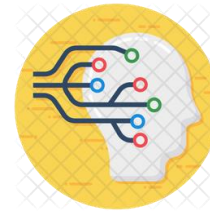


TOPIC 1:

Introduction to Artificial Intelligence

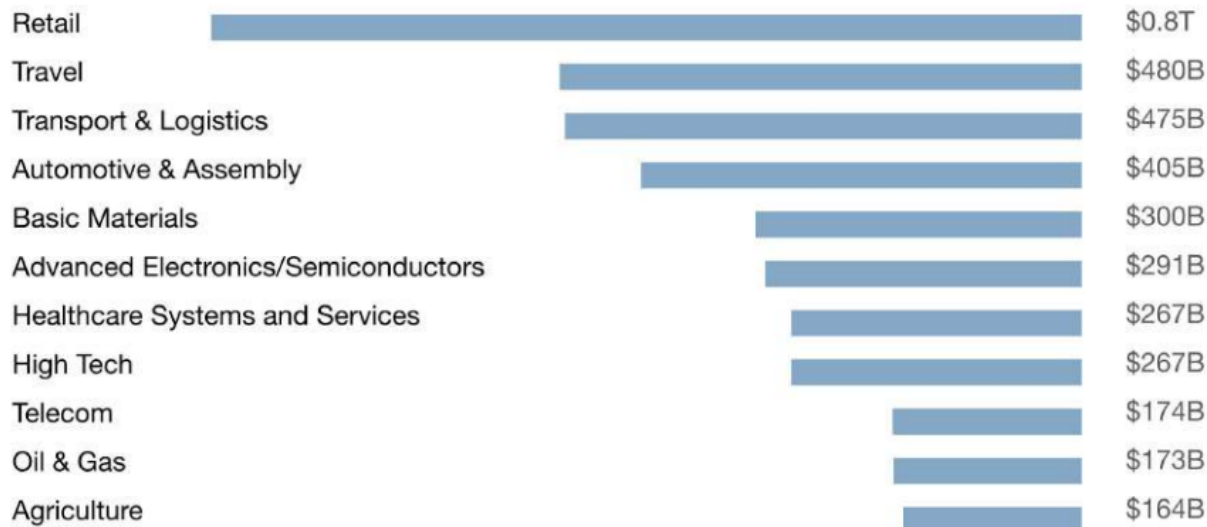


Prepared by Nima Dema

Introduction

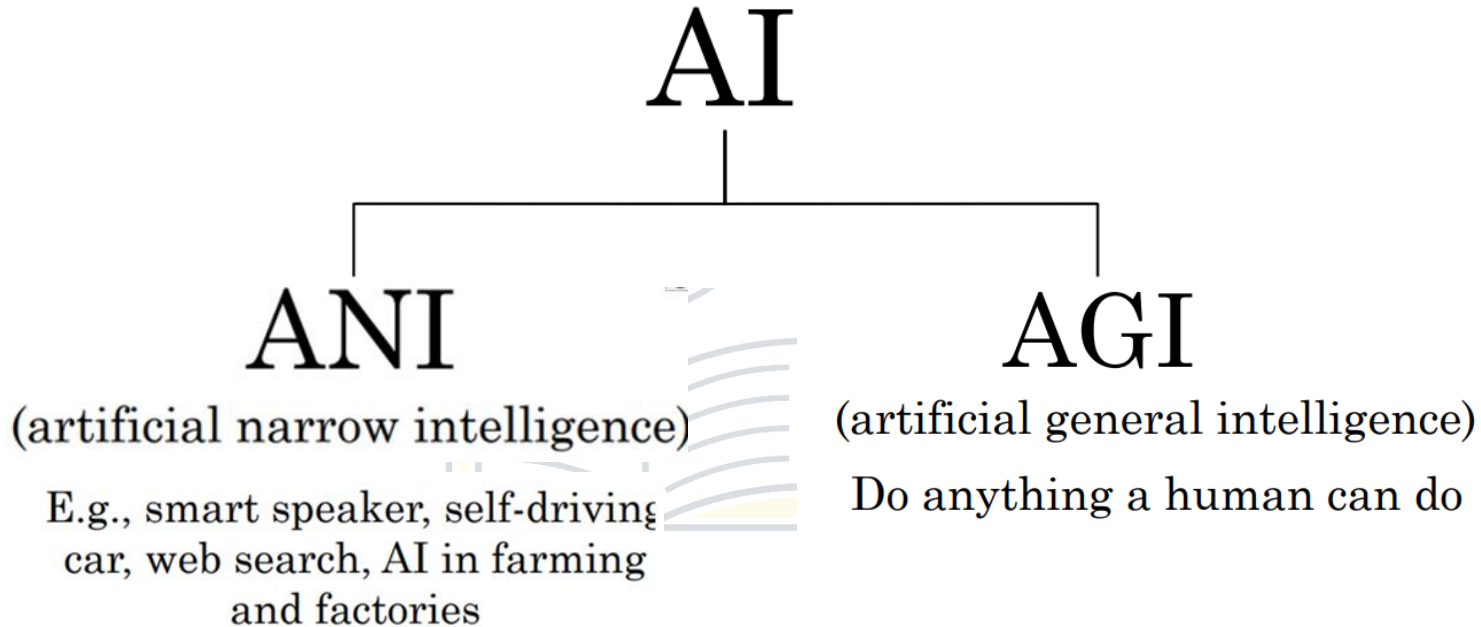
AI value creation
by 2030

\$13
trillion



[Source: McKinsey Global Institute.]

Demystifying AI



What is AI?

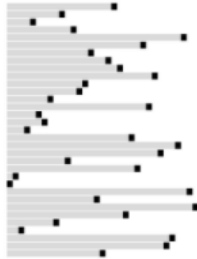
Artificial intelligence (AI), the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings.



Source: <https://www.britannica.com/technology/artificial-intelligence>



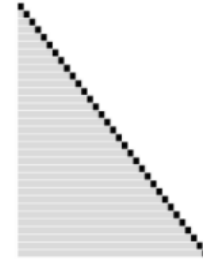
Algorithm



Input



**Programmable
Computer**



Output



Algorithm



“Horse”



Input



**Programmable
Computer**



Output

Search

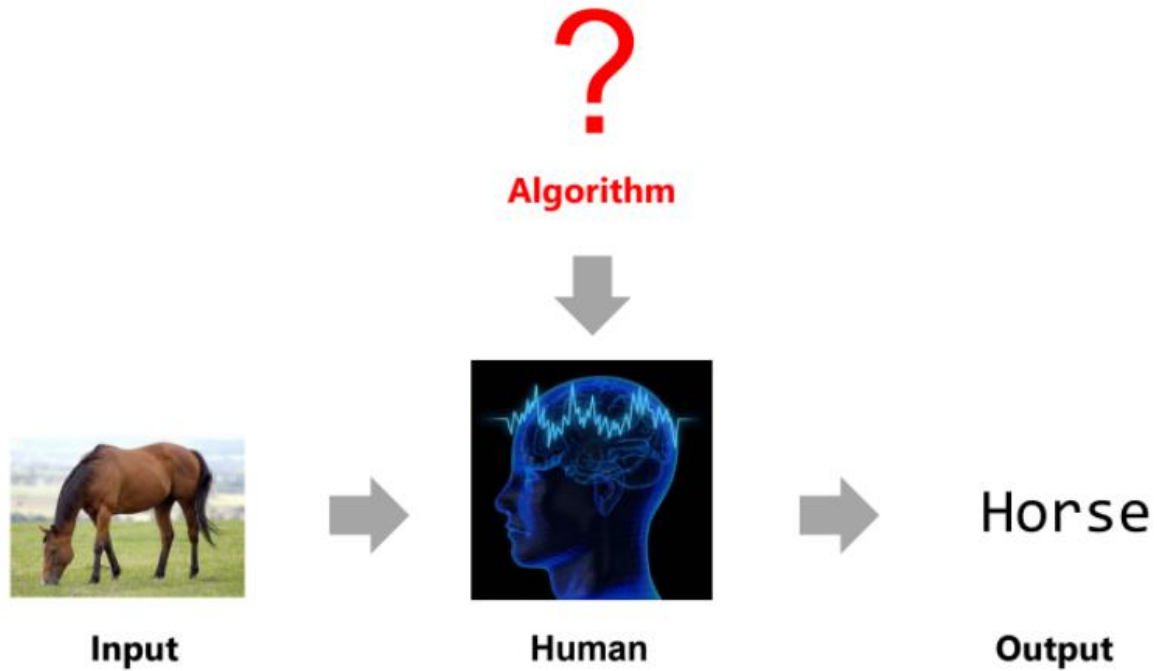


Image Classification

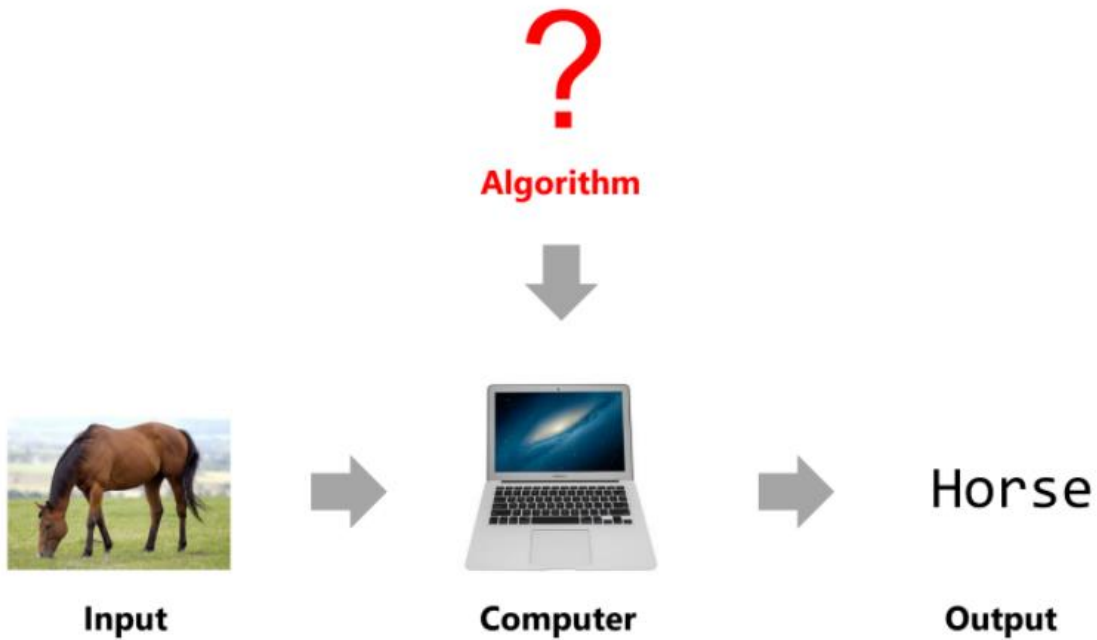


Image Classification

Input(A)

Output(B)

Application

Email

spam?(0/1)

Spam Filtering

Audio

text transcripts

Speech Recognition

English

Chinese

Machine Translation

Ad, user info

click?(0/1)

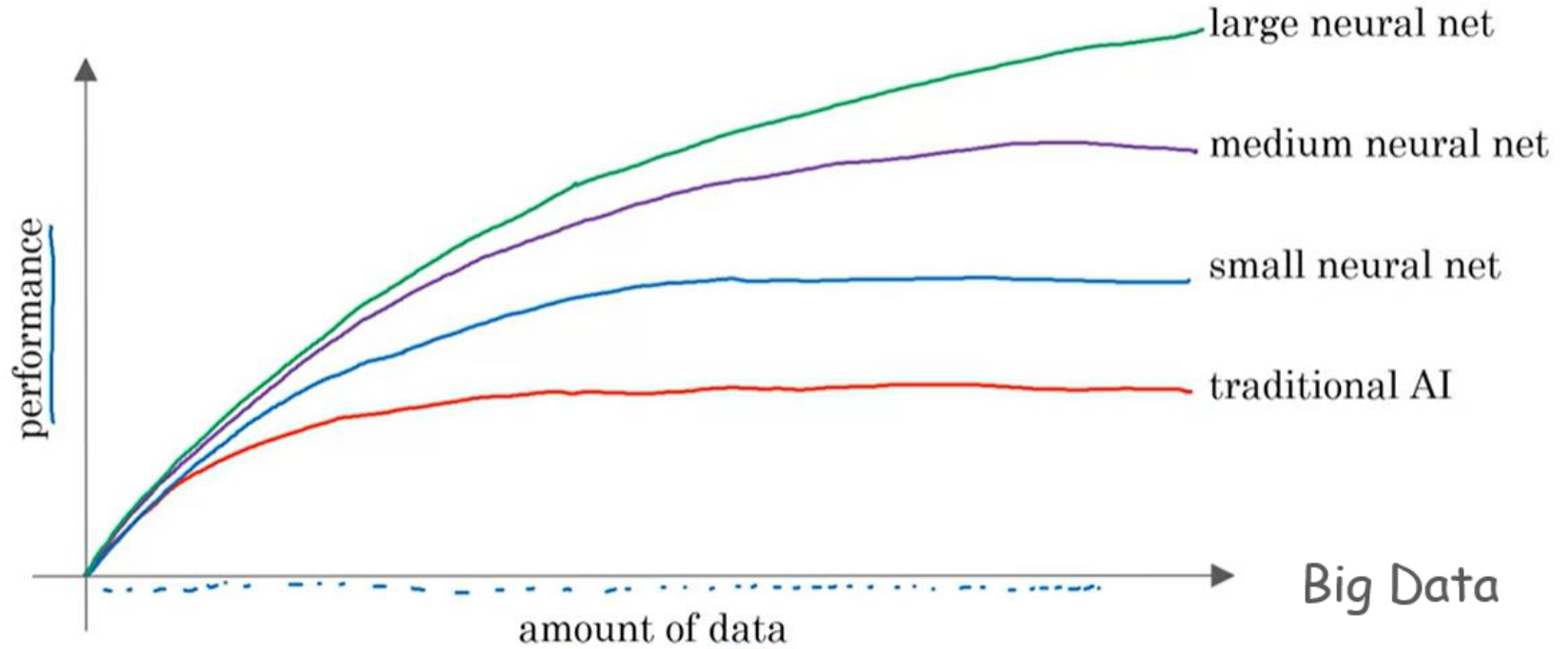
online advertising

Image, radar info

position of other cars

self-driving car

Why now?







Example of data(dataset)

Size of house (square feet)	# of bedrooms	Price (1000\$)
523	1	100
645	1	150
708	2	200
1034	3	300
2290	4	350
2545	4	440



A → B

image	label
	cat
	not cat
	cat
	not cat

A B

Acquiring Data

- Manual Labelling



cat



not
cat



cat



not
cat

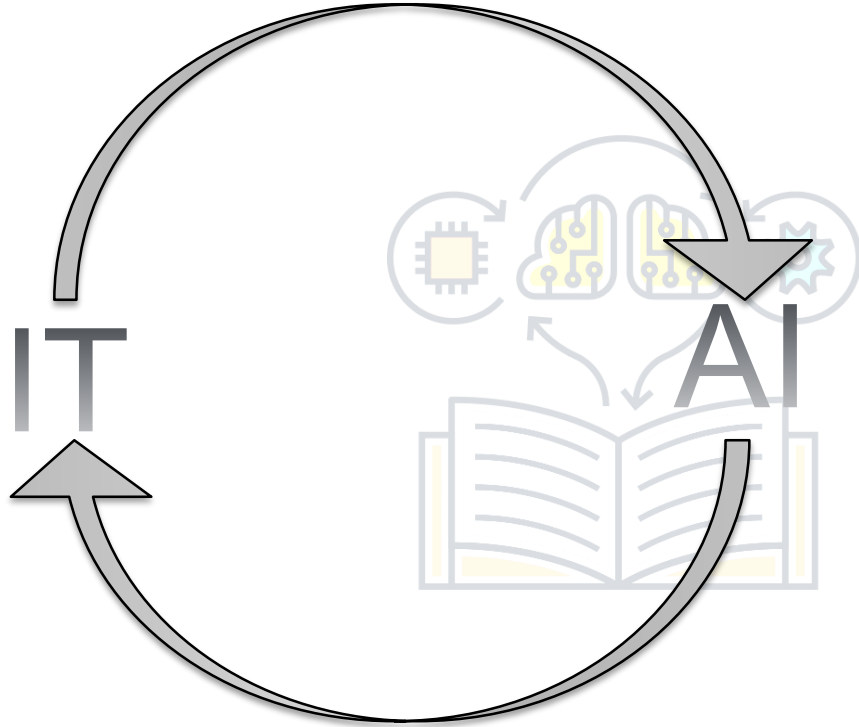
- From observing behaviour

user ID	time	price (\$)	purchased
4783	Jan 21 08:15.20	7.95	yes
3893	March 3 11:30.15	10.00	yes
8384	June 11 14:15.05	9.50	no
0931	Aug 2 20:30.55	12.90	yes

machine	temperature (°C)	pressure (psi)	machine fault
17987	60	7.65	N
34672	100	25.50	N
08542	140	75.50	Y
98536	165	125.00	Y

- Download from websites/partnerships

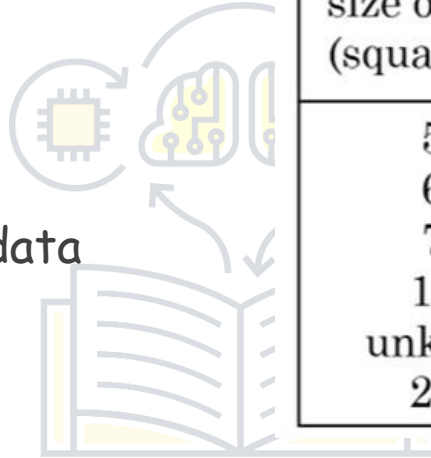
Use and misuse of data



Don't throw data at an AI team and assume it will be valuable.

Data is messy

- Data Problems
 - Incorrect labels
 - Missing values
 - Outliers
- Multiple types of data
 - Image, audio, text



size of house (square feet)	# of bedrooms	price (1000\$)
523	1	115
645	1	0.001
708	unknown	210
1034	3	unknown
unknown	4	355
2545	unknown	440

CPU vs GPU

CPU: Computer processor (Central Processing Unit)

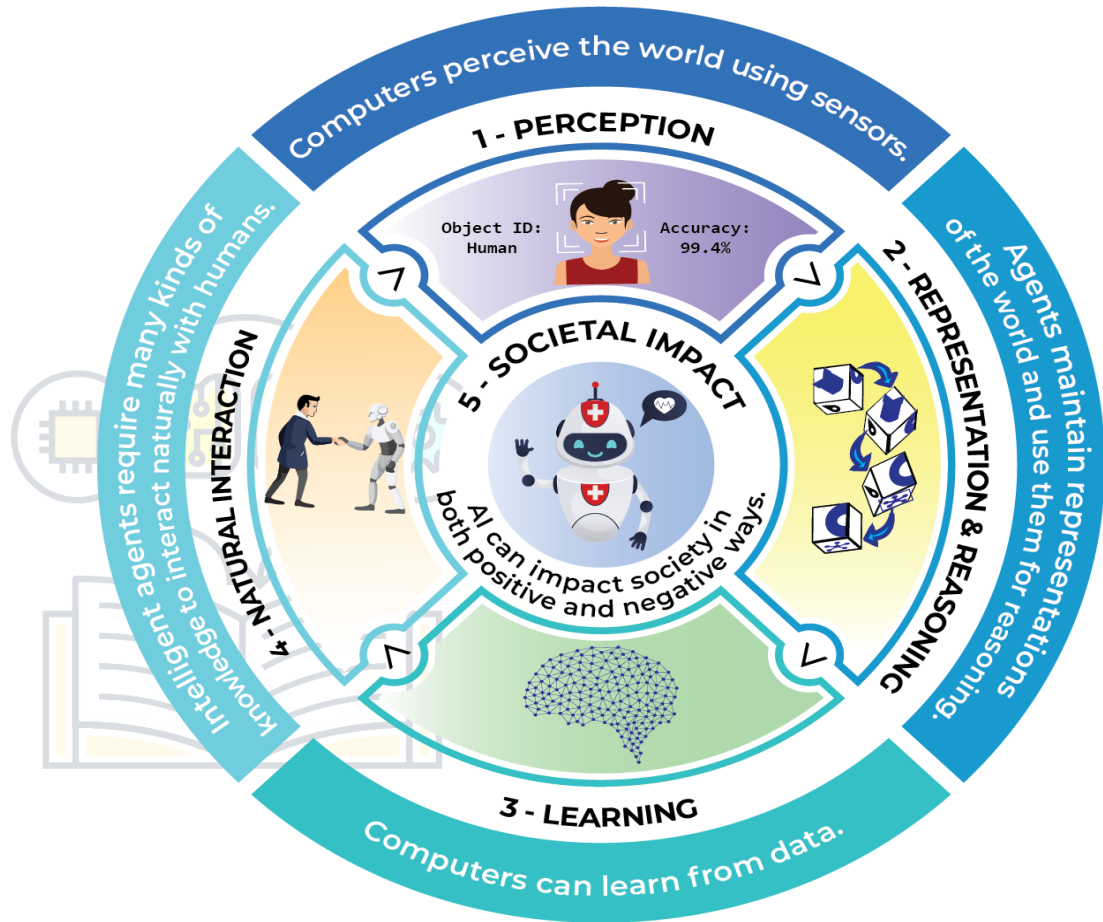


GPU: Graphics Processing Unit



Cloud vs. On-premises

5 big Ideas of AI



5 big Ideas of AI

Five Big Ideas in Artificial Intelligence

5. Societal Impact

AI can impact society in both positive and negative ways. AI technologies are changing the ways we work, travel, communicate, and care for each other. But we must be mindful of the harms that can potentially occur. For example, biases in the data used to train an AI system could lead to some people being less well served than others. Thus, it is important to discuss the impacts that AI is having on our society and develop criteria for the ethical design and deployment of AI-based systems.

4. Natural Interaction

Intelligent agents require many kinds of knowledge to interact naturally with humans. Agents must be able to converse in human languages, recognize facial expressions and emotions, and draw upon knowledge of culture and social conventions to infer intentions from observed behavior. All of these are difficult problems. Today's AI systems can use language to a limited extent, but lack the general reasoning and conversational capabilities of even a child.

1. Perception

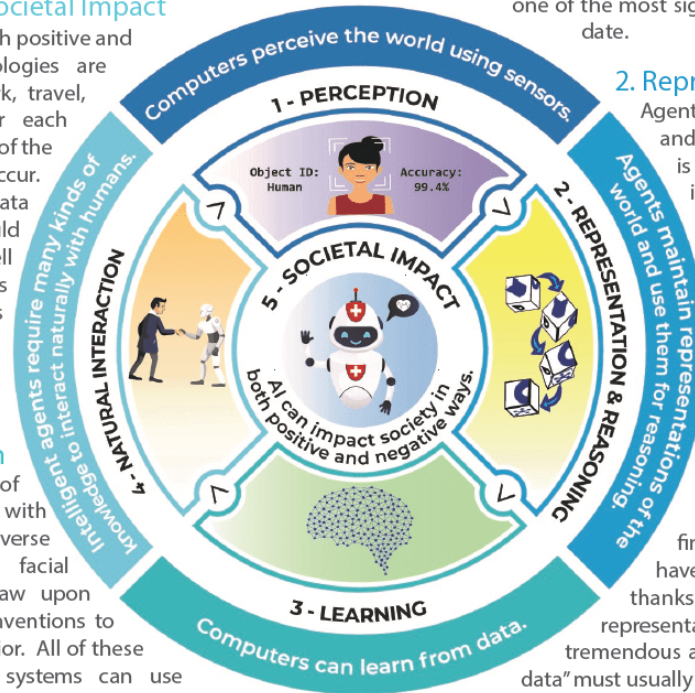
Computers perceive the world using sensors. Perception is the process of extracting meaning from sensory signals. Making computers "see" and "hear" well enough for practical use is one of the most significant achievements of AI to date.

2. Representation & Reasoning

Agents maintain representations of the world and use them for reasoning. Representation is one of the fundamental problems of intelligence, both natural and artificial. Computers construct representations using data structures, and these representations support reasoning algorithms that derive new information from what is already known. While AI agents can reason about very complex problems, they do not think the way a human does.

3. Learning

Computers can learn from data. Machine learning is a kind of statistical inference that finds patterns in data. Many areas of AI have progressed significantly in recent years thanks to learning algorithms that create new representations. For the approach to succeed, tremendous amounts of data are required. This "training data" must usually be supplied by people, but is sometimes acquired by the machine itself.



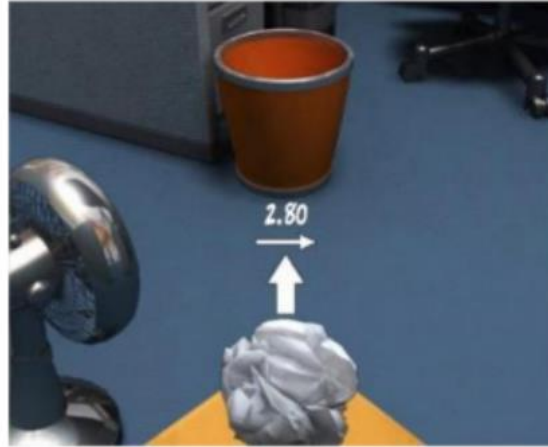
Machine Learning

- Machine learning, in artificial intelligence, is a discipline concerned with the implementation of computer software that can learn autonomously.



source: <https://www.britannica.com/technology/machine-learning>

Machine Learning in layman's term



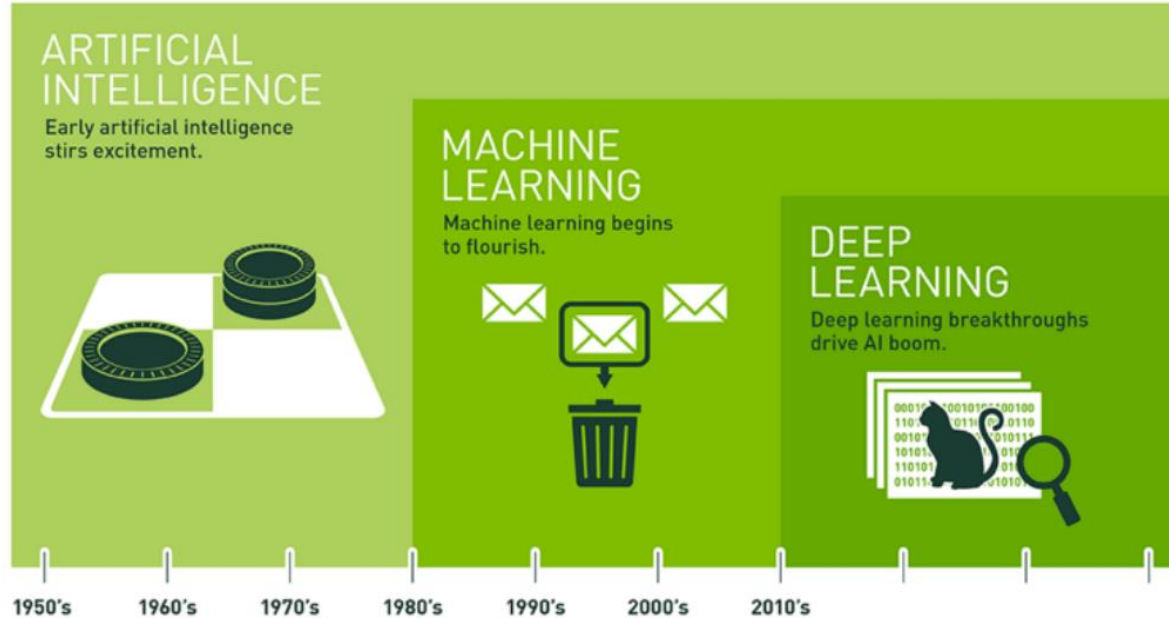
Non-machine learning way:

- Apply some pre-defined formula
- Need to reprogram for new conditions; such as wind

Machine learning way:

- Identify the relationship from repeated success/failures
- No need to reprogram for new conditions; just need more data

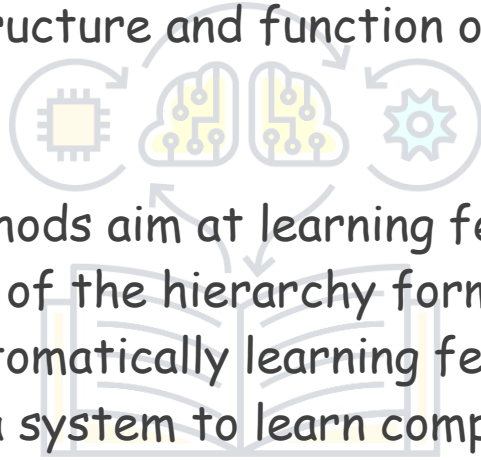
Deep Learning



Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

Machine Learning in layman's term

- Deep Learning is a subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called artificial neural networks.
- Deep learning methods aim at learning feature hierarchies with features from higher levels of the hierarchy formed by the composition of lower level features. Automatically learning features at multiple levels of abstraction allow a system to learn complex functions mapping the input to the output directly from data, without depending completely on human-crafted features.



Deep learning

