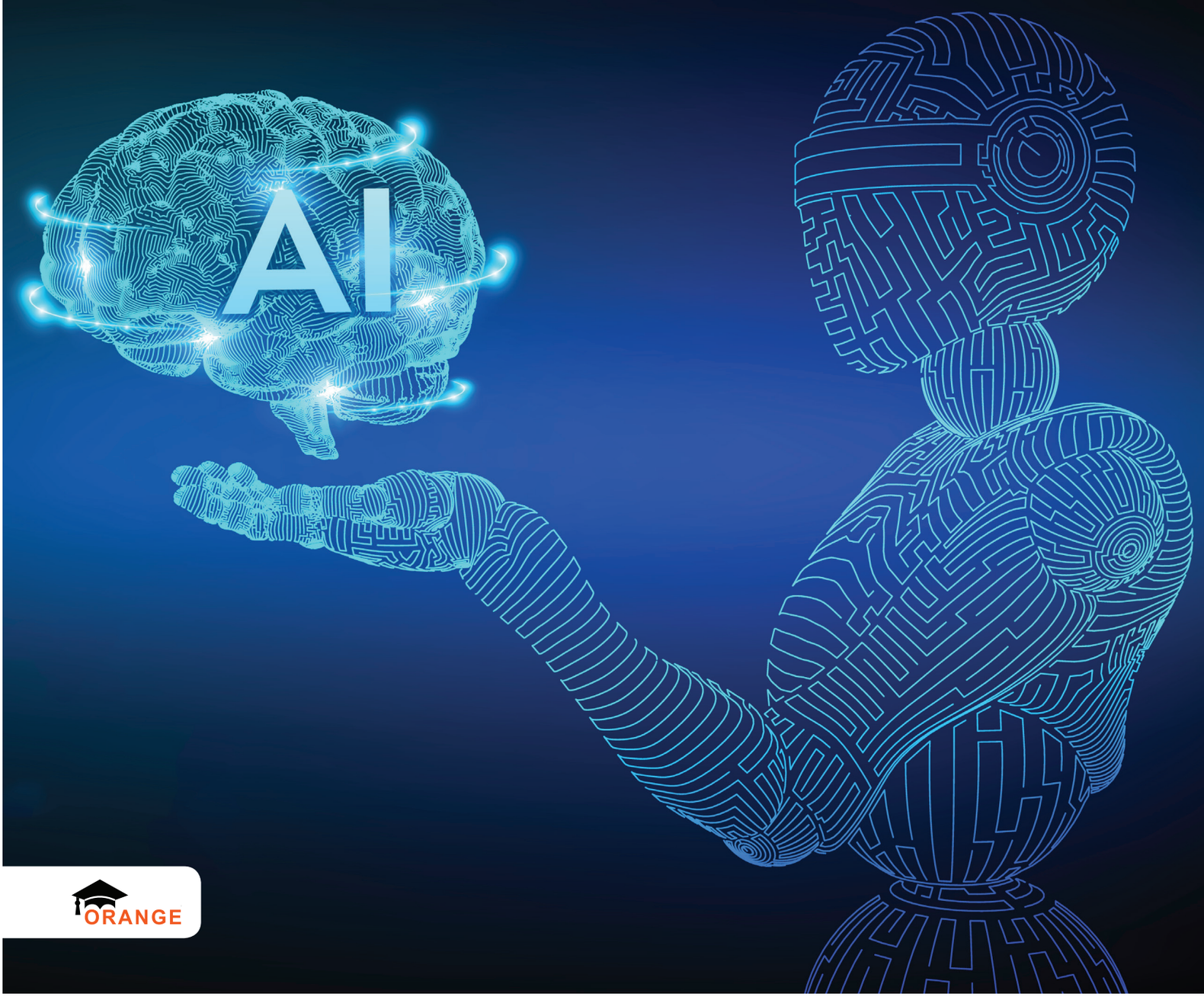
7

Artificial Intelligence & Robotics



ORANGE


2022
ChatGPT is available to public testing.
2020
GPT-3 tool for automated conversations is introduced.
2014
Amazon launches Alexa - intelligent virtual assistant that completes shopping tasks.
2011
Question answering computer Watson wins 1st place on TV show Jeopardy.
2011
Apple integrates into iPhone Siri - intelligent virtual assistant.
2002
The first mass- produced robotic vacuum cleaner Roomba learns to navigate homes.
1999
Sony launches the first robot pet dog AIBO whose personality and skills develop over time.
1997
A chess-playing computer Deep Blue defeats chess champion Garry Kasparov.
1964
Joseph Weizenbaum- chatbot capable of holding conversations with humans.
1956
John McCarthy introduces the term 'Artificial Intelligence
1950
Alan Turing test - if a machine tricks human into thinking it's a human, then it has intelligence.

1 FIELDS OF AI

Learning Outcomes

- Smartphone Industry
- Banking and Financial Sector
- Autonomous Vehicles
- Navigation
- Education
- Social Media Platforms
- E-Commerce
- Security and Surveillance
- Healthcare
- Manufacturing

Vincy! Have you seen mom's phone?

No, but why are you looking for mom's phone?

I need to make a call.

Even if you find her phone, it won't start until it recognises mom's face.

Oh no, I wanted to speak to him about something important. On second thought, Face Recognition feature makes the cell phone quite secured.

Yes, and it is because of Artificial Intelligence.

Wow! You mean to say that her smartphone has AI?

Yes! Ofcourse, there are many apps that use AI. In this chapter, I will tell you more about such apps.

Artificial Intelligence (AI) is the technology that allows machines and computers to think, learn, and perform tasks like humans. AI can solve problems, make decisions, recognise patterns, and improve its performance over time.

Learning in AI can be categorised under different types "narrow intelligence," "artificial general intelligence," and "super." These categories demonstrate AI's capabilities as it evolves—performing narrowly defined sets of tasks, simulating thought processes in the human mind, and performing beyond human capability.

Types of Artificial Intelligence

Based on its capacity to mimic human characteristics and their real-world applications, AI is categorised into the following three categories:

- Artificial Narrow Intelligence
- Artificial General Intelligence
- Artificial Super Intelligence

Let us learn about them in detail.

Artificial Narrow Intelligence

Artificial Narrow Intelligence (ANI) has a limited/narrow range of abilities. It is most dedicated to performing only one task. It is also called Weak AI or Narrow AI as it operates under limited capabilities. It is goal oriented and focussed to do a single task. Consider Siri—virtual assistant on an iPhone—it uses speech and language recognition techniques to set an alarm, or send an SMS to a contact on your phone. Narrow AI uses Natural Language Processing (NLP) to perform. Examples of Weak AI or Narrow AI are as follows:

- Image/facial recognition software
- Apple Siri, Amazon Alexa, Microsoft Cortana and other virtual assistants operate on limited functions.
- IBM's Watson
- Vision recognition of self-driving cars
- Recommendations of e-commerce sites

Artificial General Intelligence

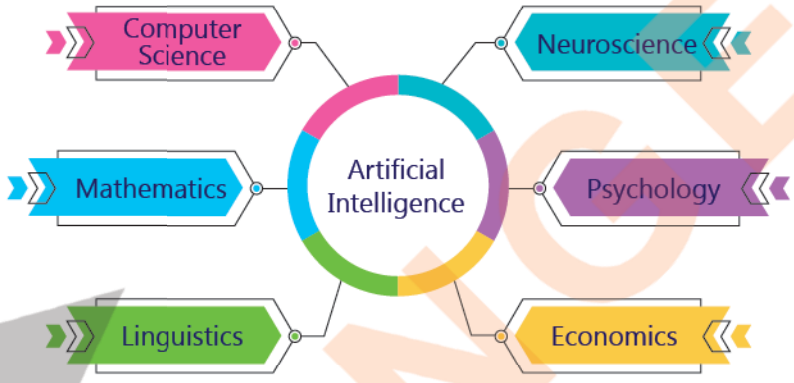
Artificial General Intelligence (AGI) has intelligence as par with human beings. Its performance is just like humans. It is called Strong AI or Deep AI. The machine can mimic human behaviour with the ability to learn and solve problems. AGI can think, learn and decide in a similar manner as humans would do in a situation. Till now Strong AI is a theory, researchers and scientists have not achieved it. Machines will have to go through experiential learning where not only the human intelligence is to be replicated, emotions, beliefs and other thought processes need to be simulated. It needs to train machines to think like humans.

Artificial Super Intelligence

Artificial Super Intelligence (ASI) has intelligence more than human beings. It can do tasks beyond human capabilities. It is a hypothetical idea of an AI where machines become self-aware and surpass human intelligence and abilities. A super AI will be capable of thinking, analyse, perform, plan, decide, learn, and communicate on its own. The potential of such powerful machines is very appealing, but it may have its own multiple consequences.

Various Practices involved in Artificial Intelligence

Most people think that AI is related to only computer science and robotics. On the contrary, the domain of AI includes many other topics like Mathematics, Neuroscience, Psychology, etc. The thing about AI is that it is not based on one discipline only. It was built to imitate a human mind. A human mind is capable of thinking in different dimensions all at the same time. Hence, the main goal of AI is to produce machines or programs that can think in different dimensions at the same time. The image given shows the different dimensions of fields that come under AI.



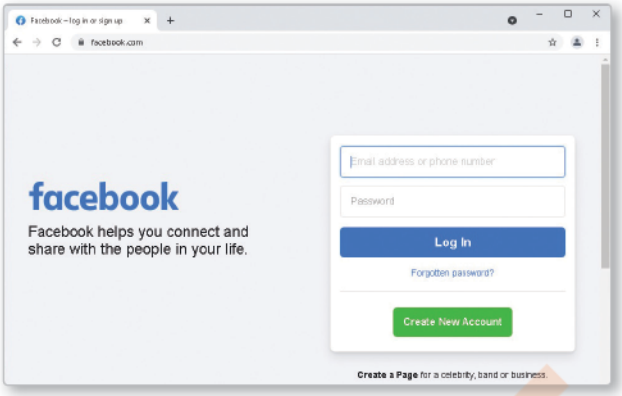
Artificial Intelligence is commonly used in wide range of fields like smartphones, social media platforms, e-commerce, autonomous vehicles, security and surveillance, entertainment industries, navigation, banking and financial sectors, smart homes, etc.

Smartphone Industry

Smartphones come preloaded with AI based special features. Right from the lock security, there is AI in many applications. To unlock your smartphone, you use face recognition, the process which needs the Computer Vision tool of AI. Similarly, the voice enabled assistant like Google Assistant or Siri uses Natural Language Processing tool of AI.

Social Media Platforms

AI is extensively used in social media platforms to serve personalized content. These sites monitor the way you use the features that they provide and record the way you use it. This data is used to create ads that are customised according to your preferences.

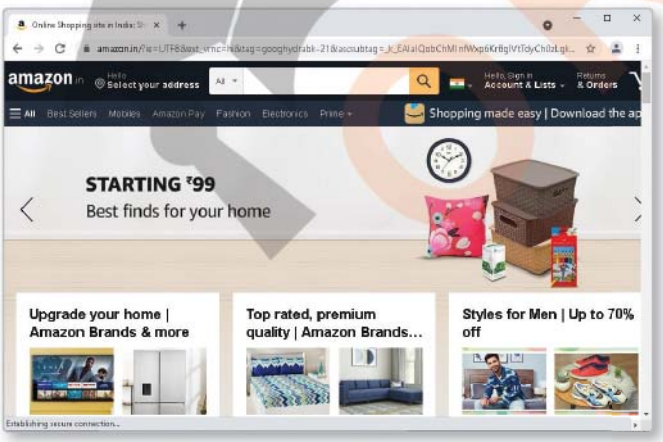


Banking and Financial Sector

AI helps the banks and financial sectors in various ways. AI predicts future scenarios by analysing past user experiences. This way it suggests the banks for future outcomes and trends. It also helps banks to identify frauds and detect anti-money laundering patterns.

AI assistants, such as chatbots, use artificial intelligence to generate personalized financial advice and natural language processing to provide instant, self-help customer service.

E-Commerce

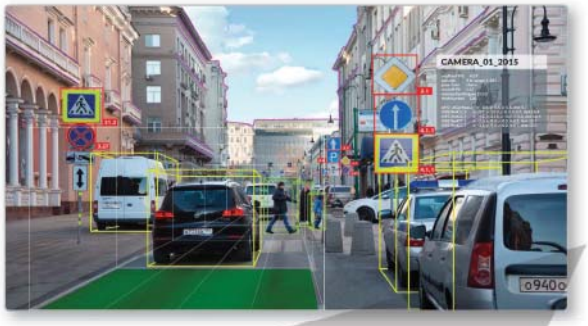


AI in e-commerce helps in interactive and personalized buying experience. With the AI-enabled systems, companies can see their customer's preferences and can boost their sales by reliable and customized shopping experiences. AI helps in the real time database analysis to predict the number of customers willing to buy a new product and also helps in running a cashierless store.

Autonomous Vehicles

The Autonomous vehicles or self-driving cars use cameras, radars, sensors and artificial intelligence to travel from one place to another without human intervention. Autonomous Driving is one of the key applications of AI. The sensors generate massive amount of data to make decisions like humans.

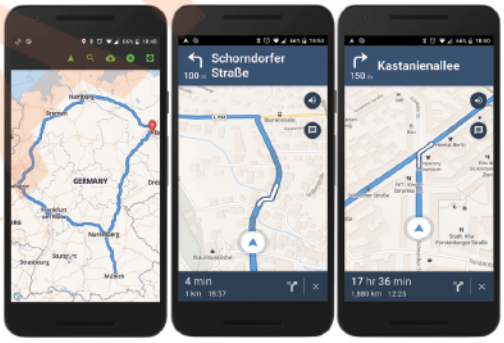
Security and Surveillance



For Security and Surveillance, AI program functions by using Computer Vision. The video surveillance cameras have AI programs that analyse images and audio in order to recognize humans, various objects, vehicles and actions. The Artificial Intelligence program sends an alert if it detects some unusual activities breaking the set rules.

Navigation

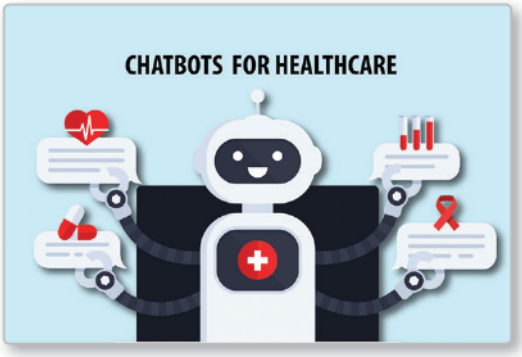
Google Maps are the best examples of use of AI in Navigation. Google Maps use Machine Learning domain of AI to generate predictions of traffic patterns and live traffic conditions based on the sets of data. It now provides real-time tracking data and can forecast delays in hundreds of cities worldwide.



Healthcare

AI in healthcare is used to diagnose ailments, treat patients, develop new drugs, provide personalized medicines, monitor and take care of the patients.

AI based healthcare products include mental health care chatbots like Shim, Woebot, Wyse, Toss and Therachat. These apps can track the emotions of the patient and then suggest exercises and provide psychoeducation too.



Education

Education sector can highly benefit with the use of AI. Now, primarily its being used as a tool to develop skills and test systems. Today essay-grading systems are in place to grade the children's thoughts in its primary stage. It can also be used in providing individualised learning, which is a challenging task at teacher's level.

These systems respond to the needs of a student, putting greater emphasis on certain topics, repeating things that students haven't mastered, and generally helping students to work at their own pace, whatever that may be.

Manufacturing

AI is transforming manufacturing by optimising processes, improving quality, and reducing costs. Predictive maintenance enables early detection of equipment issues, minimising unexpected downtime and extending machine life. AI-powered robotics enhance automation on assembly lines, performing repetitive tasks with speed and precision, while collaborative robots (cobots) work alongside humans to improve efficiency. In quality control, AI systems can identify defects in real time, ensuring consistent product standards. Additionally, AI-driven supply chain optimisation helps manage inventory, forecast demand, and streamline logistics. By integrating AI, manufacturers can reduce waste, enhance safety, and improve overall productivity.

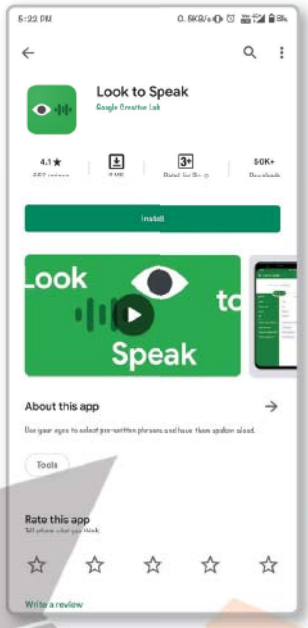
Experiential Learning

AI GAME 01 Look to Speak

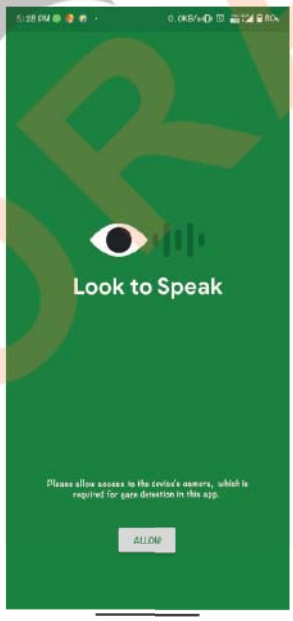
This is an application that can be downloaded from the Play Store. This app can be used to select pre written devices and have them spoken aloud.

To download this app, follow these steps:

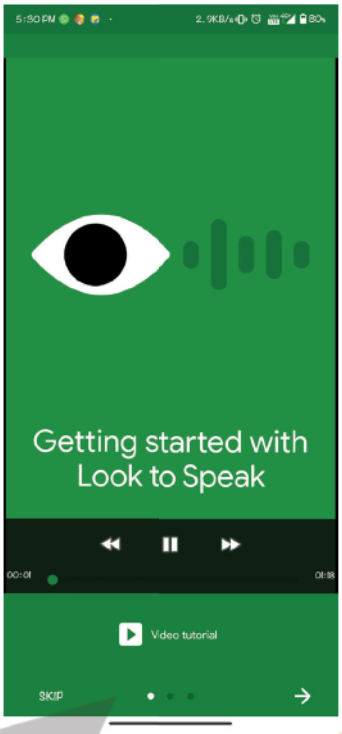
Step 1: Open Play Store and search Look to Speak.



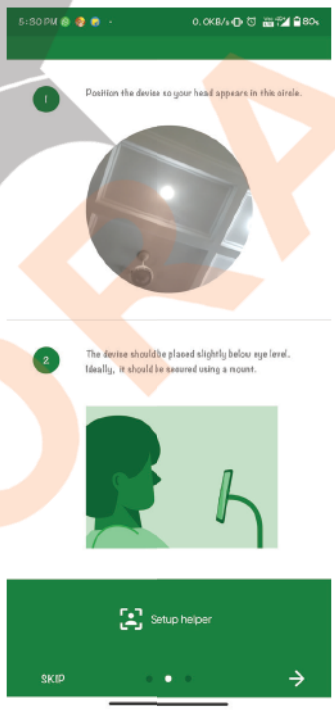
Step 2: Touch on the app icon shown below and click on Install button.



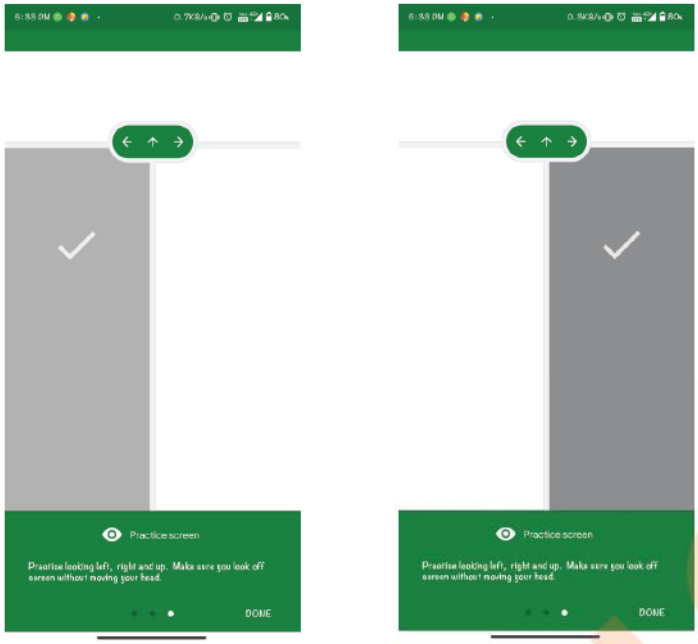
Step 3: Once the app is installed, open the app. It will ask your permission to set up camera functions. Click on Allow button.



Step 4: Go through the video tutorial and follow the instructions to setup the app.



Step 5: After the setup is complete, you will see a practice screen, follow the instructions and complete the practice run. Touch the Done button to complete the process.



Step 6: Now you can see a list of words on which you can practice. You can also add more phrases through the menu button from the top left corner.

At a Glance

- AI is being used in many areas like healthcare, economic development, entertainment and education.
- AI has contributed a lot during pandemic to the healthcare sector.
- Many robots are developed which help in skilled surgery.
- AI based apps help in accurate diagnosis of diseases and predict its future occurrence and severity etc.
- In financial sector, AI is being used to predict credit scores of the customers.
- Online banking, digital wallets, financial risk calculations, chatbots for customer care are few examples where AI is providing great support.
- AI in transportation sector helps increase passenger safety, prevent accidents, reduce carbon emissions, manage traffic congestion thereby minimising overall financial expenses.
- Real life uses of AI includes spam filters in emails, online shopping, smart phones, digital personal assistant, social media etc.

Ai Quiz

Tick (✓) the correct option.

1. Which of the following features uses computer vision?
   a. Fingerprint scanner ◯ b. Facial recognition ◯
   c. Dolby Atmos ◯ d. None of these ◯
2. Which of the following is not a social media platform?
   a. Facebook ◯ b. Youtube ◯
   c. Twitter ◯ d. All of these ◯
3. Which of the following domains of AI is used by Google Maps to generate predictions of traffic patterns?
   a. Deep Learning ◯ b. Computer Vision ◯
   c. Machine Learning ◯ d. None of these ◯
4. AI in banking helps to detect ..... .
   a. identity frauds ◯ b. money laundering ◯
   c. future trends ◯ d. all of these ◯

5. Which of the following generate a massive amount of data to take decisions like a human being?

a. mirror ◯ b. camera ◯

c. engine ◯ d. sensor ◯

6. How does AI enhance quality control in manufacturing?

a. By manually inspecting each product ◯

b. By identifying defects in real time ◯

c. By reducing the number of employees ◯

d. By replacing all human worker ◯

7. What is another term for Artificial Narrow Intelligence (ANI)?

a. Strong AI ◯ b. Deep AI ◯

c. Weak AI ◯ d. Super AI ◯

8. Which of the following is an example of Artificial Narrow Intelligence?

a. A robot with human-like intelligence ◯

b. Self-driving cars' vision recognition ◯

c. A machine capable of emotions ◯

d. A human-like chatbot with reasoning ability ◯

9. Which of the following is NOT an example of Artificial Narrow Intelligence?

a. Apple Siri ◯

b. Amazon Alexa ◯

c. IBM's Watson ◯

d. A robot that learns human emotions ◯

10. In manufacturing, how does AI contribute to predictive maintenance?

a. By performing tasks with speed and precision ◯

b. By detecting equipment issues early ◯

c. By ensuring product consistency ◯

d. By automating the supply chain ◯

11. Which of the following functions does Artificial Narrow Intelligence (ANI) NOT perform?

a. Language recognition ◯ b. Problem-solving like humans ◯

c. Image recognition ◯ d. Voice commands ◯

Exercise

A. State whether these statements are true or false.

1. Unlocking the mobile device using face recognition is not an example of AI. .....
2. Siri is an example of voice recognition system of AI. .....
3. AI is incapable of detecting money laundering patterns. .....
4. AI in e-commerce help to serve personalized products for the customer. .....
5. Autonomous vehicles uses radars, cameras, sensors and AI to work efficiently. .....

B. Fill in the blanks.

1. E-commerce sites are powered with ..... for a hassle free delivery experience.
2. AI programs uses ..... for security and surveillance.
3. Google Maps use ..... to generate predictions of traffic patterns
4. ..... is an example of a mental health chatbot.
5. ..... systems helps in grading essays at school.

C. Answer the following questions.

1. How AI is useful in healthcare?
2. Why do we use AI in e-commerce websites?
3. How does Google map predict traffic?
4. How is AI used in autonomous vehicles?
5. How is education sector benefitted from using AI?

Ai Lab

Experiential Learning

Create a presentation using MS PowerPoint or Google Slides to compare the features of different payment apps available for commercial uses. Choose the app that your like the most and discuss its advantages and disadvantages with the class.

2 FIELDS WHERE ROBOTS ARE USED

Learning Outcomes

- Security and Surveillance
- Military
- Cooking
- Space Exploration
- Agriculture
- Manufacturing
- Customer Service
- Healthcare
- Entertainment
- Underwater Research

In the previous class, you have learnt about different robots.

Yes, the journey of robots is amazing. This also taught me that these are here to help us and make our life easier but they are not going to replace humans as humans are the creator.

Exactly, but the question of replacing humans is often raised to make people understand where to draw the line of its usage.

I couldn't get you. Are you not everywhere?

Yes, almost. I have been here with you in this journey of teaching and learning process. As humanoid I appreciate your inquisitive nature. Today, I will take you to the world of Robots so that you understand how we are helping humans to make their life easy.

Since technological advancements there are many areas where these robots are being used. Education, healthcare and many such areas where robots are successfully implemented. Usually robots are assigned to specific tasks so let us now understand different fields where robots are used in this chapter.

Security and Surveillance

Robots are being deployed as security guards to protect humans. These robotic security guards work in real time and have actionable intelligence. They can help with crimes like armed robberies, domestic violence, fraud, hit and run cases, etc. Flyability is world's first collision-tolerant flying robot which can fly safely close to people.

Manufacturing

Since 1960 the manufacturing industries are using robots for different purposes. Robotic arms which are capable to perform multiple tasks such as welding, cutting, lifting, sorting, etc. are used in factories. Unimate was the first robot joined the assembly line in 1961. ArcWielding was a robot wielding machine brought to use in 1980s. Material handling robots are used to move, pack and select products.

Military

In military, robots have achieved remarkable success. Aerial vehicles like Predator drone are able to launch missiles at ground target without a pilot. These robots are also capable of taking surveillance photographs. MAARS looks like a tank and it contains tear gas and lasers to confuse enemies. Another robot DOGO has camera to spy on the activities of the enemy. The biggest advantages are they don't get tired, whatever the weather is or time they don't need shelter or sleep.

Customer Service

Human-like Robots are used in the fields of customer services. Nadine, a humanoid robot in Singapore can recognise people from the database of their previous visits. It can shake hands, make eye contact and can indulge in familiar chat based on previous visit. Junko Chihira in Japan works in the tourist information centre. Odaiba another Humanoid works in Tokyo's shopping centre.

Cooking

Chef robots can cook complete meals for you. They are power packed with hundreds of recipes. You just need to choose the recipe, provide necessary ingredients for it and then they cook by their own. Moley is one such master chef robot. Motoman SDA5 is a culinarily savvy robot. Suzumo Sushi Chef prepares Japanese food. Cui Runguan can slice noodles from piece of dough and toss them into boiling water.

Healthcare

Surgical robots help doctors in performing surgery in healthcare field. They are also used as prosthetic limbs. Some of the humanoids can be a good companion to the recovering patients with serious illness. Da Vinci is a complete surgical system which performs complex surgeries with great skills of heart, head, neck and other sensitive areas.

Space Exploration

NASA has made a number of robotic devices to support or substitute astronauts to perform high risk tasks. DARPA is a humanoid robot that can function like humans. Currently R1 and R2 are working as Robonaut. Robonaut 2 or R2 was the first humanoid robot sent to space as a part of STS-133 mission. RASSOR (pronounced as "Razor") is a lunar robot, Spidernaut is a robot constructed for maintenance and repair projects in space.

Entertainment

In entertainment industries, robots are proving to be a great help in managing the cameras, providing special effects, performing stunts in an action movie etc. An industrial robot continually sprayed Tony Stark with a fire extinguisher in the movie Iron Man. Camera operations in Gravity movie was done with the help of robots.

Robots are assisting movie directors in the film making process. Theme parks like Disney World are also using autonomous robots to enhance the magical experience of their customers.

Agriculture

Agriculture is a seasonal sector and it depends a lot on season, ideal weather conditions, optimal soil, etc. There are a number of repetitive tasks that can be done by robots to save human time and efforts. Merlin robot is a Milkbot and is widely used in UK farms for milking. RV-100 is designed to transport potted plants in greenhouse settings and outdoor. Thorvald is an autonomous modular multipurpose agricultural robot. Root AI is a tomato picking robot.

Underwater Research

The main objective of underwater research is primarily on a safer and cleaner future for our oceans. Underwater robots are being helpful in brining ecological balance in ocean. Humanoid robots will soon replace human divers in carrying out deep or dangerous ocean research and engineering tasks. Shipwreck Robots search the wracked ships like Titanic, etc. Deep Trekker drone is controlled by a video-link handset that can be operated from the surface or by a diver in the water.

At a Glance

- Robots are being deployed as security guards to protect humans.
- Robotic arms are most common industrial robots who are capable to perform multiple tasks like welding, cutting, lifting and sorting, etc.
- Human-like robots are used in the fields of customer services.
- Robots can cook meals.
- Healthcare robots are deployed as surgeons, prosthetic limbs, operating tumours etc.
- Robots are used in space exploration where they could replace astronauts in performing high risks tasks.
- Movie making process are also now shared with humans by robots.
- Agriculture robots are being used to yield better crops.
- Underwater robots are being helpful in brining ecological balance in ocean.

Ai Quiz

Tick (✓) the correct option.

1. Which of the following is an example of a robot used in security?
   a. Flyability ◯ b. Picard ◯
   c. Argus ◯ d. All of these ◯
2. Suzumo Sushi Chef prepares ..... food.
   a. Italian ◯ b. Chinese ◯
   c. Vegetarian ◯ d. Japanese ◯
3. Which of the following is not a military robot?
   a. MAARS ◯ b. DOGO ◯
   c. Chihira ◯ d. Predator ◯
4. Which of the following is a complete surgical system which performs complex surgeries?
   a. Da Vinci ◯ b. PARO ◯
   c. CyberKnife ◯ d. Exoskeletons ◯
5. Merlin robot is a ..... .
   a. Stunt robot ◯ b. Milkbot ◯
   c. Transport robot ◯ d. Movie making robot ◯

Exercise

A. State whether these statements are true or false.

1. Flyability is world's first collision-tolerant flying robot. .....
2. Odaiba is a drone. .....
3. Unimate was the first industrial robot. .....
4. R1 and R2 are Robonauts. .....
5. We cannot deploy robots underwater. .....

B. Fill in the blanks.

Material handling Gravity security Nadine Shipwreck

1. Robots are deployed as ..... guards to protect humans.
2. ..... can shake hands and chat with customers based upon their previous visit.
3. Robots handled cameras in the ..... movie.

4. ..... robots are used to move, pack and select products.

5. The ..... robots searched wracked ships like Titanic.

C. Match the following robots with their fields:

1. 

2. 

3. 

4. 

5. 

a. Agriculture Robot

b. Military Robot

c. Chef Robot

d. Field name of the robot

e. Surgical Robot

D. Answer the following questions:

1. Name any two robots that are used in agriculture.

.....

.....

2. The tasks given below are performed by a robot:
   i. Welding
   ii. Cutting
   iii. Painting
   Identify the type of the robot used to perform the above tasks.

   .....

   .....

3. Write any two uses of robots in healthcare.

   .....

   .....

4. How NASA is using robotic devices in space exploration?

   .....

   .....

AI Lab

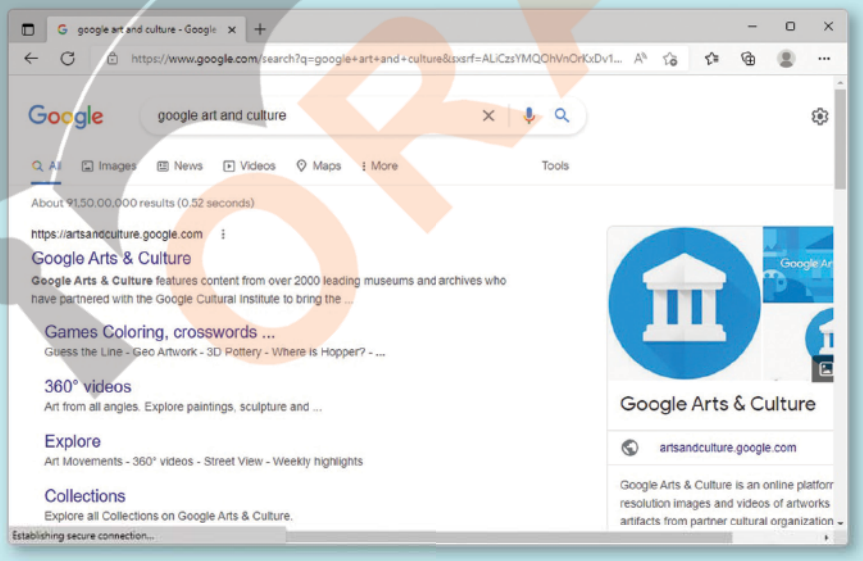
Experiential Learning

Explore Google Art and Culture Projects.

Perform the following steps to use the Google Art and Culture:

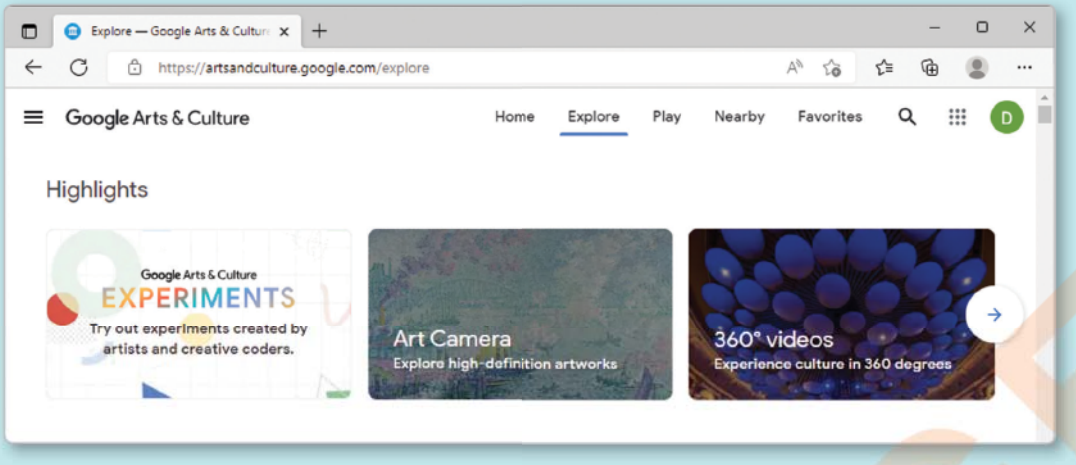
Step 1 Type google art and culture in Google search engine. The search results appear.

Step 2 Click on the Google Arts & Culture link:

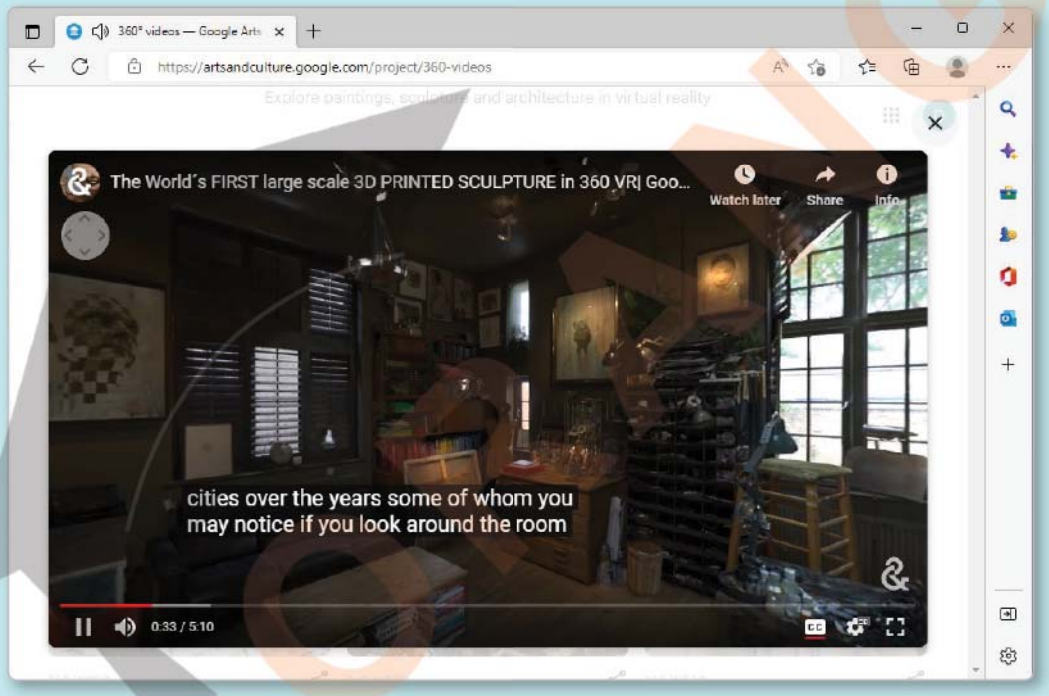


Step 3 Click on **Explore** link in the top bar. Several categories of videos appear.

Step 4 Click on the **360° videos** and explore beautiful videos of Virtual Reality.



The video starts playing.



Ai Task

Subject Enrichment

We are surrounded by many devices and machines. Every machine is operated in a different manner. Find out three such devices and mention their features and the way they are used in the space given below.

1. Name: _____

Features: _____

_____

_____

_____

_____

How to interact: _____

_____

2. Name: _____

Features: _____

_____

_____

_____

_____

How to interact: _____

_____

_____

3. Name: _____

Features: _____

_____

_____

_____

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How to interact: _____

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_____

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