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A Multi-Objective Genetic Algorithm with Adaptations for Healthcare Supplier Selection

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Description

In the healthcare industry, supplier selection is a critical process that involves selecting suppliers who can provide high-quality medical equipment, pharmaceuticals, and other supplies at a reasonable cost. However, this process is complex due to various factors such as the quality of the products, delivery time, cost, and reputation of the supplier. To simplify this process, a Multi-Objective Genetic Algorithm with Adaptations for Healthcare Supplier Selection (MOGA-HSS) has been developed. The optimization technique that uses genetic algorithms to solve the supplier selection problem. This algorithm is based on the principles of natural selection, where the fittest individuals are selected for reproduction and the weaker ones are eliminated. In the case of supplier selection, the algorithm evaluates the suppliers based on multiple objectives, including cost, quality, delivery time, and reputation.

The MOGA-HSS algorithm consists of several stages. The first stage is the initialization stage, where the initial population of supplier solutions is generated randomly. The second stage is the evaluation stage, where each solution is evaluated based on the multiple objectives. The third stage is the selection stage, where the fittest solutions are selected for reproduction. The fourth stage is the crossover stage, where the selected solutions are combined to create new solutions. The fifth stage is the mutation stage, where the new solutions are randomly mutated. The final stage is the termination stage, where the algorithm stops when a stopping criterion is met. One of the adaptations made to the MOGA-HSS algorithm is the inclusion of a Pareto dominance-based selection mechanism. This mechanism ensures that the solutions generated by the algorithm are non-dominated, meaning that no other solution in the population is better than them in all objectives. This mechanism also improves the diversity of the solutions generated by the algorithm, ensuring that a wide range of possible solutions are explored [1,2].

Another adaptation made to the algorithm is the use of a weighted sum method to aggregate the multiple objectives. This method allows the decision-makers to assign different weights to each objective, based on their relative importance. The algorithm then uses these weights to calculate a weighted sum score for each solution, which is used to evaluate the fitness of the solutions.

The research suggested in identified the fundamental buying configuration that concentrated on concerns with supplier choice and supply quantity allocation. A genetic algorithm-based approach was introduced to analyse the product part configuration and build the supplier assessment and quantity allocation model. The research described in created a multi-objective mathematical model for built-to-order supply chain difficulties that take into account product assembly, supplier selection, and the logistical supply chain distribution system. Using a GA, the multi-objective optimisation problem was successfully resolved. A non-dominated sorting GA was used in the work proposed in to offer a multi-objective nonlinear programming model for joint pricing, lot sizing, and supplier selection. Creating and solving a multi-objective optimisation problem for supplier selection was suggested by the authors

NSGA-II-based product line designs are also used. An integer-programming model that considers the multi-buyer group optimisation in a network of buyers and suppliers is offered by the work described .The proposed multi-product and multi-buyer supplier selection model, which seeks to simultaneously maximise two objective functions, is examined using the GA. In the recommended ranking approach, buyers evaluated providers using linguistic variables. A fuzzy analytic hierarchy process ranking model was used to rank each product from each supplier from the standpoint of the buyers. To prevent going over the production capacity and demand constraints, the authors suggested a model based on the network optimisation problem. Finally a was created to get the right [3-5].

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Conflict of Interest

There are no conflicts of interest by author.

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