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Smart Tourism using Augmented Reality Technology

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Abstract: ***Augmented Reality (AR) has been traditionally used over the past years as a bridge between Real surroundings and Virtual Environment. Augmented Reality (AR) is an actual, direct or indirect view of a physical real-world situation that has been enhanced by the addition of virtual computer-generated content. AR is both interactive and 3D-registered, combining physical and virtual objects. In recent years, augmented reality has been used as a method to enhance communication between the physical world and virtual worlds. Education, urban planning, automotive design, and outdoor entertainment are only a few examples of application domains where interactive Augmented Reality Systems are being used. One sector which has a wide application in Tourism. The aim of this study is to know the advantages of using AR in the Tourism sector. The outcome of this study is to depict how AR enhances the on-site experience of tourists. It shows an innovative way of integrating AR in the tourism sector. Also, AR has a wide variety of implementations in other sectors as well.***
Keywords: Augmented Reality, Smart Tourism, Travelling, 3D model

I. INTRODUCTION

While the idea of Augmented Reality (AR) has been around since the 1960s, it has only been in the last 2 centuries that technical advancements have allowed for the formation of a distinct research area. AR is a visualisation technique that enlarges digitally created data, such as text, audio, images, GPS data, and other are across, on top of a complex real - world view captured by a computer, cell phone, and other device's camera.

AR technology has capabilities for superimposing visual content over users' views of the natural world have also been used in a variety of fields, including education, medicine, and entertainment. In other words, using a computer or a mobile device, AR will augment and change one's view, improving the user's understanding of reality and the surrounding world. Furthermore, in an AR enhanced sense, knowledge becomes interactive and easily manipulatable.

Several studies have shown how AR can help visitor organizations and practitioners reach more people by acting as the distribution technology for appealing digital content and mobile apps that are fine-tuned to different information levels. AR information technology, on the other hand, will assist tourists in obtaining useful information and improving their awareness about a tourist attraction or destination, all while maximizing the tourist experience and delivering enhanced levels of enjoyment in the process. In recent years, AR technology has become more reliable and has reduced the lag caused by image processing, vastly enhancing the user's immersion in the augmented environment.

It is crucial to include access to seamless interfaces that facilitate integrating with virtual and physical objects at the same time to facilitate the development of collaborative augmented reality. According to the co-located capabilities that it offers, such as GPS and Wi-Fi service, as well as the high prevalence of these phones in the world's population, the new development of cellular phones offers a great potential for the introduction of interactive Augmented Reality.

In several business environments, mobile augmented reality applications play an important role. They are mostly used in the automobile industry to offer new experiences to car buyers. Customers, for example, may use their own mobile device to navigate about and explore the interior of a vehicle. Mobile augmented reality devices are becoming increasingly useful for many current IT systems used in daily life. However, designing this application in a stable and consistent manner remains a challenge. Most notably, the variations between mobile systems must be properly addressed.

II. OBJECTIVE

The main objectives of this research topic are to find the different benefits and applications of Augmented Reality Technology in Tourism. This will help in enhancing the different cultural heritage sites and modern places having unique experience with augmented reality.

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III. WHAT IS AR (AUGMENTED REALITY)

Augmented reality is the so-called variant of a virtual environment (VE) or virtual reality (VR). Technologies in augmented reality plunge a user completely into a synthetic universe as well as the user can never see the physical world surrounding him when sub-merged. (Poetker, 2019). The use of augmented reality (AR) increases the user's understanding of and connection with the physical world. Augmented Reality (AR) is defined as a real-time view of a physical actual world that's been enhanced by the addition of digital computer-generated information. In comparison, Augmented Reality takes and overlays pictures, audio, video and touches or hap tic experiences from visual or computer-generated information in a real-times world. The distinctions between these AR forms are that each meets a different purpose (Poetker, 2019). Augmented reality (AR) technology is a type of digital experience in which information is applied to the user's field of view. AR applications can be enabled on a smartphone and coupled with tourism applications to provide functionality. In short, you are handy, and you are creative. The first kind of AR tells us what we see and could do. The second form demonstrates what is not real and allows one to see the imaginary. This is unlikely due to the AR GUI. We will examine several differences in these environments in this section and how they come into one of those two groups (Poetker, 2019).

IV. DIFFERENT TYPES OF AR

A. Marker-based AR

Marker based AR uses markers to cause an increased perception. The markers, often created with distinctive patterns such as QR codes or other special styles, function as tech anchors. If an augmented reality application detects a marker in the real world, the visual material is applied. Augmented reality based on markers is typically used for advertisement and retail uses. Dream of cards speaking and pamphlets going (Poetker, 2019).

B. Marker less AR

Failure to mark This helps users to choose where to position their virtual objects Marker less Augmented Reality is more flexible than marker-based AR. Without moving through your setting, you can try various styles and places completely digitally. The increased realism of Marker less relies on the hardware of the unit, including its sensor, accelerometer, Global positioning system and compass, to collect the information required for AR to do its job (Poetker, 2019).

C. Location Based AR

This AR connects interactive information to a real location and the experience it provides. Objects are mapped in a way that shows on the computer when the position of the user meets the default location. One of the AR gaming example is Pokémon Go which is focused on different places. The game that brought the increasing truth for the masses. The experience takes Poke- mon virtually to the world with your smartphone and invites users to find as many of the characters as possible (Poetker, 2019).

D. Superimposition AR

Overlapping AR defines an entity and strengthens it to have a distinct perspective in some manner in the real world. This may involve recreating the whole or part of the piece. One of the examples is IKEA furniture app. The chair having replicated, rotated, and put around the table elsewhere. The use of this technology helps the consumer to do too many things, for example to determine whether to have 4 seats and one limited elbow space or to sit six on the same table comfortably (Poetker, 2019).

E. Projection-based AR

AR based on projection varies considerably from other forms of substantially enhanced realities. In other words, to view the content, you do not need a mobile computer. Light rather projections computer graphics onto an object or surface to construct a user's immersive interface. Example Microsoft HoloLens is one of the great tools of this projection-based AR. Projection based AR is used for creating 3D objects with which the user can communicate. The prototype or mockup of a new product will be used to also disassemble each component to help demonstrate its inner function (Poetker, 2019).

F. Outlining AR

AR's definition identifies borders and lines in instances where the human eye cannot support. To highlight enhanced truth, object recognition is used to recognize the actual world of a user. Consider driving in low light or staring around us at a building's structure. During the self-driving car when object or the human detected they make 3D AR model of that element. Interactive dashboard helps the user to easily understand and work with them (Poetker, 2019).

V. COST OF AR

A. *Project Type*

Apps with less functionality and less effort like MVP are quickly created. However, it could be more costly to create such software with personalized features.

B. *Simple MVP App*

These applications allow you to introduce your proposal in a lively way to the target audience. Generally, the applications are lightweight, simple, and simple to use, enabling users to experience the vision as never before. AR Apps with simple movements such as rotation, stack 3D models, take snapshot, etc., are around 1-5 AR models aboard.

Designing & Framing - 20+ hours Coding - 40+ hours
Deploying 3D Model - 1 hour 20 minutes it vary as per model
Uploading on Store – Android store- 4 hours – few days, iOS app store - 7 hours – few days (How Much AR-VR App Development Cost | Estimating an Augmented Reality App Development Cost, 2020).

C. *Custom AR App*

Create your own knowledge of enhanced reality. The app offers various functionalities, such as selecting an object, displaying objects, taking a picture, and more. Further features will impact the increased cost of the app. Development time shall be allocated as follows.

Register In/Order - 13 hours Catalogue - 25-30 hours.
iOS app store - 3 hours, Android store - 3 hours sharing.
Cart - eight hours.
API for third party - 12+ by API
Production Back-end - Depends on functionality (How Much AR-VR App Development Cost | Estimating an Augmented Reality App Development Cost, 2020).

D. *Enterprise-Grade AR App*

Almost every sector, including banking, design, and healthcare, has entered AR. AR is a development that is becoming more prevalent in all companies and would benefit all. These applications are used to train workers, fast reference and cooperate. This software can also help you track inventory seamlessly and complement the company workflows as much as possible.

Sign In/Sign up - 8 hours Catalog - 24 hours.
AI-based recommendation - 100+ Sharing - 9 hours
Recognition system - 50+ hours Integration of 3D models - 5 hours each Time for Publishing - 24 hours (How Much AR-VR App Development Cost | Estimating an Augmented Reality App Development Cost, 2020).

E. *App By Features*

Type	Development time	Cost
Marker Based AR	75-210 hours	$1800 - $2900
Marker-less AR	400–500 hours	$9500-$11,000
Projection Based AR	250-600 hours	$6100-$8500
Marker-Based AR with Animation Based AR	115–255 hours	$2500-$3200
Outlining-Based AR	160–250 hours	$4000-$5000
Superimposition – Based AR	290-400 h0urs	$7100-$8000

(How Much AR-VR App Development Cost | Estimating an Augmented Reality App Development Cost, 2020)

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VI. TOURIST BUYING BEHAVIOR.

A stronger emphasis has been placed on tourist impulse buying, as identifying tourists' impulse buying patterns will provide useful data for the tourism sector in terms of creating retail opportunities. Tourist impulse purchasing behavior, like all impulse purchasing behavior, is motivated by a range of variables, including quick access to goods, ease of purchasing, and a lack of social strain. (Hai-Ninh Do, 2020).

VII. HYPOTHESIS DEVELOPMENT

A. The Role of Interactivity in Mobile AR apps

Interactivity has been extensively studied in previous e-commerce studies from the stand- point of the communication between customer and product/service.

In the case of augmented reality (AR), testing has shown that interconnectivity increases the consumer's expected ease of use of the AR try-on device for glasses substantially.

HT1 Expected Interactivity has a favorable effect on Perceived Usefulness and ease of Use of Smartphone AR (Hai-Ninh Do, 2020).

B. The relation Between the Perception of Mobile AR Applications and the Perception of Flow

Previous research has also shown that mobile platform perceived interactivity (PI) has a tangible impact on user reaction, largely through the integration of customer experience-related principles.

HT2a - Perceived Utility affects Perceived Pleasure of Using Smartphone AR.

HT2b - Performance Expectancy of Use affects Perceived Pleasure of Using Smartphone AR.

HT2c - Expected Interactivity influences Presumed Enjoyment of Using Mobile AR (Hai-Ninh Do, 2020).

VIII. POTENTIAL PROBLEMS

One of the key concerns with existing AR applications is that presenting existing content in an AR display without pre-defined search requirements results in an overloaded and cluttered display.

In terms of accessibility, the AR view in the examined applications allows the tourist to represent either several virtual layers of spatially pertinent data or a single virtual layer of spatially necessary information.

Just two systems support context-based information drive, allowing the user to set conditions for context-based alerts. Input is one function that can be used in AR view, allowing the user to rate and comment on his or her visible surroundings in real time. Furthermore, as AR encourages navigation, routing and tour generation will be acceptable in AR view (Tasneem Khan, 2019).

IX. EFFECT OF COVID -19 ON TOURISM SECTOR

In early January 2020, the recent coronavirus (COVID-19) sparked widespread alarm, and by the end of March 2020, the outbreak had infected numerous people worldwide. The COVID-19 pandemic is predicted to cost the travel and tourism sector 100.08 million jobs worldwide.

As the rate of contamination increased around the world, and as such initiatives and strategies such as social distancing, neighborhood shutdowns, work from home, stay at home, self-or mandatory quarantine, crowding laws, and so on are enforced, stress is being put on the tourism sector to pause (Sanjita Jaipuria, 2020).

Tourism is a major economic sector around the world. India contribution 7% to global trade and it is 3rd largest exporter of refined fuels and chemicals in 2019. It can account for more than 20% of a country's GDP in some cases.

The most downfall and widely affected industries by the covid-19 pandemic is Tourism industry, which influences the livelihoods, economies, opportunities, and social utilities across all continents. Every aspect of its large chain has been impacted. Tourism sector involve total exports could fall by $910 billion from $1.2 trillion in 2020 (UNWTO, 2020). This will have a greater affect; it will bring down overall global GDP from 2.8 to 1.5 percent.

Tourism supports one out of every ten jobs and provides a living for millions more in both developed and emerging economies (UNWTO, 2020). Tourism accounts for up to 80% of exports in some Small Island Developing States (SIDS), and it contributes significantly to national economies in both developed and developing countries (Sanjita Jaipuria, 2020).

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X. THE HUMAN FACTOR IN AR

To incorporate AR in a realistic manner, it is important that knowledge be interpreted and treated by users in such a way that meets the needs of each person.While AR technology provides uniform details and functionality, it must be designed in a way that is adaptable to each user's preferences. However, it is important to build information layers in such a way that information overload is avoided, which leads to low efficiency and distraction. AR, for example, is predicted to influence people's daily lives in the future. However, when planning and integrating AR, the human aspect and assistance should be the subject of continual technological development.

XI. AUGMENTED TOURISM BY INTERPRETING 5G

Although several businesses are working to miniaturize AR displays for wearable glasses, enabling users to display AR details as they pass around real-world environments and turn their heads, this approach enables many audiences to enjoy the augmented layers at the same time. Photos and video show that tour guides and nearby users can touch the display to get more information about specific tourist attractions, but most viewers will just look at the overlays actively.

The pilot's AR content is split into two categories: heavy, high-contrast white highlighted artifacts and splashes of color that utilize edge animations to stand out against the natural world. Similar AR window screens in upcoming cars are expected to have higher quality and be more broadly spread (Horwitz, 2020).

XII. BENEFITS OF AUGMENTED REALITY

Current applications of augmented reality in tourism make it easier to Tourists may use GPS to locate their positions and receive information about their immediate surroundings. sources from the internet Other AR Assessment tools have been produced. Reviewed in exhibitions to serve as a virtual travel guide to improve how visitors see, interpret, and interact engage with the exhibits. Until now, companies have described augmented reality (AR) as a possible method of low-cost marketing that engages customers with the brand with a rich consumer interface and enhances perceived value. Companies have sparked a new movement to market to different segments of the market through digital marketing strategies, especially the generation of interactive marketing.

XIII. APPLICATION OF AR

There are many innovative ways to implement the AR techniques. Different AR techniques are used in many applications of AR. Some of the applications are given below.

A. Advertising and Commercial

Now a days, most of the new product are promoted using AR technology. Most of the techniques used are marker based where user must put marker in front of their camera either using software or company advertising website (Carmigniani, 2011).

B. Entertainment

AR has been used effectively for pure entertainment in film, TV and many other network advertising efforts in PR and marketing activities. This usually enable the identification of written digital or real-life objects, where a particular mark is identified using such a Web camera or a smartphone (Morozova, 2018).

C. Medical Applications

Many medical devices deal with robotic and image-based operations. Various medical devices such as video-based system taken on an endoscopic camera system shown on a display monitor that looks at the surgical area inside the patient which created significant breakthroughs. As a result, substantial different research has been carried out to include AR with medical imaging system and resources to integrate the innate abilities of the physician (Carmigniani, 2011).

D. Education

In Applied Sciences department of Inland Norway University, Rena, Norway they started AR courses for educational purpose. We used the Microsoft HoloLens platform for communication and radio hunting. Inside a rescue mission, the students build their own situation. You must then play workers as a party resolves the situation. When each party has played the scene of the other group, they have input both on the scene, on learning goals and on how players are implemented (P. A. LØvsletten, 2019).

IX. DIFFERENT APPLICATION OF AR IN TOURISM INDUSTRY

A. Interactive Hotel Elements

To date, more immersive features have been introduced in hotels and the entire experience improved. The commonest use of AR in the tourism business. Essentially, this can offer more detail on demand to hotels, resorts, and other such companies (Saxena, 2020).

For example, Premier Inn's Hub Hotel, a British resort, has made the room maps it puts in hotel rooms compliant with augmented reality. The wall maps provide additional information on certain local sites of interest when seen by a smartphone or tablet. As a kind of visitor information tool (Saxena, 2020).

B. Augmented Tourist Sites and Destinations

Apart from hotel settings, several travel companies create applications to increase reality that allow visitors to improve physical locations and tourist attractions. This will help a user point a building or a landmark on their mobile and learn more in real time.

For e.g., a user will direct his/her telephone to a restaurant and immediately provide analysis or menus or target his/her tablet at the historic landmark. This enables visitors to massively improve the whole journey experience and take notes on the way (Saxena, 2020).

C. Beacon Technology and Push Notifications

The beacon technology, which operates by Bluetooth, is another fascinating application of the enhanced reality. This specific technology is useful in the travel and tourism field, as it enables corporations and advertisers to push alerts or activate certain functions when people come to a particular venue (Saxena, 2020).

Starwood Hotels use beacon technologies to allow clients to unlock their hotel room while in near proximity to the entrance, one of the better examples of this is inside hotels. However, it can also be used to deliver the most important maps, ratings, menus, promotional deals or coupon coupons to customers (Saxena, 2020).

D. Gaming with Augmented Reality

Increased truth finally has a clear correlation with the gaming universe, and travel is beginning to benefit from it. Using an augmented-actual application, a hospitality services-based company or may enhance the client experience by adding an aspect of fun into the physical world.

Gaming games with Virtual Reality are used to add aspects of treasure searching in a restaurant, while Best Western used AR to encourage children in their own homes to see Disney characters. Examples for adults include AR applications that allow users to restructure rooms and apps that put simulated celebrities in the hotel (Liu, 2011).

X. RESULT

This research discovered five important dimensions: marketing, technological, tourism, epistemic, and institutional. The similarities and disparities between various points of view are explored. These results have major implications for policy development, AR execution, and the design of tourist experiences.

In addition to its theoretical ramifications, this work has many practical implications. Firstly, the study's results showed that the functionality of Digital AR apps has a beneficial impact on the user's perceived utility and usability, as well as satisfaction and comfort (Bogomolov, 2019).

These results show that software companies should give greater attention to app design in order to maximize the app's interactive elements and thereby enhance the user experience. Secondly, the significance of HT1 and HT2 demonstrates that users are more willing to follow the purchase advice of Mobile AR applications if they like and are pleased with the offering (Bogomolov, 2019).

AR Tourism marketing must learn to better understand travelers and respond quickly and strategically to their needs, preferences, and preferences with the aid of effective technology. The current study tackles this need by broadening the traditional TAM model to include a Subjective Personalization construct, which is extremely significant in today's rapidly changing IT environment (Bogomolov, 2019).

XI. CONCLUSION AND FUTURE WORK

Augmented reality (AR) is increasingly being used in the tourism industry as an advertisement, content, and experience platform. However, little is understood about the actual importance of augmented reality for the tourism industry, with most studies already in its early stages. The concept of augmented reality is to modify what we see around us. It is supposed to boost our interaction and maximize our pleasure when flying around the globe. As a result, virtual reality is an excellent platform for tourist and tourism sector. It brings new value and gives new options for both visitors and the tourism sector (Bogomolov, 2019).

AR will assist our clients in their quest for whatever they are looking for: a pub, a hotel, a popular bridge, or a historic site. When

users point their smartphone at a particular image, sticker or logo, the application shows all available details. This will give a different feel to the tourist and new way to guide them, it can be ten times more entertaining and fascinating.

AR helps us to enhance consumer service, make them satisfied and gain their attention to a particular spot. It can help us portray and destination in an attractive and eye-catching way.

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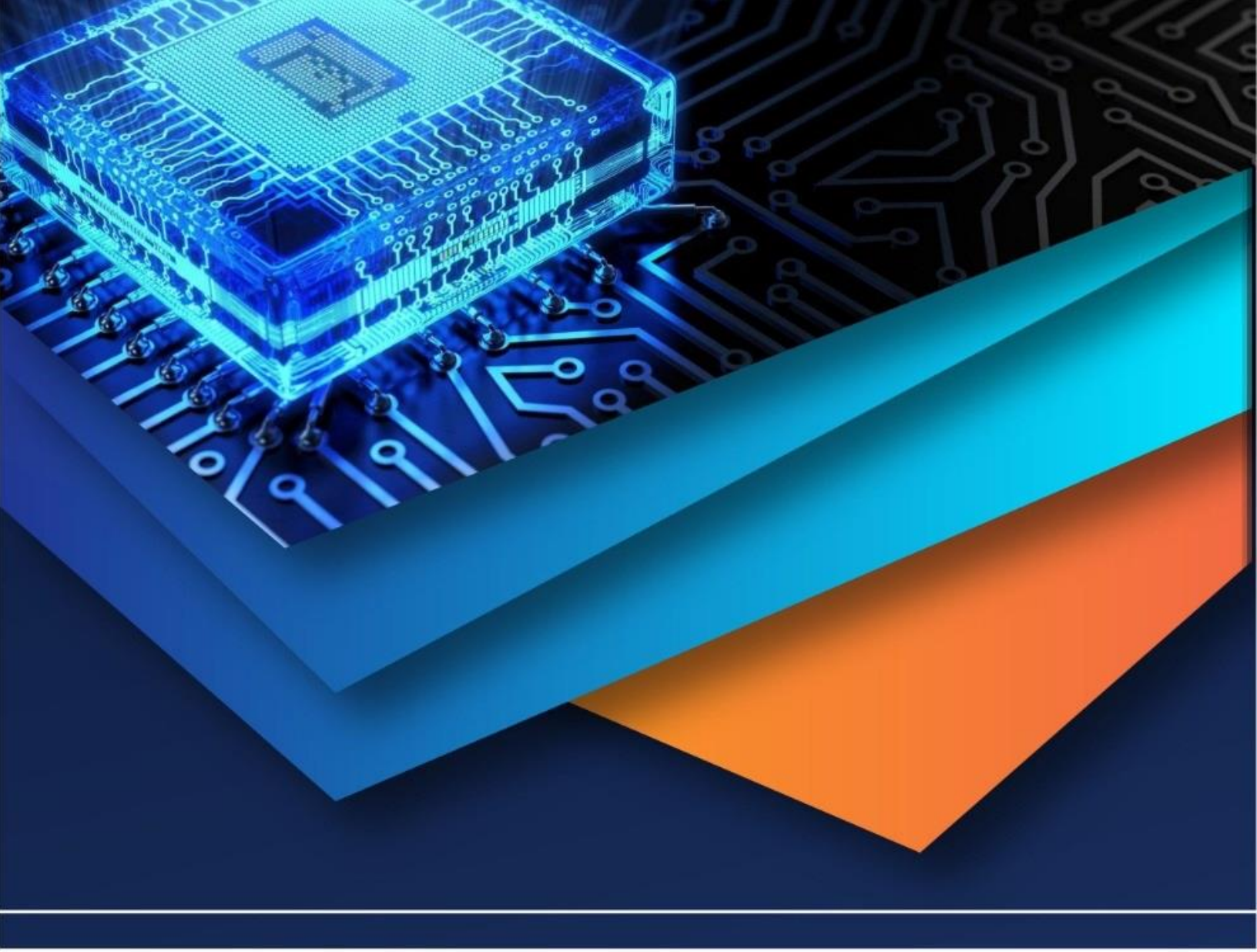

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