# ABSTRACT

Ship route optimization is the process of determining the optimal route with the aim of maximizing revenue and minimizing operational costs on the ship. Ship route optimization is very important because it can reduce operational costs, increase shipping efficiency, and increase the profitability of shipping companies. Therefore, optimal ship routes are the key to maximizing revenue and minimizing operating costs in the shipping industry. Several factors significantly affect revenue potential, including demand fluctuations at each port, limitations on maximum ship capacity, limitations on maximum ship sailing time, and limitations on the capacity of the type of cargo carried. In this paper, we develop a model to optimize ship route selection to maximize revenue by considering constraints such as the possibility of port properties, ship capacity, and the type of cargo carried. This study uses a machine learning-based model called the Ant Colony Optimization (ACO) algorithm to generate routes that allow for maximizing revenue while meeting various constraints. This case study was conducted on a very complex shipping route in Indonesian waters, focusing on the optimization of 5 ships out of 25 ships currently in operation. This optimization considers various factors, including ship capacity, sailing time constraints, maximum capacity for various types of cargo on each ship, and fluctuations in cargo demand at each port. As an optimization method, a per-ship approach was used, where each ship was optimized individually to determine the most optimal route and revenue. As validation, the results obtained from Ant Colony Optimization (ACO) were compared with the results from Genetic Algorithm (GA) and manual routes used previously. The results of the study showed that the route generated by ACO had an average increase in revenue of 697% compared to benchmark routes.

**Keywords:** Ship route optimization, maximize revenue, multiple constraints, Ant Colony Optimization (ACO).