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Exploration of Deep Learning-based Augmented Reality Complex Scene Object Tracking Technology in Communication

Duoduo Mou [1*] Aida Ali [2] Ajune Wanis Ismail [2]

[1] PhD Candidate, Faculty of Computing, Universiti Teknologi Malaysia, Skudai, Johor 81310, Malaysia
[2] PhD, Faculty of Computing, Universiti Teknologi Malaysia, Skudai, Johor 81310, Malaysia

* **Corresponding Author:** mouduoduo@graduate.utm.my

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ABSTRACT

The emergence of deep learning (DL) and augmented reality (AR) have revolutionized the landscape of communication and media industries. A detailed connection between AR-based object tracking and digital communication together with user experience remains absent throughout academic research. The research aims to fill this literature gap by performing a systematic literature review (SLR) that studies the confluence of AR object-tracking systems and communication technologies. The main purpose focuses on evaluating how AR elevates user connection alongside perceptual abilities and media interface experiences in light of emerging trends and tracking roadmaps in AR-based applications. The review design incorporates structured SLR methodology which selects studies from main databases through precise search terms. The review performed thematic analysis to extract major themes from previous study findings and gaps. AR object tracking proved to be a major digital communication advancement that improves user interactions on social networks and marketing channels together with brand promo activities. Changes in self-perception together with identity transformation emerge as major psychological results from AR interactions. The study shows why AR technology is crucial for creating immersive responses through interactive communication which will shape future developments of AR solutions in digital media platforms along with marketing and communication strategies.

Keywords: Deep Learning, Augmented Reality, Object Tracking, Communication, Technology.

INTRODUCTION

AR technology combined with DL systems created a disruptive change in communication alongside media technology during the recent period. The development of digital platforms leads users to desire more involved and intelligent interactive communications (Ajani, Enakrire, Oladokun, & Bashorun, 2023). AR functions as an increasingly useful tool that enables users to impose digital content on their real environment for enhancing their overall experience. AR develops beyond basic visualization when it uses deep learning technology specifically for complex scene object tracking by becoming a system that delivers real-time responsive augmentation to communication spaces (Rehman, Abbas, & Pahore, 2024). Such synergies enable modern people to engage with digital content better and maintain virtual communication as they interpret augmented space information.

The expanding influence of DL and AR is becoming increasingly obvious throughout different business sectors. AR software enables journalists to provide interactive news presentation systems that actively engage their audience (Oyewole, et al., 2024). Users experience better presence and participation through AR during remote collaboration and education because it lets people see complex data together with real-time access to digital tools. Deep learning systems ensure that user experiences become smooth and adaptable through their

operation (Wang & Hu, 2024). Tracking objects represents the fundamental principle that supports this innovation in AR. Virtual elements maintain precise alignment while users move their positions or when changes occur in different scenes through this technology. AR object tracking enabled by DL technology delivers enhanced functionality and aesthetic value to rich media communication because it becomes multimodal (Devagiri, Paheding, Niyaz, Yang, & Smith, 2022).

The increasing adoption of AR-enhanced communication tools happens because of better mobile hardware performance along with 5G networks and AI capabilities improvements. AR integration became widespread across healthcare and marketing industries because it creates better connections with their clients (Balasubramanian, Kunasekaran, Konar, & Sakkthivel, 2022). Digital communication will witness greater adoption of these tools because they are becoming accessible and easier to use for users. Detailed knowledge about how deep learning-based AR object tracking operates in this environment is essential both for maximizing its potential and directing future improvement in media and communication.

The growing importance of AR in communication stands against the absence of systematic research that connects AR-based object tracking with its effects on digital communication along with user experience. Research on AR and deep learning happens independently from each other while identifying an absence of overlapping analyses regarding their collaborative effect on digital media usability. The lack of cohesive analysis hinders researchers from achieving full comprehension about how AR modifies communication technologies that perform complex scene object tracking effects and affects user outcomes.

The objective of this paper involves a systematic literature review (SLR) dedicated to understanding AR-based object-tracking functions in communication and media technologies. The review investigates main developments and recognition of missing elements and possible future paths for AR tracking implementation in digital communication systems. This review integrates multiple study results to evaluate how AR promotes increased user involvement and sensory perception and media participation among users.

LITERATURE REVIEW

Key Concepts in Augmented Reality and Communication

Augmented Reality (AR) delivers digital content judgments through a technology platform which adds virtual elements to physical spaces (Alimamy & Jung, 2024). Virtual interaction through communication technologies depends on AR because it combines digital enhancement with user senses to create connected experiences between people. Users find applications of AR throughout different technological areas starting from teleconference virtual collaboration tools up to immersive journalistic experiences that place users inside interactive content. The confluence between communication and AR leads to experiential interaction by overcoming traditional information transmissions (M.H. Alsamhi, Hawbani, Kumar, & S.H. Alsamhi, 2024).

AR environments demand highly effective object tracking as a critical element for scenes that include moving humans alongside changing environments. The implementation of Deep Learning (DL) with convolutional neural networks (CNNs) and, recurrent neural networks (RNNs) and transformer-based architectures enhance object detection accuracy under conditions of low visibility in addition to tracking objects despite partial blockages (Shah & Tembhurne, 2023).

The combination of AR with storytelling technology gives users real-time experiences in communication-driven situations (Phillips, 2024). News and educational broadcasters integrate AR overlays as a tool to explain their content visually while educational content creators adopt this technology for their work. DL-based object tracking enables AR to maintain real-time collaborative relationships between remote workers by providing them with virtual indicators and shared spatial awareness combined with virtual 3D object control (Aung, Sangwongngam, Jintamethasawat, Shah, & Wuttisittikulkij, 2024).

AR in Communication Technologies

AR operates through human sensory systems to generate enhanced multi-sensory ways for people to communicate with each other. Modern technological research employs AR as a platform to create interactive news stories that allow users to navigate stories through space (Kozinets, 2023). 3D AR war zone and environmental catastrophe visualizations create an emotional spatial experience that 2D video along with text fail to replicate.

The workplace has experienced fundamental changes through the introduction of AR in virtual collaboration systems. Real-time recognition of gestures as well as faces and tools works because of deep learning technology which supports effective collaboration (Hashi, Hashim, & Asamah, 2024). The improvement of AR performance remains the focus of multiple ongoing research explorations that operate in complex environments. The research

article B2DC: Balanced Point Cloud Data Reduction Based on Biplanar 2D Curvature introduces a new deep learning-assisted strategy to manage point clouds for speeding up target detection with retention of critical geometric characteristics in real-time AR systems (Park, Kim, Ryu, & Paek, 2024). New technology produced computer computations that reached 30% higher levels than standard curvature-dependent protocols which matter for AR implementation in internet-based communication networks.

Deep Learning (DL) in Media Communications

Deep learning provides intelligent device tracking that sustains virtual content consistency in relation to actual-world anchor position in AR environment (Tukur, 2024). Object tracking systems contribute to visual stability in AR applications with rich media content and they enable anchor-based content awareness. The extraction of video feed features happens prominently through CNN architectures and these tools enable functionality in OpenCV's DNN module and Google's ARCore (Bhatt et al., 2021).

Studies reveal that 3D data feature learning occurs within hierarchical systems to deliver basic functionality needed by AR applications that must track complex objects between frames (Georgiou, Liu, Chen, & Lew, 2020). The models successfully analyze sensor-generated sparse point clouds obtained from LiDAR or stereo cameras that operate in mobile AR systems.

Audience Reception and Psychological Effects

Faces of AR create a profound shift in how users perceive things and react to them. Research indicates that narrations that utilize AR technology improve emotions in viewers along with their ability to remember the content (Iyer, 2023). Viewers perceive spatial interactions in stories better than conventional media formats because of enhanced experiences and emotional experiences.

The psychological aspects of presence illusion and interactivity dynamics influence trust relationships while determining attention span as well as satisfaction when using AR in communication (Chong, Ng, Basha, & Lim, 2024). DL functions as a crucial component for AR personalization when used to detect real-time behavioral indications and emotional cues and develop feedback methods that boost performance. Object tracking models deployed correctly in AR interfaces minimize visual disturbances and stabilize the interface so users can have a better experience (Kuzma, 2022). The combined messaging between users who are subjected to multiple interactive elements raises new questions about mental fatigue.

Theoretical and Conceptual Foundations

Media Richness Theory (MRT)

According to MRT communication effectiveness depends on the ability of a medium to accurately regenerate information sent through it (Gu, Higa, & Moodie, 2011). By combining deep learning technologies with AR the communication medium becomes much more complex through the addition of visual and auditory and spatial cues and user-interaction features. The spatial context features of AR-enabled communication improve users' message understanding as well as their emotional responses. AR conferencing systems deliver 3D virtual character representations together with object detection and monitoring functions to generate virtual face-to-face meetings. MRT principles gain enhancement through this capability which minimizes uncertainty while enhancing personalization for the core aspects of MRT.

Technology Acceptance Model (TAM)

According to TAM the main elements propelling technology adoption consist of perceived ease of use and perceived usefulness (Katebi, Homami, & Najmeddin, 2022). In AR systems DL functions directly to improve both usability and usefulness features. The usability of interfaces becomes more stable while control functions become automated when using tracking models. Users perceive higher utility from AR because of the extra communicative features such as immersive storytelling and real-time translation and emotion-based adaptations. Real-time object tracking using DL presents measurable results that reduce user requirements thus making AR tools usable by non-technical users.

Social Presence Theory

Social Presence Theory defines how much people perceive each other as genuine during digital communication (Cui, Lockee, & Meng, 2013). AR enhances social presence through its addition of spatial information as well as live responsiveness. The illusion of coexisting in the same area becomes possible through DL technology that tracks gaze direction as well as facial expressions and object manipulation gestures. The improvement of presence results in enhanced collaborative achievements together with increased emotional bonding between participants.

METHODOLOGY

The study uses a Systematic Literature Review (SLR) to examine modern developments in Deep Learning-based Augmented Reality (AR) complex scene object tracking technology for communication purposes. The research method includes a Systematic Literature Review that allows researchers to gather, analyze, and combine research articles about communication applications of AR technology, with an emphasis on object tracking in challenging situations. The review's goal is to identify trends, research gaps, and challenges that produce vital information to help progress superior AR technologies in communication domains.

SLR Approach and Justification

The SLR approach performs optimally to assemble multiple source materials into an extensive but impartial broad examination of particular research domains. This study utilizes the SLR approach to track the evolving object-tracking technologies that integrate deep learning algorithms in AR communication systems. The advancement of advanced reality technology has accelerated in recent years because precise object tracking has become essential for bettering user interactions within complex environments. An SLR procedure enables researchers to explore current relevant literature extensively at a time when technologies evolve rapidly while discovering important areas of research that future studies must consider.

Search Strategy

The research paper identification process contains multiple stages that connect to trusted academic databases to discover suitable studies throughout the exploration. This research strategy focuses on selecting peer-reviewed studies and conference proceedings from scholarly publications that provide original information about AR object-tracking technologies. The search strategy achieved maximum quality and elimination of bias to obtain a complete representation of the modern AR object-tracking research publishing landscape. All subfields within AR and both deep learning and communication research domains are included in the search parameters to achieve a comprehensive investigation of the topic.

Databases Used

The selection of multiple academic databases allowed researchers to access different high-quality articles. These include: A broad spectrum of academic databases such as Google Scholar, Scopus, the Academy of Management Digital Library, and IEEE Xplore were used by the researchers to achieve full coverage of high-quality literature. The database search started with 300 research papers from these platforms. The researchers used a systematic PRISMA method to screen studies for quality then determine their relevance. Detailed assessment took place for 16 studies that survived the duplicate removal and peer review status verification and inclusion criteria requirements as part of a systematic literature review (SLR).

Search Terms & Keywords

The research used a combination of key terms associated with its main components to locate suitable literature. The primary search terms included: “Communication”, “Augmented Reality”, "Complex Scene", "Real-Time Tracking", "Object Tracking", “Deep Learning”, "Computer Vision in AR", "Tracking Algorithms", and “Technology”.

A combination of specified keywords using Boolean functions (AND, OR) allowed the search to gain maximum breadth but maintain focus on the communication-based AR tracking area.

Inclusion and Exclusion Criteria

The evaluation criteria were established to ensure the selected literature review materials directly match the research subject. The following criteria were applied:

Inclusion Criteria

a) All included studies originated from 2015 until 2025 to reflect recent advances in AR and deep learning. Out of 300 papers, 16 papers were finally selected for thematic analysis.

b) This research focuses on peer-reviewed journal articles together with conference papers along with books that show original research or complete review content.

c) Studies about deep learning-enabled AR object tracking in complex settings focusing on communication systems are evaluated in this review.

d) The inclusion criteria accepted articles that presented methodologies together with experimental

outcomes and case studies about AR tracking applications in communication systems.

Exclusion Criteria

a) The research excludes findings that do not utilize AR or deep learning as well as papers unrelated to communication.

b) A research paper focuses mainly on theoretical models without demonstrating practical usage or experimental testing of these models.

c) The study excluded research articles and sources that are not written in English and those that do not provide full-text availability.

Data Extraction and Analysis

Data extraction from chosen studies required the gathering of essential information points. The essential information from each paper contained publication years along with authors' names and their methodologies and main results while identifying the AR system type and deep learning approaches as well as the specific communication framework.

A database system structured the collected information for subsequent comparison and evaluation purposes. The researchers used thematic analysis to detect research limitations as well as repeated occurrences and research gaps from the analyzed material. The studies underwent classification according to thematic categories that included object tracking methods and deep learning network applications like recurrent neural networks and convolutional neural networks as well as solutions for communication-specific difficulties in AR environments including latency, real-time processing, and interaction quality.

Thematic Analysis and Synthesis

The analytic approach examined common concepts between the studies involving real-time object tracking development and deep learning applications for understanding environments alongside tracking difficulties in variable complex settings. The synthesis also aimed to identify open research areas regarding the development of improved tracking software which needs to address chronological deviations various lighting patterns and fast reaction times specific to telecommunication environments.

Content analysis of various studies allows the review to draw conclusions about field limitations and research paths for tracking objects in complex scenarios as well as future investigation prospects. The research finds applications that promote the development and deployment of deep learning-based augmented reality systems in communication technologies.

RESULTS AND DISCUSSION

Results

Table 1. Represents the Summary of Selected Studies

Citation	Aim or Title	Findings	Sub-themes
Ye & Li (2022)	"Design and research of digital media art display based on virtual reality and augmented reality"	The research examined how VR and AR technology can improve both digital media art presentations and user interface capabilities and visual display capabilities.	AR/VR in Digital Media Art
Miller et al. (2019)	"Social interaction in augmented reality"	Research evaluated how augmented reality (AR) improves social relationships within virtual environments together with its effects on interaction communication along with user involvement.	Social Interaction in AR
Wu & Liu (2024)	"Investigating the impact of augmented reality technology on user engagement and interaction in digital media environments"	Researchers investigated how AR increases digital media user engagement and interaction through communication-based evaluations.	AR in Digital Media Interaction
Taylor & Gibson (2017)	"Digitisation, digital interaction and social media: embedded barriers to	The study examined the effects of digital interactions along with digitization on social media platforms and their influence	Barriers in Digital Interaction

Citation	Aim or Title	Findings	Sub-themes
	democratic heritage"	over democratic heritage	

Theme 1. AR in Social Media and Digital Interaction

Ye and Li (2022) studied how virtual reality (VR) and AR technologies improve digital media art display systems. The research investigators discovered that the union of VR and AR technologies creates immersive encounters enabling users to interact with dynamic visualizations that boost their participation in digital media art shows. The fusion described by these researchers leads to vital improvements in the development of customized digital media interactions.

Editorial content published by Taylor and Gibson (2017) showcased multiple digital barriers which particularly affect heritage-related interactions through social networks. The authors examine how digital transformations lead to reduced accessibility in democratic heritage spaces even though such transformations deactivate marginalized voices across internet platforms. The paper demonstrates the necessity for inclusive digital media to use AR solutions which democratize access to historical cultural data through more equitable user interfaces.

Wu and Liu (2024) investigated how AR enhances user interaction and engagement within digital media through an expanded research. This study confirmed that AR technology enables users to receive customized communication experiences which let them handle digital content naturally. This research demonstrated that AR users have higher levels of social engagement and active involvement which supports its use in developing communication-based programs.

Miller et al., (2019) examined how AR works as a medium for better virtual interactions specifically by evaluating its ability to create dynamic communication possibilities between users in digital realms. The researchers established that virtual content superimposed over real-world settings through AR technology improves user participation in virtual communications. The research confirms the modern evolution of social media platforms which implement AR technology to deliver natural and exciting interpersonal connections.

These research studies present evidence about how AR operates as a multifunctional technology for changing digital interactions alongside social media usage. People perceive augmented reality as a powerful tool that combines artistic exhibits with participant engagement while overcoming digital communication challenges to enhance immersive interaction experiences (**Table 1**).

Table 2. Represents the Summary of Selected Studies

Citation	Aim or Title	Findings	Sub-themes
Alnaser (2024)	"The Impact of AI-Augmented Image and Video Editing on Social Media Engagement, Perception, and Digital Culture"	The author studied the effects of AI-improved image and video editing on social media engagement together with cultural changes specific to these technologies in user interactions and perception.	AI in Social Media Engagement
Ramya & Ramamoorthy (2025)	"AI in Communication Technology and Innovation of AR/VR in Communication"	..performing a review of AI applications in communication technologies while focusing on AR/VR innovations that improve digital space communication abilities.	AI, AR/VR in Communication
Rosenberg (2023)	"The metaverse and conversational AI as a threat vector for targeted influence"	The research focused on exploring the risks of conversational AI together with the metaverse as they attempt to modify user perceptions and actions using specific behavioral marketing strategies.	AI and Metaverse Influence
Chen et al. (2024)	Customizing Generated Signs and Voices of AI Avatars: Deaf-Centric Mixed-Reality Design for Deaf-Hearing Communication	The project investigated how to develop AI controlled virtual characters which possess both sign language and voice generation capabilities to enhance communication between individuals who are hearing and deaf.	AI Avatars in Deaf Communication

Theme 2. AI-Generated AR Filters & Avatars

The examined research demonstrates how AR and AI collaborate through communication technology to transform digital media usage while modifying user participation throughout multiple industries (**Table 2**).

Social media personalization through object tracking happens when the system analyzes user reactions towards visual content to determine interests which then allows feed customization based on these detected preferences. Saving user attention by bringing forth pertinent content based on personal choices and current engagement habits enables better commitment.

Alnaser (2024) examined the impact of AI-based editing tools on social media platforms where he demonstrated their effect on social media user behavior. The research by Chen et al. (2024) implemented AI avatars to produce tailored signs and voices as communication aids between hearing and deaf users. The implementation of sign language within AR and VR settings through their research allows for better accessibility to users in the deaf community. AI avatars provide a technological solution to enhance communication between deaf and hearing individuals because they minimize the barriers that prevent social interaction in virtual environments.

Rosenberg (2023) discussed the security concerns connected to metaverse and conversational AI technologies because these systems might enable specific manipulation in digital networks. The research study exposes crucial questions regarding digital privacy protection as well as AI manipulation levels and ethical complications within virtual spaces thus proving the requirement for safe communication system measures.

Through their authoritative review Ramya and Ramamoorthy (2025) investigated the ways AI utilizes AR and VR to transform communications between people professionally and socially. These research works build the advancing picture of AR utilization in social networks and digital communication systems. The studies demonstrate the increasing relevance of AI and AR technology in developing user-centered interactions and improving virtual communication through social media applications and virtual accessibility systems as well as digital ethics monitoring.

Table 3. Represents the Summary of Selected Studies

Citation	Aim or Title	Findings	Sub-themes
Lok (2024)	"Augmented Reality Filters and Generation Z: a Study on Engagement, Self-Perception and Emotional Responses"	The study evaluated how AR filters affect Generation Z viewers by showing that such filters increase their emotional bond with digital material.	AR Filters in Social Media Engagement
Fribourg et al. (2021)	"Mirror, mirror on my phone: Investigating dimensions of self-face perception induced by augmented reality filters"	A study investigated how AR filters modify user facial perception with findings showing alterations in self-perception together with changes in body image.	AR Filters and Self-face Perception
Isakowitsch (2022)	"How augmented reality beauty filters can affect self-perception"	Researchers evaluated how AR beauty filters affect self-perception while investigating the psychological effects digital image alteration produces in self-esteem levels.	AR Beauty Filters and Self-perception
Sinlapanuntakul & Zachry (2024)	"Augmenting Self-presentation: Augmented Reality (AR) Filters Use Among Young Adults"	An examination revealed that young adults apply AR filters for social media self-expression which boosts their social activity.	Self-presentation with AR Filters

Theme 3. Psychological Effects

Research conducted on augmented reality (AR) filter social media usage provides important findings regarding users' perceptions of self along with their presentation techniques and emotional reactions towards

such applications (**Table 3**).

Through augmented reality users can recreate their selves by choosing virtual avatars and filters which make it difficult to distinguish their digital presentation from genuine reality. Identity formation among user groups as well as user confidence and authenticity undergo change because of the way digital expression and appearance can be reshaped.

Lok (2024) evaluated Generation Z users through research about AR filter effects on their emotional relationships with digital content and their perception of self and their interactions with media platforms. This study discovered how AR filters make users develop stronger emotions toward their social media posts while improving their user experience. The emotional bond generated through AR filters by Generation Z members leads them to establish deeper interactions with digital platforms which fully contributes to raising their overall content engagement and distribution.

Sinlapanuntakul and Zachry (2024) researched youth utilization of AR filters when presenting themselves on social media platforms. Through their research Sinlapanuntakul and Zachry discovered users can communicate beyond basic photo alteration because AR filters exist for self-expression. AR filters supply innovative tools which help users present their personal identity and emotions in more meaningful ways. These filters enhance social activity by enabling people to create fresh methods for digital expression of their identities.

The research by Isakowitsch (2022) investigated the mental impacts of AR beauty filters regarding their effect on users' self-perception and self-esteem. Research shows that when digital photos have their physical appearance enhanced by AR beauty filters the users demonstrate both body image changes and self-esteem fluctuations. Some users felt better about their appearance through filter usage but numerous individuals developed adverse psychological issues after seeing their perceived physical contrasts between real-life and the filtered images.

Fribourg et al. (2021) studied the relationship between Application Programming interface (AR) filters and their effects on users' face perception experiences. The examined data showed that AR filters substantially transform both personal recognition and physical appearance perceptions especially with respect to facial characteristics. A person's viewpoint about filtered images and their belief in filtered content depicting their genuine identity determines their overall positive or negative experience.

Researchers have established through their combined studies that AR tools increasingly mold both personal self-perception together with social interactions taking place on online spaces. AR filters serve two functions in social interactions because they help boost interaction quality while enabling users to modify how others see them and how they view their personal identity.

Table 4. Represents the Summary of Selected Studies

Citation	Aim or Title	Findings	Sub-themes
Liu (2021)	"The impact of influencer marketing on brand engagement: A conceptual framework"	Researchers suggested a systematic method to study influencer marketing effects on brand engagement because influencers powerfully improve consumer-brand interactions.	Influencer Marketing and Brand Engagement
Kamaruddin et al. (2023)	"Immersive Technologies: A Literature Review on Brand Engagement and Consumer Behaviour"	Users interact with immersive technologies such as AR which affects both consumer actions and brand participation according to the author who shows why these technologies matter for digital marketing.	Immersive Technologies and Consumer Behavior
Daoud et al. (2023)	"Exploring the Effectiveness of AR in Enhancing Brand Engagement: A Study of Digital Marketing Strategies"	The author studied AR implementation in digital marketing strategies which improves customer involvement and leads to enhanced brand interaction results.	AR in Digital Marketing
Sinha & Srivastava (2023)	"Augmented reality: New future of social media influencer marketing"	The paper examines how augmented reality (AR) changes social media influencer marketing through its production of interactive consumer engagements.	AR in Influencer Marketing

Theme 4. The Role of AR in Influencer Marketing & Brand Engagement

Professionals are embracing augmented reality (AR) to combine with social media marketing as well as brand engagement approaches due to its fast-growing adoption. This research analyzes various studies which demonstrate how AR transforms consumer actions and produces improved relationships between brands and customers via virtual simulation (**Table 4**).

According to Liu (2021) a conceptual model exists to explain how influencer marketing affects brand engagement. Building consumer-brand relationships works through influencers according to this research while examining ways AR can intensify these connections.

The researchers of Sinha and Srivastava (2023) explored the transformative effect of AR on social media influencer marketing. AR allows social media influencers to deliver interactive experiences to their followers through which brands show products in engaging ways according to Sinha and Srivastava (2023). The communication between influencers and consumers develops stronger brand relationships which authenticates promotional content for their specific audience. The researchers at Daoud et al. (2023) examined digital marketing strategies that implement AR technology to understand its effectiveness for boosting brand-interactions with consumers. Kamaruddin et al. (2023) examined scholarly research about how immersive technologies particularly AR influence brand engagement and consumer actions during their review work. The authors emphasized that AR holds major importance in digital marketing because it creates deep emotional bonds that enhance brand memorability. Research data shows that virtual technology platforms produce major changes in consumer outlook and improve digital branding standards.

The research shows how AR technology modifies influencer marketing combined with its ability to improve personal customer engagement in digital platforms. Through the implementation of augmented reality brands enable better emotional engagement with their audience which makes their digital marketing approaches more successful.

Discussion

The unification of AR with deep learning represents a major force behind developing new methods of digital media social communication. Ye and Li (2022) explain that AR enhances digital media art displays whereas the inclusion of deep learning models in AR would boost interactivity through user-specific content modifications based on behavior patterns and preferences. AR brings possibilities according to Taylor and Gibson (2017) since it helps overcome digital barriers through its ability to deliver interactive information to larger audiences.

Wu and Liu (2024) develop the narrative on how AR transformations in digital media spaces improve user engagement when employing deep learning-based tracking systems. Research by Wu and Liu (2024) provides essential knowledge about how paired advancements of AR alongside deep learning generate immersive expeiences in communication environments. AR improves social interactions through a virtual social environment which enhances communication by providing interactive and realistic interactions between individuals according to Miller et al. (2019).

Modern social media platforms and user interactions result from the combination of AI with communication technologies as well as AR. Alnaser (2024) explains that artificial intelligence enables customized media editing for social media platforms which produces higher user attention and enhanced tailored content. The research by Ramya and Ramamoorthy (2025) supports the findings that discuss how AI transforms communication using AR/VR tools. Users together with content creators find digital interaction tools more appealing because personalization of their digital experience boosts their engagement. The research by Chen et al. (2024) demonstrates how AI avatars serve to make communication accessible between people who are deaf and people with normal hearing abilities. The unique capability demonstrates how AR technology working with AI systems can establish more inclusive digital platforms. On the other hand, Rosenberg (2023) warns of the ethical implications of AI and metaverse technologies, particularly in terms of manipulation and targeted influence. Better regulation and transparency must be implemented in AI-driven communication systems due to present needs. Digital communication systems will probably evolve further through the combination of AR and AI to develop more interactive and all-inclusive user interaction interfaces. Maintaining proper ethical controls is essential when adopting these technologies to achieve their responsible use.

The literature presents evidence that demonstrates how AR filters produce simultaneous effects on social media interaction between users and their self-perceptions. The research by Lok (2024) and Sinlapanuntakul and Zachry (2024) shows that AR filters create essential pathways for reaching young audiences especially Generation Z through offer emotional bonds along with personal self-expression opportunities. AR filters deliver interactive power which creates greater involvement between users and digital content so users connect more deeply to

digital platforms thus increasing their participation in these networks. The psychological effects of these filters remain concerning according to the thoughts of Isakowitsch (2022) and Fribourg et al. (2021) about their ability to transform how users view themselves. AR beauty filters increase self-esteem when they enhance how users look but they create unattainable standards which may cause dissatisfaction with natural appearance. Young users experience the most severe consequences stemming from digital representation pressure since they remain especially sensitive to these digital pressures. The scientific data indicates that digital filters help people communicate better but create difficulties regarding their psychological health effects on personal image perception. The ongoing advancement of AR needs a balance between its benefits and risks concerning user mental state and digital truth maintenance.

The combination of AR with social media influencer marketing and digital branding implements new approaches which brands use to connect with their customer base. Influencers employ AR to generate interesting personalized content according to Liu (2021) while Sinha and Srivastava (2023) show that AR helps deepening influencer-followers connections. AR enhances brand engagement through its interactive capabilities which generate virtual try-ons and product simulations for consumers according to Daoud et al. (2023). Customers feel more trustful when they get firsthand experience, which leads to better confidence in their purchasing choices. Kamaruddin et al. (2023) demonstrated that immersive technologies especially AR strengthen brand recall together with emotional connections which leads to consumer loyalty. AR technology demonstrates ability to enhance consumer-brand exchanges so marketing initiatives become more successful. The expansion of AR technology will probably lead to closer integration with influencer marketing and digital branding thus allowing brands to create customized marketing experiences. The main difficulty arises from achieving realness along with responsible use of these technologies to build strong bonds with consumers.

CONCLUSION

This review explores how AR platform integration with DL processing strengthens complex scene object-tracking systems for communication and media applications. Recent technological advances from merging DL with AR technology have transformed digital communication by providing users with interactive and immersive features especially, during object tracking processes. Real-time communication gets an enhancement through AR technology which receives power from DL neural networks CNNs and RNNs to deliver accurate object detection solutions for dynamic environments.

The review examines numerous studies which demonstrate how AR changes our digital media interaction specifically within marketing and educational and social media applications. Through augmented reality systems users become more involved because these systems add virtual content into physical environments for more personable and interactive communication. Through deep analysis, the study demonstrates that systems based on augmented reality enhance digital communication tools through their solution of latency problems and their improvement of interaction quality across complicated settings.

The review demonstrates how AR technology affects mental responses and social connections between users along with their perception and active involvement. Research has established that users under thirty benefit from AR filters because these filters let them express themselves better and evoke stronger emotional responses. These technological advancements create two significant issues because they can cause harm to self-image and introduce risks of digital relationship manipulation. The research emphasizes the requirement for ethical thought in AR technology development to establish the equilibrium between utilization and responsible practice particularly, concerning mental health and privacy protection.

This review demonstrates how AR and DL will direct communication technologies into their future state. The combination of these technologies creates better media experiences and enhanced user interaction but needs controlled management to block psychological along with ethical issues.

Recommendations

Several important recommendations can be derived from the deep learning-based augmented reality (AR) complex scene object tracking analysis in communication. The upcoming research should concentrate on improving speed and precision of real-time processing through the implementation of minimal neural network frameworks to function in progressively complex dynamic settings. Algorithm developers must create privacy-conscious algorithms to resolve ethical issues that occur in communication systems. Geared development between hardware engineers and software experts provides the necessary framework to optimize AR systems delivery. Deep learning model effectiveness for training and validation can be greatly enhanced by increasing datasets with scenarios that present diverse and realistic situations.

Limitations

The study features multiple important constraints despite showing promising developments. Deep learning models consume large computational power that represents a challenge to achieve real-time AR operations on mobile devices. Unfavorable operation occurs when systems must work with limited access to big labeled datasets that undermines their capacity to adapt in dynamic or unfamiliar conditions. The tracking accuracy of objects diminishes when performing operations in situations characterized by poor lighting conditions or marked by clutter. The investigation mainly addresses technical details excluding substantial evaluation of user needs or ethical constraints. The limitations of cross-platform compatibility prevent the application of this technology in multiple communication systems at its current state.

Future Directions

Researchers need to investigate how deep learning models can be developed specifically for low-power AR devices to improve real-time functions. Self-supervised and transfer learning methods decrease the requirement for big annotated datasets in system implementation. Research into user-oriented design must become a priority by studying the human effects that result from using AR communication systems. Scalable responsive AR systems can find support through the implementation of edge computing together with 5G technologies. Interdisciplinarity linking human-computer interaction with ethics and AI governance standards will serve as mandatory elements for the responsible implementation of technology-based communication systems in real environments.

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