Artificial Intelligence (AI)

Chapter 3



Introduction

- Why we are interested in AI?
  - *To develop intelligent entities*
- AI is based on the premise that:
  - Human mind can be explained in terms of computation, and
  - Computers can do the right thing given correct premises and reasoning rules

What is AI?

- There are two ideas in the definition.
  - **Intelligence**: is "thinking power“ or *the computational part of the ability to achieve goals. It relates to tasks involving higher mental process e.g. Creativity, Communicate, problem solving, Perception, Pattern recognition, Classification, Learning, Reasoning, Natural language processing and understanding, Knowledge, Acting and many more.*
  - **Artificial** means "man-made,"
  - **Artificial device**: is a system with intelligent

What is AI?

- Accordingly there are two possibilities:
  - A system with intelligence is expected to behave as intelligently as a human
  - A system with intelligence is expected to behave in the best possible manner
- Given this scenario the AI can be defined as
  - “The science and engineering of making intelligent machines”, specifically computer program
  - AI is the study of the mental faculties through the use of computational models (Chorniak and McDermolt 1985)
  - The branch of CS that is concerned with the automation of intelligent behaviour (Luger and Stubble field,19 93)

What is AI?

- The study of computations that make it possible to perceive, reason, and act (Winston 1992)
- The exciting new effort to make computer think …. Machines with minds, in the full and literal sense (Haugeland,19 85)
- The art of creating machines that perform functions that require intelligence when performed by people (Kurzweil 1990)
- The study of how to make computer to do things at which, at the moment, people are better (Rich and Knight 1991)
- It is the imitation of human thinking to solve problems

Artificial Intelligence

- Artificial intelligence comprises integration of several technologies such as machine learning, natural language processing, reasoning, and perception
- AI deals with the area of developing computing systems that are capable of performing tasks that humans are very good at.
  - Example recognizing objects, recognizing and making sense of speech, and decision making in a constrained environment.
- Generally , AI is the field of CS that is associated with the concept of machines “thinking like human” to perform tasks such as learning , problem solving , planning, reason and identifying patterns.

Intelligent Agents

- IA:- Anything that can be *viewed as* perceiving its environment through sensors and acting upon that environment through its effectors to maximize progress towards its goals.
  - The set of inputs at a given time is called a **percept**.
  - The sequence of percept influence the action of an agent.
  - **Action** is operations involving an effectors .
  - Agent can gave a goal which is tries to achieve.
  - The performance measure is used to evaluate an agent.

Intelligent Agents

- An **agent** is defined as someone or something that makes something happen e.g. human, robots, softbots etc
- The *agent* perceives its environment via sensors and acts in that environment with its effectors.

  Properties:
  - Autonomous:
    - An autonomous agent decides autonomously which action to take in the current situation to maximize progress towards its goals.
  - Interacts with other agents plus the environment
  - Reactive to the environment

Intelligent Agents

- Example of agent :
  - **Chess agent**
    - World knowledge is the board state (all the pieces)
    - Sensory information is the opponents move
    - It’s moves also change the board state
  - **Human** : sensor(eye, ears, skins, taste). effectors (Hand, fingers , legs, mouth)
  - **Robot**: sensor (camera, infrared,..), effectors (gripper, wheel, speaker,.)
  - **Soft ware agent** : function as sensor and actuator

Behavior and performance of IAs

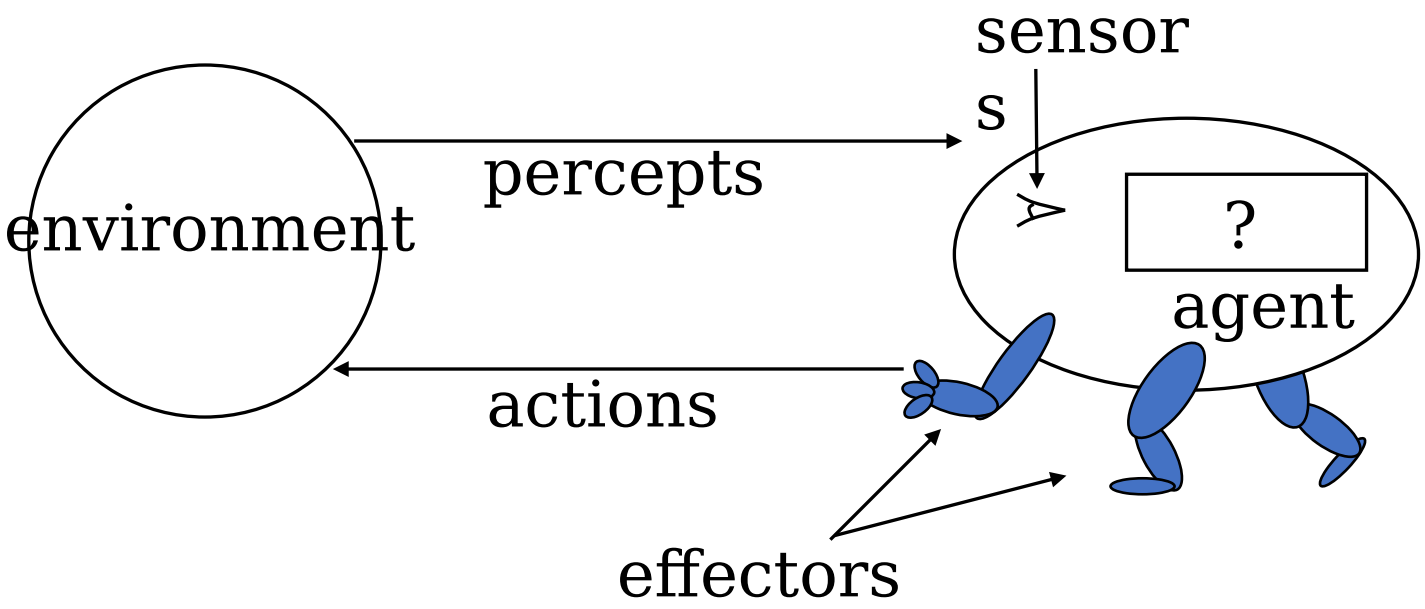
- The behavior and the performance of an agent is evaluated in terms of the agent function.
- The agent function implements a mapping from perception history to action
- Perception (sequence) to Action Mapping: $f : P^* \rightarrow A$
  - **Ideal mapping**: specifies which actions an agent ought to take at any point in time
  - **Description**: Look-Up-Table, Closed Form, etc.
  - **Performance measure**: a *subjective* measure to characterize how successful an agent is (e.g., speed, power usage, accuracy, money, etc.)
  - **(degree of) Autonomy**: to what extent is the agent able to make decisions and take actions on its own?

Intelligent Agents

- Knowledge of Environment (World)
  - Different to sensory information from environment
- World knowledge can be (pre)-programmed in
  - Can also be updated/inferred by sensory information
- Using knowledge to inform choice of actions:
  - Use knowledge of current state of the world
  - Use knowledge of previous states of the world
  - Use knowledge of how its actions change the world

An agent and its environment

AI system is composed of an agent and its environment



Task of the Environment

- The are four elements to take account when designing an agent to solve a particular problem
- PEAS
  - **P**erformance: measure the success of an agents behaviour
  - **E**nvironment: where an agent operates
  - **A**ctuator: agent acts with in its environment
  - **S**ensor: the agent senses its environment
- E.g. Taxi driver
  - P: safe, fast, legal, maximize profit
  - E:road, other traffic, customer, pedestrian
  - A: brake, accelerator, signal, horn, steering wheel
  - S: camera, sonar, speedometer, GPS, odometer, engin sensor, keyboard.

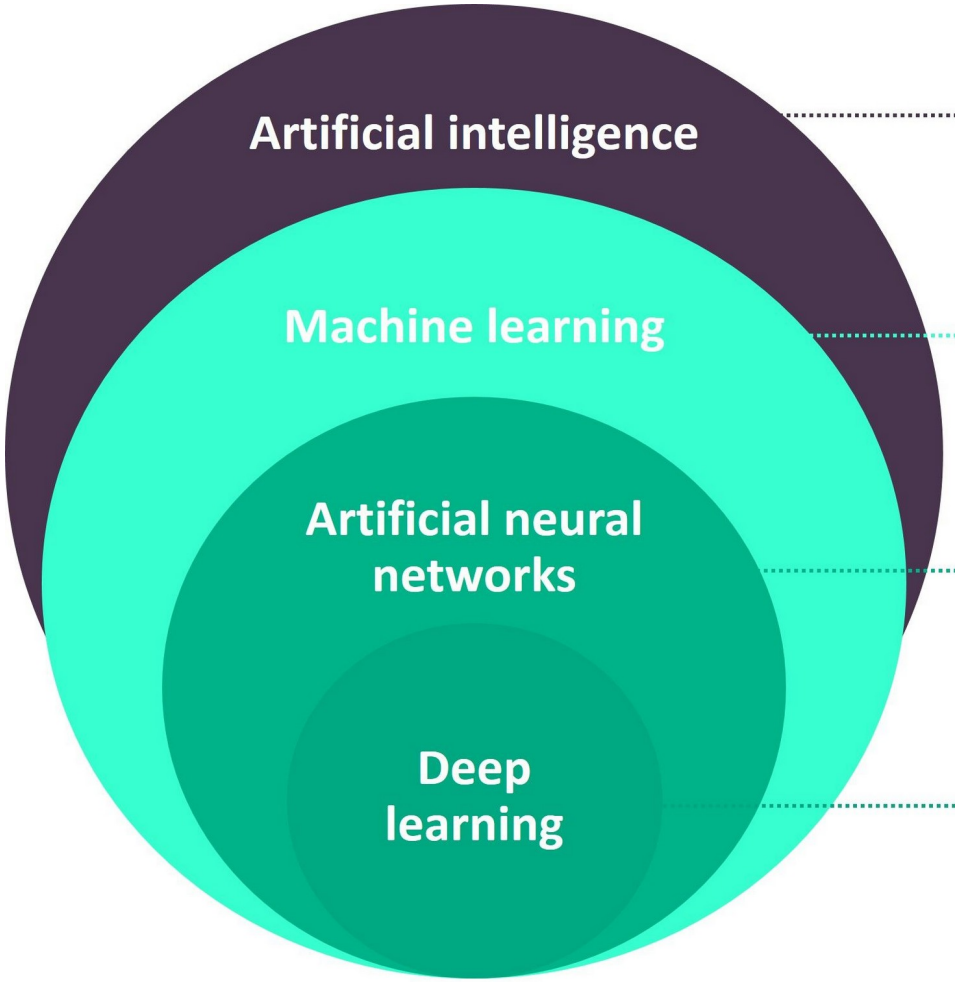
Examples of agents in different types of applications

Agent type	Percepts	Actions	Goals	Environment
Medical diagnosis system	Symptoms, findings, patient's answers	Questions, tests, treatments	Healthy patients, minimize costs	Patient, hospital
Satellite image analysis system	Pixels of varying intensity, color	Print a categorization of scene	Correct categorization	Images from orbiting satellite
Part-picking robot	Pixels of varying intensity	Pick up parts and sort into bins	Place parts in correct bins	Conveyor belts with parts
Refinery controller	Temperature, pressure readings	Open, close valves; adjust temperature	Maximize purity, yield, safety	Refinery
Interactive English tutor	Typed words	Print exercises, suggestions, corrections	Maximize student's score on test	Set of students

Influence of AI

- The advent of Big Data, driven by the arrival of the internet, smart mobile and social media has enabled AI algorithms, in particular from Machine Learning and Deep Learning, to leverage Big Data and perform their tasks more optimally.
- Cheaper and more powerful hardware such as Graphical Processing Units (GPUs) has enabled AI to evolve into more complex architectures.

Artificial Intelligence (AI), Machine Learning (ML) and Deep Learning (DL)



Artificial intelligence (AI)
Any techniques that enable machines to solve a task in a way like humans do

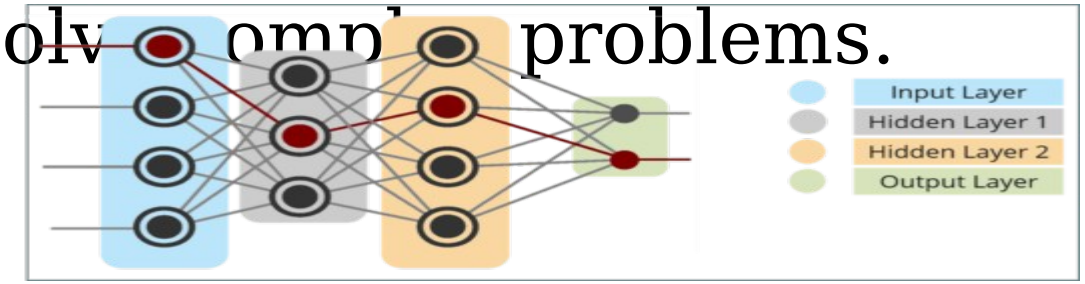
Machine learning (ML)
Algorithms that allow computers to learn from examples without being explicitly programmed

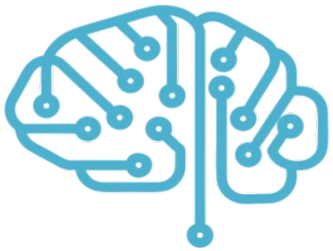
Artificial neural networks (ANN)
Brain-inspired machine learning models

Deep learning (DL)
A subset of ML which uses deep artificial neural networks as models and automatically builds a hierarchy of data representations

Artificial Intelligence (AI), Machine Learning (ML) and Deep Learning (DL)

- Artificial Intelligence is a technique that enables machines to mimic human behavior.
- Machine Learning is a subset of Artificial Intelligence. It is the science of getting computers to act by feeding them data and letting them learn a few tricks on their own, without being explicitly programmed to do so.
- **Deep learning** imitates the way our brain works i.e. it learns from experiences. It uses the concepts of neural networks to solve complex problems.



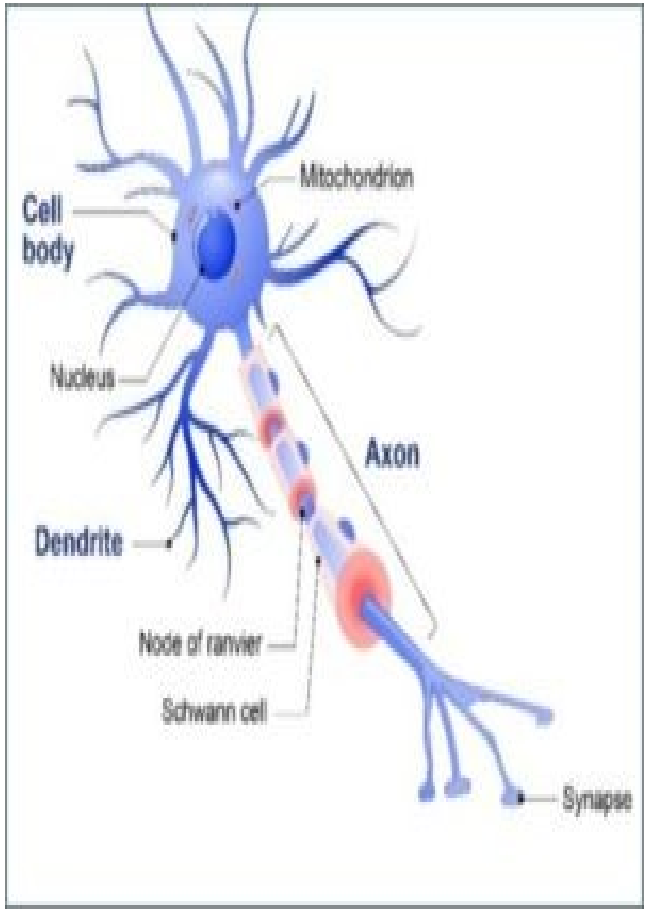
 Artificial Intelligence	 Machine Learning	 Deep Learning
Artificial intelligence originated around 1950s.	Machine learning originated around 1960s.	Deep learning originated around 1970s.
AI represents simulated intelligence in machines.	Machine Learning is the practice of getting machines to make decisions without being programmed.	Deep Learning is the process of using Artificial Neural Networks to solve complex problems.
AI is a subset of Data Science.	Machine learning is a subset of AI & Data Science	Deep learning is a subset of Machine learning, AI & Data Science.
Aim is to build machines which are capable of thinking like humans.	Aim is to make machines learn through data so that they can solve problems.	Aim is to build neural networks that automatically discover patterns for feature detection.

What are the different types of Machine Learning?

	Supervised Learning	Unsupervised Learning	Reinforcement Learning
Definition	The machine learns by using labelled data	The machine is trained on unlabelled data without any guidance	An agent interacts with its environment by producing actions & discovers errors or rewards
Type of problems	Regression & Classification	Association & Clustering	Reward based
Type of data	Labelled data	Unlabelled data	No pre-defined data
Training	External supervision	No supervision	No supervision
Approach	Map labelled input to known output	Understand patterns and discover output	Follow trail and error method
Popular algorithms	Linear regression, Logistic regression, Support Vector Machine, KNN, etc	K-means, C-means, etc	Q-Learning, SARSA, etc

Deep Learning works

- Deep Learning is based on the basic unit of a brain called a brain cell or a neuron. Inspired from a neuron, an artificial neuron or a perceptron was developed.
- A biological neuron has dendrites which are used to receive inputs.
- Similarly, a perceptron receives multiple inputs, applies various transformations and functions and provides an output.
- Just like how our brain contains multiple connected neurons called neural network, we can also have a network of artificial neurons called perceptron’s to form a Deep neural network.



Need for Artificial Intelligence

- To create expert systems that exhibit intelligent behavior
  - capability to learn, demonstrate, explain and advice its users.
- To find solutions to complex problems
- To automate the routine work
- To automates repetitive learning and discovery through data.
- To adapts through progressive learning algorithms
- To achieves incredible accuracy through deep neural networks

Goals of Artificial Intelligence

- The main goals of Artificial Intelligence:
  - Replicate human intelligence
  - Solve Knowledge-intensive tasks
  - Building a machine which can perform tasks that requires human intelligence such as:
    - Proving a theorem, Playing chess, Plan some surgical operation, Driving a car in traffic, etc
  - Creating some system which can exhibit intelligent behavior, learn new things by itself, demonstrate, explain, and can advise to its user
  - Enhance human-computer interaction/ communication

What Comprises to Artificial Intelligence ?

- Intelligence is an intangible part of our brain which is a combination of Reasoning, learning, problem-solving, perception, language understanding, etc.
- To achieve the above, AI requires the following disciplines:
  - Mathematics , Biology , Psychology , Sociology , Computer Science , Neurons Study , Statistics

Advantages of Artificial Intelligence

- Following are some main advantages of Artificial Intelligence
  - **High Accuracy with fewer errors:** AI machines or systems are prone to fewer errors and high accuracy as it takes decisions as per pre-experience or information.
  - **High-Speed:** AI systems can be of very high-speed and fast-decision making, because of that AI systems can beat a chess champion in the Chess game.
  - **High reliability:** AI machines are highly reliable and can perform the same action multiple times with high accuracy.

Advantages of Artificial Intelligence

- **Useful for risky areas**: AI machines can be helpful in situations such as defusing a bomb, exploring the ocean floor, where to employ a human can be risky.
- **Digital Assistant**: AI can be very useful to provide digital assistant to users such as AI technology is currently used by various E-commerce websites to show the products as per customer requirements.
- **Useful as a public utility**: AI can be very useful for public utilities such as a self-driving car which can make our journey safer and hassle-free, facial recognition for security purposes, Natural language processing (for search engines, for spelling checker, for assistant like Siri, for translation like google translate), etc.

Disadvantages of Artificial Intelligence

- Create a superintelligence that can threaten human existence.
- **High Cost**: The hardware and software requirement of AI is very costly as it requires lots of maintenance to meet current world requirements.
- **Can't think out of the box**: Even we are making smarter machines with AI, but still they cannot work out of the box, as the robot will only do that work for which they are trained, or programmed.
- **Unemployment**: Replacement of humans with machines can lead to large-scale unemployment

Disadvantages of Artificial Intelligence

- **No feelings and emotions**: AI machines can be an outstanding performer, but still it does not have the feeling so it cannot make any kind of emotional attachment with humans, and may sometime be harmful for users if the proper care is not taken.
- **Increase dependence on machines**: With the increment of technology, people are getting more dependent on devices and hence they are losing their mental capabilities.
- **No Original Creativity**: As humans are so creative and can imagine some new ideas but still AI machines cannot beat this power of human intelligence and cannot be creative and imaginative.

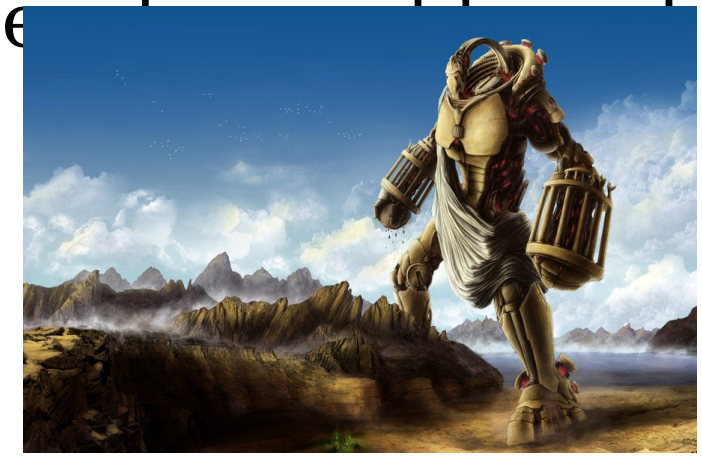
History of AI

- The concept of intelligent machines is found in Greek mythology. There is a story in the 8th century A.D about Pygmalion Olio, the legendary king of Cyprus.
- He fell in love with an ivory statue he made to represent his ideal woman.
- The king prayed to the goddess Aphrodite, and the goddess miraculously brought the statue to life.

History of AI

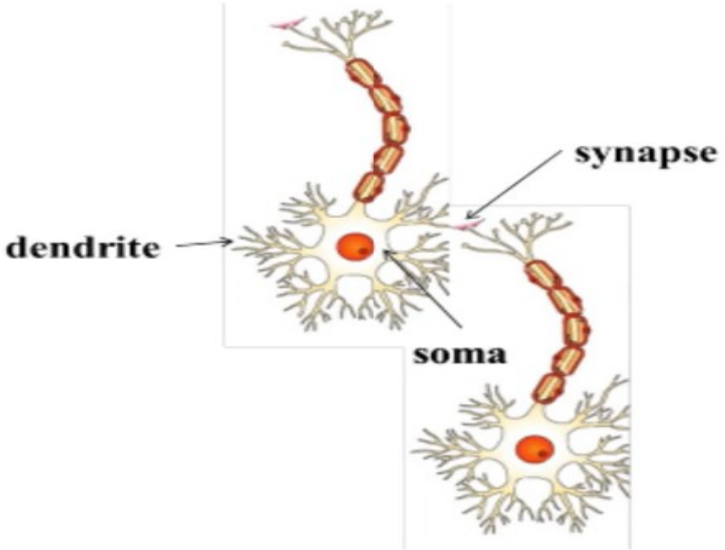
- Other myths involve human-like artifacts. As a present from Zeus to Europa.
- Hephaestus(son of Zeus and Hera and married to Aphrodite) created Talos, a huge robot. Talos was made of bronze and his duty was to patrol the beaches of Crete. who guarded the island of Crete-to protect [illegible] to kidnap her.

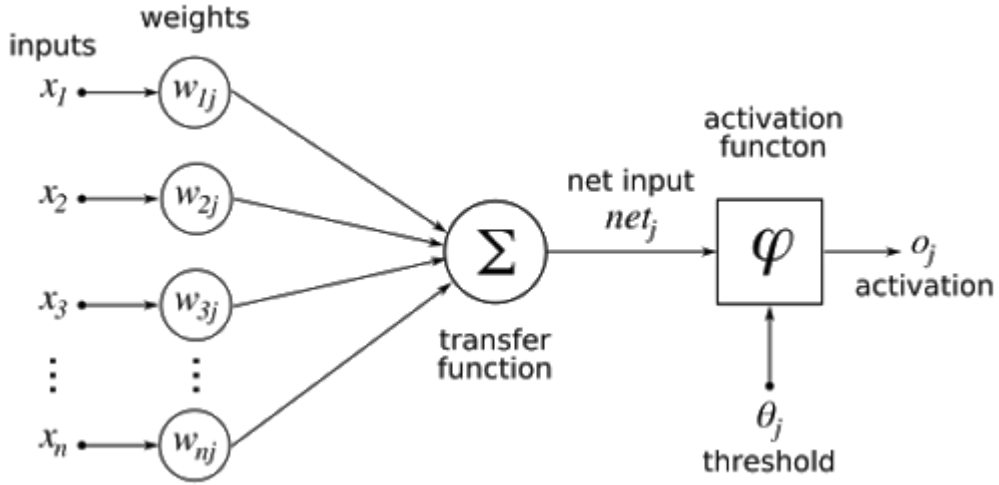




A. Maturation of Artificial Intelligence (1943-1952)

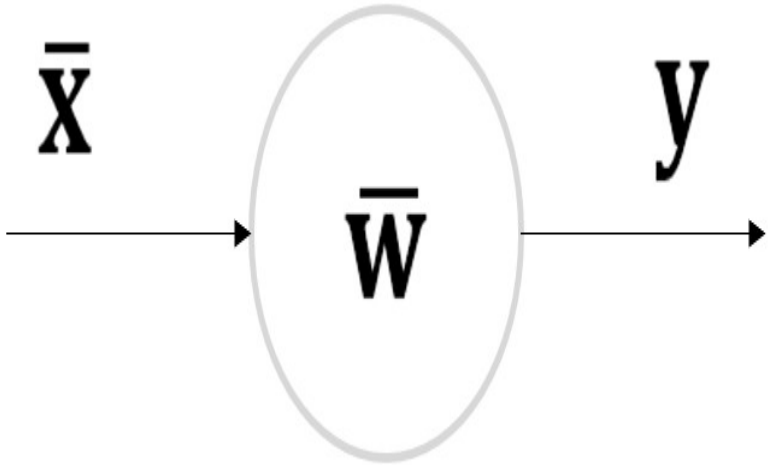
- **The year 1943**: The first work which is now recognized as AI was done by Warren McCulloch and Walter pits in 1943. They proposed a model of artificial



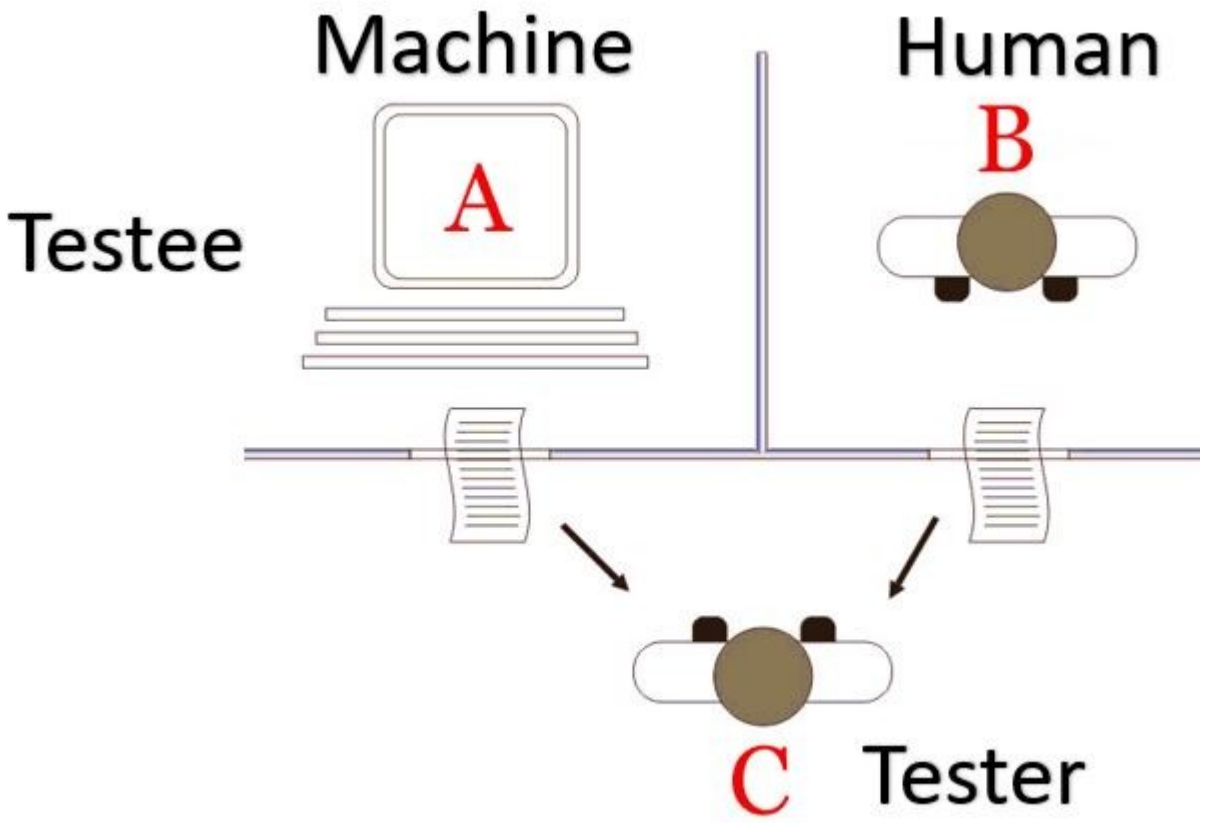


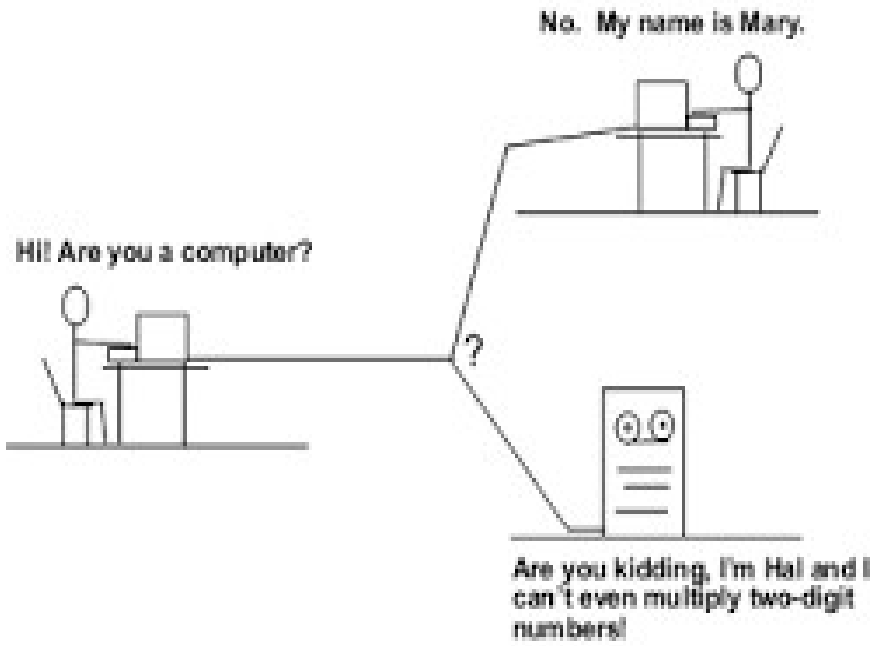
A. Maturation of Artificial Intelligence (1943-1952)

- **The year 1949**: Donald Hebb demonstrated an updating rule for modifying the connection strength between neurons. His rule is now called Hebbian learning.
- **The year 1950**: The Alan Turing who was an English mathematician and pioneered Machine learning in 1950. Alan Turing publishes "Computing Machinery and Intelligence" in which he proposed a test. The test can check the machine's ability to exhibit intelligent behavior equivalent to human intelligence, called a Turing test.



$$y = \bar{w} \cdot \bar{x}$$


Machine
Human
Testee
A
B
C
Tester


No. My name is Mary.
Hi! Are you a computer?
?
Are you kidding, I'm Hal and I can't even multiply two-digit numbers!

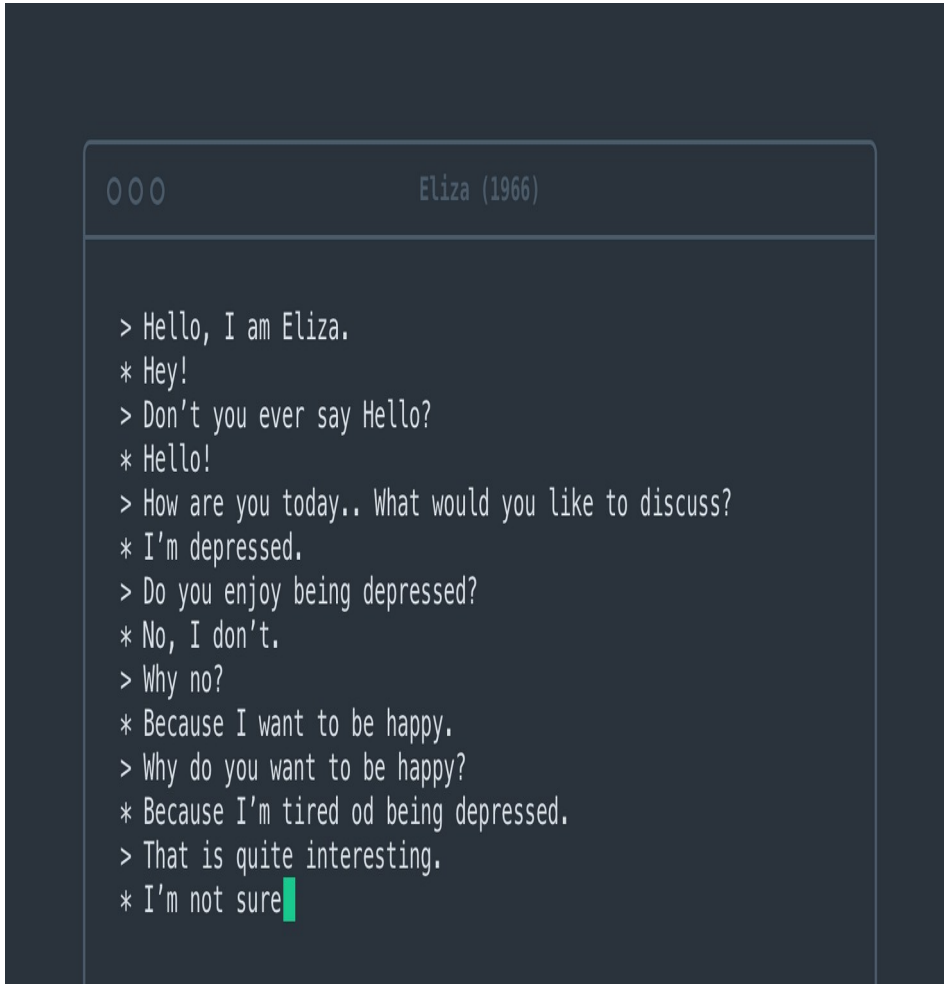
B. The birth of Artificial Intelligence (1952-1956)

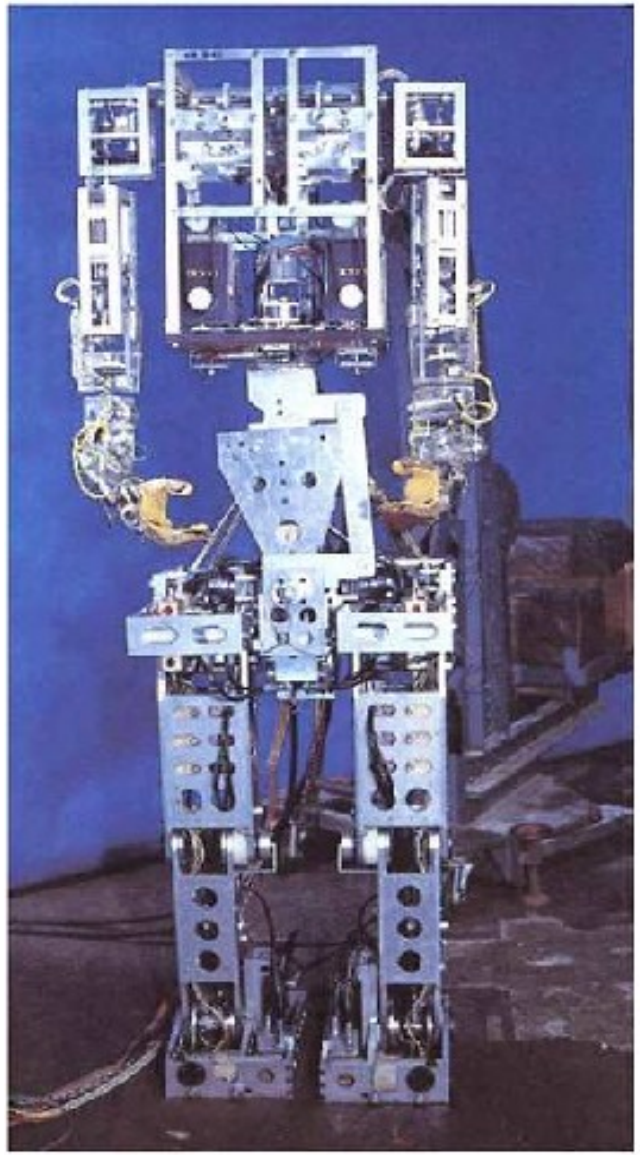
- **The year 1955**: An Allen Newell and Herbert A. Simon created the "first artificial intelligence program" Which was named "Logic Theorist". This program had proved 38 of 52 Mathematics theorems, and find new and more elegant proofs for some theorems.
- **The year 1956:** The word "Artificial Intelligence" first adopted by American Computer scientist John McCarthy at the Dartmouth Conference. For the first time, AI coined as an academic field. At that time high-level computer languages such as FORTRAN, LISP, or COBOL were invented. And the enthusiasm for AI was very high at that time.



C. The golden years-Early enthusiasm (1956-1974)

- **The year 1966**: The researchers emphasized developing algorithms that can solve mathematical problems. Joseph Weizenbaum created the first chatbot in 1966, which was named as ELIZA.
- **The year 1972**: The first intelligent humanoid robot was built in Japan which was named WABOT-1.





(a) WABOT-1 (1973)



(b) WABOT-2 (1984)

D. The first AI winter (1974-1980)

- The duration between the years 1974 to 1980 was the first AI winter duration.
- AI winter refers to the time period where computer scientists dealt with a severe shortage of funding from the government for AI researches.
- During AI winters, an interest in publicity on artificial intelligence was decreased.

E. A boom of AI (1980-1987)

- **The year 1980**: After AI winter duration, AI came back with "Expert System".
- Expert systems were programmed that emulate the decision-making ability of a human expert.
- In the Year 1980, the first national conference of the American Association of Artificial Intelligence was held at Stanford University.

F. The second AI winter (1987-1993)

- The duration between the years 1987 to 1993 was the second AI Winter duration.
- Again, Investors and government stopped in funding for AI research due to high cost but not efficient results.
- The expert system such as XCON was very cost-effective.

G. The emergence of intelligent agents (1993-2011)





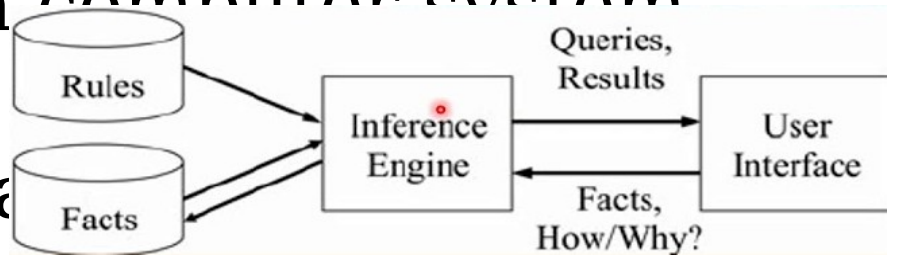
- **The year 1997**: In the year 1997, IBM Deep Blue beats world chess champion, Gary Kasparov, and became the first computer to beat a world chess champion
- **The year 2002**: for the first time, AI entered the home in the form of Roomba, a vacuum cleaner.
- **The year 2006**: AI came into the Business world until the year 2006. Companies like Facebook, Twitter, and

H. Deep learning, big data and artificial general intelligence (2011-present)

- **The year 2011**: In the year 2011, IBM's Watson won jeopardy, a quiz show, where it had to solve complex questions as well as riddles. Watson had proved that it could understand natural language and can solve tricky questions quickly.
- **The year 2012**: Google has launched an Android app feature "Google now", which was able to provide information to the user as a prediction.
- **The year 2014**: In the year 2014, Chatbot "Eugene Goostman" won a competition in the infamous "Turing test."
- **The year 2018**: The "Project Debater" from IBM debated on complex topics with two master debaters and also performed extremely well.
- Google has demonstrated an AI program "Duplex" which was a virtual assistant and which had taken hairdresser appointment on call, and the lady on the other side didn't notice that she was talking with the machine.

Levels of AI

- **Stage 1 – Rule-Based Systems**
  - A rule-based system (e.g., production system, expert system) uses rules as the knowledge representation.
  - These rules are coded into the system in the form of if-then-else statements.
  - The main idea of a rule-based system is to capture the knowledge of a human expert in a specialized domain and embody it within a computer system.
  - That's it. No more, no less.
  - Hence, knowledge is encoded a



Levels of AI

- **Stage 2 – Context Awareness and Retention** :
  - Algorithms that develop information about the specific domain they are being applied in. e.g. chatbots and “roboadvisors”.
  - **Context awareness** is the ability of a system or system component to gather information about its environment at any given time and adapt behaviors accordingly.
  - **Contextual** or **context-aware** computing uses software and hardware to automatically collect and analyze data to guide responses.

Levels of AI

- **Stage 3 – Domain-Specific Expertise** :
  - **Expertise** and **Domain Specific Knowledge**.
  - An expert is a person with extensive **knowledge** about **a particular** subject matter or area of **expertise**.
  - Much problem solving involves **domain-specific knowledge.**
  - These systems build up expertise in a specific context taking in massive volumes of information which they can use for decision making. E.g. AlphaGo.

Levels of AI

- **Stage 4 – Reasoning Machines** :
  - **Machine reasoning** (MR) systems generate conclusions from available knowledge by using logical techniques like deduction and induction.
  - They have a sense of beliefs, intentions, knowledge, and how their own logic works.

Levels of AI

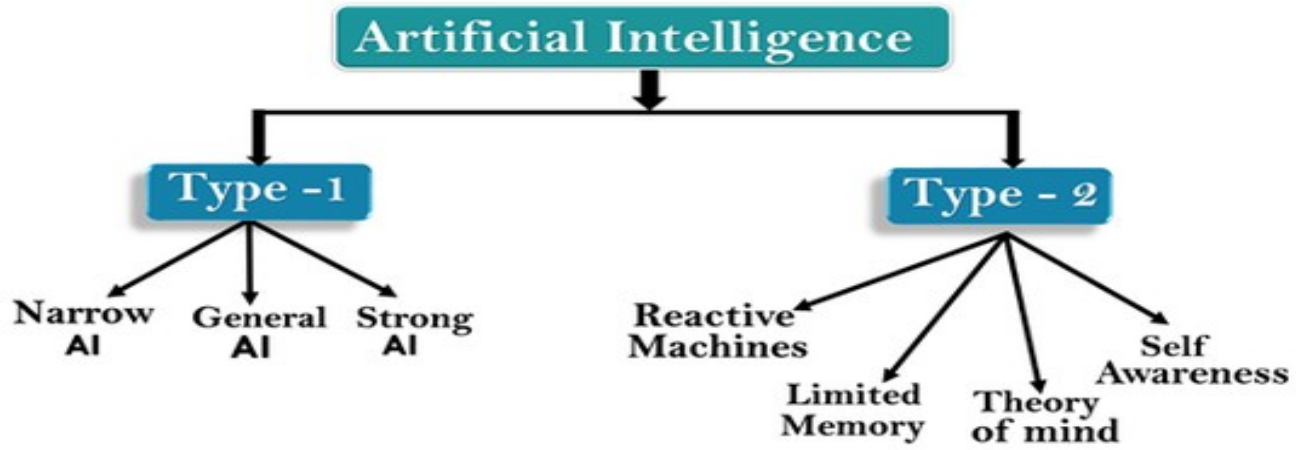
- **Stage 5 – Self Aware Systems / Artificial General Intelligence (AGI)**
  - These systems have human-like intelligence.
  - **AGI** is the **intelligence** of a machine that has the capacity to understand or learn any intellectual task that a human being can.
- **Stage 6 – Artificial Superintelligence (ASI)** : AI algorithms can outsmart even the most intelligent humans in every domain. Experts claim it can be realized by 2029.

Levels of AI

- **Stage 7 – Singularity and Transcendence** : is a hypothetical future point in time at which technological growth becomes uncontrollable and irreversible, resulting in unforeseeable changes to human civilization.
- Some proponents of singularity such as Ray Kurzweil, Google’s Director of Engineering, suggest we could see it happen by 2045 as a result of exponential rates of progress across a range of science and technology disciplines.

Types of AI /AI Advocators

- Artificial Intelligence can be divided into various types, there are mainly
  - Based on Capabilities
  - Based on the functionality



Based on Capabilities

1. **Weak AI or Narrow AI**:
   - Narrow artificial intelligence is a specific type of AI that is used to perform a narrow task.
   - They believe AI lack the self-awareness, consciousness to perform Intelligent tasks.
   - It is the most common and currently available
   - Can fail in unpredictable ways if it goes beyond its limits.
   - E.g. Apple Siri , IBM's Watson supercomputer ,Google translate, playing chess, purchasing suggestions on e-commerce sites, self-driving cars, speech recognition, and image recognition.

Based on Capabilities

2. **Strong AI** aka Artificial General intelligence

- In the future technologists will one day be able to build a computer with all cognitive, memory, and emotional capabilities of the human brain.
- They believe that computers will someday be more intelligent than human beings
- They are self-aware and conscious to take decisions.
- General AI is a type of intelligence that could perform any intellectual task with efficiency like a human
- Currently, there is no such system exists which could come under general AI and can perform any task as perfect as a human.

Based on Capabilities

3. Super AI

- is a level of Intelligence of Systems at which machines could surpass human intelligence, and can perform any task better than a human with cognitive properties.
- This refers to aspects like general wisdom, problem solving and creativity.
- It is an outcome of general AI.
- Some key characteristics of strong AI include capability include the ability to think, to reason solve the puzzle, make judgments, plan, learn, and communicate on its own.
- Super AI is still a hypothetical concept of Artificial Intelligence. The development of such systems in real is still a world-changing task.

Super AI



Based on functionalities there are 4 types:

1. **Reactive Machines** :
   - Reactive Artificial Intelligence is one of the basic forms of AI.
   - They don’t have past memory or historic data to use and to make current decisions.
   - Such machines work on the present, to perform a task that is right in front of them.
   - **Example:** IBM chess program that beat Garry Kasparov, Google's AlphaGo

2. Limited Memory

- These AI systems can use past experiences or some data for a short period of time to take future decisions.
- As the name suggests they have limited memory or short-lived memory.
- **Example:** self-driving cars

3. Theory of Mind AI

- Simply thinking like a human.
- This type of AI understands human emotions, thoughts and is able to interact socially.
- This type of AI machines is still not developed, but researchers are making lots of efforts and improvement for developing such AI machines

4. **Self-Aware AI**

- In this type of artificial intelligence the machines are self-conscious, and self-aware like humans.
- This can be a future of robots, though how pleasant will it be for humans will be an interesting thing to find out.
- These machines will be super intelligent and will have their own consciousness, sentiments, and self-awareness.
- These machines will be smarter than the human mind.

How humans think

- The goal of many researchers is to create strong and general AI that learns like a human and can solve general problems as the human brain does.
- Achieving this goal might require many more years.
- Intelligence or the cognitive process is composed of three main stages:
  - Observe and input the information or data in the brain.
  - Interpret and evaluate the input that is received from the surrounding environment.
  - Make decisions as a reaction towards what you received as input and interpreted and evaluated.

Mapping human thinking to AI components

- Because AI is the science of simulating human thinking, it is possible to map the human thinking into 3 stages to the layers or components of AI systems.
- In the first stage,
  - humans acquire information from their surrounding environments through human senses, such as sight, hearing, smell, taste, and touch, through human organs, such as eyes, ears, and other sensing organs, for example, the hands.
  - For example, there are sensing agents such as voice recognition for sensing voice and visual imaging recognition for sensing images. Thus, these agents or sensors take the role of the hearing and sight senses in humans.

Mapping human thinking to AI components

- The second stage
  - Interpreting and evaluating the input data.
  - Reasoning and thinking about the gathered input that is acquired by the sensing layer.
- The third stage
  - Taking action or making decisions.
  - After evaluating the input data, the interacting layer performs the necessary tasks.
  - Robotic movement control and speech generation are examples of functions that are implemented in the interacting layer.

Influencers of artificial intelligence

- The following some of the reason why AI is popular:
  - **Big data**: Structured data versus unstructured data
  - Advancements in computer processing speed and new chip architectures
  - Cloud computing and APIs
  - The emergence of data science

Big Data

- Big data refers to huge amounts of data.
- Big data requires innovative forms of information processing to draw insights, automate processes, and help decision making.
- Big data can be
  - Structured, semi-structured and unstructured data such as databases, word-processing documents, videos, images, audio, presentations, social media interactions, streams, web pages, and many other kinds of content

Structured data versus unstructured data

- Traditionally, computers primarily process structured data, that is, information with an organized structure, such as a relational database that is searchable by simple and straightforward search engine algorithms or SQL statements
- Real-world data does not constitute structured data *Unstructured data* is not contained in a regular database and is growing exponentially, making up most of the data in the world.
- The unstructured data is exponential growth

Advancements in computer processing speed, new chip architectures, and big data file systems

- Significant advancements in computer processing and memory speeds enable us to make sense of the information that is generated by big data more quickly.
- In recent years, big data and the ability to process a large amount of data at high speeds have enabled researchers and developers to access and work with massive sets of data.
- Processing speeds and new computer chip architectures contribute to the rapid evolution of AI applications.
- The Hadoop file system is a distributed file system that may run on a cluster of commodity machines, where the storage of data is distributed among the cluster and the processing is distributed too.

Cloud computing and application programming interfaces

- Cloud computing is a general term that describes the delivery of on-demand services, usually through the internet, on a pay-per-use basis.
- These services might be data analysis, social media, video storage, e-commerce, and AI capabilities that are available through the internet and supported by cloud computing.
- APIs enable software components to communicate with each other easily.
- for example,
  - IBM delivers Watson AI services over IBM Cloud.
  - Amazon AI services are delivered over Amazon Web Services (AWS).
  - Microsoft AI tools are available over the MS Azure cloud
  - Google AI services are available in the Google Cloud Platform

Cloud computing and application programming interfaces

- These services benefit from cloud platform capabilities, such as availability, scalability, accessibility, rapid deployment, flexible billing options, simpler operations, and management.

The emergence of data science

- Data science has emerged in the last few years as a new profession that combines several disciplines, such as statistics, data analysis, machine learning, and others.
- The goal of data science is to extract knowledge or insights from data in various forms, either structured or unstructured, which is like data mining.

Applications of AI

- AI in agriculture
- AI in Healthcare
- AI in education
- AI in Finance and E-commerce
- AI in Gaming
- AI in Social Media
- AI in Data Security
- AI in Travel &Transport
- AI in Robotics
- AI in Entertainment
- AI in the Automotive Industry

AI tools

- AI has developed a large number of tools to solve the most difficult problems in computer science, like:
  - Search and optimization
  - Logic
  - Probabilistic methods for uncertain reasoning
  - Classifiers and statistical learning methods
  - Neural networks
  - Control theory
  - Languages

The most common AI platforms

- The most common artificial intelligence platforms include
  - Microsoft AZURE Machine Learning, Google Cloud Prediction API,
  - IBM Watson, TensorFlow,
  - Infosys Nia, Wipro HOLMES,
  - API.AI, Premonition,
  - Rainbird, Ayasdi, MindMeld, and Meya

Semple AI application

- Commuting
  - Google’s AI-Powered Predictions
  - Ridesharing Apps Like Uber and Lyft
  - Commercial Flights Use an AI Autopilot
- Email
  - Spam Filters
  - Smart Email Categorization
- Social Networking
  - Facebook - When you upload photos to Facebook, the service automatically highlights faces and suggests friends tag.

Semple AI application

- Online Shopping
  - Search - Your Amazon searches (“ironing board”, “pizza stone”, “Android charger”, etc.) quickly return a list of the most relevant products related to your search
  - Recommendations
- Mobile Use
  - Voice-to-Text
  - Smart Personal Assistants-Siri and Google Now, Alexa , Cortana,

Quizzes 2

1. What is Artificial Intelligence? Give an example of where AI is used on a daily basis.
2. What is Turing Test
3. List the different types of Artificial Intelligence
4. List some application of AI?
5. What is AI winter?
6. What is the difference between Strong Artificial Intelligence and Weak Artificial Intelligence?

THANKS

End of chapter 3
Does anyone have any questions?