

Lecture 1

Machine Learning: basic concepts and a general model

LÊ ANH CƯỜNG

Outline

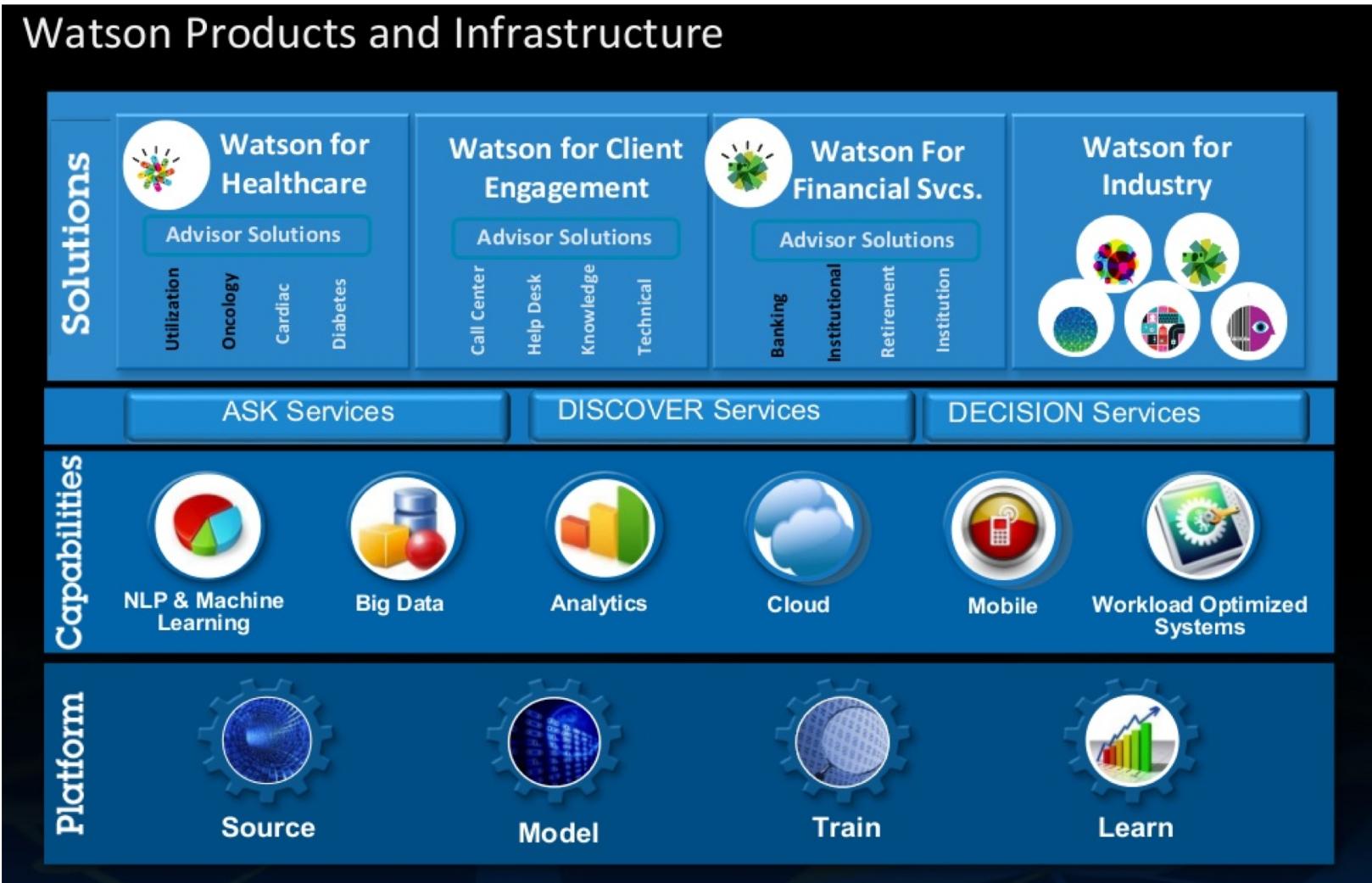
- What is Machine Learning (ML)?
 - Examples of AI systems
 - Distinguish between AI and ML
 - Roles of ML in AI systems
- ML general architecture and basic concepts
 - Knowledge and reasoning
 - Model and parameters
 - Learning
 - Definition of ML
- Examples of some ML models

Watson IBM

- Watson is a question answering computer system capable of answering questions posed in natural language, developed in IBM.
- In 2011, Watson competed on Jeopardy! against former winners Brad Rutter and Ken Jennings. Watson received the first place prize of \$1 million.



Watson IBM



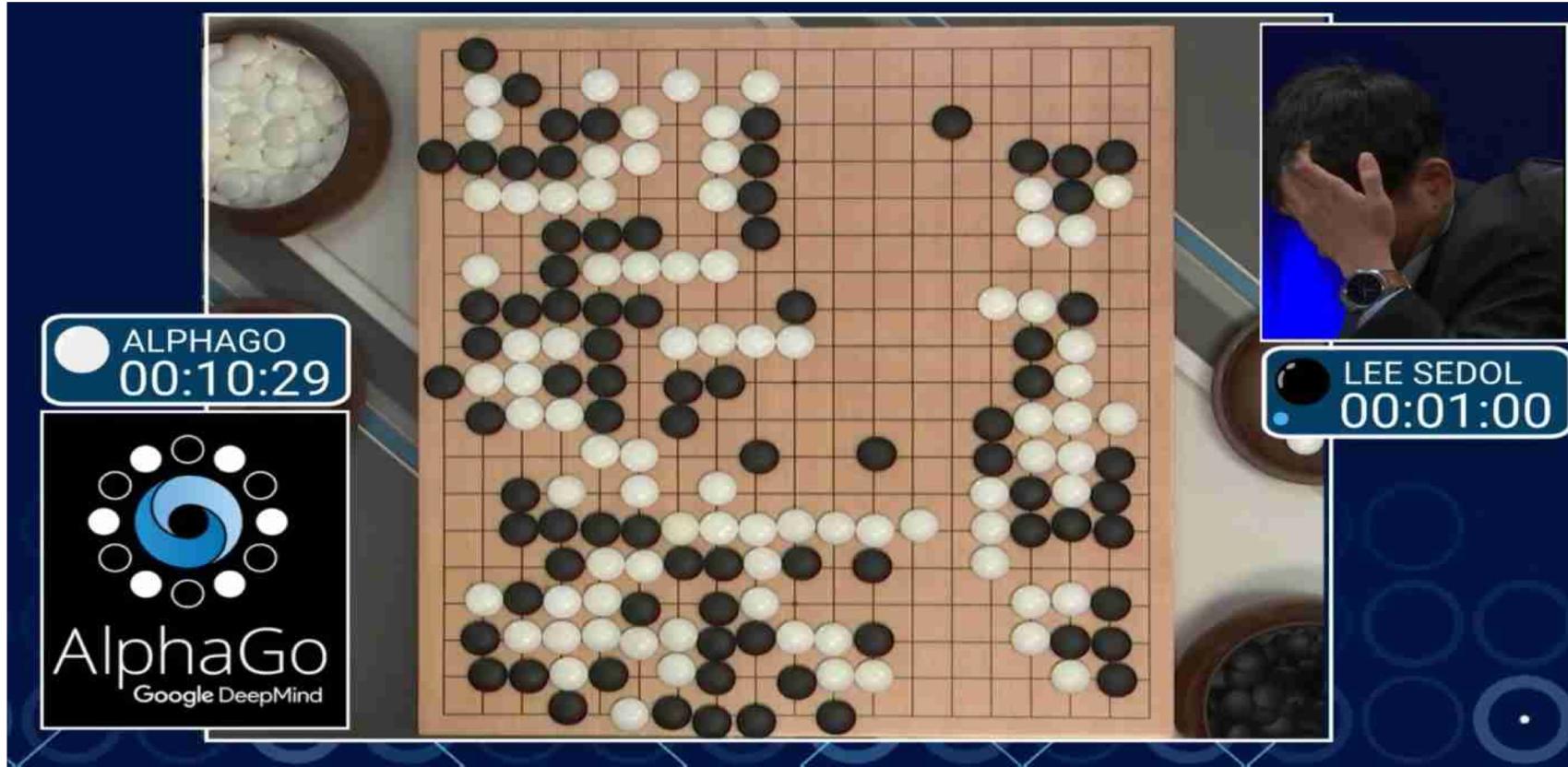
Game (Deep Blue)

- Deep Blue was a chess-playing computer developed by IBM.
- Deep Blue won its first game against a world champion on February 10, 1996, when it defeated Garry Kasparov.



Game (AlphaGo)

- AlphaGo is a computer program developed by Google DeepMind. In October 2015, the first Computer Go program to beat a professional human. In March 2016, it beat Lee Sedol.

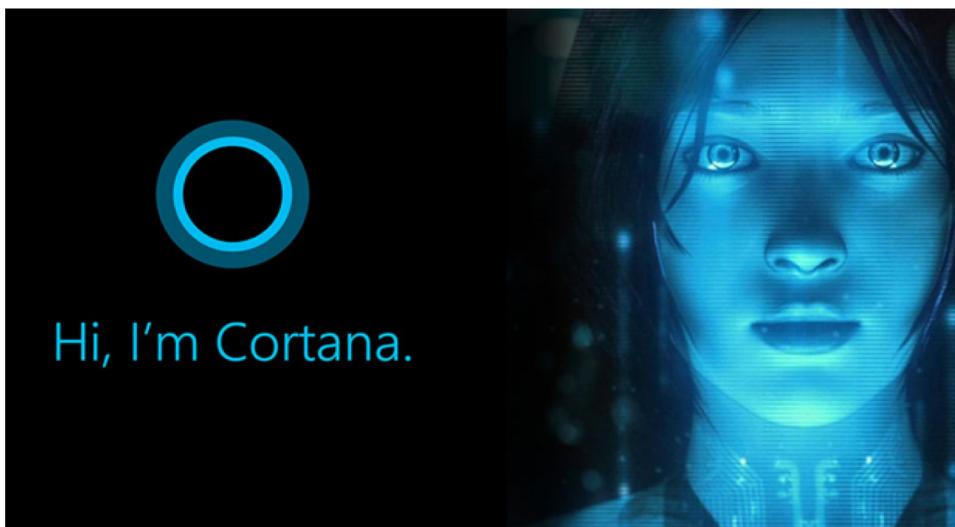
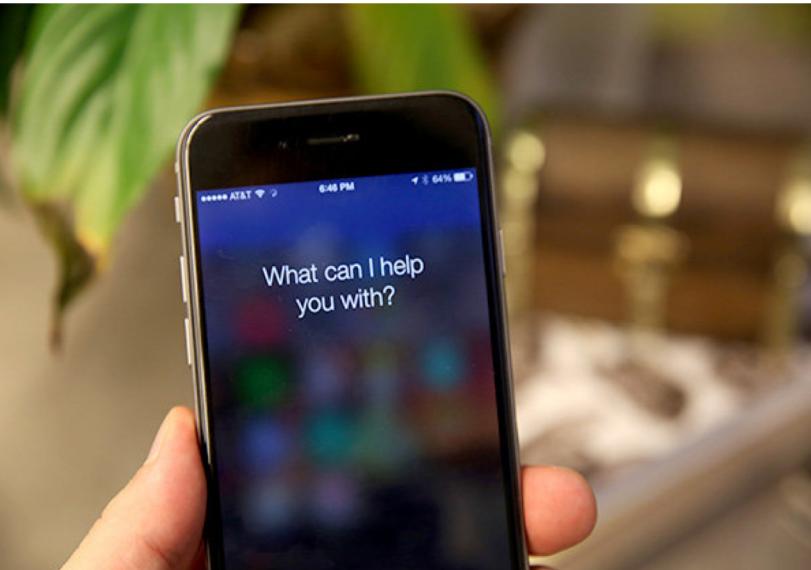


Self Driving Cars

- Google self-driving cars
- Elon Musk is the founder, CEO, and CTO of SpaceX; co-founder, CEO, and product architect of Tesla Motors; co-founder and chairman of SolarCity; co-chairman of OpenAI;



Cortana-Microsoft, Siri-Apple



Face Recognition



Machine Translation

The screenshot shows the Google Translate web interface. At the top, there's a navigation bar with a menu icon, the "Google Translate" logo, and a settings icon with a letter "A". Below the bar, there are two tabs: "Text" (selected) and "Documents". The main area has language detection and selection dropdowns: "DETECT LANGUAGE" (set to English), "ENGLISH" (selected), "VIETNAMESE" (selected), and "VIETNAMESE" (selected). A double-headed arrow icon is between the English and Vietnamese sections. To the right, there are dropdowns for "SPANISH" (selected) and "ENGLISH" (selected). The text input field contains the sentence: "The virus: The coronavirus outbreak has killed at least 427 people and infected more than 20,000 globally as it continues to spread beyond China." The translated output in Vietnamese is: "Virus: Sự bùng phát của coronavirus đã giết chết ít nhất 427 người và lây nhiễm hơn 20.000 người trên toàn cầu khi nó tiếp tục lan rộng ra ngoài Trung Quốc." There are also icons for microphone, speaker, keyboard, and a clipboard.

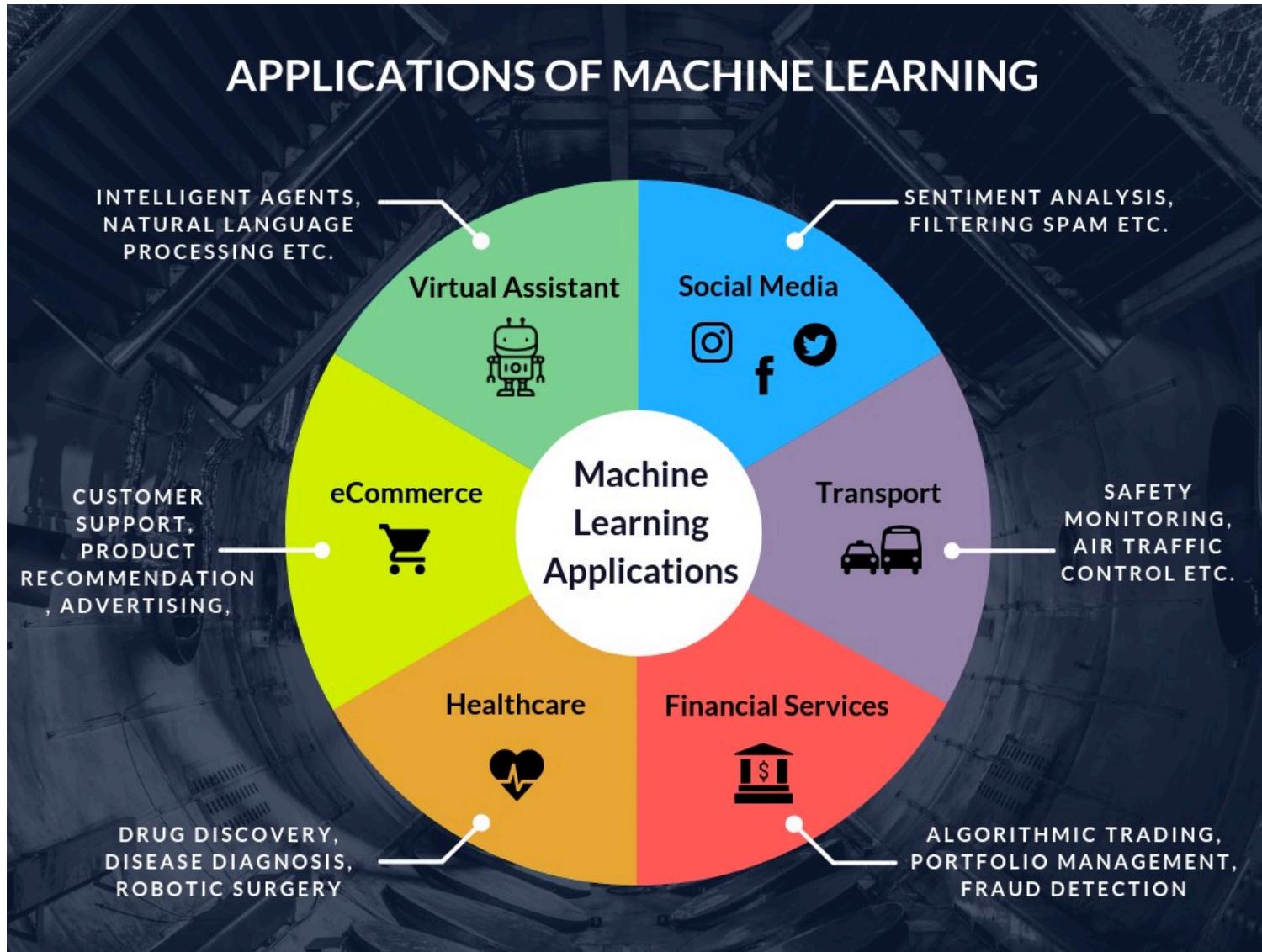
The virus: The coronavirus outbreak has killed at least 427 people and infected more than 20,000 globally as it continues to spread beyond China.

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- Speech translation
- Using automatic translation in various situations (email, hotel, restaurant, business,...)

Japan's New "Society 5.0" Commercial



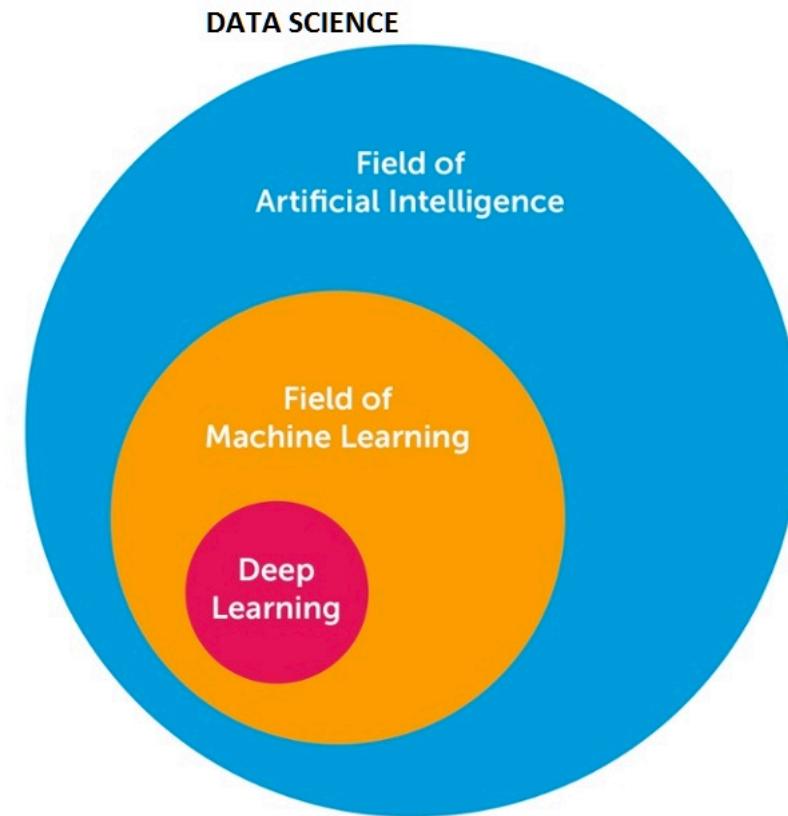


AI and ML?

- Relationship between AI and ML?
- What is AI?
- What is ML?

AI and ML?

- Relationship between AI and ML?
- What is AI?
- What is ML?



What is Artificial Intelligence?

- Characteristics?
- When a system is considered as an intelligent system?

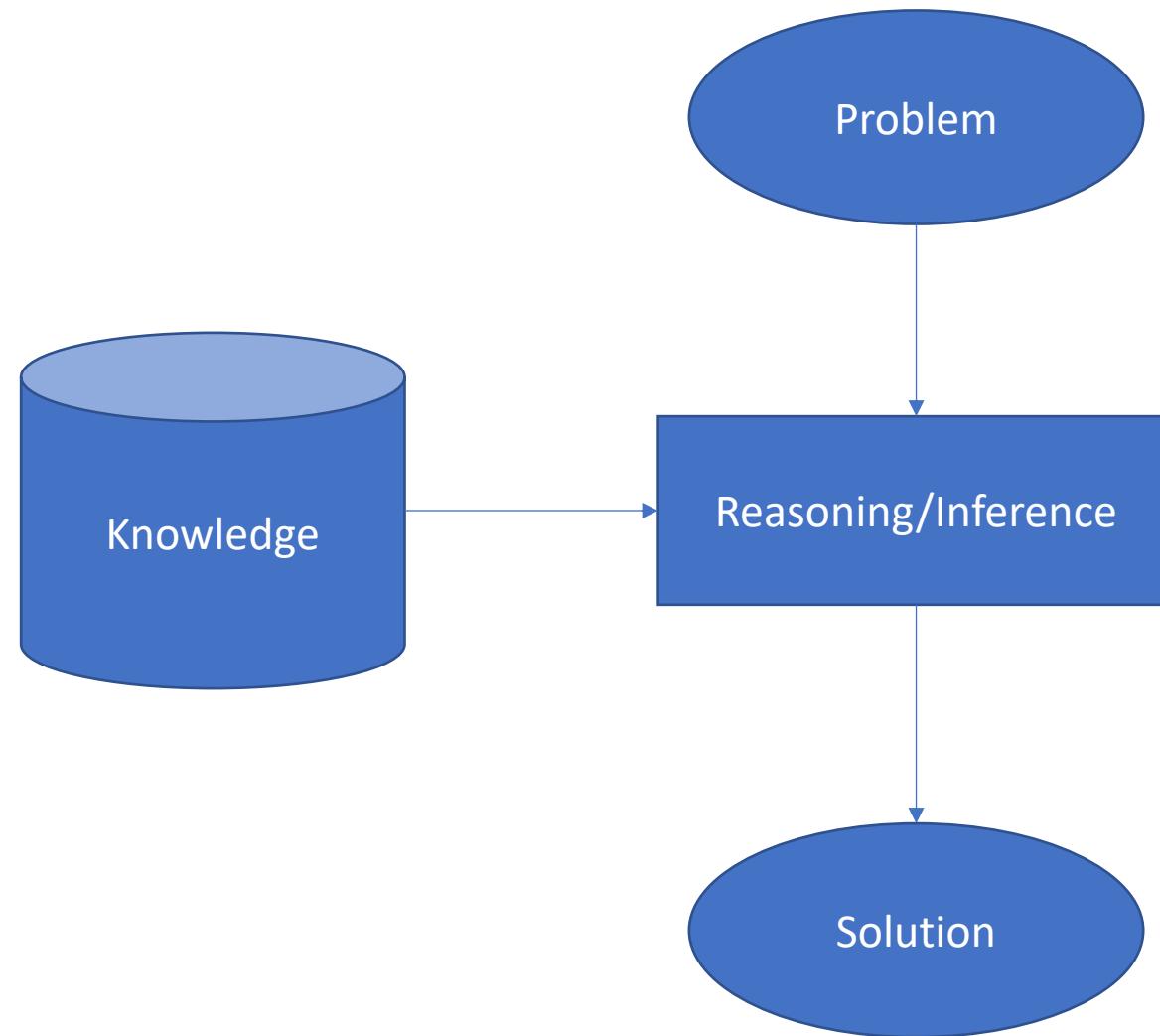
What is Artificial Intelligence?

- Have intelligence as Human
- How do people solve a problem?
- Show processing steps?

What is Artificial Intelligence?

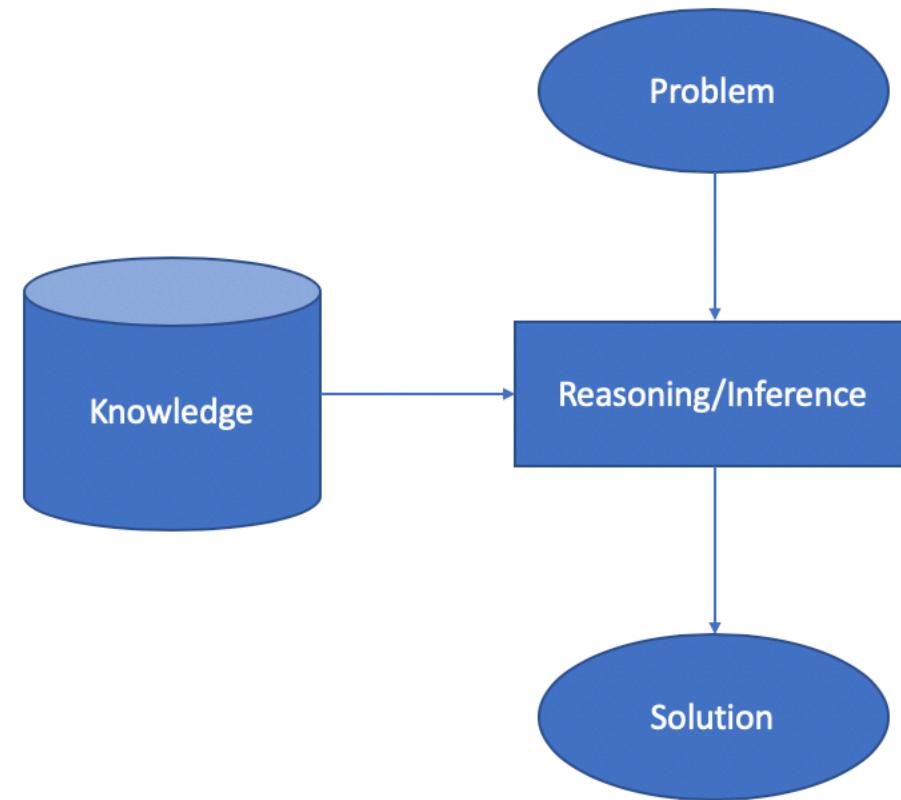
- Knowledge
- Thinking and Reasoning

Human

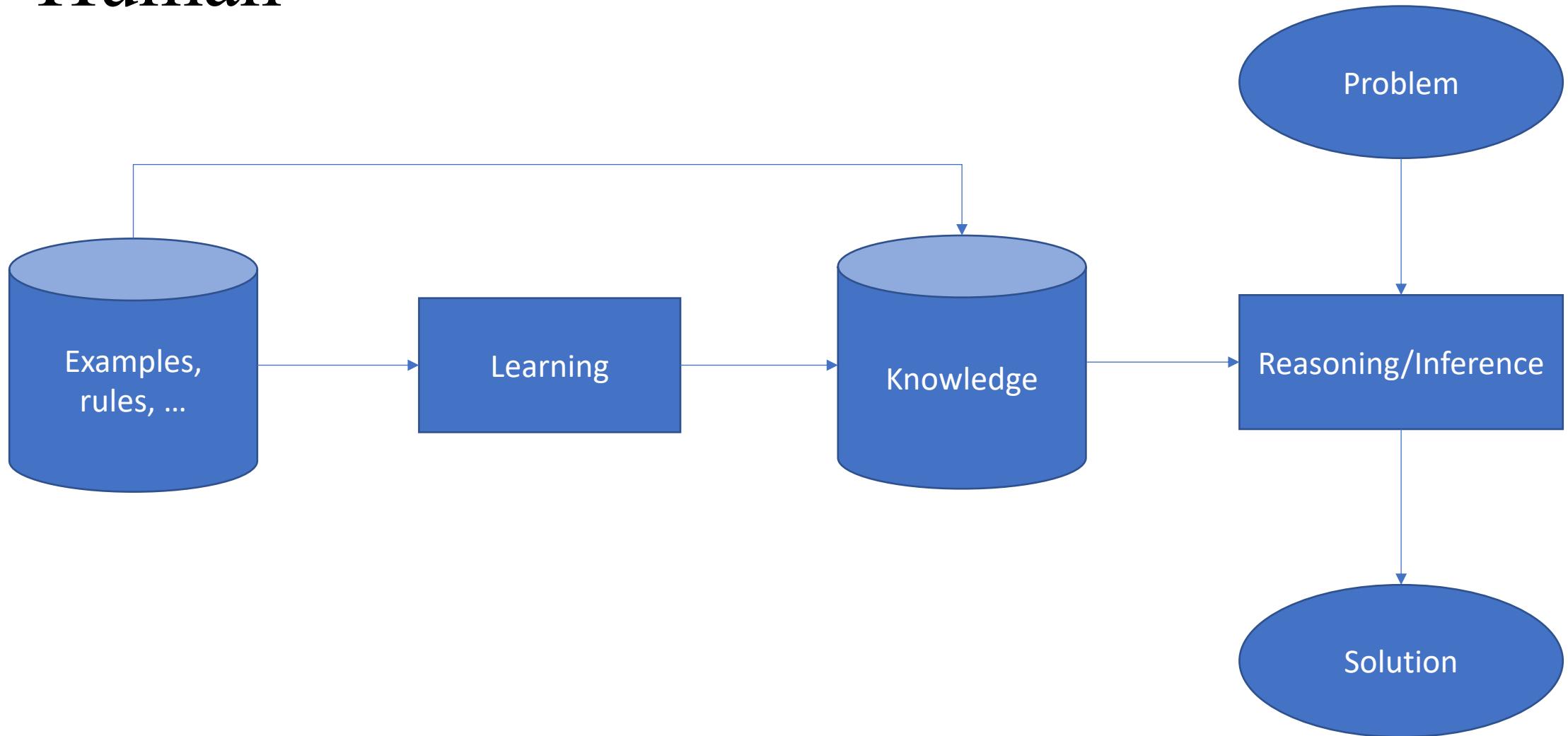


Human

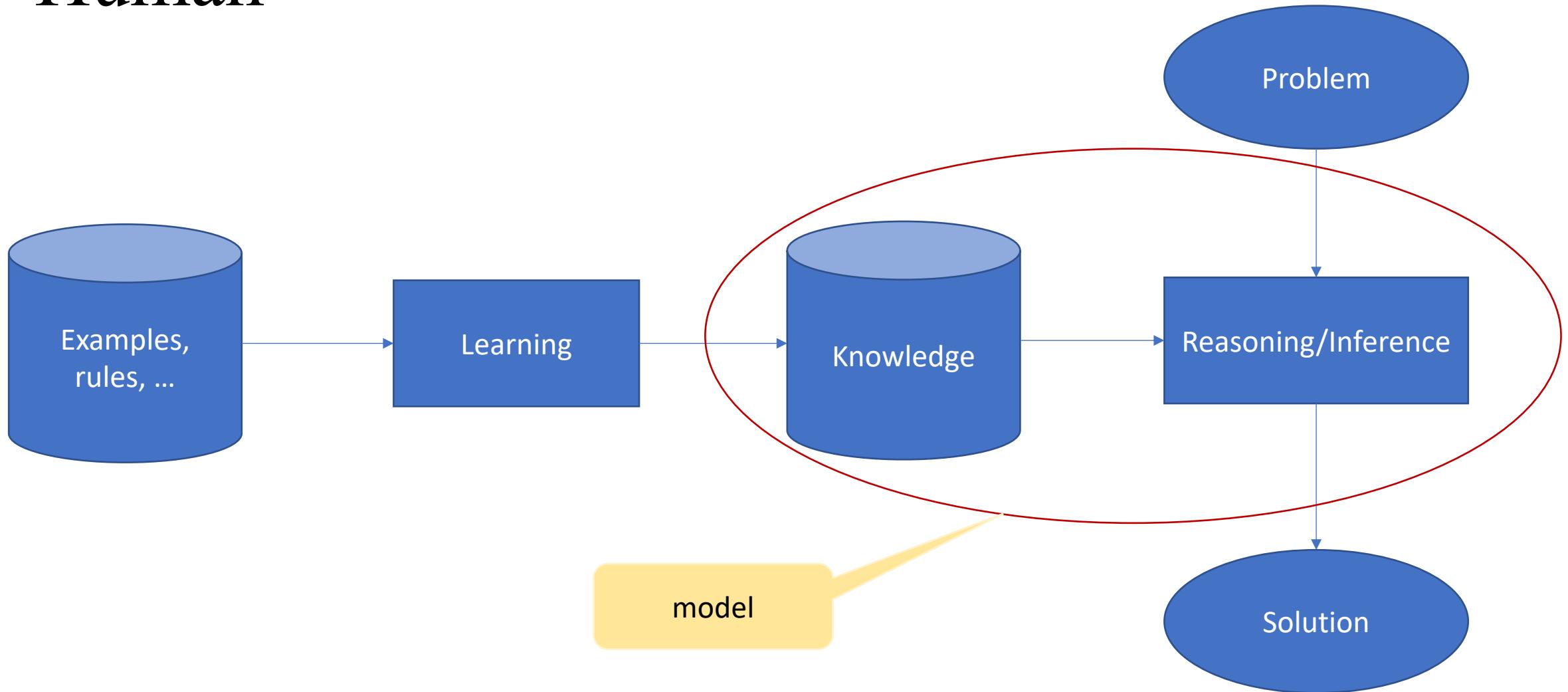
- How to have **knowledge**?



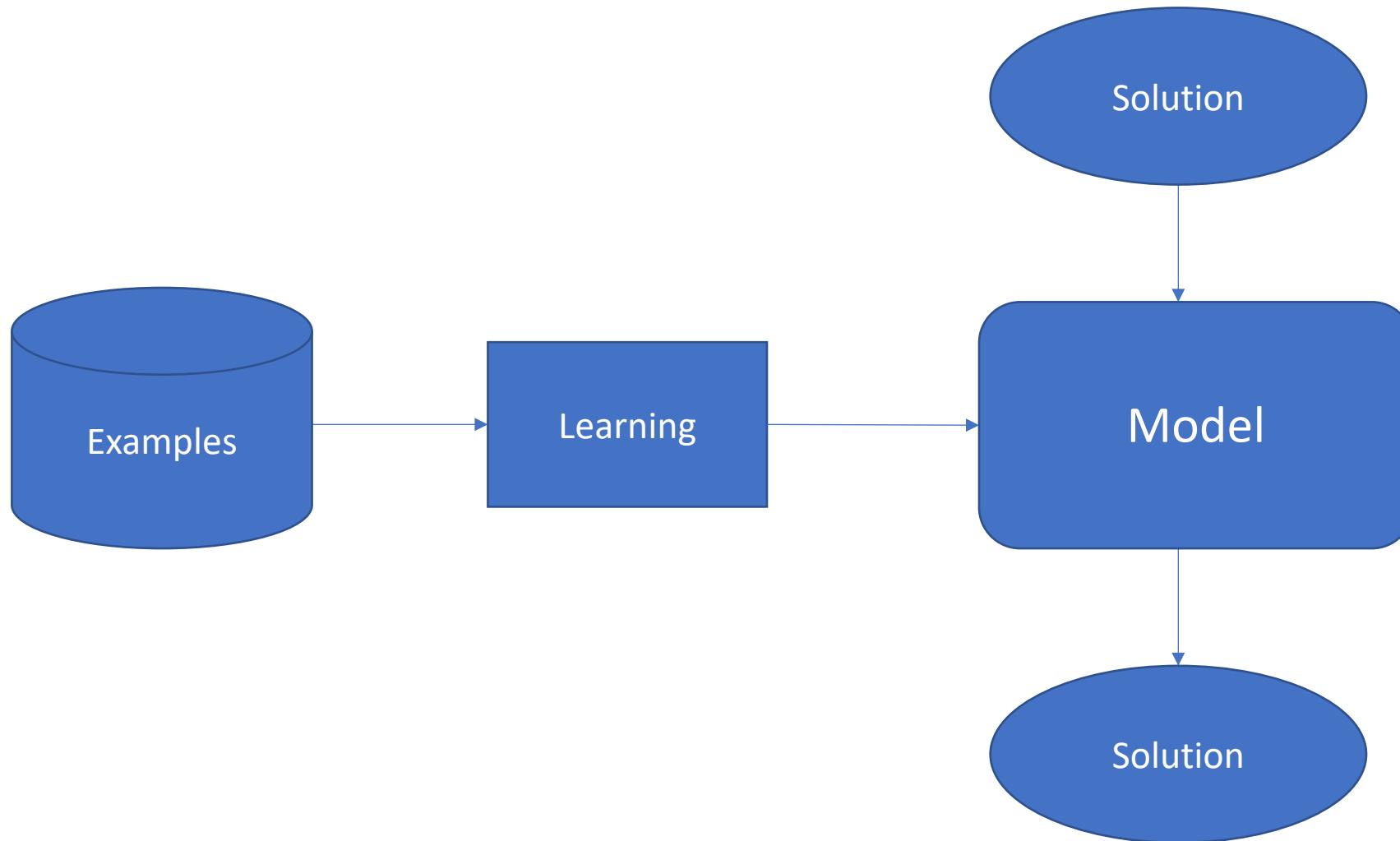
Human



Human



Intelligence for Machine?

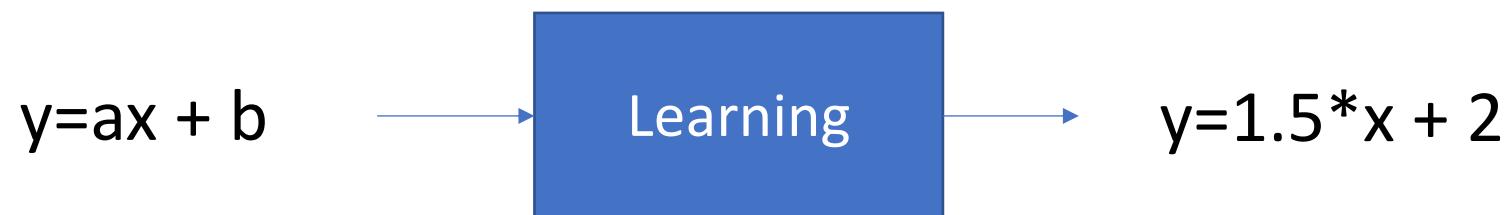


How to understand Model?

- Rule: if ... then
- $y=ax + b$
- $y = ax^2 + bx + c$
- Neural network
- Graph
-

How to understand **Learning**?

=> learn values for model's parameters by inferencing from examples



What is Machine Learning?

What is Machine Learning?

wikipedia

machine learning

Cambridge
dic

noun [U] • COMPUTING • specialized

UK /məˈʃɪn̬ ˈlɜː.nɪŋ/ US /məˈʃɪn̬ ˈlɜː.nɪŋ/



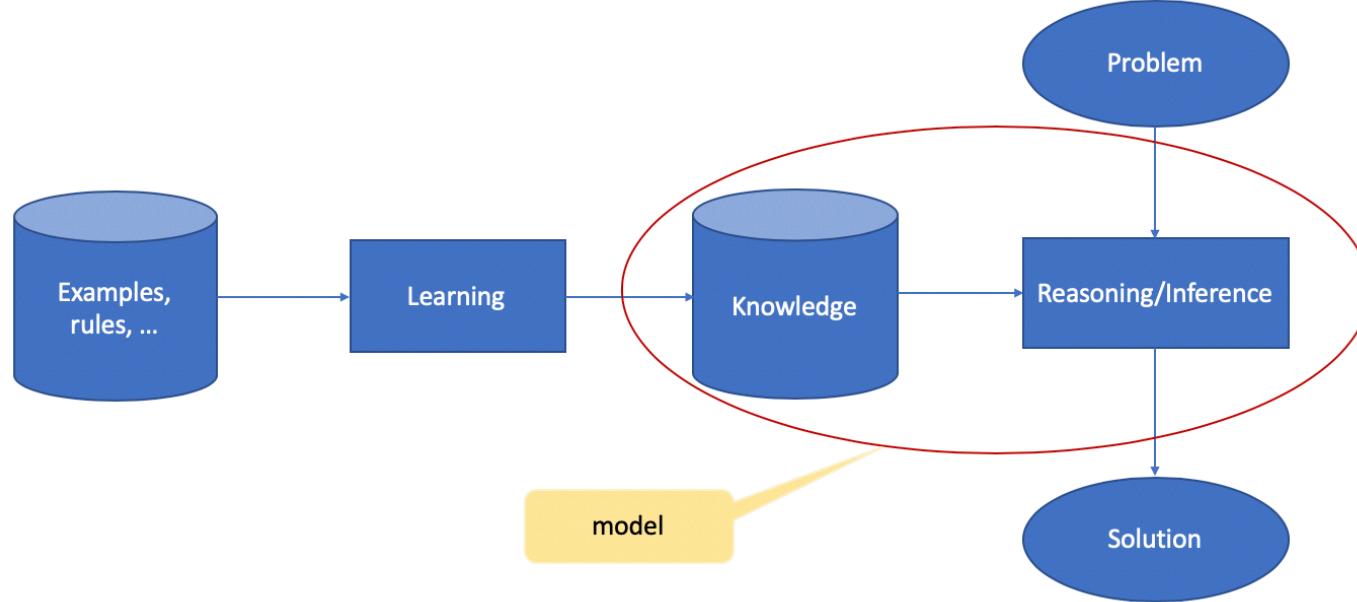
the process of computers changing the way they carry out tasks by learning from new data, without a human being needing to give instructions in the form of a program:

Machine learning is the science of getting computers to act without being explicitly programmed. In the past decade, machine learning has given us self-driving cars, practical speech recognition, effective web search, and a vastly improved understanding of the human genome. Machine learning is so pervasive today that you probably use it dozens of times a day without knowing it. Many researchers also think it is the best way to make progress

Stanford
ML course

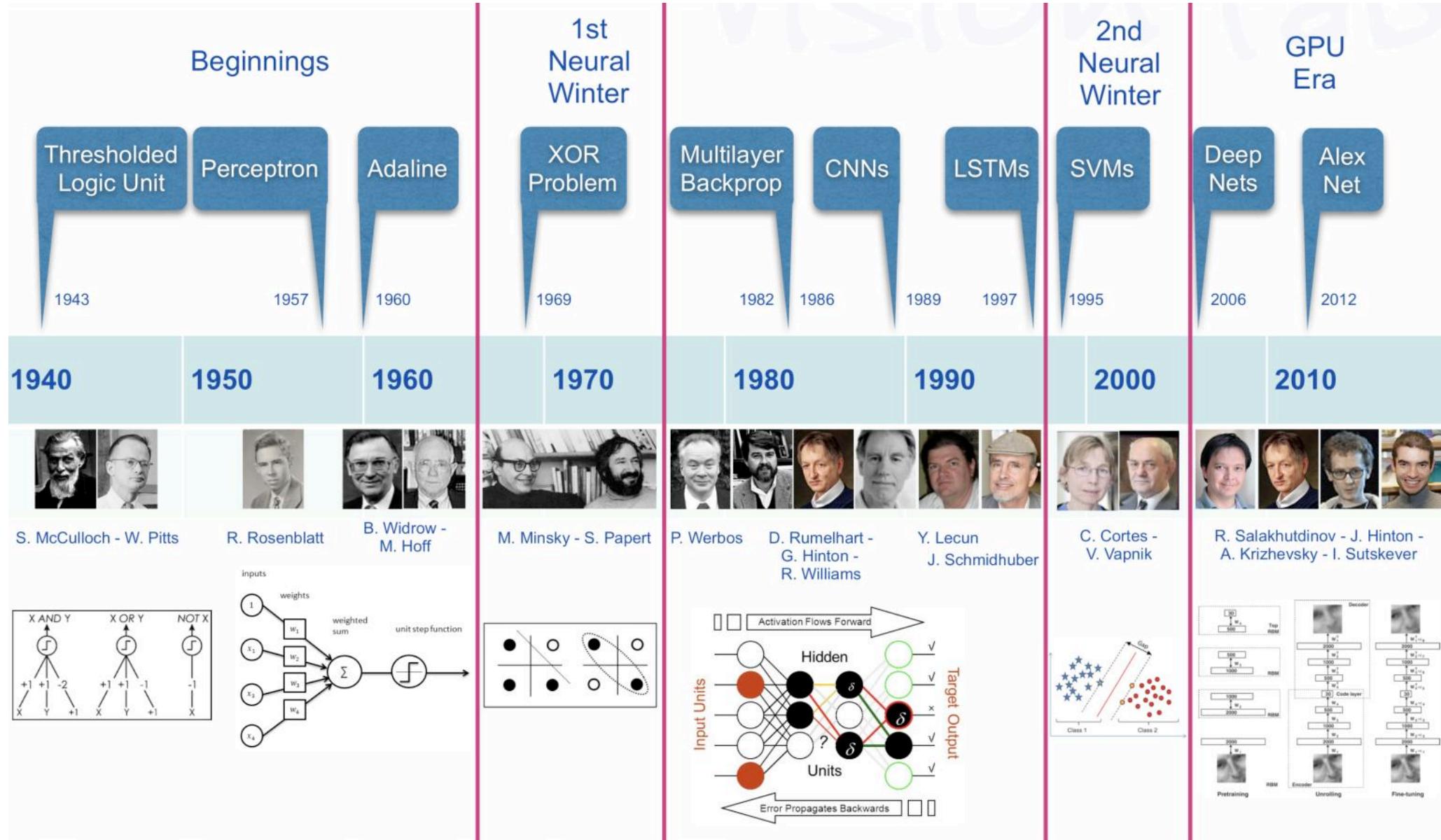
Machine learning (ML) is the [scientific study of algorithms and statistical models](#) that computer systems use to perform a specific task without using explicit instructions, relying on patterns and [inference](#) instead. It is seen as a subset of [artificial intelligence](#). Machine learning algorithms build a [mathematical model](#) based on sample data, known as "[training data](#)", in order to make predictions or decisions without being explicitly programmed to perform the task.^{[1][2]} Machine learning algorithms are used in a wide variety of applications, such as [email filtering](#) and [computer vision](#), where it is difficult or infeasible to develop a conventional algorithm for effectively performing the task.

What is Machine Learning?

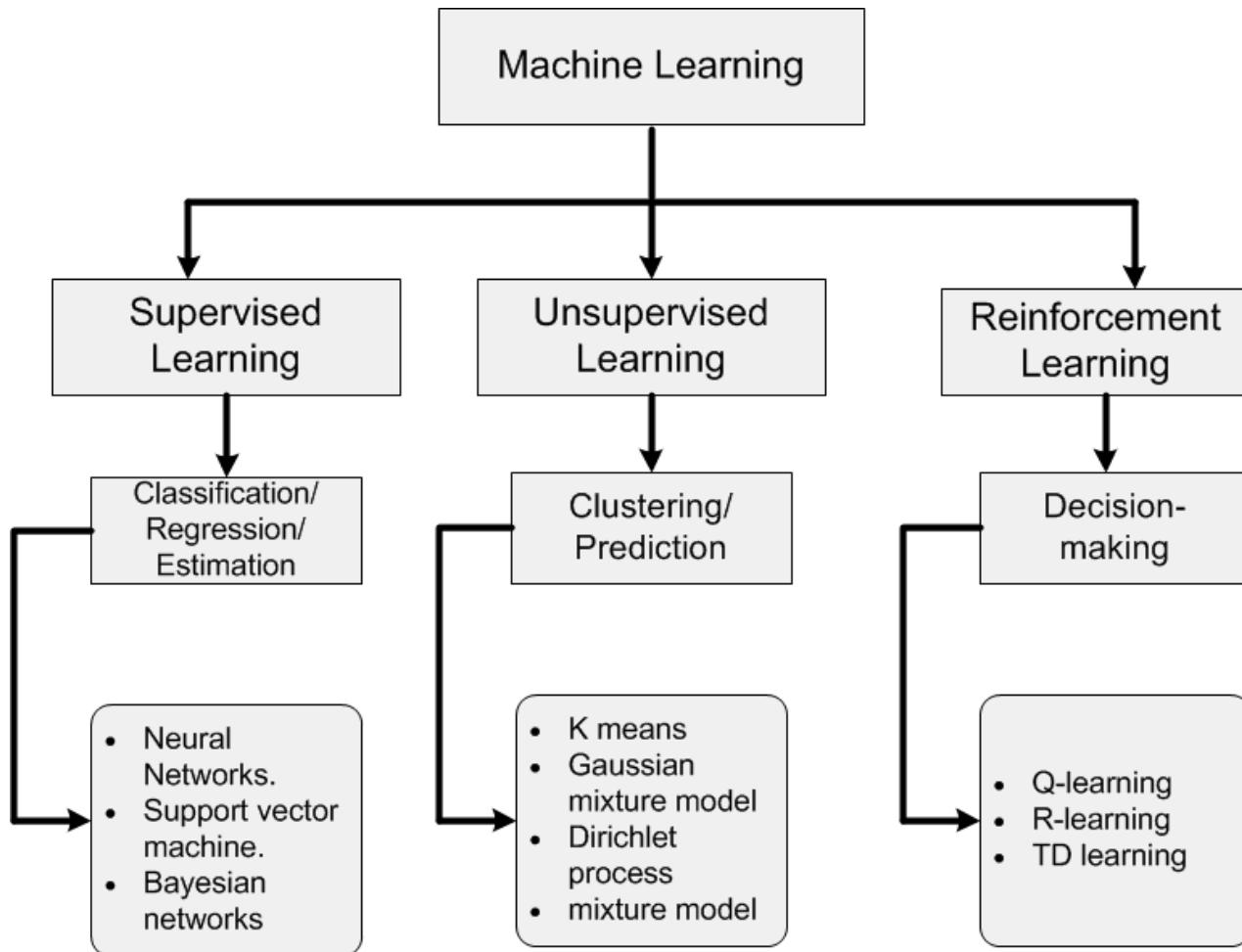


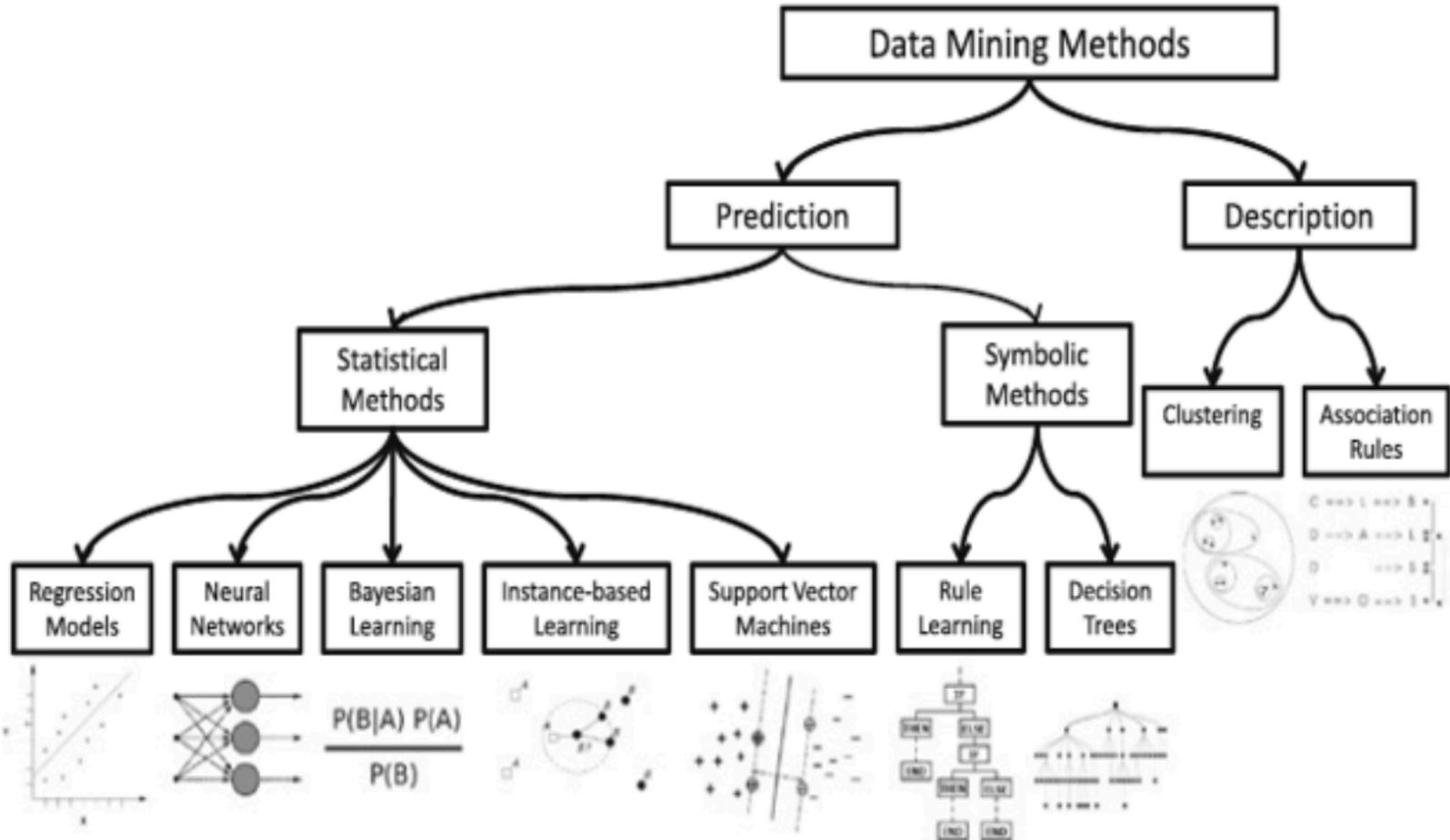
- Study on model creation and generation for computer based recognition, prediction and generation problems.

History of ML



Types of Machine Learning



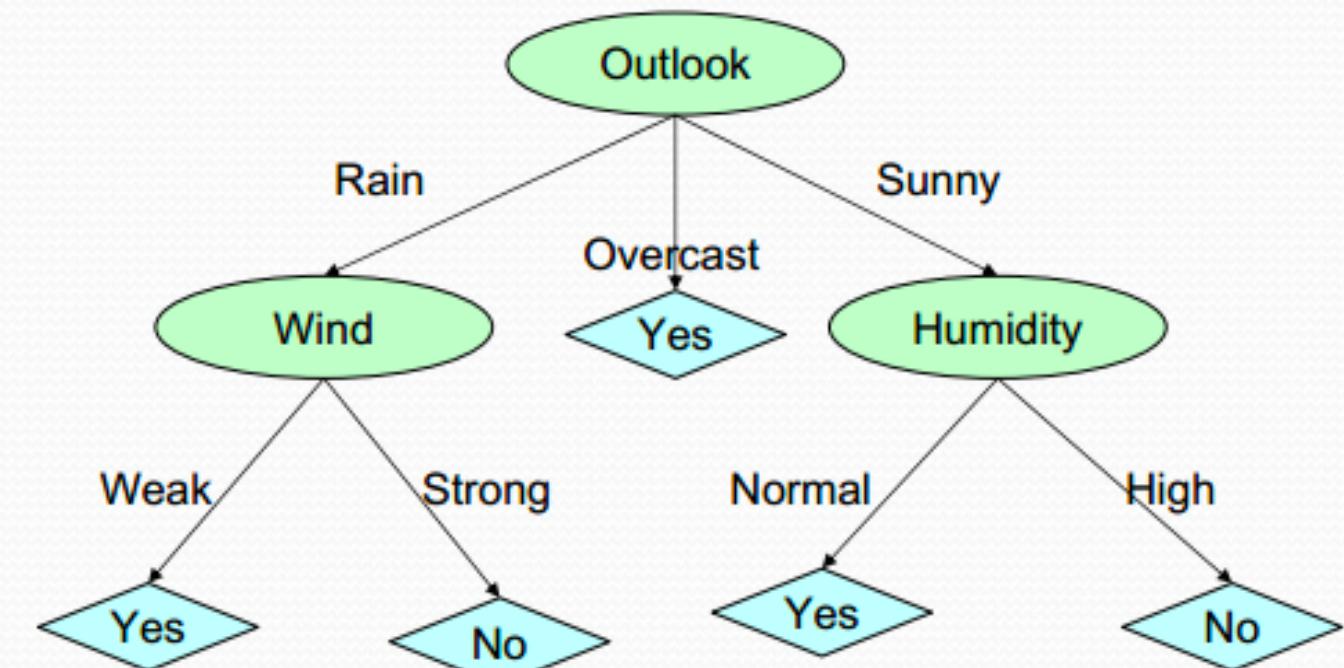


Examples of machine learning models

- Decision Tree
- Naïve Bayesian Classifier

Decision Tree

Outlook	Tempreature	Humidity	W indy	Class
sunny	hot	high	false	N
sunny	hot	high	true	N
overcast	hot	high	false	P
rain	mild	high	false	P
rain	cool	normal	false	P
rain	cool	normal	true	N
overcast	cool	normal	true	P
sunny	mild	high	false	N
sunny	cool	normal	false	P
rain	mild	normal	false	P
sunny	mild	normal	true	P
overcast	mild	high	true	P
overcast	hot	normal	false	P
rain	mild	high	true	N



new instance $X = \langle \text{sunny}, \text{mild}, \text{high}, \text{true} \rangle$.

Naïve Bayesian Classifier

- Homework



Summary

- Role of machine learning and artificial intelligence.
- A general model of AI systems.
- Concepts: knowledge, reasoning, inference, model, learning.
- Definition of machine learning.
- Understanding ML concepts through examples.