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Optimization of store and warehouse based e-grocery fulfillment

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The increasing adoption of e-groceries makes the optimization of the order handling process important. Customers order the desired products in an online webshop, after which the company should fulfill the orders. For this fulfillment, orders should first be picked in a warehouse, followed by their delivery to the customer's location. The order picking operations can be performed in either a dedicated warehouse, or in a brick-and-mortar store. Whereas a warehouse allows for very efficient order picking operations, its location is usually relatively far from customers, increasing the delivery distance. The opposite is true for the store, where picking is less efficient due to its marketing-based layout, but delivery can be organized efficiently due to its proximity to the customers. This creates an interesting optimization problem, with a trade-off between order picking and order delivery efficiency.
In this context, we study the integrated problem of assigning orders to fulfillment locations and constructing the delivery routes starting from an order's picking location. To solve this problem, we developed a metaheuristic algorithm. This algorithm is used on instances constructed from real-life data, to examine the impact of operational context and order characteristics on the location assignment decisions, and provide managerial insights.