IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 3, Issue 19, May 2023
Impact Factor: 7.301

Retail Assortment Optimization: An AI-Driven Decision Framework

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Abstract: *Retail businesses face increasing challenges in managing product assortments due to evolving customer preferences, extensive SKU portfolios, and dynamic market conditions. Conventional assortment planning approaches are often static and unable to adapt effectively to changing demand patterns. This paper presents an AI-driven decision framework for retail assortment optimization that leverages data-driven intelligence and machine learning techniques to support strategic product selection and inventory decisions. The proposed framework integrates deep learning-based representation learning, demand pattern analysis, and reinforcement learning-based optimization to generate adaptive assortment strategies. By continuously learning from retail data, the framework enables more accurate decision-making and improved responsiveness to market changes. Simulation-based evaluation demonstrates enhanced revenue performance, reduced stock-out occurrences, and improved inventory utilization compared with traditional heuristic-based approaches. The findings highlight the potential of artificial intelligence to support efficient and scalable assortment optimization in modern retail environments.*

Keywords: Artificial Intelligence, Retail Analytics, Store Clustering, Assortment Optimization, Multi-Tier Retail, Reinforcement Learning, Demand Forecasting.

DOI: 10.48175/IJARSCT-11979K