IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Elevate The Online Shopping Experience Using Augmented Reality (AR) And Artificial Intelligence (AI) For Enhanced Apparel Recommendations

[1]Loganathan D, [2]Aman Kumar Mishra, [3]Aniket Kumar, [4]Janardhan M, [5]Manikant Kumar

[1] Professor, [2] Student, [3] Student, [4] Student, [5] Student

Department of Information Science and Engineering,

Cambridge Institute of Technology, Bangalore, India

Abstract: Utilizing cutting-edge technology solutions, the integration of Artificial Intelligence and Augmented Reality has significantly enhanced the traditional clothing shopping experience. Customers can virtually try on clothing and accessories, all from the comfort of their own homes. With specialized software and 3D modelling, customers can upload their images or avatars and virtually "try on" various outfits in real-time, achieving a higher degree of accuracy in sizing and fit predictions. This cutting-edge concept offers an immersive and highly interactive shopping experience, empowering customers to not only seehow different clothing items fit and look on them but also providing accurate size recommendations through AI technology. Additionally, the integration of AR in virtual trial rooms enhances the virtual shopping experience by allowing customers to explore products in a more realistic and engaging way, ultimately enhancing their confidence in making online fashion purchases while reducing the need for physical store visits.(Abstract) Keywords— Artificial Intelligence, 3D, machine learning, Augmented Reality

I.INTRODUCTION

In the digital age, online shopping has become an integral part of our daily lives. However, the absence of physical interactionand the challenge of making informed purchasing decisions have been persistent issues for consumers, especially when it comesto apparel. To address these challenges, a groundbreaking project aims to revolutionize the online shopping experience by integrating Augmented Reality (AR) and Artificial Intelligence (AI) technologies. Augmented reality (AR) is a technology that has taken the world by storm in the past few decades. Its applications are now found in almost all the fields possible. It is a technology that puts graphics, images, and other computer generated augmentations upon a reality that already exists, in order to improve the experience of the user by enabling different interactions between the user and his environment. In this report, we present how AR actually works in shopping application and what are the different types of technologies that are used in its implementation. These technologies help o project or augment the virtual object into the real world.

The main idea of augmented reality is to overlay images, graphics, and audio over a real environment in real time. The system isto grow the user's idea of and interaction with the real world by augmenting the real world with 3D virtual objects that appear to exist in the same space as the real environment. Various technologies like virtual reality, augmented reality, sixth sense technology, computer graphics and different sensors work together, to create a world where virtual objects are superimposed upon the real life environment. AR technologies have grabbed the eyes of researchers for quite some time now. It takes the real time environment of the present world and projects or displays digital images and sounds into it. Virtual reality (VR) artificially replicates or recreates the real time world environment by using computer generated graphics. The hearing and vision areenhanced in such a manner that the user feels he is actually experiencing the computer

generated or recreated environment. The project's core objective is to enhance the way customers interact with and purchase apparel online. By combining AR and AI, it seeks to offer consumers a more immersive and personalized shopping experience. Here's a brief overview of the project's key components:

II. PROJECT OVERVIEW

Augmented Reality (AR): Augmented Reality technology will allow customers to virtually try on clothing items from the comfort of their own homes. Through AR applications, users can superimpose digital representations of clothing onto their bodies, giving them a realistic sense of how the apparel fits, looks, and feels.

Artificial Intelligence (AI): AI will play a crucial role in making tailored apparel recommendations. Machine learning algorithms will analyze a customer's preferences, body type, and previous shopping history to suggest clothing items that are not only fashionable but also fit the individual's style and body shape. Enhanced Apparel Recommendations: The system will take into account various factors such as the latest fashion trends, user reviews, and inventory availability. These recommendations will be highly personalized, increasing the hances of customers finding clothing items that genuinely suit their preferences.

Real-time Interactivity: Through AR, customers can virtually interact with the clothing, check for colour options, patterns, and even receive styling tips. The system will also provide real-time feedback, such as fit adjustments, helping customers make confident choices.

Sustainability and Convenience: By reducing the need for physical shopping, this project aligns with sustainability goals. Additionally, it offers the convenience of shopping from anywhere at any time

Privacy and Security: Protecting user data and ensuring the security of AR interactions are paramount. The project will incorporate robust data privacy measures to reassure customers about the safety of their personal information.

III. LITERATURE SURVEY

Richard Fedorko , Stefan Krail , and Radovan Bacik,“Artificial Intelligence in E-commerce: A Literature Review”.

With the development of information and communication technologies, artificial intelligence is becoming increasingly popular. The main aim of companies in today’s e-commerce world is to influence customer behaviour in favour of certain products and brands. The application of artificial intelligence as an innovative tool in the field of e-commerce may seem as a positive step forward.

- Jeevan S Devagiria, Sidike Pahe inga , Quamar Niyazb , Xiaoli Yangc , Samantha Smith ,“Augmented Reality and Artificial Intelligence in Industry: Trends, Tools, and Future Challenges”. Augmented Reality (AR) is an augmented depictionof reality formed by overlaying digital information on an image of objects being seen through a device. Artificial Intelligence(AI) techniques have experienced unprecedented growth and are being applied in various industries. The combination of ARand AI is the next prominent direction in upcoming years with many industries and academia recognizing the importance oftheir adoption.
- Apoorva Jain, Assistant Professor, Department of Computer Science Engineering, JEMTEC, Greater Noida, “Study of Artificial Intelligence(AI) with Augmented Reality(AR).” Artificial Intelligence is the subarea of Computer Science, which deals with making machines work like humans. The concept of artificial intelligence has almost overruled the concept oftyping on various Search Engine tools, rather people are interacting with computers like they interact with the humans. Theygive command to the systems and the systems respond accordingly, as humans does.

Yong-Chin Tan , Sandeep R. Chandukala, and Srinivas K. Reddy , “Augmented Reality in Retail and Its Impact on Sales”. The rise of augmented reality (AR) technology presents marketers with promising opportunities to engage customers and transform their brand experience. Although firms are keen to invest in AR, research documenting its tangible impact in real-world contexts is sparse. In this article, the authors outline four broad uses of the technology in retail settings. They then focus specifically on the use of AR to facilitate product evaluation prior to purchase and empirically investigate its impact on sales in online retail. Using data obtained from an international cosmetics retailer, they find that AR usage on the retailer’smobile app is associated with higher sales for brands that are less popular, products with narrower appeal, and products thatare more expensive.

Arshif Ali, Kishor Saikia, Biki Nayak, Monoj Kr.Muchahari and Pranav Kumar, Augmented Reality Based Online Application For E-Shopping, International Journal of Advanced Research in Engineering and Technology
(IJARET), 12(3), 2021, pp. 212-232. In Today’s time online shopping is very popular among the people because it provides quality of products at good prices. Many people prefer to buy product directly through online of instead of offline shops. But buying cloths from online always have a problem such as problem is the cloth size which doesn’t fit after buying the product, therefore the returning of the product will at least

take 1 – 2 weeks. • Shannon School of Business,Cape Breton University, Nova Scotia, Canada, ”Artificial Intelligence (AI) applications in on-line shopping in India”. Retailing in India has attracted many global players and has reached nearly 350 Billion USD according to KPMG in 2010.While the retail environment is experiencing a significant growth, Indian consumer tastes and preferences are also changing rapidly forcing retailers to grow in numbers and formats. Technological advances and expansion of internet have also paved the way for electronic retail channels. India, as an emerging economy, offers substantial opportunities for e-retailers.

The problem at hand is the inadequacy of traditional online shopping experiences, particularly when it comes to purchasing apparel. Customers often face challenges related to size and fitting accuracy, leading to a high rate of returns and customer dissatisfaction. Furthermore, online shoppers are limited by their inability to physically try on clothing, assess how items look on them, or feel the fabric's texture. This deficiency in the shopping process leads to inefficiencies and higher operational costs for businesses.

Limited User Engagement: Traditional online shopping platforms lack advanced features such as augmented reality (AR) and artificial intelligence (AI), resulting in limited user engagement and a less immersive shopping experience.

High Return Rates: The absence of virtual try-ons contributes to higher return rates as users face uncertainty regarding the fit and appearance of clothing items. This poses a challenge for both customers and retailers in terms of operational efficiency and customer satisfaction.

Problem Statement

Generic Recommendations: Current personalization algorithms often provide generic recommendations based on basic user data, lacking the ability to offer highly tailored suggestions that consider individual preferences and real time fashion trends.

Sustainability Awareness Gap: Existing systems do not effectively address the increasing consumer demand for sustainable fashion choices. Lack of information on product sustainability metrics creates a gap in meeting the preferences of environmentally conscious shoppers.

Competitive Disadvantage: E-commerce platforms without advanced AR and AI features risk falling behind in the competitive landscape. Failure to provide an innovative and personalized shopping experience may result in a loss of customers .

IV. PROPOSED SYSTEM

AI-Powered Apparel Recommendations: Implement advanced AI algorithms to analyse user data, including preferences and purchase history, to provide highly accurate and personalized apparel recommendations. Immersive Virtual Try-Ons: Integrate cutting-edge AR technologies to enable users to virtually try on clothing items in a highly immersive and realistic manner, enhancing the online shopping experience. Continuous Learning and Improvement: Develop the system to continuously learn from user feedback and evolving fashion trends, ensuring that the AI algorithms and virtual tryon experiences are regularly refined and improved over time.

Comprehensive Security Features: Implement robust security measures to safeguard user data, including encryption protocols, secure data storage, and regular security audits to address potential vulnerabilities

V. SYSTEM ARCHITCTURE

Certainly! Elevating the online shopping experience using Augmented Reality (AR) and Artificial Intelligence (AI) forenhanced apparel recommendations involves a multifaceted architecture. Below is a high-level overview of the key components and their interactions:

User Interface (UI)

AR Interface: Provides a seamless AR experience for users to virtually try on apparel.

Web/App Interface: Allows users to navigate through the online store, view product details, and manage their preferences.

AR Module:

AR Core Functions: Handles real-time tracking of the user's movements and environment for accurate placement of virtualapparel.

Rendering Engine: Generates realistic and high-quality visuals of apparel on the user through AR.AI Recommendation Engine:

Data Collection: Gathers data from user interactions, purchase history, preferences, and external sources like social media.

User Profiling: Creates user profiles based on historical data and current preferences. **Collaborative**

Filtering: Recommends apparel based on the preferences of similar users. **Content-Based Filtering:** Recommends apparel similar to the user's past choices.

Deep Learning Models: Utilizes neural networks for more advanced pattern recognition and personalized recommendations. **Apparel Catalogue Management:**

Product Database: Stores detailed information about each apparel item, including images, descriptions, sizes, and availability.

Metadata Tagging: Tags products with relevant attributes to enhance recommendation accuracy. 5. Augmented Reality Integration:

3D Modelling: Converts 2D product images into 3D models for AR visualization.

Integration with AI Recommendations: Combines AI recommended apparel with AR for virtual try-ons.

Backend Services:

Authentication and Authorization: Manages user access to the platform securely.

APIs for External Services: Integrates with payment gateways, shipping services, and external databases.

Encryption: Ensures secure communication between the user's device and the server.

User Consent Management: Provides transparency and control over user data sharing.

VII. METHODOLOGIES

Data Collection: Gather user data, including preferences, purchase history, and demographic information, to train the AI algorithms. Utilize data from fashion trends, social media, and industry reports to stay informed about current styles and preferences.

Algorithm Development: Develop and refine AI algorithms for personalized apparel recommendations. Utilize machine learning techniques to analyze user data and predict preferences. Implement deep learning models to continuously improve the accuracy of recommendations over time.

AR Integration: Implement AR technologies for virtual tryons. Use computer vision to simulate realistic clothing appearances on users. Explore advanced rendering techniques to enhance the visual fidelity of virtual garments and ensure a lifelike experience.

User Testing: Conduct extensive user testing to gather feedback on the virtual try-on experience and AI driven recommendations. Iteratively refine the system based on user input, addressing issues related to fit accuracy, visual realism, and overall satisfaction.

Security and Privacy Measures: Implement robust security measures to protect user data, ensuring compliance with privacy regulations. Incorporate encryption protocols for data transmission and storage. Conduct regular security audits to identify and address potential vulnerabilities

ALGORITHM

The implementation of algorithms in a project like "Elevate the Online Shopping Experience using Augmented Reality (AR) and Artificial Intelligence (AI) for Enhanced Apparel Recommendations" involves several key algorithms across different modules. Here are some algorithms commonly used in such a system:

3.3 Theoretical framework

Variables of the study contains dependent and independent variable. The study used pre-specified method for the selection of variables. The study used the Stock returns are as dependent variable. From the share price of the firm the Stock returns are calculated. Rate of a stock salable at stock market is known as stock price.

1. **Collaborative Filtering:**
   Algorithm: User-User Collaborative Filtering or Item-Item Collaborative Filtering.
   Description: Recommends products based on the preferences and behaviours of similar users (user based) or similar items (item-based). This algorithm helps identify patterns and similarities in user behaviours to make personalized recommendations.

2. **Content-Based Filtering:**
   Algorithm: TF-IDF (Term Frequency-Inverse Document Frequency), Cosine Similarity.
   Description: Recommends products similar to those the user has liked or interacted with in the past. This algorithm is based on analysing the content and attributes of items to find matches with the user's preferences.

Deep Learning Models:
Algorithm: Neural Collaborative Filtering (NCF), Deep Neural Networks (DNN).
Description: Utilizes neural networks to learn complex patterns and relationships in user behaviour and

preferences. Deeplearning models can capture intricate features and improve the accuracy of recommendations.

AR Tracking Algorithms:
Algorithm: SLAM (Simultaneous Localization and Mapping) for Marker less Tracking. –
Description: SLAM algorithms enable AR devices to understand and navigate the user's environment in real-time, providingaccurate tracking of the user's movements and the placement of virtual objects Fig 1:Random Forest

Functional Description and working

Implementing your project involves several key steps, each building on the previous one to create a cohesive andfunctional ecommerce platform. Here's a high-level overview of the implementation process.

Kotlin for App Development:
Utilizing Kotlin allows for the development of a single codebase that works seamlessly on both iOS and Android platforms.
This ensures a consistent user experience across different devices, reducing development time and effort

Firebase as the Database:

Firebase is employed as the database to store product information, user profiles, and relevant data.
•Its flexible schema and scalability make it suitable for handling the dynamic nature of product catalogues in an e-commercesetting.

ARCore for Augmented Reality Integration:

ARCore is implemented for Android devices, providing AR capabilities across a wide range of smartphones.
The AR functionality enhances the shopping experience by allowing users to virtually try on apparel items, visualizing how theylook in real-time.).

TensorFlow Lite for AI-Powered Suggestions:

TensorFlow is utilized to implement machine learning models for personalized product recommendations.
The AI suggestions enhance the user experience by analysing user preferences, purchase history, and current trends, providingtailored recommendations for apparel items. Virtual Try-On Feature:
•The app functions similarly to traditional ecommerce platforms but introduces a unique virtual try-on feature using ARtechnology.
Users can virtually try on clothing items using their device's camera, allowing them to see how the apparel looks on them beforemaking a purchase decision.

E-commerce Functionality:
The app incorporates standard e-commerce features such as product listings, detailed product descriptions, pricing, and a securecheckout process.
Users can browse, search, and filter through the product catalogue, adding items to their cart for a seamless shopping experience.

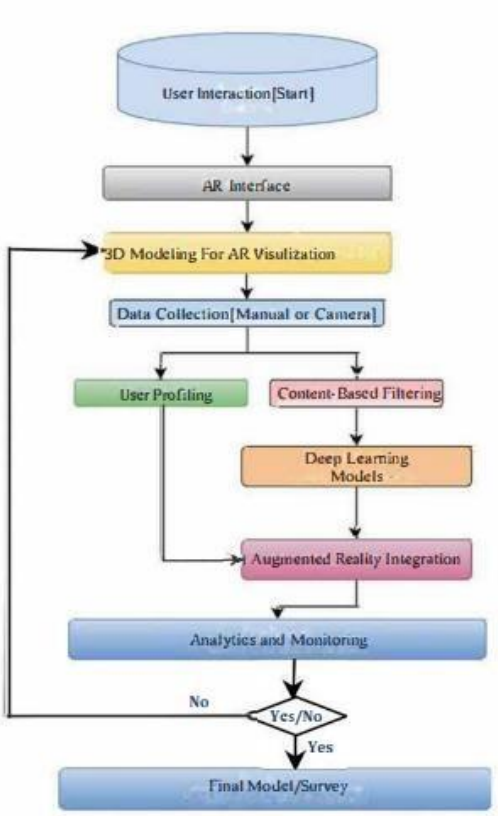
EQUATION

The Receiver Operating Characteristic Curve (ROC Curve) permits to predict the correctness of machine learning algorithms(Bradley, 1997). It consists of a plot visualizing the algorithm true positive rate (TPR) versus its false positive rate (FPR).
Predictive rates are divided in four classes:
True Positive (TP): The binary is correctly predicted as being malicious.

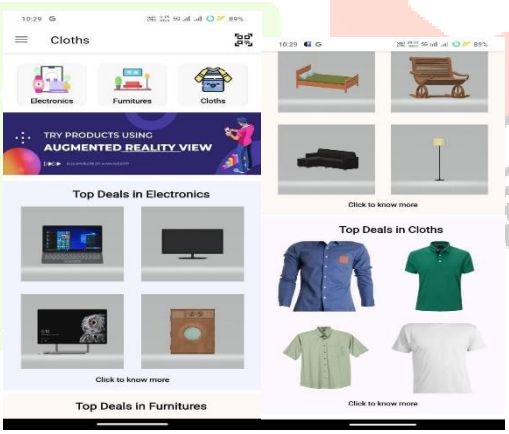
- True Negative (TN): The binary is correctly predicted as being benign.
- False Positive (FP): The binary is incorrectly predicted as being malicious.
- False Negative (FN): The binary is incorrectly predicted as being benign.

$$TPR = \frac{True\ Positives}{}$$

$$FPR = \frac{False\ Positives}{False\ Positives + True\ Negatives}$$



VIII. RESULTS



VIII. CONCLUSION

The AR-based shopping project with integrated AI for enhanced size and fitting aims to tackle the pressing issues of ill-fitting apparel and the lack of a physical try-on experience in online shopping. By precisely identifying the problems and setting clear objectives, this project offers a comprehensive solution to revolutionize the onlineapparel shopping landscape. Through the integration of AR technology, customers will have the ability to virtually try on clothing items in real-time, enabling them to visualize how garments fit and look on their own bodies. The AI component of the project enhances the experience by providing accurate sizing recommendations based on individual body measurements and personal preferences, reducing the likelihood of returns and increasing customer satisfaction. Efficiency in inventory management is another key benefit, as AI helps businesses maintain optimal stock levels, reducing operational costs. The user-friendly interface ensures that customers can easily access and utilize AR and AI features, making the shopping process more accessible. In the next ten years , people will highly rely on artificial intelligence and augmented reality technology, search engine will get a bit slower and will soon vanish. Augmented reality technology has various disadvantages associated with it. The cameras used in clickingthe
pictures are not good enough that they can take good quality pictures at night as well. The quality of a picture also depends on the distance from which the picture has been taken.

REFERENCES

VI. Bergquist, R., & Stenbeck, N. (2018). Using Augmented Reality to Measure Vertical Surfaces

VII. Chandan, G., Jain, A. and Jain, H., 2018, July. Real time object detection and tracking using Deep Learning and OpenCV. In 2018 International Conference on Inventive Research in Computing Applications(ICIRCA) (pp. 1305-1308). IEEE.

VIII. Gidaris, S. and Komodakis, N., 2015. Object detection via a multi-region and semantic segmentation- aware cnn model. In Proceedings of the IEEE international conference on computer vision (pp. 1134-1142).

IX. Liu, L., Li, H., & Gruteser, M. (2019, August). Edge assisted real-time object detection for mobile augmented reality. In The 25th Annual International Conference on Mobile Computing and Networking.

X. Popelka, O., Prochazka, D., Kolomaznik, J., Landa, J., & Koubek, T. Adaptive real-time object recognition for augmented reality.

XI. Silva, R.L., Rodrigues, P.S., Mazala, D. and Giraldi, G., 2004. Applying object recognition and tracking to augmented reality for information visualization. Technical Report. Technical report, LNCC, Brazil.

XII. Zhao, Z.Q., Zheng, P., Xu, S.T. and Wu, X., 2019. Object detection with deep learning: A review. IEEEtransactions on neural networks and learning systems, 30(11), pp.3212-3232.

XIII. Redmon, J., Divvala, S., Girshick, R. and Farhadi, A., 2016. You only look once: Unified, realtime object detection. In Proceedings of the IEEE conference on computer vision and pattern recognition (pp. 779-788).

XIV. Boukhtouta, A., Mokhov, S. A., Lakhdari, N.-E., Debbabi, M., and Paquet, J. (2016). Network malware classification comparison using dpi and flow packet headers. Journal of Computer Virology and Hacking Techniques, 12(2):69–100.

XV. Bradley, A. P. (1997). The use of the area under the roc curve in the evaluation of machine learning algorithms. Pattern recognition, 30(7):1145–1159.

XVI. Breiman, L. (2001). Random forests. Machine learning, 45(1):5–32.

XVII. Chebbi, C. (2018). Mastering Machine Learning for Penetration Testing. Packt Publishing.

XVIII. Fan, C.-I., Hsiao, H.-W., Chou, C.-H., and Tseng, Y.F.(2015). Malware detection systems based on api log data mining. In 2015 IEEE 39th annual computer software and applications conference, volume 3, pages 255–260. IEEE.

XIX. Filiol, E. (2006). Computer viruses: from theory to applications. Springer Science & Business Media.

XX. Chandan, G., Jain, A. and Jain, H., 2018, July. Rtime object detection and tracking using Deep Learning and OpenCV. In 2018 International Conference on Inventive Research in Computing Applications(ICIRCA) (pp. 1305-1308). IEEE.