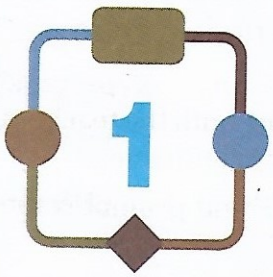
UNIT 1: EXCITE

Unit Introduction

This unit focuses on building the groundwork for learning various aspects of Artificial Intelligence in entire course. This unit will help you in developing an interest in AI and explore the basics of human intelligence, types of artificial intelligence in a very simple way and understanding the three core domains on which the working of AI is based.



INTRODUCTION TO ARTIFICIAL INTELLIGENCE

OBJECTIVES

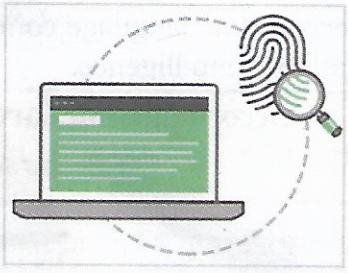
By the end of this chapter you will be able to:

- Define the term browser fingerprinting.
- Define the term Artificial Intelligence in 4 different ways.
- List the challenges faced in achieving AI for machines.
- Understand 5 major traits of human intelligence.

This is social networking age. We all spend a considerable amount of time online depending on our interests and requirements. When we browse through social websites and online stores, a lot of suggestions pop-up or slide-in in our way. Where have they come from? A programmed component of the web site or mobile app is doing it. The big question is - *How does these programs know what we might be interested in?* Answer is, we are tracked right from the moment we logon to any online platform until we logoff. Websites and apps are programmed to track us in various ways like:

- Which pages and other web sites we visited?
- Which section of a web page we scrolled up to?
- Which links or buttons we clicked?
- How much time we spent on a web page?
- Which products or services we clicked on to?
- How much time we spent in reading the features of a product?
- Which products did we add to shopping cart but didn't buy?
- Which products we did buy?
- Which products we marked as 'liked'?
- Which products we bought and later returned?
- How often we visit which web sites or particular section of a website?

These are a few examples of how our browsing is tracked which is called our *browsing signature* or *browser fingerprinting*.



This data is analysed by the intelligent programs and as a result we are recommended new products likely to interest us thereby increasing the chances of we end up buying them. Isn't it intelligent?

These programs compile such huge data chunks from millions of visitors daily and churn out the intelligent results out of it. This analysis of such an enormous amount of data to produce useful patterns of visitor's browsing habits, interests and buying preferences is called *analytics*.

This is one glimpse of artificial intelligence. But we did not recognize it as artificial intelligence because it worked so naturally around us that it did not feel like AI. What works, does not surprise us much, no?

So, as we read this and buckle up to explore AI and its concepts, it has already been the part of our lives. Many exciting things are happening out there in this field which we shall soon discover.

But, first things first. The basics!

Just like many other fields of study, Artificial Intelligence is also one such field. But what is so exciting about it?

AI is the field of conceiving, designing and developing machines which should perform tasks that usually require human intelligence.

AI is the art and science of developing machines running on intelligent algorithms that make them capable of thinking, acting and learning like human beings.

This very nature of AI field makes it a huge umbrella of technology which covers all the domains and application areas which can be influenced by it in a revolutionary manner.

Think of what a machine as intelligent as a human being can do in any field!

The impact is tremendous and very promising. Hardly any field of application would be left out. Medical and health care, research and development, manufacturing, sales, travel, education, defence, real estate, FMCG etc. all would be revolutionised by the touch of AI. This way, AI, as a field has remarkable scope in career building no matter which domain you belong to.

Some methods to use browser fingerprinting are:

- **Cookies**
- **HTML 5 Canvas fingerprinting**
- **IP Address of the device**

Understanding Artificial Intelligence

The term Artificial Intelligence was first coined by Stanford researcher John McCarthy in 1956. In plain and simple words, *the ability of a machine to think and learn is called artificial intelligence.*

The AI field refers to the study of the principles, concepts and technology for building such machines and systems that should think, act and learn like humans.

Machines possessing AI should be able to interact with their environment and perceive it through various stimuli such as visual perception, speech

recognition, language comprehension etc. in the form of received data and respond to them, based on gathered intelligence.

According to **McCarthy:**

"AI is the science and engineering of making intelligent machines."

INTERACTIVE ACTIVITY: IMPACT OF AI ON DAILY LIFE

Think of zooming in a little farther into the future. Let us assume, after a decade, how is AI going to influence our life and help us in our day-to-day activities?

List at least 7 such findings which, in future, may be greatly influenced by AI.

Why AI Today?

Why artificial intelligence is a buzzword today in the field of computer science? The simple reason is that today we are technologically more advanced and ready to do better research and experiment in this field. We have computers with faster computational power, we have an enormous amount of data to process thanks to constant online presence of people, we have identified a number of important application areas where AI could prove extremely useful and we are now becoming able to program computers in much better way with complex and intelligent algorithms.

AI Challenges

Having understood the traits of human intelligence, we can easily figure out the challenges posed in the path to achieving true AI. Some of the obvious challenges are to make machines who are able to do the following:

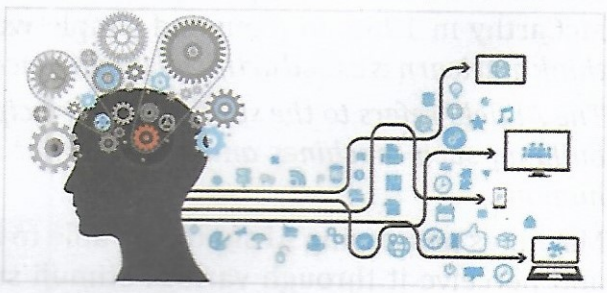
- Retain the facts as knowledge.
- Recall the knowledge in a situation.
- Think, analyse and apply logic.
- Make useful and accurate predictions.
- Make decisions and upgrade their intelligence algorithm themselves.

So, the biggest challenge is to develop a machine or a computer that can store knowledge and improve its own program to solve new problems with its evolved or improved intelligence.

Human Intelligence and Machines

Intelligence is a process that evolves by the time and has practically no limit.

What makes humans intelligent is their ability to reason. But what triggers reasoning? What stimulates us to initiate the process of reasoning? The answer is *sensing*. We sense, we perceive, we receive a variety of stimuli from our surroundings and then we *process* that input. This processing of what we sense is called reasoning. This power has been given to animals too but up to the extent of their ability to survive. We humans had never been meant for just to survive. Human brain reasons at a very higher and different level than animals. This power of reasoning determines our actions.



A human brain senses, reasons and then, finally, acts upon it. For example, we come across an old friend, recognise him or her and greet him or her.

We sense through our receptive organs. How should a machine sense?

A machine should first know what it is supposed to sense and then it should be able to sense (input) images, patterns, faces, signatures, prints, textures, audio, moving images, numbers etc.

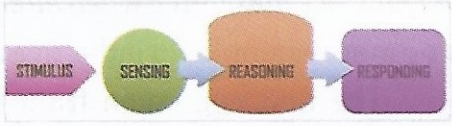
What should it sense from these? - the purpose is another aspect. For instance, in an image of a group of people, is it supposed to sense entire image, a face or just the background?

So, sensing is not just about simple input. That can be achieved by scanners and sensors. The purpose of sensing is determined by the *intelligence*.

Image scanner, audio sensor, speech recognition engine, fingerprint recognition program, motion sensor, thermal sensor, light sensors, proximity (distance) sensor, chemical sensors, barometric sensors are the equipment which play central role where a machine is able to receive various stimuli from its surroundings.

After sensing, what to do with the stimulus (input) is entirely the problem domain of artificial intelligence. Comparing facts and making decisions like in an Expert System, recognising speech and identifying the language to process the command given in voice, assessing the situation, identifying blocks and barriers during movement and deciding the course of movement, making logical comparisons, ability to understand the evidence and its weightage, planning before action by considering all available facts, able to compare complex rules to solve problems etc. are some of the basic expectations from a machine in the field of AI.

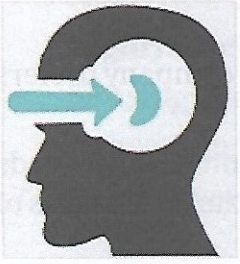
Then comes the action, the outcome, the response which, again, falls in the domain of AI. Responding with voice, moving in a particular direction or taking a pause before next movement, accomplishing a task as desired etc. are expected of the intelligent machine.



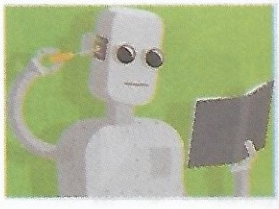
Human intelligence is the combination of the following traits:

Perception

Humans perceive their surroundings with their sensory organs. Then the objects that make the surroundings are identified and recognized depending on the retained knowledge about the world. A machine can have artificial sensory organs like cameras, scanners, photosensors for light, thermo-sensors for temperature etc. to picture and understand the surroundings. Think of a robot or machine designed to move in a closed area like office or factory, more complex environments are railway platforms & airports and most complex of them is a busy road.



Learning



Humans learn in many ways – guidance and training by others or by self-paced trial and error method. They retain the learning by practice, remembering and applying it in various situations. Getting machines learn and remember is quite challenging. Machines are being developed to learn by trial and error. For example, a machine playing a strategy game like chess may keep looking for a move that matches the closest correct move and stores it for further usage. This is like learning by rote. Generalised learning is difficult as it demands application of learning in various situations by using previous knowledge and experience.

Problem Solving

In a simple situation, a machine can be programmed into looking for, finding and applying the possible steps of solution to achieve a set goal. Such machines are useful in a specific task-oriented environment like bottling plant, loading/ unloading of items, counting, assembling parts etc. In a generalized situation, a machine needs to be trained into selecting the best suited approach to achieve the goal and then retain it for future use. Machine should be able to analyse and update its algorithm in such a way as to recognize similar situation and able to understand that such and such previously learnt solution is needed to be applied. This is what AI is trying to achieve.

Reasoning

Logical reasoning is the distinct characteristic of human brain. Reasoning has broadly 2 types: *Deductive* and *Inductive*. In deductive reasoning the facts are analysed and guarantee a conclusion. For example:

Raj is a non-vegetarian so he will also eat a vegetable if non-vegetarian dish is not available.

Some more examples of deductive reasoning are:

- All bats are mammals, all mammals give birth to young ones; therefore, all bats give birth to young ones.
- Dogs can smell from a longer distance, Jade is a dog; therefore, Jade can smell from a longer distance.
- Obtuse angles are more than 90 degrees, this angle is 120 degrees so, it must be obtuse angle.

In inductive reasoning, facts only support the conclusion without any guarantee. For example:

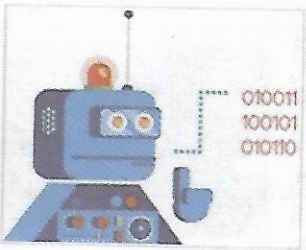
Ram falls sick most often when he eats eggs. Ram must be allergic to eggs.

Some more examples of inductive reasoning are:

- The first egg taken from the pot is boiled, the second egg taken from the pot is boiled; therefore, all the eggs in the pot are boiled.
- Fish is a non-vegetarian dish, Rajesh loves to eat non-vegetarian dishes; therefore, Rajesh loves to eat fish.
- Most of the pass-outs hired from the local college are loyal employees so, the company prefers to hire pass-outs from the local college.

Hardest challenge in AI is to develop machines that are able to apply inductive reasoning which needs a critical and intelligent analysis of the available facts in different scenarios or contexts on the basis of previous experience.

Language



Learning any language is a complex process even for humans unless a methodical approach, right kind of training and enough practice is not involved. Language contains grammar and words – word with multiple meanings, words with similar meanings (synonyms), similar sounding words (homophones), speech accents, symbols, signs and special notations. After learning the language, an endless variety of sentences can be formed which is challenging for a machine to do. AI based voice response systems and chat bots etc. are being developed in a restricted application area but there is still a lot needs to be done.

INDIVIDUAL ACTIVITY: SMART HOME OF MY DREAMS

You might have earlier read about it or seen in some movie, but what is your unique idea of a smart home. If you have the freedom to conceive the design of your own smart home, how do you visualise it? Its dimensions, height, number of stories, unique features, different rooms, backyard, front-yard, drive way, surroundings, garden, terrace, security, appliances and equipment, facilities and luxuries, its location and look etc.

Let us have a floor plan of your dream smart home!

Note: Use a pencil for initial drawing for easier corrections/modifications.

LEARNING POINTS

- Tracking of user's browsing habits make his/her browser signature.
- Enormous amount of data to produce useful patterns of visitor's browsing habits, interests and buying preferences is called analytics.
- The ability of a machine to think and learn is called artificial intelligence.
- AI is the science and engineering of making intelligent machines.
- The biggest challenge is to develop a machine or a computer that can store knowledge and improve its own program to solve new problems with its evolved or improved intelligence.
- What makes humans intelligent is their ability reason.
- The purpose of sensing is determined by the *intelligence*.
- In deductive reasoning the facts are analysed and guarantee a conclusion.
- In inductive reasoning, facts only support the conclusion without any guarantee.

KEYWORDS

- **Browsing signature/ browser fingerprinting:** Pattern of a user's browsing habit.
- **Analytics:** Analysis of enormous amount of data to produce useful patterns.
- **Algorithm:** A process or logical set of rules to solve a problem or perform a calculation.
- **Sensing:** Perceiving an external stimulus.
- **Reasoning:** Thinking logically to reach a conclusion.
- **Expert system:** A system that compares facts and makes decisions.

ASSESSMENT

CONCEPTUAL SKILLS ASSESSMENT

A. Choose the correct answer.

1. Users' regular browsing habits together make his/ her _____.

   a. *Browser fingerprinting* b. *Browsing signature*

   c. *Both a) and b)* d. *None of these*

2. Process of producing useful patterns by processing enormous amount of data is called _____.

a. Data processing
b. Sensing
c. Analytics
d. Reasoning

3. The term Artificial Intelligence was first coined by whom?

a. John McCarthy
b. Tim Berners Lee
c. Charles Babbage
d. Bill Gates

4. Which of the following capabilities is a challenge to develop in machines?

a. Retain facts as knowledge
b. Recall the knowledge
c. Think, analyse and apply logic
d. All of these

5. What makes humans intelligent is their ability to _____.

a. Sense
b. Think
c. Reason
d. Read

6. Reasoning has broadly two types – deductive and _____.

a. Addictive
b. Inductive
c. Logical
d. Calculative

B. Fill in the blank.

Inductive, Algorithm, Deductive, Knowledge, Learn

1. The ability of a machine to think and _____ is called artificial intelligence.
2. An AI machine is supposed to retain the facts as _____.
3. An AI machine should be able to upgrade its _____ to use the retained learning.
4. In _____ reasoning, the facts are analysed and guarantee a conclusion.
5. In _____ reasoning, the facts only support the conclusion without any guarantee.

C. State whether True or False.

1. Artificial intelligence is the science of developing intelligence in animals and birds.
2. The biggest challenge is to develop machines that retain knowledge to solve new problems.
3. The purpose of sensing is determined by the intelligence.
4. Generalised learning is easier for machines to implement.
5. Logical reasoning is the distinct characteristics of animals.

D. Answer the following questions.

1. What do you mean by browser fingerprinting?
2. What is McCarthy's definition of AI?
3. List any two challenges in achieving true AI for machines.
4. What do you mean by sensing and reasoning?

E. Categorise the following statements into deductive and inductive reasoning:

1. Anu finds the reviews of a newly released movie very good so she is convinced that she will like that movie.
2. A language teacher finds that students learn and perform better in tests with practical, real-life assignments so he includes such assignments in all his lessons.
3. My teacher said that the highest test scorer will get a chocolate as reward. I scored highest in the test so I look forward to get the chocolate.
4. David likes computer programming. Python is a programming language so David likes Python.
5. The sum of all angles in a triangle is always 180 degrees so in a right-angled triangle, sum of two of the angles will be 90 degrees.
6. Monkeys often steal fruits from our orchard. Today, some guavas were plucked from the trees so they must have been stolen by monkeys.

LIFE SKILLS ASSESSMENT

Information Highway – *Self-paced Learning, thinking skills, creativity*

- *https://kids.kiddle.co/Artificial_intelligence*
- *https://www.iste.org/explore/artificial-intelligence/teaching-kids-what-ai-and-isnt*
- *https://www.aisingapore.org/talentdevelopment/ai4k-2/*
- *https://www.roboticsbusinessreview.com/ai/3-basic-ai-concepts-explain-artificial-intelligence/*

Experiential Learning – *Teamwork, communication, presentation, critical thinking, decision making, problem solving, leadership*

Prepare a 1000 words write-up or a 5 slide presentation on **How insects Inspire Artificial Intelligence.**