# Study on Emergence of Machine Learning and Artificial Intelligence in the Retail Industry

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**Abstract**: *Artificial intelligence (AI) is quickly transforming the retail sector by automating numerous operations that were previously time-consuming and required a lot of manual labour, which are essential for running a profitable business. AI applications in the retail industry can assist organizations in determining the most effective pricing strategies by offering visual representations of the potential effects of various pricing methods. To do this, systems gather information on different items, advertising campaigns, sales numbers, and other pertinent data.*

*There is currently a growing use of Artificial Intelligence (AI) and Machine Learning (ML) terms in the industrial sector. Retailers are progressively employing AI-driven applications. The aim of this study is to gain a more profound understanding of artificial intelligence (AI), its emerging applications in the retail industry, and to choose the most favourable course for future research in this field. Retailers are increasingly incorporating artificial intelligence (AI) into several aspects of their retail operations, as stated in the study. Moreover, a considerable percentage of retail businesses are integrating artificial intelligence (AI) into their operational plans. Artificial Intelligence (AI) is very advantageous in the retail sector in India for operations like order processing, shipping, and inventory management..*

**Keywords:** Artificial Intelligence, Machine Learning, Retailing, Store management

## I. INTRODUCTION

Three significant technological advancements—artificial intelligence (AI), big data analytics (BDA), and machine learning (ML)—are predicted to drastically alter every element of human existence. According to McCarthy (1998), artificial intelligence (AI) is the science and engineering of creating intelligent devices, particularly intelligent computer programs. Through ongoing data collecting and analysis, the AI system continuously learns and solves issues in a dynamic environment (Cao, 2021). The goal of creating machines that could either fully or partially replace people in specific tasks is where artificial intelligence (AI) originated. The pandemic has accelerated the global retail industry's use of technology. This study aims to investigate the potential uses of artificial intelligence in the retail sector as well as future research avenues.

**Application of AI in Retail**
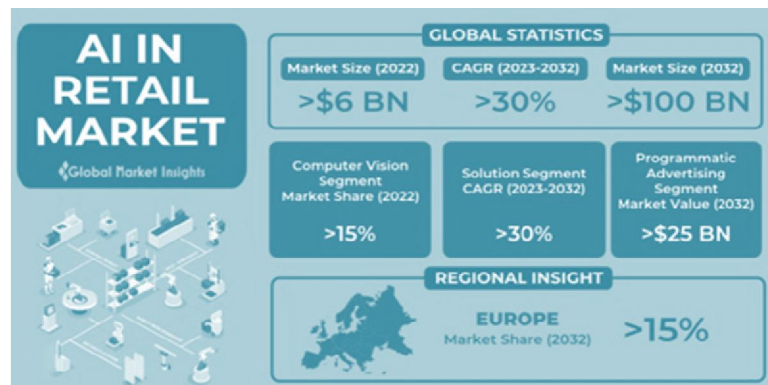
The retail business leverages artificial intelligence (AI) in several crucial areas, such as customer services, shop management, supply chain management, media optimization, online risk management, omnichannel and mobile consumer behavior analysis, and other applications.

## Customer Support

AI is playing a number of roles in customer service, both online and in physical retail spaces. AI-based solutions have been created for a variety of purposes, some of which include advertising, automation, and POS digitalization. Computer vision, sensor fusion, and deep learning are used in the automated self-checkout systems developed by Amazon Go shop in Seattle (Ruschen and Wiehenbrauk, 2017).

According to Bertacchini et al. (2017), the use of robotic technology can boost staff wellbeing, lower labour costs, provide customers with quick, intelligent counsel, and boost sales. At the US-based home improvement company Lowe's, robots are used to help with sales (Forgan, 2020). Online chatbots are also used to help customers with ordering, other services, and customer support (Christie, 2018). The UK-based supermarket Lidl introduced Margot, an AI-powered Facebook Messenger chatbot that helps users choose the ideal wine according to their tastes and budget. According to Syam and Sharma (2018), machine learning algorithms have the potential to generate personalized purchasing experiences and virtual assistants that enhance communication between customers and retailers. According to Shankar (2018), Coversica is an AI program that can communicate with potential clients and enhance customer-retailer interaction.

## Store Management

One of the most important parts of the retail industry is store management. AI-powered humanoid robots can lead consumers through stores and help them locate the products they want to buy.

- **Pepper**: In Ave and Softbank mobile stores, Pepper, a humanoid robot, assists customers (Shankar, 2018). Retailers can guarantee that the right products are on their shelves at the right times and in the right quantities by utilizing AI-based technologies. Effective in-store management can be made possible via AI-powered visual merchandising, category management, and merchandising.
- **Eden**: is an intelligent software that helps store employees determine when produce goes bad and how fresh the fruits and vegetables are (Musani, 2018). With the program, they can take a picture of the fruit or vegetable and receive an evaluation regarding its degree of staleness and remaining shelf life. This helped the merchant optimize their supply chain and guarantees the quality of fruits and vegetables. Walmart has 43 distribution centers that use this software. AI can help in automating retail processes as well. Robots designed to scan shelves have been installed by Walmart to keep track of the stock levels on various shelves.
- **Tally** :A business called Tally has created an automated robot that looks for empty areas and lost goods (Vanian, 2018).Lawson, a retailer, has optimized temperature and lighting in its stores with AI-based apps. BestBuy uses Alexa to answer consumer questions. Thus, it's clear that AI can help with efficient retail administration.

## Supply Chain Management

A vital role for supply chain management exists in the retail industry. AI-driven solutions are improving inventory management and the effectiveness of the supply chain. Additionally, it can help with autonomous order processing and demand forecasting. The supply chains can be optimized by the forecasting systems. AI can be used to optimize the fulfillment process (Ning et al., 2009). Customers' individual ordering processes can also be facilitated by AI-based solutions, such as voice-enabled ordering systems (Dennis, 2018 a &b). Additionally, it can help reduce risk in supply chains (Giannakis and Louis, 2011). According to Weber and Schutte (2019), AI may be used to determine how many products should be kept in different warehouses based on factors like the local warehouse, the time of year, the region, and key cities.

## Optimization of Media

Some of the major international shops employ AI for social media and web management. "Kroger Precision Marketing," an ML-based tool, is being used by Kroger to enhance its individualized communication initiatives (Davenport, 2018). An AI-based digital marketing tool called Albert is used by an Australian online gift retailer to target customers on social media platforms like Facebook, YouTube, and Google (Shankar, 2018). Retailers are using artificial intelligence (AI) to target potential customers through various media and to plan, organize, and oversee marketing campaigns across various online media.

## Internet-Based Risk Assessment

Cybersecurity risks, such as data breaches and online frauds, are a concern for retailers operating in the omnichannel model (online, brick and mortar locations). Applications with an AI foundation can strengthen internet security and shield systems from intrusions. Additionally, by employing ML, behavioral analytics, and predictive analytics to spot anomalies, they can help detect fraud (Cao, 2021).

AI is used by Amazon to detect fraudulent reviews on its website. The Swiss retailer Coop Group employs CognitoTM, a cyberthreat detection and monitoring tool. Artificial Intelligence (AI) can offer clients a safe and easy shopping experience, especially with digital becoming a main channel for retail businesses. PayPal employed a deep learning algorithm to detect and prevent fraudulent payments (Shankar, 2018). AI is used by Amazon to detect fraudulent reviews on its website. The Swiss retailer Coop Group employs CognitoTM, a cyberthreat detection and monitoring tool. Artificial Intelligence (AI) can offer clients a safe and easy shopping experience, especially with digital becoming a main channel for retail businesses. PayPal used a deep learning system to identify and avoid payment fraud (Shankar, 2018). PayPal used a deep learning system to identify and avoid payment fraud (Shankar, 2018).

## Recognizing Omnichannel and Mobile Consumer Behaviour

AI is a useful tool for tracking customer journeys and identifying challenges customers have when transacting digitally. Retailers use natural language processing and computer vision to analyze client behavior in order to improve the customer experience. Increased sales were the outcome of the French retailer L'Occitane identifying and fixing customer pain points in their mobile applications (Shankar, 2018). Retailers now employ AI and mobile data to better analyze customer behavior thanks to the development of mobile applications.

## Other Applications

Prospecting with AI can help find clients who are prepared to make a purchase (Flaiz, 2019). The Uniqlo apparel store is investigating the use of AI-powered UMood kiosks, which show clients a range of items and employ neurotransmitters to evaluate their reaction to color and style. According to Dwivedi et al. (2019), customer-specific profiles that anticipate their purchasing patterns can be created using data gathered by AI applications.

## Prospects and Issues for AI in the Retail Sector

Major businesses have adopted technology as a result of the global pandemic, and the retail sector is no exception. This industry is dynamic and has adopted technology more quickly. The deployment of AI technology is relevant to shops operating online and offline. By 2020, intelligent personalization engines that are able to discern the intentions of consumers will be created in order to boost revenue, claim Jain and Laney (2016). By 2021, 85% of retail businesses intend to use supply chain automation, which might expand the industry (IBM, 2019).

The retail business must generate new jobs and positions to counteract the displacement effect that may result from growing automation followed by AI's replacement of low-skilled, tiresome shop tasks (Acemoglu, Restrepo, 2018). Retailers must use AI technology as socially conscious companies that take into account the interests of customers, employees, and society at large, even though AI is not meant to replace people (Mahmoud et al., 2020).

### Future Directions for AI and Retail Research: An Overview and Discussion

Retailers may obtain and use deep consumer insights from AI, according to Camberia (2016). Thus, gathering insights from consumer research and pinpointing the essential elements that can improve the buying experience is one of the burgeoning fields of study. The retailer may be able to implement automation and hyper-personalization as a result. Applications using AI offer a great deal of promise to improve customer experiences. It would be fascinating to conduct research on the main features, capabilities, and ways that AI can benefit both customers and retailers. There aren't many in-depth studies on the value realized by adopting these technologies, despite the fact that many shops are taking the initiative to develop AI-based tools.One of the biggest obstacles facing every retailer is running a store. The main areas that potentially offer enormous scope for future research include AI and its potential contribution to item quality control, shelf management, customer help, product placement, and retail atmosphere management. AI has broad applications in supply chain and inventory management. Fascinating fields of study include artificial intelligence (AI), supply chain risk management, and frameworks for implementing AI for retailers. Retailers want to create AI and ML applications for a variety of purposes, including cyber security challenges, the simplicity of ordering, and the online shopping experience.



**Asia Pacific AI In Retail Market**
size, by component, 2020 - 2030 (USD Billion)

● Solution  ● Service
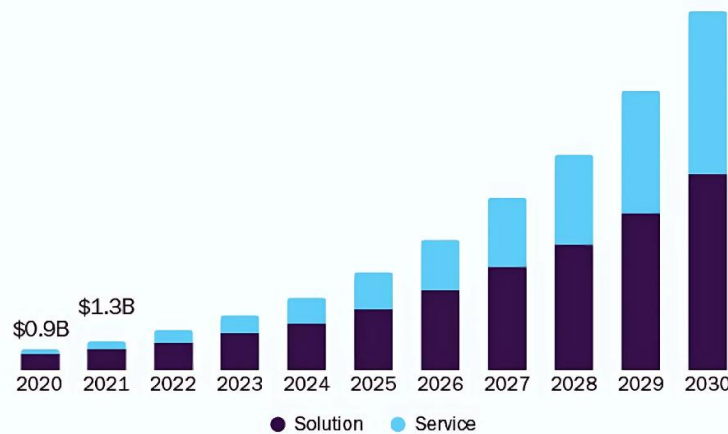
Future study will have a huge amount of scope since it will concentrate on applications, how AI affects these functions, and how it might benefit customers and retailers. One such area where merchants are investigating the use of AI is online media management. There is significant research value in the studies looking into how AI may help stores manage their social media and online presence. Lastly, research on AI's function in retail location analysis, store atmospherics, and format selections is likely to be of interest to academics.

### Limitations and the Scope for Future Research

The present study investigated artificial intelligence and its developing uses in retailing. Artificial Intelligence and its possible applications in various industries and corporate processes is a new field of study. Thus, there aren't many in-depth scientific research on the subject of AI and retailing. Large-scale studies and publications cover AI applications within a Western setting. This restricts the study's focus to a small number of retailers in particular regions. The study's sole reliance on content analysis of published research restricts the evaluation of how AI has affected these merchants' businesses in the specific domains where it has been implemented. Therefore, in order to understand the effects of using AI, future study can take a case-based approach and conduct a thorough investigation of a retailer that has embraced AI.

## II. CONCLUSION

AI-based technologies are expected to have a substantial impact on the retail sector. The content analysis reveals that businesses such as supply chain management, media optimization, customer service, retail operations, and risk

management have embraced the use of AI. According to analysts, it is expected that by 2030, 2035, or 2040, artificial intelligence would replace around one-third of the job positions in the retail industry (Shankar, 2018). Artificial intelligence is forecasted to revolutionize and supplant existing retail procedures and job roles. Retailers aim to utilize AI to assist, rather than supplant, human involvement in retail operations. To enhance the shopping experience, the shops would give priority to integrating the optimal blend of technology and interpersonal connection. Therefore, it can be inferred that retailers are adopting artificial intelligence (AI) in order to enhance consumer experiences and create value for both customers and other stakeholders. The primary domains of focus for AI research should encompass factors, challenges, impacts on AI adoption, and AI's capacity to provide value.

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