



AI in Visual Merchandising

Pradeep P¹, Keertan C¹, Harshini S.¹, Subrata Das²

¹UG student, Bannari Amman Institute of Technology, Sathyamangalam, India

²Professor and Head of Department, Bannari Amman Institute of Technology, Sathyamangalam, India

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ABSTRACT

By improving the visual attractiveness of products and influencing consumer purchase behavior, visual merchandising plays a crucial role in the retail sector. In this research, a unique method for visual merchandising that makes use of Artificial Intelligence (AI) approaches is proposed. In order to optimize product placement, shelf organization, and overall store design, the suggested system makes use of computer vision and machine learning algorithms to examine product displays, store layouts, and consumer behavior. Retailers can create more interesting and useful shopping environments by automating the visual merchandising process, which will eventually improve consumer experiences and boost sales.

Keywords: Keywords: Visual Merchandising, Artificial Intelligence, Computer Vision, Machine Learning, Retail Industry, Product Placement, Store Layout, Customer Behavior, Automated Merchandising, Customer Experience

1. Introduction

Visual merchandising is an artful and strategic practice that bridges the gap between a product and its potential customer. In the dynamic world of retail, where competition is fierce and attention spans are fleeting, the way products are presented can significantly impact a consumer's perception, engagement, and ultimately, their purchasing decision. This integral aspect of retail marketing focuses on creating visually appealing and enticing displays that effectively communicate a brand's identity, tell a story, and stimulate an emotional connection with shoppers. The primary objective of visual merchandising is to optimize the aesthetics and layout of a retail space, ensuring that products are not merely placed on shelves but are curated to evoke a desired response. Store design encompasses several key components that collectively contribute to an innovative and customer-centric retail environment. These fundamental elements of visual merchandising serve as tools for enhancing store outlets, fostering heightened customer satisfaction, and bolstering competitiveness within the market. These elements include the strategic arrangement of the store layout, the captivating arrangement of window displays, the deliberate choice and application of colors, the artful use of lighting, and, on occasion, the integration of auditory experiences through music systems. Collectively, these components synergize to create a unique and engaging shopping experience that not only appeals to customers but also sets the store apart in a competitive marketplace. Use the enter key to start a new paragraph. The appropriate spacing and indent are automatically applied.[1]

Nomenclature

Title: AI in visual merchandising

Application of AI in Store details

Visual merchandising in retail stores goes beyond the mere arrangement of products; it encompasses the entire sensory experience that customers encounter. The integration of Artificial Intelligence (AI) in store details visual merchandising is revolutionizing this traditional practice, enhancing the way products are showcased, and reshaping customer interactions. Here's how AI is making a significant impact on the minutiae of visual merchandising which is shown in the below figure (1).[2]

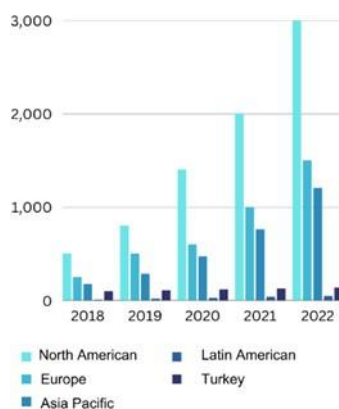


Figure 1: Impact of AI in visual merchandising

Smart

AI has introduced a transformative edge to store details visual merchandising through the implementation of Smart Shelf Management. This novel method makes use of AI-enabled cameras and sensors to constantly monitor and improve shelf conditions. By leveraging advanced computer vision and data analysis, Smart Shelf Management introduces a host of dynamic capabilities that significantly enhance visual merchandising and customer experiences.[1]AI-driven cameras and sensors continuously scan shelves, capturing a wealth of data that extends far beyond mere visual observation. These technologies track stock levels, monitor the arrangement of products, and assess the overall organization of the shelf space. One of the primary functions of Smart Shelf Management is to ensure that products are consistently available and easily accessible to customers. AI analyzes historical sales data, demand trends, and external factors to determine the appropriate quantity of each product to be displayed. This prevents both overstocking and understocking, leading to efficient inventory management. The AI system evaluates customer movement patterns within the store, identifying high-traffic areas and prime locations. This data informs decisions about where to strategically place products for maximum visibility and engagement. With AI insights, retailers can spotlight products in locations that naturally draw customers' attention. Smart Shelf Management leverages AI's predictive capabilities to anticipate stock depletion. When product levels are low, the system generates automatic alerts for staff to restock the shelves promptly. This minimizes the occurrence of empty spaces and ensures a seamless shopping experience. With AI handling the monitoring and analysis of shelf conditions, store staff are liberated from routine stock-checking tasks. This enables them to focus on higher-value activities, such as customer interaction and maintaining the store's overall aesthetics.: The data collected by Smart Shelf Management goes beyond immediate stock concerns. AI-generated insights help retailers understand which products are the most popular, which placements yield the best results, and how customer behavior impacts purchasing decisions. By maintaining consistently stocked shelves, retailers enhance the visual appeal of their store. Customers are met with a pleasing and organized display, fostering a positive impression and improving their overall shopping experience. Smart Shelf Management's ability to align product availability with demand reduces the likelihood of slow-moving or outdated inventory. This, in turn, contributes to improved inventory turnover rates and optimized sales performance.

Dynamic Product Placement

In the realm of cutting-edge visual merchandising, Dynamic Product Placement harnesses the power of AI to revolutionize how products are strategically positioned within a retail environment. By leveraging advanced data analysis and customer behavior insights, this approach goes beyond static arrangements, optimizing product placements to create a shopping experience that seamlessly aligns with shoppers' preferences and movements[3]. At the heart of Dynamic Product Placement is AI's capacity to analyze intricate customer movement patterns and shopping behaviors. Through a network of sensors, cameras, and data collection tools, AI captures an abundance of information that sheds light on how customers navigate the store, where they pause, and which areas hold their attention.AI processes data in real-time, generating a comprehensive understanding of customer interactions with the retail space. It identifies popular pathways, frequented sections, and the duration of customer stops. This holistic view provides invaluable insights into which areas are prime real estate for product placement. Armed with a deep comprehension of customer preferences, AI orchestrates the placement of products in high-traffic zones. These areas are often the focal points where customers converge, such as entrances, main walkways, or checkout lanes. By situating products in these locations, retailers maximize their visibility and engagement potential. The positioning of products in high-traffic areas capitalizes on human behavior. Customers are more likely to notice and consider products placed along their natural pathways. This not only boosts product visibility but also encourages spontaneous purchases and cross-selling opportunities. Dynamic Product Placement is not a one-time strategy; it evolves in tandem with shifting customer behaviors and preferences. AI continually analyzes new data to adapt the placement of products as shopping patterns change over time, ensuring optimal engagement and customer satisfaction. Placing products strategically where customers are already inclined to look enhances their engagement with offerings. This, in turn, amplifies the chances of interaction, exploration, and ultimately, purchases. The application of AI removes guesswork and subjectivity from product placement decisions. Instead, decisions are guided by real-time, data-backed insights that align with shopper behaviors. Products placed strategically in high-traffic areas are more likely to catch customers' attention and influence their purchase decisions. The convenience of encountering products along familiar routes enhances the overall shopping experience. AI's insights into

movement patterns can identify complementary products often chosen together. Retailers can capitalize on these insights to strategically position related items nearby, promoting cross-selling and increasing the average transaction value.

Virtual store Simulation

In the realm of modern retail, Virtual Store Simulation emerges as a revolutionary tool, empowered by Artificial Intelligence (AI), which empowers retailers to revolutionize visual merchandising strategies with unprecedented precision. By leveraging AI-driven technologies, retailers can immerse themselves in a virtual environment that replicates their physical store, allowing them to test, refine, and optimize visual arrangements before making any physical changes. This innovative approach not only eliminates the need for disruptive rearrangements but also empowers retailers to make informed, data-driven decisions that enhance customer experiences and drive sales[3]. Virtual Store Simulation relies on AI's capacity to replicate real-world environments in a digital realm. AI-generated algorithms mimic store layouts, fixtures, and product displays, creating a lifelike simulation that accurately mirrors the physical retail space. One of the primary advantages of Virtual Store Simulation is its ability to facilitate experimentation without affecting day-to-day operations. Retailers can try out various visual merchandising strategies, adjusting product placements, lighting, and layouts, all within the virtual environment. The virtual simulation is not just a visual tool; it's a data-rich environment. Retailers can collect insights on customer engagement, movement patterns, and interactions with products. This data informs decision-making, ensuring that adjustments align with customer preferences. Traditionally, testing new visual arrangements required physical changes to the store, which could be time-consuming and costly. Virtual Store Simulation eliminates these expenses, allowing retailers to explore different strategies efficiently. AI-powered simulations enable retailers to model various scenarios and assess their impact. For instance, retailers can simulate the effects of seasonal changes or the introduction of new product lines, preparing in advance for any required adjustments. Retailers can tailor the virtual simulation to reflect specific customer demographics and behaviors. This enables them to assess how different groups of customers might interact with the store layout and products. Virtual simulations can be shared with stakeholders and team members, fostering collaborative decision-making. This ensures that all relevant parties can provide input before implementing changes. By testing strategies virtually, retailers can identify potential challenges and issues before they arise in the physical store. This risk mitigation reduces the likelihood of costly mistakes or disruptions. As AI-powered simulations generate data on customer behavior, retailers can receive real-time feedback on how adjustments influence engagement, providing actionable insights for refinement..

Augmented Reality Fitting Rooms

In the dynamic landscape of retail, Augmented Reality (AR) Fitting Rooms have emerged as a cutting-edge fusion of AI and immersive technology that transforms the traditional fitting room experience. Powered by AI algorithms, these smart mirrors introduce a revolutionary approach to shopping by allowing customers to virtually try on various clothing items without the need for physical changes. This innovative technology not only enhances convenience but also elevates customer engagement, personalization, and purchasing confidence[4]. The below figure (2) shows the increase in the usage of the augmented reality fitting rooms in the retail market.

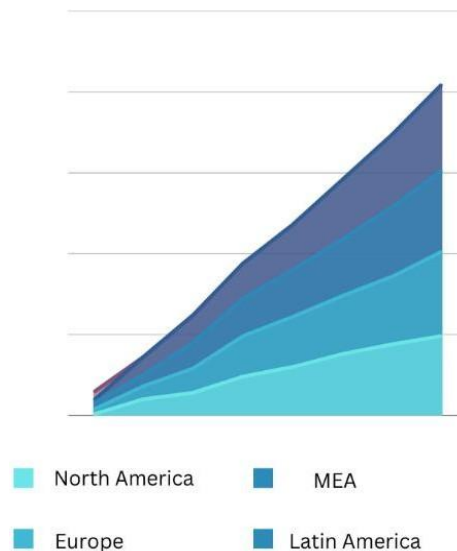


Figure 2: Increase in the usage of the AR fitting rooms

AI-driven python algorithm was used for leveraging AI fitting rooms in order to overlay different clothing options onto the customer's live image accurately. This Python program is a simple computer vision application that uses OpenCV and the cvzone library to overlay virtual shirts onto a person in a video. The program allowed to change the virtual shirt by using hand gestures recognized through pose detection. Here's a breakdown of how the program works:

Import necessary libraries:

- os: provides functions to interact with the operating system, used for file handling.
- cvzone: A library that simplifies computer vision tasks.
- cv2: OpenCV, a popular computer vision library.
- PoseDetector: A class from cvzone used for pose detection.
- Initialize variables and capture video: A video file named "1.mp4" is captured using OpenCV's VideoCapture function.
- A PoseDetector instance named detector is created to detect human poses in the video. Various variables related to shirt selection, image overlay, and button interaction are initialized. Figure 3 shows how the virtually checking of the garments will be done by using python program



Figure 3: Virtual checking of the available garments

These python algorithms ensure that clothing items align seamlessly with the customer's body proportions, offering a realistic and personalized virtual try-on experience. The AI-powered mirror blends real-time camera feeds with virtual clothing, creating a harmonious interaction between the customer's reflection and the virtual garments. This synergy enables customers to visualize how different clothing pieces would actually look on them. With AR Fitting Rooms, customers can bypass the limitations of physical dressing rooms, such as waiting for available rooms or struggling to change clothes. This technology enables them to virtually try the multiple outfits effortlessly. The below figure (4) shows the different garments and the correct alignment of the garment to the person trying the VR fitting room.



Figure 4: Virtually trying the garments

The software is using a laptop camera to check the body structure of the person and it fits the pre-installed garment products to the person as shown in the figure (4). The efficiency and the accuracy of the program and the fitting of the garments is around 80% because of the movements of the person's which is hard to calibrate. AI algorithms can learn from customer preferences and past choices, recommending clothing options that align with individual styles. This personalized curation facilitates quicker decision-making and a tailored shopping experience.

By allowing customers to virtually "wear" the clothing items, AR Fitting Rooms address the uncertainty associated with purchasing clothes. Shoppers can confidently assess how different styles and sizes flatter their appearance before making a purchase. The AI-powered mirror speeds up the fitting process, enabling customers to explore a wider range of clothing options within a shorter period. This efficiency encourages exploration that is more extensive and potentially boosts sales. Through AI analytics, retailers can gather data on customer interactions with different clothing items. This

information provides insights into popular styles, preferred colors, and trending designs. AR Fitting Rooms bridge the gap between physical retail and online shopping experiences. Customers can preview items in-store and then confidently make online purchases based on their virtual try-ons.

Conclusion

Artificial intelligence (AI) is increasingly being used in the field of visual merchandising to improve the effectiveness of displays and promotions. AI can be used to analyze customer data, such as purchase history, browsing behavior, and social media activity, to identify trends and patterns that can be used to create more targeted and effective displays. AI can be used to personalize displays to individual customers, based on their preferences and needs. AI could be used to recommend products that are similar to those that a customer has previously purchased or to show products that are trending on social media, can be used to optimize displays to maximize sales and engagement. AI could be used to determine the optimal placement of products, the best time to run promotions, and the most effective use of space. AI can be used to automate tasks related to visual merchandising, such as creating and managing product catalogs, generating reports, and tracking inventory levels. This can free up visual merchandisers to focus on more creative and strategic tasks. AI has the potential to revolutionize the field of visual merchandising by making it more efficient, effective, and personalized. As AI technology continues to develop, it is likely that we will see even more innovative applications of AI in visual merchandising in the years to come.

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