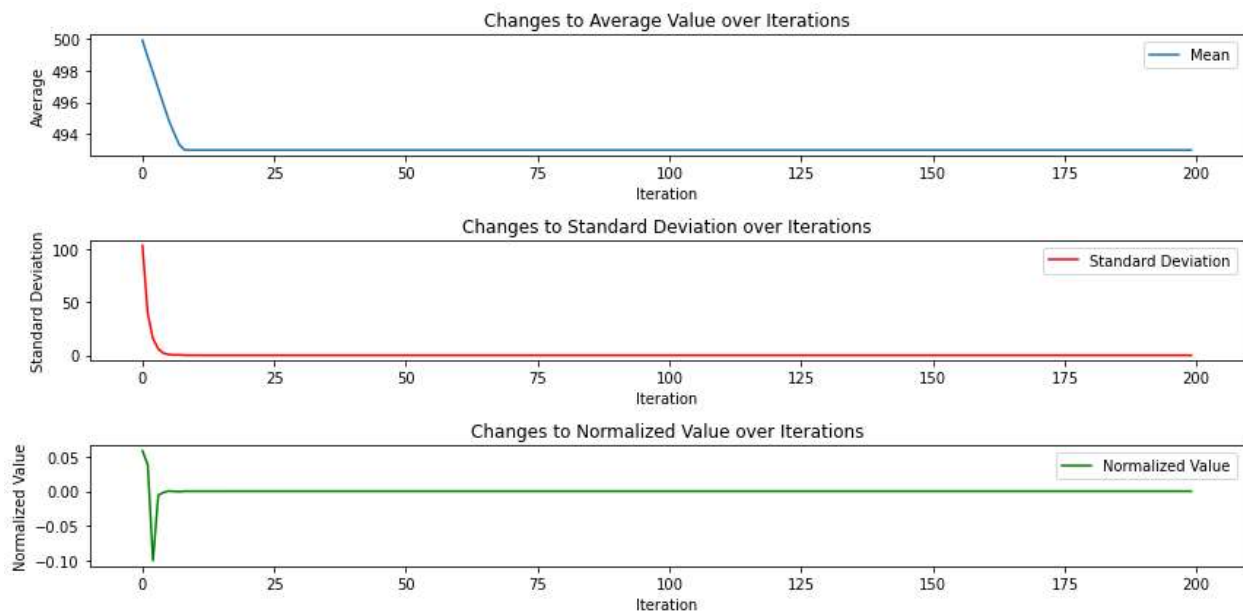
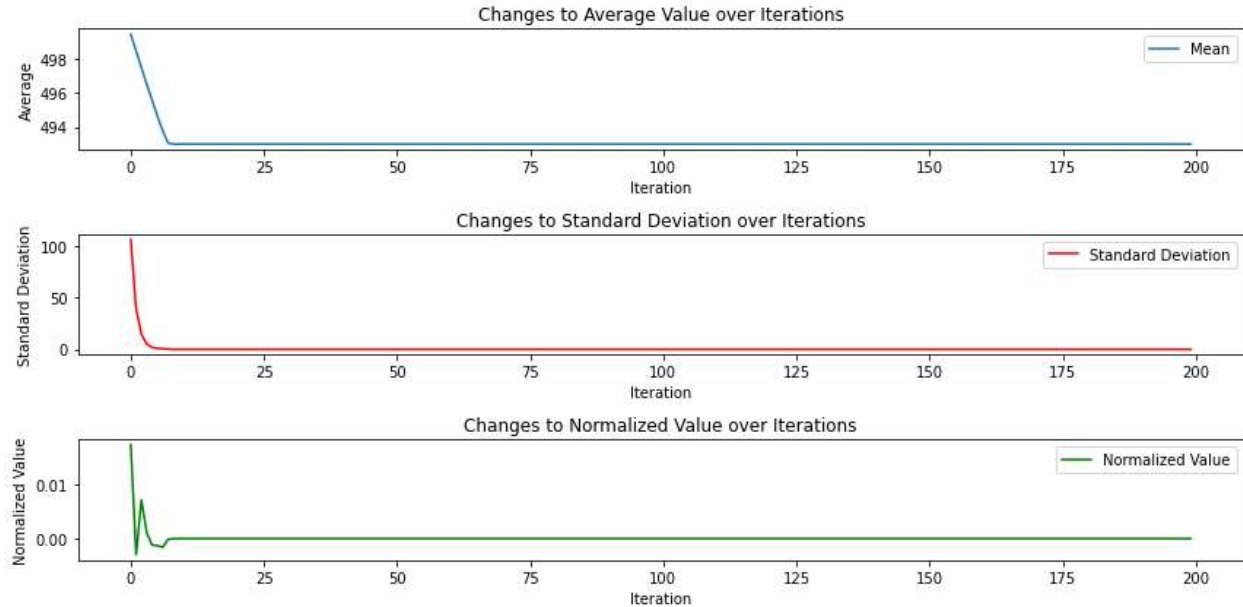
1. By selecting any two values and averaging them and replacing them, the average value declines over number of iterations until it stabilizes at around 493.0. Once the average value is ~ 493.0 , the value does not change until end of iterations. This is the center of an 1000-dimension array is around 493.0 so the averaging process pulls the mean towards the center.
2. The standard deviation also declines but more rapidly towards 0 over time. The process of replacing average of two values in the 1000 array creates uniformity and reduces variability to 0.
3. Using the method of selecting an element at random and treating it as a typical value, it also converges towards the average value in less than 25 iterations. So increasing beyond 25 values does not impact the convergence process towards the average value.

- When three elements are used for the averaging process of the array, the convergence towards average value of about 493.0 happens quicker and uniformity is reached more rapidly than in the case of two elements.

Response to Problem 5: Each run is slightly different due to the randomness of the selection of elements to do the averaging process. This is the effect of stochasticity seen with instantiating the process multiple times and selecting randomly elements to include in the averaging process.

Output of few runs:





Repository

https://github.com/lydiateinfalt/CSS610-AgentBasedModelingSimulation-Spring2025/blob/main/css610_hw1_lteinfalt_spring2025.py