Artificial Intelligence

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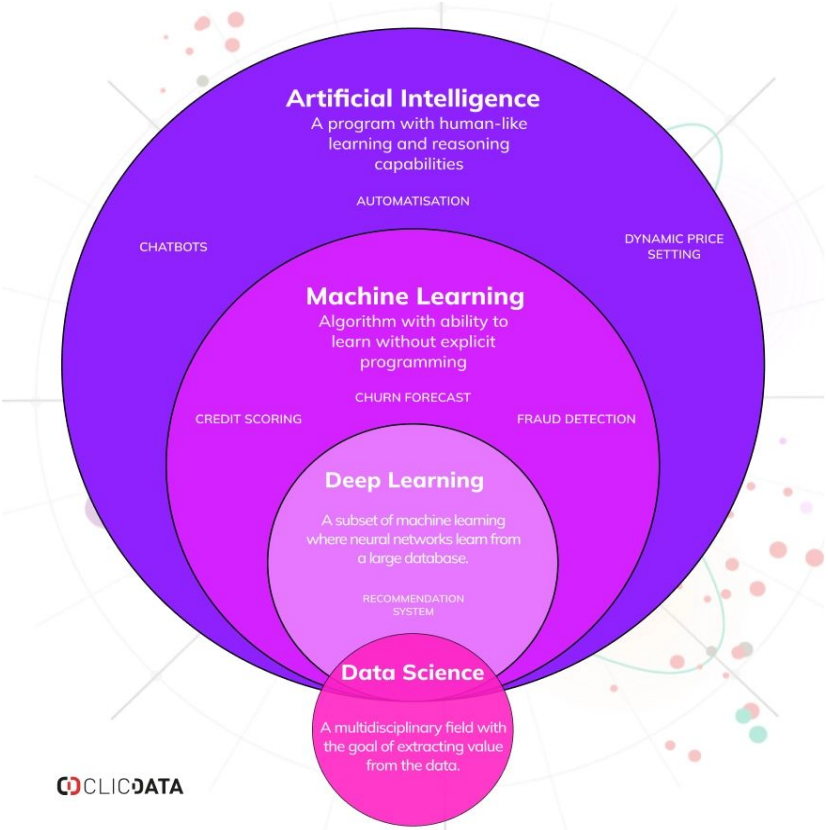
Concepts and History of AI

What is Artificial Intelligence (AI)?

- *AI is a broad term and an even broader discipline with many different meanings.*
- *It is the science and engineering of making **intelligent machines**, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence*
- *It refers to systems or machines that mimic human intelligence to perform tasks and can iteratively improve themselves based on the information they collect*



What is Artificial Intelligence (AI)?

How AI works:

- *AI systems use algorithms and data to analyze information, identify patterns, and make predictions or recommendations.*

Artificial intelligence training models

- ***Supervised learning** is a ML model that maps a specific input to an output using labeled training data **(structured data).** In simple terms, to train the algorithm to recognize pictures of cats*
- ***Unsupervised learning** is a ML model that learns patterns based on unlabeled data **(unstructured data)**. An algorithm learns from the data, **categorizing it into groups based on attributes**. For instance, it's good at pattern matching and descriptive modeling.*
- ***Reinforcement learning** is a ML model that can be broadly described as "learn by doing." The agent receives **positive reinforcement** when it performs the task well and **negative reinforcemen**t when it performs poorly. An example of reinforcement learning would be teaching a robotic hand to pick up a ball.*

Concepts and History of AI

A Brief History of AI

- *1943: McCulloch and Pitts created a model of a neuron. The thinking was that the ability to model a neuron would help create an artificial human brain and intelligence.*
- *1956: The first Artificial Intelligence conference in Dartmouth college (birth of AI).*
- *The 1960s: The first robot Shakey which incorporated robotics, computer vision, and natural language processing, was able to move boxes in a room.*
- *The 1970s: Lack of funding in AI research. This period called the 1st AI Winter.*
- *1980s: Neural networks which use a back-propagation algorithm to train itself become widely used in AI applications.*
- *The 1997: IBM's Deep Blue beats then world chess champion Garry Kasparov, in a chess match (and rematch). It's brought a lot of interesting in AI.*

Concepts and History of AI

A Brief History of AI

- ➢ *2009: The world-largest dataset (ImageNet) was created.*
- ➢ *2011-2012: Speed of GPUs had increased significantly, that enabled researchers to train large Deep Learning models (e.g. AlexNet)*
- ➢ *2014:* ***Generative adversarial networks (GAN)*** *frameworks that teach AI how to generate new data based on the training set, was developed.*
- ➢ *2015:* ***DeepMind's AlphaGo*** *program is the first AI to beat a Go world champion. Go is one of the oldest and hardest abstract strategy games, which was previously thought to be a near-impossible game to teach a computer.*
- ➢ *2016- present: many interesting AI researches, algorithms/models, and systems. ✓ChatGPT, Generative AI, ...*

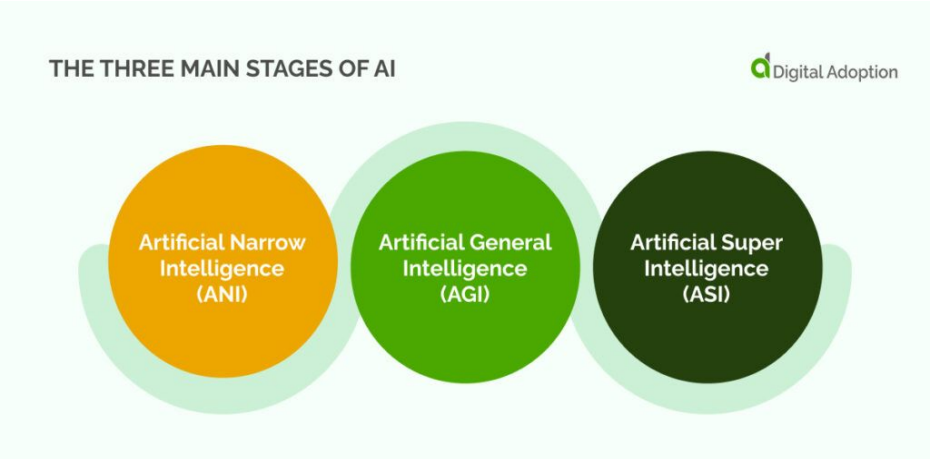
Stages of AI

There are 3 stages of AI:

- Artificial Narrow Intelligence (ANI) or Weak AI
- Artificial General Intelligence (AGI) or Strong AI
- Artificial Super Intelligence (ASI)

Key Components:

- Machine Learning (ML), Natural Language Processing (NLP), Computer Vision, Robotics.



Stages of AI

➢ ***Artificial Narrow Intelligence (ANI) or Weak AI***

- *ANI is the stage of AI involving machines that can perform only a narrowly defined set of specific tasks.*
- *ANI cannot perform beyond its field or limitations, as it is only trained for one specific task.*
- *Almost all the AI-based systems built till this date fall under the category of Weak AI.*
- ***Examples of Weak AI:*** *Apple Siri, Alexa, Google Assistant, Self-driving car, Product recommendations, Speech recognition, etc.*

Stages of AI

➢ ***Artificial General Intelligence (AGI) or Strong AI***

- *AGI is the AI where a machine will possess the ability to perform any intellectual tasks or think and make decisions just like a human.*
- *AGI is to make a machine that could be smarter and think like a human by its own.*
- *Currently no existing system or example and AGI is considered as a threat to human.*
- ***AGI is still under research and it take lots of efforts and time to develop such systems.***
- ***Imagine a self-driving car piloted by an AGI.*** *It cannot only pick up a passenger from the airport and navigate unfamiliar roads but also adapt its conversation in real time*

Stages of AI

➢ ***Artificial Super Intelligence (ASI)***

- *ASI is the AI when the capability of computers/machines will surpass human intelligence and can perform any tasks better than human with cognitive properties.*
- *Some key characteristics include the ability to* ***think, to reason, to solve problems, to plan, to learn, to make judgements or decisions, and also to communicate by its own.***
- ***ASI is still a hypothetical concept as depicted in movies and science fiction books where machines take control the world.***

Real-world AI Applications

Real-world AI Applications

AI Fields and Applications

AI is applied in various fields such as:

AI in Healthcare

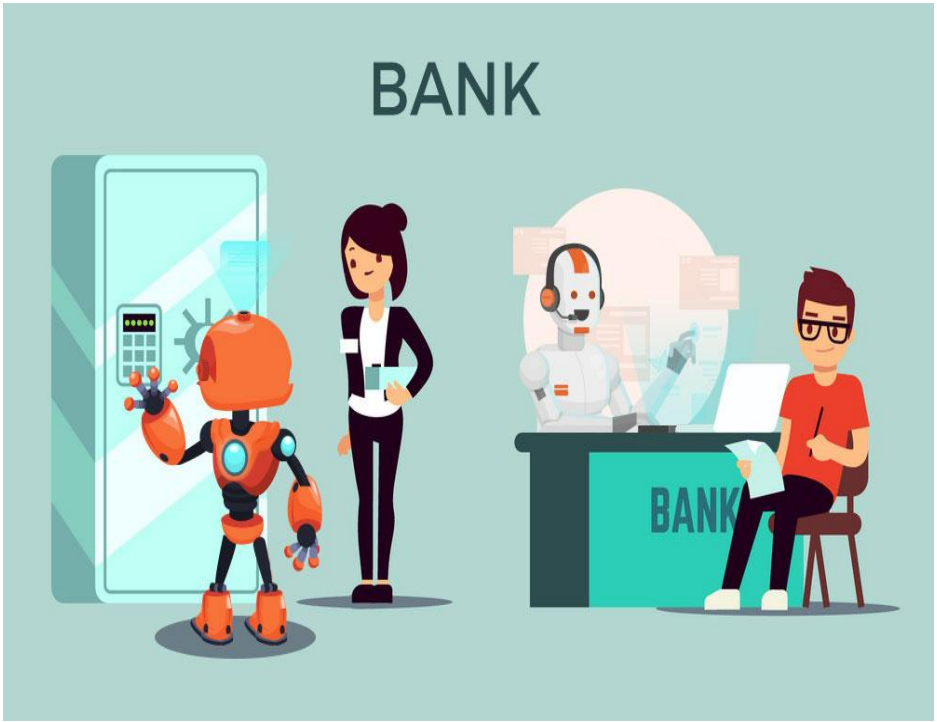
- ➢ Diabetes classification
- ➢ Robotics surgery, image analysis
- ➢ Breast/lung cancer detection
- ➢ Early detection of diseases, etc.
- ➢ Read more: https://www.ibm.com/blog/the-benefits-of-ai-in-healthcare/

Real-world AI Applications

AI Fields and Applications

AI in Banking/Finance

- Retails Credit Scoring,
- Know Your Customer (KYC)
- Fraud Detection
- Cybersecurity
- Chatbot
- Read more: https://appinventiv.com/blog/ai-in-banking/



Real-world AI Applications

AI Fields and Applications

AI in Social Media

- *Facebook (ads suggestion, face recognition)*
- *Google (search suggestion)*
- *Instagram (shorts video recommendation)*
- *YouTube (video recommendation)*
- *AI in E-commerce*
- *Recommendation system.*
- *Voice and image search etc.*
- *AI in Automotive Industry*
- *Robot-arm etc.*

AI Techniques

AI Techniques - A bit of definition

There are some common techniques used in developing AI.

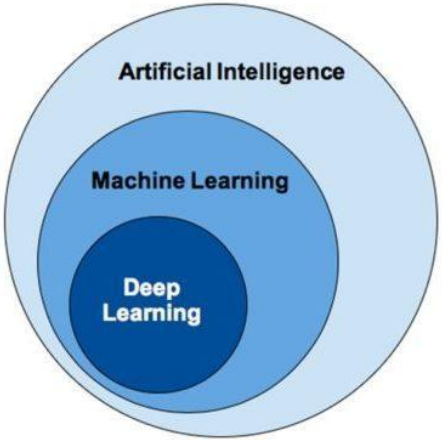
- ➢ Machine Learning
- ➢ Artificial Neural Network
- ➢ Deep Learning
- ➢ Computer Vision
- ➢ Natural Language Processing (e.g. RNN, LSTM)
- ➢ Searching algorithms (e.g. a popular A* search) and others (logic, statistic, ...)

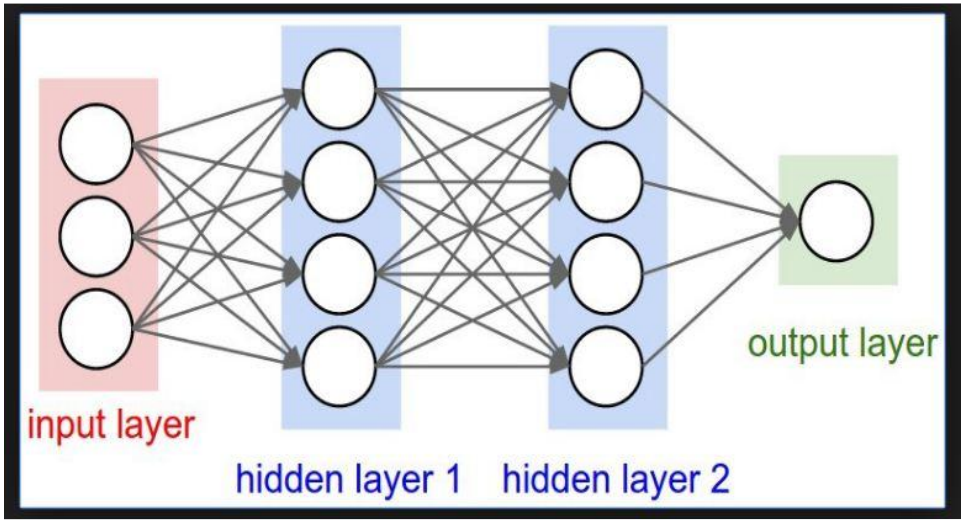
AI Techniques - A bit of definition

- ***Machine Learning (ML):*** A domain of artificial intelligence that gives computers the ability to learn without being explicitly programmed.
- ***Deep Learning (DL):*** is a subfield of machine learning based on artificial neural networks with representation learning.
- ***Computer Vision (CV):*** A domain of artificial intelligence focused on processing and understanding visual inputs through complex machine learning algorithms.
- ***Natural Language Processing (NLP):*** A domain of artificial intelligence focused on understanding human language and helping computers and humans interact through human language.

AI Techniques - ML, DL Relation

- ***Deep Learning (DL) and Machine Learning (ML)*** are sub-fields of Artificial Intelligence (AI), and Deep Learning is a sub-field of Machine Learning.
- ***Deep Learning*** is comprised of neural networks. "**Deep**" in deep learning refers to a **neural network** comprised of more than three layers (input, hidden, output included).





Any questions?