1 Motivate with AI

Structure

In this chapter, we will discuss the following topics:

- Meaning of the term Artificial Intelligence
- Applications of Artificial Intelligence in our daily lives
- Three domains of Artificial Intelligence
  - Data for Artificial Intelligence
  - Natural Language Processing
  - Computer Vision
- Conclusion
- Questions and Answers

Objectives

At the end of this chapter, you should be able to:

- Understand the concept of Artificial Intelligence.
- Demonstrate /discuss/ elaborate the use of AI applications in our daily lives.
- Determine the type of domains used in various AI applications.
- Interact and explain the use of AI domains in various applications.
- Learn to relate with Artificial Intelligence Domains, namely, Data for Artificial Intelligence, Natural Language Processing, and Computer Vision.

What is Artificial Intelligence?

Let's start by asking a few questions.

1. What things are easy for computers to do that are hard for humans?
   a. Math problems such as adding/multiplying/dividing
   b. Searching for an item from a list
   c. Sorting items based on a particular attribute (numbers, letters, words, and so on.)
2. What tasks are easy for humans to do that are hard for computers?
   a. Voice recognition – sarcasm (emotion)
   b. Voice recognition – the context and semantics of language
   c. Image recognition – finding objects in images
   d. Facial recognition – recognizing someone in a photo

3. What makes a human intelligent?

Artificial Intelligence, or 'AI', is the new face of technological innovation responsible for the new age changes all around us. Teaching awareness about Artificial Intelligence is an important step in aiding today's generation to comprehend the restrictions, challenges, prospects, ethics, and menaces of using technology. Along the same lines, it is equally necessary to be able to create technological solutions using elements of AI to new modernizations.

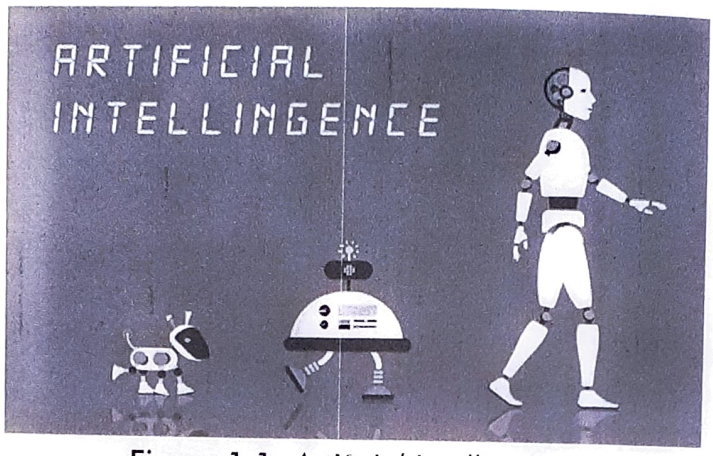


Figure 1.1: *Artificial Intelligence*

Artificial Intelligence (AI) was first coined in 1956 by a cognitive scientist, John McCarthy, at the Dartmouth Conference—the first Artificial Intelligence conference. The main thought behind the project was to explore ways to make a machine that could reason like a human, was capable of abstract thought, problem-solving and self-improvement. Artificial Intelligenceis the creation of machines to impersonate human capabilities such as teaching a machine to be able to distinguish objects in an image and to listen, deduce, and evaluate sounds.

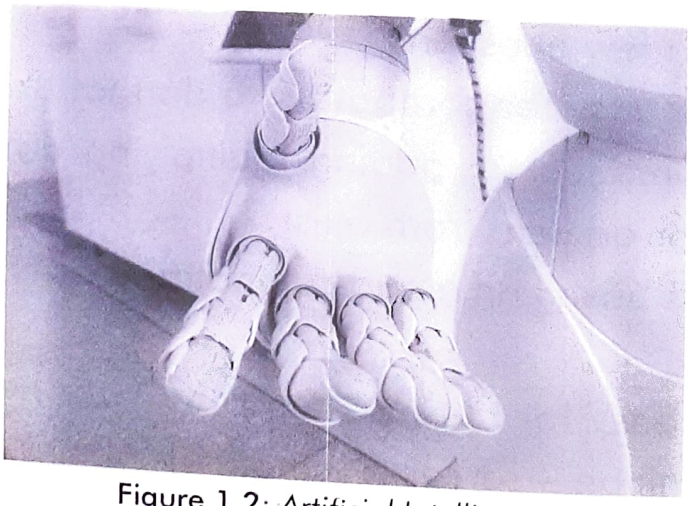


Figure 1.2: *Artificial Intelligence*

There are multiple areas where AI has made a lot of progress in the past years. AI systems have been used across areas creating solutions for individuals and

society. Four main areas where AI has made the most possible advancements till date are as follows:

- To see
- To communicate
- To move
- To think

Figure 1.3: *Waymo: driverless car*

Self-driving vehicles are cars or trucks in which human drivers are never required to take control to safely operate the vehicle. Also known as autonomous or 'driverless' cars, they combine sensors and software to control, navigate, and drive the vehicle.

The AI app is one of the many apps that has several provisions that communicate with other technologies which are useful to users with visual impairments.AI expanded microscopes are used by pathologists for real-time detection of cancer, thus saving patients' lives. AI supported apps can even help people with visual impairments to use the touch feature of the app to explore the objects and people in photos based on data generated by converting visual data into audio feedback. In recent developments, a team of international astronomers captured an image of a black hole's silhouette by creating a network of telescopes known as the Event Horizon Telescope. There are multiple language translators available online which assist in communication. There are many online portals available which help us in learning the language online. Such users help in improvement of AI associated with translating languages.

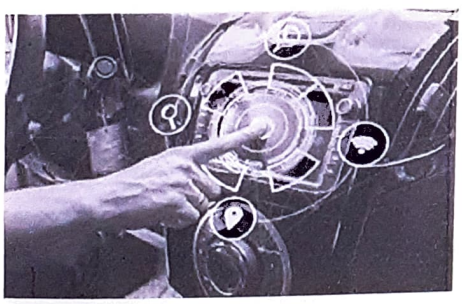


Figure 1.4: *AI in transport*

Figure 1.5: *AI in Food production*

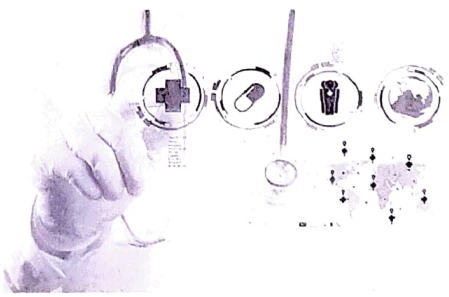


Figure 1.6: *AI in Health care*

Recent technologies such as Siri, Google Assistant, Alexa, AI-based chat bots, and so on provide interactions using Natural Language Processing in interpreting user questions providing meaningful solutions and information such as news, weather, time, and directions. Very recently, Harish Natarajan who holds the world record for the highest number of international debate victories was served a convincing argument by IBM's 'Project Debater' about

a given topic which it had not been programmed to learn. This was the first time an AI machine was able to do so.

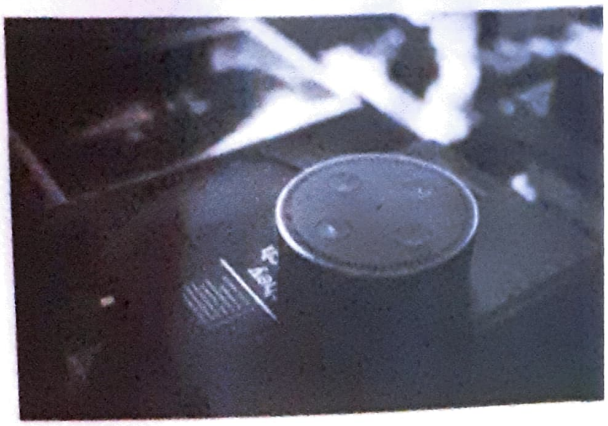


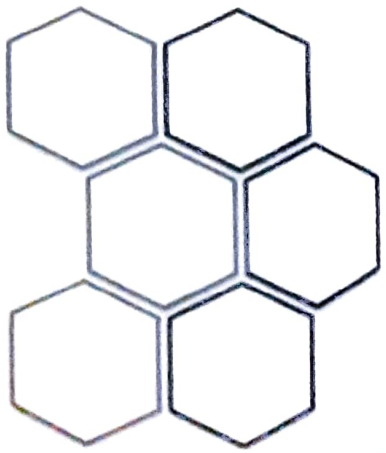
Figure 1.7: AI device - Alexa

Figure 1.8: AI device - Cortana

AI systems are also capable to think based on logic-based and pattern matching algorithms to beat humans in games like chess. Two examples are IBM's 'Deep Blue', which holds the record of beating the world chess champion in 1997 and Google Deep Mind's Go-playing AI, 'Alpha-Go' defeated the world champion in 2017. Robotics has made a huge impact using technology where they can learn to perform actions like humans. Assistive robots and drones have been used in search and rescue, bomb squads, and agriculture.

Activity 1.1: Let's pen down our thoughts here to understand how AI can help in our daily lives. Also, mention a few areas where AI is used in our daily lives.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____



To sum it up, we can easily state a few uses of AI in our everyday life.

1. Music and Media: Artificial Intelligence is helping users to find music and media of their choice on apps like Spotify, Netflix, or YouTube. This is done by AI algorithms, which learn about user selections

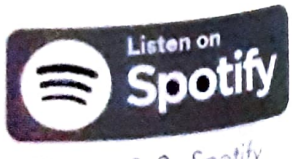


Figure 1.9: Spotify

done regularly over a time period and hence provide recommendations to add to one's playlist.

2. Smart Home Devices: Artificial Intelligence is used in smart home devices to adjust the house temperature and lighting based on one's preferences.

3. Online services: Industries ranging from travel to banking, shopping, and entertainment rely heavily on Artificial Intelligence for using chatbots or through algorithms that enable it to track spending, suggest purchases, prevent fraud, and complete other transactions much faster.

4. Smart phones: AI integration in mobile technology is bringing features like face detection, virtual reality elements, photo editor, and many more to name some. A huge emphasis on AI is quite evident with the latest Android and iOS updates. Many new features like app actions, splices, and adaptive battery in Android Pie and Siri shortcut and Siri suggestions in iOS 12 have been made possible with AI.

Figure 1.10: *Smartphone*

5. Smart Cars: A huge progress is evidently seen with automatic cars on the road. Tesla cars are a prime example of how the AI is impacting our daily life. An estimated 50,000 Tesla cars are running in the US alone.

6. Social Media Feeds: Artificial Intelligence plays a vital role on one's actions on Social media apps. The feeds that you see in your timeline along with the notifications that you receive from these apps is curated mainly by AI. A user's past behavior, web searches, interactions; namely, one's Digital Footprint tailors the experience for that user. Such intentions only make the apps so addictive that you come back to them again and again.

7. Video Games: Every user that plays a game such as PUBG or Fortnite essentially starts playing against a couple of AI-powered bots and then move to play against real players in consecutive levels. If you are playing racing games, you are racing against AI bots.

8. Online Ads Network: The online advertisement industry uses AI to not only track user statistics but also serves user ads based on those statistics. The online ad industry will just fail if it were not relying heavily on the user preferences and past behaviors. It would show random ads to users with no connection to their preferences. The user surveys aid to data collection algorithms which help set the repetition or display of such advertisements online.

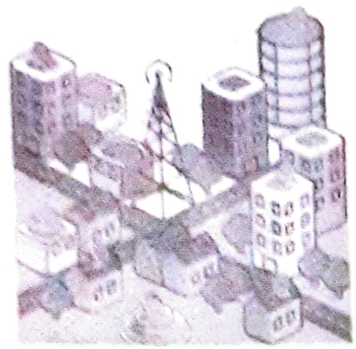


Figure 1.11: AI in navigation

9. Navigation and Travel: Artificial Intelligence is used to interpret hundreds of thousands of data points that they receive with user inputs to suggest real-time traffic data. Google Maps and Waze are one of the few examples along with others which are used for navigation services. While calling an Uber or Ola, both the pricing and the car that matches one's ride request is decided by AI algorithms.

10. Security and Surveillance: With latest developments in technologies like object recognition and facial recognition getting better every day, soon all the security camera feeds will be monitored by AI and not a human.

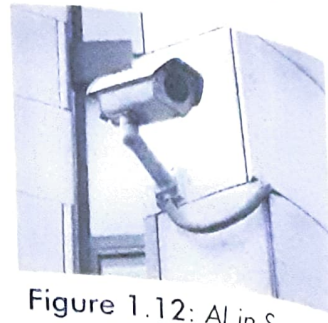


Figure 1.12: AI in Security

Dream Smart Home

The dream of creating smart homes which help us in our everyday lives has been made possible with the latest innovations in the field of sensors, neural networks, engineering, and Artificial Intelligence.

Figure 1.13: Smart Home

Figure 1.14: Smart Home

Smart homes are used for several purposes. They can improve comfort at home, reduce energy consumption, and enable automation of household chores. They can provide a better-quality entertainment by adapting their behaviors to the preferences of residents.

However, many scientists believe that the field of smart homes will reach its full potential by providing health assistance to impaired or frail persons and aid in assisted living.

Activity 1.2: Let's investigate some of the technologies which might be available to us in the future.

1. Watch the video at https://youtu.be/CPH1sAY8Vhg very carefully and fill the organizer.
2. Identify five different technologies which you saw in the video and expect them to be available at home in the near future.

1. _____
2. _____
3. _____
4. _____
5. _____

Activity 1.3: Design a floor plan of your ideal Smart Home which could have different technologies in the future. Clearly, earmark all rooms, garden, swimming pool, and so on and title them accordingly. Also, list the gadgets which could be in your Smart Home.

List the Smart Gadgets that could be in your Smart Home.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

A floor plan example can be as follows:

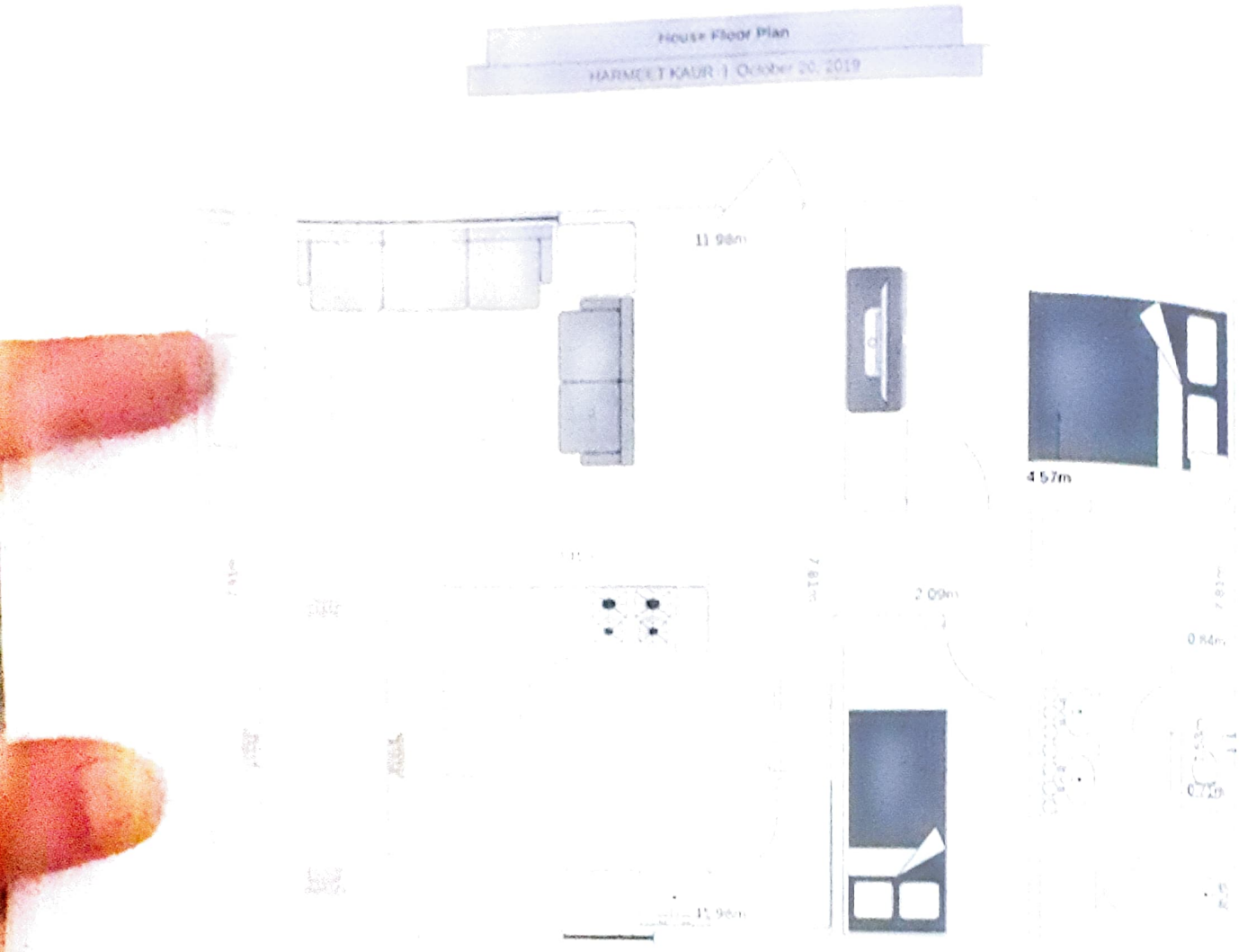


Figure 1.15: *Smart Home Floor Plan*

Gamification

It is the process of adding game-like components to a task so as to encourage user participation. It helps in combining fun with non-game activities to understand a concept better. The process uses data-driven techniques to engage players and motivate learners.

The latest research in AI has focused chiefly on the following components of Intelligence: learning, cognitive, logic building, observation, analytics, and understanding vocal commands. Fun features such as winning badges and leader boards add an extra edge to the whole learning process.

How is Artificial Intelligence used in games?

In video games, Artificial Intelligence (AI) is used to generate responsive, adaptive or intelligent behaviors primarily in non-player characters (NPCs) similar to human-like Intelligence.

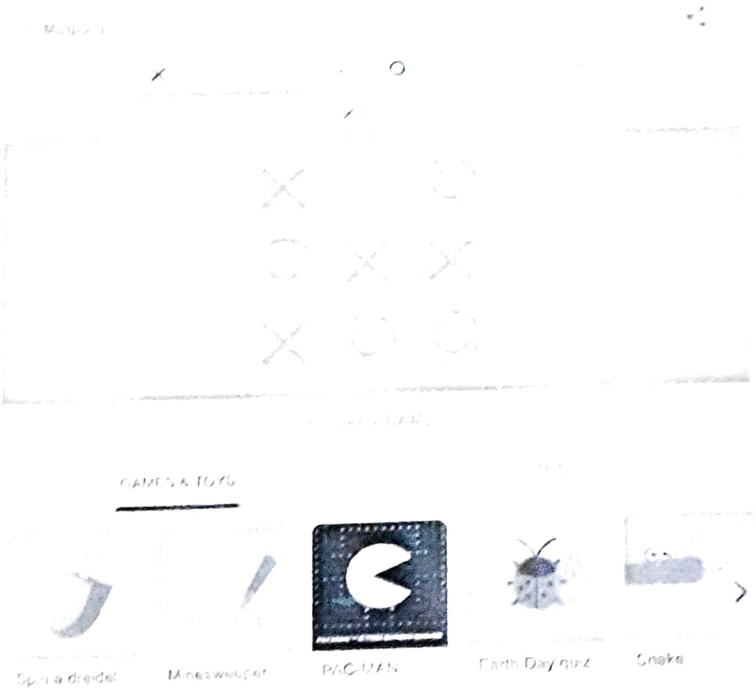


Figure 1.16: Gamification

Games play a very important role in our lives. Game-based learning makes students very enthusiastic and it becomes very easy to make them understand the concept. They like to collaborate, communicate, interact, and work in teams. Gaming actually creates the atmosphere that inspires learners to develop skills and build an emotional connect with the subject which is very difficult otherwise.

Research has shown that it is very easy to make the student learn by play way method. Each game has the object of the game, players and equipment, scoring, and winning. So, a game has certain set of rules before we start playing.

Game 1: Rock-Paper-Scissors

Let us talk about Rock-Paper-Scissors, which is a hand game. Let us understand some set of rules for the game:

1. We require two players.
2. Each player simultaneously forms one of the three shapes with an outstretched hand.
   a. If you show a flat hand that means a paper.
   b. If you show a closed fist that means a rock, and if you show a fist with the index finger and middle finger extended forming a V that means a scissor.
3. It has only two possible outcomes: either a draw or a win.
4. A player who decides to play a rock wins over the one who shows scissors (rock crushes scissors) but lose to one who plays a paper (paper covers rock). Scissors win over paper (as scissors cut paper). If both the players choose the same shape, the game is tied.

5. The players usually count 1, 2, 3 or speak Rock, Paper, Scissor, and then swing it in front of one another.

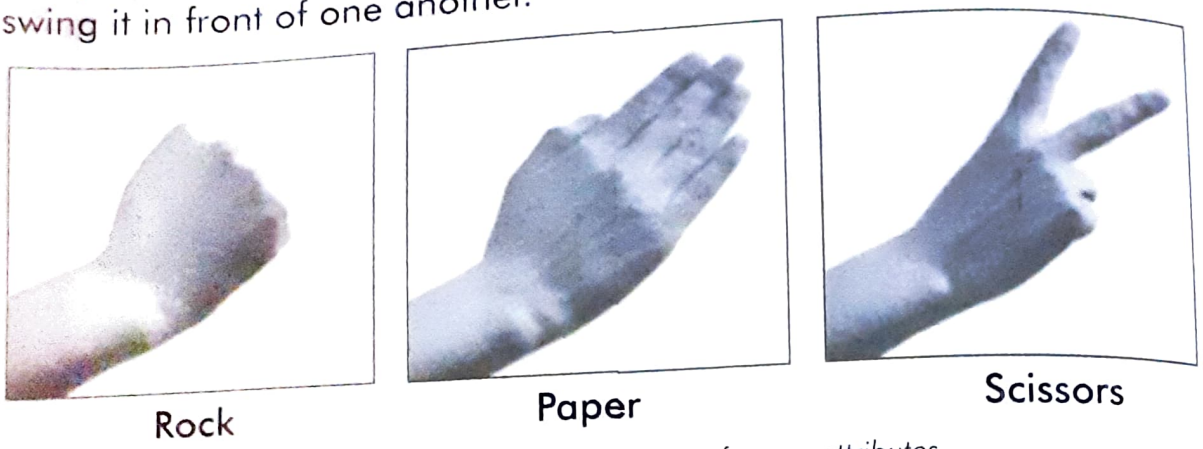


Figure 1.17: *Image representations of game attributes*

Using this game, one player is always trying to predict the next move of another player. Also, remembering the moves and predicting from the previous moves, the game is played.

Activity 1.4: Let us play Rock, Paper, Scissors game on a computer based on Data and try to understand how we can play against a computer.

1. Step 1: Open the link: https://www.afiniti.com/corporate/rock-paper-scissors.

   Prerequisite to play this game:

   Open the link in a web browser on your device.

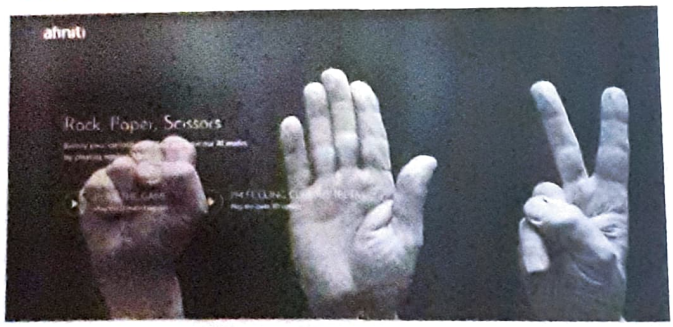


Figure 1.18: Screenshot image of the game

2. Step 2: Click on Play the Game.
3. Step 3: Click on the shapes which you want to choose and play against the system. The result will be shown after each move.

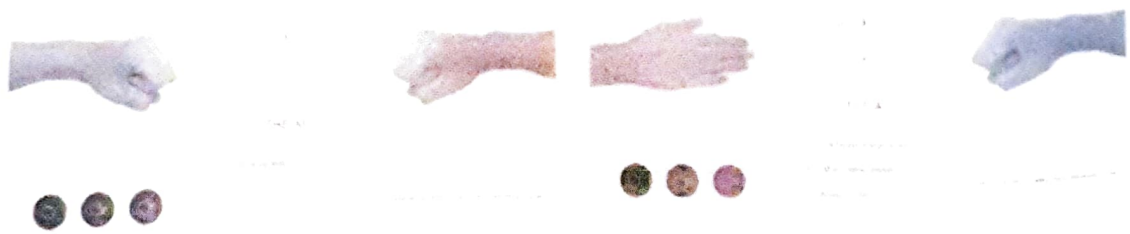


Figure 1.19: *Screenshot of the game in action*

After playing this game, you must have observed that the system is predicting your next move by identifying the patterns of your game behavior. The system is actually analyzing your previous moves' strategy to predict the next move. Therefore, the system is collecting data (that is, your previous moves in this game) and then analyzing it to decide the next move. Collecting data and analyzing it is known as Data for Artificial Intelligence.

Activity 1.5: Write any three things you learned from the game.

1. _____
2. _____
3. _____

Activity 1.6: Write the requirements to play Rock, Paper and Scissor:

1. Internet Connection _____
2. _____
3. _____

Game 2: Mystery Animal

Let us play another game using a computer that is Mystery Animal. Before starting the game, please read the instructions carefully. Let us understand some set of rules for the game:

1. A microphone must be attached to your computer.
2. The participant needs to ask a question to the computer in such a manner that will be answered by the computer in YES or NO form only.
3. The participant gets a chance of asking only 20 questions to decide upon the name of the animal.

Activity 1.7: Let us play the game of Mystery Animal based on Natural Language Processing (NLP).

1. Step 1: Open the following link in Google Chrome browser:

https://mysteryanimal.withgoogle.com/

Figure 1.20: Screenshot of the game in action

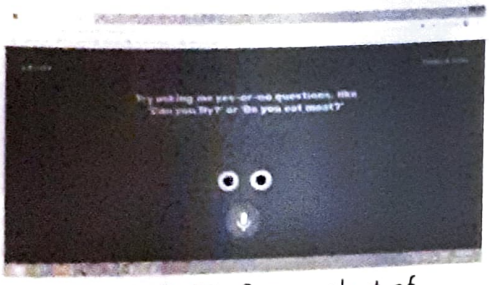


Figure 1.21: Screenshot of the game in action

2. Step 2: Click on PREVIEW IT HERE and start playing the game.

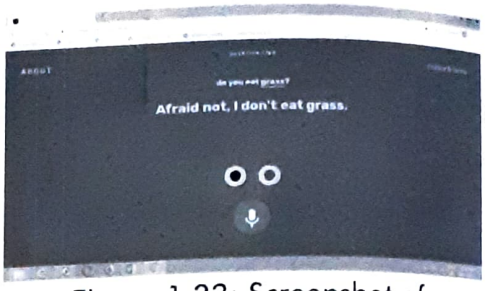


Figure 1.22: Screenshot of the game in action

3. Step 3: Click on the microphone button and start asking a question which has needs to be answered in YES or NO.

After playing this game, you must have observed that as you ask a question on the computer's microphone, it gets typed by the computer. Thus, in this game, the computer is processing whatever questions are asked by you. The questions have to be in logical form with either of the answers YES or NO. A maximum of 20 questions can be asked where the animal randomly gets selected for each game by the machine.

Natural Language Processing (NLP): It is the technology used to aid computers to understand the human's natural language such as English. Processing of the natural language is required when an intelligent machine needs to perform some actions based on instructions given by you.

Activity 1.8: Mention three things you understood about the game.

1. _____
2. _____
3. _____

Activity 1.9: Write the requirements to play Mystery Animal.

1. Internet Connection _____
2. _____
3. _____

Game 3: Emoji Scavenger Hunt

Let us play another game known as Emoji Scavenger on a web browser. Some of the rules to play the game are as follows:

1. A webcam must be attached to your computer or the user can make use of the camera of your Smart phone / tablet.
2. The player must have access to a few of objects used in everyday lives.

Activity 1.10: Let us play the game of Emoji Scavenger Hunt based on Computer Vision.

1. Step 1: Open the following link in a web browser:

   https://emojiscavenger hunt.withgoogle.com/

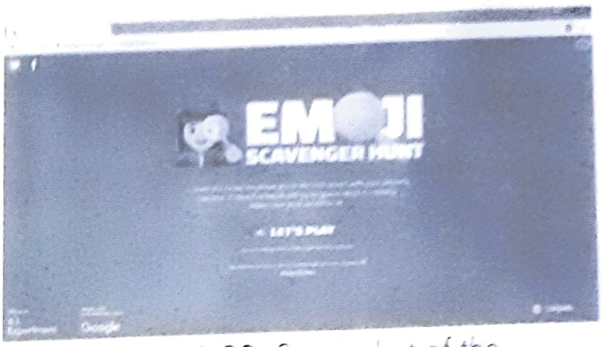


Figure 1.23: Screenshot of the game in action

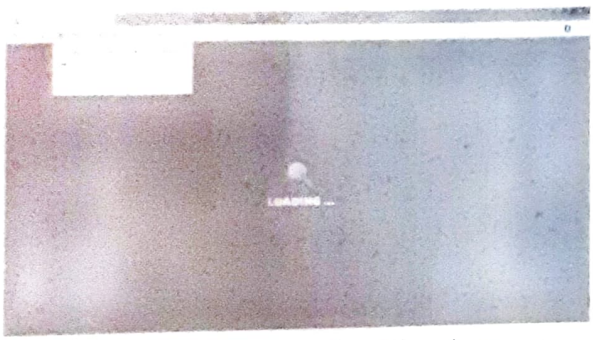


Figure 1.24: Click on the Allow button to make use of the web camera

2. Step 2: Allow the camera and microphone and then start playing as per the instructions coming on the screen.

3. Step 3: Show the image on the camera so that it can detect the image and match it with the object asked in the Find. The Find box displays the icon of the image being searched to be shown in the camera.

   Emoji Scavenger Hunt is a game based on Computer Vision where the machine initiates the game by showing emoji. The participant is expected to show a similar object in front of the camera while the machine keeps on guessing what is being shown to it.

Figure 1.25: Show the picture of a book in front of the camera

Computer Vision: It is the science and technology of machines that see. It is concerned with the theory and technology for building Artificial systems that obtain information from images.

Activity 1.11: Did you face any difficulty while playing this game? How did you overcome this?

1.
2.
3.
4.

Activity 1.12: Write the requirements to play Emoji Scavenger Hunt.

1. Internet Connections
2.
3.
4.

Food for thought #1

Rock, Paper and Scissors How does the machine react if you: • Move in a specific pattern • Make moves randomly	
Mystery Animal What kind of questions would you ask the computer to figure out the basic characteristics of the animal?	
Emoji Scavenger Hunt How would the machine react if you were to show an emoji drawn on the paper to the machine?	

Food for thought #2

Activity 1.13: Write a letter to your future self, keeping the following points in mind.

1. Mention what you have learned about Artificial Intelligence.
2. Mention the skills you would like to learn and acquire for availing future jobs.

Solution: Letter to Future Self

Hello My Future Self,

Artificial Intelligence is combining Intelligence with Artificial devices. Artificial Intelligence refers to computer systems with combination of hardware and software that are capable of performing special tasks such as recognizing multimedia such as images, videos, speech, etc. which influence decision making and strategic planning.

An efficient AI computer system is capable of carrying out behavioral tasks that require humans to use their common Intelligence. Representation of facts and information, learning problem solving skills, detailed perceptions with reasoning, enhancing creativity and understanding net etiquettes, and social Intelligence are primary skills required for understanding Artificial Intelligence.

Artificial Intelligence makes the machine behave like humans. It allows the machine to imitate human cognitive processes which includes seeing around, learning from experiences and patterns, and process the language to understand and perform an action.

Most AI examples that you hear about today from chess-playing computers to self-driving cars - rely collecting data for machine, computer vision, and natural language processing. Using these technologies, computers can be trained to accomplish specific tasks by collecting and processing large amount of data and recognizing patterns in the data either using natural language or from computer vision.

The job opportunities scenario will be changing with the demand for specific jobs in different industries in our future years. The situations are going to create a huge shortage of individual trained in specific areas. The most important areas of AI career jobs will be two faced; Developing and deploying AI systems and Operating AI computer systems.

So, I would like you to be conscientious in your efforts and keep yourself updated with AI future readiness skills for futuristic opportunities.

All the best!!

Your Present Self

Activity 1.14. This is an open-ended activity. The above mentioned activities are that of the authors. You should try to express your understandings and views for the same activity. Write a letter to your future self, keeping the following points in mind.

1. Mention what you have learned about Artificial Intelligence.
2. Mention the skills you would like to learn and acquire for availing future jobs.
3. Mention the AI integration in multiple career options that shall require technical skills in future jobs.

Points to Remember

- The main goal of Artificial Intelligence is to make the machine behave intelligently by seeing, moving, thinking, and communicating.
- The three pillars of Artificial Intelligence are Data for AI, Natural Language Processing and Computer Vision.
- Data for AI in machine is used to predict the next move of human from previous moves collected by the machine.
- Natural Language Processing is a technology with which the machine is able to understand human language such as English and perform an action based on the command.
- Computer Vision is a technology with which the machine can see around and also collect information from images.
- Rock Paper Scissor, Mystery Animal, and Scavenger Hunt are games developed by Google powered by AI to understand the domains of AI.
- Chatbot is an Artificial Intelligence software that can simulate a conversation with users in natural language processing.
- Many AI-based techniques such as Siri, Google Assistant, Alexa, and chatbots are capable of having conversation with a human in real time using NLP. They primarily work on two techniques such as speech recognition and natural language processing.
- The research in the field of Artificial Intelligence is based mainly on learning, cognitive, logic building, observation, analytics, and understanding vocal commands.
- Examples of AI can be seen in smart phones, smart cars, drones, social media feeds, and music and media streaming, video games, online advertisements, navigation, travel and tourism, banking, finance management, smart home gadgets, security and surveillance.
- Alan Turing was a computer scientist and cryptanalyst who founded the Turing test, which is used to check whether or not a machine is capable of thinking like a

I. Multiple Choice Questions:

1. Artificial Intelligence means:
   a. Programming with your own Intelligence
   b. Making a machine intelligent
   c. Playing a game with machine
   d. Putting your Intelligence in a computer

2. What is the primary method for communication between humans?
   a. Reading
   b. Writing
   c. Speaking
   d. All of the above
3. This is a system of programs and data structures that approximates the operation of the human brain.
   a. Intelligent network
   b. Neural network
   c. Genetic programming
   d. Decision support system
4. This is the tendency for people to think of inanimate objects as having human-like characteristics.
   a. Personalization
   b. Aliasing
   c. Self-replication
   d. Anthropomorphism
5. Artificial Intelligence was first coined in 1956 by a cognitive scientist named:
   a. Dr. Lofti Zadeh
   b. John McCarthy
   c. Alain Colmerauer
   d. Seymour Papert
6. The AI domain that is capable of communication between people and machines is:
   a. Robotics
   b. Decision support
   c. Computer vision
   d. Natural language processing
7. This is an AI software/program that simulates a conversation with a human being:
   a. Chatbot
   b. Voice recognition
   c. Speech application
   d. Data for AI
8. The full form of NLP is:
   a. Neuro-Language Programming
   b. Natural Language Programming
   c. Natural Language Processing
   d. Natural Language Presentation
9. Which generation of computers is associated with Artificial Intelligence?
   a. Fifth
   b. Fourth
   c. Third
   d. Second
10. What is the study of how the language sounds?
   a. Speechology
   b. Trilogy
   c. Biology
   d. Phonology

PRACTICE QUESTIONS

1. Fill in the blanks:
   a. Artificial Intelligence covers a broad range of _____.
   b. Computer Vision is the technology of machines that can _____.
   c. _____ is a game based on Data for AI.
   d. _____ have made a huge impact using technology where they can learn to perform actions like humans.
   e. Assistive robots and _____ have been used in search and rescue, bomb squads and agriculture.
   f. AI systems are capable to think based on logic-based and pattern matching algorithms.

2. Match the following:

1. Chatbots	a. Python, Lisp
2. Applications of AI	b. NLP
3. Mystery Animal	c. Siri, Alexa
4. Programming language used in AI	d. Computer Vision
5. Emoji Scavenger Hunt	e. Self-driving cars, chatbots

3. What is Artificial Intelligence? Give a few examples of AI used in your daily life.

4. Write a definition for the following:
   a. NLP
   b. Computer Vision
   c. Data for AI
   d. Gamification

5. Name the three domains of Artificial Intelligence.

6. Name any other game where the computer predicts your next move using your previous moves.

7. Name any two chatbots where the machine interacts with you using your language.

8. Write any four examples/applications of Artificial Intelligence with their description.