

## Machine Learning for Demand Forecasting in the Retail Industry: Applications and Future Research Directions

HT Gunasekara<sup>1#</sup>, PRD Wijesinghe<sup>1</sup>, and WAAM Wanniarachchi<sup>1</sup>

<sup>1</sup>Faculty of Computing, General Sir John Kotelawala Defence University, Ratmalana,  
Sri Lanka

<sup>#</sup>38-bit-0003@kdu.ac.lk

### Abstract

Accurate demand forecasting is critical for retail inventory planning, supply chain management, and sustaining profitability. However, complex real-world retail demand patterns with promotions, trends, pricing variations and evolving consumer preferences pose modelling challenges. Recent advances in Machine Learning (ML) offer new data driven capabilities for uncovering hidden non-linear patterns toward improved demand sensing. This paper reviews Machine Learning applications in retail demand forecasting and synthesizes key findings on techniques, comparative accuracies of selected models and benefits of implementation. Popular methods examined include Autoregressive Integrated Moving Average (ARIMA) model, Support Vector Machines (SVMs) as well as Neural Networks. Key challenges such as computational complexity, model interpretability, and data limitation and integration are analysed and future research directions proposed related to creation of transfer learning models, lightweight deep learning models and customized demand forecasting models. The review suggests that while current machine learning implementations demonstrate forecast accuracy gains, considerable research is still needed to yield tangible business value, upon practical implementation of these models.

**Keywords:** *Autoregressive Integrated Moving Average, Neural Networks, Support Vector Machines*