

CS 355: Program 1

Josh Patton & Vaishak Menon

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We declare that we have completed this assignment in accordance with the UAB Academic Integrity Code and the UAB CS Honor Code. We have read the UAB Academic Integrity Code and understand that any breach of the Code may result in severe penalties. We also declare that the following percentage distribution faithfully represents individual group members'

contributions to the completion of the assignment

Vaishak Menon, 50% contribution, Partial Code Work and Partial Report Work, VM, 03/02/2023

Josh Patton, 50% contribution, Partial Code Work and Partial Report Work, JP, 03/02/2023

Report

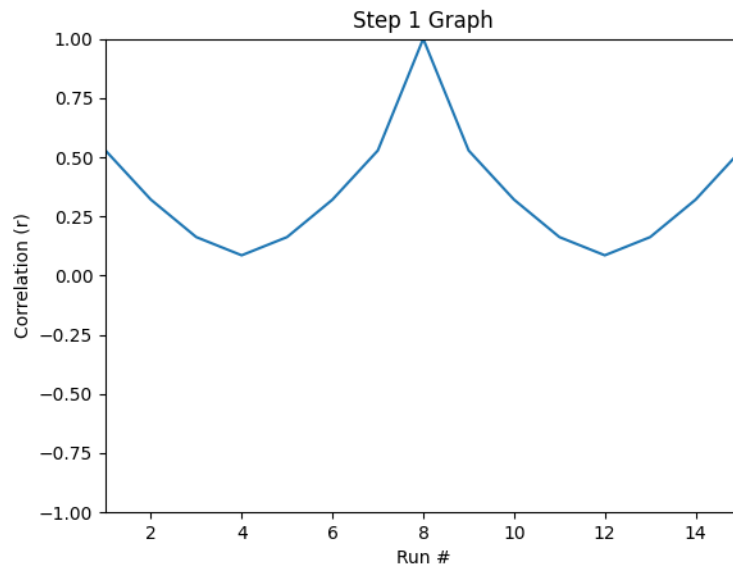
1. Functionality:

The code has 3 main functions: shuffle, splitArray, and plotR. The shuffle function will create an array of size n based on the given bounds. It will then call splitArray to get the properly shuffled array and then compute the correlation coefficient on every shuffle done. After the shuffling is complete, we call plotR to plot the correlation for each run.

First Run

1. Plot r with respect to the times of shuffling. After how many shuffles are the cards in the most random order? (That is, when is r at a minimum value?)

The cards are in the most random order at shuffle 3 and 11.



2. Do the cards return to their original order? After how many runs?

They eventually return to the original order at around run 6, 8, and 11.

3. Is a total of 15 runs enough to return to the original order?

It is enough runs to return to 15 as shown in the graph above.

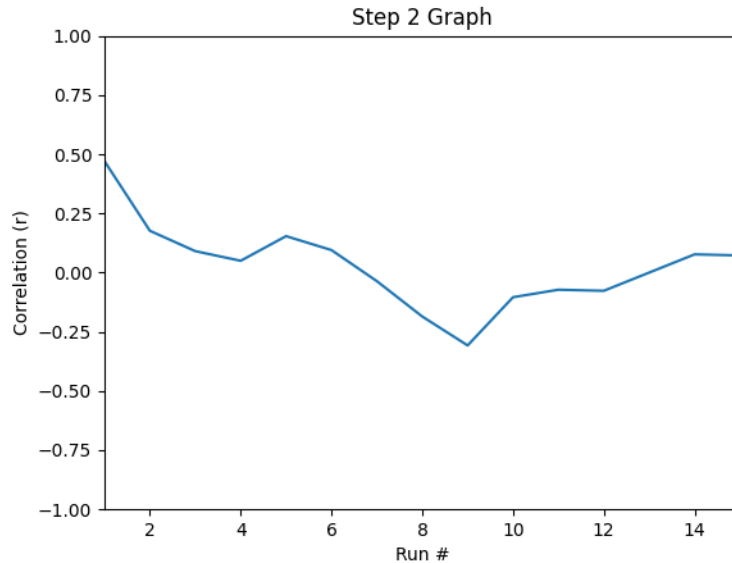
4. If not, does it appear that the cards will return to their original order in a relatively small number of shuffles?

In this case, it does return and it continues to look like it will reach again.

Second Run

1. Plot r with respect to the times of shuffling. After how many shuffles are the cards in the most random order? (That is, when is r at a minimum value?)

The cards are in the most random order at shuffle 9, which is the lowest point for this graph.



2. Do the cards return to their original order? After how many runs?

The cards do not return to their original order, based on the correlations calculated.

3. Is a total of 15 runs enough to return to the original order?

It is not enough to get back to the original order within 15 runs.

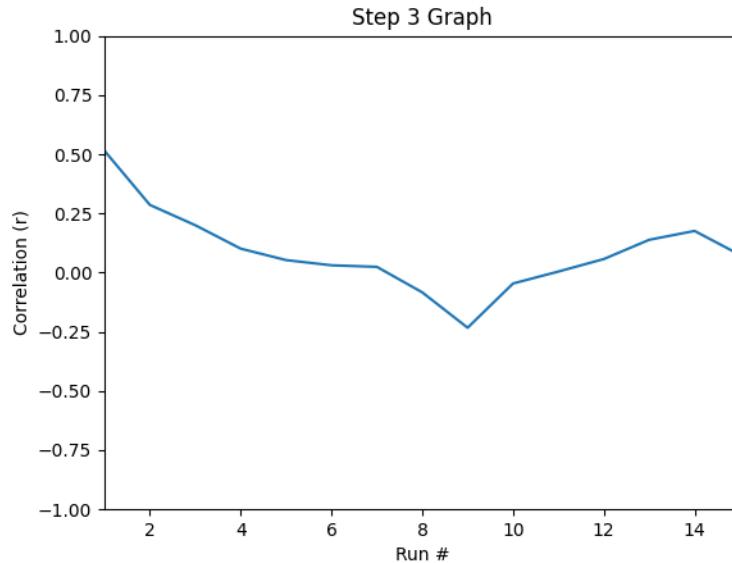
4. If not, does it appear that the cards will return to their original order in a relatively small number of shuffles?

In this case, it does not appear to be rebounding at a consistent pace to return to the original order.

Third Run

1. Plot r with respect to the times of shuffling. After how many shuffles are the cards in the most random order? (That is, when is r at a minimum value?)

The cards are in the most random order at shuffle 9, which is the lowest point for this graph.



2. Do the cards return to their original order? After how many runs?

The cards do not return to their original order, based on the correlations calculated.

3. Is a total of 15 runs enough to return to the original order?

It is not enough to get back to the original order within 15 runs.

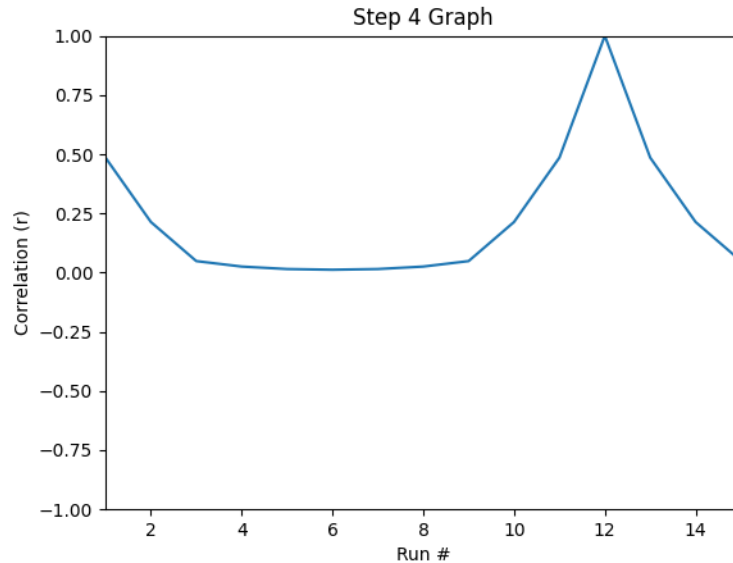
4. If not, does it appear that the cards will return to their original order in a relatively small number of shuffles?

In this case, it does not appear to be rebounding at a consistent pace to return to the original order.

Fourth Run

1. Plot r with respect to the times of shuffling. After how many shuffles are the cards in the most random order? (That is, when is r at a minimum value?)

The cards are in the most random order at shuffle 6, which is the lowest point for this graph.



2. Do the cards return to their original order? After how many runs?

The cards do not return to their original order, based on the correlations calculated.

3. Is a total of 15 runs enough to return to the original order?

It does reach the original order at around shuffle 11 and 13.

4. If not, does it appear that the cards will return to their original order in a relatively small number of shuffles?

In this case it does appear within the graph that the original order is reached based on correlation.