TRANSPARENT IN-SITU DATA PROCESSING

Marcos Nogueira Lobo de Carvalho[1,2];
Anna Queralt[1]; Oscar Romero[1]; Alkis Simitsis[2];

[1]Home Institution: Universitat Politècnica de Catalunya (UPC)
[2]Host Institution: Athena Research Centre (ARC)
Contact: marcos.nogueira@upc.edu

Motivation

Research Question: Would it be possible to use learning techniques to dynamically predict the most appropriate hardware (CPU or GPU) to run each task of an execution Directed Acyclic Graph (DAG) in a disaggregated architecture?

Figure 1: Example of DAG tasks in K-means parallel execution.

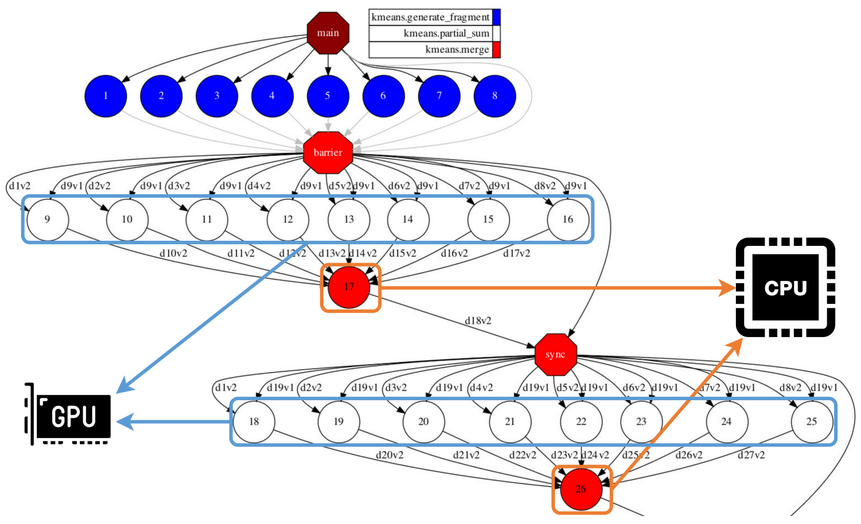
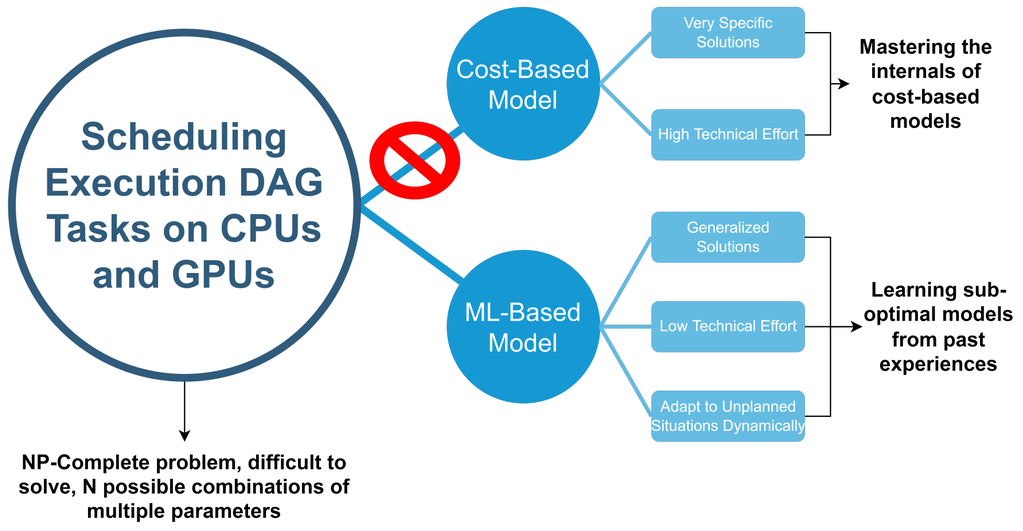
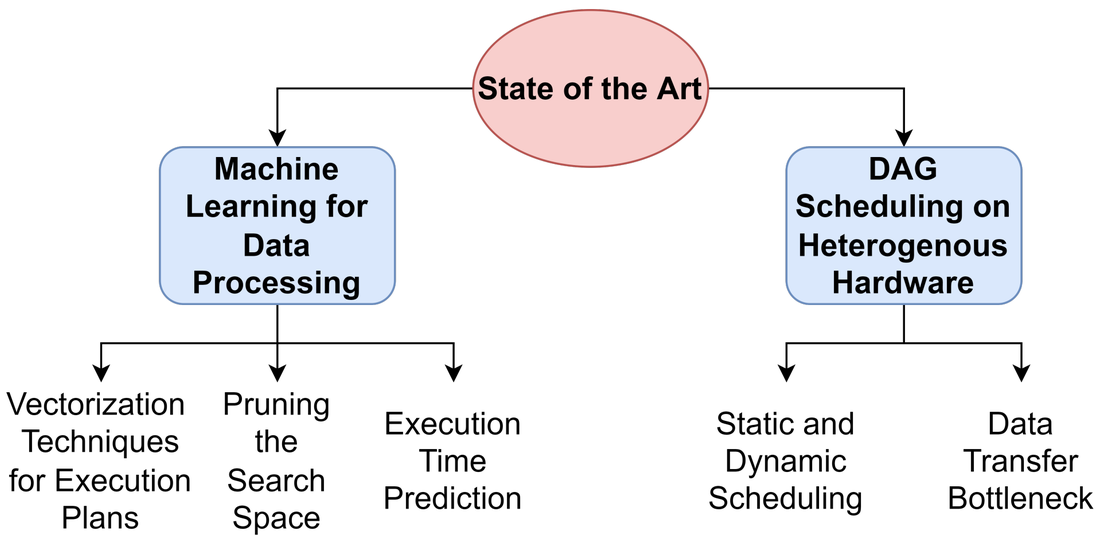


Figure 2: Approaches to schedule DAG tasks on CPUs and GPUs.



Key Aspects to Develop a ML-based Solution

Figure 3: Structure of the state of the art.



Scientific Goal and Outcomes

Goal: An adaptive learning optimizer to execute DAG tasks by balancing heterogeneous resources in disaggregated architectures as follows:

- Given a data set and a DAG workflow, predict the best processor to execute each DAG task;
- Integrating our adaptive optimizer in real-world data processing engines.

Outcomes:

- Automate device offloading for developers without requiring advanced knowledge of the internals of cost-based heuristics approaches;
- Efficient use of available resources;
- Integration with data processing engines;
- Active topic for both industry and scientific community;

Solution Approach

Figure 4: Tentative system model architecture.

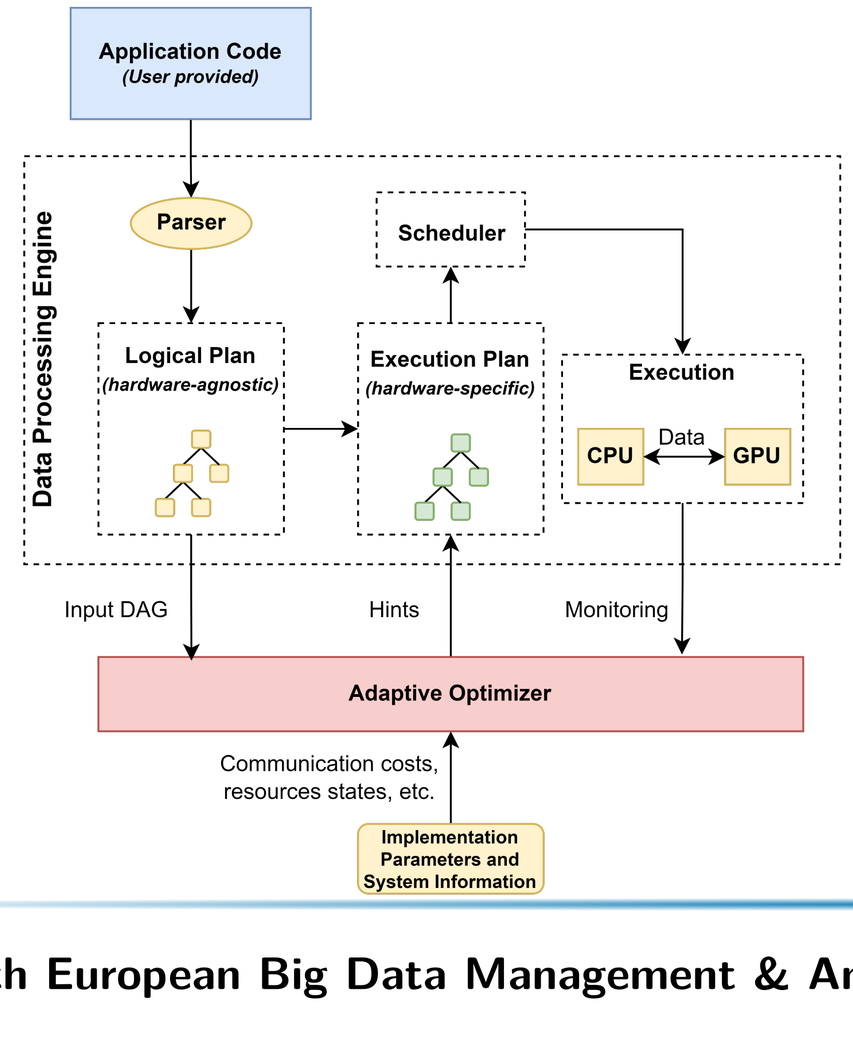


Figure 5: Tentative workflow for the adaptive model.