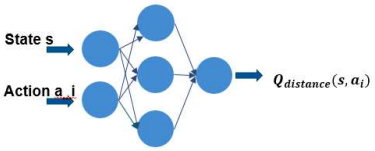
Combining Reinforcement Learning and Graph Neural Networks to solve the Job Shop Problem

Background



Production planning and control requires quick decision making in dynamic environments with changing requirements and circumstances. Within the Cluster of Excellence „Internet of Production“, the IMA investigates the use of reinforcement learning the so called “job shop problem” (JSP). Here, a reinforcement learning algorithm learns to solve a scheduling problem step-wise by receiving information about the current state and performing certain actions based on this information. Since problem sizes can vary significantly, the representation of the state is of particular interest in this case. Recently, approaches based on graph neural networks have started to receive considerable attention in this context.

Research methodology

- Literature review of approaches using reinforcement learning & graph neural networks to solve the JSP and related optimization problems
- Setup of a suitable experiment to compare different approaches
- Evaluation of the performance of the different approaches

Goal and expected results

The thesis‘ goal is the investigation of multiple approaches based on graph neural network to determine the advantages and disadvantages of each approach given the same experimental conditions.

Requirements

- Interest in reinforcement learning and graph neural networks
- Experience with machine learning would be advantageous
- Programming experience in Python would be advantageous

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Type of thesis

Bachelor Thesis, Master Thesis

Degree Program: Mechanical Engineering, Computational Engineering Science, Industrial Engineering