ABSTRACT

Data Center is an infrastructure that uses very large amounts of energy. Optimizing energy usage at server locations and storage devices becomes very challenging. This makes the issue of energy efficiency in the Data Center become important. This fact explains the need for long-lasting systems that manage energy consumption while ensuring optimal system performance. The aim of this thesis is to develop and design a Task Scheduling to improve Data Center efficiency through the application of Multi-Armed Bandit (MAB). We proposed Multi-Armed Bandit method to perform Task Scheduling on Cooling Systems. The goal is to maintain temperature in the range of 22℃ – 26℃, reduce Power Usage Effectiveness (PUE) below 1.8, and increase energy efficiency of data center. The MAB approach using Epsilon Greedy (e-Greedy) algorithm is used to model the dynamic and complex Data Center environment correctly so that the best action is obtained in Task Scheduling. To support this goal, the Long Short Term Memory (LSTM) is used to obtain temperature prediction values. The results show that the Multi-Armed Bandit approach, especially the e-Greedy algorithm, can effectively increase overall energy efficiency for data centers while ensuring that PUE and temperature limits comply with SLA. After modeling with e-greedy, the PUE value is below 1.8, the temperature is below 26℃, and there is an increase in energy efficiency (DCiE) by 4%. This shows that the use of the LSTM method to predict temperature and e-Greedy to produce the best action can ultimately increase energy efficiency in the Data Center.

Keywords: Energy Efficiency; Cooling System; Data Center; LSTM; ARIMA; Prophet; Multi-Armed Bandit; E-Greedy.