INTRODUCTION TO AI

WHAT IS INTELLIGENCE?

Intelligence is the ability to understand, learn, and think. Intelligence is the ability to acquire and apply knowledge and skills to deal with situations.

TYPES OF INTELLIGENCE

The **Psychologist Howard Gardener** describes nine types of intelligence

1. Intrapersonal Intelligence
2. Spatial Intelligence
3. Naturalist Intelligence
4. Musical Intelligence
5. Logical-Mathematical Intelligence
6. Existential Intelligence
7. Interpersonal Intelligence
8. Kinaesthetic Intelligence
9. Linguistic Intelligence

DECISION MAKING

"Decision making is the process of identifying and picking a final choice/action / item / belief for a need from an available set of choices, after carefully assessing the available options."

WHAT IS AN ARTIFICIAL INTELLIGENCE?

Definition :

Artificial Intelligence is a technology and a branch of computer science that deals with the study and development of intelligent machines and software. Artificial Intelligence is teaching machines to learn, think, decide, and act as humans would.

Artificial Intelligence means making machines capable of performing quick tasks like human beings.

Artificial Intelligence is made up of two words: -

1. **Artificial:** means something made or produced by Humans or not natural.
2. **Intelligence:** means the ability to acquire and apply knowledge.

An Artificial Intelligence is a technology by which we can develop the intelligent machines that behaves like humans. It means AI machines can learn from their surround, think on it and act just like humans.

ADVANTAGES & DISADVANTAGES OF ARTIFICIAL INTELLIGENCE

Advantages of Artificial Intelligence: -

1. **Reduction in Human Error:** It can reduce errors and increase accuracy and precision. The decisions taken by AI in every step are decided by information previously gathered and a certain set of algorithms. When programmed properly, these errors can be reduced to null.
2. **Zero Risks:** Humans can overcome many risks by letting AI robots do them for us. Whether it be defusing a bomb, going to space, or exploring the deepest parts of oceans, machines with metal bodies are resistant to nature and can survive unfriendly atmospheres.
3. **24x7 Availability** Humans also need breaks and time off to balance their work life and personal lives. But AI can work endlessly without breaks. They think much faster than humans and perform multiple tasks at a time with accurate results. They can even handle tedious repetitive jobs easily with the help of AI algorithms.
4. **Digital Assistance:** Nowadays, Most of the big organizations use digital assistants (known as Chatbots) to interact with their customers which minimizes the need for human resources. Some chatbots have become so intelligent that you wouldn't be able to determine whether you are chatting with a chatbot or a human being.
5. **New Inventions:** AI has helped in coming up with new inventions in almost every domain to solve complex problems. A recent invention has helped doctors to provide treatments for Corona patients using advanced AI-based technologies.
6. **Unbiased Decisions:** Human beings are driven by emotions. Whereas AI is devoid of emotions and highly practical and rational in its approach. Therefore, it doesn't have any biased views, which ensures more accurate decision-making.

Disadvantages of Artificial Intelligence:-

1. **High Costs:** To create a machine that can simulate human intelligence requires plenty of time, and resources and can cost a huge amount of money.
2. **Increase in Unemployment** AI reduces the need for human interference from many tasks that resulted in the death of many job opportunities.
3. **Make Humans Lazy:** AI applications automate the many tedious and repetitive tasks due to which we do not have to memorize things or solve puzzles to get the job done, we tend to use our brains less and less. This addiction to AI can cause problems for future generations.
4. **No Ethics:** Ethics and morality are important human features that can be difficult to incorporate into an AI. AI became a time at which technological growth became uncontrollable and irreversible, resulting in unforeseeable changes to human civilization. This moment is referred to as the **"AI singularity"**.

APPLICATIONS OF ARTIFICIAL INTELLIGENCE

Today, Artificial Intelligence has various applications in different sectors as AI is making our daily lives more comfortable and fast.
Some sectors which have the application of Artificial Intelligence are as follows:-

1. **Robotics:-** With the help of AI, we can create intelligent robots that can perform tasks with their own experiences without pre-programmed.
Humanoid Robots are the best examples of AI in robotics, recently the Intelligent humanoid robot named as Erica and Sophia has been developed that can talk and behave like humans.
2. **Content Creation: -** Today, AI can generate text content in the form of articles, blogs, etc., video content, images and graphics, music content etc.
Some AI-based tools for content creation are Wordsmith, GPT-2, Arvicola, Canva, Synthesis, Rephrase.ai etc.
3. **Chatbots and Virtual Assistants:-** A **Chatbot** is an AI-enabled software which can simulate a real life conversation (either written or spoken) between the user and the digital device. Some examples are Watson (IBM), Meena (Google), BlenderBot (Facebook), Replika Chatbot etc.
4. **A Virtual Assistant** is an AI-enabled application program that understand natural language voice commands and complete the task for users. Some examples are Cortana (Microsoft), Google Assistant (Google), Baby (Samsung), Siri (Apple), Alexa (Amazon) etc.
5. **Entertainment:-** Nowadys, We are using some AI based applications with some entertainment services such as Netflix, Amazon, Youtube etc. With the help of AI algorithms, these services show the recommendations for programs or shows.
6. **E-commerce:-** AI becoming more demanding in the e-commerce business. AI is helping shoppers to discover associated products with recommended size, color, or even brand.
7. **Agriculture:-** Agriculture is an area which requires various resources, labor, money, and time for best result. Now a day's Agriculture is applying AI as agriculture robotics, solid and crop monitoring, predictive analysis. AI in agriculture can be very helpful for farmers.
8. **Education:**AI chatbot can communicate with students as a virtual teaching assistant or tutor which will be accessible easily at any time and any place.
9. **Automotive Industry:-** Some Automotive industries are using AI to provide virtual assistant to their user for better support and performance. Such as Tesla has introduced TeslaBot.
Also various Industries are currently working for developing self-driven cars which can make your journey more safe and secure.
10. **Travel & Transport:-** AI is capable of doing various travel related works such as making travel arrangement to suggesting the hotels, flights, and best routes to the customers. Travel industries are using AI-powered chatbots which can make human-like interaction with customers for better and fast response.

11. **Finance:-** AI and finance industries are the best matches for each other. The finance industry is implementing automation, chatbot, adaptive intelligence, algorithm trading, and machine learning into financial processes.
12. **Data Security:-** The security of data is crucial for every company as cyber-attacks are growing very rapidly in the digital world. AI can be used to make your data more safe and secure. Some examples such as AEG bot, AI2 Platform are used to determine software bug and cyber-attacks in a better way.
13. **Social Media** Social Media sites such as Facebook, Twitter, and Snapchat contain billions of user profiles, which need to be stored and managed in a very efficient way. AI can organize and manage massive amounts of data. AI can analyze lots of data to identify the latest trends, hashtag, and requirement of different users.
14. **Astronomy:** Artificial Intelligence can be very useful to solve complex universe problems such as how it works, origin, etc.
15. **Healthcare** In the last, five to ten years, Healthcare Industries are applying AI to make a better and faster diagnosis than humans. AI can help doctors with diagnoses and can inform when patients are worsening so that medical help can reach to the patient before hospitalization.
16. **Gaming : AI** can be used for gaming purpose. The AI machines can play strategic games like chess, Ludo etc where the machine needs to think of a large number of possible places.

WHAT IS NOT AI?

Today, we have a lot of different technologies exist around us. Therefore, it is very common for us to misunderstand any other technology as AI. That's why, here we make clear the difference between what is AI and what is not AI.
As we know, any machine that has been trained with data and can make decisions/predictions on its own can be termed as AI.

AI is not just automation:

AI means the use of own intelligence not just the automation.

A fully automatic washing machine can work on its own, but it requires human intervention to select the parameters of washing and to do the necessary preparation for it to function correctly before each wash, which makes it an example of automation, not AI.

An air conditioner can be operate remotely with the help of internet but still needs a human touch. This is an example of Internet of Things (IoT).

We can also say that not all the devices which are "smart" in works are AI-enabled. For example, a TV does not become AI-enabled if it is a smart one.

Just as humans learn how to walk and then improve this skill with the help of their experiences, an AI machine too gets trained first using training data and then optimises itself according to its own experiences which makes AI different from any other technological device/machine.

AI is not magic: *AI is a mathematical and logical algorithms not a magic.*

DOMAINS OF ARTIFICIAL INTELLIGENCE

To learn how AI is capable to do such complex tasks, Three domains on which an Artificial Intelligence depends.

1. Data Science (Collection of big data) 2. Computer Vision (CV) 3. Natural Language Processing (NLP)

1. **Data Science:** It is a process of identifying the various sources of data, collecting the data in the correct format or as per the requirements and preparing it for any specific AI model.
   For example:- If we are making a weather prediction model using AI, we need to identify the parameters that defines weather such as temperature, humidity, etc. and the sensors from which this data can be collected and so on. Therefore, Predictive and forecasting models are completely dependent on the quality of data collected.

2. **Computer Vision (CV):** It is a process of capturing, processing and analysing real world images and videos to allow machines to extract meaningful informations from the physical world.
   For example:- Self-driving cars, facial recognition based tracking system with camera, image searchin shopping webs like Amazon, QR codes, Google lens, Snapchat filters, expression detection (Smile), virtual sports replay, medical imaging like MRI, AI-guides surgery etc.

3. **Natural Language Processing (NLP):** It is the ability of computer program to understand the human languages as it is spoken.
   For example:- Alexa, Google Assitant, Siri, cortona, Google Translator, Microsoft Translator etc.

THREE DOMAIN OF AI

1. DATA SCIENCE OF AI –

It is a process of identifying the various sources of data, collecting the data in the correct format and preparing it for any specific AI model.

Note: We need to ensure right data in correct formats with good quality for any AI model to be success.

For example:- If we are making a weather prediction model using AI, we need to identify the parameters that defines weather such as temperature, humidity, etc. and the sensors from which this data can be collected and so on. Therefore, Predictive and forecasting models are completely dependent on the quality of data collected.

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AI can learn the patterns in the data to automate the tasks.

1. **For example:-** Shopping Websites, YouTube, etc. uses predictive analysis to get the information of what the users are actually looking for.

DATA SCIENCE BASED GAME –

1. **AI enabled Duet:** In this activity, you have to play a duet with the computer. So, just play some notes and the computer will respond to your melody.

2. **Rock, Paper and Scissors:** In this activity, the machine tries to predict the next move of the participant. It is a replica of basic rock, paper and scissors game where the machine tries to win ahead by learning from the participant's previous moves.

APPLICATIONS OF DATA SCIENCE

Some real-life applications of Data Science:

1. Internet Search:
2. Digital Advertisements:
3. Fraud and Risk Detection:
4. website Recommendations:
5. Speech Recognition:
6. Image Recognition:
7. Medicine
8. Airline Route Planning
9. Gaming
10. Virtual Reality

2. COMPUTER VISION FOR AI

Computer Vision (CV) : "It is a process of capturing, processing and analysing real world images and videos to allow machines to extract meaningful informations from the physical world."

Some applications of CV are:-

- **Web :** face recognition, object recognition, geolocalization, Google maps, Youtube - content categorization etc.
- **Smartphones :** QR codes, face detection, Snapchat filters, Google Lens, Expression detection (Smile), Android lens blur, iphone portrait mode etc.
- **Medical imaging :** MRI, assisted diagnosis, automatic pathology, AI-guided surgery etc.
- **Media :** virtual sports replay, visual effects for film etc.
- **Insurance :** claims automation, damage analysis, property inspection etc.
- **Health Care :** analyzing health records, lab reports, x-ray images, etc.
- **Automobiles :** Self driving cars etc.

Some Challenges using Computer Vision are:-

- **Privacy and Ethics :**
- **Lack of explainability :**
- **Deep Fakes :**
- **Adversarial attacks :**
- **Undesired situations :** like for facial recognition, circumstances of lightening, expression, clothing on face etc.

Let us learn it with the help of activities :-i.e. computer vision based Game is -

- **Emoji Scavenger Hunt:** In this activity, machine initiates the game by showing an 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.

3. NATURAL LANGUAGE PROCESSING FOR AI

Natural Language Processing (NLP) : "It is the ability of computer program to understand the human languages as it is spoken."
NLP is all about algorithms to understand and interpret **speech and text** which is natural language data.

Its goal is to build systems that can make sense of text and perform tasks like translation, grammar checking, or topic classification.

Some applications of NLPs are:-

- **Translation tools** like Google Translator, Microsoft Translator.
- **Document Processors** like Microsoft Word to check for grammatical and semantic errors of texts, Search auto-complete etc.
- **Personal Virtual Assistants** like Alexa, Siri, Google Assistant, Cortona etc.
- **Interactive Voice Response (IVR)** used in call centres to handle support queries.
- Voice text messaging
- Spam filters in email
- Related keywords on search engines
- Knowledge based supports using Chatbots.
- Social media monitoring Knowing what customers are saying on social media about a brand can help businesses.

Let us learn it with the help of activities :- i.e. NLP based Game is -

- **Mystery Animal:** In this activity, the participant has to guess the animal by asking maximum 20 questions to AI. The animal randomly gets selected for each game by AI and the machine replies in either yes or no.

DIFFERENCE BETWEEN NLP AND NLU

Any natural language is a free from the rules. It means there are no set of keywords that helps the computer to understand the exact meaning or sense.

There are multiple ways to express something using a natural language. For example-

1. How is the weather today?
2. Is it going to rain today?
3. Do I need to take my umbrella today?

All these sentences have the same question, which is to enquire about today's weather prediction.

As humans, we can identify such similarities and respond accordingly but machines can not.

Natural Language Processing (NLP):

Natural Language Processing (NLP) is a domain of AI that *gives machines the ability to understand natural languages.* It breaks down the language into small and understable chunks that are possible for machines to understand. It focuses on processing the text in a literal sense, like what was said.

Natural Language Understanding (NLU):

Natural Language Understanding (NLU) is a subfield of Natural Language Processing. It focuses on extracting the meaning or hidden intent of the sentence. It helps to analyses the data to determine its actual meaning. It enables computers to understand different human languages.