ARTIFICIAL INTELLIGENCE

Tutorial 1

Artificial Intelligence Job Profiles

1. Machine Learning Engineer
2. Data Scientist
3. Artificial Intelligence Engineer
4. Business Intelligence Developer
5. Research Scientist
6. Big Data Engineer/Architect

Intelligence

Intelligence:

- The capability of learning, understanding, reasoning and learning from mistakes.

Intelligent:

- having or showing intelligence

Examples:

- speech recognition
- face detection
- smell identification
- decision making
- learning new things

Types of Intelligence

Natural Intelligence:

- Capacity of the mind to understand principles, truths, facts or meanings, acquire knowledge, and apply it to practice using the ability to learn and comprehend

Artificial Intelligence or Machine Intelligence:

- Study of how to make computers do things which at the moment people do better

What is Artificial Intelligence? (AI)

- AI is a technique that enables machines to mimic human behavior.
- Artificial Intelligence is the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making and translation between languages.

Intelligent Systems

System: a group of things or parts working together as a whole in an environment.

An Intelligent System is a system

- which learns how to act so it reaches its goals/objectives.
- which learns from experience and makes decisions about appropriateness of actions.
- which continually acts, mentally and physically, and by acting reaches its objectives more often than pure chance would indicate.

Objectives of AI & IS

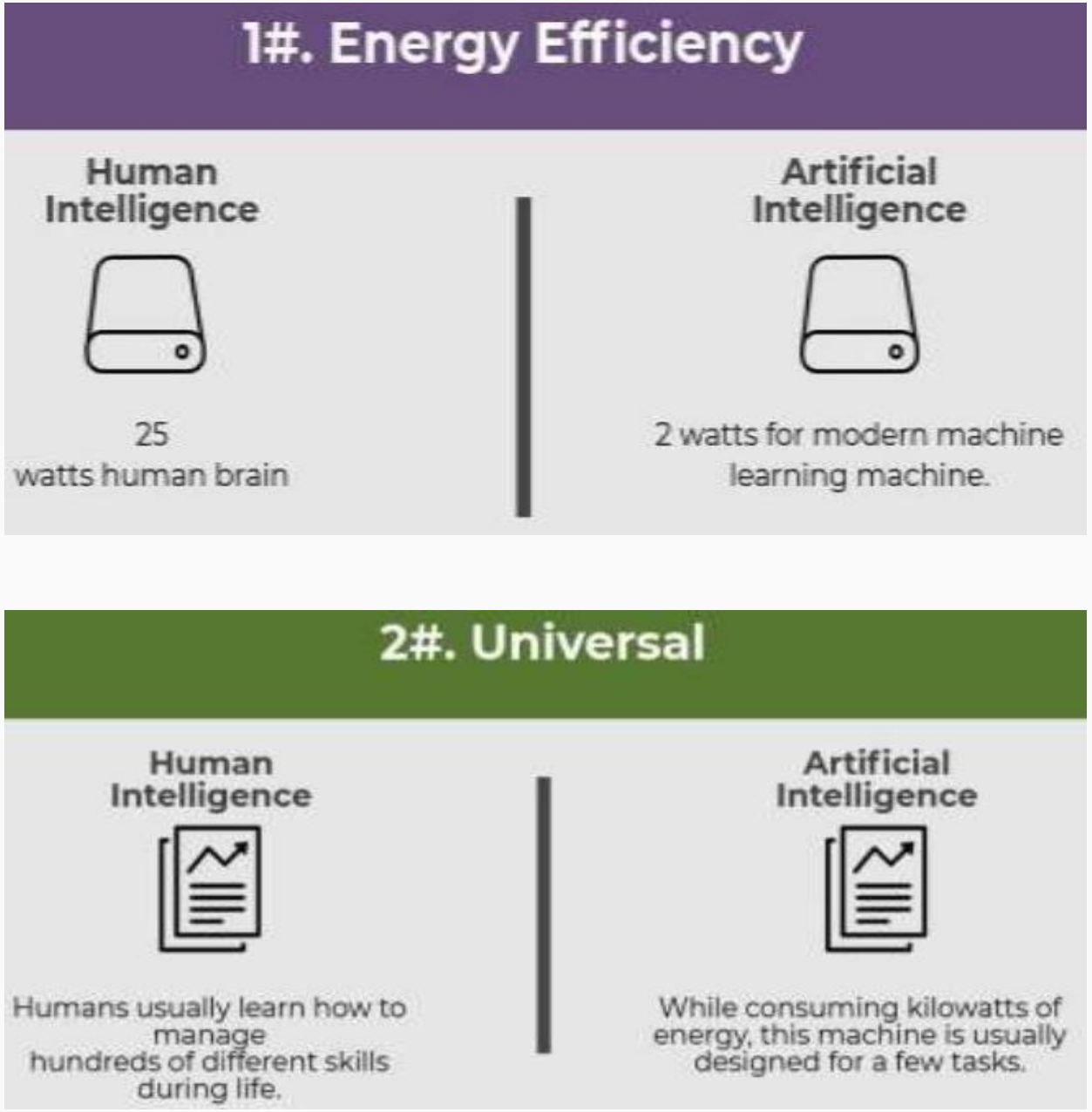
To understand and model the workings of natural intelligence and human beings

Implement them to create intelligent systems with machine intelligence

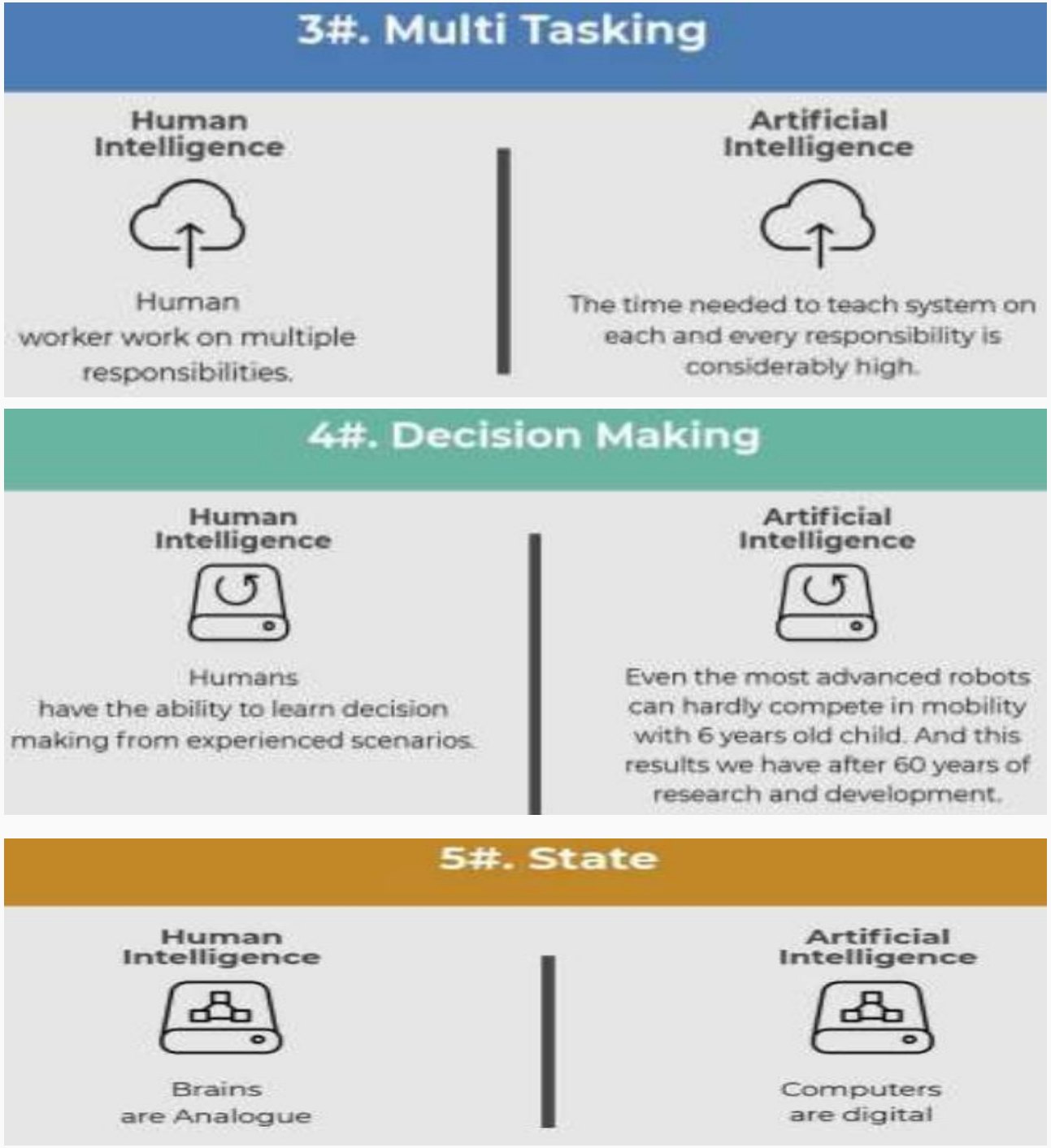
Examples:

- Robots – completely artificial
- Cyborgs – organisms that combine natural and artificial intelligence as well as physical components, e.g. a cyborg may have half a human brain combined with an artificial brain

Human Intelligence v/s Artificial Intelligence

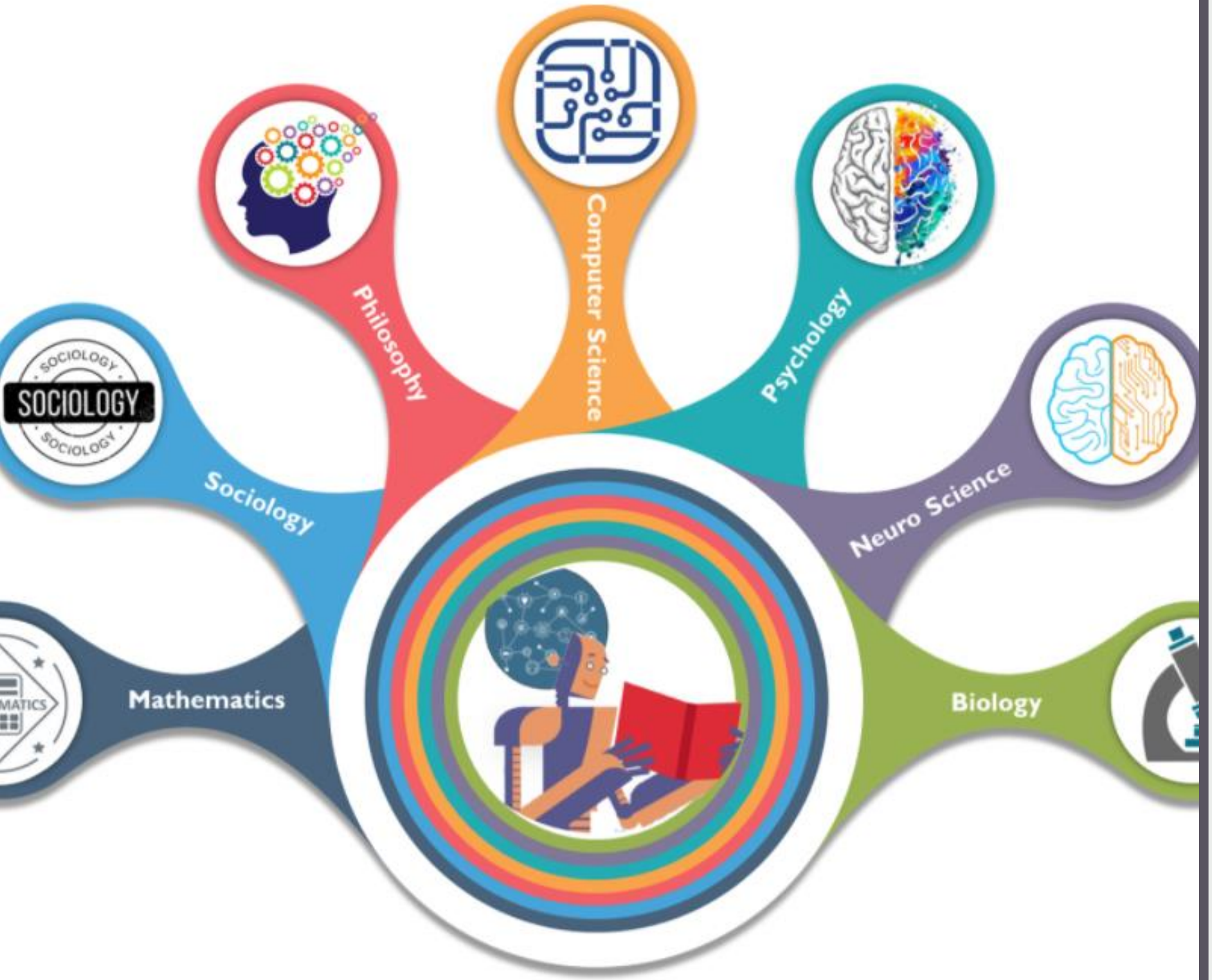


Human Intelligence v/s Artificial Intelligence



Importance of Artificial Intelligence (AI)

- AI **automates Repetitive Learning** and discovery through data. Artificial Intelligence performs frequent, high-volume, computerized tasks reliably and without fatigue
- AI **adds intelligence** to existing products. In most cases, AI will not be sold as an individual application. Rather, products you already use will be improved with AI capabilities, much like Google Assistant was added as a feature to a new generation of Mobile Phones.
- AI **adapts through progressive learning algorithms** to let the data do the programming. The algorithm becomes a classifier or a predictor. So, just as the algorithm can teach itself how to play any game, it can teach itself what product to recommend next online.
- AI analyzes **more and deeper data** using neural networks that have many hidden layers. You need lots of data to train deep learning models because they learn directly from the data. The more data you can feed them, the more accurate they become.
- AI **achieves incredible accuracy** through deep neural networks, which was previously impossible. AI techniques from deep learning, image classification, and object recognition can now be used to find cancer on MRIs with the same accuracy as highly trained radiologists.



Areas which contribute to Artificial Intelligence

- Mathematics
- Sociology
- Philosophy
- Computer Science
- Psychology
- Neuroscience
- Biology

Applications of Artificial Intelligence

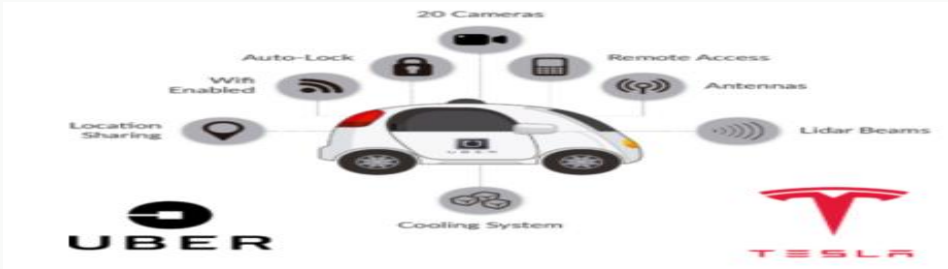
Speech Recognition

Machine Translation

Facial Recognition nd Automatic Tagging

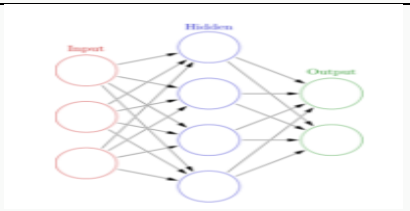
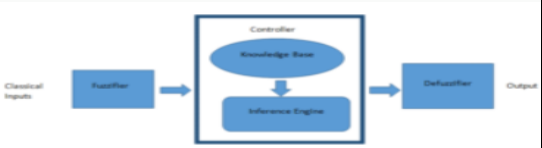
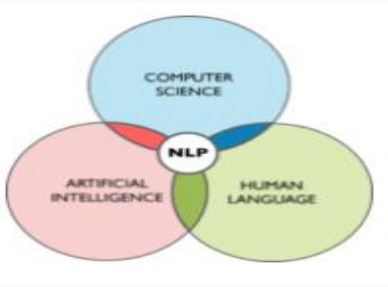
Virtual Personal Assistants

Self Driving Car



Chatbots

Domains of Artificial Intelligence

Neural Networks	**Neural Networks are a class of models within the general machine learning literature. Neural networks are a specific set of algorithms that have revolutionized machine learning and Artificial Intelligence.**	
Robotics	**Robotics is a branch of AI, which is composed of different branches and application of robots. AI Robots are artificial agents acting in a real-world environment. Artificial Intelligence Robot is aimed at manipulating the objects by perceiving, picking, moving, and destroying it.**	
Expert Systems	**In artificial intelligence, an expert system is a computer system that emulates the decision-making ability of a human expert. It is a computer program that uses artificial intelligence (AI) technologies to simulate the judgment and behavior of a human or an organization that has expert knowledge and experience in a particular field.**	
Fuzzy Logic Systems	**Fuzzy logic is an approach to computing based on "degrees of truth" rather than the usual "true or false" (1 or 0) Boolean logic on which the modern computer is based. Fuzzy logic Systems can take imprecise, distorted, noisy input information. Fuzzy logic is a solution to complex problems in all fields of life, including medicine, as it resembles human reasoning and decision making.**	
Natural Language Processing	**Natural Language Processing (NLP) refers to the Artificial Intelligence method of communicating with intelligent systems using a natural language. By utilizing NLP and its components, one can organize the massive chunks of text data, perform numerous automated tasks and solve a wide range of problems such as – Machine translation, Named Entity Recognition, Sentiment Analysis, Speech Recognition, and Topic Segmentation etc.**	

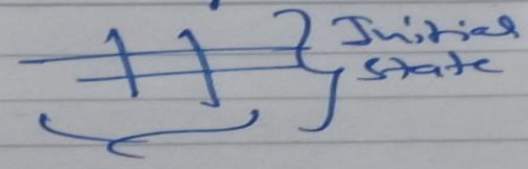
APPLICATION OF AI TECHNIQUES TO TIC-TAC-TOE

* TIC – TAC – TOE PROBLEM :- (Zero-batta)

Two-Player Game where one player called MAX (X-letter marks) and the opponent called MIN (O-letter marks)

↳ '3×3' Grid where two players put their letters.

Example:



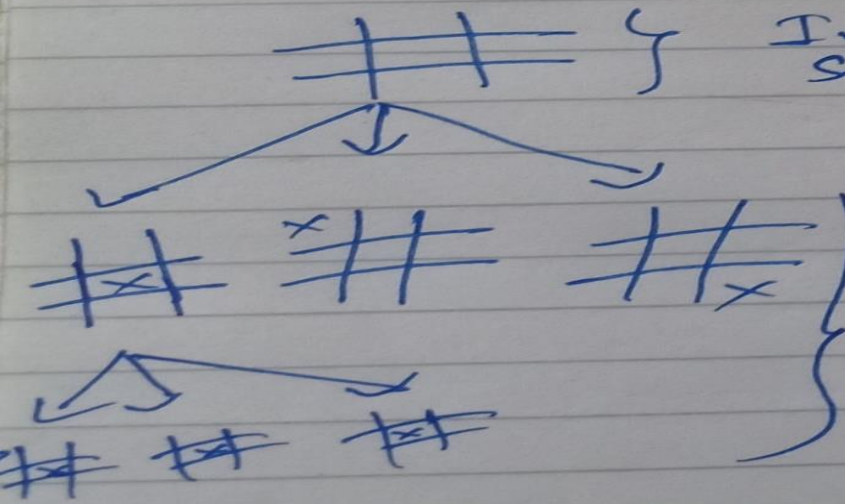
↳ Players with same marks (three) in complete ROW / Column / Diagonal wins the Game → winning condition

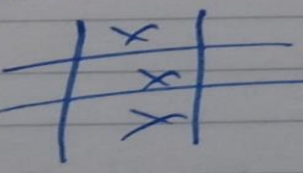
→ Start State = Empty Grid

→ Goal State = win for either of player

MAX (3 consecutive X)

MIN (3 consecutive O)





Goal State
Winning State for MAX

Program 1 for Tic-Tac-Toe:Data Structures

- **Data structures:**
  - **Board :**

    A 9-element vector

    Each element can contain the value

    0 if corresponding square is blank

    1 if filled with a X

    2 if filled with a O

  - **Movetable :**

    Large vector of 19,683 (3^9) elements

    Each element of which is a 9-element vector whose contents are chosen in such a way so as to allow the algorithm to work.

1	2	3
4	5	6
7	8	9

Board

1	2	3	4	5	6	7	8	9

	1	2	3	4	5	6	7	8	9
1									
2									
…									
19683									

Movetable

Program 1 for Tic-Tac-Toe: Data Structures

Algorithm:

To make a move, do the following:
Step 1: Take value of the vector Board as a base 3 number. Convert it to decimal.
Step 2: Use the number computed in Step 1 as an index into Movetable and access the vector(X) stored there.
Step3: Set Board equal to vector X in Movetable