



Artificial Intelligence (ACCA7026)

Introduction to Artificial Intelligence

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Artificial Intelligence

Artificial Intelligence [AI] – Definition

- *A system's ability to correctly interpret external data, to learn from such data and to use those learnings to achieve specific goals and tasks through flexible adaptation [1]*
- *Science and Engineering of making intelligent machines [2]*
- *Any computer that passes Turing test [3]*
 - *Turing Test ?*
- *Theory and development of computer systems capable of performing tasks that historically required human intelligence, such as recognizing speech, making decisions, and identifying patterns*
- *Programs that can sense, reason, act and adapt*

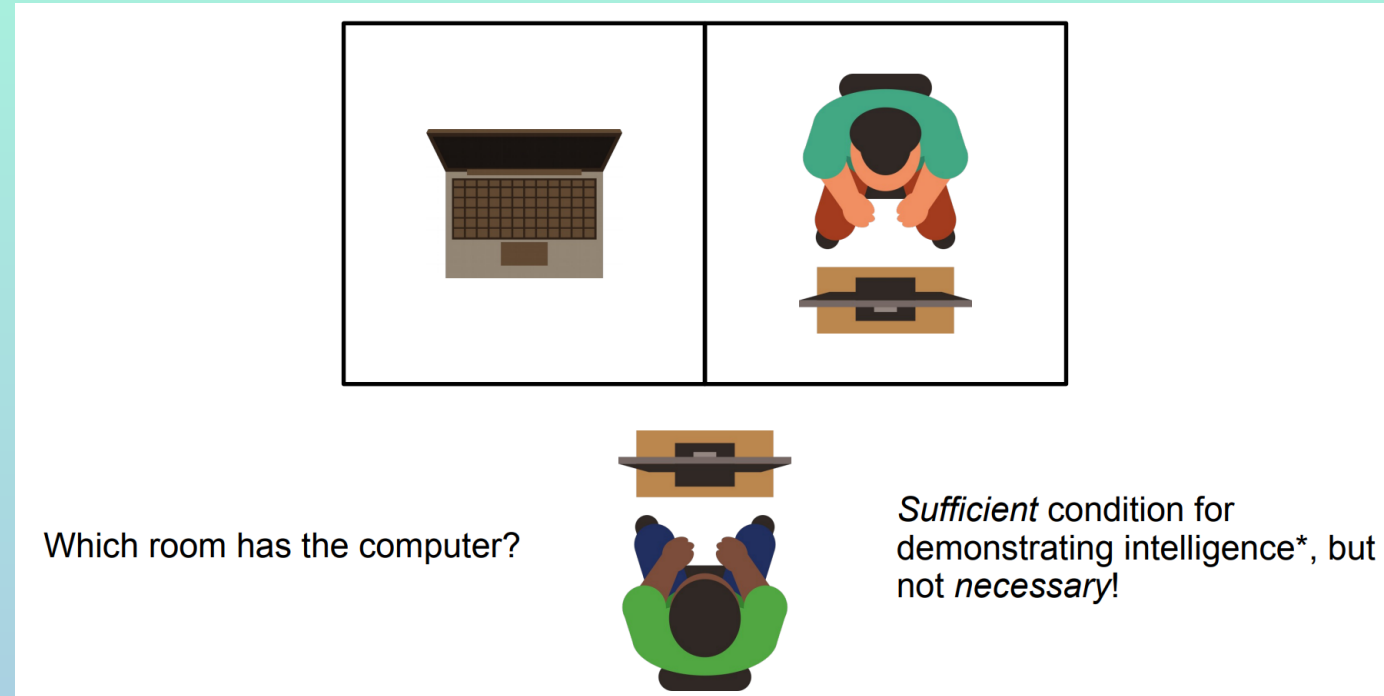
Artificial Intelligence

Artificial Intelligence [AI] – Definition

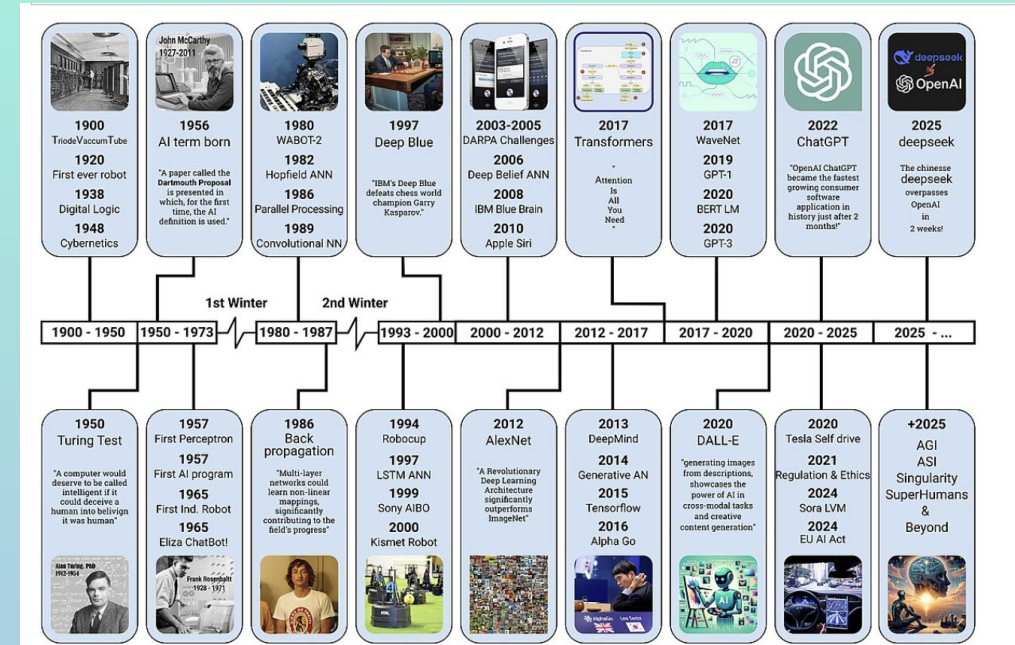
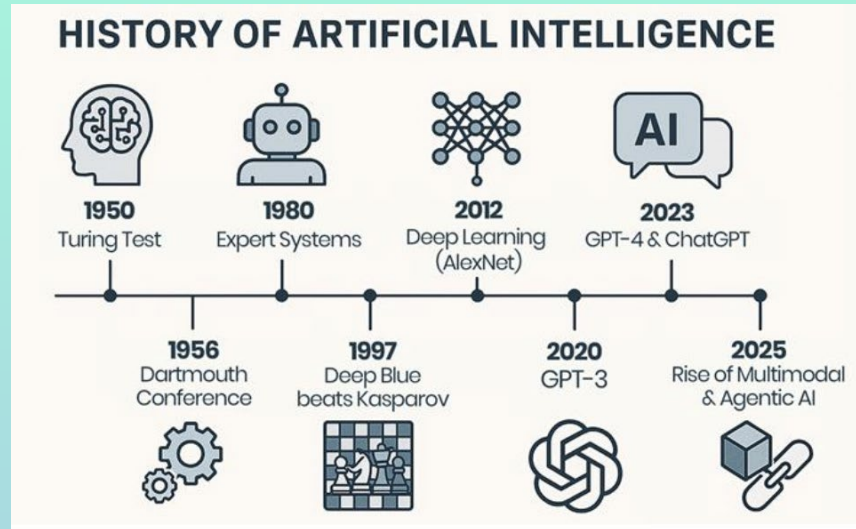
- AI – study of how to make computers perform intelligent tasks that in the past could only be performed by humans [4].
- AI - a multidisciplinary field with the capability of integrating cognition, machine learning, emotion recognition , human computer interaction, data storage and decision making.

Artificial Intelligence

Turing Test



Artificial Intelligence Development Timeline



- What is the position of AI in 2025 and beyond ?

Artificial Intelligence Development Timeline

 [The Ultimate Evolution of Artificial Intelligence Timeline: From Turing to Agentic AI \(1950–2025\) - Ai Digital Friend](#)

- What is the position of AI in 2025 and beyond ?

Artificial Intelligence Development Timeline

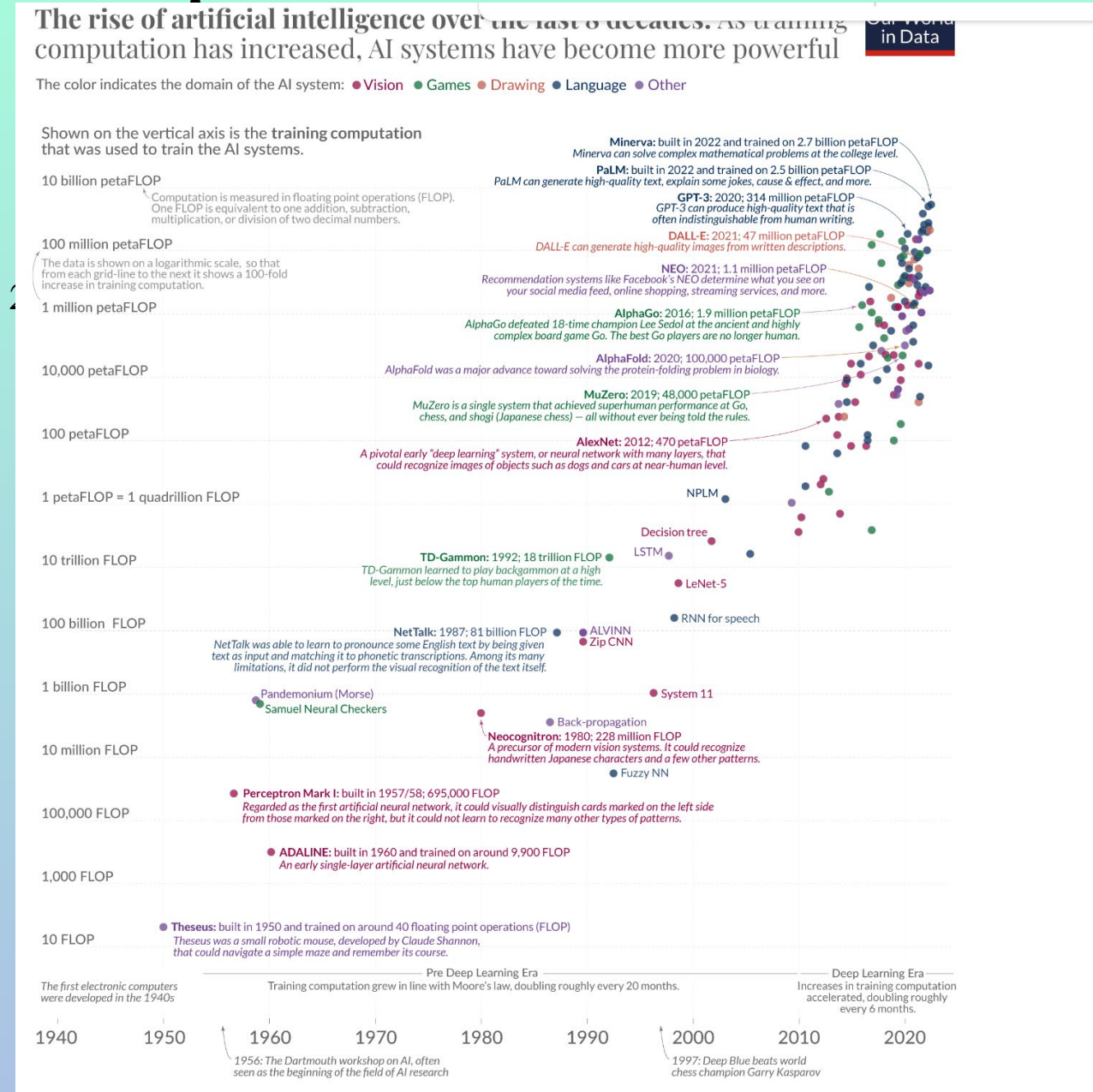
- The rise of AI over the years

Source: [2]



Artificial Intelligence Development Timeline

- The rise of AI over the years
- Computing capacity – by counting FLOPS
- Floating point operations per second
- A FLOP is a floating-point operation; e.g. $3.1416 + 2$



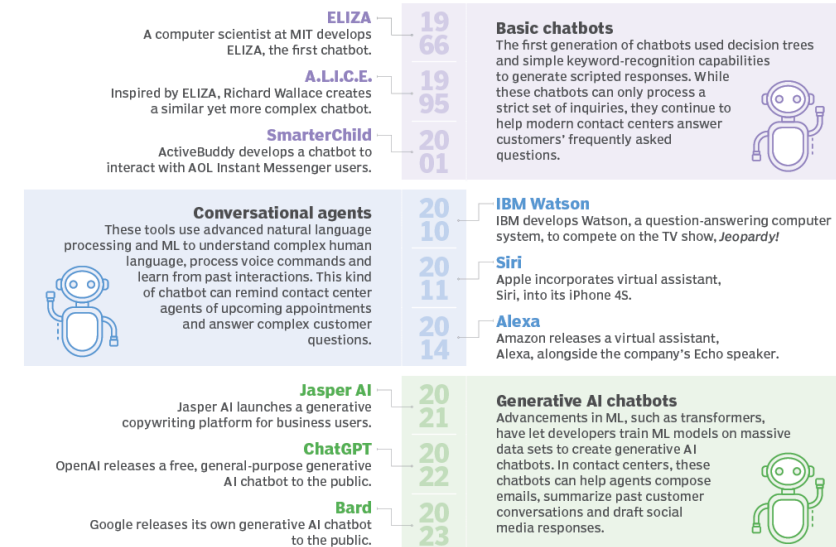
Source: [2]

Artificial Intelligence Development Timeline

- Evolution of chatbots

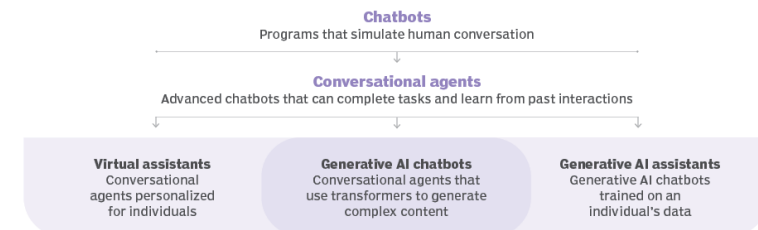
The evolution of chatbots from ELIZA to Bard

Early chatbots struggled to understand human language. Over time, machine learning (ML) advancements have ushered in chatbots that can process natural language, learn from experience and generate full-length articles.



Types of chatbot technology

As chatbots have evolved, they've broken off into smaller subsets: conversational agents, virtual assistants, generative AI chatbots and generative AI assistants.



Drivers and technologies of AI

- Big Data
- Algorithms
- Machine learning
- Natural Language processing
- Computer vision
- Hardware

Drivers and technologies of AI

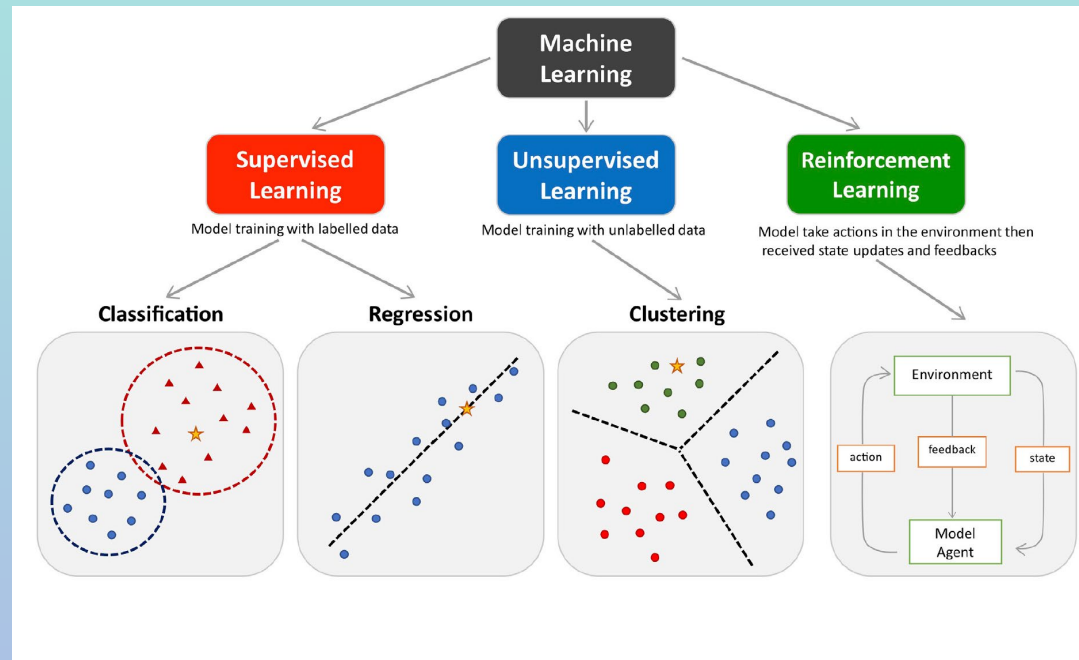
- Big Data
 - Prerequisite of AI
 - A core factor that promotes AI to improve recognition rate and accuracy
 - Increased growth in data generation
 - More comprehensive data – high dimensional data
- Algorithm
 - Mathematical models designed to mimic human intelligence by learning from data, recognize patterns, decision making and prediction.
 - Speech recognition, semantic analysis, recommendation system etc.

Drivers and technologies of AI

- Machine learning (ML)
 - Developing algorithms that enables learning, prediction or decision making based on the given data, without being explicitly programmed.
 - Types of problem solved using ML – Clustering, Classification, Prediction and Dimensionality reduction
 - Four categories of ML algorithm – Supervised Learning, unsupervised learning, and reinforcement learning.
 - **Supervised learning**
 - Labelled data-> Model training-> Prediction (Classification and Regression)
 - Classification – prediction of output of discrete values
 - Regression – prediction of output of continuous values

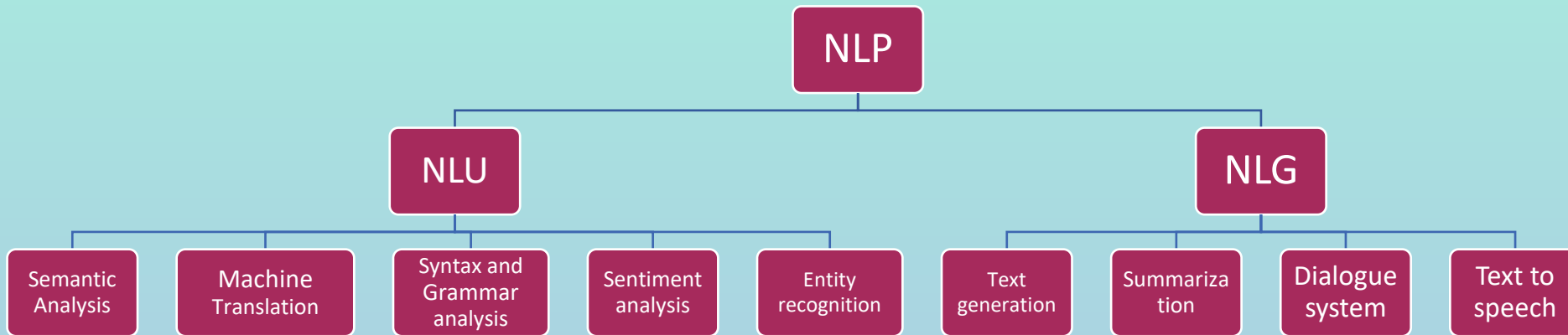
Drivers and technologies of AI

- Machine learning (ML)
 - Unsupervised learning
 - Clustering – data is grouped into different classes without any tags or labels
 - Reinforcement learning
 - Obtain rewards by interacting with environment, assessing the action quality at reward levels, and then training the model.



Drivers and technologies of AI

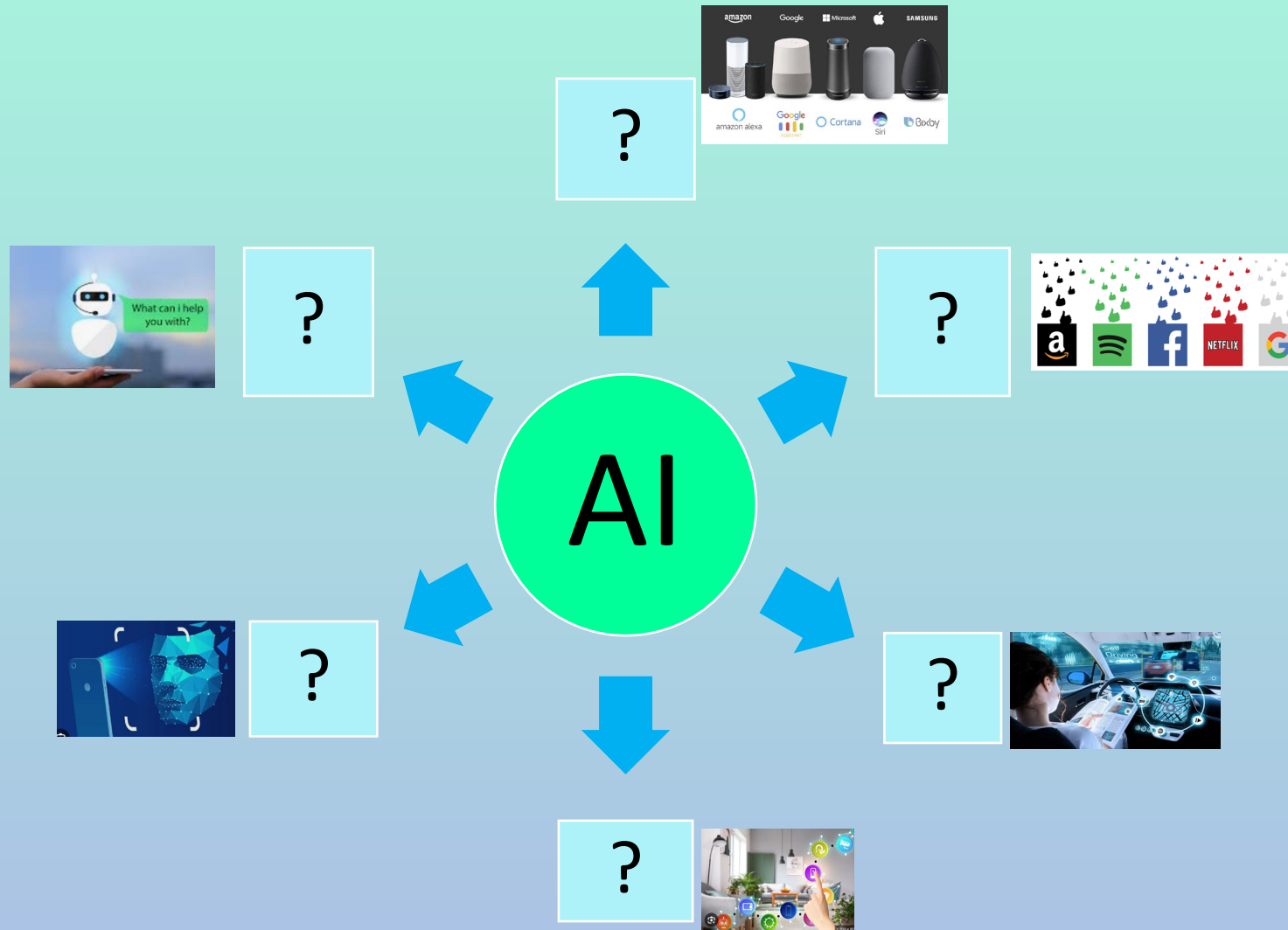
- Natural Language processing
 - Ability of computers to recognize and understand human text language.
 - Natural language understanding (NLU) and natural language generation (NLG)



Drivers and technologies of AI

- Computer vision
 - Enable computers to mimic human vision
 - Identify and analyze images
 - Facial recognition, object detection, image recognition and classification
- Hardware
 - GPU (Powerful parallel computing power)
 - Handle large matrix operation
 - CPU
 - Handle general purpose computing
 - Memory, Storage devices, Network and storage infrastructure

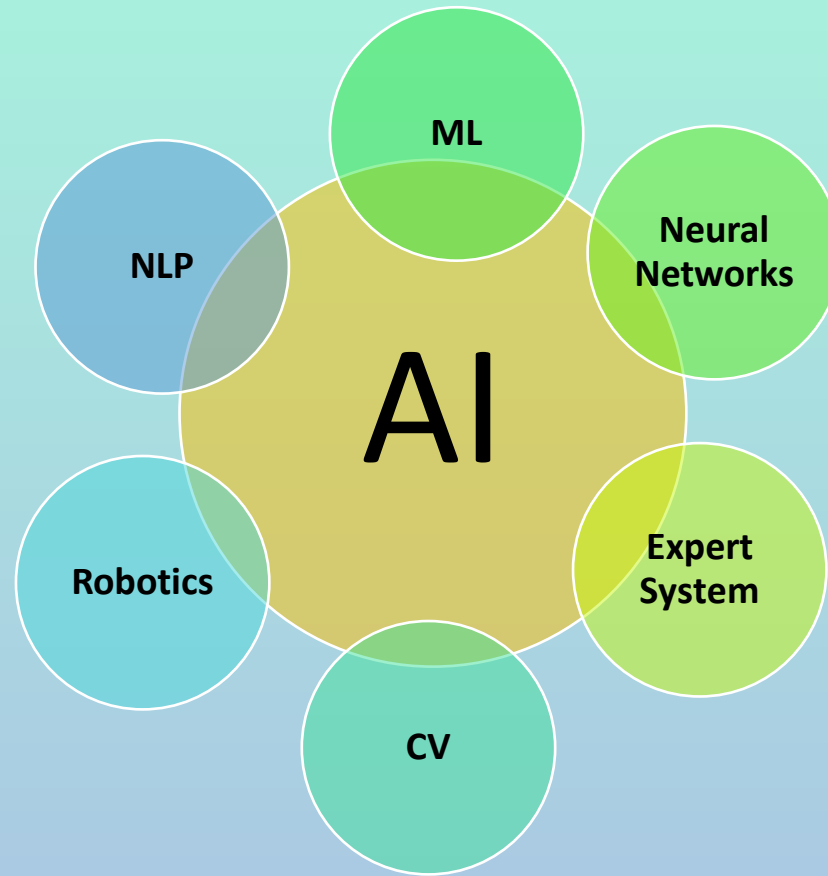
Artificial Intelligence Applications



Artificial Intelligence Applications

- Voice Assistant
- Recommendation system
- [Basics of Recommendation Systems - Cankat Saraç \(cankatsarac.com\)](http://cankatsarac.com)
- Chatbots
- Self-driving car
- [5 Ways Self-Driving Cars Could Make Our World \(And Our Lives\) Better \(forbes.com\)](http://forbes.com)
- Facial recognition
- Smart home devices

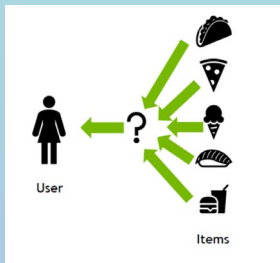
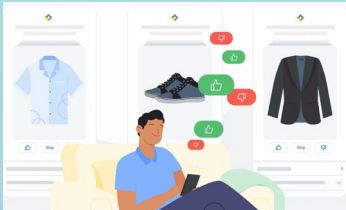
AI : Key disciplines



AI : Key disciplines

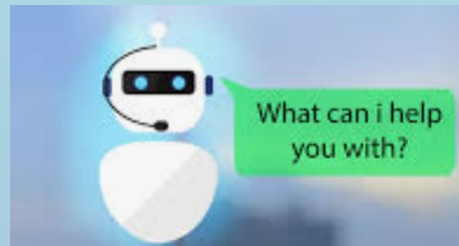
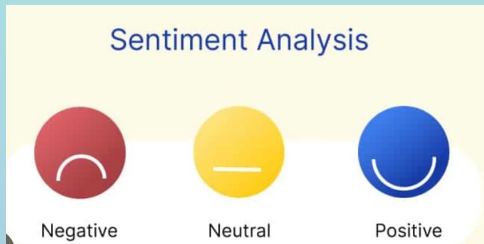
- **ML** : Algorithms that allow system to learn from data and improve over time without being explicitly programmed.
 - Fraud detection, recommendation systems, personalized shopping

Personalized shopping tools ?



AI : Key disciplines

- **NLP:** Enables machines to understand, interpret and generate human language.
 - Virtual assistance; chatbots; sentiment analysis; machine translation (Google Translate)



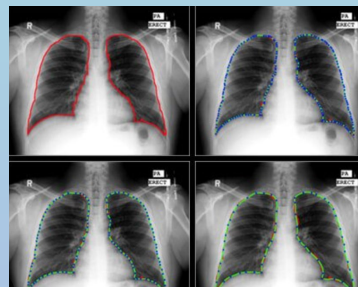
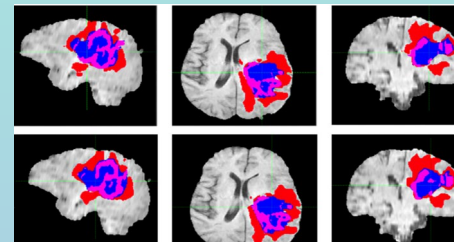
AI : Key disciplines

- **Robotics** : The design and creation of robots that can perform tasks autonomously or semi autonomously
 - Robotic surgery; autonomous vehicles; drones for delivery and surveillance; industrial robots.



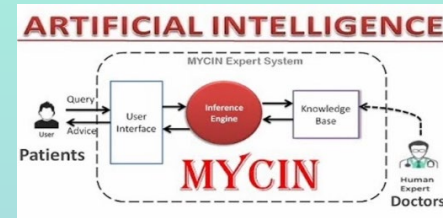
AI : Key disciplines

- **CV** : Enable machines to mimic human vision [interpret and make decisions based on visual inputs from the world]
 - Facial recognition; medical imaging diagnostics; video surveillance

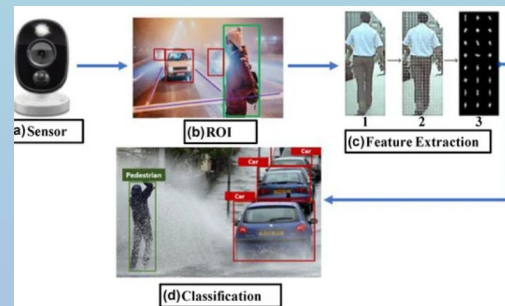


AI : Key disciplines

- **Expert systems** : Programs that mimic human expertise in specific domains to make decisions or solved problems.
 - Financial investment advising; customer support systems;
 - Example of expert systems ?

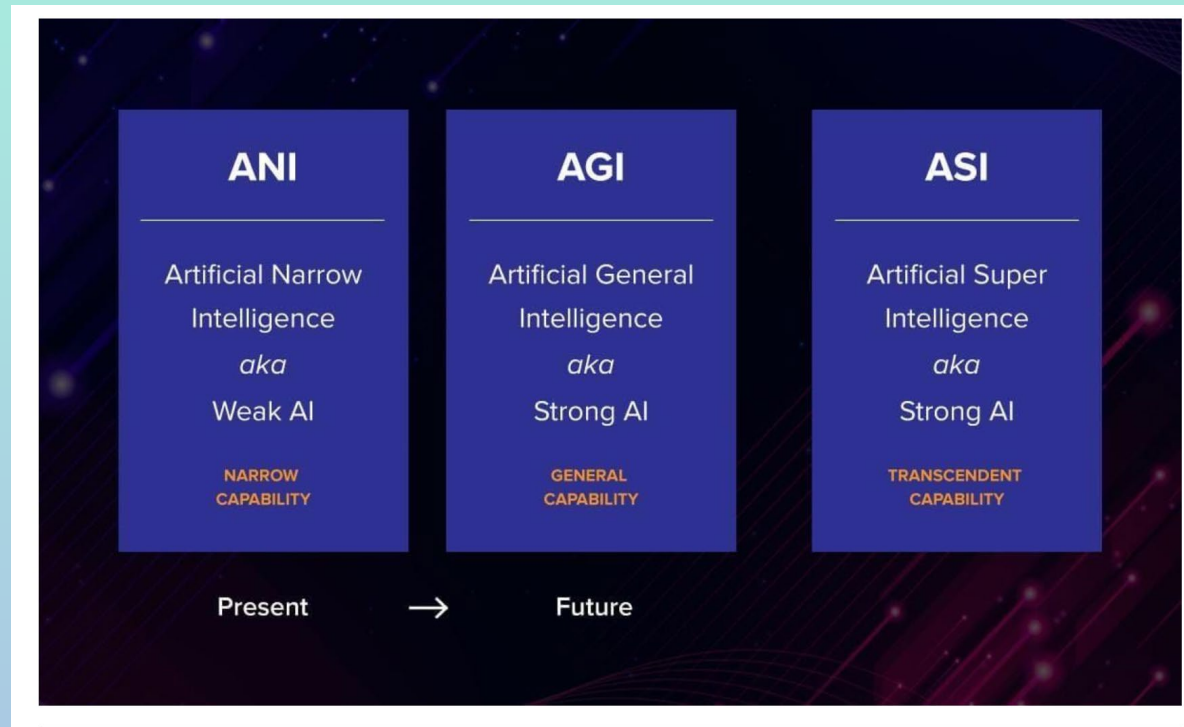


- **Neural networks**: systems inspired by human brain, used to recognize patterns and perform complex tasks like image and speech recognition
 - Speech recognition; image recognition; natural disaster prediction.



Artificial Intelligence : Weak and Strong AI

- Weak and Strong AI



Artificial Intelligence : Weak and Strong AI

- Weak AI or Narrow AI
 - Designed to perform a specific task
 - Applications : speech recognition; image processing; NLP
 - Trained on a specific dataset and can provide answers based on that
 - Eg: a chatbot designed to answer customer service question
 - Designed to operate within a specific set of rules
 - Cannot adapt to new situations or learn new tasks without being programmed
 - Easy design and implementation
 - Have all mental capabilities of humans or animals but are not alive..
No conscious experience.
 - Model of a mind

Artificial Intelligence : Weak and Strong AI

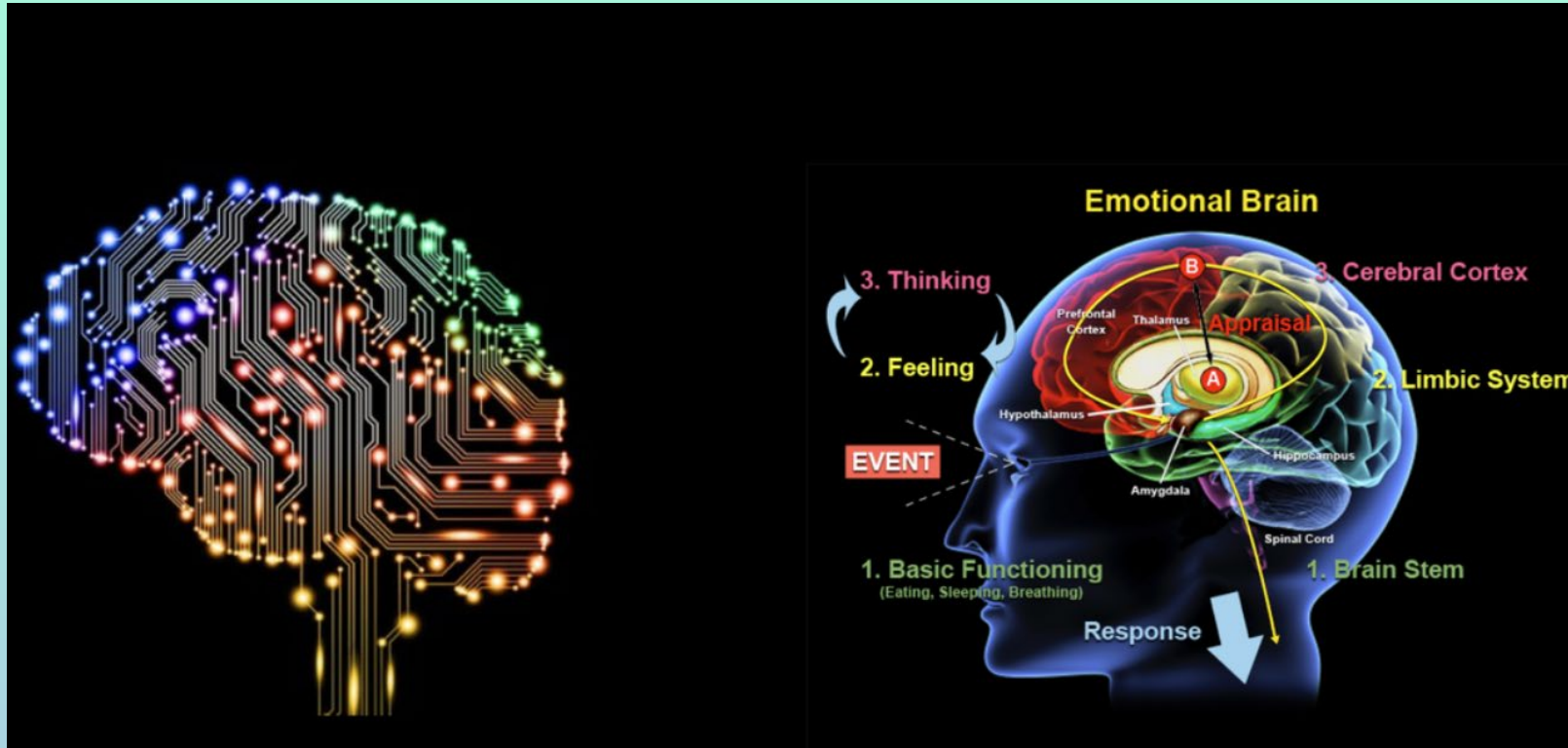
- Strong AI or Artificial general intelligence (AGI)
 - Designed to mimic the cognitive abilities of a human being
 - Correct simulation really a mind
 - Perform wide range of tasks instead of being limited to a specific set of tasks
 - Designed to learn and adapt to new situations
 - Designed to be self-aware and conscious (think, reason and make decisions)
 - Development of strong AI raises important ethical challenges

Artificial Intelligence : Weak and Strong AI

- Strong AI
 - analyse data, make decision consciously to the extent that a person does.
 - Properties of Strong AI (agreed by AI researchers)
 - Making decisions, using strategies, solving puzzles and dealing with uncertainty
 - Representation of knowledge, idea of reality
 - Planning
 - Strength of will
 - Empathy; the ability to feel
 - Wisdom, self motivation
 - Current challenges
 - defining consciousness ? What is consciousness in humans ?
 - Develop an algorithm that human being does not understand.
 - Computing resources for processing an almost unlimited set of conditions

A quote from Prof. Joseph Macrae Mellichamp (University of Alabama) — The 'artificial' in artificial intelligence is real."

Artificial Intelligence V Human Intelligence



Artificial Intelligence V Human Intelligence

Key insights	AI Intelligence	Human Intelligence
Functionality	Specific functionalities with high efficiency. Depends on the input (data) and programming from human	Broader and adapt to any task; simple, to complex and abstract
Learning ability	Depends on ML algorithms ; learning is limited to data and training; Hard facts and data	Stems from various sources such as education, training, and life experiences. Data, ethics, emotions and judgement
Scope	Constantly expanding, finance and healthcare to education; the processes and abilities depends on human decision.	It is virtually endless. Not limited by predetermined parameters, allowing space for innovation.
Flexibility	Limited based on the training and data; ability to think outside the box or apply knowledge to unfamiliar situation is limited	Highly flexible; absorb new information, learn and make decisions;
Accessibility	AI is increasingly accessible due to the availability of technology across industries. There is democratized access to its capabilities. However, its accessibility is still limited to people who have niche expertise in technology.	Human intelligence is extremely accessible on the individual and organizational level. It is not dependent on technology or expertise in data but is readily available within
Pace of Operations	One of the biggest advantages of AI is its ability to process and complete tasks at a pace exceeding human capabilities.	Compared to AI, human intelligence is not as fast-paced.

Hands on AI Tool

Class Activity

- [Image Model - Teachable Machines](#)
- How do you think AI could be used in your field of study or future career?
 - Have you seen or heard of AI being used in your field?
 - What kind of tasks do you think AI could help with?
 - Are there any risks or concerns you can think of?

Artificial Intelligence

To Explore

[11 New Technologies in AI: All Trends of 2023-2024 \(devabit.com\)](#)

[The History of Artificial Intelligence: Key Milestones in AI](#)

[File:AI-History-Timeline-300dpi.jpg - Wikimedia Commons](#)

<https://www.jaroeducation.com/blog/ai-vs-human-intelligence/>

Reference

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