

## Advancements in Multi-Objective Optimization Algorithms to Trade Promotion Strategy

Employing stochastic search methods and the temperature cooling schedule for Multi-Objective Optimization Algorithms

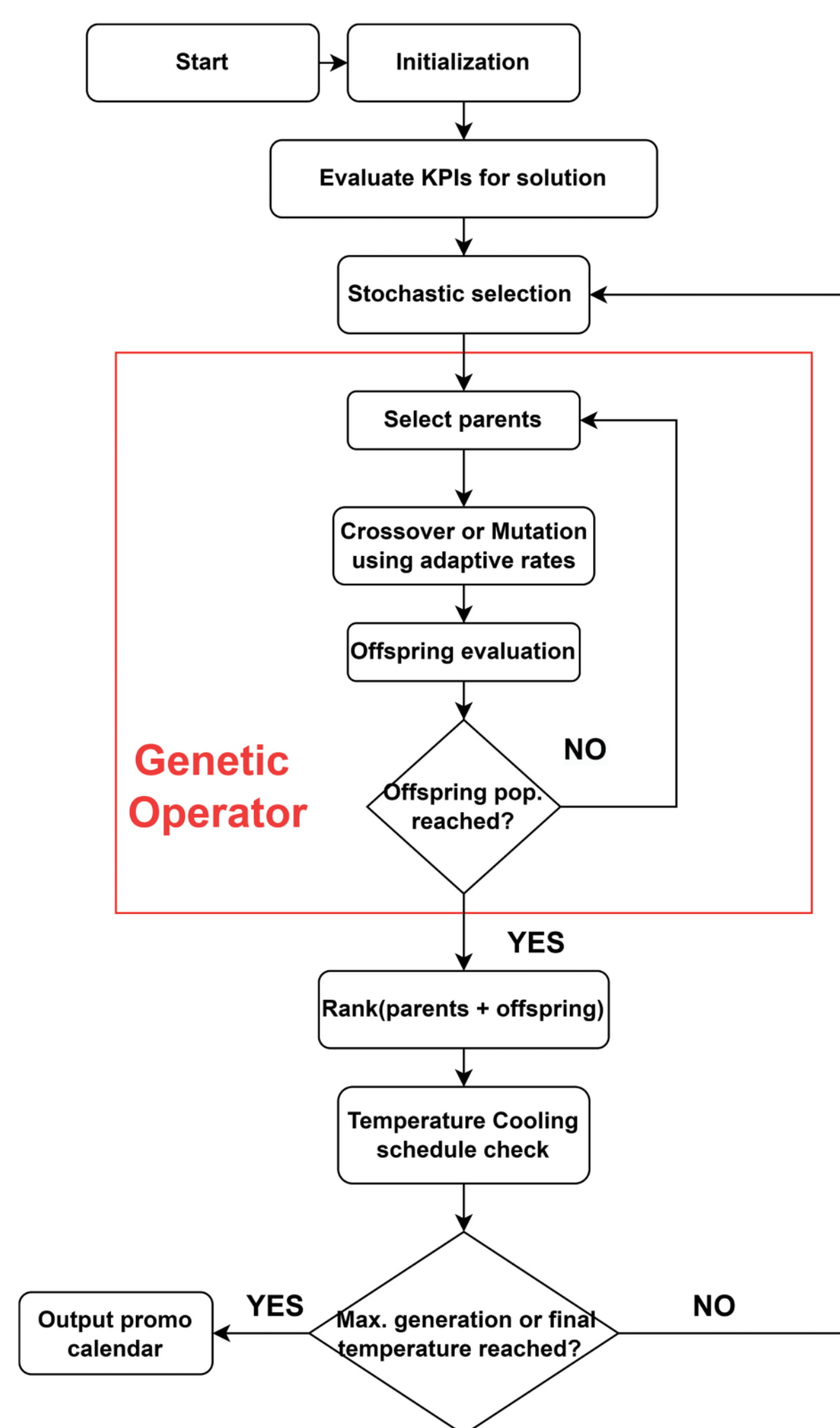
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### PROJECT SUMMARY

This research constitutes a thorough exploration into the domain of trade promotion optimization(TPO), primarily emphasizing critical objectives such as increased profitability, enhanced sales value, and augmented turnover, alongside other pivotal performance metrics. Given the intricate landscape of consumer goods companies, the imperative need for crafting comprehensive promotional strategies becomes essential and timely.

This study primarily concentrates on advancing and refining sophisticated multi-objective optimization techniques, particularly emphasizing the utilization of Genetic Algorithms and Simulated Annealing Algorithms. Drawing from Genetic Algorithms (GA), our approach incorporates innovative modifications, including adaptations to temperature and cooling schedules, the introduction of stochastic searching selection algorithms, and the application of a dynamic mutation rate. Furthermore, we conducted multiple hyper-parameter tuning methods for both optimization algorithms, including population size, mutation rate, crossover rate, etc. This transformative enhancement is firmly anchored in a data analysis framework, including sources of point-of-sale data, store-level, and historical promotional data. Our findings not only validate the effectiveness of these methodologies in attaining optimized outcomes across diverse objectives but also underscore their ability to reduce convergence time. In practical application, it yields substantial enhancements in operational efficiency, facilitating a more robust and adaptable approach to trade promotions within the consumer goods industry.



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