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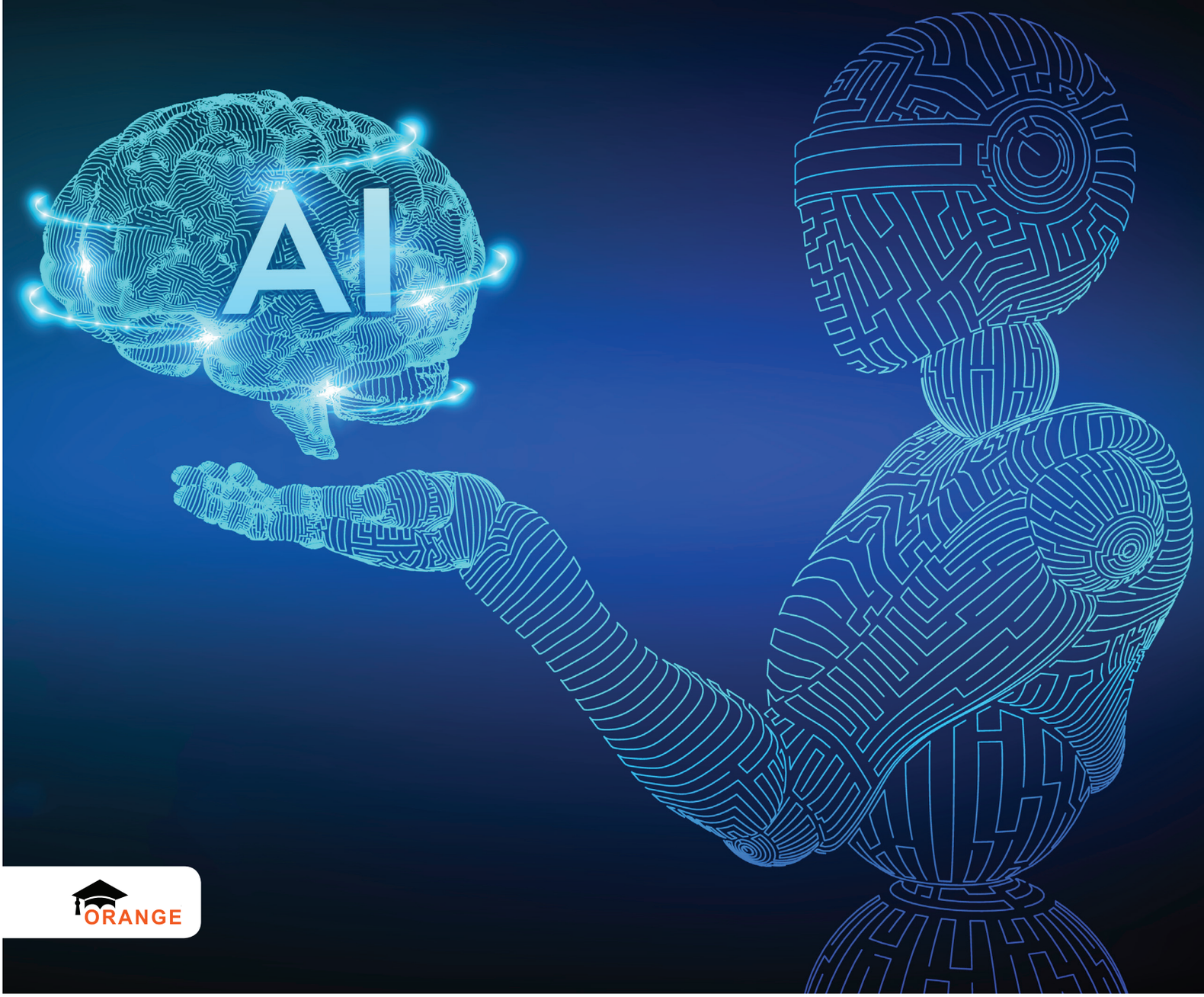
Artificial Intelligence & Robotics



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 INTRODUCTION TO AI

Learning Outcomes

- Understanding AI Through a Game
- Need of AI
- Human Intelligence Vs Artificial Intelligence
- Terminologies Associated with AI


Hello Vincy! Today in our class, mam spoke about Google's Quick Draw.


Wow! What did she tell you?

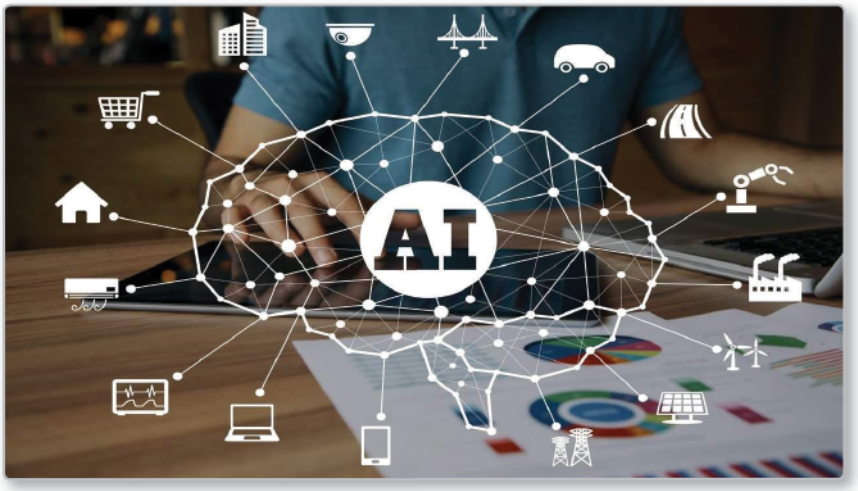

She told us that Google's Quick Draw predicts what we are drawing and sometimes it guesses in one go but how?


Yes, that's because AI makes this possible using different tools.


Can you please tell us more about AI.


Sure, I will tell you about the basics if AI and the terms associated with it.

Artificial Intelligence is the ability of a computer program or machine to think and learn. It also makes any machine perform tasks that requires intelligence. In a broader sense, we can say that machines which can mimic human behaviour are artificially intelligent. AI can be defined as a computer program which is capable of executing a task that requires intelligence. Tasks that need learning, planning, problem solving, etc. which are usually performed by a intelligent human or trained animals can accomplish.



Understanding AI Through a Game

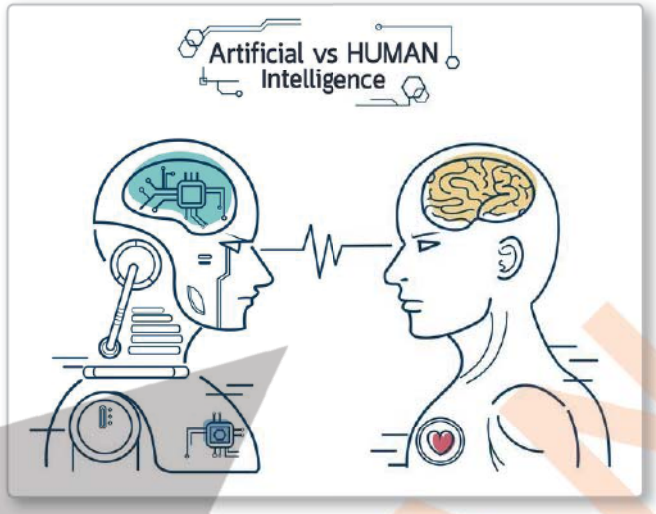
All of us love to play video games and you must have heard of the game Pac-man. Let us understand the game.

The game takes place in a maze. The player controls Pac-man whose task is to eat all of the dots placed in the maze while avoiding four ghosts. The exciting part of the game is that the four ghosts have their own personality controlled by the central AI system. Blinky (red) is the leader and consistently follows Pac-man. Inky (cyan) is a shy ghost and tends to follow Blinky. Pinky (pink) is a slow ghost which tries to trap Pac-man by predicting where he is likely to go. Finally, Clyde (orange) is a coward ghost which escapes as soon as Pac-man is closing by. Pac-man is a simple game, but the AI's actions can be seen in practice and easily understood.

Similar AI mechanics can be found in most games. In football games such as FIFA, the opposite team is controlled by the AI. In simulation games such as "The Sims", most of the other characters are handled by the AI. Practically all games use some form of AI!

Human Intelligence Vs Artificial Intelligence

So, how do these games achieve the intelligence to defeat their human opponent? It's because they learn the pattern of human behaviour. That is what we wish our machines to achieve through artificial intelligence. But, before we learn about that, let us first understand the difference between human intelligence and artificial intelligence.



S.No.	Parameter	Human Intelligence	Artificial Intelligence
1.	Nature	It aims to adapt to new environment by utilizing combination of different cognitive processes.	It aims to mimic human behaviour and perform human like actions.
2.	Functioning	Human beings use the computing power, memory and thinking power of their brain.	AI machines rely on data, specific instructions and learnings that are fed into their system.
3.	Learning Power	Humans learn from various incidents and past experience. Humans also learn from their mistakes made via trial and error approach.	Machine learn from data and continuous training. AI does not learn from their mistakes made via trial and error approach.
4.	Decision making power	Humans can make rational decisions.	AI machine make decisions based on events, the data they are trained on, how they are related to a particular event.
5.	Human factor	Humans possess the unique ability to learn and apply their acquired knowledge in combination with logic, reasoning and understanding.	AI machines cannot understand the concept of "cause and effect" simply because they lack common sense.

Need of AI

AI is probably the most powerful tool invented by humans. Consider your cell phone, for making a phone call you needed to suspend all the tasks and search the contact and then make a call. Today, AI has powered the phones, turning them into Smart phones with virtual assistants who would do the same thing without halting your ongoing task.

We need the power of AI to let the machine reduce our tasks that do not require specific skills, so that we could tend to do other productive work.

AI is used for the development of drugs and vaccines, and the reduction of workload of healthcare workers. It is also helpful for proper screening, tracking and predicting the current and future patients. The major applications of this AI are for early detection and diagnosis of the infections and diseases.

Terminologies Associated with AI

While understanding types of Artificial Intelligence we came across many terms like Big data, Past experience, Chat bots, Perceptions, etc. These terminologies are no longer alien and are now a part of our everyday vocabulary. Let us understand them.

Internet of Things (IoT)

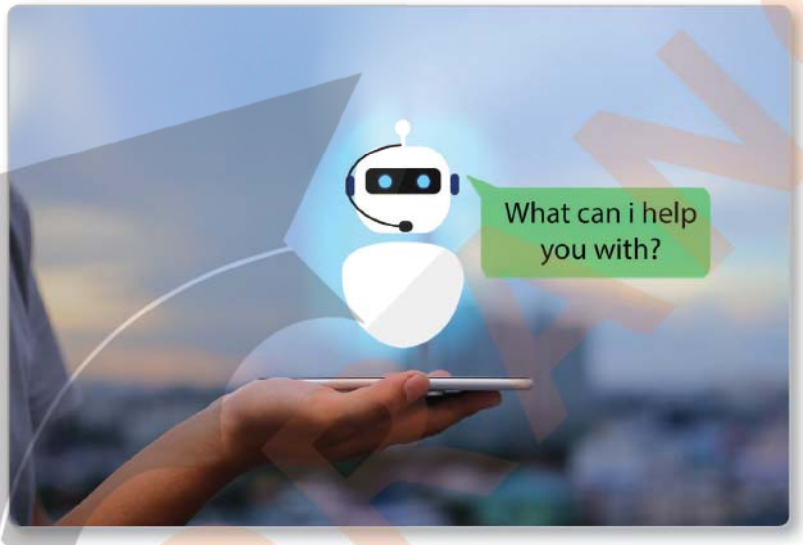
The term "Internet of Things" was coined by Kevin Ashton in 1999. This refers to the systems connected with each other through internet to collect and transfer data without any human intervention.

Real world application of IoT

- **Smart Devices:** These are part of an ecosystem of devices that can communicate with each other, for example, thermostat, surveillance camera, etc.
- **Smart Healthcare:** This includes a series of devices and programs that can be used for patient care and medical purposes, for example, Aarogya setu, Fitness bands, etc.
- **Smart Communication:** These devices assist in the integration of communications and control across various transportation systems which includes smart traffic control, smart parking, safety and road assistance, vehicle control, etc.
- **Smart Buildings:** These use IoT devices to monitor and control the mechanical, electronic systems in public, private, industrial, institutional or residential buildings.

Chatbot

A chatbot is an artificial intelligence application that can simulate a conversation or a chat with a user in a natural language through messaging applications, websites, mobile apps or through the telephone.

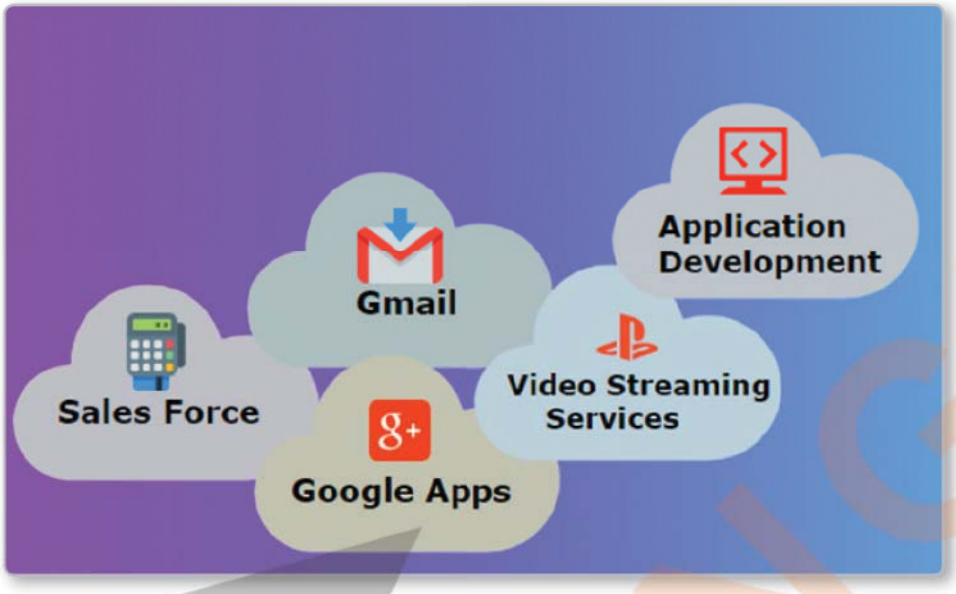


Real World application of Chatbots

- **Query resolution:** This chatbot is capable of answering FAQs in real For e.g., Slush.
- **Elimination of fill up forms:** These chatbots are capable of enriching customer conversations without form fill ups. For e.g., Vainu.
- **Financial queries:** It answers queries and provides suggestions regarding the policies and products. For e.g., LIC Mitra.
- **Travelling:** A digital interaction bot which offers help to passengers by providing answers to most common queries. For e.g., Ask DISHA by IRCTC.

Cloud Computing

When different types of services are delivered through internet, it is called Cloud Computing. AI integrated with Cloud Computing makes it more powerful. It is a very powerful technology and can be used to enrich almost all the existing computers and similar devices. This can be achieved by providing them with additional computing power and storage space.



AI empowered by Cloud computing is very powerful and it is going to be applied in many AI systems in future too.

Real world applications of cloud computing

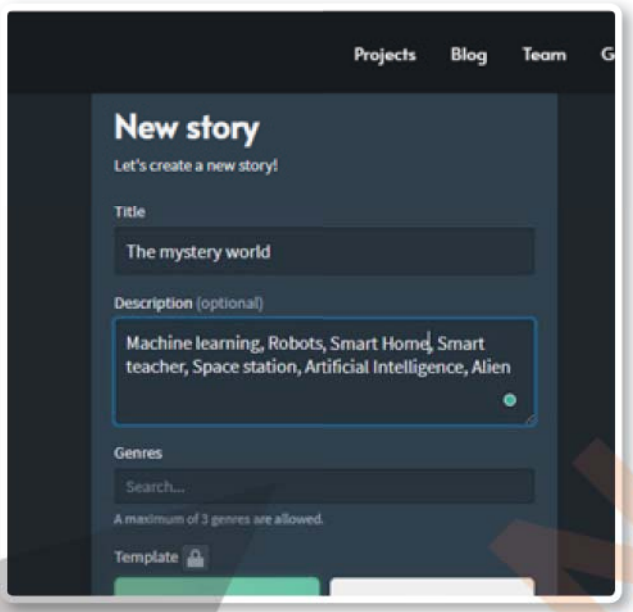
- **Online Storage:** There are various retailers who provide online storage for a nominal fee. For e.g, Dropbox.
- **Marketing Cloud platform:** These provide a platform for the marketing officials to connect with each other and communicate securely. For e.g, hubspot.
- **Education:** Cloud computing in education has opened new ways for the students to interact with each other and imrove their learning capabilities. For, e.g, SlideRocket.
- **Healthcare:** Often medical professional need to share huge amount of data quickly. Cloud computing helps to facilitate that conveniently and at low costs. For e.g, IBM Cloud.

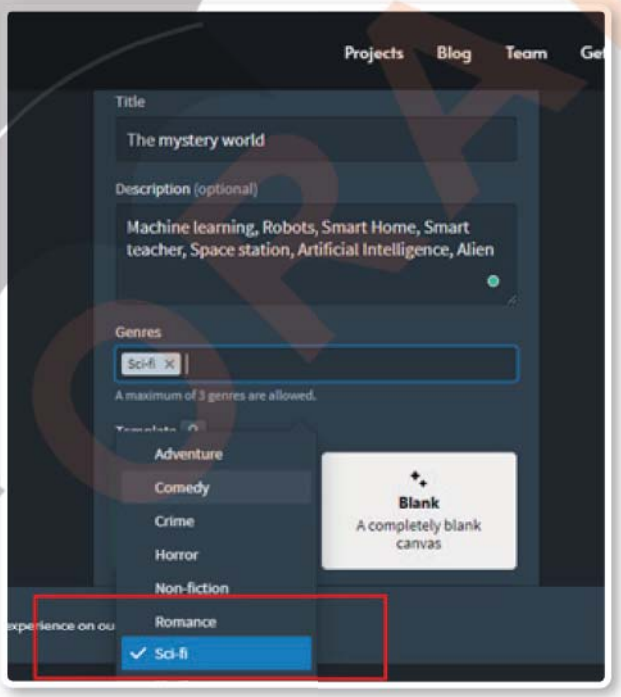
Creativity

AI GAME 01 Charisma AI

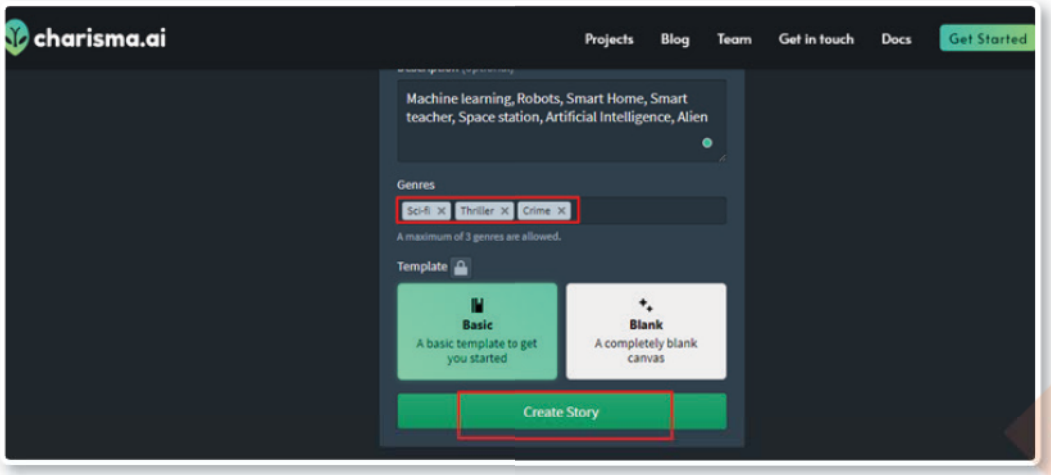
Charisma AI is AI based story teller and creator. You can create your own story using its various features.

1. Visit https://charisma.ai/ or scan the QR Code.





2. Click Preview it here.



You may watch a video to learn how charisma works on YouTube.

Visit https://www.youtube.com/watch?v=QQnp8MggqzE or scan the QR code.

Task

Develop a story using following words, Use your imagination, you may go beyond the reality of life you lead. Use words Machine learning, Robots, Smart home, Smart teacher, Space station, Artificial Intelligence, Alien. Share your story with your friends and teacher.

At a Glance

- AI can be defined as a computer program which is capable of executing a task which requires intelligence.
- There are many differences in Human intelligence and Artificial Intelligence. Human beings use computing power, memory, think power of their brain whereas AI machine relay on big data, instructions and learning that are fed into their systems.
- We need machines to be Artificially Intelligent to let them reduce our tasks that do not require specific skills so that we could involve in other productive work.
- AI is being used in tandem with a variety of fields, such as Chatbot, IoT, Cloud computing.

Ai Quiz

A. Tick (✓) the correct option.

1. In which of the following year Kevin Ashton coined the term "Internet of Things"?

a. 2005 ◯ b. 2003 ◯

c. 2000 ◯ d. 1999 ◯

2. Which of the given option is a programming language?

a. Excel ◯ b. MS Word ◯

c. Python ◯ d. Notepad ◯

3. Which of the following refers to the services delivered through the Internet?

a. Logical thinking ◯ b. Cloud computing ◯

c. Business computing ◯ d. Local computing ◯

4. Which of the following can be used for voice search?

a. Cortana ◯ b. Siri ◯

c. Alexa ◯ d. All of these ◯

5. ..... is a computer program that uses artificial intelligent methods to solve problems using specialised skills.

a. Computer System ◯ b. Expert system ◯

c. Number system ◯ d. Echo system ◯

6. Which of the following artificial intelligence application can simulate a conversation with a user?

a. Robot ◯ b. IoT ◯

c. Chatbot ◯ d. Cloud Computing ◯

7. Which of the following is an app that helps travelers?

a. Mitra ◯ b. Diksha ◯

c. Disha ◯ d. Vainu ◯

Exercise

A. State whether these statements are true or false.

1. AI is used for the development of drugs and vaccines, and the reduction of workload of healthcare workers. .....
2. Chatbot does not use Natural Language Processing. .....
3. Chatbots are not beneficial when it comes to handling most common queries. .....
4. IoT helps a device to interact with another device with the help of Internet. .....

B. Fill in the blanks.

1. ..... aims to mimic human behaviour and perform human like actions.
2. The term "Internet of Things" was coined by ..... in 1999.
3. A ..... is an artificial intelligence application that can simulate a conversation or a chat with a user.

4. ..... in education has opened new ways for the students to interact with each other and improve their learning capabilities.

5. ..... use IoT devices to monitor and control the mechanical, electronic systems in public, private, industrial, institutional or residential buildings.

C. Answer the following questions.

1. What is Artificial Intelligence?
2. Name any two games based on AI.
3. How Artificial Intelligence is different from Human Intelligence?
4. Write any two applications of IoT.
5. Write a short note on Cloud Computing.

Ai Lab

Experiential Learning

1. Prepare a Table in MS Word of things that you find around you which has some intelligence. State the reason what makes you think that those machines have intelligence.
2. Prepare a PowerPoint presentation and imagineyou are in year 2030, how would you like your home to be. What kind of power you would like to give to your home appliances etc.

2 ROBOTS AROUND US

Learning Outcomes

- Characteristics of Robots
- AI and Non-AI Robots
- Artificial Intelligence in Robotics

What comes to your mind when I say robots?

Robots are giant machines with very long legs; when they walk, the whole whole earth trembles and they have colossal bodies and machine guns that kill whatever comes their way.

I resemble any of the descriptions you gave just now?

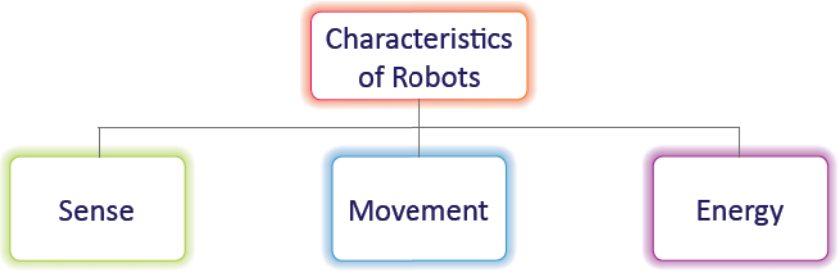
You are not a robot. Are you? When dad gave you to me as a birthday gift, he said you are my buddy and a humanoid.

Right, I am a humanoid robot. So in this chapter, let me introduce you to my ancestors and some of my companion robots.

Robots are machines programmed by computers capable of automatically doing difficult or complex tasks. There is no precise definition for a robot. If you look at modern robots, you can say that they are electro-mechanical devices that can follow instructions to carry out specific jobs.

Characteristics of Robots

There are some essential characteristics that a robot must possess. These characteristics define whether any machine is a robot or not. Some of the characteristics of robots are as follows:



Let us learn about these in detail.

Sense

Robots have some sensors that enable them to sense and create awareness about their surroundings and act accordingly. Just like humans have sense organs, robots may possess one or more sensors like:

- Light Sensors: work as eyes for robots
- Touch or Pressure Sensors: work as hands for robots
- Chemical Sensors: work as nose for robots
- Hearing and Sonar Sensors: work as ears for robots

Movement

A robot needs to be able to move around its environment. It may roll on wheels, walk-on legs, etc. In the case of robots, the movement can be of the whole body or just the arms. In humanoid robots, the entire body moves but for some industrial robots, only their arms move and function.

Energy

To function or work, a robot needs power. It can work on solar power, electric power, or can be battery operated. Which kind of energy will be best for the robot is decided by the task it needs to perform. Heavy-duty robots that work in industries may be electrically powered, whereas a robot on Mars may be solar-powered.

Artificial Intelligence in Robotics

Robotics is the field where machines are programmed to perform tasks automatically. The most common use of robots is to do either the tasks that are too difficult for a human to perform or repetitive tasks.

Artificial Intelligence is a technology where machines emulate the human mind to learn, solve problems and make decisions.

When Robotics and AI come together, we receive robots that would demonstrate human intelligence.

AI and Non-AI Robots

With new advancements in the field of Artificial Intelligence, more and more robots are coming into the market with artificial intelligence leaving a thin difference between them.

All the robots that are available in the market are not AI-enabled. Some of them are non-AI robots that look similar to AI robots. Let us understand the AI and non-AI robots.

AI Robots

AI gives robots a computer vision to navigate, sense and calculate their reaction accordingly. These robots are called AI-enabled robots. Let us learn about some of the popular AI robots.

Kuri

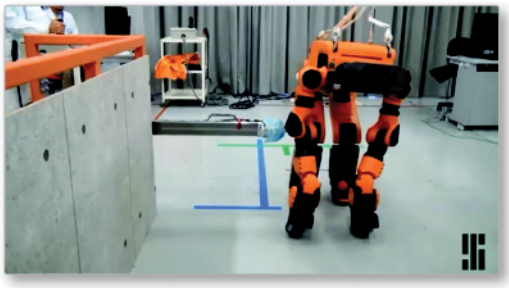
It is also known as an intelligent robot which can understand context and surroundings, recognise specific people and respond to questions with facial expressions, head movements and unique sounds.

Sophia

A humanoid is a kind of robot which resembles a human. Sophia is, till now, the most famous social humanoid. It was released in 2016, and now she has become a media personality. She can display up to 60 facial expressions and is capable of keeping track and recognising faces. She is the first humanoid to receive citizenship in Saudi Arabia.

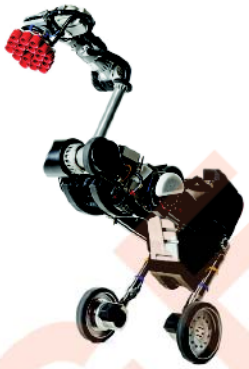
Aibo

Aibo is a robotic dog. It can develop emotional bonds with family members and provide love, affection and joy in nurturing and raising a companion.



E2-DR

E2-DR is a disaster relief robot. It can walk like humans. It is flexible, solid and waterproof. It is capable of handling a variety of different potential issues caused in a disastrous situation.



Handle

The "handle" can navigate on a small wheel. It can roll back and forth, spin in circles, go down steps, jump, squat and pick up boxes. It can plot paths in snowy hills and perform stunts too.

NASA Puffer

Puffer is a space rover from NASA. It is lightweight, can fold in narrow terrain, and expand on flats. It can also wholly flatten itself to crawl and move under a shallow surface.

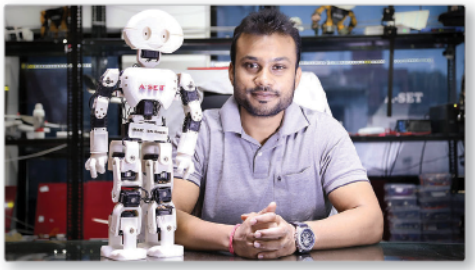
Snake Robot

It is a search and rescue device. Imagine after an earthquake it could reach trapped survivors to supply water. It has a fixed tail on one end and the other end has a camera. The movement is always in the camera's direction.

Humanoid Shalu

Humanoid robot Shalu is artificially intelligent. It is a multilingual and social humanoid robot made up of waste material. Shalu can speak 47 languages, of which 9 are Indian languages and 38 foreign languages. Inspired by the Bollywood movie robot, a Mumbai-based teacher Dinesh Patel has developed Shalu.

Some other humanoids are also available like Manav is India's first 3D-printed human robot. This robot is invented by Diwakar Vaish.



Rashmi is the world's first Hindi-speaking and India's first realistic lip-syncing humanoid robot. This robot is invented by Ranjit Shrivastava.

Non-AI Robots

On the other hands, the robots which work automatically but have no intelligence and no ability to sense are known as non-AI robots.

Cobots

Cobots are also called collaborative robots. Cobots work alongside human beings. A Cobot is designed to work with people and not to replace people.

Cobots are also called people-focused robots and can help people make their work easy. Cobots are used by manufacturers of lighting, mobile phones, speakers, computers, and more.

Industrial Robots

Industrial robots are also known as non-AI robots. Typical applications of these type of robots include welding, painting, assembly, palletising, product inspection, and testing; all accomplished with high stamina, speed, and accuracy. They can assist in material handling.

Agriculture Robots

The main area of application of robots in agriculture today is at the harvesting stage. Emerging applications of robots or drones in agriculture include weed control, cloud seeding, planting seeds, and soil analysis. Robots are used to pick apples, gather strawberries, harvest lettuce and strip away weeds.

AI GAME 01 Thing Translator

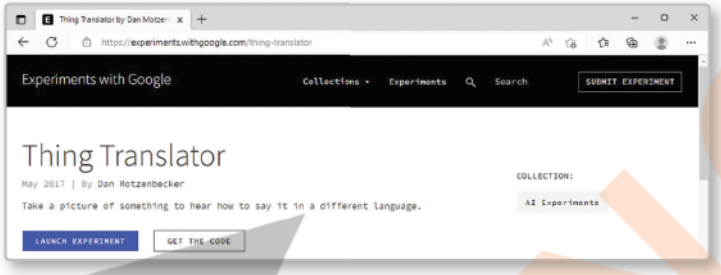
Art Integration

Thing Translator is an AI-based game which takes a photo of an object and identifies it. After identifying the object, the game says it in different languages. It is very helpful in learning how to say an object in other languages. You must have a web camera and speakers attached with your computer to play this game. Perform the following steps to play the game:

Step 1: Visit the following link OR scan the QR code to play the game:

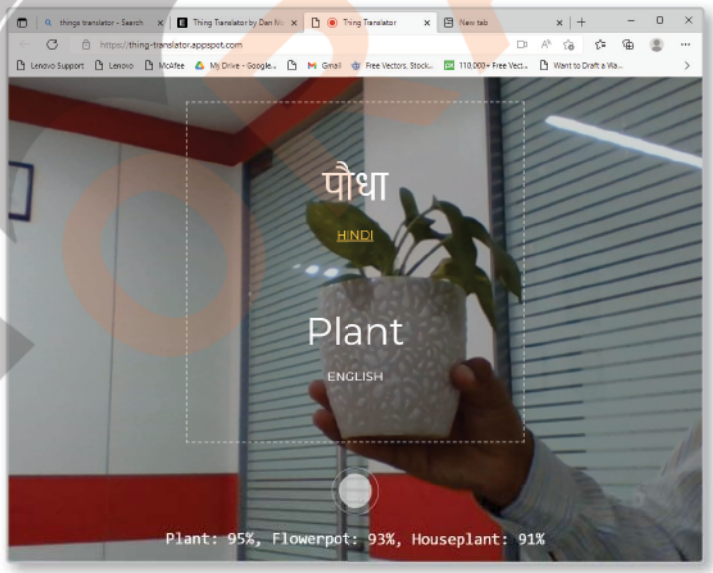
https://experiments.withgoogle.com/thing-translator

Step 2: Click on **LAUNCH EXPERIMENT** button. The game will ask you to open the web camera to take the picture of an object.



Step 3: Place an object in front of the camera and choose a language in which you want to listen the object name.

Step 4: Click on Capture button. The game will identify the object and says its name in the selected language. In this case, the language is Hindi. You can choose any of the available languages like German, Spanish, etc.



Inter-Disciplinary

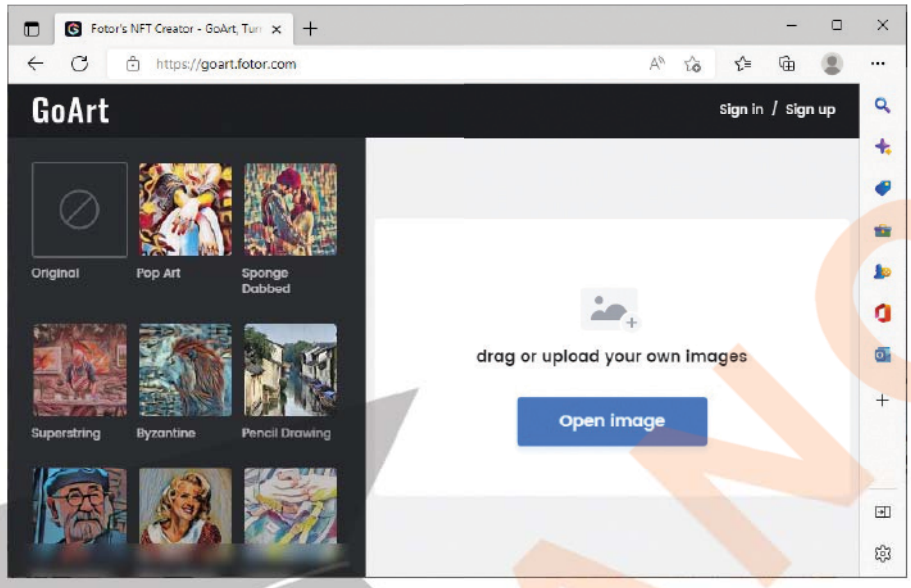
AI GAME 02 Foto GoArt

Foto GoArt is an AI-enabled game to convert your photos into paintings. Perform the following steps to play this game:

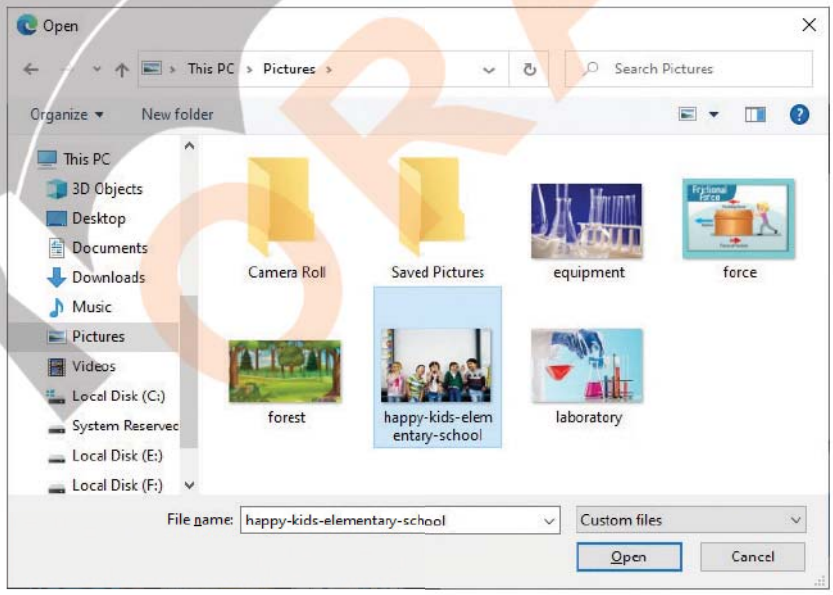
Step 1: Visit the following link OR scan the QR code to play the game:

https://goart.fotor.com/

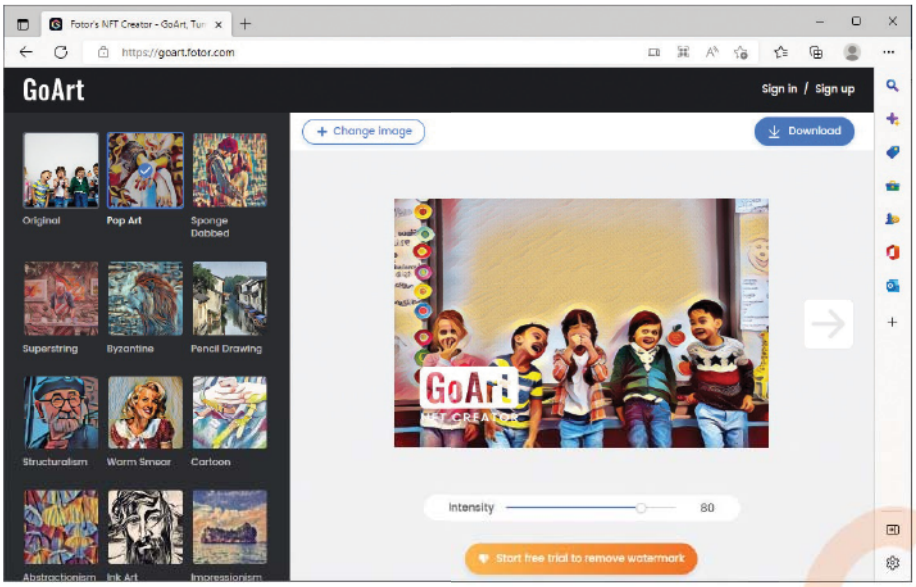
Step 2: Click on the **Open image** button. A dialog box appears.



Step 3: Select the image and click on the **Open** button.



Artificial Intelligence used in the game will convert the photo into painting.



At a Glance

- Robots are machines programmed by computers capable of automatically doing difficult or complex tasks.
- Robots have some sensors that enable them to sense and create awareness about their surroundings and act accordingly.
- A robot's movement depends on its functions.
- When Robotics and AI, co-exist, we receive robots that would demonstrate human intelligence and emotions.
- Hanson robotics, Sophia is one of the most famous social humanoid.
- Cobots are also called collaborative robots that work alongside human beings.

AI Quiz

Tick (✓) the correct option.

1. E2-DR is a ..... robot.

   a. pet ○ b. domestic ○

   c. disaster relief ○ d. agriculture ○

2. A robot can work on ..... .

a. Solar power ◯ b. Electric power ◯

c. Battery ◯ d. All of these ◯

3. Which of the following is the world's first Hindi-speaking humanoid?

a. Shalu ◯ b. Rashmi ◯

c. Manav ◯ d. Sophia ◯

4. Shalu is a ..... humanoid.

a. multilingual ◯ b. domestic ◯

c. industrial ◯ d. non-AI ◯

5. To function or work, robots need ..... .

a. humans ◯ b. support ◯

c. energy ◯ d. food ◯

Exercise

A. State whether these statements are true or false.

1. Aibo is a robotic dog. .....
2. Puffer is a space astronaut from NASA. .....
3. The main area of application of robots in agriculture today is at the harvesting stage. .....
4. All the robots are artificially intelligent. .....
5. Cobots cannot work with humans. .....

B. Identify the robots and write their names:

1. .....

2. .....

3. .....

4. .....

C. Fill in the blanks.

light Manav intelligent collaborative electro-mechanical

1. Kuri is also known as an ..... robot.
2. Cobots are also called ..... robots.
3. ..... is India's first 3D-printed human robot.
4. Modern robots are ..... devices.
5. The ..... sensors work as eyes for robots.

D. Answer the following questions:

1. Write the names of any three sensors a robot has.

.....

.....

2. Define robotics.

.....

.....

Ai Lab

Life Skills & Values

1. Watch the following video by visiting the given link or scan the QR code:
   https://www.youtube.com/watch?v=DR1awEMAq2Y
   Now, write four lines about the video in Word.
2. Prepare a Word document on any two robots that are useful in everyday life. Use images of the robots wherever required.

AI Task

Experiential Learning

Surf the Internet and try to find a game that has a prominent AI character in the gameplay. Paste a picture of the game in the space given below and write 100 words about the character. You may even draw the character yourself.

NAME:

ABOUT:

ORANGE

@orangeeducation

Orange Education

Adding Value to 'Education'

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