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Resource Allocation and Task Scheduling with Skill Level and Time Bound Constraints

Authors : Salam Saudagar, Ankit Kamboj, Niraj Mohan, Satgounda Patil, Nilesh Powar

Abstract : Task Assignment and Scheduling is a challenging Operations Research problem when there is a limited number of resources and comparatively higher number of tasks. The Cost Management team at Cummins needs to assign tasks based on a deadline and must prioritize some of the tasks as per business requirements. Moreover, there is a constraint on the resources that assignment of tasks should be done based on an individual skill level, that may vary for different tasks. Another constraint is for scheduling the tasks that should be evenly distributed in terms of number of working hours, which adds further complexity to this problem. The proposed greedy approach to solve assignment and scheduling problem first assigns the task based on management priority and then by the closest deadline. This is followed by an iterative selection of an available resource with the least allocated total working hours for a task, i.e. finding the local optimal choice for each task with the goal of determining the global optimum. The greedy approach task allocation is compared with a variant of Hungarian Algorithm, and it is observed that the proposed approach gives an equal allocation of working hours among the resources. The comparative study of the proposed approach is also done with manual task allocation and it is noted that the visibility of the task timeline has increased from 2 months to 6 months. An interactive dashboard app is created for the greedy assignment and scheduling approach and the tasks with more than 2 months horizon that were waiting in a queue without a delivery date initially are now analyzed effectively by the business with expected timelines for completion.

Keywords : assignment, deadline, greedy approach, Hungarian algorithm, operations research, scheduling
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