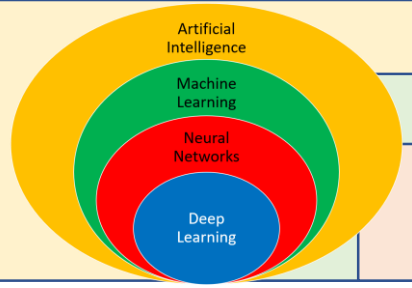


Artificial Intelligence (AI)

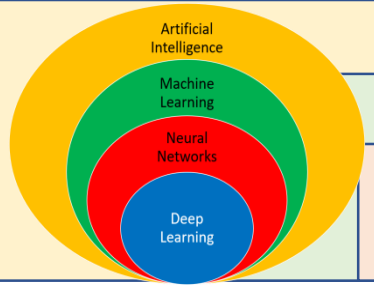
Machine Learning (ML)

Neural Networks (NNs)

Deep Learning (DL)

Advanced Artificial Intelligence

Dr. Rastgoo



Artificial Intelligence (AI)

Machine Learning (ML)

Neural Networks (NNs)

Deep Learning (DL)

Outline

- Introduction to Artificial intelligence (AI) and Machine Learning (ML).
- Introduction to Neural Networks (NNs).
- Introduction to Deep Learning (DL).
- Programming.

References

K. Kiani, R. Rastgoo, Sh. Foolad, The joy of step-by-step learning of deep learning with numerical examples (First book: Restricted Boltzmann Machine (RBM) and Deep Believe Network (DBN)), 2021.

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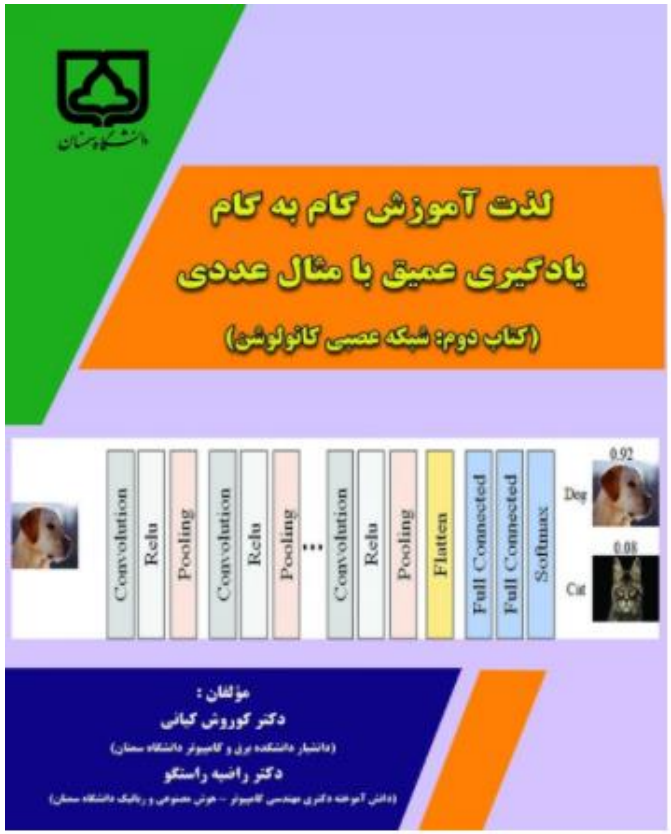

K. Kiani, R. Rastgoo, The joy of step-by-step learning of deep learning with numerical examples (Second book: Convolution Neural Network (CNN)), 2021.

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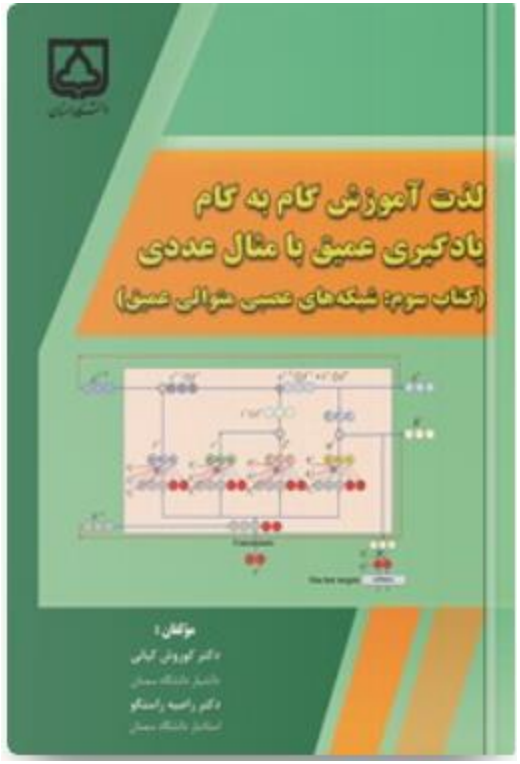
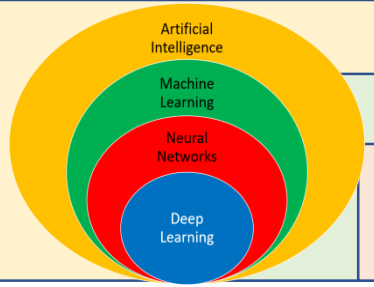
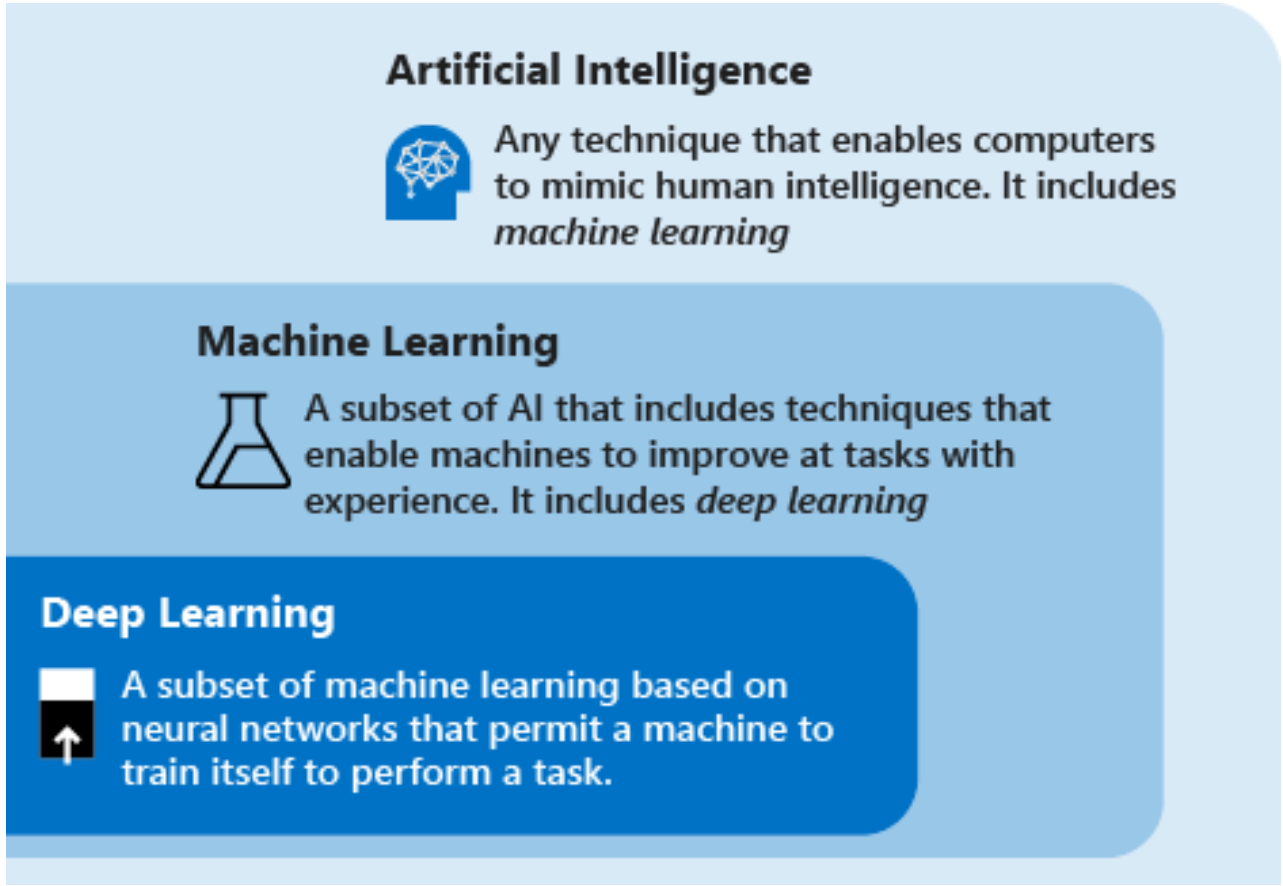
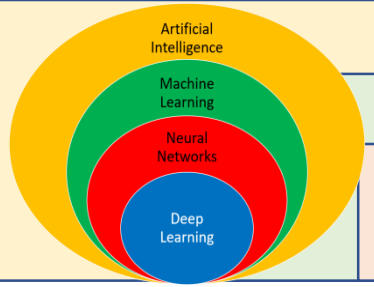


K. Kiani, R. Rastgoo, The joy of step-by-step learning of deep learning with numerical examples (Third book: Recurrent Neural Network (RNN)), 2023.



Introduction





Artificial Intelligence (AI)

Machine Learning (ML)

Neural Networks (NNs)

Deep Learning (DL)

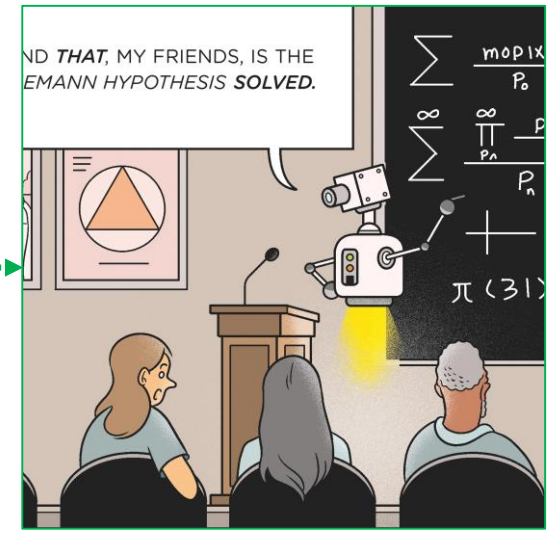
Introduction

- Artificial intelligence (AI) is the ability of a computer or a robot controlled by a computer to do tasks that are usually done by humans because they require human intelligence and discernment.

- The term is frequently applied to the project of developing systems endowed with the **intellectual** processes characteristic of humans, such as the ability to **reason**, **discover meaning**, **generalize**, or **learn** from past experience.

Introduction

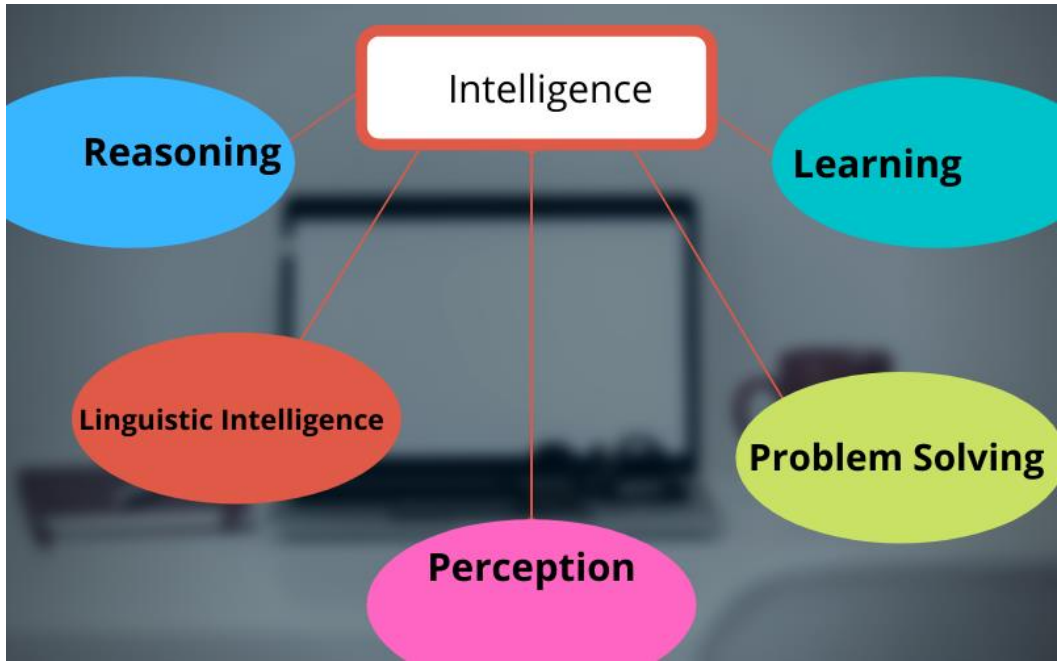
- Since the development of the digital computer in the **1940s**, it has been demonstrated that computers can be programmed to carry out very **complex tasks**—as, for example, **discovering proofs for mathematical theorems** or **playing chess**—with great proficiency.



What is intelligence?

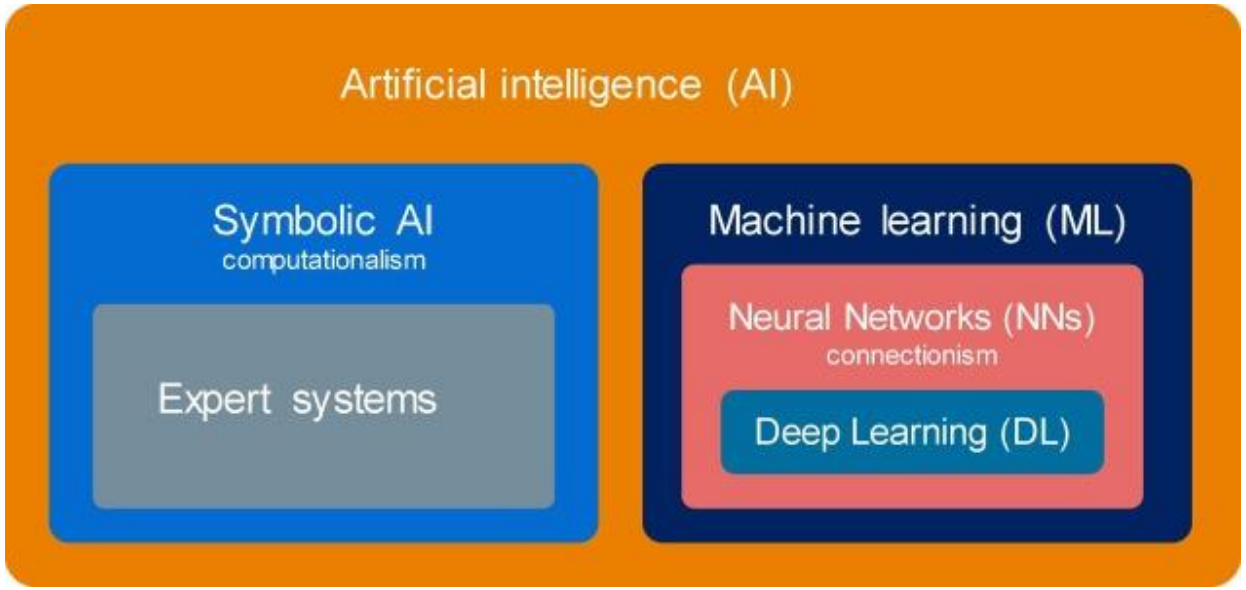
- Psychologists generally do not characterize human intelligence by just one trait but by the combination of many diverse abilities.

- Research in AI has focused chiefly on the following components of intelligence: **learning**, **reasoning**, **problem solving**, **perception**, and **linguistic**.



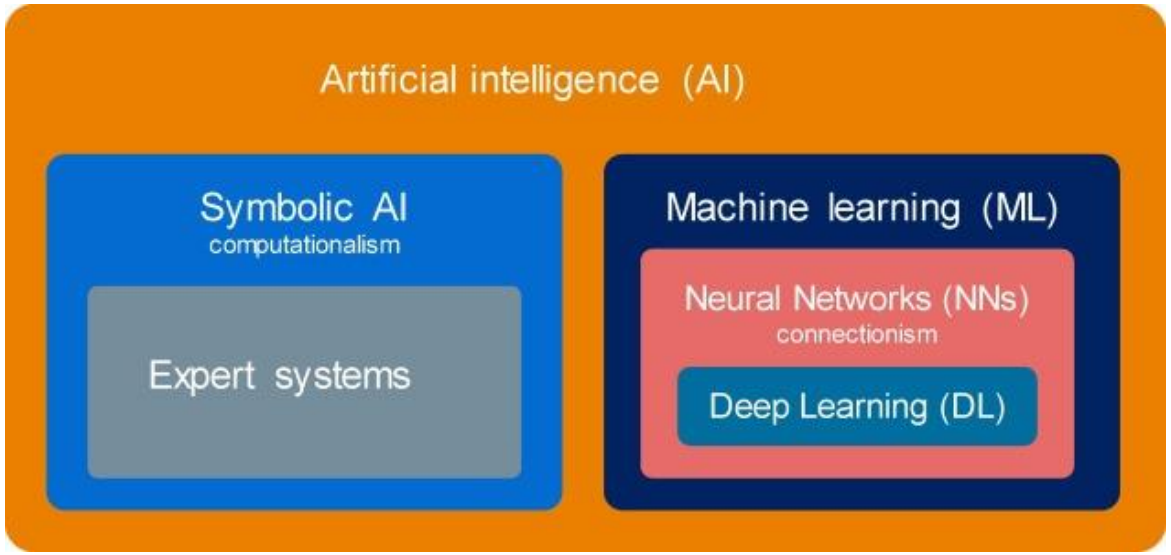
Methods and goals in AI: Symbolic vs. connectionist approaches

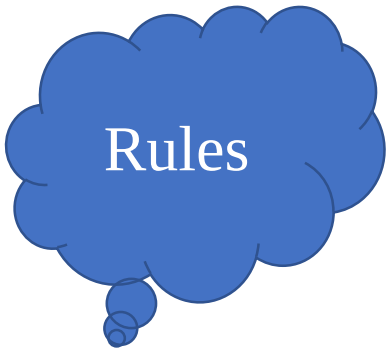
- AI research follows two distinct, and to some extent competing, methods, the **symbolic** (or "**top-down**") approach, and the **connectionist** (or "**bottom-up**") approach.



Methods and goals in AI: Symbolic vs. connectionist approaches

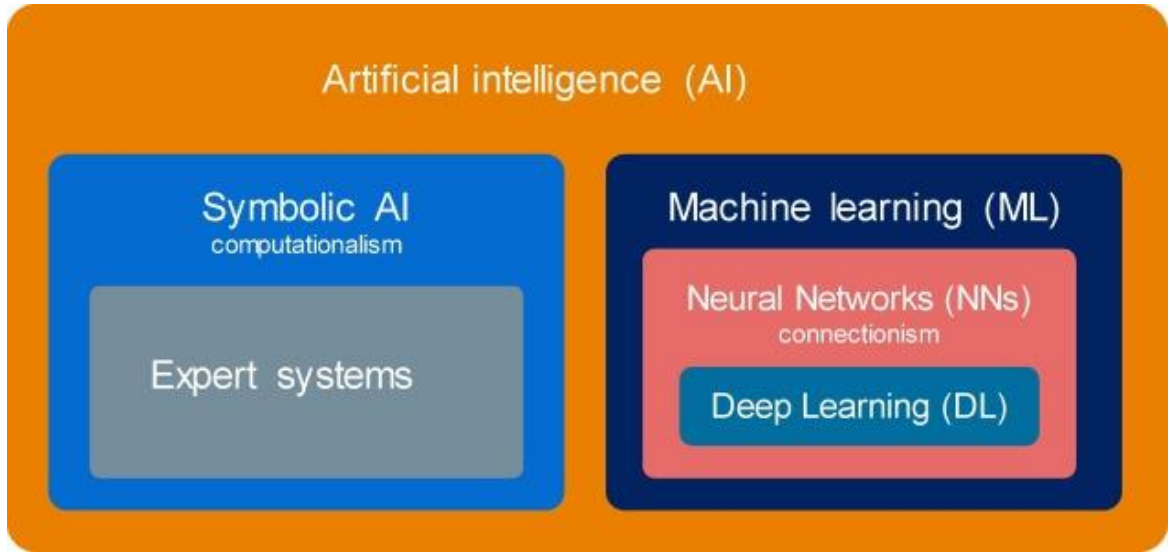
- The **top-down** approach seeks to replicate intelligence by analyzing cognition independent of the **biological** structure of the brain, in terms of the processing of symbols—whence the symbolic label.

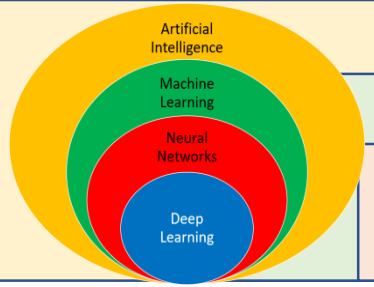




Methods and goals in AI: Symbolic vs. connectionist approaches

- The **bottom-up** approach, on the other hand, involves creating **artificial neural networks** in imitation of the brain's structure—whence the connectionist label.





Artificial Intelligence (AI)

Machine Learning (ML)

Neural Networks (NNs)

Deep Learning (DL)

Methods and goals in AI: Strong AI, applied AI, and cognitive simulation

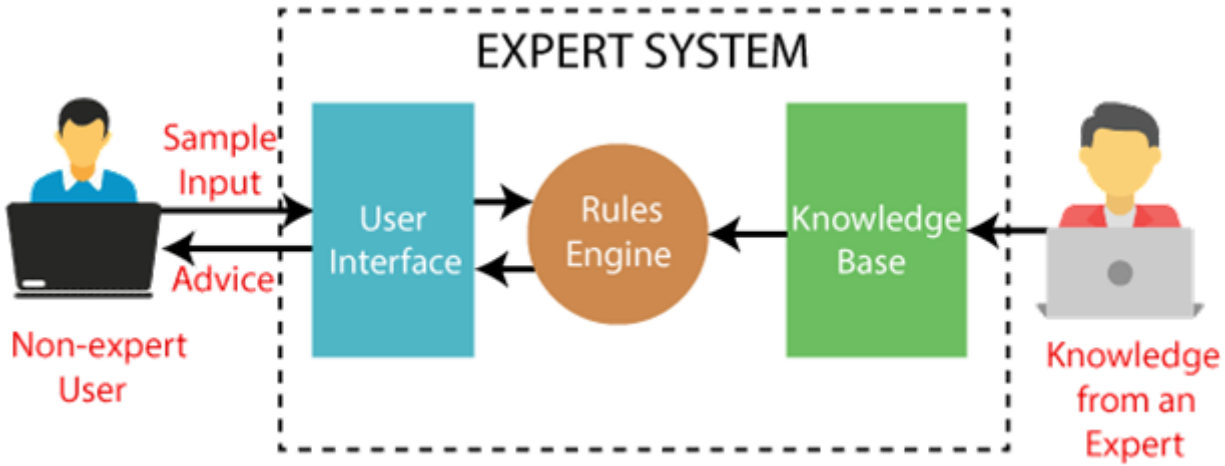
- AI research attempts to reach one of three goals: strong AI, applied AI, or cognitive simulation.

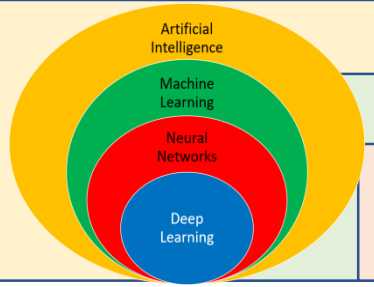
- Strong AI aims to build machines that **think**. (The term strong AI was introduced for this category of research in **1980** by the philosopher **John Searle** of the **University of California at Berkeley**.)

Methods and goals in AI: Strong AI, applied AI, and cognitive simulation

- **Applied AI**, also known as **advanced information processing**, aims to produce commercially viable "smart" systems—for example, "expert" medical diagnosis systems and stock-trading systems.

- Applied AI has enjoyed considerable success, as described in the section **Expert systems**.





Artificial Intelligence (AI)

Machine Learning (ML)

Neural Networks (NNs)

Deep Learning (DL)

Methods and goals in AI: Strong AI, applied AI, and cognitive simulation

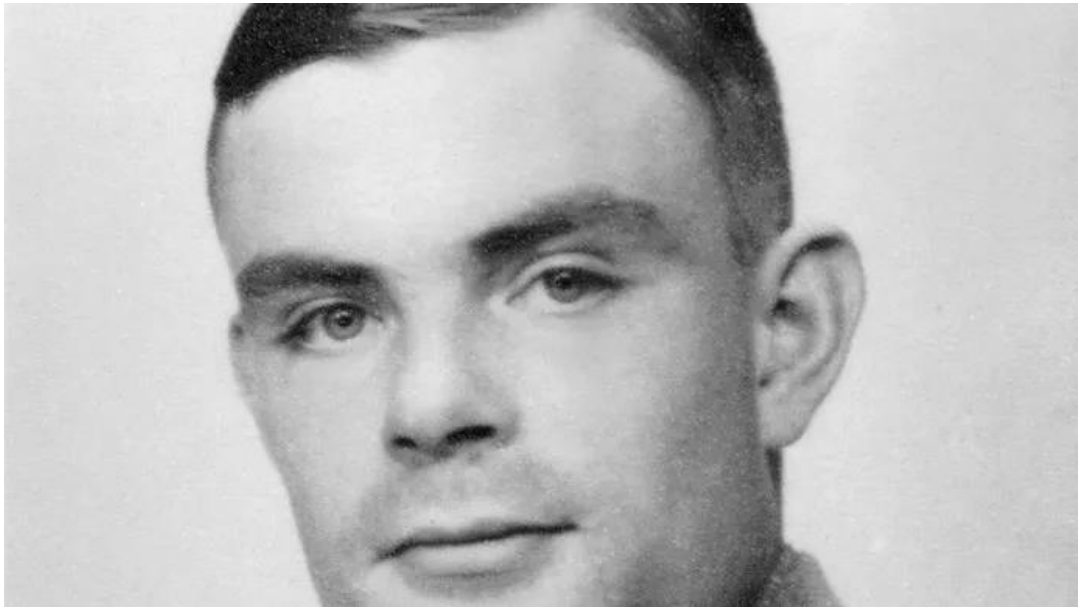
- In **cognitive simulation**, computers are used to test theories about how the **human mind** works—for example, theories about how people **recognize faces** or **recall memories**.

- Cognitive simulation is already a powerful tool in both **neuroscience** and **cognitive psychology**.

Alan Turing and the beginning of AI

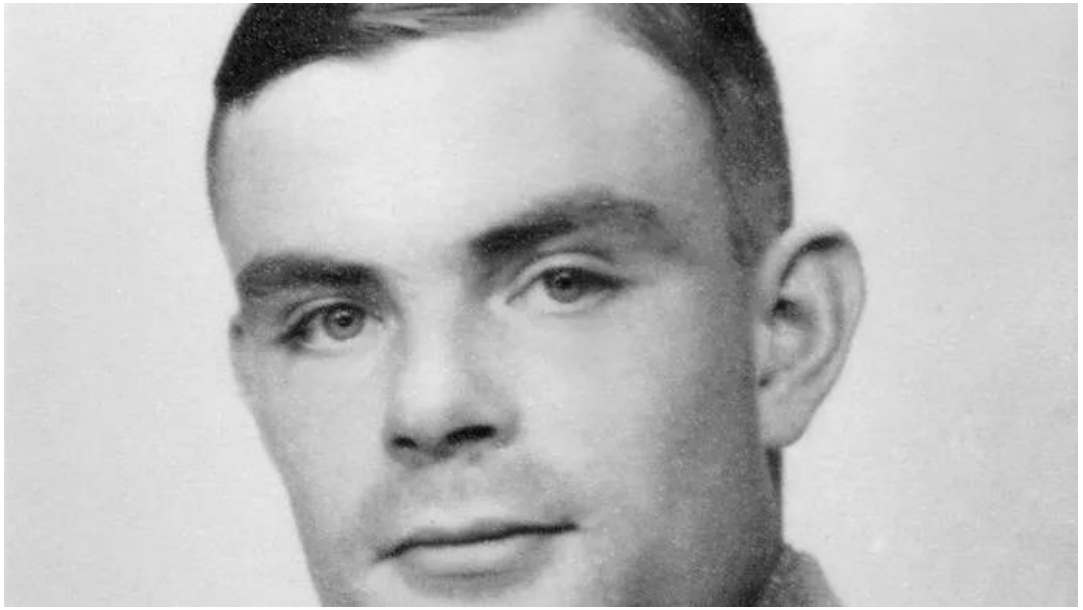
- The earliest substantial work in the field of artificial intelligence was done in the mid-20th century by the British logician and computer pioneer **Alan Mathison Turing**.

- In 1935 Turing described an **abstract computing machine** consisting of a limitless memory and a scanner that moves back and forth through the memory, symbol by symbol, reading what it finds and writing further symbols.

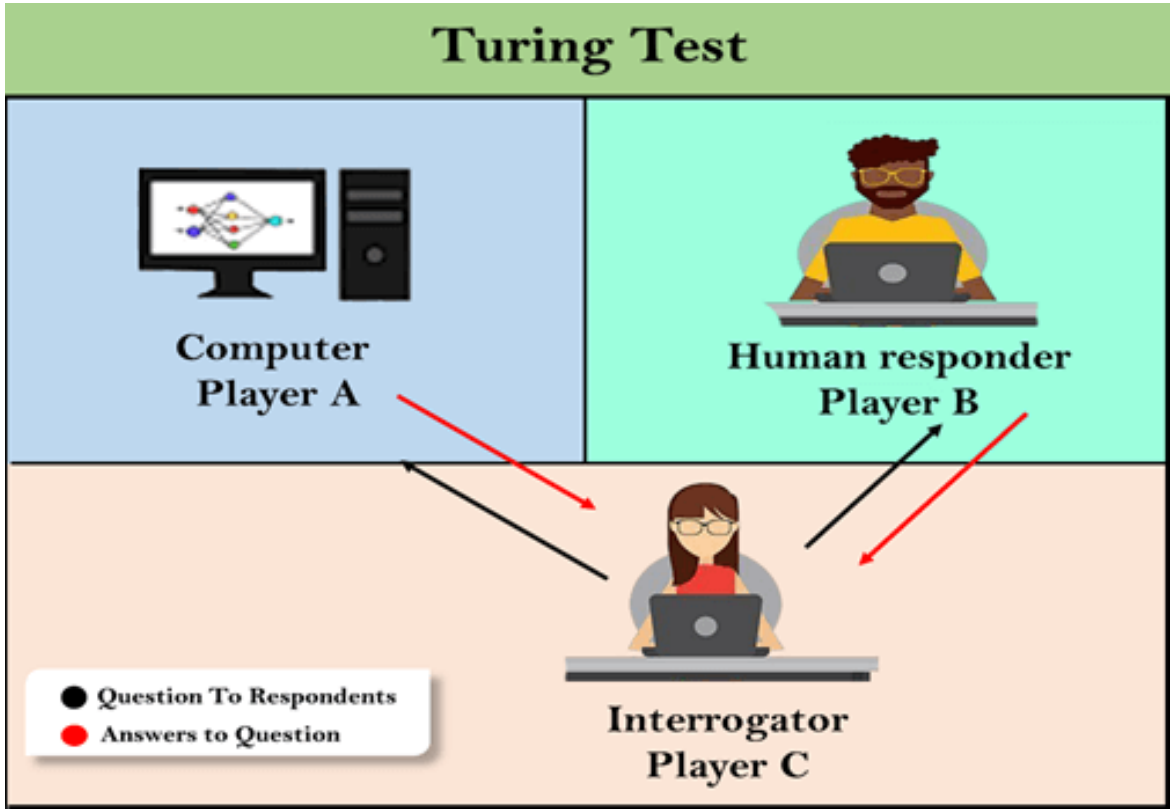


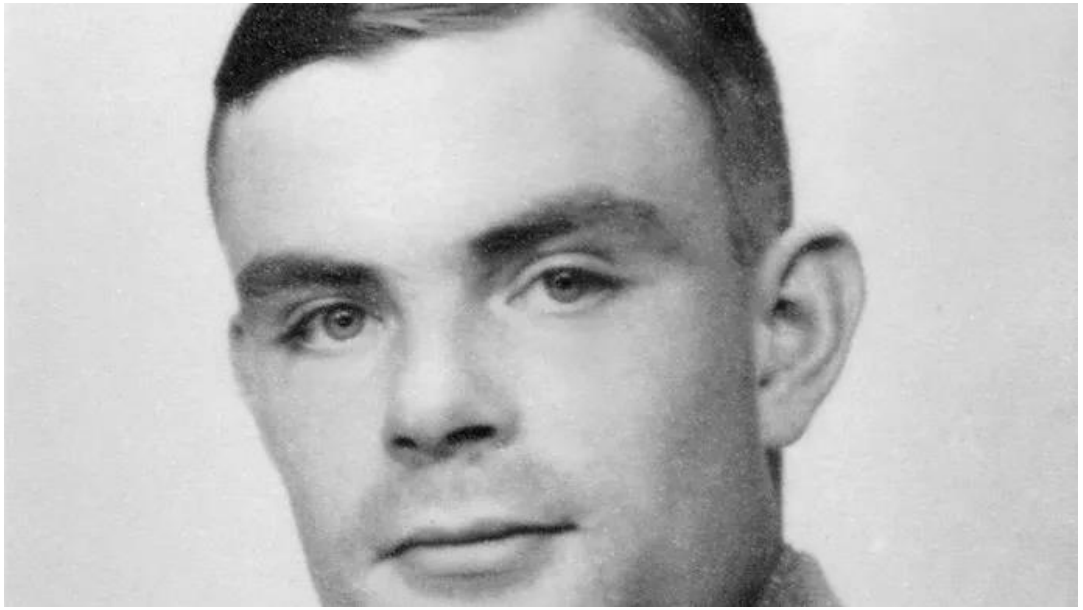
Alan Turing and the beginning of AI

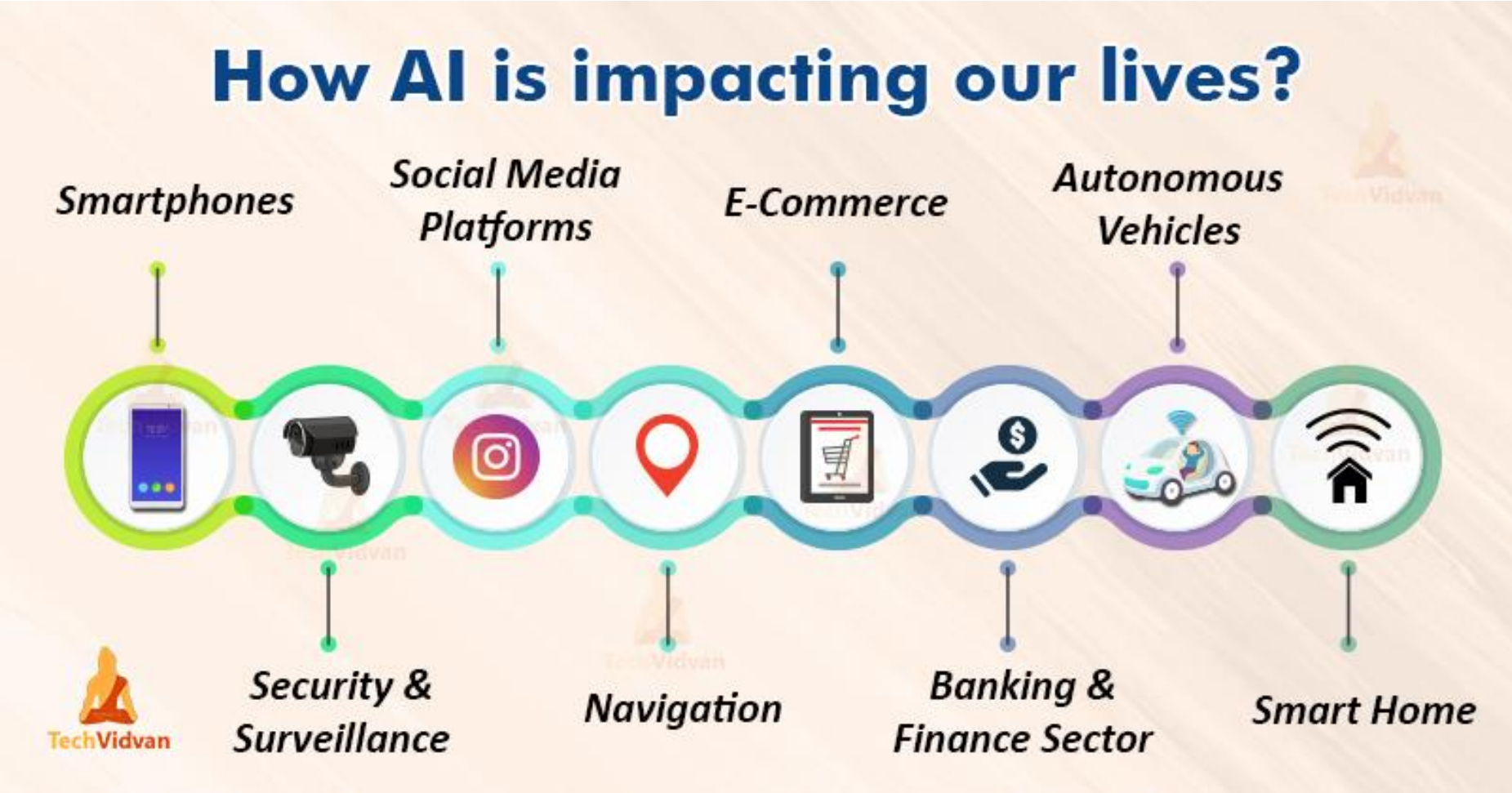
- At Bletchley Park, Turing illustrated his ideas on machine intelligence by reference to **chess**—a useful source of challenging and clearly defined problems against which proposed methods for problem solving could be tested.

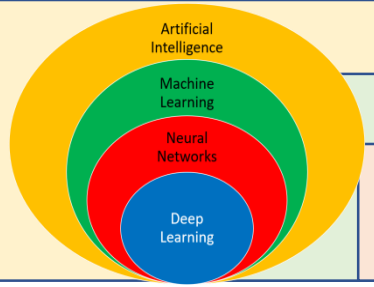


The Turing test






How AI is impacting our lives?
Smartphones
Social Media Platforms
E-Commerce
Autonomous Vehicles
Security & Surveillance
Navigation
Banking & Finance Sector
Smart Home
TechVidvan

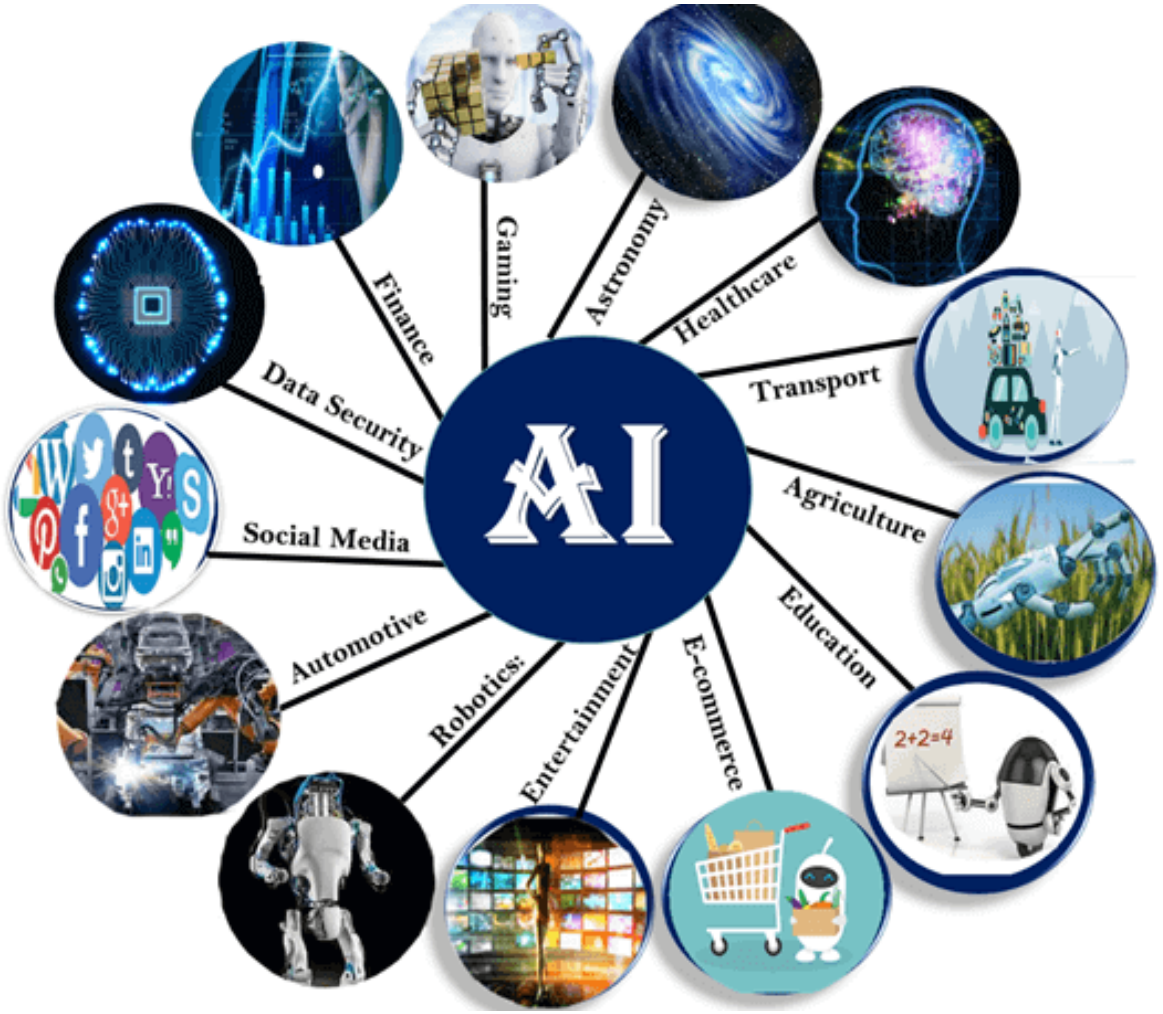


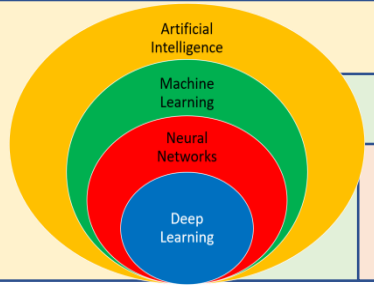
Artificial Intelligence (AI)

Machine Learning (ML)

Neural Networks (NNs)

Deep Learning (DL)





Transportation

- Applications like Uber, Lyft, etc. are the best examples of the use of AI in commuting.

- Navigation apps use AI to update routes in real-time.

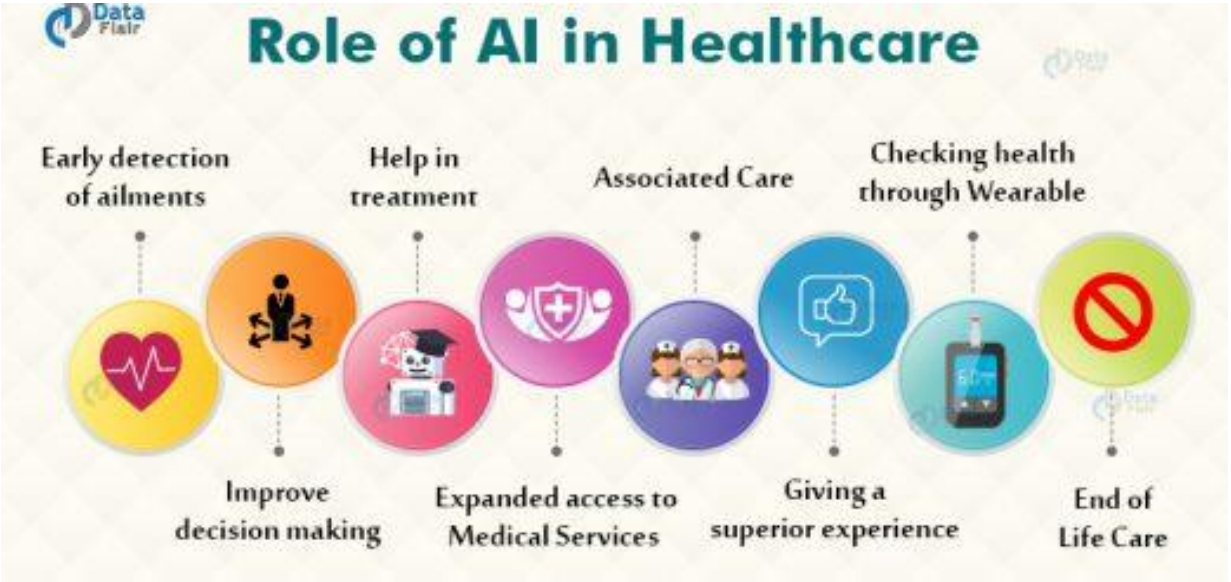
E-Commerce

❖ If there is one sector where the latest artificial intelligence applications can be vividly seen and experienced, it is e-commerce.

❖ From **Amazon** to **Alibaba**, **eBay**, etc. the world of online shopping has taken a 360-degree turn with the onset of AI especially through AI in mobile applications.

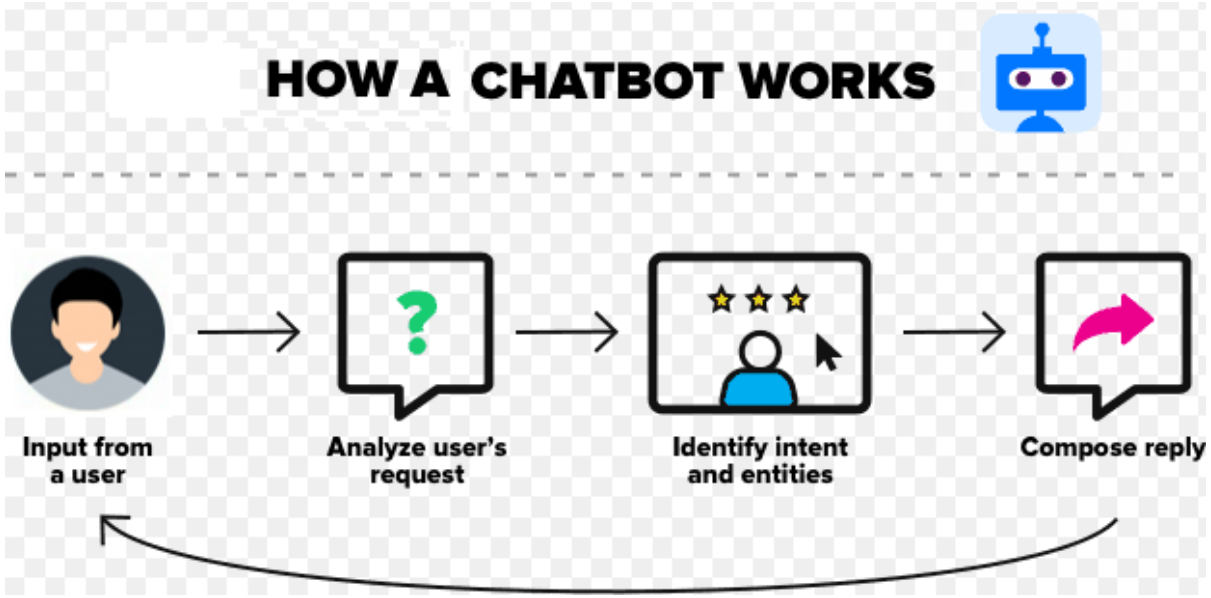
Healthcare

- The daily applications of AI in the medical field, not only helps to save on time and money but also delivers timely and accurate results for faster treatment and decision making.



Finance, banking and insurance

- For instance, AI-powered chatbots using NLP, as a platform for initiating loan processing, are proven real-life use cases in the financial sector. For example, Emma in China!

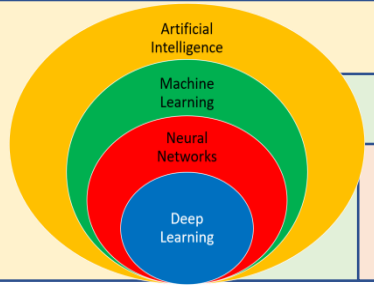


Social media

- When using platforms like Facebook, for instance, AI-powered face recognition tools are employed; on Instagram, location-search is activated; in Snapchat, filters are used to track facial movements to add digital edits/masks, etc.

AI programming languages

R Java Julia C++ Python Prolog



Artificial Intelligence (AI)

Machine Learning (ML)

Neural Networks (NNs)

Deep Learning (DL)

Python

- Python is one of the most powerful and easy programming languages that anyone can start to learn.
- Python is initially developed in the early stage of 1991.
- Most of the developers and programmers choose Python as their favorite programming language for developing Artificial Intelligence solutions.
- Python is worldwide popular among all developers and experts because it has more career opportunities than any other programming language.

Python

- Python is also a portable language as it is used on various platforms such as Linux, Windows, Mac OS, and UNIX.

Linux

Windows

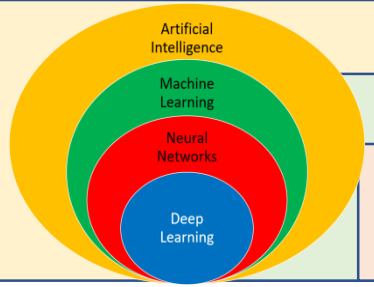
Mac OS

UNIX

Python libraries

- There are some standard Libraries in Python used for Artificial Intelligence as follows:

- TensorFlow Python
- Keras Python
- Theano Python
- Scikit-Learn Python
- PyTorch Python
- NumPy Python
- Python Pandas
- Seaborn Python



Artificial Intelligence (AI)

Machine Learning (ML)

Neural Networks (NNs)

Deep Learning (DL)