This slides from the following paper

Adaptively Accelerating Map-Reduce/Spark with GPUs: A Case Study

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<th>Iterative Machine Learning Applications (ML)</th>
<th>Data Analytics Frameworks</th>
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<td></td>
<td>Hadoop Map-Reduce (HMR)</td>
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<td>IBM Main-Memory Map-Reduce (M3R)</td>
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<td>Spark</td>
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<tr>
<td>Multinomial logistic regression</td>
<td>by up to 8×</td>
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<td>Multiple linear regression</td>
<td>by up to 18×</td>
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<td>K-Means clustering</td>
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• The aim is to accelerate ML applications implemented in stock HMR, M3R, and Spark without changing the APIs of these frameworks or without redesigning them.

• HMR and M3R require applications to be programmed in Java, while Spark supports Scala, Python, and Java. To ensure uniformity and fairness, they choose Java to implement all their applications and accelerate them by using JCUDA.

• They empirically analyze the performance of four popular iterative ML algorithms on the above frameworks under different parameter settings and different deployment sizes (number of nodes).

• All experiments are conducted on the Amazon EC2 IaaS cloud. They use EC2 G2 instances (g2.2xlarge), each with one NVIDIA GRID K520 GPU with 1536 CUDA cores at a clock frequency of 800 MHz and 4GB of global GPU memory. Each instance also has 8 vCPUs, 15GB of RAM and a 60GB SSD drive.

• For each application, they vary the number of EC2 instances from 1 to 15, and consequently the number of vCPUs and GPUs.

• They use the open-source data generator included with Apache Spark to generate a 100GB workload for the applications with different characteristics.

The results of the experiments using Hadoop Map-Reduce (HMR)

The results of the experiments using IBM Main-Memory Map-Reduce (M3R)

The results of the experiments using Spark

Fig. 3: Accelerating Spark with GPUs

The results of the experiments

References

doi: 10.1109/ICAC.2019.00022
URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8831192&isnumber=8831188