

Chapter three(3) : Artificial Intelligence (AI)

❖Points to be covered under this topics are:

➤Definations of AI.

➤Types, application areas and approaches of AI.

➤Need for Artificial Intelligence

➤Advantages and Disadvantages of AI

➤History of AI

➤Applications of AI

- What is Artificial Intelligence?
- The power of a machine to copy

behavior.



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- Are they really intelligent?
- ✓ A robot is only as smart as its initial program.
- ✓ Answer: The power of a machine to copy and learn from intelligent human behavior.

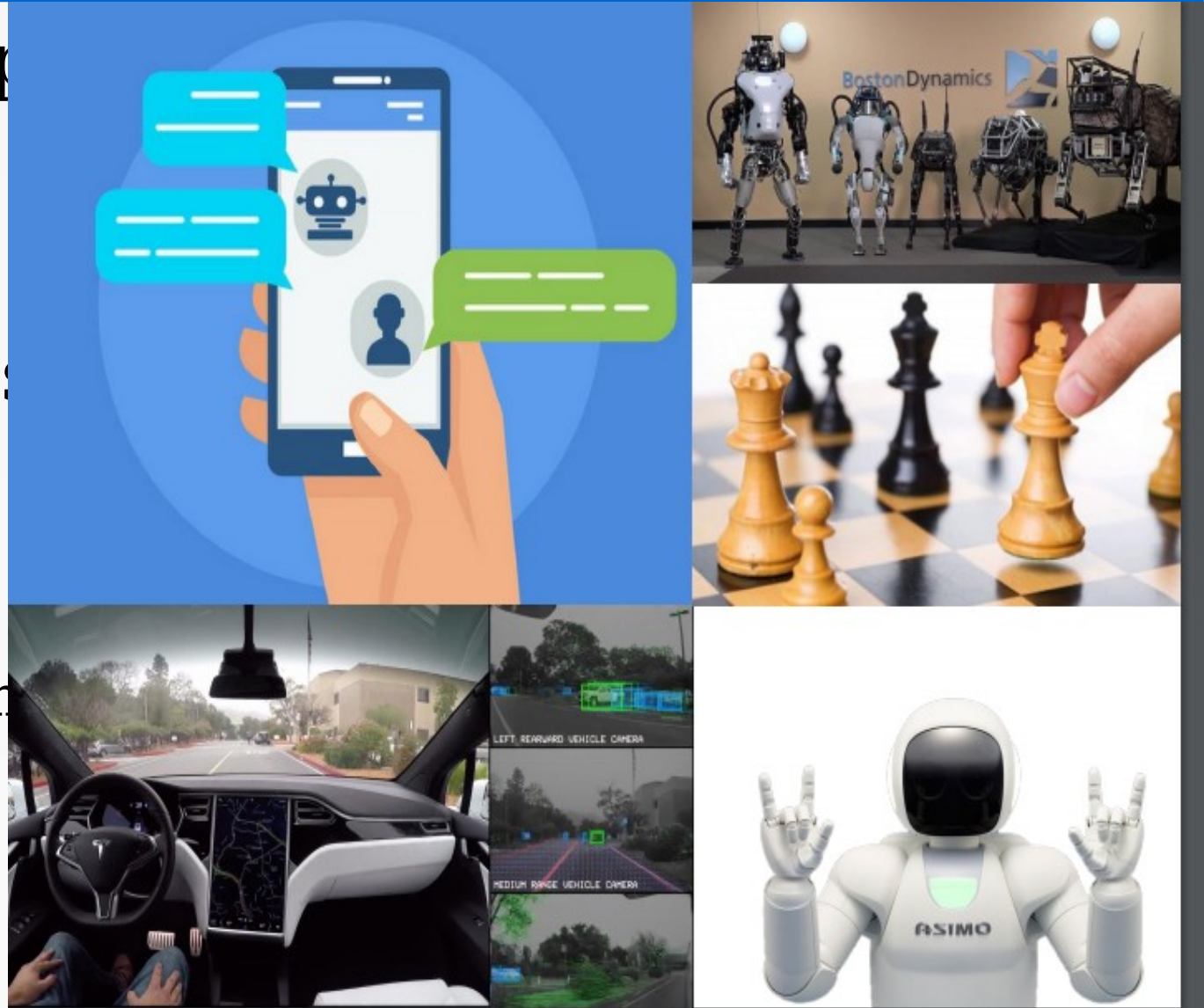
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- What is Artificial Intelligence?
- Artificial Intelligence is the development of computer systems that are able to perform tasks that would require human intelligence.
- Examples of these tasks are visual perception, speech recognition, decision-making, and translation between languages.

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- **Real Life A.I.** Examples
 - ✓ Self Driving Cars
 - ✓ Boston Dynamics
 - ✓ Navigation Systems
 - ✓ ASIMO
 - ✓ Chatbots
 - ✓ Human vs Computer Games
 - ✓ Many More!



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- AI

- Programmed to think
- Social Interaction
- Learns program



Robot

Programmed to do

Low level interaction

Only as smart as

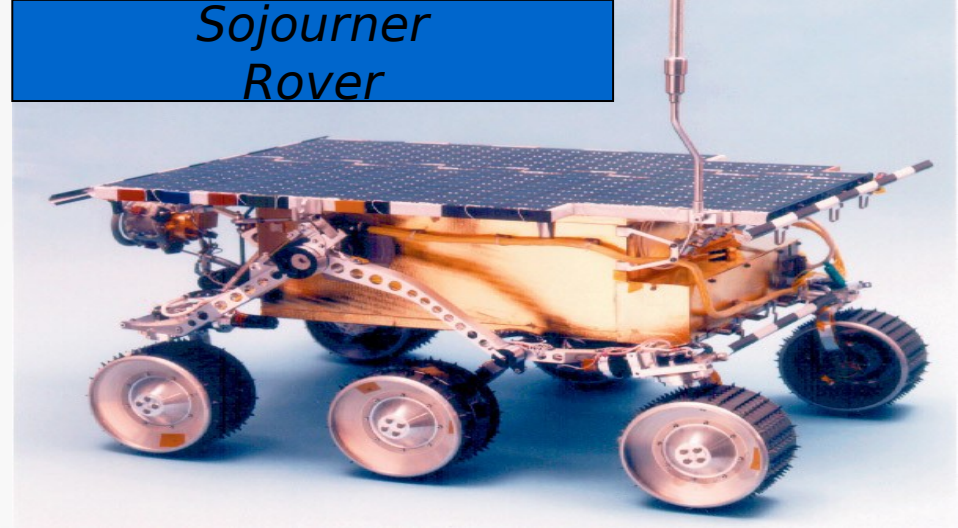
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Robots



Sony's Aibo

Sojourner
Rover



Spirit or
Opportunity Rover



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- AI is composed of two words **Artificial** and **Intelligence**.
- Artificial Intelligence means "a man-made thinking power."
- It is the science and engineering of making intelligent machines, especially intelligent computer programs. Those intelligent machines can behave like a human, think like humans, and able to make decisions.
- **what is intelligence?**
- Intelligence is the computational part of the ability to achieve goals in the world. Varying kinds and degrees of intelligence occur in people, many animals and some machines.

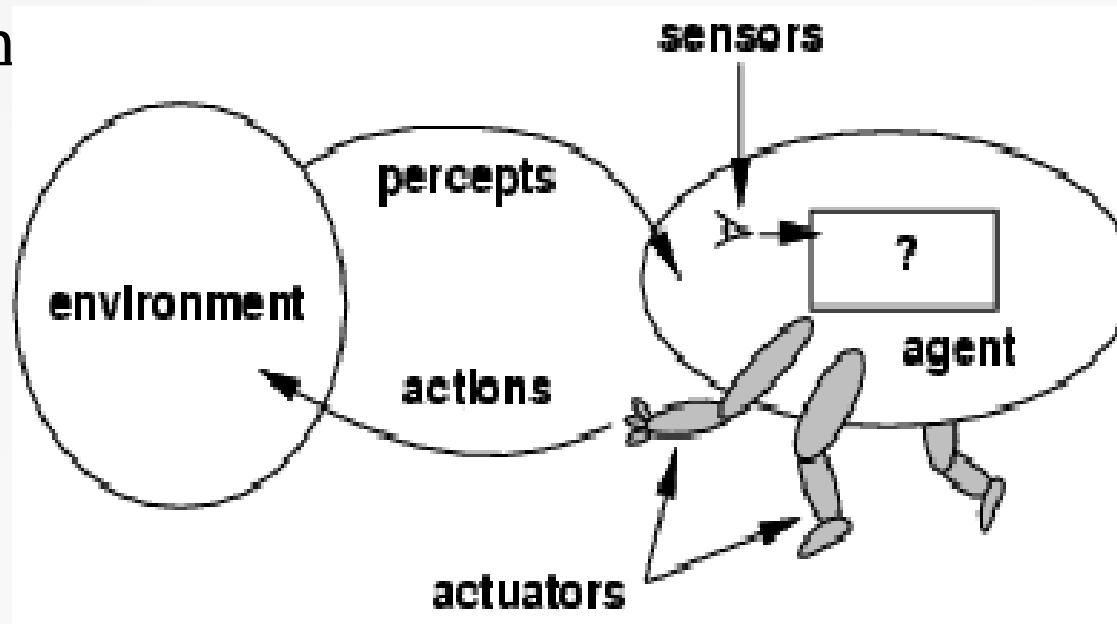
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- Intelligence is the ability to acquire and apply **knowledge**.
Knowledge is the information acquired through experience.
Experience is the knowledge gained through exposure (training)
Summing the terms up, we
- Intelligence is composed of
 - Reasoning
 - Learning
 - Problem Solving
 - Perception
 - Linguistic Intelligence



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- AI system is composed of an agent and its environment.
- An agent (e.g., human or robot) is anything that can perceive its environment through sensors and acts upon that environment through



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- Intelligent agents must be able to set **goals** and achieve them.
- Other examples of AI include :-
 - ✓ autonomous vehicles (such as drones and self-driving cars),
 - ✓ medical diagnosis,
 - ✓ creating art (such as poetry),
 - ✓ proving mathematical theorems,
 - ✓ playing games (such as Chess or Go)

- ✓ search engines (such as Google search),
- ✓ online assistants (such as Siri),
- ✓ image recognition in photographs,
- ✓ spam filtering,
- ✓ prediction of judicial decisions and targeting
- ✓ online advertisements

- AI deals with the area of developing computing systems that are capable of performing tasks that **humans** are very good at, for example **recognizing** objects, recognizing and **making** sense of speech, and decision making in a constrained **environment**.
- Machine Learning is an advanced form of AI where the machine can learn as it goes rather than having every action programmed by humans.

Need for Artificial Intelligence

- AI needed for the following :
 - ✓ To create **expert systems** that exhibit intelligent behavior with the capability to learn, demonstrate, explain and advice its users.
 - ✓ Helping machines, find solutions to complex problems like humans do and applying them as algorithms in a computer-friendly manner.

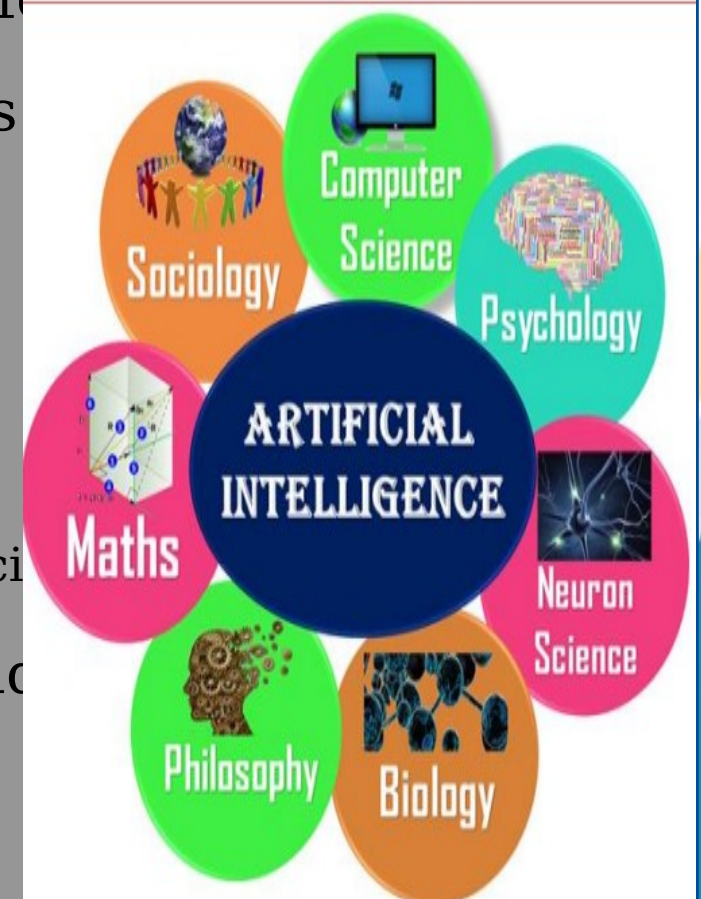
- Following are the main goals of AI:
 - ✓ Replicate human intelligence
 - ✓ Solve Knowledge-intensive tasks
 - ✓ An intelligent connection of perception and action
 - ✓ Building a machine which can perform tasks that requires human intelligence
 - ✓ Creating some system which can exhibit intelligent behavior, learn new things by itself, demonstrate, explain, and can advise to its user.

Comprises to Artificial Intelligence

- To create the AI-first we should know that how intelligence is composed.
- Intelligence is an intangible part of our brain which is a combination of Reasoning, learning, problem-solving, perception, language understanding, etc.

- To achieve the factors for a machine or software Artificial Intelligence requires the following disciplines.

- ✓ Mathematics
- ✓ Biology
- ✓ Psychology
- ✓ Sociology
- ✓ Computer Sci
- ✓ Neurons Stud
- ✓ Statistics



Advantages and Disadvantages of AI

- Following are some main advantages of Artificial Intelligence:

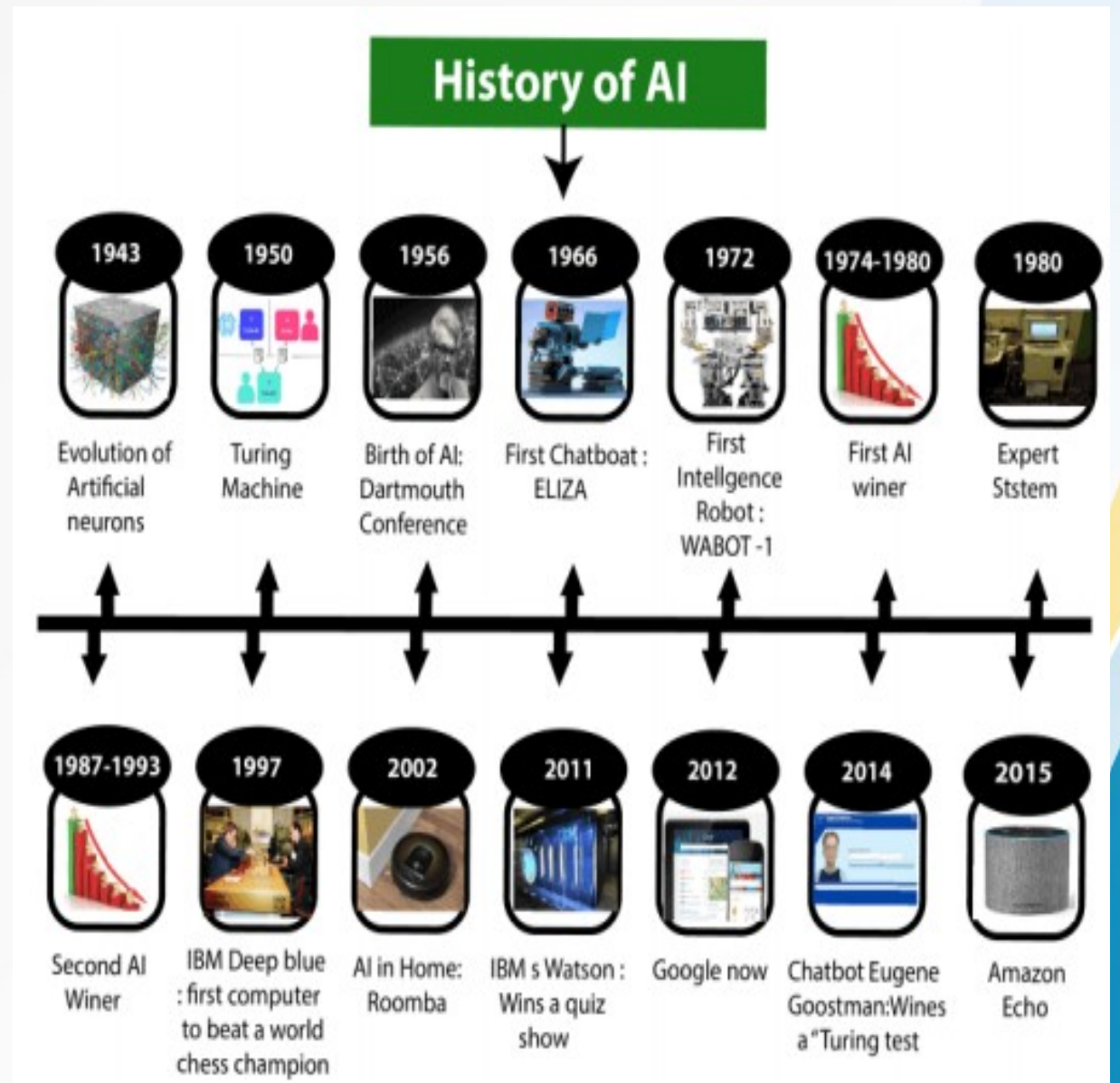
- High Accuracy with fewer errors
- High-Speed
- High reliability
- Useful for risky areas
- Digital Assistant
- Useful as a public utility

- Following are some main advantages of Artificial Intelligence:

- High Cost
- Can't think out of the box
- No feelings and emotions
- Increase dependence on machines
- No Original Creativity

History of AI

- Following are some milestones in the history of AI which define the journey from the AI generation to till date development.



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- The history of AI can be seen from different perspectives some of them are:

A. Maturation of Artificial Intelligence (1943-1952)

- ✓ Warren McCulloch and Walter Pitts (1943) : proposed a model of artificial neurons.
- ✓ Donald Hebb (1949) : updating rule for modifying the connection strength between neurons. his rule is called **Hebbian learning**.
- ✓ Alan Turing (1950) : mathematician and pioneered
Machine learning

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

- ✓ Allen Newell and Herbert A. Simon(1955) : created first artificial intelligence program (named Logic Theorist).
- ✓ John McCarthy(1956) : The word "Artificial Intelligence" first adopted and high-level computer languages such as **FORTRAN**, **LISP**, or **COBOL** were invented.

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

- ✓ Joseph Weizenbaum(1966): created the first chatbot which is called ELIZA.
- ✓ In the year 1972 : The first intelligent humanoid robot was built in Japan which was named WABOT-1.

D. The first AI winter (1974-1980)

- ✓ Between the years 1974 to 1980 was the first AI winter duration.

E. A boom of AI (1980-1987)

F. The second AI winter (1987-1993)

- ✓ The second AI Winter duration.

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

- ✓ In the year 1997 IBM Deep Blue beats world chess champion, Gary Kasparov, and became the first computer to beat a world chess champion.
- ✓ In the year 2002 : AI entered the home in the form of Roomba, a vacuum cleaner.

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✓ In the year 2006 : AI came into the Business world . Companies like Facebook, Twitter, and Netflix also started using AI.

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

✓ IBM's Watson won jeopardy (2011) : to solve complex questions as well as riddles. understand natural language and can solve tricky questions quickly.

✓ In the year (2012) : Google has launched an Android app feature "Google now",

✓ In the year (2014): Chatbot "Eugene Goostman" won a competition in the infamous "Turing test."

✓ In the year (2018): The "Project Debater" from IBM debated on complex topics with

two master debaters and also performed extremely well.

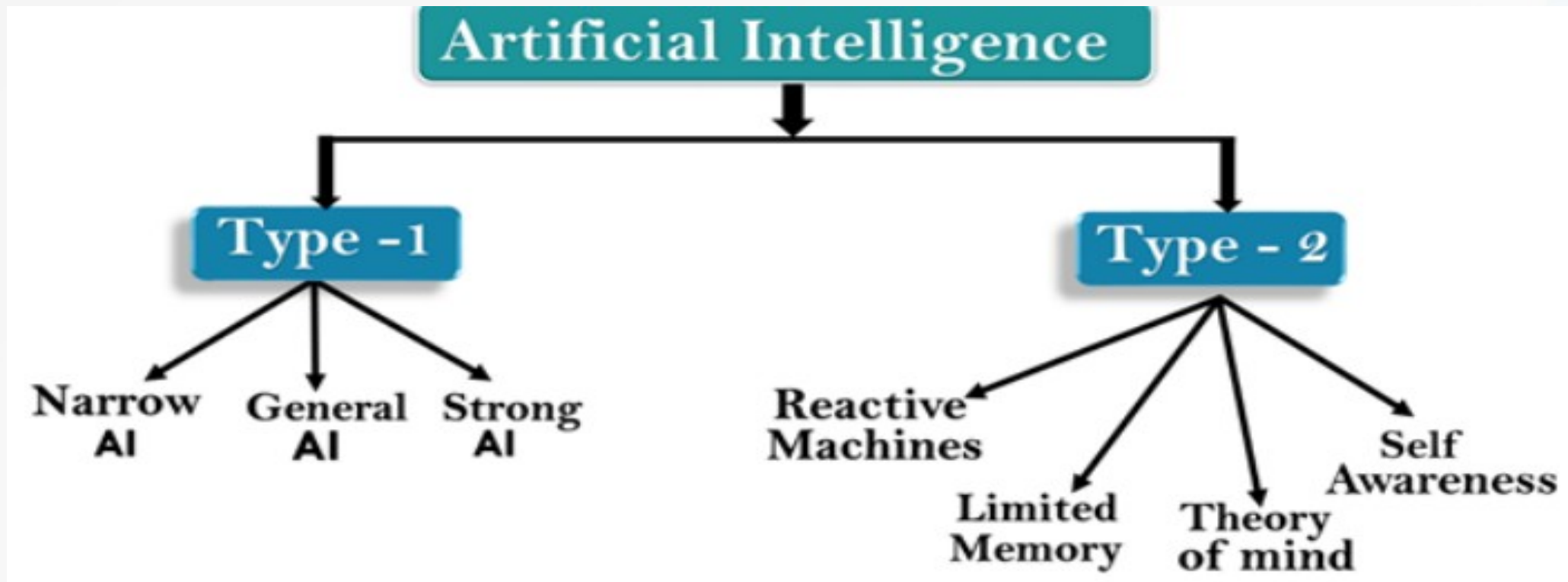
Levels of AI

- AI have seven stage or levels.
- Stage 1 – Rule-Based Systems
- Stage 2 – Context Awareness and Retention
- Stage 3 – Domain-Specific Expertise
- Stage 4 – Reasoning Machines
- Stage 5 – Self Aware Systems / Artificial General Intelligence (AGI)
- Stage 6 – Artificial Superintelligence (ASI)
- Stage 7 – Singularity and Transcendence



Types of AI

- There are mainly two types of the main categorization which are based on **capabilities** and based on **functionally** of AI.



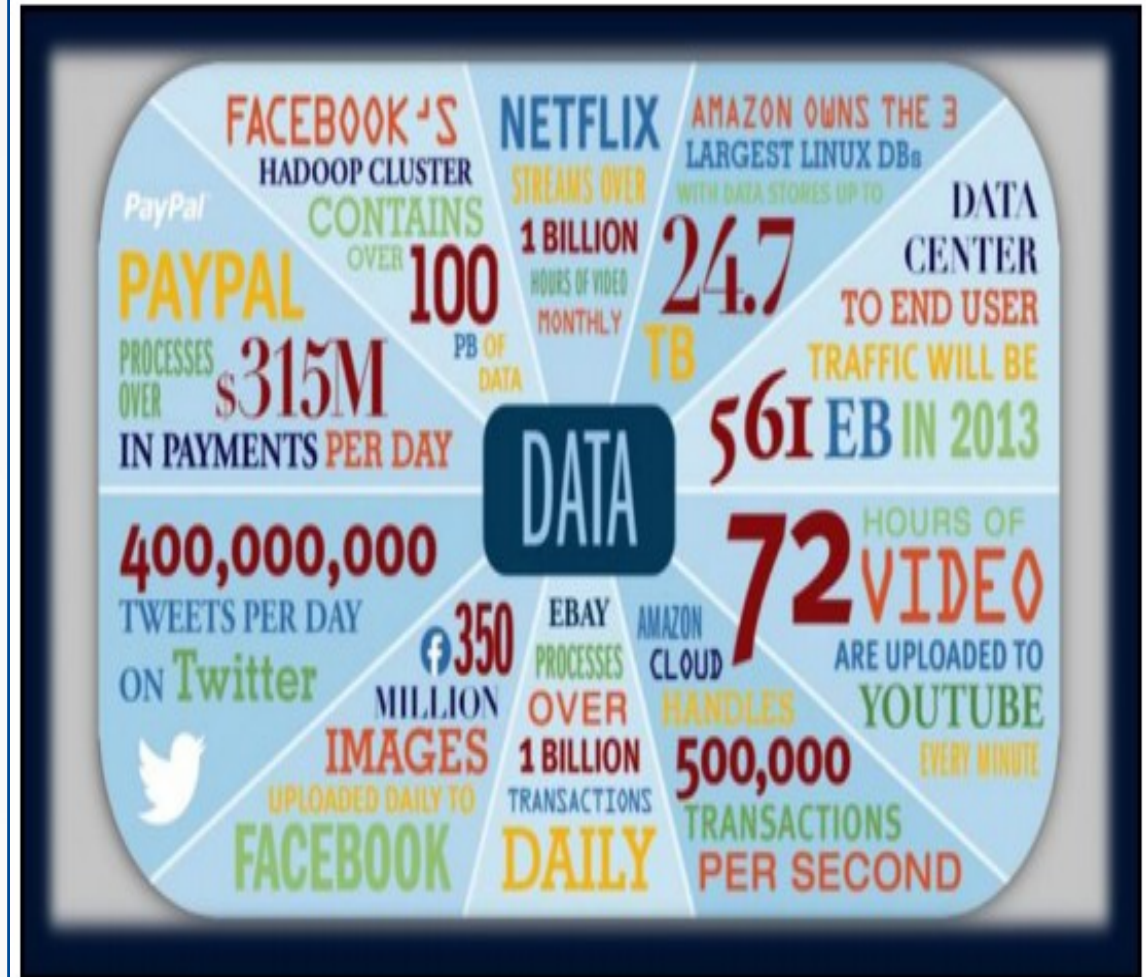
Influencers of artificial intelligence

- Some of the influencers of **AI** are:-
 - 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

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- i. **Big Data** :- refers to huge amounts of data.
 - ✓ It requires innovative forms of information processing to draw insights, automate processes, and help decision making.
 - ✓ It can be **structured** data that corresponds to a formal pattern, such as traditional data sets and databases. **semi-structured** and **unstructured** formats, such as word-processing documents, videos, images, audio, presentations, social media interactions, streams, web pages,

- The following figure show the rapid change of the data



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ii. Cloud computing and application programming interfaces :-

What is the cloud and cloud computing ?

- **Cloud computing** is a general term that describes the delivery of on-demand services, usually through the internet, on a pay-per-use basis.
- ✓ Companies worldwide offer their services to customers over cloud platforms.
- ✓ Those services might be **data analysis**, **social media**, **video storage**, **e-commerce**,
- ✓ Application Programming interfaces (APIs) expose capabilities and services.
- ✓ APIs enable software components to communicate with each other easily.

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- All the significant companies in the AI services market deliver their services and tools on the internet through APIs over cloud platforms, 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.
- ✓ 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

- It 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.
- After you collect a large enough volume of data, patterns emerge. Then, data scientists use learning algorithms on these patterns.
- Data science uses machine learning and AI to process big data.

Applications of AI

- It is becoming essential for today's time because it can solve complex problems in an efficient way in multiple industries, such as **Healthcare, entertainment, finance, education**, etc.
- It makes our daily life more comfortable and faster.
- Some sectors which have the application of Artificial Intelligence are:
 - AI in agriculture
 - AI in Healthcare
 - AI in education
 - AI in Finance and E-commerce
 - AI in the Automotive Industry
 - AI in Gaming
 - AI in Data Security
 - AI in Social Media
 - AI in Travel &Transport
 - AI in Robotics etc..

AI tools and platforms

- AI platforms are defined as some sort of hardware architecture or software framework (including application frameworks), that allows the software to run.
- It involves the use of machines to perform the tasks that are performed by human beings.
- Artificial intelligence (AI) platforms provide users a tool kit to build intelligent applications.
- Many tools are used in AI, including versions of search and mathematical optimization, logic, methods based on probability and economics.

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- Some of the tools used are :

- ✓ Search and optimization

- ✓ Logic

- ✓ Probabilistic methods for uncertain reasoning

- ✓ Classifiers and statistical learning methods

- ✓ Neural networks

- ✓ Control theory

- ✓ Languages

- Some of the platforms are :

- ✓ Microsoft AZURE Machine Learning,

- ✓ Google Cloud Prediction API,

- ✓ IBM Watson,

- ✓ TensorFlow,

- ✓ Infosys Nia,

- ✓ Wipro HOLMES,

- ✓ API.AI,

- ✓ Premonition, etc.

Semple AI application

I. Commuting

- Google's AI-Powered Predictions
- Ridesharing Apps Like Uber and Lyft
- Commercial Flights Use an AI Autopilot

II. Email

- Spam Filters
- Smart Email Categorization

III. Social Networking

- Facebook
- Pinterest
- Instagram
- Snapchat

IV. Online Shopping

- Search
- Recommendations

V. Mobile Use

- Voice-to-Tex
- Smart Personal Assistants