

# Case Studies of Augmented Reality (AR)

Augmented reality overlays digital information onto the real world.

This technology has diverse applications, transforming how we interact with our surroundings.



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- AR in Industrial Maintenance
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- Ar in Education
- AR in Military Defense
- Ar in Sports

# AR in Industrial Maintenance

Presented By :-

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2021UCD2107



# Boeing: Soaring with AR in Aircraft Wiring

## The Challenge

Aircraft wiring is a complex process, demanding utmost precision. Technicians previously relied heavily on extensive manuals, leading to potential errors and delays.

## The AR Solution

Boeing equipped technicians with AR smart glasses, providing real-time 3D wiring diagrams directly overlaid onto the aircraft structure.

## Impact

This innovation resulted in a 25% reduction in installation time and a significant decrease in error rates, highlighting the power of AR in streamlining complex tasks.



# Boeing: Enhanced Training Through AR



1

## Step 1: Visual Guidance

AR glasses provide trainees with step-by-step instructions, visually guiding them through each wiring task. This real-time support accelerates the learning curve for complex procedures.

2

## Step 2: Reduced Errors

The system's ability to clearly highlight correct placements minimizes errors, leading to higher accuracy and a deeper understanding of the wiring process.

3

## Step 3: Increased Confidence

With AR assistance, new technicians gain confidence in their abilities, as the technology provides constant support and reduces the risk of costly mistakes.

# General Electric: Powering Turbine Maintenance with AR



1

## Real-Time Data

GE utilizes AR headsets to display crucial data such as temperature, pressure levels, and visual instructions directly in the technician's field of view, facilitating informed decisions.

2

## Hands-Free Operation

Interactive 3D models, maintenance checklists, and instructional videos are overlaid onto the equipment, allowing for hands-free operation and improved efficiency in challenging environments.

3

## Remote Expertise

AR enables remote assistance, connecting field technicians with experts who can provide real-time guidance, ensuring swift troubleshooting and reducing downtime.

# GE: AR's Impact on Turbine Maintenance



## Increased Efficiency

By providing immediate access to critical information, AR streamlines maintenance tasks, resulting in a significant reduction in completion time.

## Reduced Errors

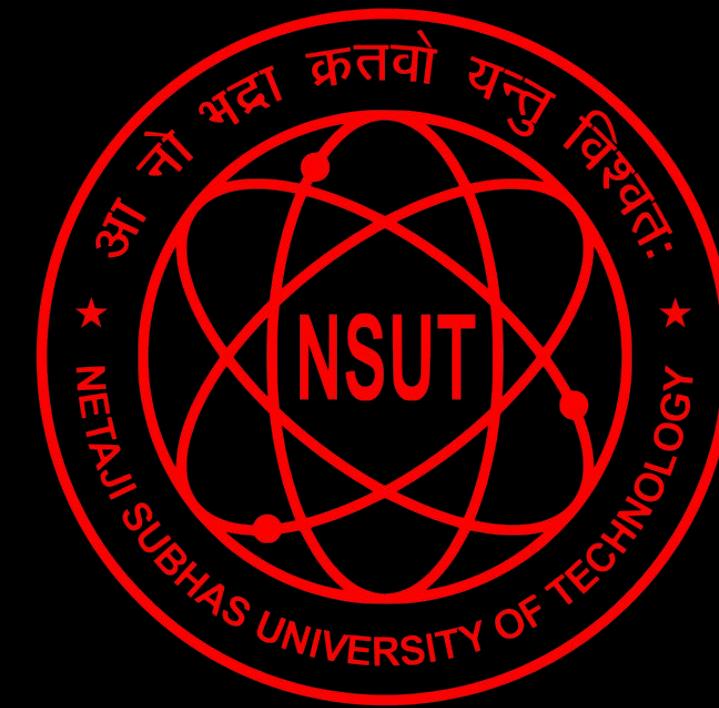
Visual guidance and interactive elements minimize errors during maintenance procedures, ensuring repairs are conducted accurately the first time.

# AR in Healthcare

Ayush Verma

2021UCD2134

CSDS





# AR in Healthcare

1

## Surgical Planning

Surgeons use AR to visualize procedures beforehand. This reduces risks during surgery.

2

## Medical Training

AR simulations provide realistic training scenarios. This allows for practice without risk to patients.

3

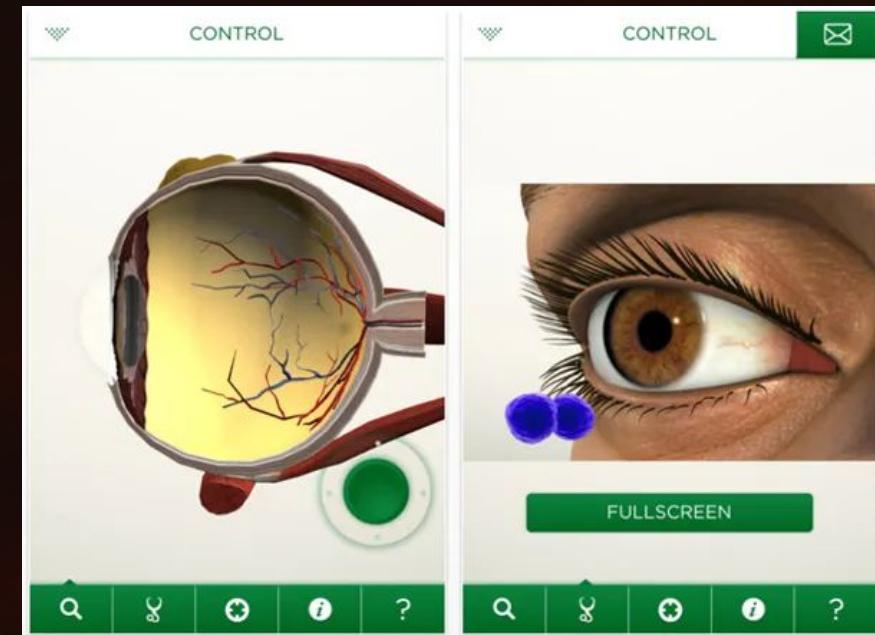
## Real-Time Guidance

AR offers real-time information during procedures. This improves accuracy and efficiency.

# EyeDecide AR

EyeDecide AR is an augmented reality (AR) app designed for eye health and patient education. It helps users understand the effects of different eye conditions by simulating how the world would appear with them.

1. Simulates Visual Impairments in Real-Time: EyeDecide AR uses the device's camera to overlay visual simulations of various eye conditions, such as cataracts, macular degeneration, and glaucoma. It allows users to see their surroundings through the perspective of someone with these impairments, helping them visualize the potential impact on daily activities, such as reading or driving.
2. Interactive Patient Education Tool: The app is designed to assist eye care professionals by visually explaining complex conditions to patients. Patients can compare a "normal vision" view with an "affected vision" view side-by-side, fostering better understanding of their condition and the importance of treatment.
3. Integration of Medical Information: Along with simulations, the app provides detailed medical descriptions of each eye condition, including symptoms, risk factors, and potential treatments.
4. Augmented Reality for Personalized Consultation: The AR functionality makes consultations more engaging, allowing doctors to demonstrate the effect of eye conditions based on the patient's specific environment. The interactive nature of AR enhances communication between doctors and patients, leading to more effective consultations.



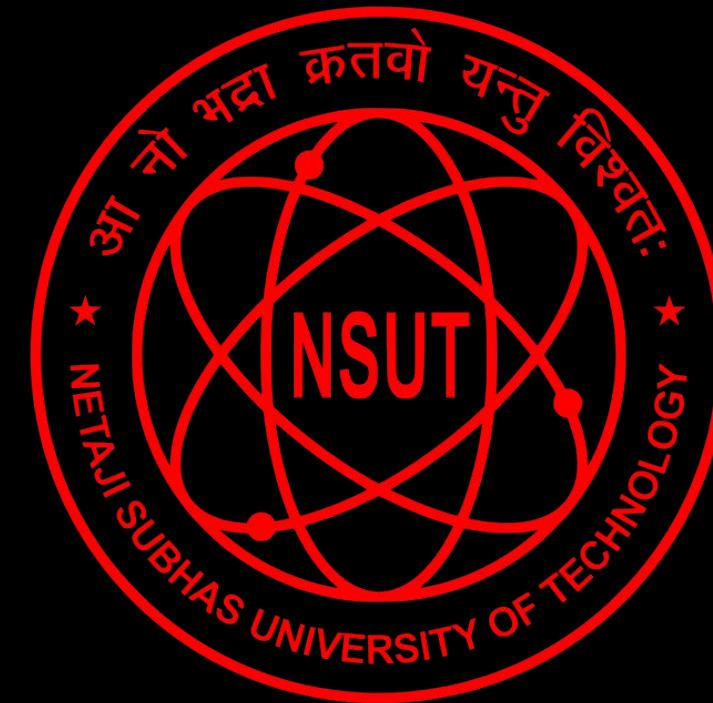
# FlexAR

FlexAR offers medical students a tangible, AR-powered anatomy learning experience using a prototype tool. The app gives users both written and 3D visual information about anatomy without the need for traditional study materials and cadaver dissections. Ohio-based Case Western Reserve University uses Microsoft HoloLens devices to study human anatomy, where an entire class can view the same life-sized 3D image at once.



# **AR in Architecture and Real Estate**

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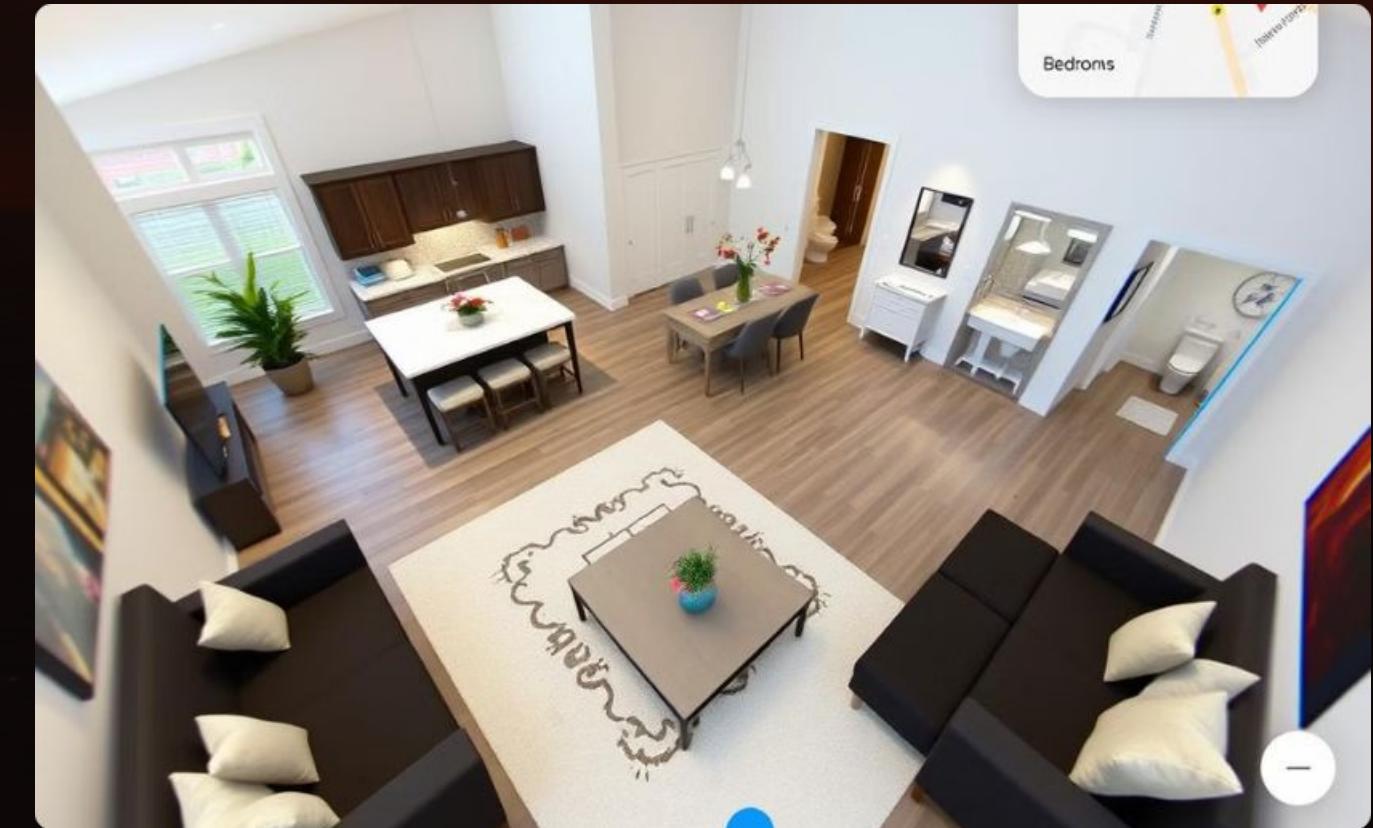


# AR in Architecture and Real Estate



## Visualization

AR allows clients to visualize building designs before construction. This helps in decision-making.



## Property Tours

AR enables virtual property tours from anywhere in the world. This saves time and resources.

# AR in Architecture and Real Estate

Virtual Property Tours: Virtual property tours are one of the biggest examples of uses of Augmented Reality in Real Estate. AR allows users/potential customers to be able to:-

- Inspect the virtual model of a property
- Add Modifications based on things like colour, size, room scheme, interior etc
- AR might also help a client to better value a property according to their needs
- Virtual Property Tours can allow remote buying/selling of Real Estate across large distance



2>Neighbourhood Exploration: Augmented Reality overlays can help a user better locate and assess nearby Schools, Hospitals, Markets and other necessity of life. This will help the user to be able to make better purchase systems and to be able to prepare before moving into a far

# AR in Architecture and Real Estate

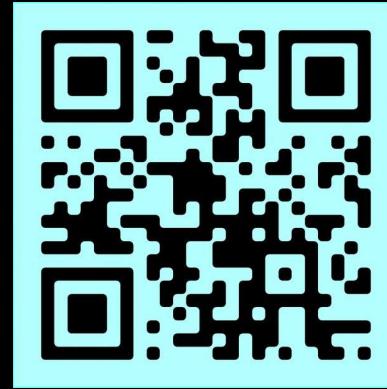
Construction and Development: For properties which are currently under construction, the developers can give clients tours of properties even if the building is not finished yet or rather has not even begun to be constructed.

AR can help people visualise their projects before they are implemented. This can lead to developers better be able to judge the dimensions involving a construction and how its aesthetic properties fair off against a given background. All in all AR technology can be extremely beneficial when it comes to its use in Construction and Development.



Improved Marketing and Sales Tools: Augmented Reality can also really be used to improve existing marketing and sales tools by allowing a user to get for example tactile feedback for the texture of tiles before they are bought, thus leading to a more satisfactory sale/

# Timeline Of AR in Real Estate



P R O J E C T

## QR Based Triggers

The application of AR in Real estate was set off with QR based triggers used for advertising and business purposes

## GPS and Image Recognition

Basic AR apps were developed for mapping of land areas using GPS and of verification using image recognition

## Interactive Property Tours

This set the advent of AR based property tours setting up the stage for higher AR applications

## Mixed Reality in Real Estate

This year marked the use of Mixed Reality in Real Estate. e.g. The Zillow app

## Digital Twins

This involved creating digital recreations of Estates. Example of such would be Project Dastaan

# Timeline Of AR in Real Estate

QR Based Triggers: The earliest use of AR in real estates would be the indirect use of QR based triggers on sales cards and advertisements. This is the earliest use of Augmented Reality based technology in Real Estate and Architecture



GPS and Image Recognition: After the use QR based triggers came the GPS and image recognition, GPS was used to remotely map the boundaries of houses and properties and to better enforce property laws, Image recognition coupled with the GPS led to easy construction of reliable and accurate maps for both construction and for the sale of properties

Interactive Property Tours: This involved the use of AR technology to design interactive property tours based on the concepts of mixed reality, these were the precursor which was later developed into more sophisticated AR technology for Real Estate and Architecture



# Timeline Of AR in Real Estate

Digital Twins: This technology involved the virtual reconstruction of real estate and properties to make exact virtual replicas of real world objects, these virtual replicas could then be further used to fulfill purposes like demonstration, testing, potential changes and to assess and gauge improvements. It involved a way to improve real estate and test without damaging or even touching the original structure.



Complete Mixed Reality: This refers to the final stage of mixed reality when it comes to use in Real Estate, it refers to a stage of mixed reality where it is fully immersed into the experience of real estate, where it is widely used and understood by both the salesman and the client. It signals to the future of potential applications of Augmented Reality and Mixed Reality in the field of Real Estate and Architecture.

# Zillow's 3D House

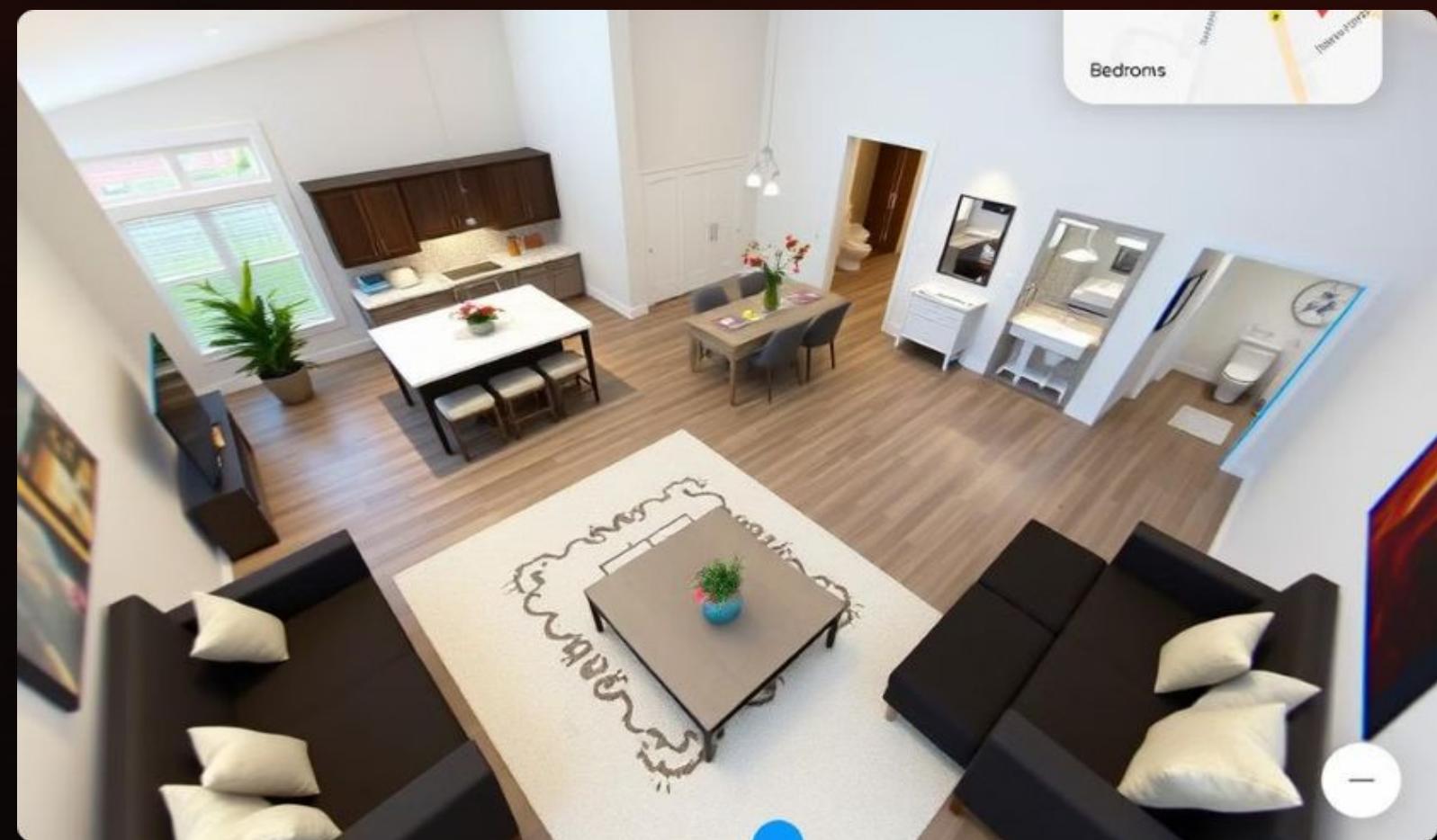


**3D home Tours**

**Uses ARKit , ARCore**

**3D Modelling of Houses**

An AR based platforms that allows Real Estate Agents to generate 3D house renders using just their smartphones. It also allows customization of houses.



# **zillow 3D**

# **Architecture**



## **User Layer**

input devices  
and capture tools  
e.g. Zillow 3D App



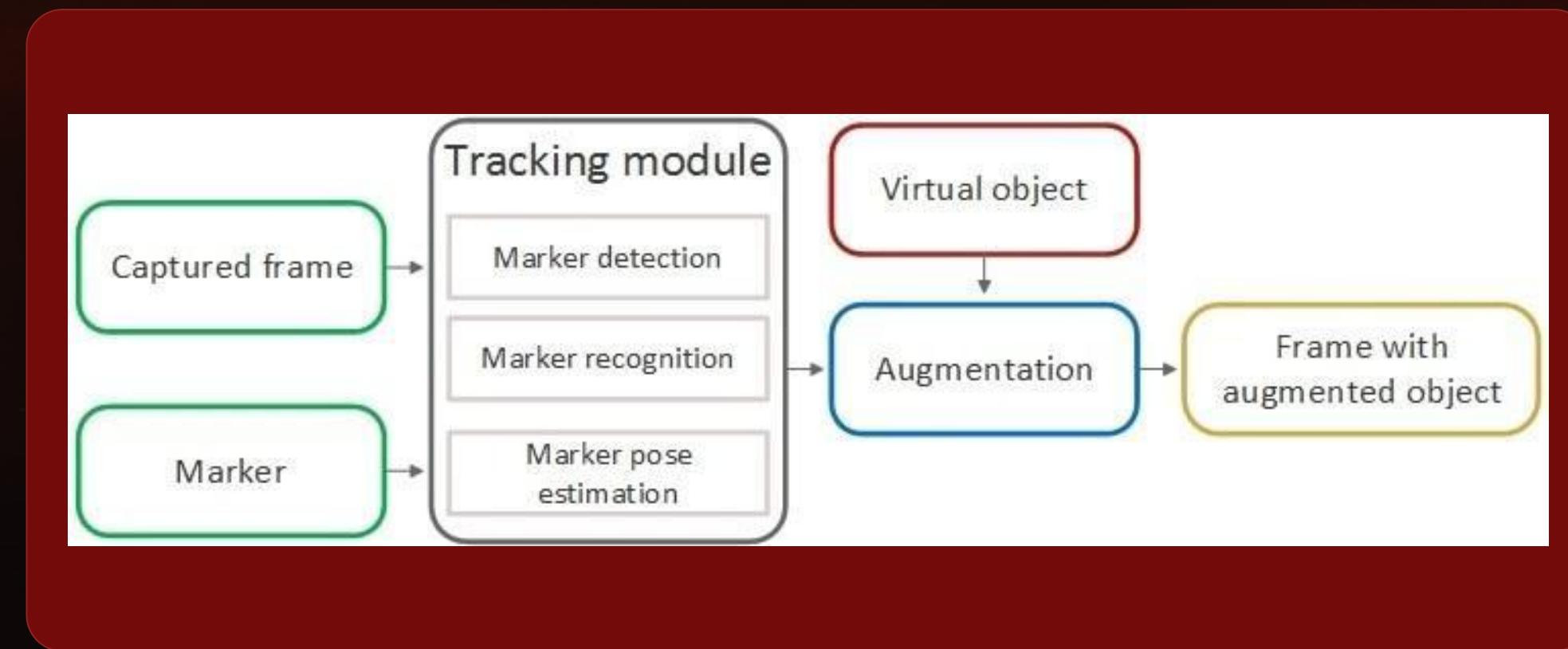
## **Front End Layer**

Panoramic image  
capture, Depth  
sensing and AR  
rendering, Screen.



## **Augmented Reality Layer**

Scene generation,  
Real time sensor  
integration and AR  
interaction



# **ARKit and ARCore: The Foundation**

## **ARKit**

Apple's augmented reality platform for iOS devices. Enables precise tracking and realistic rendering.

## **ARCore**

Google's AR development platform for Android. Offers motion tracking, environmental understanding, and light estimation.

## **Benefits**

These technologies provide a stable foundation for creating accurate 3D models of properties.

# Project Dastaan



The above picture shows Brajesh Chandra Sen, A hindu made to relive his home at Dhaka by Project Dastaan's AR project. He had fled to Calcutta post partition from his home in Dhaka



VR in Real Estate

VR for Humanity

Looking Beyond Borders

Non Profit

# Project Dastaan

Project Dastaan is a non profit which helps victims of the India and Pakistan partition by helping them relive their memories of their past homes with virtual reconstructions. Project Dastaan is an example of the very high persuasive power that Augmented Reality has over us. Never has a technology before been able to generate such personal and emotional feelings in people.

Project Dastaan is a case study where the primary purpose of use of technology was not profit but happiness. Augmented Reality's ability to generate lifelikes visualisation is beautifully demonstrated in this case study



# **AR in Automotive**

**Presented by:**  
**Nitin Bisht**  
**2021UCD2113**



# AR in Automotive Navigation

In AR-based navigation systems, real-time route information is projected directly onto the windshield or a HUD, allowing the driver to follow directions without glancing away from the road. This creates a seamless driving experience, improving focus and reducing the risk of accidents caused by distractions.

- **How it works:** The navigation system uses AR to overlay turn-by-turn directions on the windshield. For example, arrows appear on the road ahead, showing exactly where to turn, while markers highlight upcoming exits or points of interest.
- **Benefits:** By superimposing route guidance onto the real-world view, it minimizes confusion, especially in unfamiliar areas, and enables hands-free, distraction-free navigation. Drivers can focus entirely on the road while receiving real-time instructions.
- **Example:** Companies like Audi and Mercedes-Benz are integrating AR navigation, where directions are superimposed onto a live feed of the road, making navigation clearer and reducing the likelihood of missed turns.

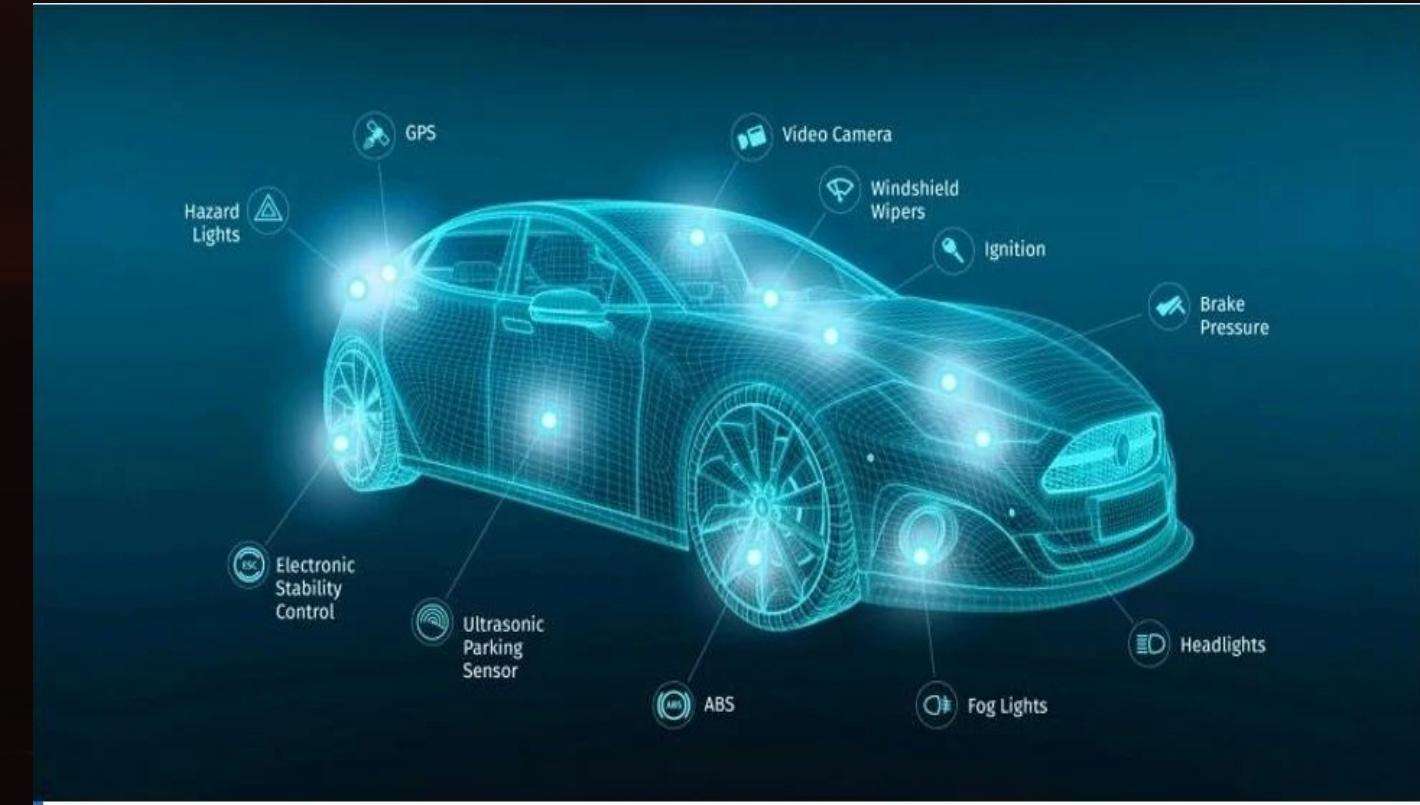




## Heads-Up Displays

HUDs in cars are designed to project critical information such as speed, fuel levels, and upcoming hazards onto the windshield. This ensures that drivers always have **key data** in their line of sight without looking down at the dashboard.

- **How it works:** The system uses a projector or AR glasses to cast information onto a transparent surface. Unlike traditional displays, which require drivers to look down or away from the road, HUDs show essential information directly in front of the driver's eyes.
- **Benefits:** It enhances **safety and convenience** by allowing drivers to monitor vehicle status (e.g., speed, engine alerts) while keeping their focus on the road. It also helps reduce driver fatigue by minimizing eye movement between the road and dashboard.
- **Example:** BMW's **HUD** projects speed, navigation, and warning indicators onto the windshield. The display adjusts brightness based on lighting conditions and even shows real-time traffic signs or hazard alerts.



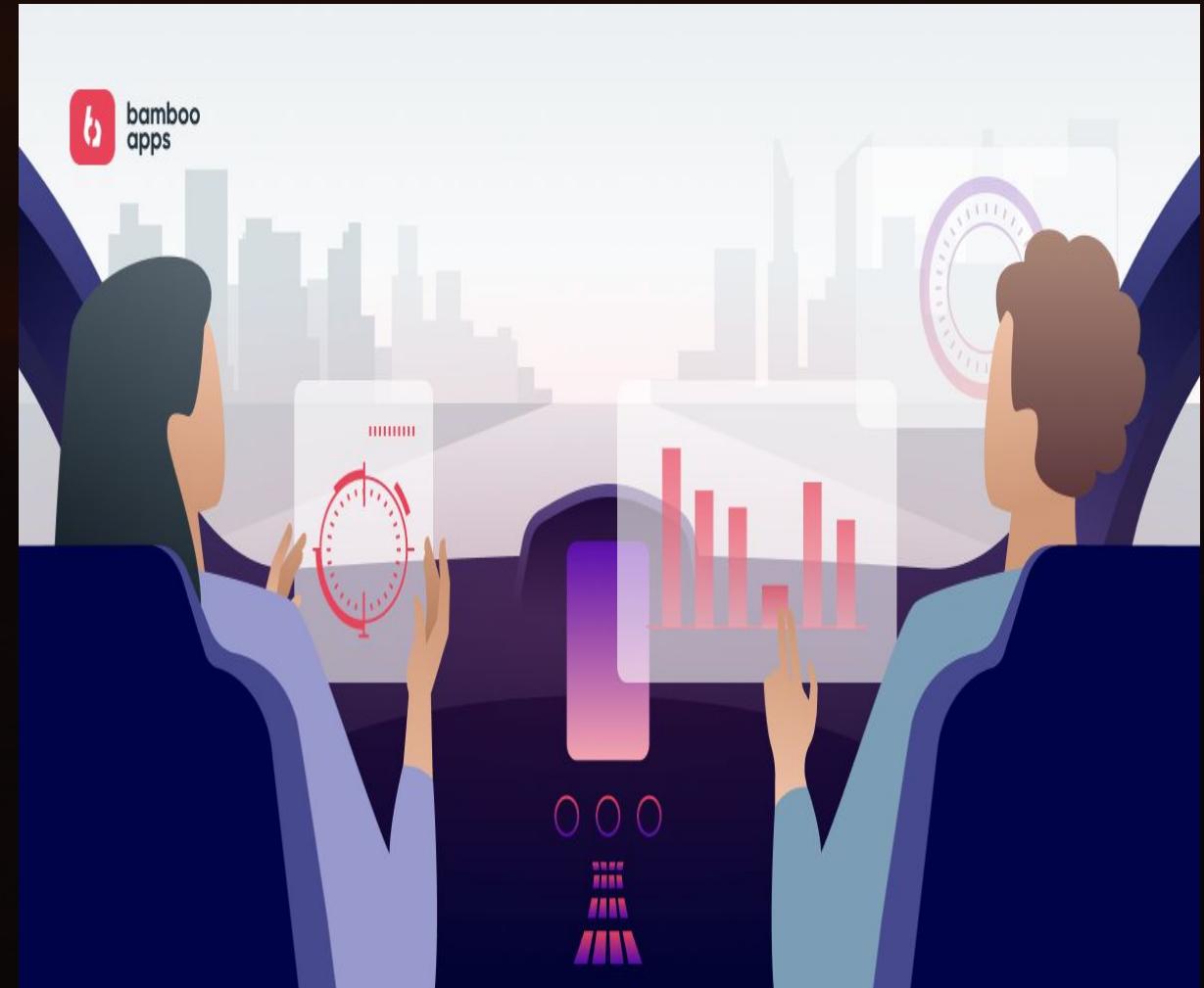
Lux outlines the drivers behind AR's potential in auto





## User Experience

- **Real-Time Data on HUDs:** Key information like speed, fuel, and navigation is projected onto the windshield, reducing distractions.
- **AR Navigation:** Directions are overlaid on the road itself, making turns and routes easier to follow without glancing at maps.
- **Enhanced Situational Awareness:** AR highlights nearby hazards, such as pedestrians or other vehicles, improving driver safety.
- **Adaptive Content:** AR adjusts to weather conditions and driver preferences, enhancing visibility and safety.
- **Passenger Engagement:** In autonomous vehicles, AR overlays provide info on landmarks and attractions, enriching the travel experience.
- **Increased Convenience:** AR allows drivers to access crucial data without looking away from the road, supporting safer decisions.
- **Personalized Driving:** AR tailors guidance based on each driver's needs and environment, making the drive more intuitive and enjoyable.





# Case Study: BMW's AR-Powered HUD

BMW uses AR-based heads-up displays in its vehicles to improve safety and convenience. The display projects important information, such as navigation directions, speed, and collision warnings, directly onto the windshield in front of the driver. This reduces distractions and helps drivers focus on the road. For example, if the driver is approaching a sharp curve, the system highlights the road path in real-time, making the driving experience smoother and safer. This application of AR enhances both the safety and ease of navigating complex driving environments.

# AR in Advertising and Marketing

## 1 Interactive Ads

AR creates immersive and interactive advertising experiences.

This captures audience attention.

## 2 Brand Engagement

AR campaigns increase brand visibility and engagement. This

leads to higher conversion rates.

## 3 Examples

Pepsi Max and Burger King's AR campaigns demonstrate the potential of AR. These campaigns created buzz and excitement.



# AR in Retail

## IKEA Place

Users can virtually place furniture in their homes. This helps them visualize the final look.

## Sephora Virtual Artist

Customers can try on makeup virtually using their phone's camera. This assists in product selection.

## Impact

AR enhances the customer experience. It leads to higher conversion rates.

# Ikea's Digital Furniture Visualization

1

## Furniture Visualization

Ikea's AR app allows customers to virtually place furniture in their homes to visualize how it would look and fit.

2

## Enhanced Decision-Making

The AR experience helps customers make more informed purchasing decisions, reducing the risk of buyer's remorse.

3

## Increased Conversions

By bridging the gap between online browsing and in-store purchasing, Ikea's AR app has driven higher conversion rates.





# AR in Space Sciences and Cosmology



## Scientific Exploration

AR can aid in the study and analysis of celestial bodies, allowing scientists to overlay data and annotations onto their observations.



## Navigation and Guidance

AR-powered navigation systems can provide astronauts with real-time information about their position, orientation, and the surrounding environment.



## Maintenance and Repair

AR can guide astronauts through complex maintenance and repair procedures, reducing the risk of errors and improving efficiency.



## Collaboration and Communication

AR can facilitate remote collaboration between astronauts and ground control, enabling the sharing of data and the coordination of operations.

# Case Study 1: SpaceX's manned missions

1

## Familiarization

AR allows astronauts to familiarize themselves with spacecraft systems, equipment, and procedures before even leaving Earth.

2

## Skill Development

Astronauts can practice critical skills, such as docking, spacewalking, and emergency procedures, in a safe and controlled AR environment.

3

## Mission Rehearsal

AR simulations enable astronauts to rehearse entire missions, anticipating and practicing for potential challenges and scenarios.



# Case Study 2: NASA's Space Exhibition



## Galactic Wonders

AR allows users to explore the scale and structure of the Milky Way galaxy in an immersive, three-dimensional environment.

## Stellar Phenomena

AR visualizations can bring the dynamic and violent events of the cosmos, such as supernovae and black hole formation, to life.

## Space Exploration

AR can enhance the understanding of space missions and the structures of space stations and spacecraft, making them more accessible to the public.



# AR in Gaming

## Why AR in Gaming?

AR games blend physical environments with digital graphics, sound, and haptic feedback.

## Popular AR Games

Pokémon GO, AR Pool, Minecraft Earth.



# Case Study -1

## Pokémon GO



### Launch & Popularity

Released in 2016, quickly gained over 1 billion downloads.



### Gameplay Features

Players explore real-world locations to capture PokéMon, battle, and interact with others.



### Impact

- Increased physical activity and outdoor exploration.
- Economic boost through tourism to specific locations (PokéStops).
- Social interactions and events built around the game.

# The Problem



# Case Study -2

## AR Pool

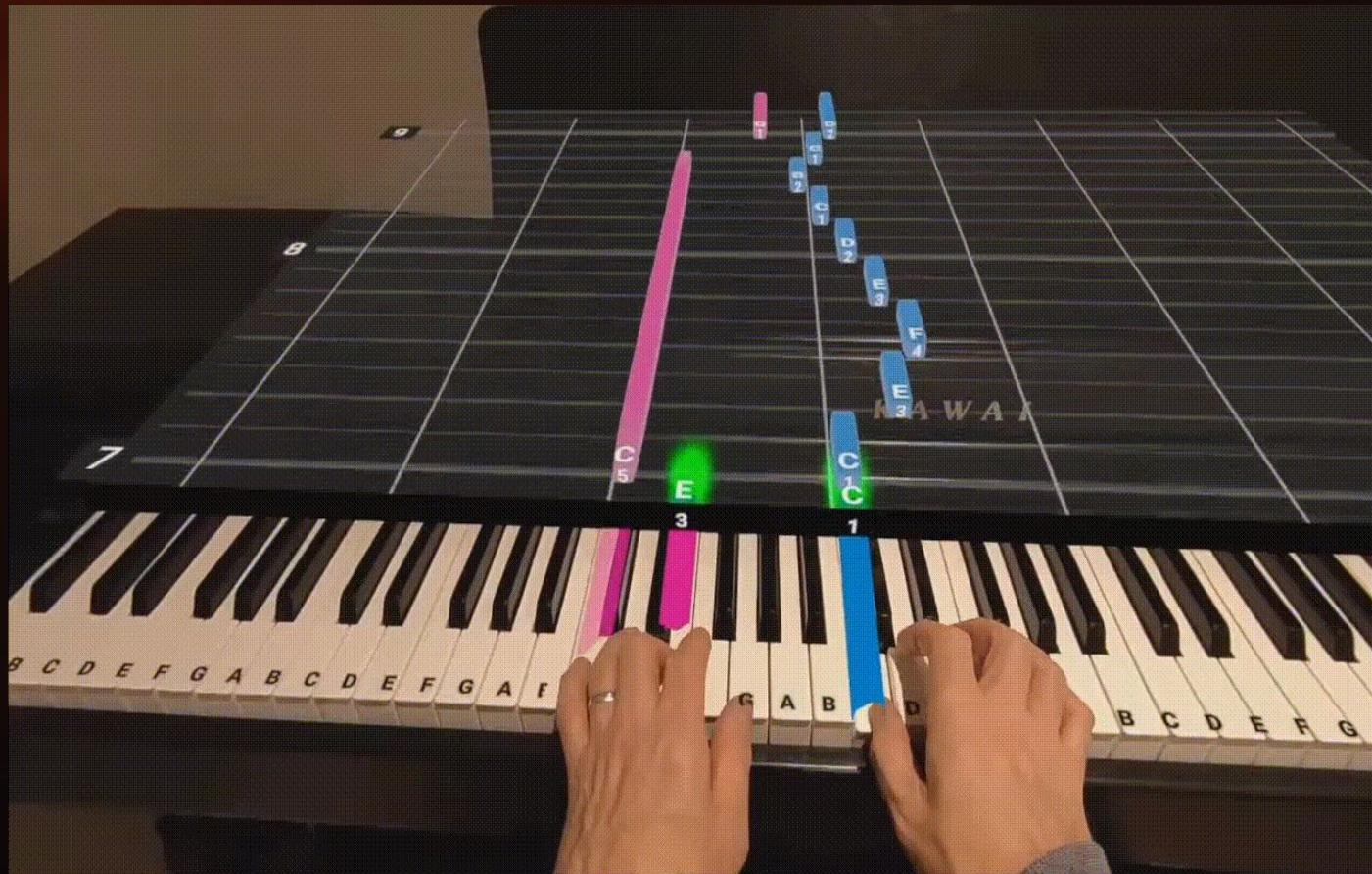


Players project a virtual pool table into their physical space, making it feel like a real game.

Revolutionizes traditional gameplay by enhancing realism and social interaction.

# Case Study -3

## AR Piano



**Gameplay:** Projects virtual piano keys onto any surface, allowing users to play music in real-time.

**Features:** Interactive tutorials, customizable sounds, and hand-tracking for accurate note recognition.

**Benefits:** Makes learning piano accessible and fun, blending education with entertainment.

**Social Impact:** Encourages creativity, and users can share performances, fostering a community around music.

# AR in Tourism



Presented by:  
**Lakshya Sanghi(Dogshit)**  
**2021UCD2137**  
**CSDS-1**

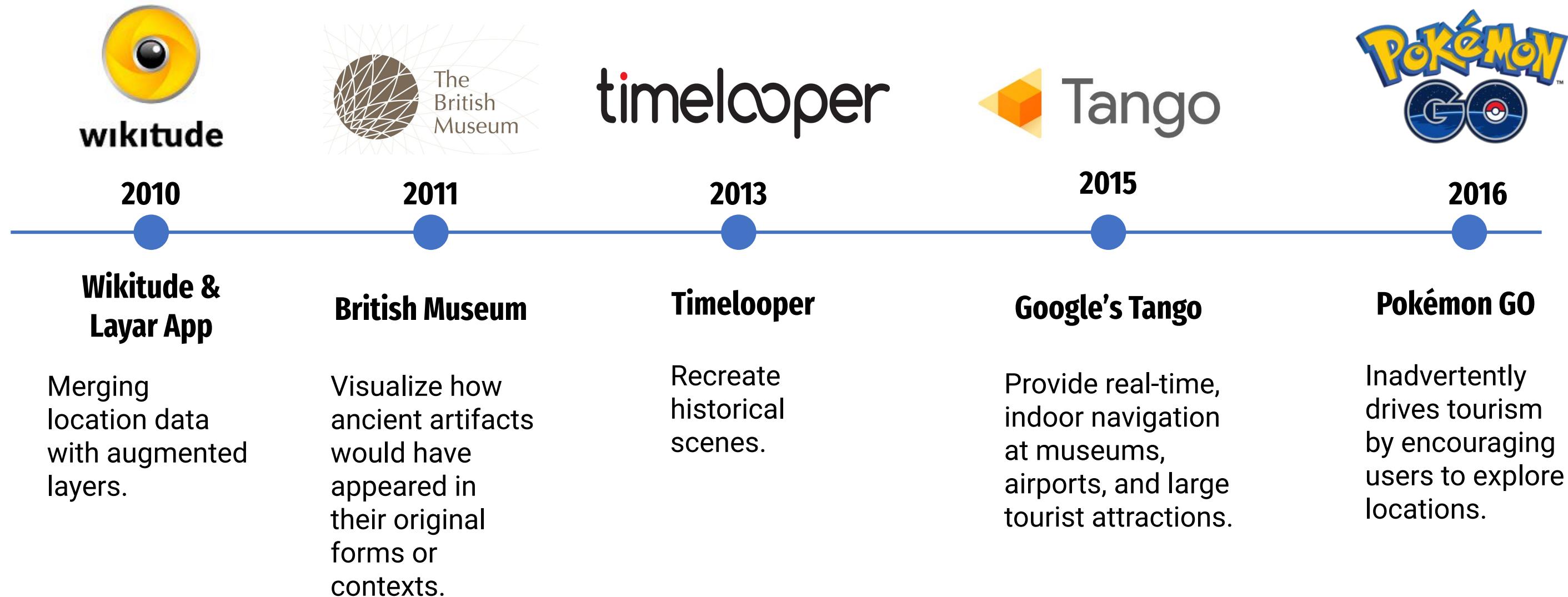


# INTRODUCTION

- In the tourism industry, AR has revolutionized the way people experience new destinations.
- By blending real-world exploration with interactive digital enhancements, AR offers a unique way to enhance tourist engagement, deepen historical understanding, and improve convenience.



# Timeline: Evolution of AR Tourism



# timelooper™

VR•AR•XR



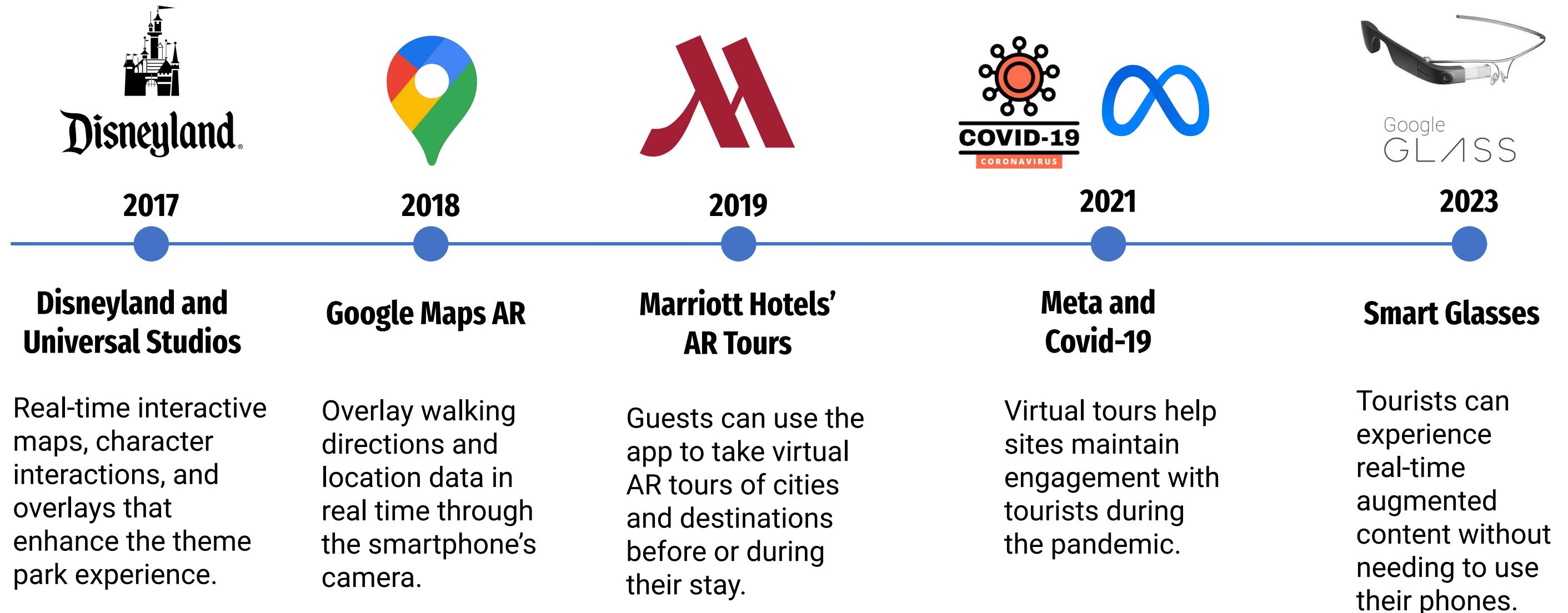
BRING HISTORY TO LIFE

STORYTELLING AND IMMERSIVE  
EXPERIENCE DESIGN FOR HISTORIC  
SITES AND CULTURAL INSTITUTIONS.

[partnerwithus@timelooper.com](mailto:partnerwithus@timelooper.com)



# Timeline: Evolution of AR Tourism



# Google Maps AR



## ARCHITECTURE

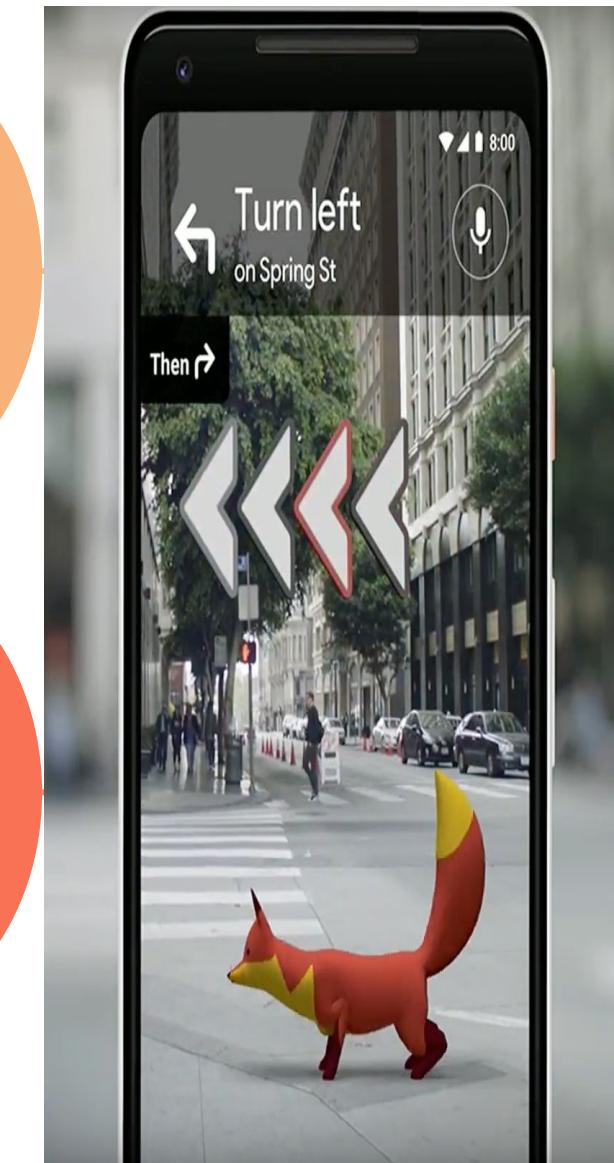
GPS, computer vision, and AR to overlay real-time directions and landmarks onto the user's surroundings.

1

## IMPACT

Enhances the tourist experience by providing interactive, immersive navigation.

2



3

## CHALLENGES

Requires continuous internet and high-quality camera access.

4

## BENEFITS

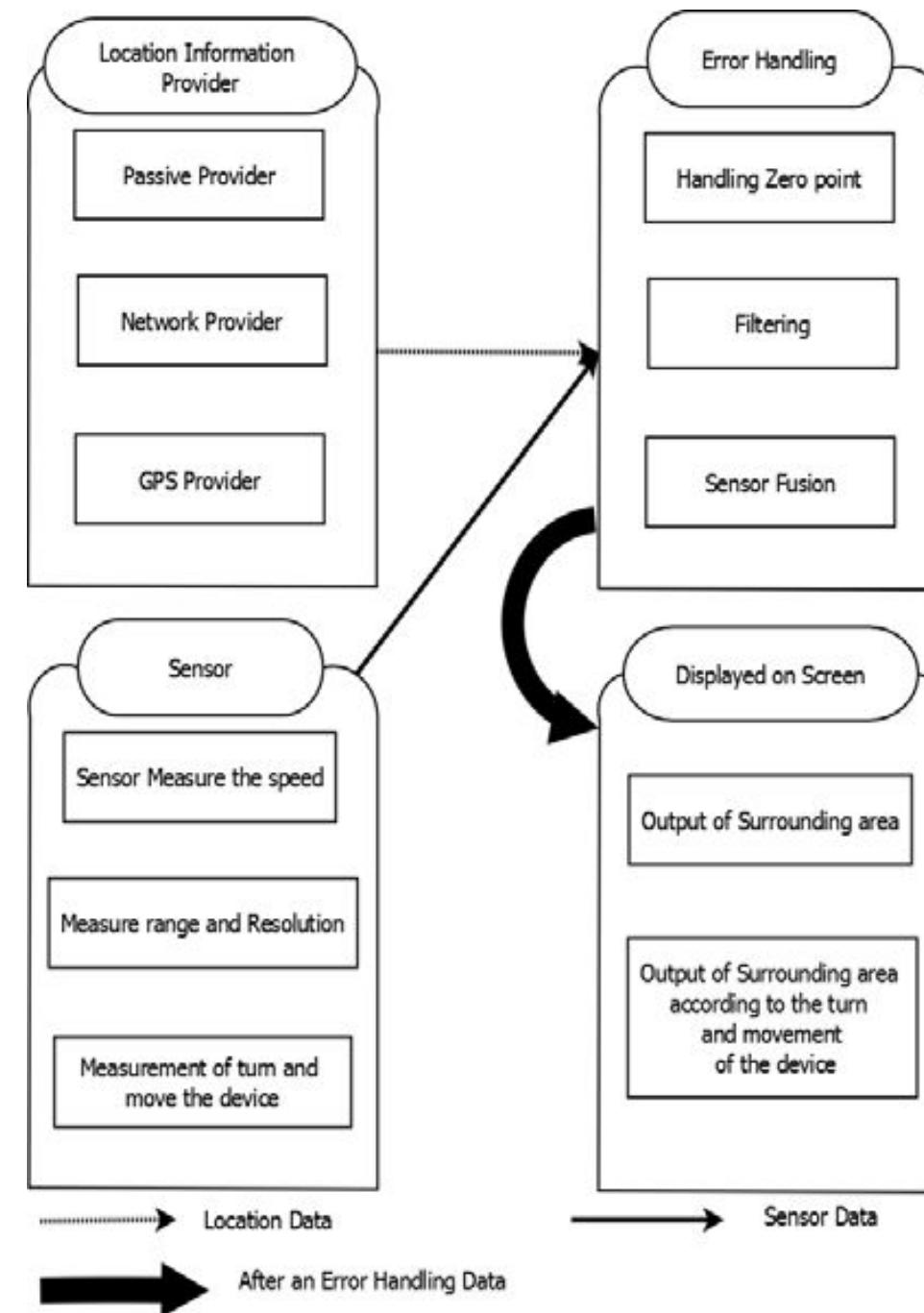
Helps tourists feel more confident and independent in exploring unfamiliar places.

## 1. Location Information Provider - Provides location data from various sources:

- I. Passive Provider: Receives location data without actively searching.
- II. Network Provider: Uses network signals (e.g., Wi-Fi, cellular) for location.
- III. GPS Provider: Provides precise GPS-based location data.

## 2. Sensor Module - Measures various parameters for navigation:

- I. Speed Measurement: Calculates the speed of the device.
- II. Range and Resolution Measurement: Determines the device's range and resolution.
- III. Turn and Movement Measurement: Tracks the device's orientation and movement.



### Data Flow:

- Location Data flows from the Location Information Provider to Error Handling.
- Sensor Data flows from the Sensor module to Error Handling.
- Error-handled Data is then sent to the Displayed on Screen module to provide accurate, real-time feedback for navigation.

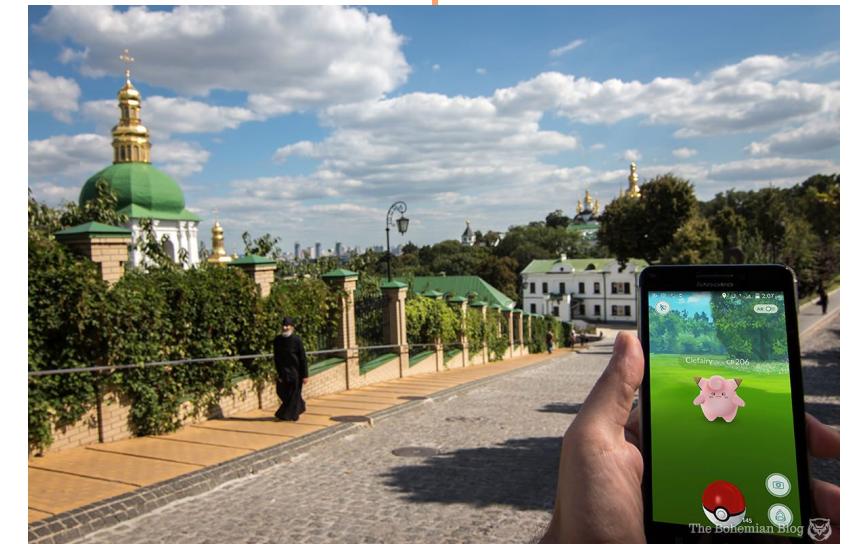
## 3. Error Handling - Processes and refines data to improve accuracy:

- I. Zero Point Handling: Calibrates to ensure accurate zero position.
- II. Filtering: Removes noise or irrelevant data.
- III. Sensor Fusion: Integrates data from multiple sensors for better accuracy.

## 4. Display Module - Outputs processed information for the user:

- I. Surrounding Area Output: Shows a general view of the surroundings.
- II. Dynamic Output Based on Movement: Adjusts output based on device orientation and movement.

# Benefits of AR in Tourism

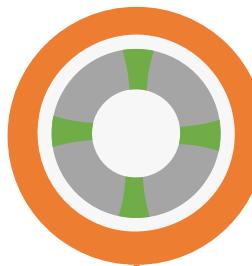


**1. Enhanced engagement and learning**

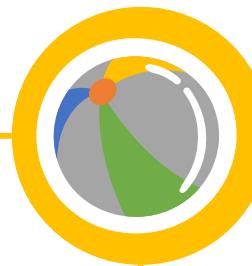
**2. Improved navigation and accessibility**

**3. Increased revenue and sustainability in tourism**

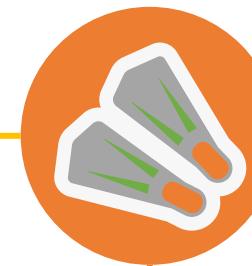
# Challenges of AR in Tourism



**High development and maintenance costs.**



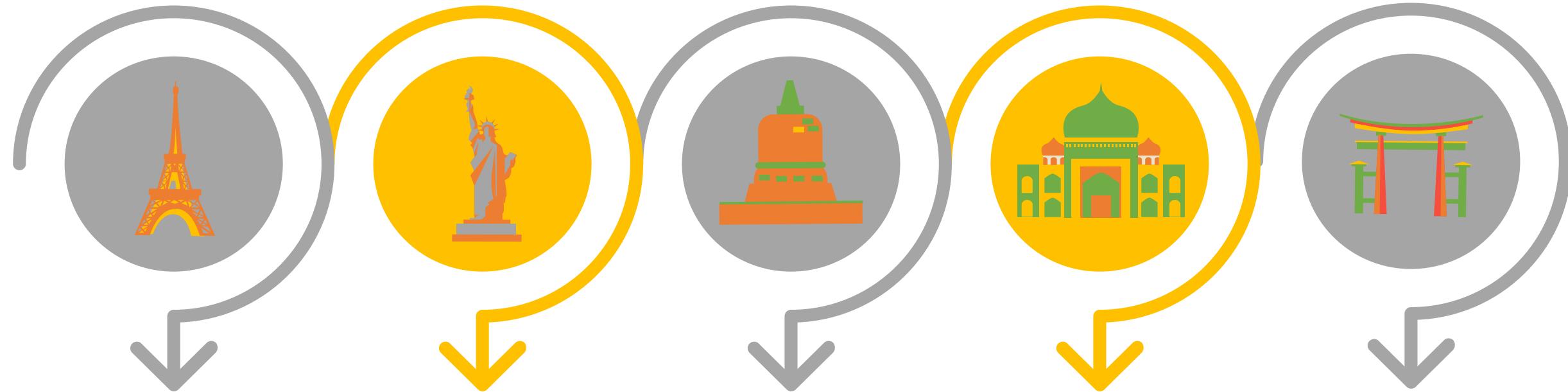
**Device dependency limits access.**



**Over-reliance on AR may detract from authentic experiences.**



# Future of AR in Tourism



## AI and Deep learning

Integrating with AI and VR to further enhance tourist experiences.

## Chip size reduction

Allows for compact, lightweight designs that consume less power.

## Improved computation

GPUs enable the rendering of high-quality, realistic graphics in real-time, which is crucial for AR applications.

## Better quality sensors

Improvements in camera quality, motion sensors, and gyroscopic sensors have significantly enhanced the capabilities of AR applications.

## More demand !!

COVID has boosted virtual event engagement through platforms like Meta.



# Augmented Reality in Education

Augmented reality (AR) is transforming education, offering interactive and engaging learning experiences. AR overlays digital content onto the real world, creating immersive environments that enhance student understanding and motivation.

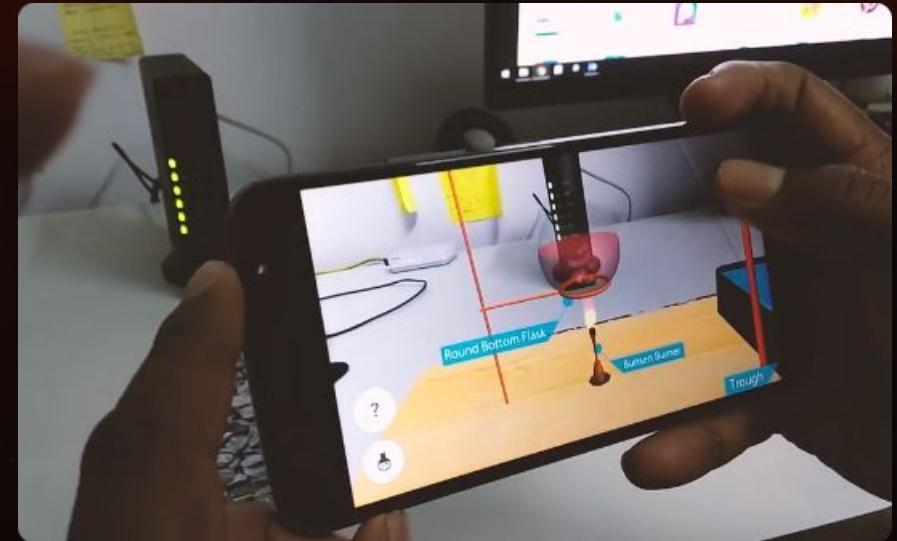
By : Rahul Kr. [ 2021UCD2151 ]

# Enhancing Engagement and Retention with AR Visualizations



## Interactive Anatomy

AR models allow students to explore the human body in 3D.



## Dynamic Simulations

AR brings chemical reactions and processes to life.



## Immersive History

AR recreates historical events for deeper understanding.

# AR-Powered Collaborative Learning: Bringing Classrooms to Life



## Shared Experiences

Students collaborate on AR-enhanced projects, building shared understanding and fostering teamwork.

## Remote Interactions

AR connects students across locations in real-time, creating interactive learning experiences regardless of physical distance.

## Engaging Lesson Plans

Teachers integrate AR to create engaging lesson plans, boosting learning outcomes and making education more interactive.

# **AR in Military Defense**



Augmented Reality (AR) is transforming military operations, providing soldiers with enhanced situational awareness, real-time data visualization, and immersive training simulations. This innovative technology is reshaping the future of defense strategies and battlefield tactics.

**By Rahul Sahu  
2021UCD2106**

# Case Study 1: Israel's Enhancing Situational Awareness System

## Overview:

- **System:** Israel Defense Forces (IDF) implemented AR-based systems to enhance battlefield situational awareness.
- **Technology:** Integrated AR in helmets for real-time data display.



# Case Study 1: Israel's Enhancing Situational Awareness System



**Real-Time Intel:**  
AR overlays critical battlefield information, such as enemy positions, terrain features, and friendly unit locations, allowing soldiers to make faster, more informed decisions.

**Enhanced Visibility:**  
AR-enabled headsets and displays provide soldiers with enhanced vision, enabling them to see through smoke, darkness, and other visual obstructions.

**Heads Up Displays(HUD):**  
AR goggles or visors can display critical information (ammo count, compass, mission objectives) without the need for soldiers to look down at devices.

## Impacts:

- **Increased Safety:** Minimizes the need for soldiers to divert attention to external devices.
- **Strategic Edge:** Enhanced visibility of threats and terrain leads to tactical advantages in combat scenarios.



## Case Study 2: Indian Army's 3D Terrain Mapping and Visualization

### Precise Mapping

AR-powered 3D terrain models provide soldiers with an accurate, real-time understanding of the battlefield environment.

### Enhanced Navigation

AR navigation aids help soldiers navigate complex terrain, avoid hazards, and reach their objectives efficiently.

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1

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2

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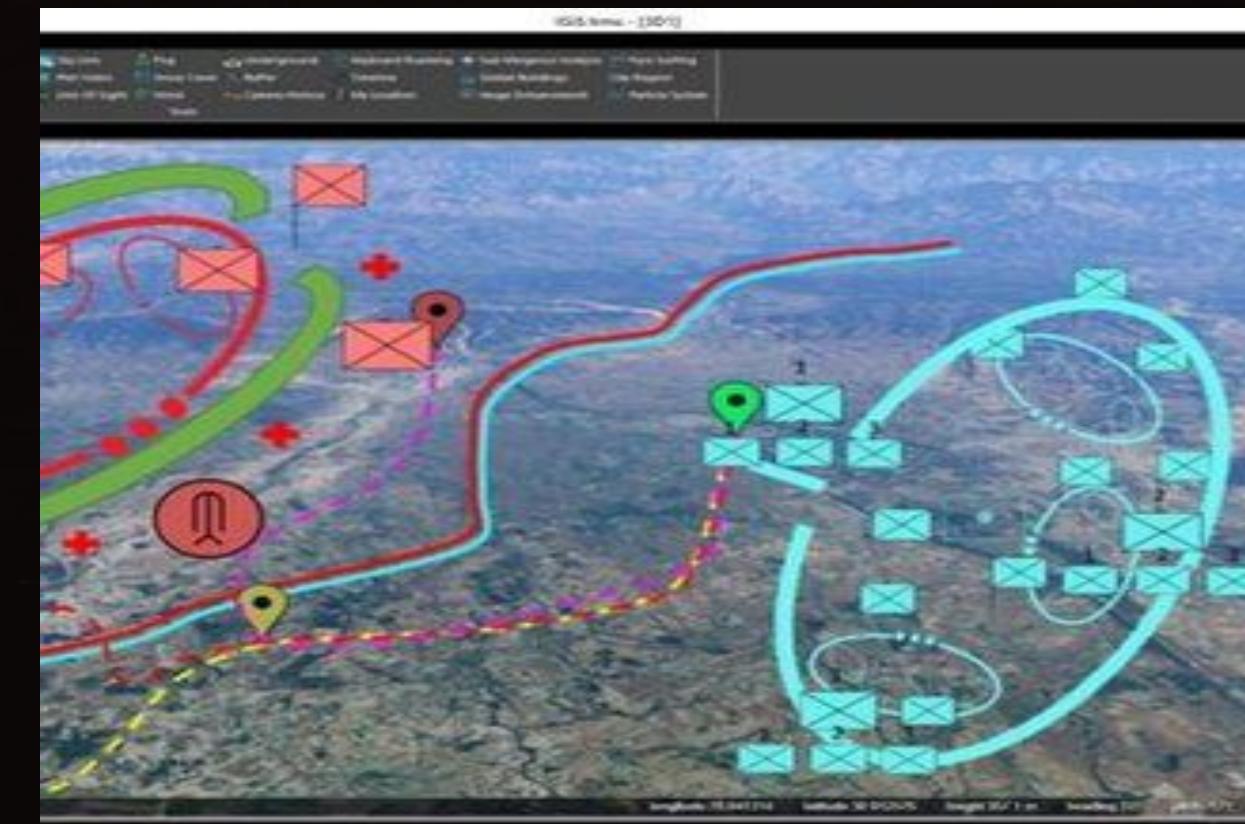
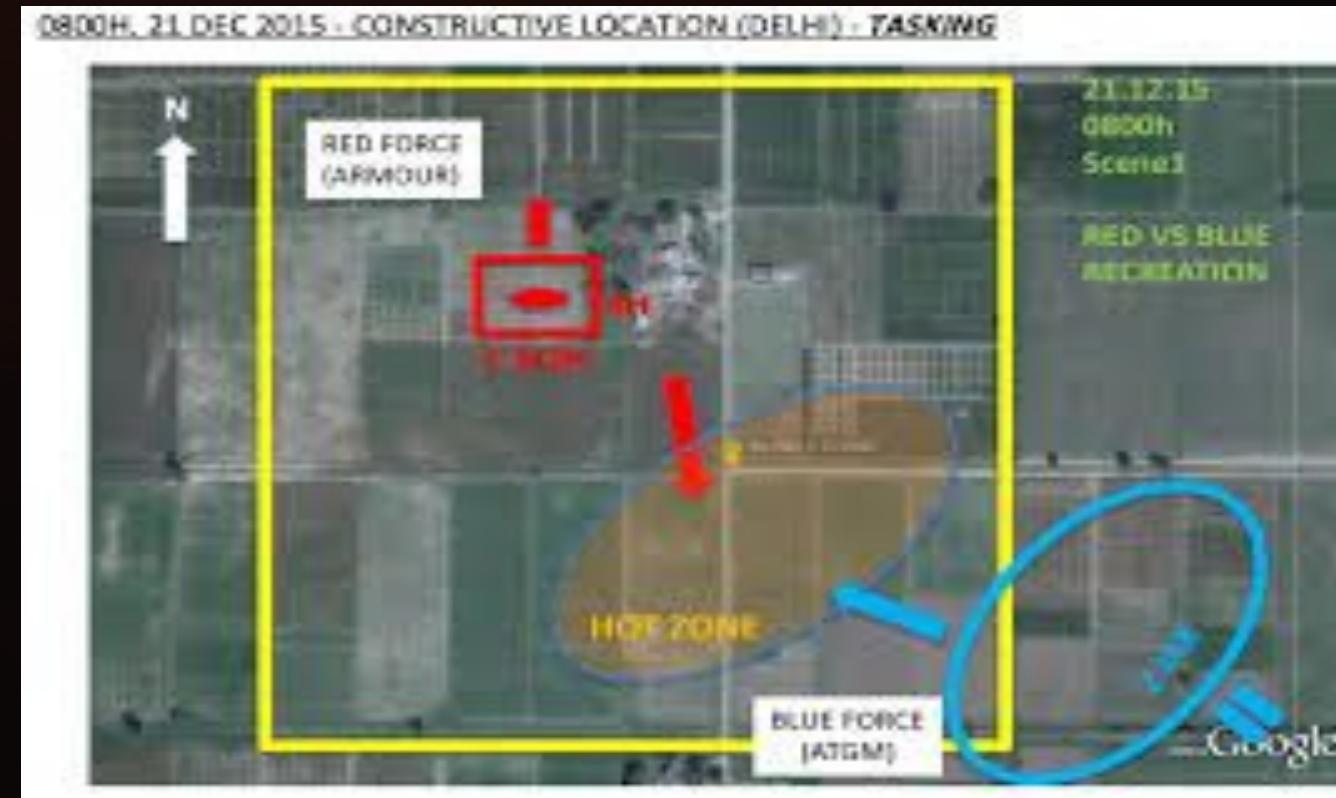
3

### Predictive Analysis

Terrain data can be analyzed to anticipate obstacles, identify potential ambush sites, and plan the most effective routes.

## Overview:

- **System:** The Indian Army has adopted AR for 3D terrain mapping and visualization, helping to manage difficult and diverse terrains.
- **Technology:** Use of AR in mission planning and reconnaissance by visualizing 3D topographical maps of conflict zones.
- **Real-Time Data Integration:** Combines real-time satellite imagery and geographical information for up-to-the-minute terrain updates.



## Impacts:

- **Enhanced Operational Efficiency:** Streamlines mission strategy in challenging environments like mountainous and border areas.
- **Improved Tactical Awareness:** Offers a clear advantage by accurately predicting obstacles and enemy hideouts within terrain.



# Augmented Reality (AR) in Sports

Presented By: Naveen Kumar(2021UCD2164)

# Case Study: VAR system in Football

1

## Real-Time Analysis

AR-powered Video Assistant Referee (VAR) systems provide referees with instant replays and advanced analytics to make accurate, data-driven decisions.

2

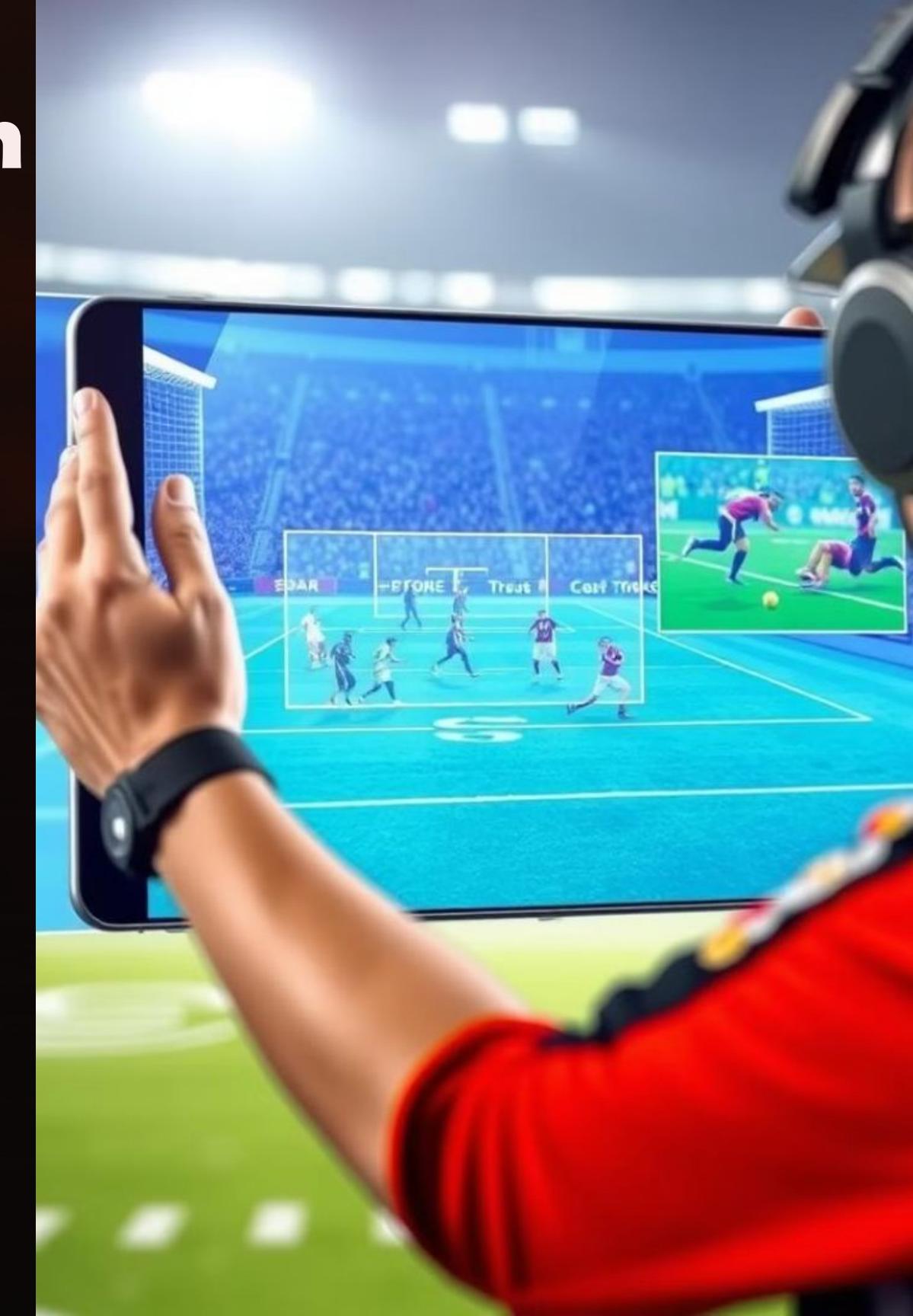
## Improved Transparency

AR overlays allow fans to see the same information that referees are using, fostering greater transparency and trust in the officiating process.

3

## Reduced Errors

By combining visual cues with statistical data, AR technology helps referees identify and correct missed calls, ensuring fairer outcomes.



# EXAMPLES:

## CHECKING OFFSIDE:

**Description:** Augmented reality assists referees in determining offside positions by overlaying a virtual offside line on the field. This line helps both referees and viewers clearly see whether an attacking player is offside, ensuring fairer and more transparent decision-making.

**Impact:** This feature minimizes controversial calls and allows fans to visually understand the basis for an offside ruling, improving the overall experience.



## CHECKING POSSIBLE GOAL :

**Description:** AR is used to verify if the ball completely crosses the goal line. When a possible goal situation arises, the system provides real-time visuals, helping referees make accurate calls without interrupting gameplay.

**Impact:** This technology ensures precision in goal verification, reducing disputes over goal-line decisions and making the game fairer and more accurate.



# PLAYER POSITIONING AND FORMATIONS DURING LIVE

## GAMEPLAY :

**Description:** Broadcasters use AR overlays to illustrate player positions, formations, and tactical moves during live matches. This allows viewers to better understand team strategies, such as defensive setups and passing lanes.



**Impact:** Fans gain deeper insight into game tactics and strategies, making the viewing experience more engaging and educational.



## CASE STUDY: AR IN OLYMPICS :

**Description:** Augmented Reality is enhancing various Olympic events, such as javelin throw and long jump, by overlaying lines that indicate bronze, silver, gold, and world record distances. These AR visuals help spectators follow the event more closely and understand athlete achievements instantly.

**Impact:** AR brings new perspectives to global sports by providing live data and visual guides, making events more engaging and accessible for fans worldwide.

