



Research School for Operations
Management and Logistics

Wait or Assign: A Look into Dynamic Time Window Assignment with Stochastic Customers and Travel Times

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Dynamic Time Window Assignment with Stochastic Customers and Travel Times (DTWASCT) is motivated by logistic service providers that offer service to customers with next-day delivery. Customers order during the day and for each customer, the service provider assigns and communicates time window for the delivery. The time limit sets the time for the last accepted customer order for the next-day delivery. When an order arrives before the time limit, the service providers inquire following choices i) assigning the time window for the customer and construct/update the route plan for the next-day accordingly, ii) wait for more orders to arrive then assign the time windows and construct/update the route plan afterwards. The two choices that the provider face provides a trade-off between customer service regarding to early communication with the customers and on-time delivery. It would be beneficial or more preferable from the customers perspective to know the time of delivery early (i.e, needed for arrangement of scheduling of the dependent processes, shift planning, etc.). Ensuring on-time delivery remains a primary concern for the service provider, primarily due to the inherent stochastic nature of travel times between customers. DTWASCT is occupied with two key decisions: when and how to assign time windows to the customers. The service provider first struggles with the decision when to assign the time windows to the customers such that the customers can have an early communication with their time windows. Given the stochastic nature of order arrivals, acquiring comprehensive information becomes imperative to facilitate "reliable" and cost-effective routing decisions. We model this problem as a Markov decision process (MDP) with a finite horizon. We adapt one-step look-ahead rollout algorithm alongside with a DRL framework based on approximate policy iteration to provide solutions to the problem.