

# Lecture 1

# Overview of Artificial Intelligence and Machine Learning

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2020

# Outline

1. What are AI systems?
2. A general paradigm for AI systems
3. Examples of ML models
4. The tasks of Machine Learning
5. History of ML

# What are AI Systems?

- Why AI?
- Domains of AI Applications

# Why AI? Like human?

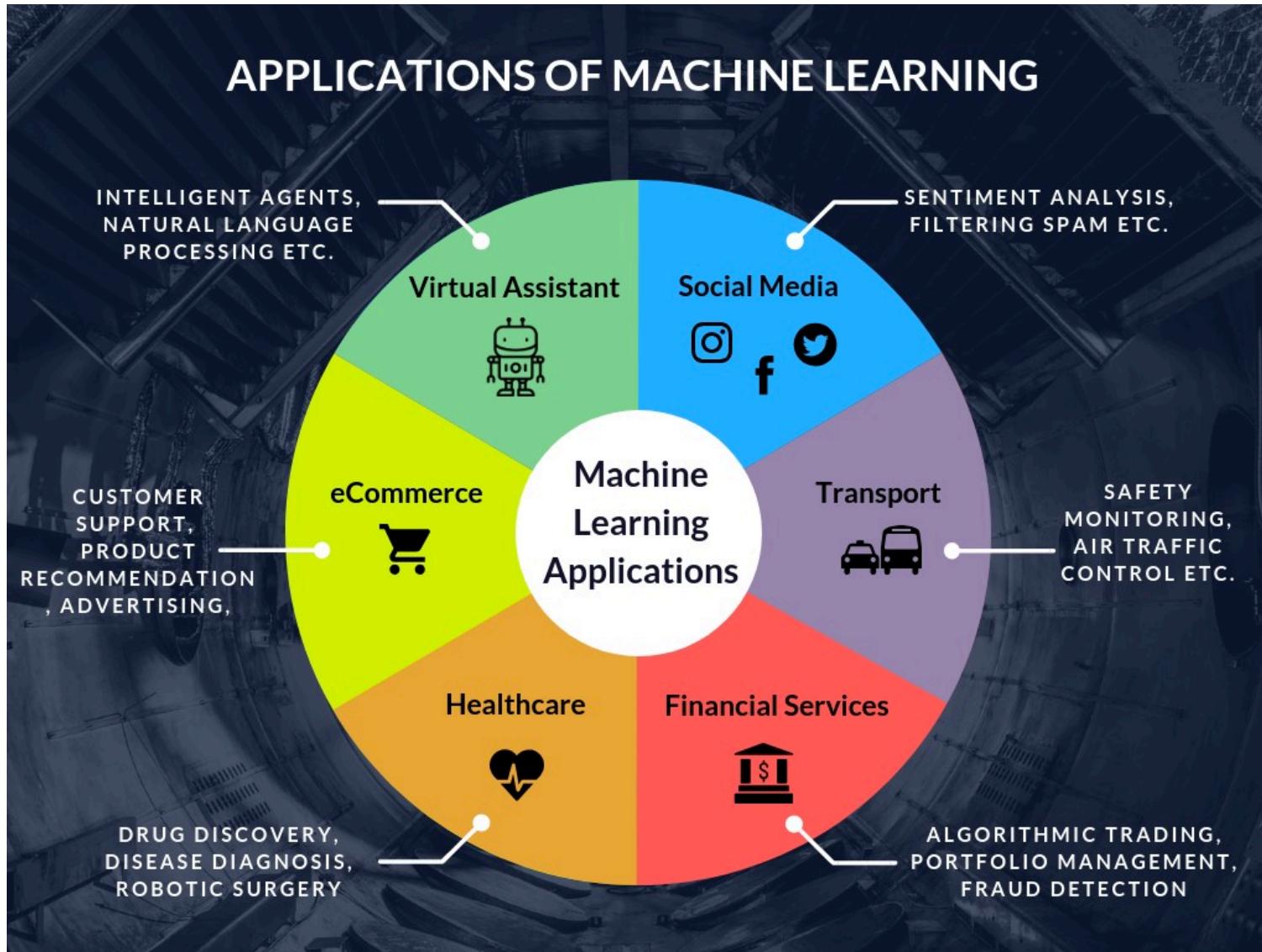
- AI is as capable as an expert
- AI acts as smart as humans
- AI solves difficult and complex problems
- AI offers optimal solutions to problems

# Why AI?

## AI capabilities

- AI adds intelligence to existing products.
- AI achieves incredible accuracy
- AI analyzes more and deeper data

[https://www.sas.com/en\\_us/insights/analytics/what-is-artificial-intelligence.html](https://www.sas.com/en_us/insights/analytics/what-is-artificial-intelligence.html)



# Domains of applying AI

- Retail
  - AI provides virtual shopping capabilities that offer personalized recommendations and discuss purchase options with the consumer.
- Banking
  - Artificial Intelligence enhances the speed, precision and effectiveness of human efforts. In financial institutions, AI techniques can be used to identify which transactions are likely to be fraudulent, adopt fast and accurate credit scoring, as well as automate manually intense data management tasks.
- Games
  - AI in games is about planning. The artificial agent must decide on the next best action(s) to perform depending on the state of the game.

# Domains of applying AI

- Transportation
  - autonomous cars; navigation system; monitoring traffic lights;
- Logistics and Warehouse Management
  - Logistics and warehouses management are two very complex problems. They depends on many parameters difficult to model, some of them even time-dependent.
- Machine Translation
- Virtual Assistant
- Computer Vision
- Healthcare
- ...

# Japan's New "Society 5.0" Commercial

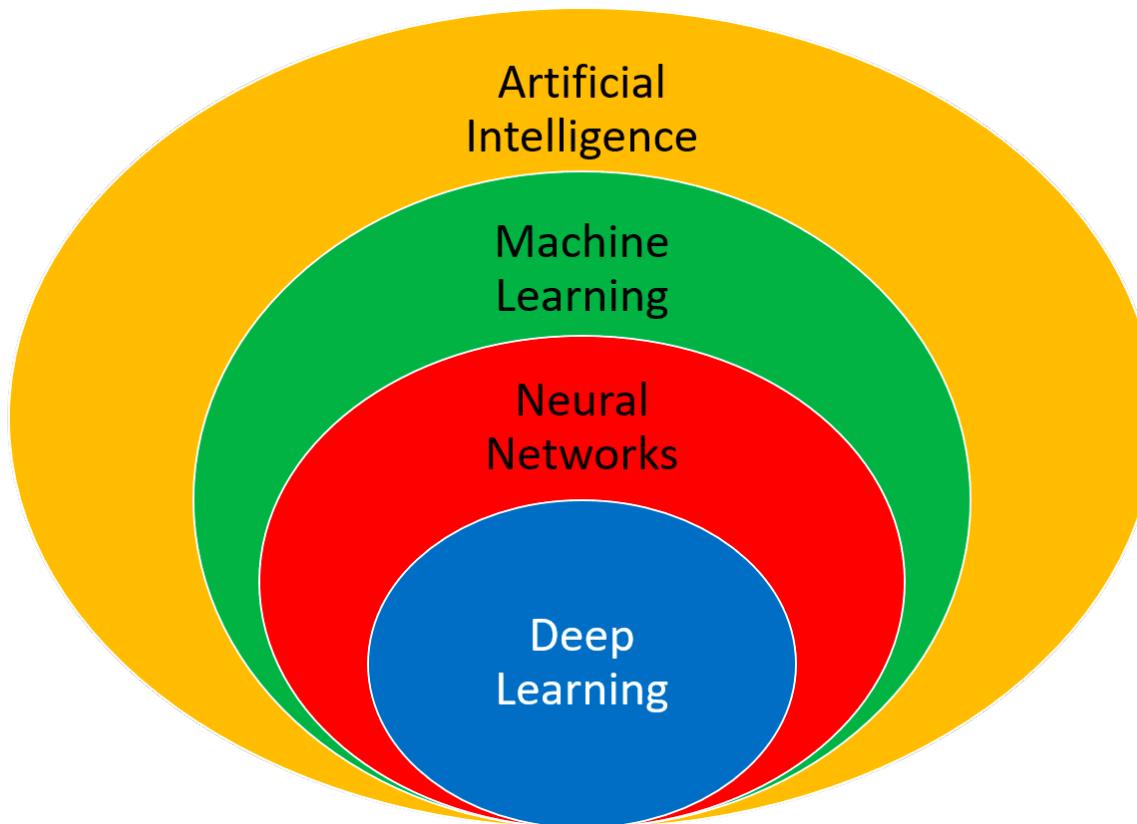


それは、  
いつもの毎日にやってくる、  
半歩先の未来。

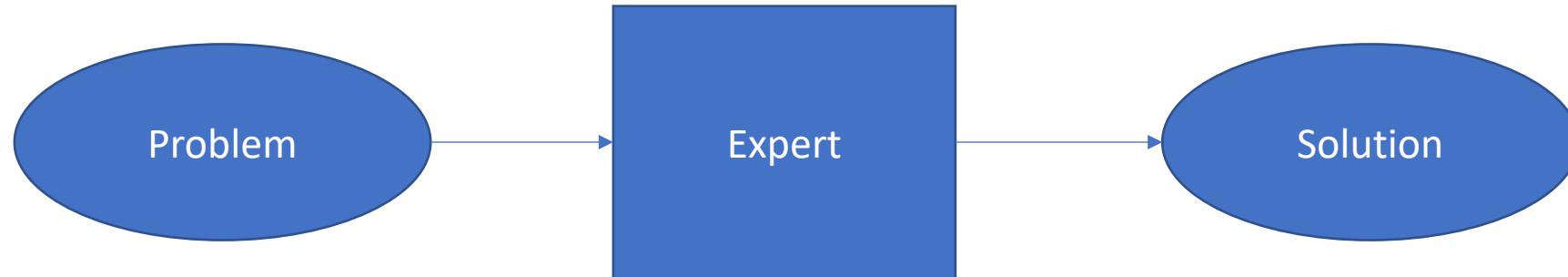
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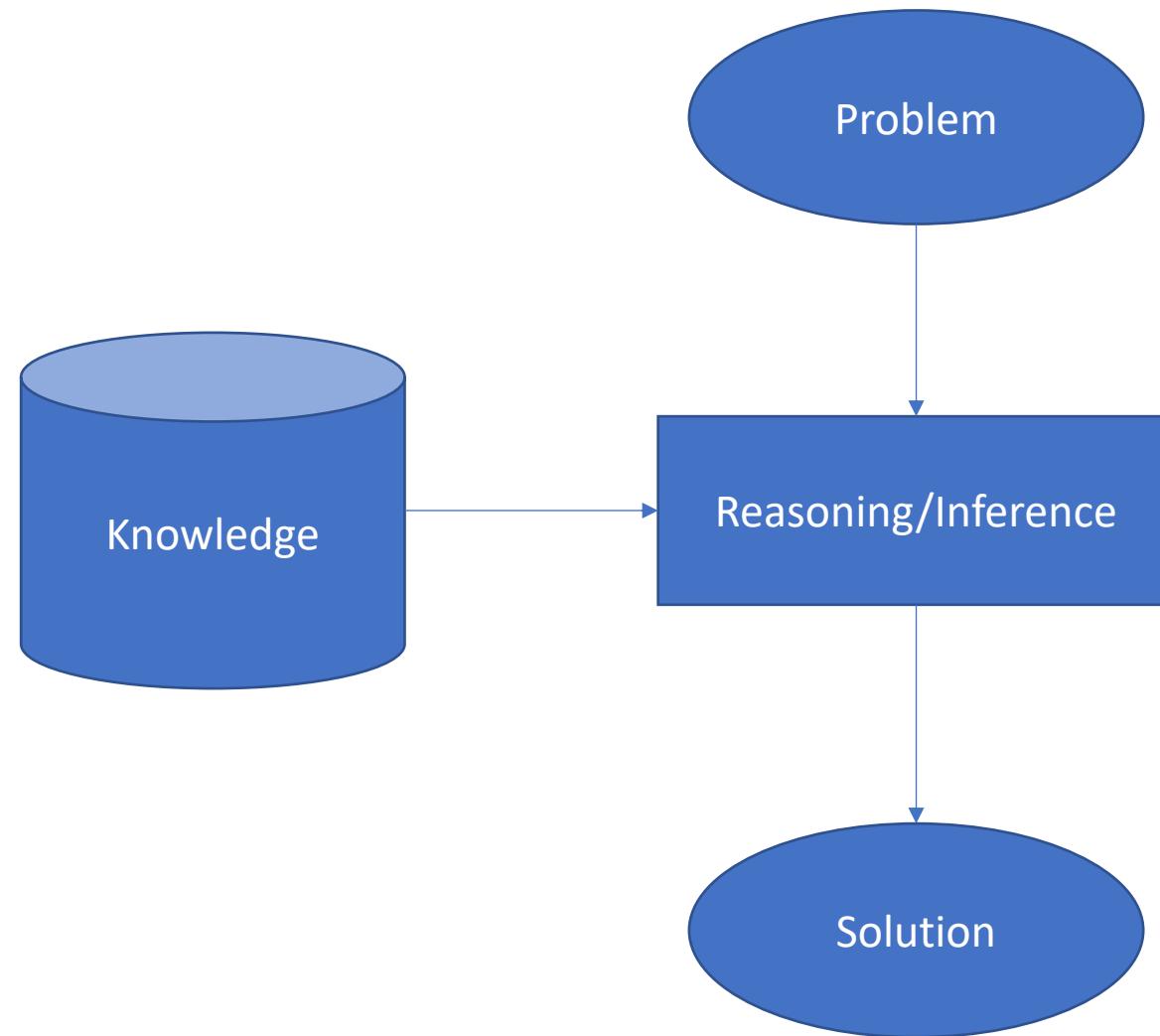
# AI, Machine Learning, and Deep Learning



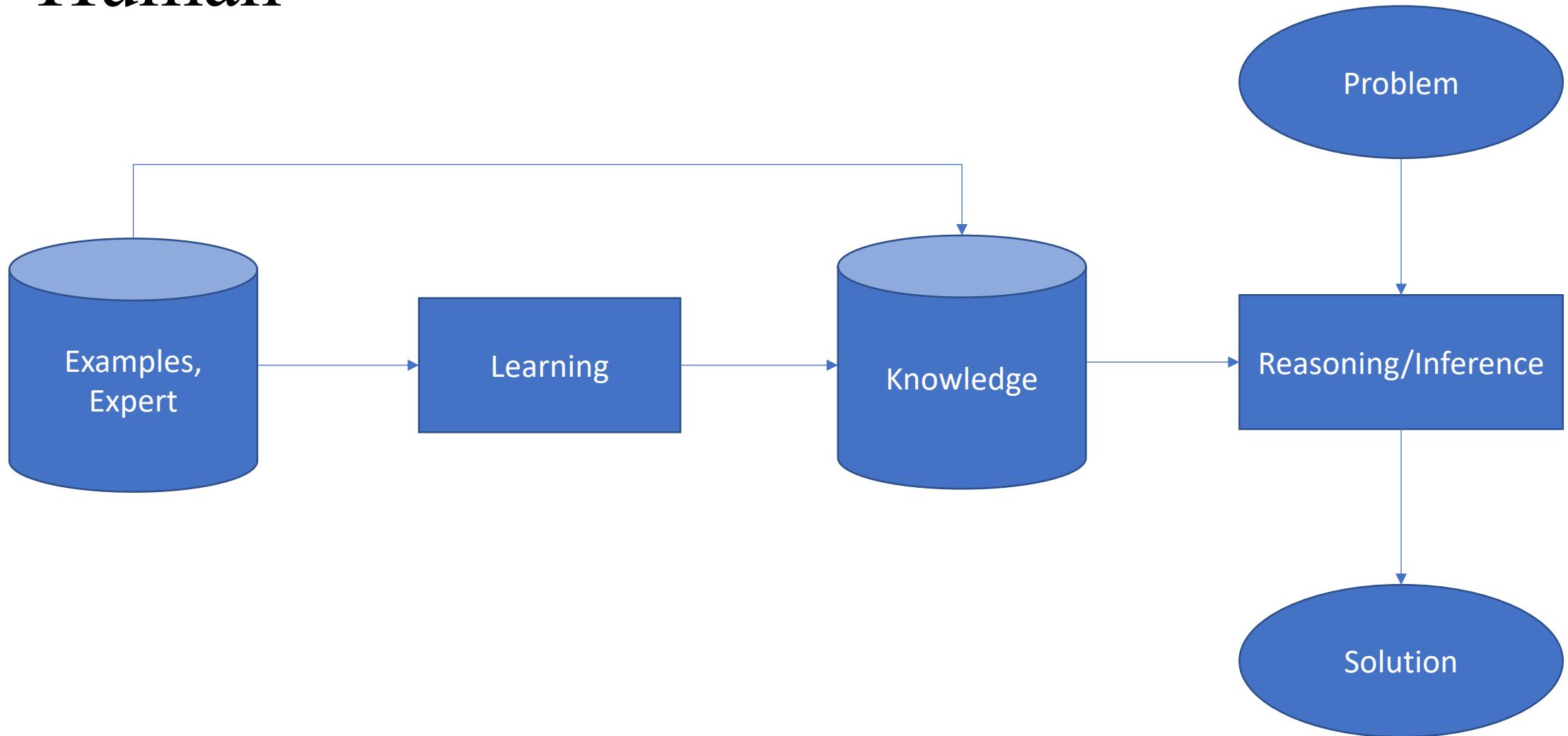
# How does a person solve problems?



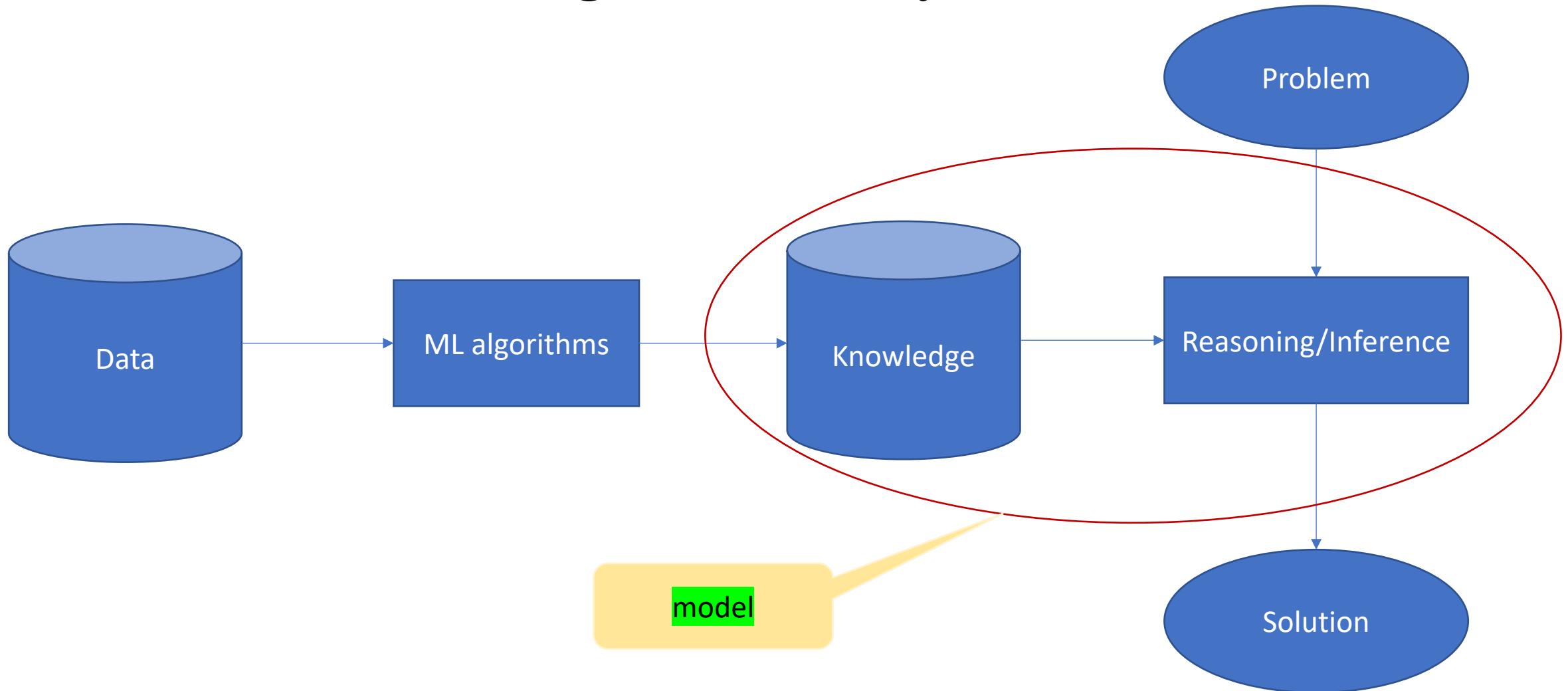
# Human



# Human



# A General Paradigm of AI Systems



# What are ML components in AI systems?

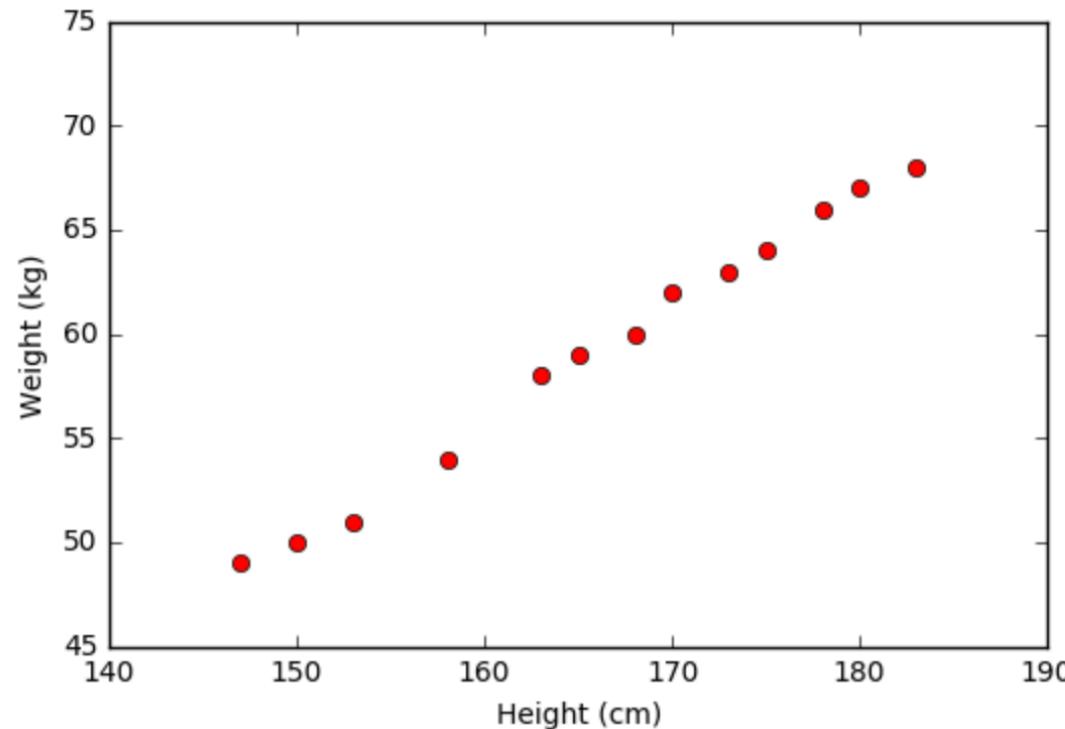
- Model
- Learning algorithms/methods

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# ML model: example 1

Chiều cao (cm)	Cân nặng (kg)	Chiều cao (cm)	Cân nặng (kg)
147	49	168	60
150	50	170	72
153	51	173	63
155	52	175	64
158	54	178	66
160	56	180	67
163	58	183	68
165	59		



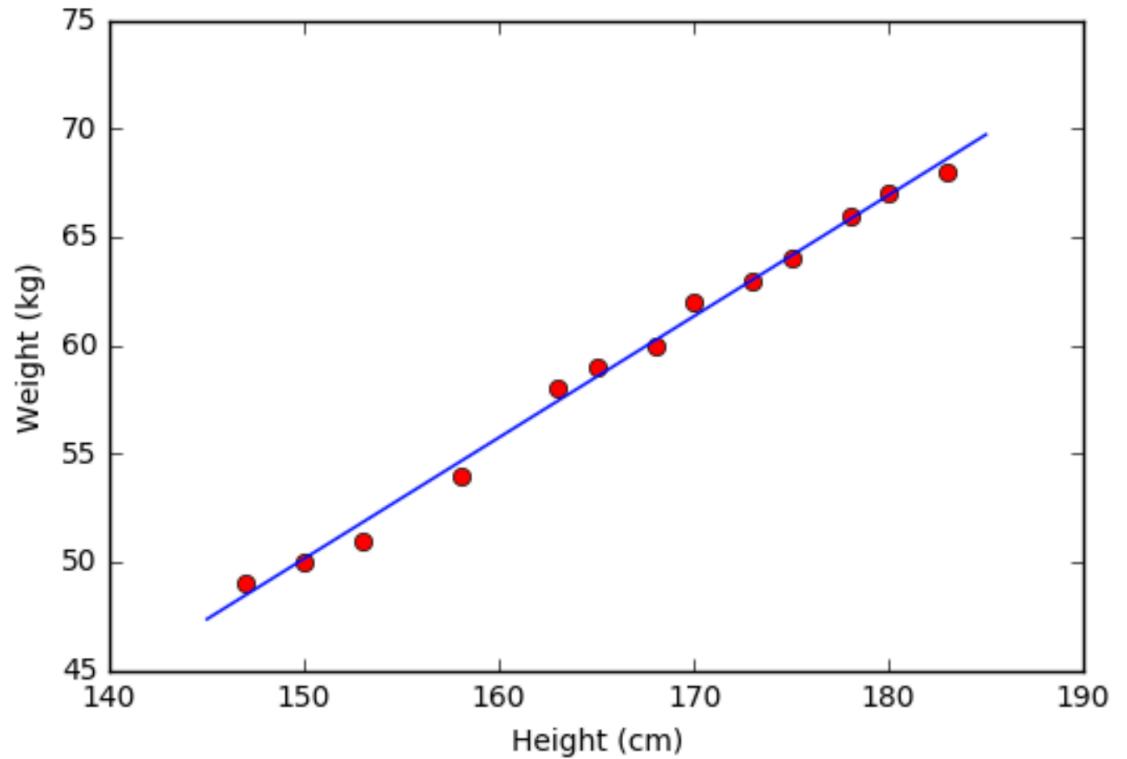
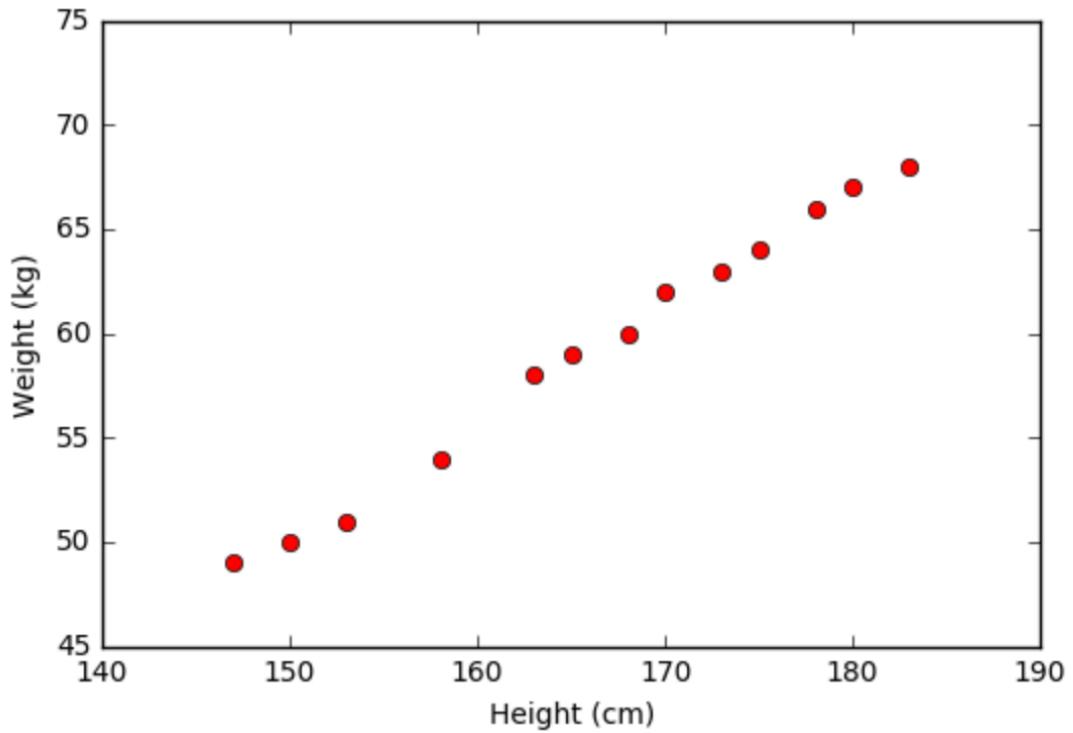
$$(\text{cân nặng}) = w_1 * (\text{chiều cao}) + w_0$$

$$y = ax + b$$

$$(\text{cân nặng}) = w_1 * (\text{chiều cao}) + w_0$$

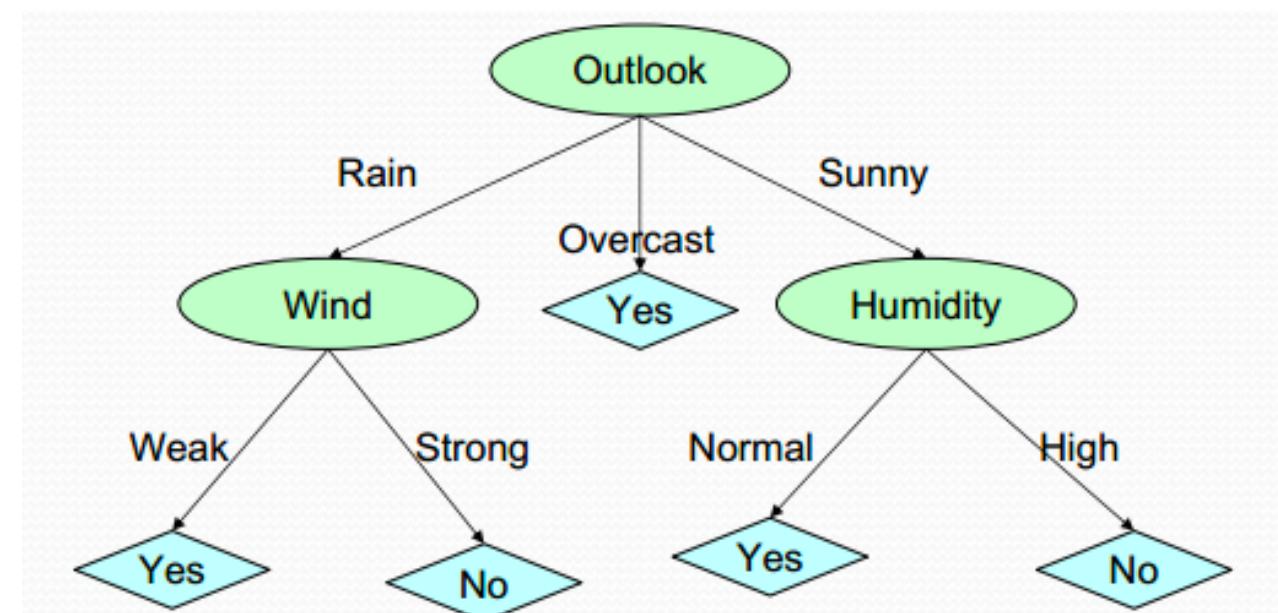
$$w = [[-33.73541021], [0.55920496]]$$

$$y = ax + b$$

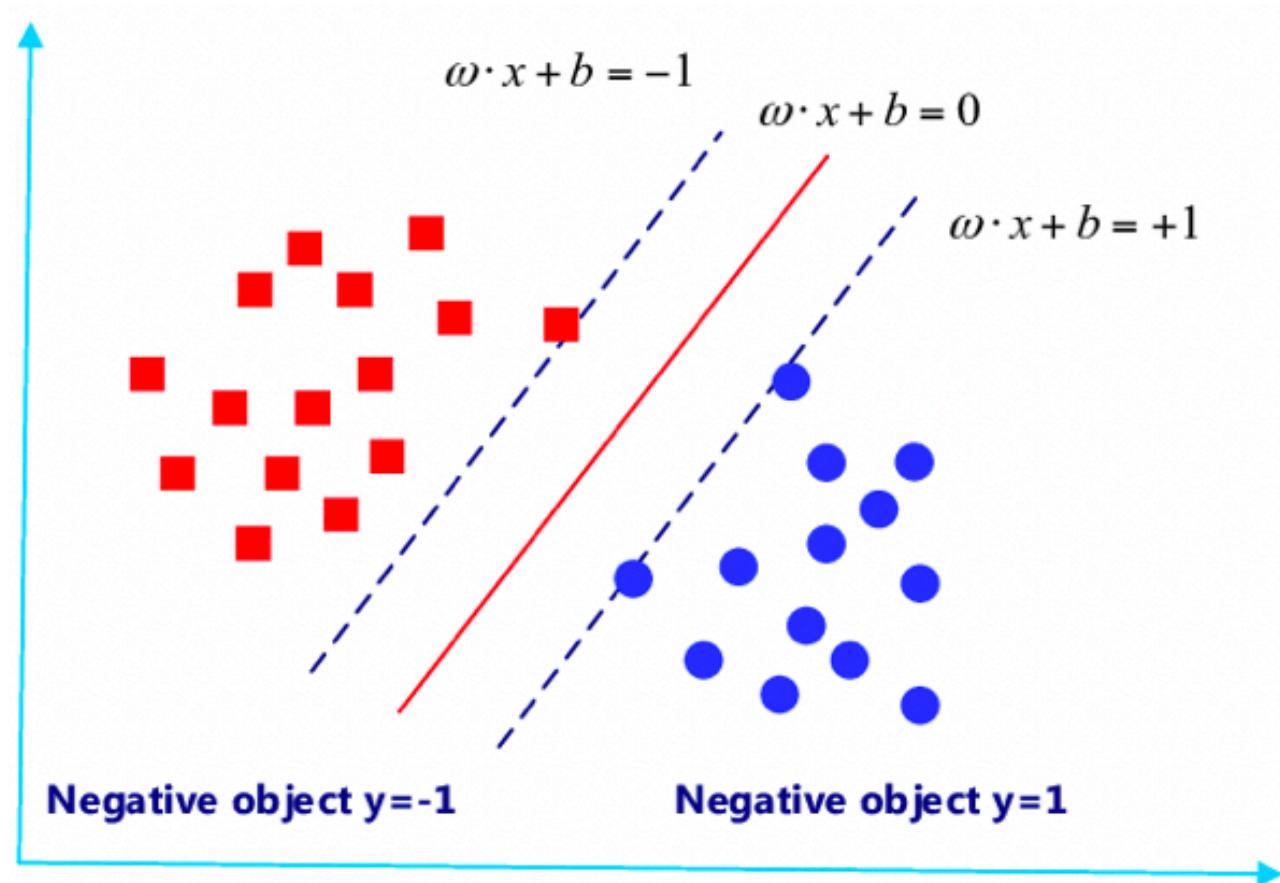


## ML model: example 2

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

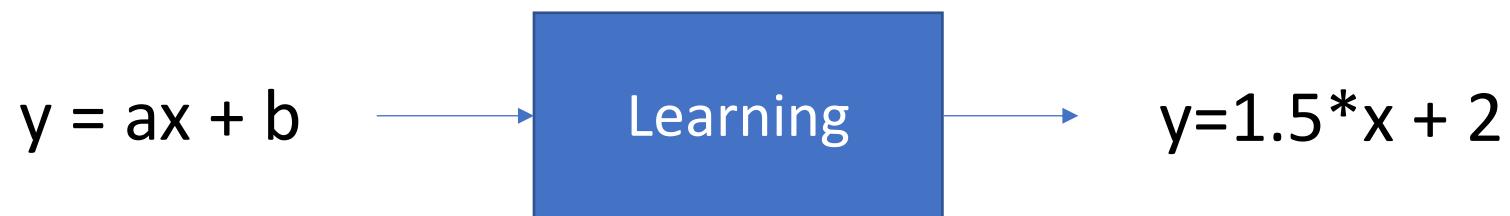


## ML model: example 3



# How to understand **Learning**?

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



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# What should be learnt in Machine Learning?

- Understanding existed models
  - Architecture, Structure, or form of the models
  - Computation, inference/reasoning
- Understanding existed model templates
  - For building specific models
- Learning methods for the models
  - Determining model's paramters
- Model evaluation
- ML problems: overfitting, spare data, regularization, normalization

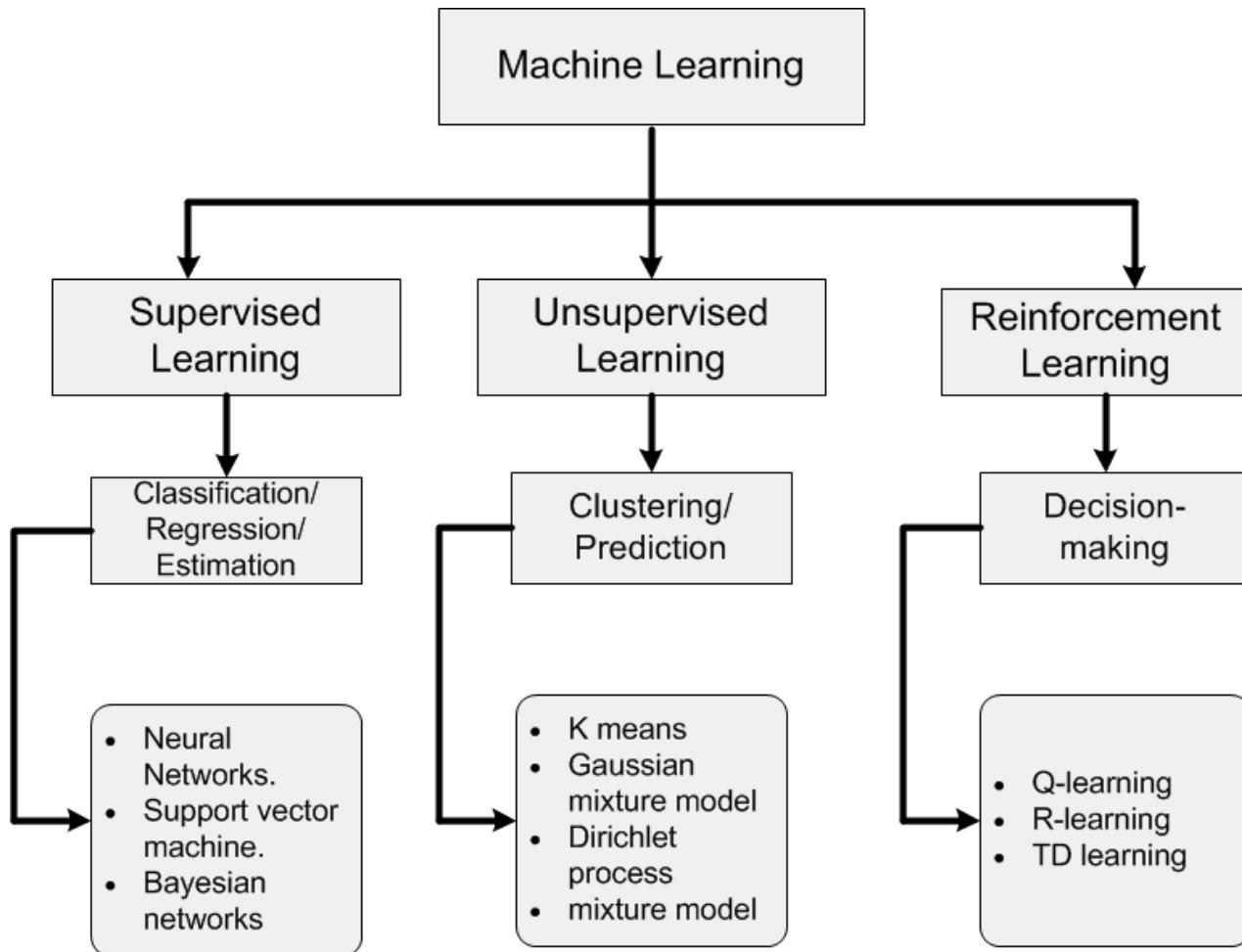
# The Task of Machine Learning

- Developing efficient models
- Learning with big data
- Learning with high dimension data
- Developing efficient learning methods
- Related tasks:
  - Feature extraction, feature selection
  - Data representation
  - Dimensional reduction of data
  - Missing data
  - Mixed data (multiple types of data)

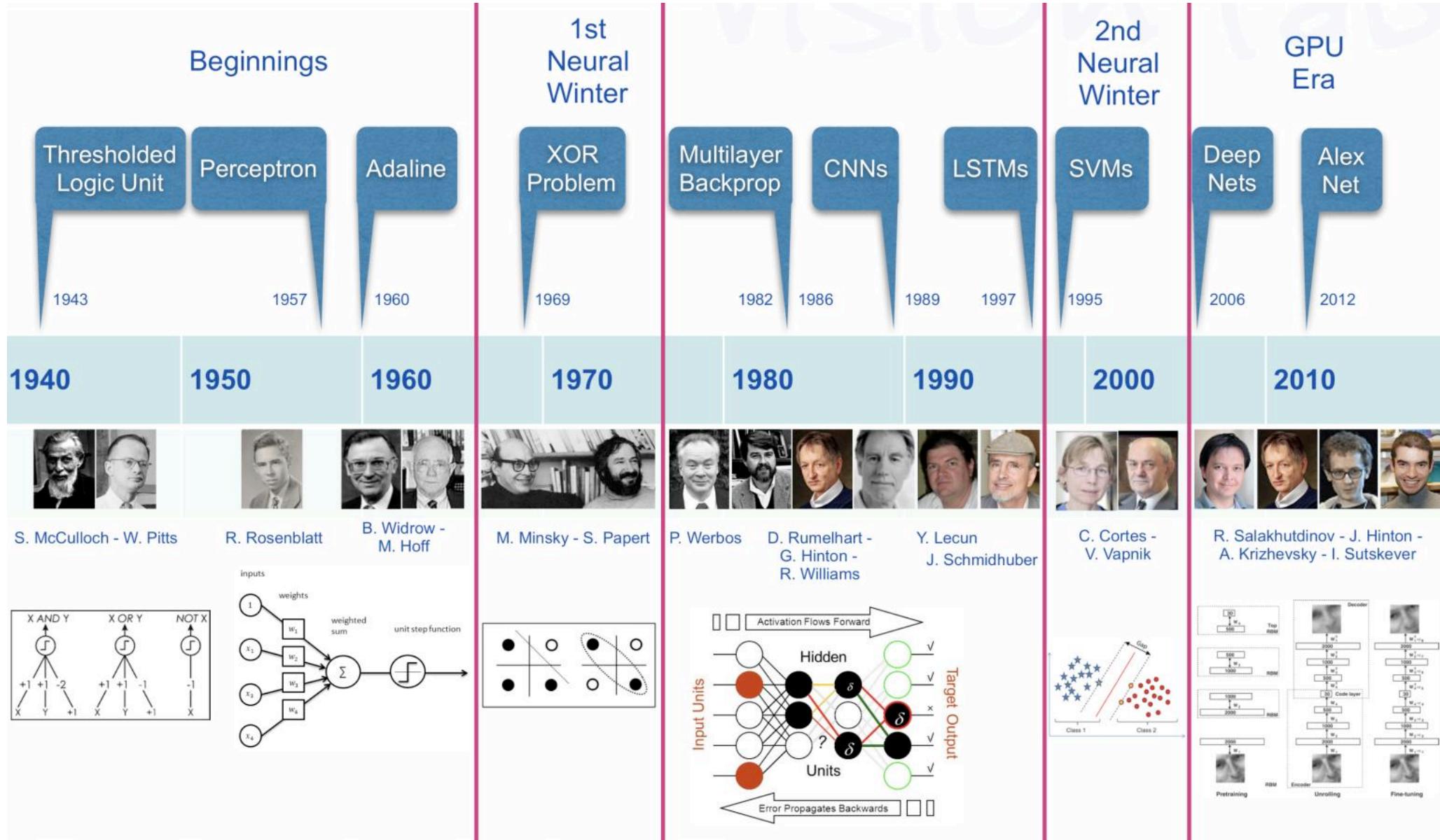
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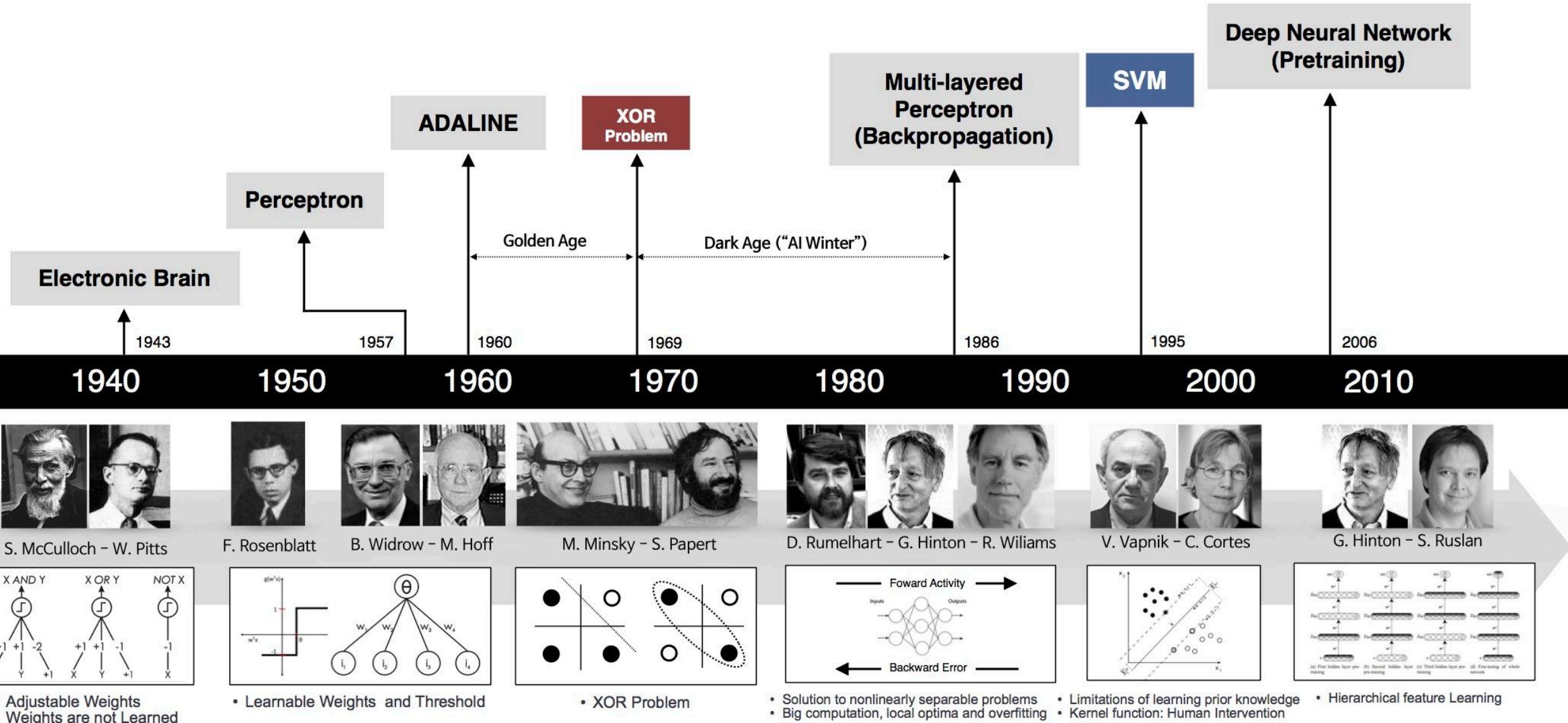
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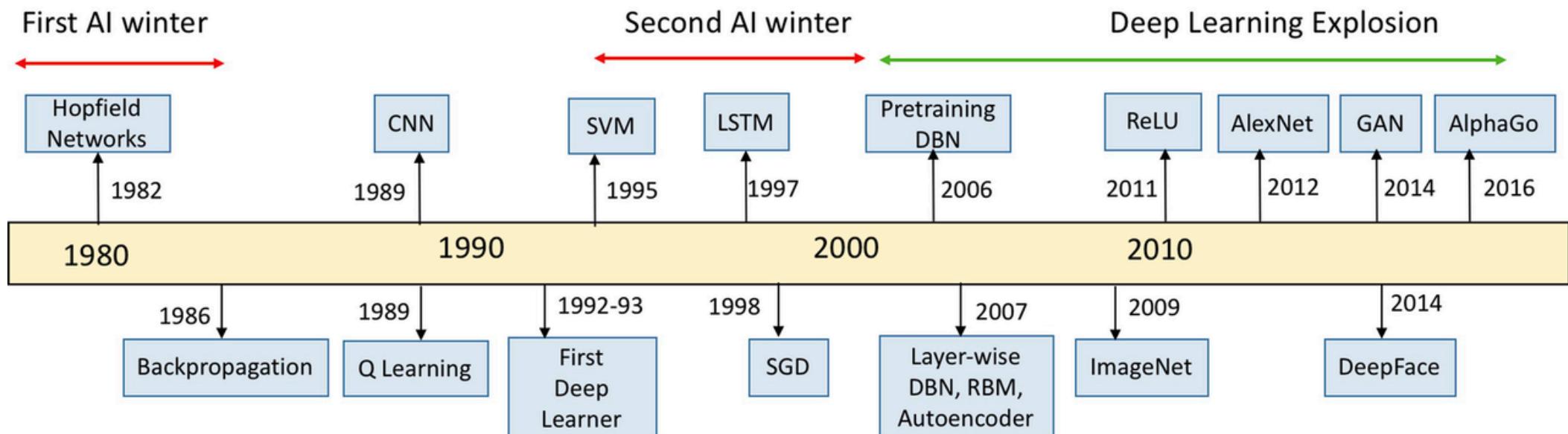
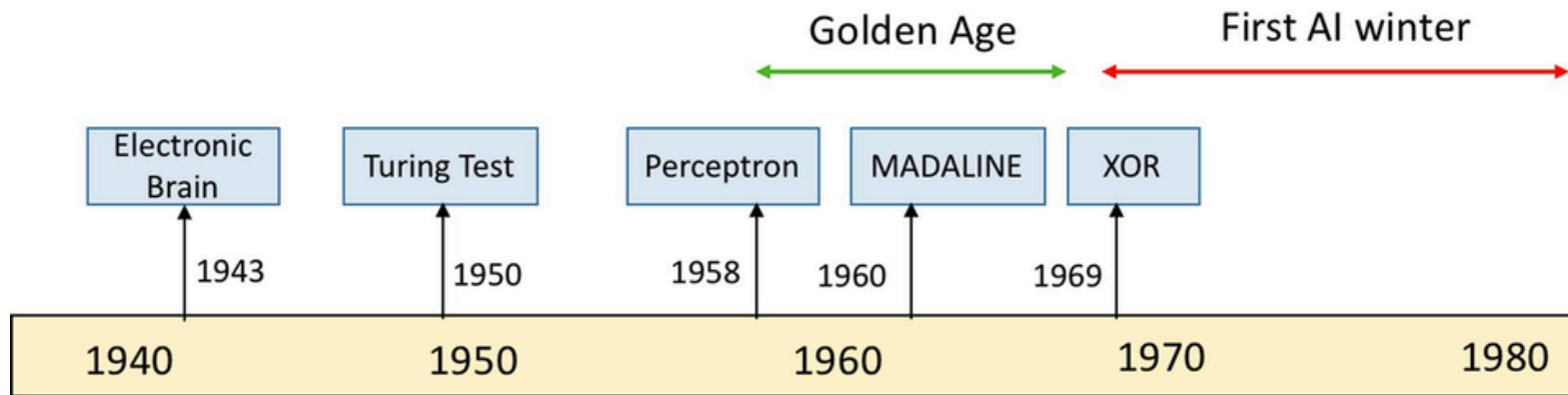
# Types of Machine Learning



# History of ML







# Summary

- AI and AI applications
- A general paradigm of AI systems
- ML role and its components
- Tasks in ML
- ML types
- History of ML/AI development