**BIG DATA COMPUTING 2021/22 - HOMEWORK 3**

**PYTHON VERSION**

Run your algorithm on the cluster on CloudVeneto using the following datasets: **HIGGS-REDUCED-7D.txt** (about 1.2M points in 7 dimensions),and **artificial9000.txt** (9200 points in 2 dimensions).The datasets are in the **directory /data/BDC2122** of the HDFS. You must fill the two tables below, one for each dataset, where the headers of the rows indicate the values to report, and the headers of the columns indicate the configurations of parameters to be used.

The first table collects results aimed at assessing the **scalability** of the algorithm.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **HIGGS-REDUCED-7D.txt** | **2 executors**  **k=10, z=150, L=2** | **4 executors**  **k=10, z=150, L=4** | **8 executors**  **k=10, z=150, L=8** | **16 executors**  **k=10, z=150, L=16** |
| **Time to read input from file (in ms)** | 10915 | 7419 | 5387 | 5116 |
| **Time of ROUND 1 (in ms)** | 23152 | 11507 | 5959 | 3139 |
| **Time of ROUND 2 (in ms)** | 24 | 51 | 155 | 465 |
| **Time to compute objective function (in ms)** | 9063 | 4527 | 2510 | 1286 |
| **Value of objective function** | 9.32264109344 | 7.56472205987 | 6.33673072798 | 6.01539567448 |

The second table collects results aimed at comparing the **accuracy** attained by the algorithm against the one attained by the sequential algorithm from Homework 2 on the entire dataset.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Artificial9000.txt** | **2 executors**  **k=9, z=200, L=2** | **4 executors**  **k=9, z=200, L=4** | **8 executors**  **k=9, z=200, L=8** | **16 executors**  **k=9, z=200, L=16** | **Sequential algorithm from Homework 2 with k=9, z=200** |
| **Value of objective function** | 12.7722883228 | 12.0586954933 | 11.9514118413 | 11.3488087921 | 11.576939707884812 |

Provide below a brief comment to justify the scalability and accuracy observed (your answer should be of at most 6 lines, font 12 points):

As the number of executors increases, the time to read the input from file, execute the first Round and compute the objective function reduces. Instead, the time of the second Round slightly increases because the coreset is made by more partitions. The value of the objective function is reduced because we can work with a bigger coreset, which allows to compute better centers for the calculation of the objective function. However, on the artificial9000 dataset, the objective function computed without partition has similar result to when is computed with 8 or 16 partition.