Learning Scheduling Algorithms for Data Processing Clusters

Tejas Ravindra Dhawale

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This paper gives an overview of how modern machine learning techniques can be used to solve the scheduling problem in data processing clusters.

1 Introduction

This paper proposes Decima, a general-purpose reinforcement learning(RL) and Neural Network based scheduling service for data processing jobs with a high-level goal of minimizing the average job completion time(JCT).

2 Motivation

Illustrate the challenges of using job-specific information to make scheduling decisions [1].

3 Design Challenges

Key challenges in the design of Decima:

3.1 Scalable state information processing.

This subsection describes the challenges of incorporating dynamic information to make scheduling decisions [2].

3.2 Huge space of scheduling decisions.

This subsection describes the challenges of having a large action space of scheduling decisions.

3.3 Training for continuous stochastic job arrivals.

This subsection describes the challenges in training with continuous job arrivals.

4 Design

This section describes the design of Decima and how it addresses the challenges mentioned in section 3.

5 Implementation

5.1 Spark Integration

This subsection describes how Decima is integrated with Spark.

5.2 Spark Simulator

This subsection describes the results of simulation in Spark.

6 Evaluation

This section compares the performance evaluation of Decima with existing baseline algorithms like Spark's default FIFO scheduling, shortest-job-first critical path heuristic, simple fair scheduling, etc [3].

7 Discussion

This section proposes future research scope and potential applications where Decima can be implemented.

8 Conclusion

Decima demonstrates the use of reinforcement learning and neural networks to automatically learn complex cluster scheduling policies.

References

[1] A. Verma, L. Pedrosa, M. R. Korupolu, D. Oppenheimer, E. Tune, and J. Wilkes. *Large-scale cluster management at Google with Borg*. In Proceedings of the 10th European Conference on Computer Systems (EuroSys). Bordeaux, France, 2019.

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[3] R. G. G. Ananthanarayanan, S. Kandula, S. Rao, and A. Akella. *Multi-resource Packing for Cluster Schedulers*. In Proceedings of the 2014 ACM SIGCOMM Conference (SIGCOMM). 455–466., 2014.