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## JOB-SHOP SCHEDULING USING NEURAL NETWORKS<sup>1</sup>

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**Abstract.** Complete enumeration of all the sequences to establish global optimality is not feasible on the search space. For a general job-shop scheduling problem,  $NP$  has an upper bound of  $10^7$ . Since the early fifties a great deal of research attention has been focused on solving  $NP$ , resulting in a wide variety of approaches such as Branch and Bound, Simulated Annealing, Tabu Search, etc. However limited success has been achieved by these methods due to the sheer intractability of this generic scheduling problem. Recently, much effort has been concentrated on using neural networks to solve  $NP$ , as they are capable of adapting to new environments with little human intervention and can mimic thought processes. Major contributions in solving  $NP$  using a Hopfield neural network, as well as applications of back-error propagation to general scheduling problems are presented. To overcome the deficiencies in these applications a modified back-error propagation model, a simple yet powerful parallel architecture which can be successfully simulated on a personal computer, is applied to solve  $NP$ .

**KEYWORDS:** Job-Shop; SCHEDULING;  $NP$  HARD; NEURAL NETWORKS; MODIFIED BACK-ERROR PROPAGATION; SEARCHED-LEARNING; INPUT/OUTPUT MAPPING

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