

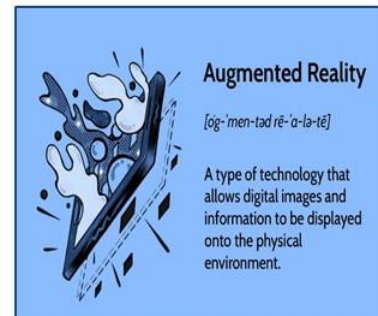
Online Communication in the Digital Age
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Indian Institute of Technology
Lecture – 57
Augmented Reality

Good morning, dear friends and welcome to this module today. We shall be discussing the Augmented Reality or AR and look at how it is changing the way we are communicating in different professional fields. AR is a revolutionary technology that blends the digital and physical worlds, enhancing our perception and interaction with reality.

In this module, we will explore the fundamentals of AR, its applications and also its potential impact on various industries. Augmented reality refers to the integration of virtual information and digital content into our real-world environment in real time.

Introduction*

- Augmented Reality (AR) technology combines virtual information with the real world.
- The technical means it uses include Multimedia, 3D-Modelling, Real-time Tracking and Registration, Intelligent Interaction, Sensing and more.
- Its principle is to apply computer-generated virtual information, such as text, images, 3D models, music, video, etc., to the real world after simulation.



Source: <https://www.investopedia.com>

*Chen, Yunqiang, et al. "An overview of augmented reality technology." *Journal of Physics: Conference Series*. Vol. 1237. No. 2. IOP Publishing, 2019.

The technical means it uses include multimedia, 3D modeling, real time tracking and registration, intelligent interaction, sensing and more. Its principle is to apply computer generated virtual information such as text, images, 3D models, music or video etc. to the real world after simulation.

Unlike virtual reality which creates an entirely virtual environment, AR enhances our existing reality by overlaying virtual elements onto it. These virtual elements can be in the form of images, videos, 3D models or interactive data.

Augmented reality although now a widely recognized and influential technology had humble beginnings. The concept of augmenting reality has been around for decades of course, but it wasn't until the 1960s that the first steps were taken towards the development of AR.

Background

- Augmented Reality has its roots in the 1960s when computer scientist Ivan Sutherland developed "The Sword of Damocles," an early AR system (1968)* .
- The system used a head-mounted display (HMD) to overlay computer-generated graphics onto the user's view of the physical world.
- The device had a basic user interface and lacked realism, and the graphics within the virtual environment were rudimentary wireframe representations of rooms.



Ivan Sutherland
Source: <https://www.invent.org>

*Sutherland, Ivan E. "A head-mounted three dimensional display." Proceedings of the December 9-11, 1968, fall joint computer conference, part I. 1968.

The first milestone came when computer scientist Ivan Sutherland developed the sword of Democles which was an early AR system. It was introduced in 1968. The system used a hand mounted display or HMD to overlay computer generated graphics onto the user's view of the physical world. The device had a basic user interface and also lacked realism and the graphics within the virtual environment were rather rudimentary, wire frame representations of rooms etc.

- The term “augmented reality” was coined in 1992 by Boeing researcher Thomas Caudell, who developed an AR application for industrial use to view some assembly diagrams.
- In the 1990s, AR experienced the first boom, which quickly subsided due to the lack of eligible hardware and digital content. (Kress, 2020)*
- Commercial augmented reality experiences were first introduced in entertainment and gaming businesses over the last decade. (Rosenberg, 2022)**



Thomas Caudell
Source: <https://www.researchgate.net/>

*Kress, B. C. Optical Architectures for Augmented-, Virtual-, and Mixed-Reality Headsets (Bellingham: SPIE Press, 2020).

** Rosenberg, Louis B. "Augmented reality: reflections at thirty years." Proceedings of the Future Technologies Conference (FTC) 2021, Volume 1. Springer International Publishing, 2022.

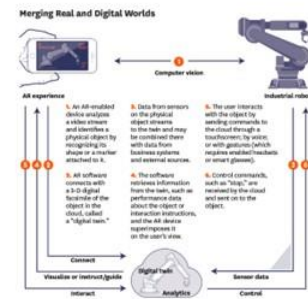


The term augmented reality was coined in 1992 by the famous Boeing researcher Thomas Caudill who developed an AR application for industrial use to view some assembly diagrams. The AR experienced its first boom as a technology. In the 1990s AR experienced the first technological boom. However, it also quickly subsided due to the lack of eligible hardware and digital content. Commercial augmented reality experiences were first introduced in entertainment and also in gaming businesses over the last decades. And we find that it is fast making inroads into different areas related with online professional communication also.

The magic of AR lies in its ability to combine computer generated content with the real world. It works by utilizing cameras, sensors and software algorithms to analyze and understand the user's environment. The AR device such as a smartphone or smart glasses captures the real world scene and overlays relevant virtual information onto it. This information is precisely aligned with the user's perspective creating a seamless integration between the real world and the virtual world.

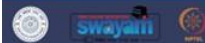
How Augmented Reality Works*

- **Capture the Real World:** AR devices, such as smartphones or smart glasses, use cameras to capture the user's real-world environment.
- **Object Recognition and Tracking:** Computer vision algorithms analyze the captured images or video to identify and track objects, surfaces, or markers in the real world.
- **Positioning and Mapping:** AR systems use sensors, such as GPS, accelerometers, or gyroscopes, to determine the user's position and orientation in relation to the real-world environment.



Source: <https://hbr.org>

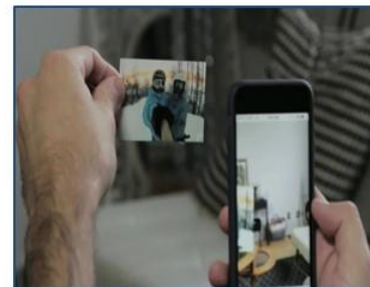
*Porter, Michael E., and James E. Heppelmann. "How Does Augmented Reality Work?" *Harvard Business Review*, 14 July 2021, hbr.org/2017/11/how-does-augmented-reality-work.



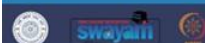
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AR devices such as smartphones or smart glasses use cameras to capture the user's real world environment. Further they work in the area of object recognition and tracking. Computer vision algorithms analyze the captured images of video to identify and track objects, surfaces or markers in the real world. AR systems use sensors such as GPS, accelerometers or gyroscopes to determine the user's position and orientation in relation to the real world environment.

- **Content Overlay:** Based on the recognized objects and user's position, virtual content is generated and overlaid onto the real-world view in real time.
- **Interaction and User Interface:** Users can interact with the augmented content through touch gestures, voice commands, or motion tracking.
- **Environmental Understanding:** Advanced AR systems use machine learning and environmental understanding algorithms to interpret the user's surroundings, recognizing objects, surfaces, and spatial context.



Source: <https://www.pinterest.com>



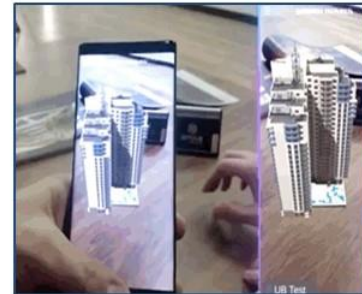
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Based on the recognized objects and user's position, virtual content is generated and overlaid onto the real world view in real time. Users can also interact with augmented content through touch gestures, voice commands or motion tracking. Advanced AR systems use machine learning and environmental understanding algorithms to interpret the user's surroundings, recognizing objects, surfaces and spatial context.

There are different types of augmented reality experiences based on the level of immersion and interaction. Firstly, we have marker based AR where the AR device recognizes specific markers or symbols in the real world and overlays digital content based on those markers.

Marker-based AR*

- Markers are distinct patterns that cameras can easily recognize and process, and can be paper-based or physical objects that exist in the real world.
- Marker-based AR works by scanning a marker which triggers an augmented experience (whether an object, text, video or animation) to appear on the device.
- Then the marker serves as a spatial reference to display the corresponding product on the screen.
- It usually requires software in the form of an app, which enables users to scan markers from their device using its camera feed.



Source: <https://www.behance.net>

* Cheng, Jack CP, Keyu Chen, and Weiwei Chen. "Comparison of marker-based AR and markerless AR: A case study on indoor decoration system." *Lean and Computing in Construction Congress (LC3): Proceedings of the Joint Conference on Computing in Construction (JC3)*. 2017.

So what are markers? Markers are distinct patterns that cameras can easily recognize and process further. They can be paper based or physical objects that exist in the real world. Marker based AR works by scanning a marker which triggers an augmented experience, whether an object takes video or animation to appear on the device. Then the marker serves as a spatial reference to display the corresponding product on the screen. It usually requires software in the form of an app which enables users to scan markers from their device using its camera feed.

Markerless AR on the other hand uses computer vision algorithms to detect and track objects or features in the environment without the need for markers.

Markerless AR*

- Markerless AR is the cutting-edge advancement in augmented reality technology, gaining widespread popularity in the industrial sector.
- It serves as a leading image recognition system, enabling the overlay of digital content onto real-world scenes without the need for markers.
- The markerless module is based on GPS technology.
- When the system is installed on a mobile device, it can get the current location using the GPS function of the device.



Source: <https://poplar.studio>

* Cheng, Jack CP, Keyu Chen, and Weiwei Chen. "Comparison of marker-based AR and markerless AR: A case study on indoor decoration system." Lean and Computing in Construction Congress (LC3): Proceedings of the Joint Conference on Computing in Construction (JC3), 2017.

Markerless AR is the cutting edge advancement in augmented reality technology, gaining widespread popularity in the industrial sector. It serves as a leading image recognition system, enabling the overlay of digital content onto real world scenes without the need for markers. The markerless module is based on GPS technology and when the system is installed on a mobile device, it can get the current location using the GPS function of the device.

Wearable AR devices are a significant milestone in the development of augmented reality. These devices allow users to experience AR seamlessly and in a hands-free mode. In 2013, Google introduced Google Glass, a head-mounted display that allowed users to access information and interact with the virtual world through a small display positioned in front of their eyes.

Wearable AR Devices

- Wearable AR technology projects an overlay of graphics onto the environment around an individual through glasses or a headset.
- It is a popular choice in factories due to its mobility and dynamic graphics.
- Example- Google Glass (2013):
 - Features a lightweight frame with a small display positioned above the user's eye.
 - Enables users to access information, take photos, and interact with virtual content through voice commands and touch gestures.
- Other devices – Microsoft HoloLens (2016), Magic Leap One (2018).



Google Glass
Source: www.techradar.com



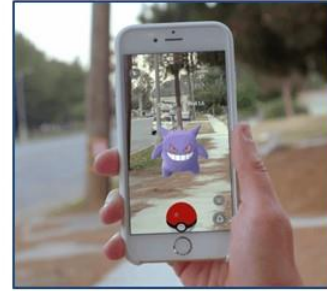
Wearable AR technology projects an overlay of graphics onto the environment around an individual through glasses or a headset. It is a popular choice in factories due to its mobility and dynamic graphics.

Let us look at certain examples of Google Glass. It features a lightweight frame with a small display positioned above the user's eye. It also enables users to access information, take photographs, and interact with virtual content through voice command and touch gestures. Other devices we can refer to in this context are Microsoft HoloLens, which came out in 2016, and Magic Leap One, which was introduced in 2018.

Wearable AR devices offer a wide range of applications, including gaming, education, healthcare, design, and many more. We will now discuss these applications with examples in the next few slides. In gaming, Pokemon Go took the world by storm with its unique approach. It captured the hearts of millions and revolutionized the gaming industry.

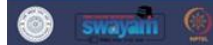
Gaming

- ***Pokémon Go***: Developed by Niantic in collaboration with The Pokémon Company and released in July 2016.
- The popular mobile game uses AR through smartphones or other mobile devices to allow players locate and catch virtual creatures hidden in real-world locations.
- The game quickly became a global sensation, breaking records and capturing the attention of players of all ages.
- Media have called *Pokémon Go* “the biggest mobile game in U.S. history”. (Lovelace, 2017)*



Pokémon Go
<https://medium.com>

*Lovelace Jr, B. "Pokemon Go" now the biggest mobile game in US history." CNBC. Retrieved January 10 (2016): 2017.



Pokemon Go was developed by Dianetic in collaboration with the Pokemon Company, and it was released in July 2016. The popular mobile game uses AR3 smartphones or other mobile devices to allow players locate and catch virtual creatures hidden in real-world locations. The game quickly became a global sensation, breaking records and capturing the attention of players of all ages. Media have called Pokemon Go the biggest mobile game in the U.S. history.

In this game, players explore their real-world surroundings using their smartphones, and the game overlays virtual Pokemon onto their camera view. Players can see Pokemon appear in parks, streets, and landmarks as if they were part of the real world.

Other applications of AR in entertainment are visible in social media apps, such as Snapchat and Dance Reality.

Entertainment*

- Snapchat Lenses: AR filters that overlay animations and effects onto users' faces in real-time for fun and interactive selfies.
- Dance Reality Apps: Dance reality apps, such as Just Dance Now and Dance Reality, use AR to bring dancing into users' living rooms.
- Live Performances and Events: During music concerts, AR effects and visuals can be projected onto the stage or surrounding screens, creating an immersive and visually stunning atmosphere.



Snapchat Lenses
Source: <https://www.adweek.com>

*Hilken, Tim, et al. "Augmenting the eye of the beholder: exploring the strategic potential of augmented reality to enhance online service experiences." *Journal of the Academy of Marketing Science* 45 (2017): 884-905.

Snapchat lenses use AR filters that overlay animations and effects onto users' faces in real-time for fun and interactive selfies. Dance Reality apps, such as Just Dance Now and Dance Reality, use AR to bring dancing into users' living rooms. There are live performances and events also which can be cited as a venue for the use of AR. During music concerts, AR effects and visuals can be projected onto the stage or surrounding screens, creating an immersive and visually stunning atmosphere.

In the field of education, AR is transforming learning by providing interactive visualizations, virtual experiments, and immersive educational content.

Education and Training

- Researchers have pursued AR because:
 - It may allow for the enhancement of users' perceptions, knowledge, and interaction with the real world. (Azuma et al., 2001)*
 - AR has the potential to improve productivity in real world tasks. (Schmalstieg, 2001)**
- **Google Expeditions:** AR-powered educational tours that allow students to virtually visit historical sites, explore ecosystems, and learn about various subjects.



Google Expeditions
Source: www.androidauthority.com

*Azuma, R., Bailiot, Y., Behringer, R., Feiner, S., Julier, S., & MacIntyre, B. (2001). Recent advances in augmented reality. *Computers & Graphics*, 1-15.

**Schmalstieg, D. (2001). An introduction to augmented reality [PowerPoint slides]. Retrieved from Lecture Notes Online Web site: http://www.iswc.ethz.ch/events/tutorials/slides_schmalstieg.pdf

In the field of education and training, we find that researchers have pursued AR because it may allow for the enhancement of users' perceptions, knowledge, and interaction with the real world. And it also has the potential to improve productivity in real-world tasks. AR-powered educational tools like Google Expeditions allow students to virtually visit historical sites, explore ecosystems, and learn about various objects.

In healthcare, AR assists surgeons in visualizing medical images and guides them during complex procedures.

Healthcare

- According to an IMARC report*, the global AR in healthcare market reached 1.6 billion US Dollars in 2022.
- In the foreseeable future, IMARC Group anticipates that the market will achieve a value of 5.7 billion US Dollars by 2028.
- Examples of AR in healthcare
 - **AccuVein:** AR technology that helps healthcare professionals locate veins by projecting a real-time image of veins onto a patient's skin, improving accuracy during procedures.
 - **Proximie:** AR platform that enables surgeons to collaborate remotely, providing real-time guidance and assistance during surgical procedures.



AccuVein
Source: <https://www.accuvein.com>

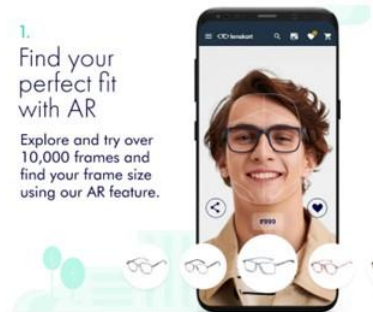
*Augmented Reality In Healthcare Market Report 2023-2028, IMARC, www.imarcgroup.com/augmented-reality-in-healthcare-market. Accessed 21 Aug. 2023.

We have cited a report by IMARC which says that the global AR in healthcare market reached 1.6 billion US dollars in 2022. And in the foreseeable future, it is anticipated that by 2028, it would achieve a value of 5.7 billion US dollars. Certain major examples are AccuVein and Proximie. In AccuVein, AR technology helps healthcare professionals locate veins by projecting a real-time image of veins onto a patient's skin, improving accuracy during procedures. In Proximie, we find that this AR platform enables surgeons to collaborate remotely, providing a real-time guidance and assistance during surgical procedures.

AR is also revolutionizing retail by enabling virtual try-on experiences and interactive product demonstrations. In this context, we can refer to IKEA Place, Sephora Virtual Artist, and Lenskart.

Retail and E-commerce

- **IKEA Place:** An app that lets users visualize how furniture would look in their homes by placing virtual 3D models of IKEA products in their actual space.
- **Sephora Virtual Artist:** Allows users to try on virtual makeup products using their smartphone camera, helping them make informed purchasing decisions (Jaekel, 2016).
- **Lenskart:** Lets users try on virtual frames for spectacles using their smartphone camera.



Lenskart AR
Source: <https://www.lenskart.com>

**Jaekel, Brielle. "Sephora's virtual artist brings augmented reality to large beauty audience." Luxury Daily (2016).*

IKEA Place is an app that allows users to visualize how furniture would look in their homes by placing virtual 3D models of IKEA products in their actual space. Sephora Virtual Artist allows users to try on virtual makeup products using their smartphone cameras, helping them in guiding towards a proper purchase. Lenskart allows users to try on virtual frames for spectacles using their smartphone cameras.

Augmented reality is transforming navigation experiences by seamlessly merging digital information with the physical world. Through AR-powered navigation systems, users can receive real-time directions, local information, and points of interest overlaid onto their view of the environment.

Navigation

- Since 2012, a Swiss-based company **WayRay** has been developing holographic AR navigation systems that use holographic optical elements for projecting all route-related information including directions, important notifications, and points of interest right into the drivers' line of sight and far ahead of the vehicle. (Walz, 2017)*
- Examples:
 - **Google Maps Live View:** AR feature that overlays directions onto the real-world view from a smartphone camera, making it easier for users to navigate their surroundings.
 - **BMW's AR HUD:** An augmented reality head-up display in BMW cars that projects navigation instructions and other relevant information directly onto the windshield.



BMW AR HUD
Source: www.bimmerfile.com

*Walz, Eric. "WayRay Creates Holographic Navigation: Alibaba Invests \$18 Million." *FutureCar.Com, FutureCar_Media*, 28 June 2017, [www.futurecar.com/1013/WayRay-Creates-Holographic-Navigation-Alibaba-Invests-\\$18-Million](http://www.futurecar.com/1013/WayRay-Creates-Holographic-Navigation-Alibaba-Invests-$18-Million).

Since 2012, a Swiss-based company, Wayray, has been developing holographic AR navigation systems that use holographic optical elements for projecting all route-related information, including directions, important notifications, and points of interest into the driver's line of sight and far ahead of the vehicle. Certain examples which we can cite and which are very popular are Google Maps Live View. The AR features that overlays directions onto the real-world view from a smartphone camera makes it easier for users to navigate their surroundings. BMW's AR HUD is an augmented reality head-up display in BMW cars that projects navigation instructions and other relevant information directly onto the windshield.

Augmented reality is revolutionizing the field of architecture, offering architects and designers powerful tools for visualizing, designing, and presenting their projects. AR enables the superimposition of digital architectural models onto physical space. It allows professionals to assess design in real-world context and communicate ideas in a more cohesive manner.

Architecture

- AR enables the overlay of computer-generated images depicting a structure onto the actual local view of a property, providing a preview before physical construction.
- After the Christchurch earthquake in 2011, the University of Canterbury introduced **CityViewAR**.
- This technology allowed city planners and engineers to visually represent the buildings that had been demolished. (Lee and Billinghurst, 2012)*
- It not only offered a reference for the pre-quake cityscape but also served as a stark reminder of the extensive devastation caused by the earthquake, which led to the complete destruction of entire buildings.



CityViewAR
Source: <https://www.hitlabnz.org>

*Lee, Gun, and Mark Billinghurst. "CityViewAR Outdoor AR Visualization." Proceedings of the 13th International Conference of the NZ Chapter of the ACM's Special Interest Group on Human-Computer Interaction, Association for Computing Machinery, 2012, p. 97, <https://doi.org/10.1145/2379256.2379281>.



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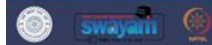
In today's workplaces, AR empowers employees to seamlessly access real-time information, engage in interactive training, and receive remote assistance right in their work environments.

Workplace

- AR has been employed to facilitate collaboration among geographically dispersed team members during conferences, involving both local and virtual participants.
- These AR-assisted tasks encompassed brainstorming and discussion meetings, leveraging shared visualization tools like touchscreen tables, interactive digital whiteboards, collaborative design spaces, and distributed control rooms. (Benford et al., 1998)
- In a Harvard Business Review article, Magid Abraham and Marco Annunziata (2020)** highlight how AR devices are now enhancing workers' productivity across various tasks, even when used for the first time, without the need for prior training.

* Benford, Steve, et al.
"Understanding and Constructing Shared Spaces with Mixed-Reality Boundaries." *ACM Trans. Comput.-Hum. Interact.*, vol. 5, no. 3, Sept. 1998, pp. 185–223.

** Abraham, Magid, and Marco Annunziata. "Augmented Reality Is Already Improving Worker Performance." *Harvard Business Review*, 15 Sept. 2020, hbr.org/2017/03/augmented-reality-is-already-improving-worker-performance.



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Augmented reality is also changing the landscape of language instructions. Also, of course, the way we instruct in our English language classes by immersing learners within interactive language-enriched settings. AR applications significantly bolster language acquisition through the integration of visual aids. Interactive instructional modules and authentic real-world contexts render the learning process both engaging and highly effective.

AR in English Language Teaching

- Studies have documented that AR can increase English language learning students' motivation. (Li & Chen, 2019)*
- AR allows interaction between the physical environment and virtual objects that actively engage students in acquiring knowledge. (Chang et al., 2016)**
- Nguyen et al. (2020)*** reported that learners perform better and engage more when AR is integrated with gamification.

*Li, Tao, and Yun Chen. "Will virtual reality be a double-edged sword? Exploring the moderation effects of the expected enjoyment of a destination on travel intention." *Journal of Destination Marketing & Management* 12 (2019): 15-26.

** Chang, Rong-Chi, Liang-Yi Chung, and Yong-Ming Huang. "Developing an interactive augmented reality system as a complement to plant education and comparing its effectiveness with video learning." *Interactive Learning Environments* 24.6 (2016): 1245-1264.

*** Nguyen, Vinh T., Kwanghee Jung, and Tommy Dang. "Blocklyar: A visual programming interface for creating augmented reality experiences." *Electronics* 9.8 (2020): 1205.



Several research studies have come out to support the idea that AR can increase the language learning students' motivation. It allows interaction between the physical environment and virtual objects that actively engage students in acquiring knowledge. It is also reported that learners perform better and engage more when AR is integrated with gamification.

Furthermore, AR is spearheading a transformative shift in the field of translation by effortlessly bridging language divides. With AR applications, text can be instantaneously translated from one language to another in real-time, ushering in a realm of fresh opportunities for enhanced communication and mutual comprehension.

AR and Translation

- AR systems like **Word Lens** exhibit the remarkable capacity to decipher foreign text encountered on signs and menus, subsequently presenting the translated text in the user's language within their augmented view .
- These systems have the capability to translate spoken words in a foreign language, offering users the convenience of seeing the translation displayed as printed subtitles directly within their field of vision.
- These applications represent a fusion of language processing and visual augmentation, ultimately transforming the way users interact with and comprehend unfamiliar linguistic contexts.



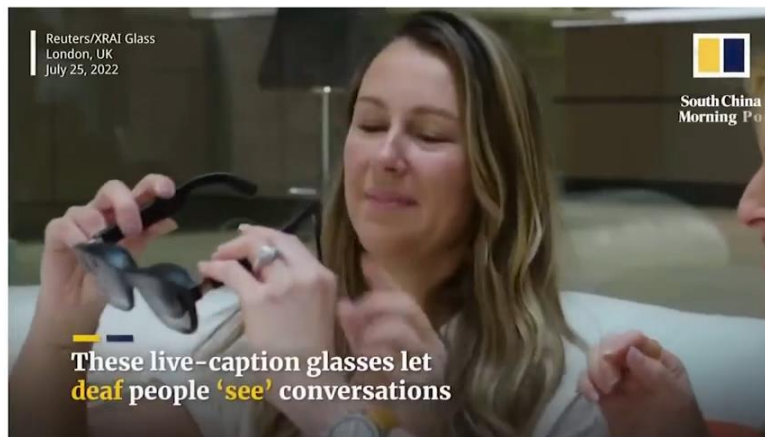
Source: <https://www.zdnet.com>

*Borghino, Dario. "Augmented Reality Glasses Perform Real-Time Language Translation." *New Atlas*, 2 May 2015, newatlas.com/language-translating-glasses/23494/.



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In addition to its impact on translation, AR plays a pivotal role in enhancing accessibility for individuals with disabilities. Let us take a look at a video that explains upon this concept.



Source: [South China Morning Post](https://www.youtube.com/watch?v=LauvOTnZMzg) Video Link: <https://www.youtube.com/watch?v=LauvOTnZMzg>



This is a new way of being able to communicate and be included in the... I can't look at it, I can't look at it, I can't see through it. No, she's like, she's naturally looking at me, but she's realising she doesn't have to look through the glass. Hello. Hey Josh, it's Juliet, how are you doing? Very well, thank you, how are you? How are you doing, do you want to get dinner sometime this week? It's powerful, it's powerful. The power and the importance for people who are hard of hearing all over the world to feel that they don't have to solely rely on lip reading anymore, on lip reading anymore.

And it's a really, it's a big moment. I'm getting a real time stream of subtitled information where ordinarily I might be behind, I might not quite catch everything, but this is giving me a real timed narrative, which enables me to be informed, it enables me to be involved. Effectively we're taking that audio stream from the microphone on the glasses, what we're doing though is then taking those captions and putting them into augmented reality. There was just a little epiphany moment where I thought, well hang on a second, he watches TV all the time with subtitles on, why can't we subtitle the world?

So it can be seen that AR offers innovative solutions that can break down communication barriers and provide a more inclusive experience. These are just a few examples of how AR is enhancing various industries. While AR offers exciting opportunities, it also presents some unique hurdles that need to be addressed. For example, privacy and security are significant considerations in AR.

Privacy and Security*

Data protection: AR applications collect and process personal data, including images and location information.

- It is crucial to address privacy concerns and implement robust data protection measures.

Security vulnerabilities: AR devices connected to the internet may be susceptible to security breaches and unauthorized access.

- Implementing robust security protocols is necessary to protect users' information and ensure a secure AR experience.



Source: www.cxotoday.com

*Gallardo, Andrea, et al. "Speculative Privacy Concerns About AR Glasses Data Collection." *Proceedings on Privacy Enhancing Technologies* 4 (2023): 416-435.



AR applications collect and process personal data, including images and location information. It is therefore crucial to address privacy concerns and implement robust data protection measures for individuals. AR devices are also connected to the internet and therefore they may be susceptible to security breaches and unauthorized access. So we have to implement strong security protocols in order to protect users' information and ensure a secure AR experience.

The widespread adoption of AR technology raises profound ethical and social considerations. These implications encompass privacy, data security, augmented experiences and societal transformations.

Ethical and Social Implications

- **Instagram** recently banned a filter that digitally altered users' facial features, after apprehensions that the filter was adversely affecting users' mental well-being by perpetuating unrealistic beauty ideals. (BBC News, 2019)*
- **Pokémon Go** led to a “disproportionate rise in vehicular accidents, resulting in vehicular damage, personal injuries, and fatalities; primarily in areas around designated playing locations known as PokéStops, where users engaged in the game while operating vehicles”. (Faccio and McConnell, 2020)**



Source: <https://edition.cnn.com>

* BBC News. (2019) Instagram bans 'cosmetic surgery' filters. Available at: <https://www.bbc.co.uk/news/business-50152053>. [Date Accessed: 23rd August 2023].

** Faccio, Mara, and John J. McConnell. "Death by Pokémon GO: The economic and human cost of using apps while driving." *Journal of Risk and Insurance* 87.3 (2020): 815-849.

For example, Instagram has recently banned a filter that digitally altered users' facial features. After apprehensions that the filter was adversely affecting the mental well-being of the users by perpetuating unrealistic beauty ideals. Pokémon Go, the popular game, also led to a disproportionate rise in vehicular accidents, resulting in vehicular damage, also personal injuries and sometimes unfortunately fatalities, primarily in areas around designated playing locations known as Pokestops, where users engaged in the game while operating vehicles.

Here is a video by Inside Edition that covers how the irresponsible usage of the game was responsible for multiple accidents.



Source: [Inside Edition](https://www.youtube.com/watch?v=bCBSBnbKWac) Video Link: <https://www.youtube.com/watch?v=bCBSBnbKWac>

Check out this crazy scene outside a library in Provo, Utah. They're all playing Pokemon Go.

So here's how it works. The new Pokemon Go app on your phone knows where you are at all times. You could be in the park, on the street, even your office. Then these little guys pop up and you capture them just like that. The goal of the game is to collect as many Pokemon characters as you can, which you can then use to wage war against other players.

But one feature of the game is causing concern today. It's called a lure. It's supposed to bring these virtual critters to your exact location. Unfortunately, somebody with evil intent could also use a lure to draw you into a trap. Cops say three dudes used the game to lure players to a secluded parking lot in Missouri where they were robbed at gunpoint. So Emily, our producer here, she loves this game and she's going to set a lure for us to see if we can attract Pokemon and other players.

All right, so let's set that. Boom. Sure enough, within a few minutes, a crowd had gathered. You guys come because we set a lure here? Yes, we set a lure. So look at this. All these people showed up because we set a lure on our phone and they're all playing.

Definitely being with someone else, not going by yourself. Definitely safety in numbers. If you can be with more than one person, that would certainly help. Paying attention while you're using these things, walking off a sidewalk, walking into traffic. I mean, I've really read stories where these things have happened. Safety concerns prompted

Nintendo, the creators of Pokemon Go, to issue this warning.

We encourage all people playing Pokemon Go to be aware of their surroundings and to play with friends when going to new or unfamiliar places. Parenting experts are praising the game as good, clean fun as long as kids don't run into trouble looking for those imaginary creatures. An iconic.

Consequently, while AR applications like Pokemon Go offer exciting gaming experiences, it is also crucial to stay vigilant and mindful of safety while exploring the virtual world in real life settings.

In conclusion, it can be said that augmented reality is not just a technology. It is a gateway to a world where the digital and the physical seamlessly co-exist. As we explore its applications in various fields, from healthcare to education, we witness the profound impact it has had on our lives already.

Conclusion

- Augmented Reality represents a groundbreaking frontier of technology with immense potential across various domains.
- AR has the potential to revolutionize industries, enhance our understanding of the world, and create immersive experiences like never before.
- It has reshaped industries, transformed communication, and enriched user experiences.
- However, as we navigate this evolving landscape, it is crucial to consider the ethical, privacy, and accessibility implications.

So, it can be considered as a groundbreaking frontier of technology with immense potential across various domains. It has the potential to revolutionize industries, enhance our understanding of the world, and create immersive experiences like never before. It won't be wrong to say that it has already reshaped industries, transformed the way we communicate, and enriched user experiences. However, as we navigate this evolving landscape, it is crucial to consider the ethical, privacy, and accessibility implications.

It is clear that AR is reshaping how we interact with the digital and physical realms, offering new possibilities for education, entertainment, and countless other industries. As we move forward to our exploration of immersive technology, next week's module will

transition to the realm of virtual reality or VR. We will also be discussing how the development of VR technology has given birth to the virtual landscape of the metaverse.

Thank you.