

# Practice of AI

## C1: Overview

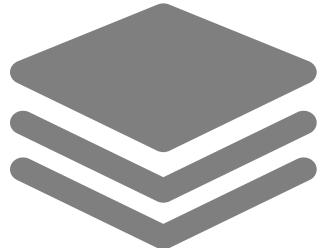
谢文伟 (Jim Xie)

2020/3/6



# Preface

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Why AI ?



Generic research



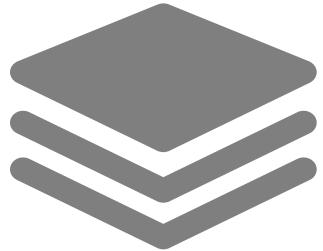
Dedicated AI model



AI applications

# Outline

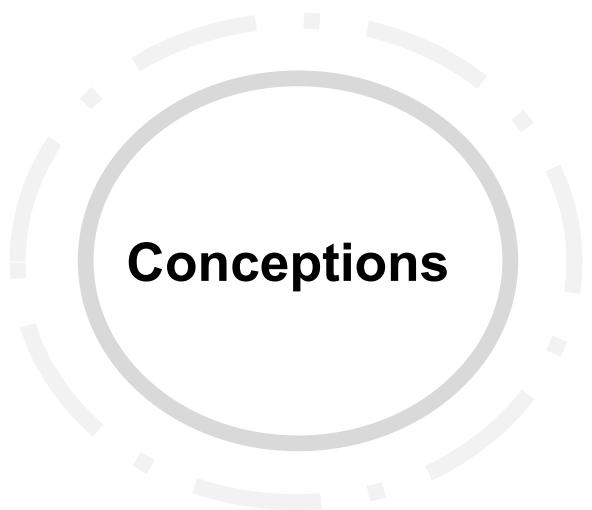
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1. Goal
2. AI terms & pipeline
3. Demo #1
4. Milestones of AI technology
5. First model
6. Demo #2
7. Resource & tools

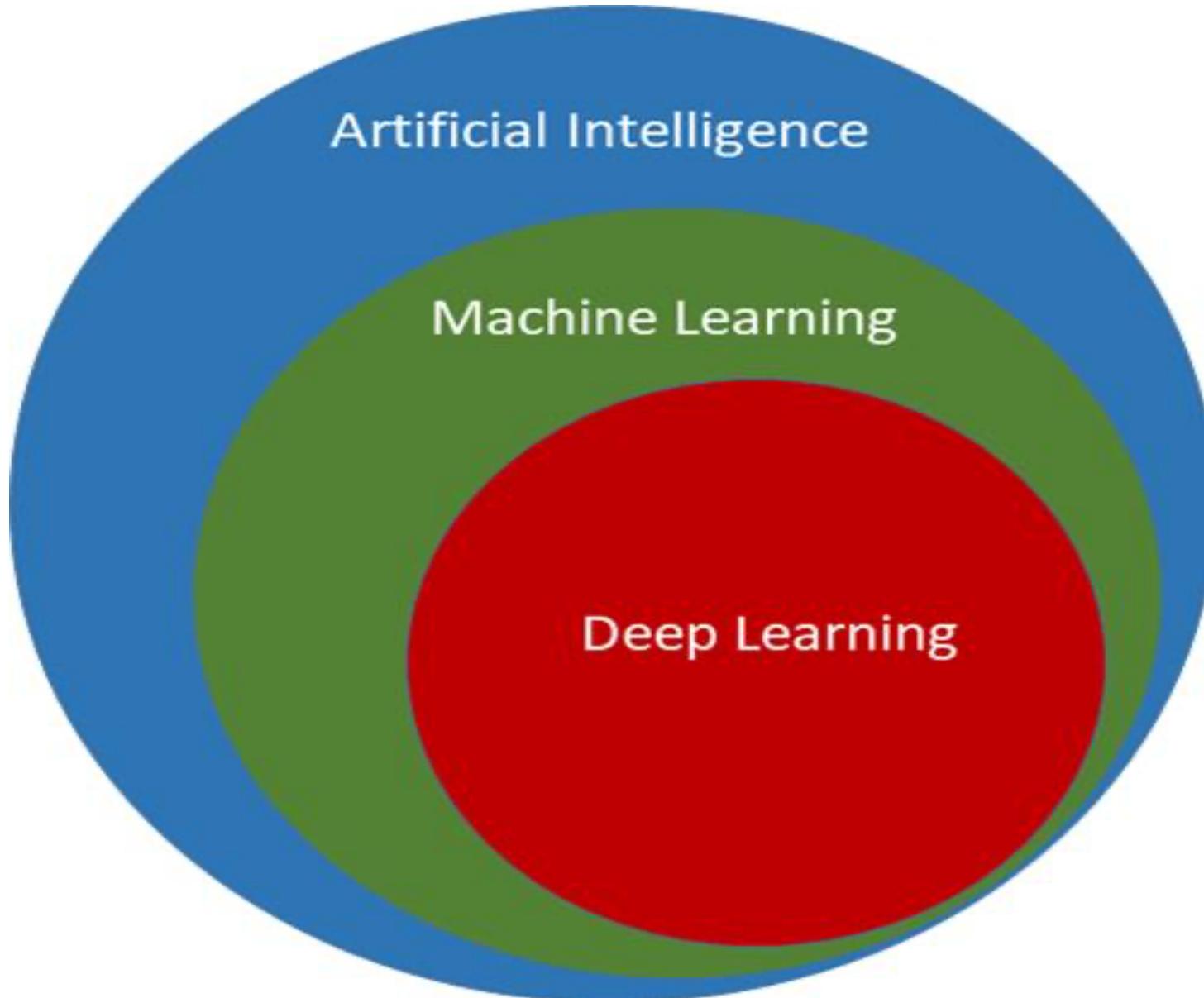
# Goal

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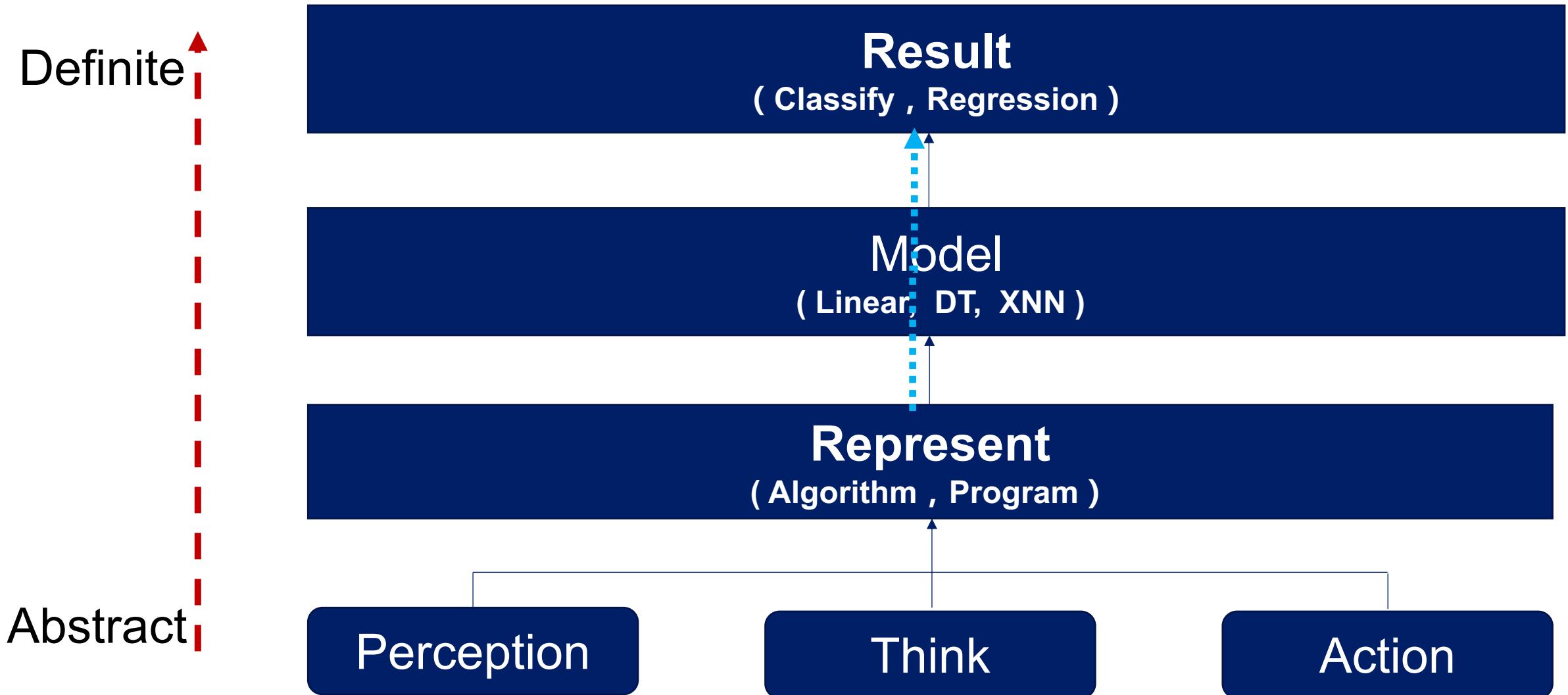
# AI/ML/DL

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# Concepts

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## Demo #1

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Computer learns how to do math calculations

## Demo #1

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Sample

$Y = F(x_1, x_2)$

x1	x2	y
18	63	40.5
8	87	47.5
38	95	66.5
48	44	46.0
67	4	35.5
90	76	83.0
19	21	20.0
67	25	46.0
38	63	50.5
55	10	32.5
77	11	44.0
56	60	58.0
92	89	90.5
50	95	72.5
53	9	31.0

## Demo #1:

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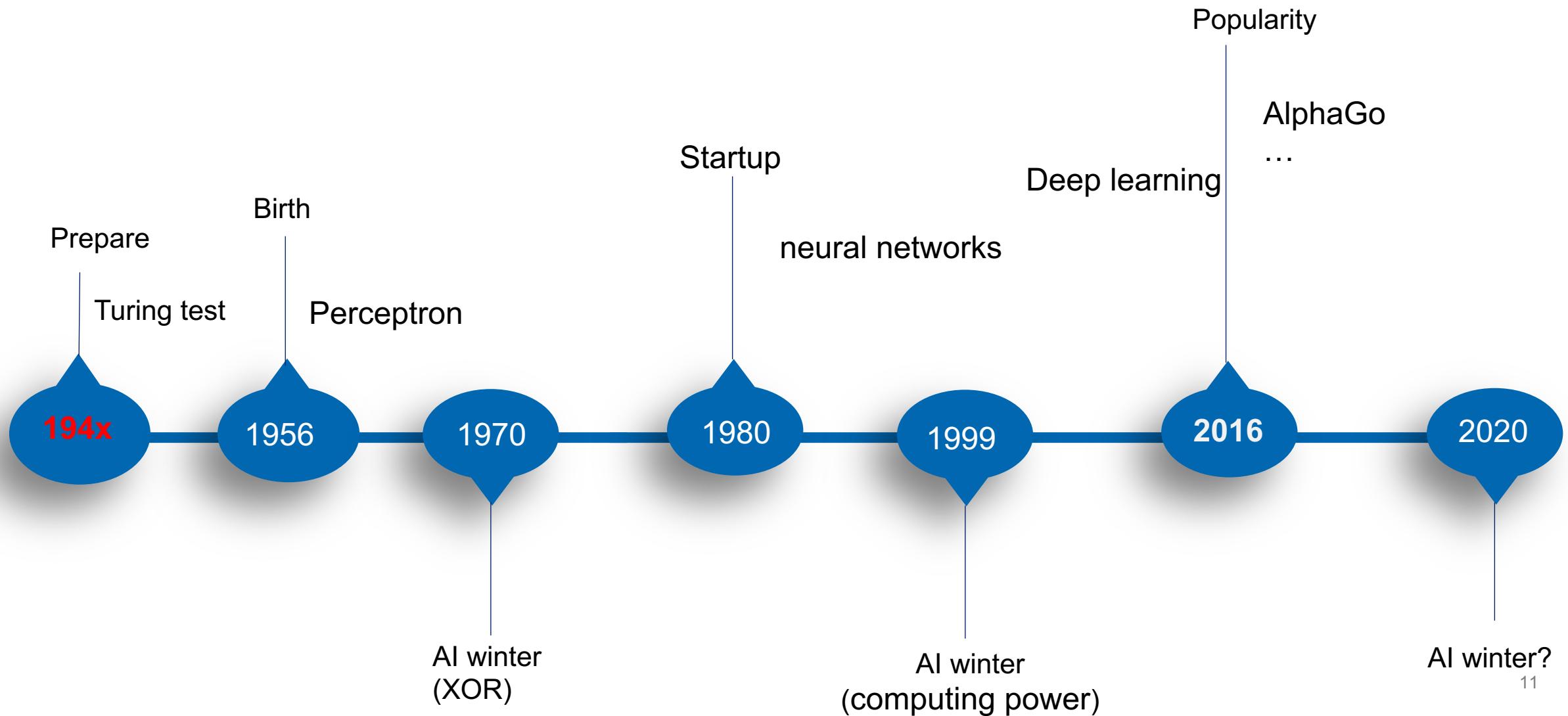
demo

## Learn from Demo #1

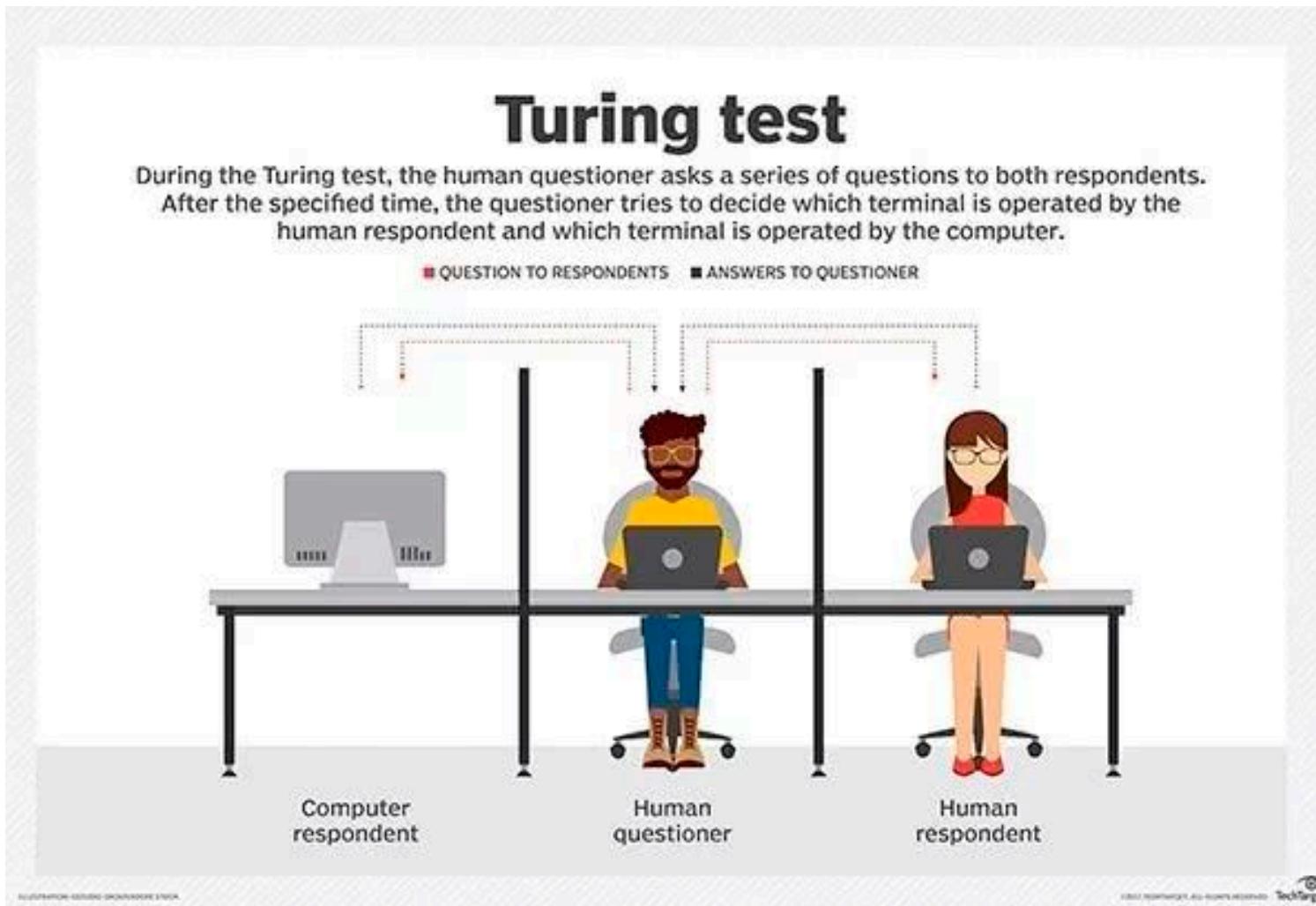
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- ✓ Execute command **VS** Learn from samples
- ✓ Full accurate **VS** ERRORs tolerance;
- ✓ Adjusting base on minimize ERRORs

# Time machine



# Turing test



Loebner Prize (1991,2008)

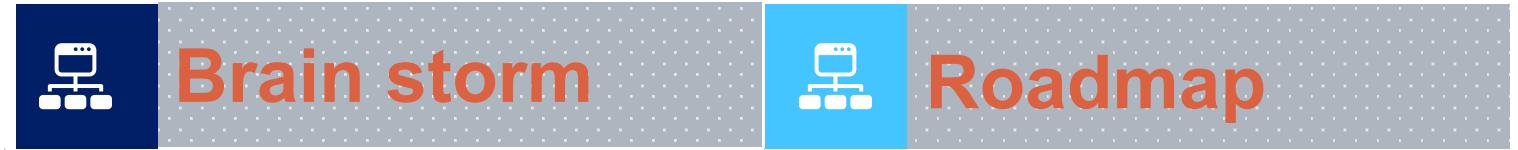
Searle Chinese room (1980)

# Prepare

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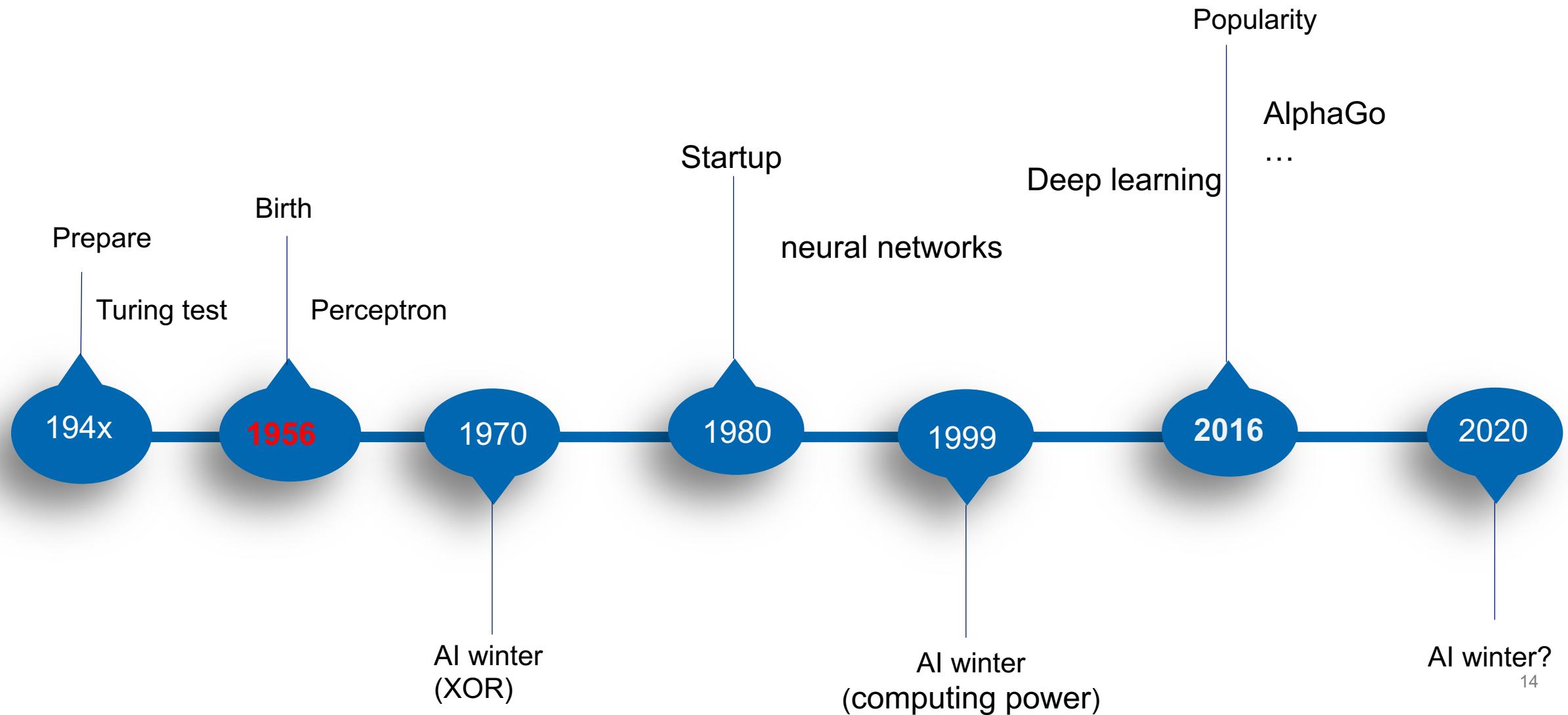
/01

1940~~1956



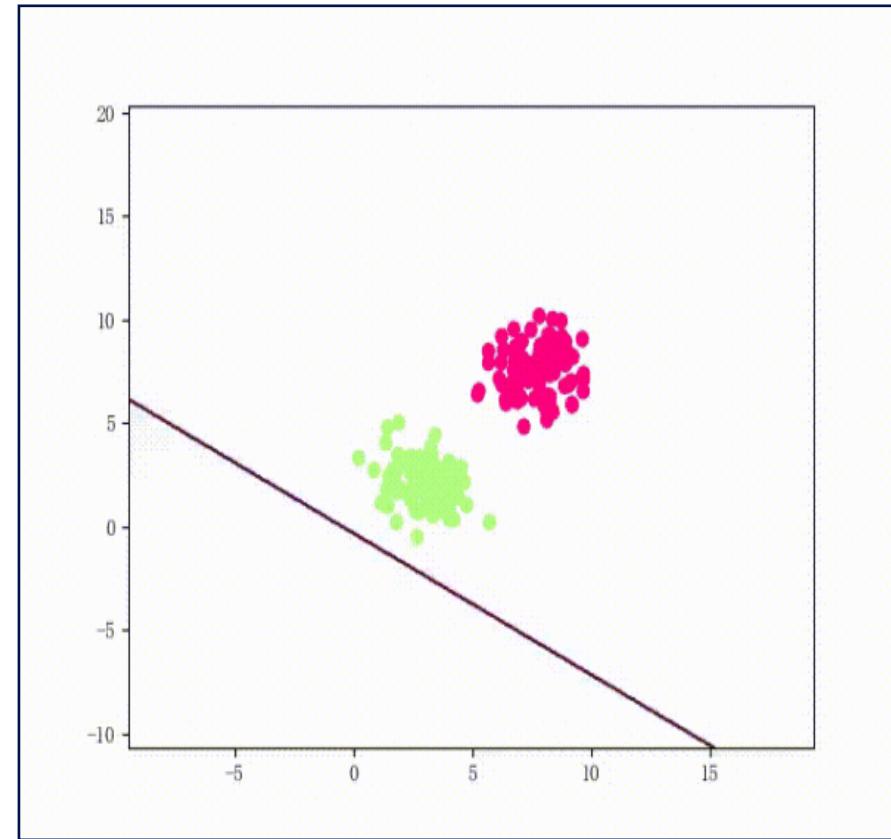
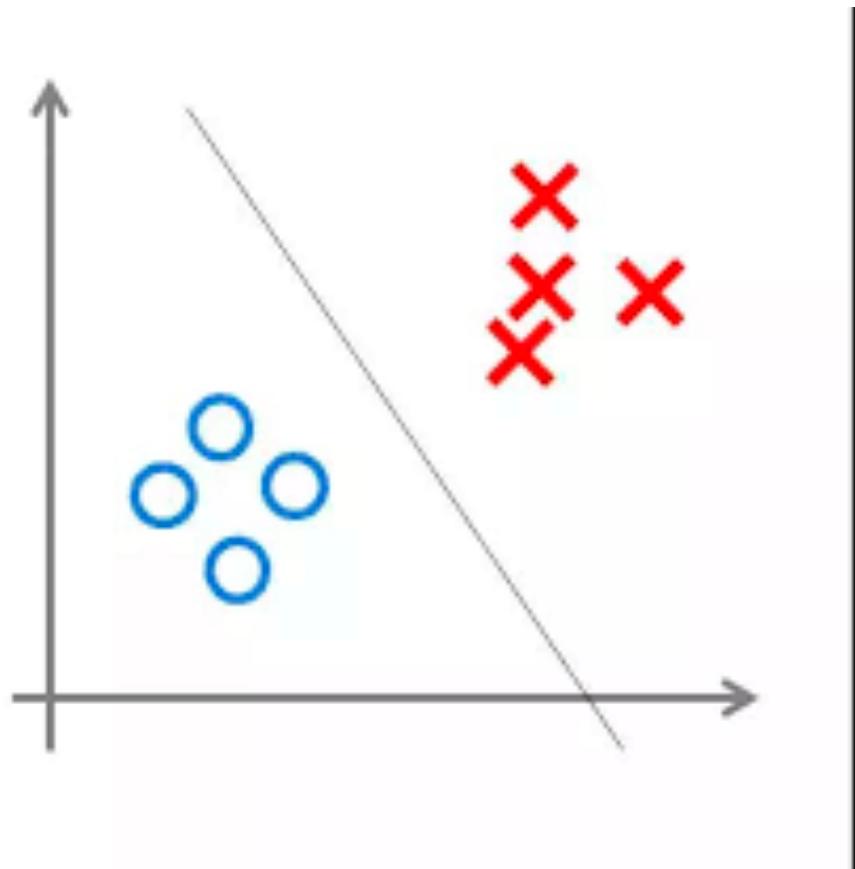
- What is AI
- How to do
- 符号主义
- 连接主义
- 行为主义

# Time machine



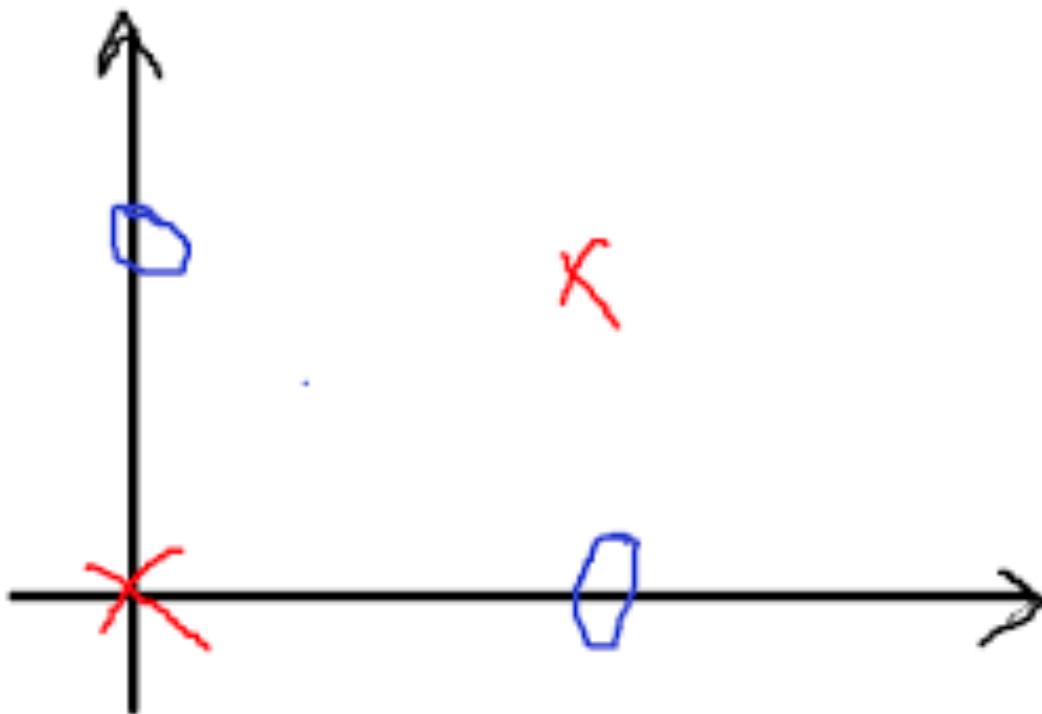
# Perceptron

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# XOR

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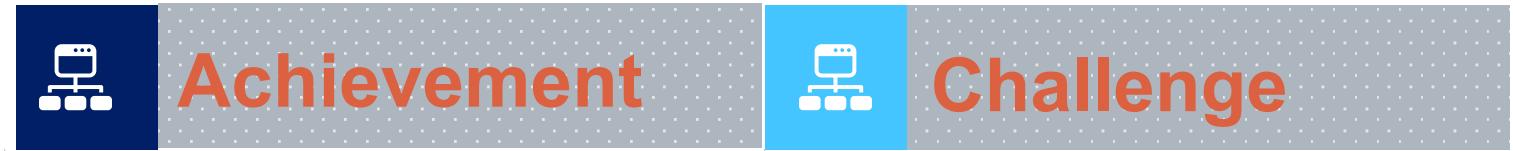


# Birth

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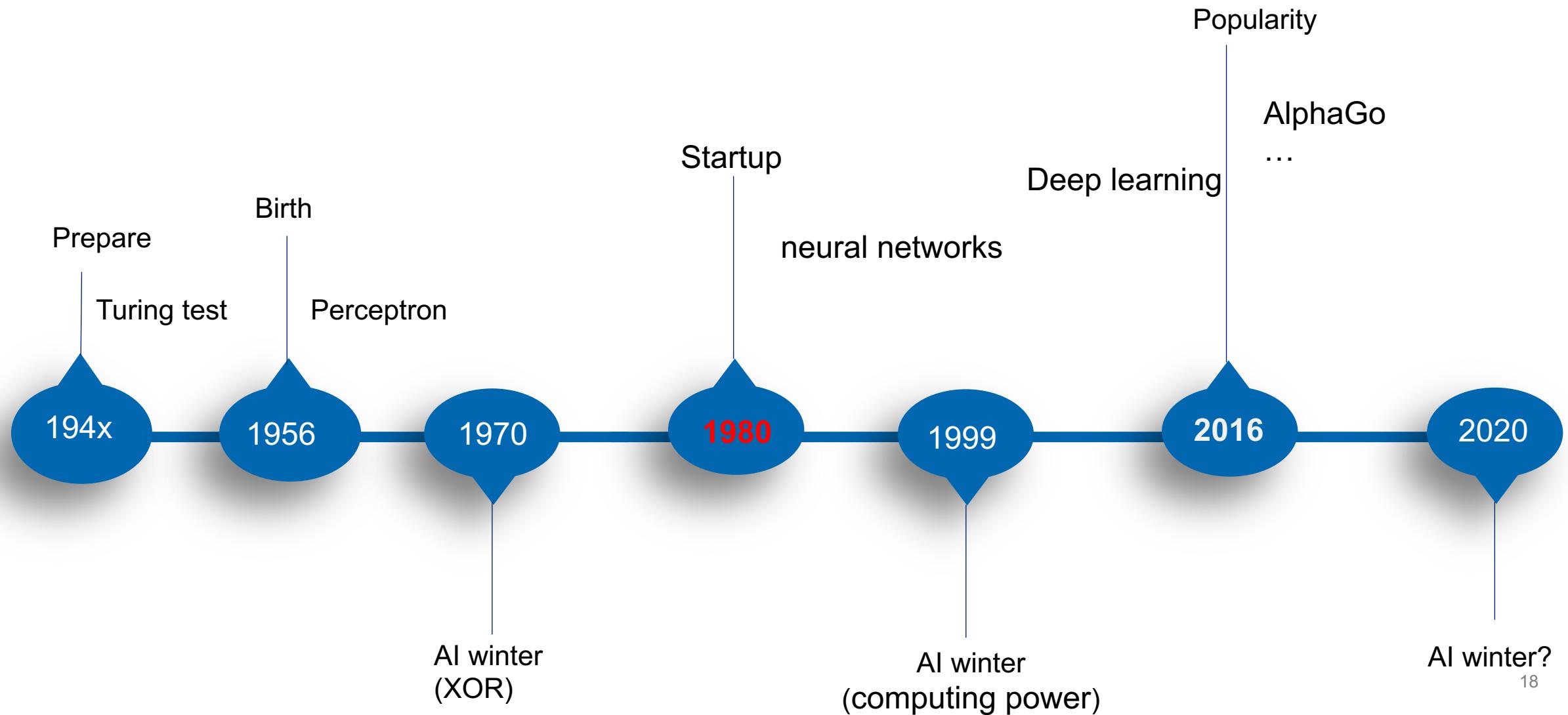
/02

1956~~1980



- Perceptron
- Algorithms
- XOR
- First winter

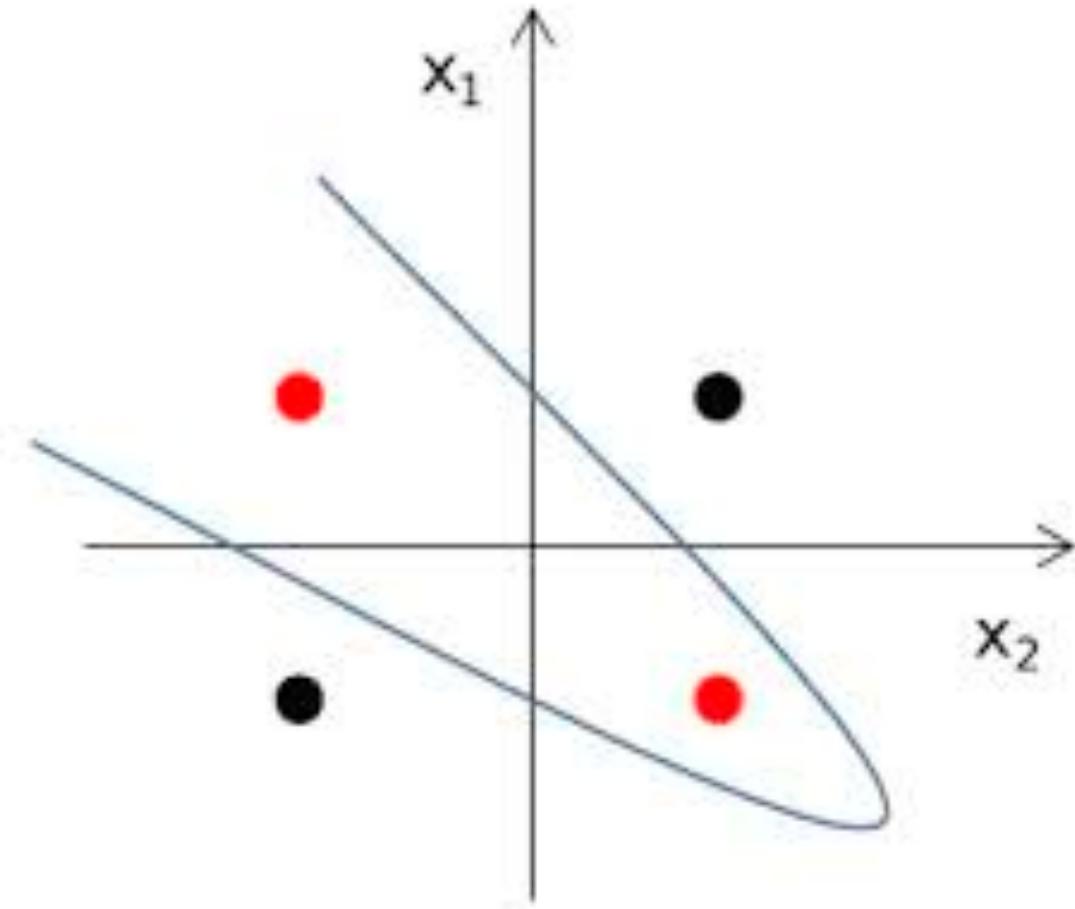
# Time machine



# Achievement

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1. XOR problem is solved;
2. Functions Simulation;
3. ERROR Back Propagation;



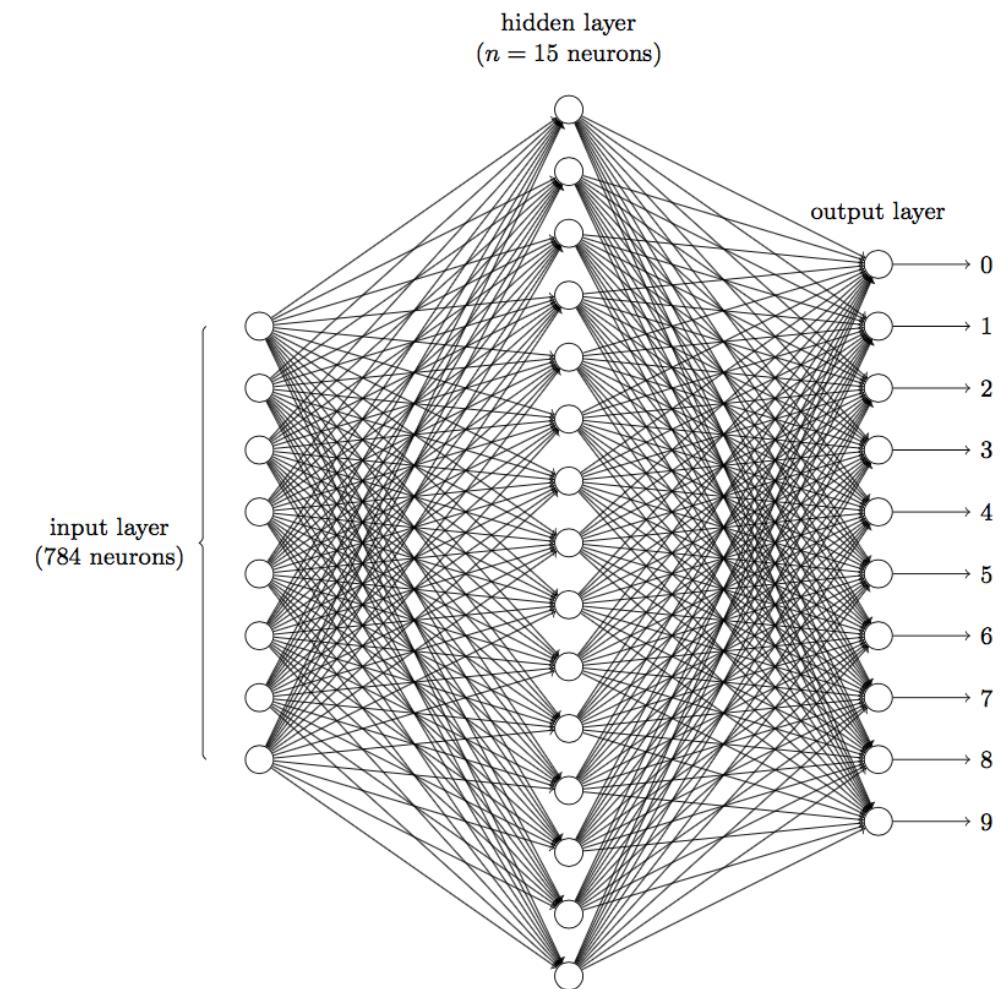
# Challenge

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Image : (1024 , 768 , 3 )

Network: (100,1)

Parameters:  $2 \cdot 1024 \cdot 768 \cdot 3 \cdot 100 + 2 > 4 \text{ 亿}$



# Startup

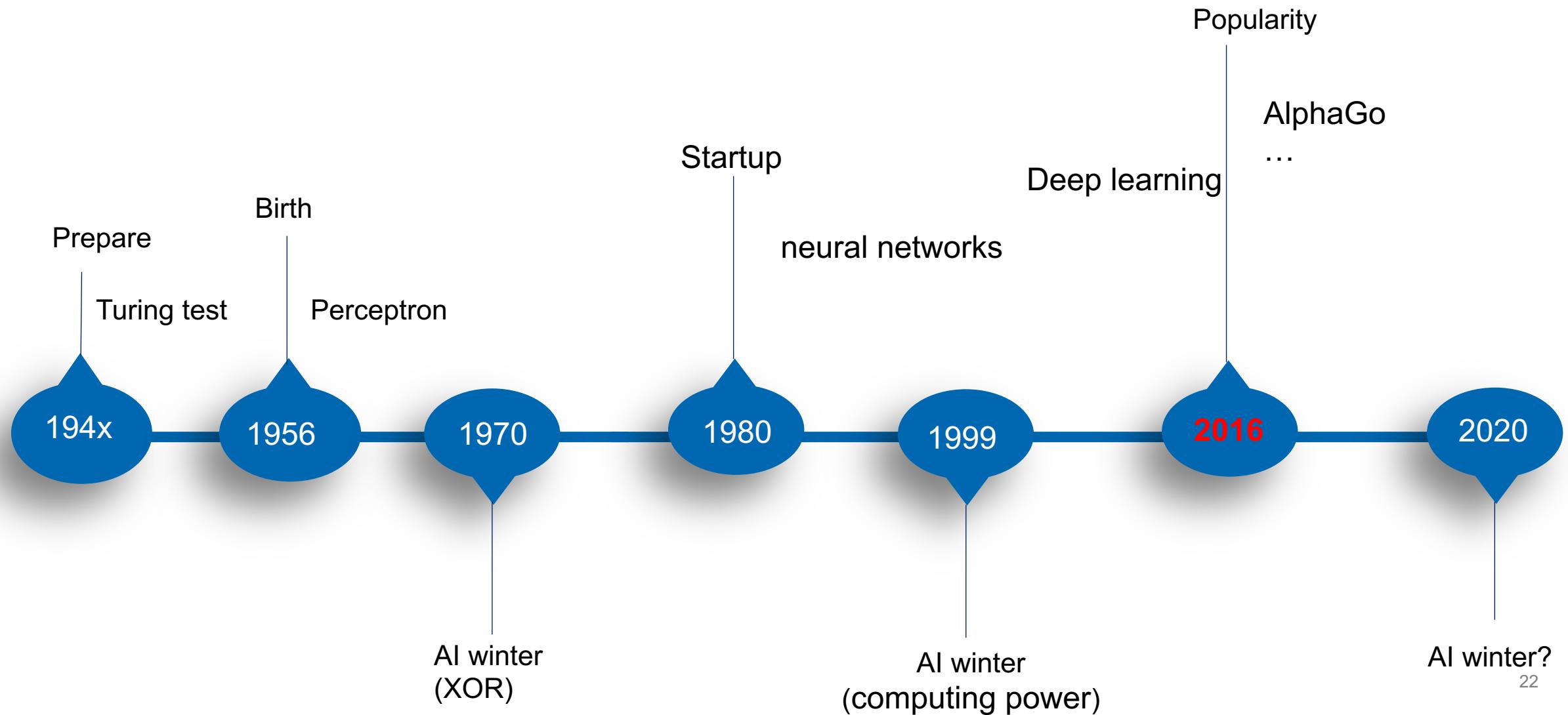
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/03

1980~~1999

	Achievement	Challenge
	<ul style="list-style-type: none"><li>• XOR is solved</li><li>• ML model<ul style="list-style-type: none"><li>• SVM</li><li>• ANN</li><li>• Boosting</li></ul></li><li>• ....</li></ul>	<ul style="list-style-type: none"><li>• Computing power</li><li>• Second winter</li></ul>

# Time machine



# Popularity

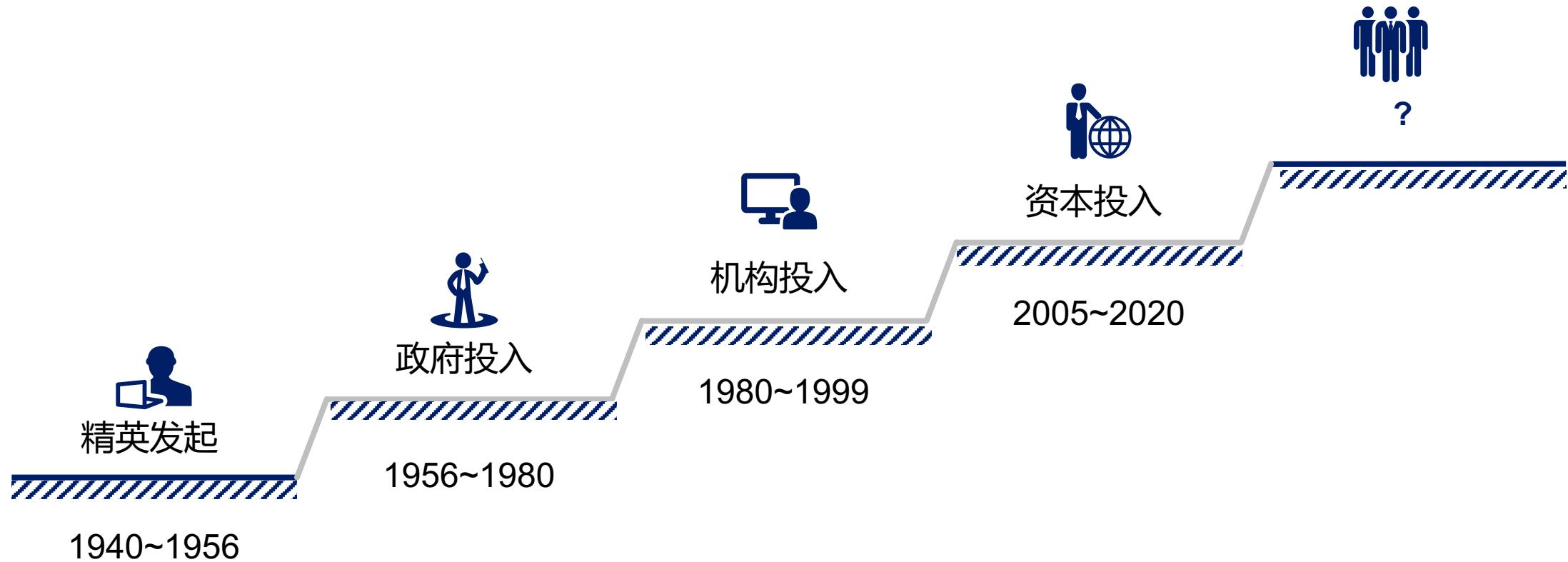
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/04

2005~~2020

	 Achievement	 Challenge
	<ul style="list-style-type: none"><li>• More deep<ul style="list-style-type: none"><li>• CNN/RNN</li><li>• ResNet/Inception/..</li></ul></li><li>• More popular<ul style="list-style-type: none"><li>• AlphaGo</li><li>• Tensorflow/pytorch/..</li><li>• Open datasets</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Unexplainable</li><li>• Bubble</li><li>• Third winter ?</li></ul>

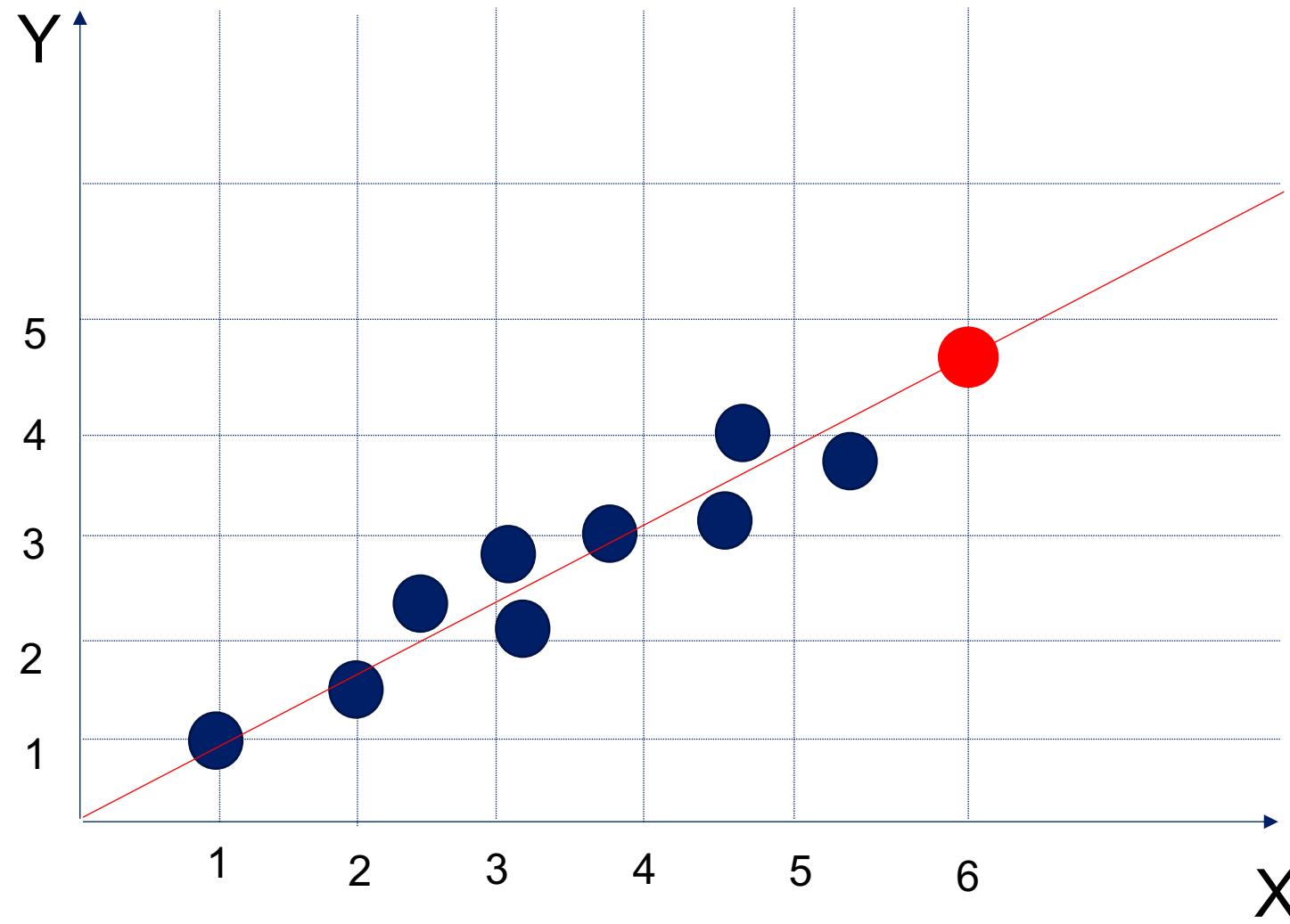
# Summary



# How

How can computer learn from data ?

# Linear #1



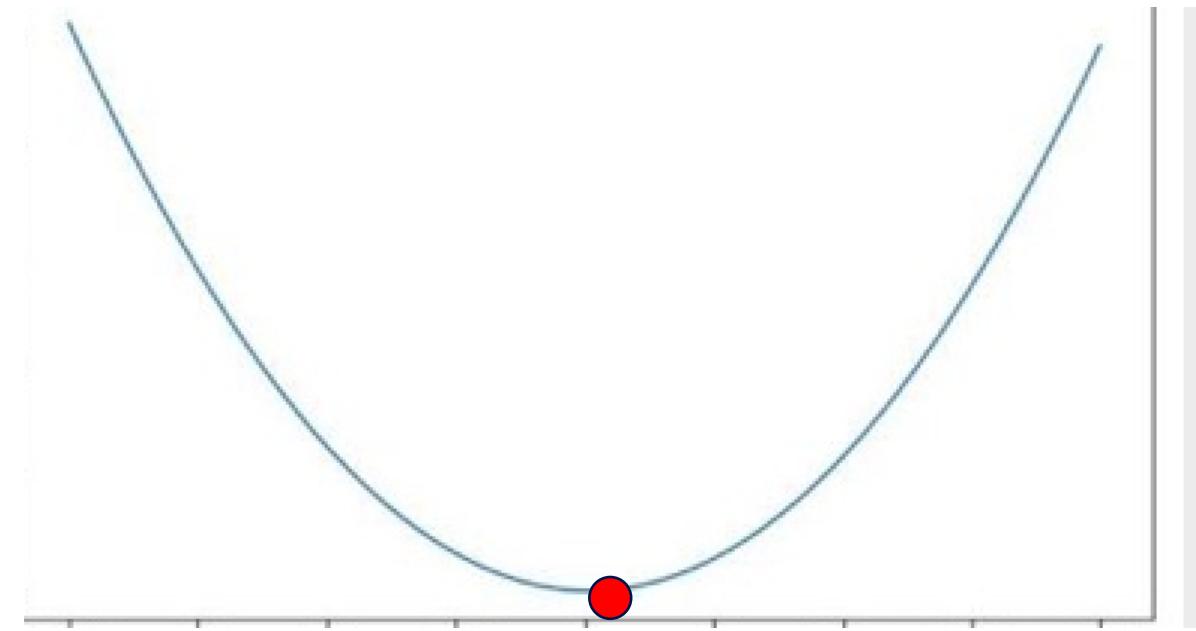
当X=6时，Y等于几比较合适？

$$Y = k * x + b$$

# Least square method

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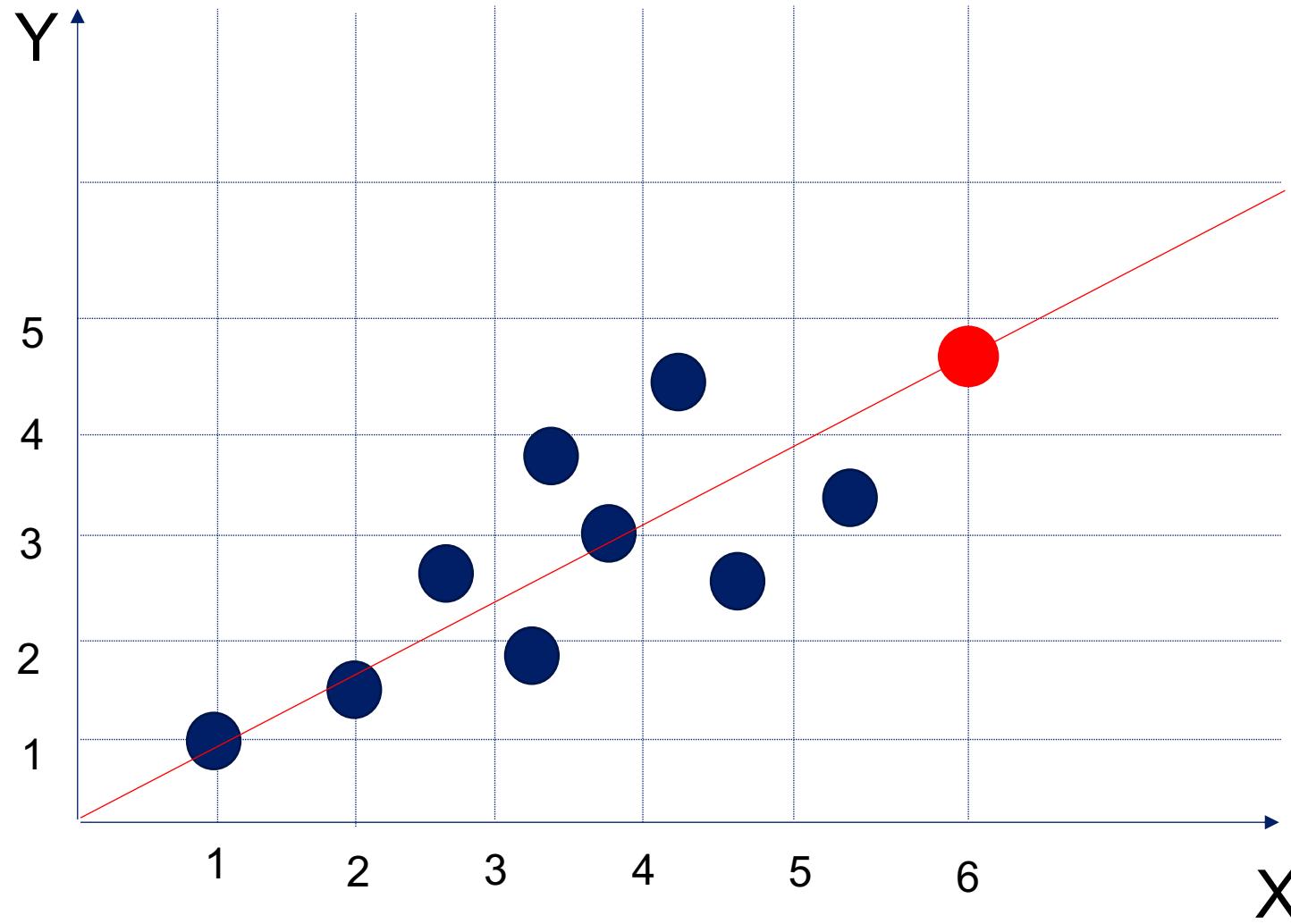
- $F(x) = k^* x + b$
- Error = Real – Pred =  $Y - F(x)$
- $E(x) = Y - F(x) = Y - k^* x + b$
- $J = \sum E(x)^2$
- $L(k, b) = \sum (Y - (k * x + b))^2$



➡ Find  $F(x)$  value when error is minimum

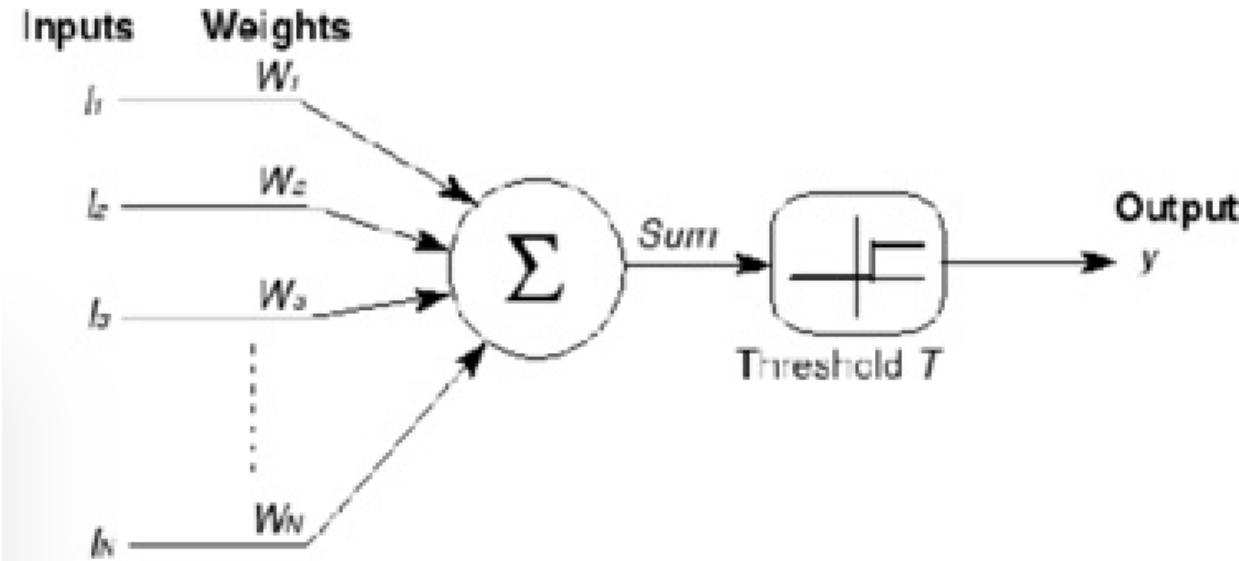
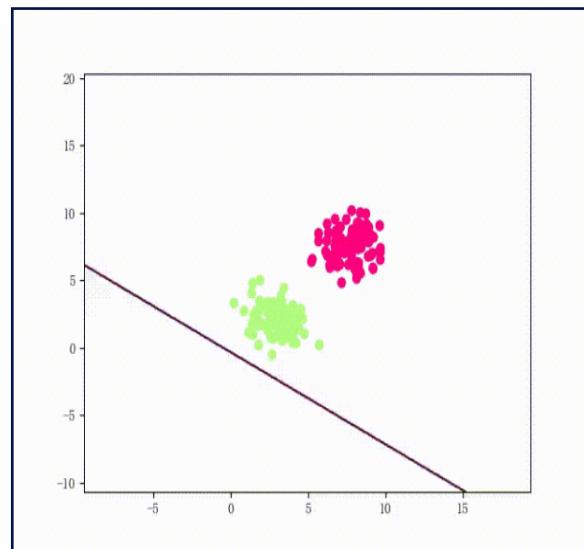
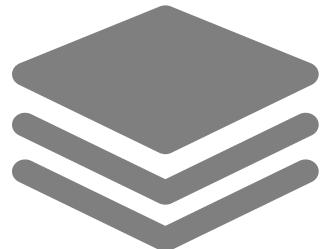
## Linear #2

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Why 100% when doing add ?

# Perceptron #1

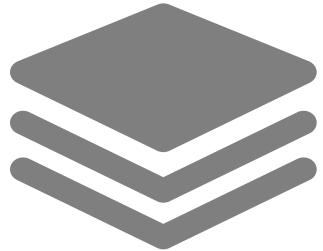


$$z = w_0x_0 + w_1x_1 + \dots + w_mx_m = w^T x$$

$$\rightarrow Y = \text{sign}(Y_i * W^T X)$$

# Perceptron #2

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- Transfer function
- Loss function
- Weight adaption

## Perceptron : Transfer function

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$$\text{Sign} = \phi(z) = \begin{cases} 1 & \text{if } z \geq \theta \\ -1 & \text{otherwise} \end{cases}$$

## Perceptron : Loss function

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$$\text{Error} = \sum i f(Y_i * W^T X_i < 0) 1 \text{ else } 0$$

$$J_{(w)} = \sum -(Y_i * W^T X_i)$$

## Perceptron : Weight adaption

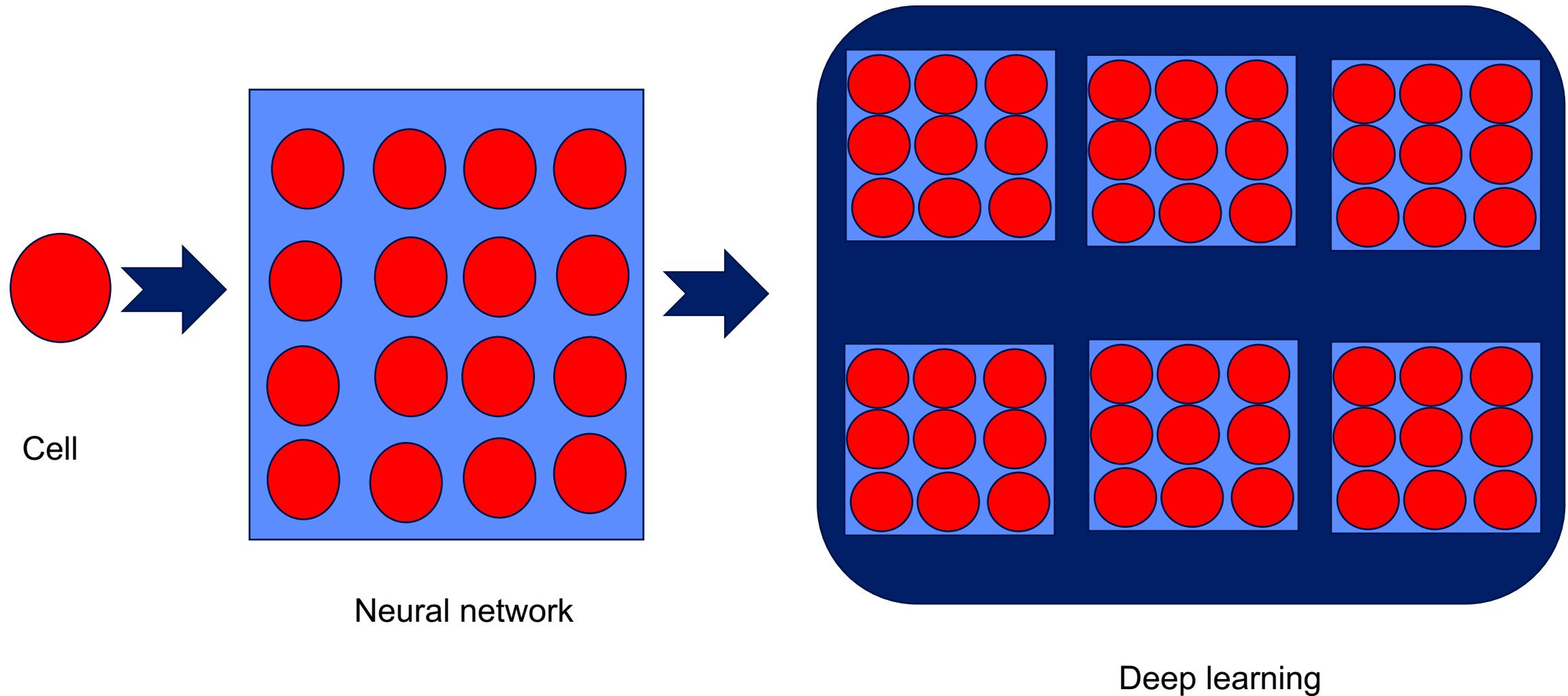
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$$\Delta w = -\lambda * Y_i * X_i$$

$$W^{(i+1)} = W^{(i)} - \Delta w = W^{(i)} + \lambda * Y_i * X_i$$

# Perceptron #3

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# Getting start from Perceptron

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- Hello world , Easy understand;
- Basic element of Neural network;
- Normal form of ML/DL;

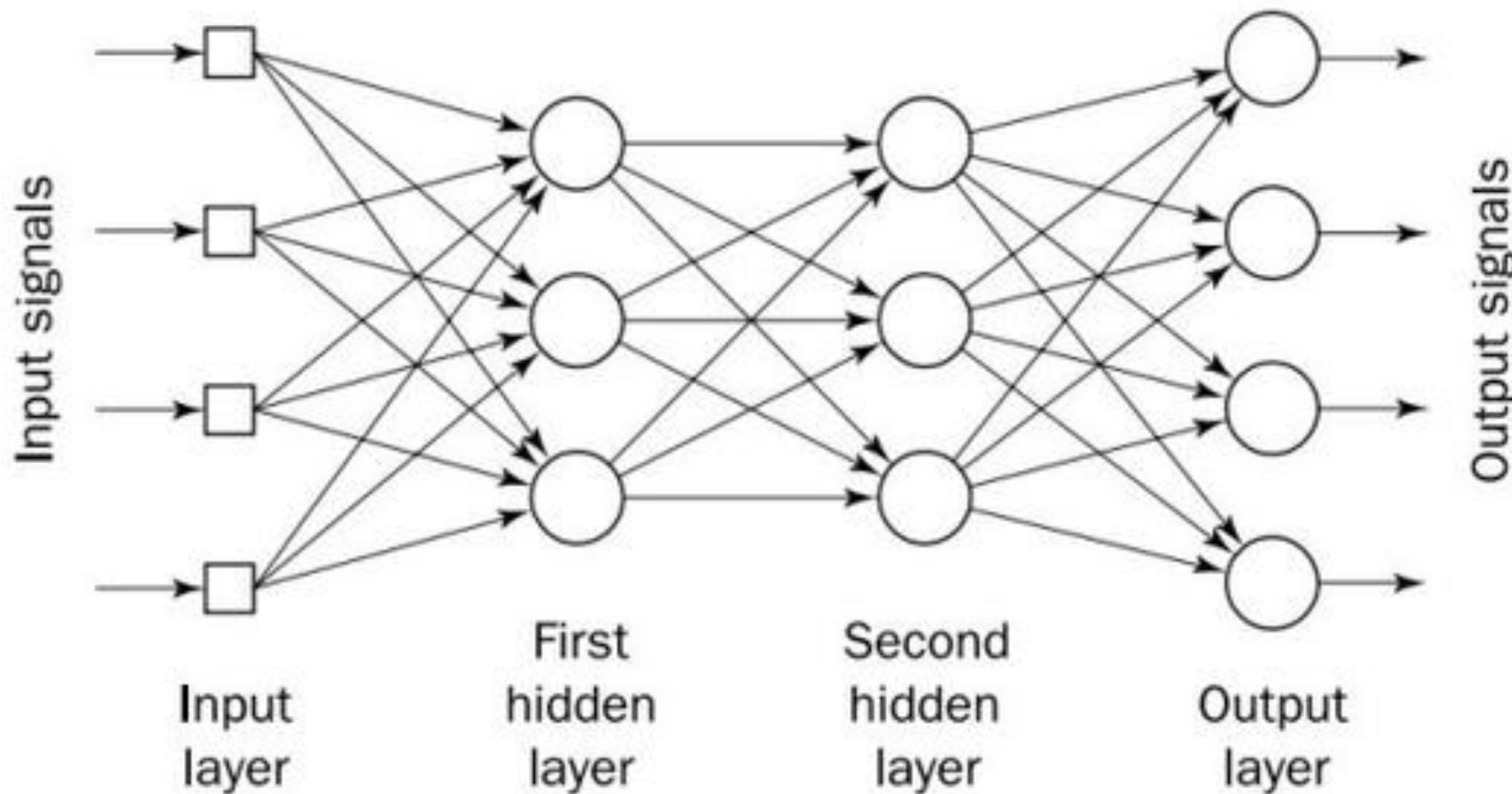
# **Artificial neural network**

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Refer to C3

# ANN: Architecture

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## Demo #2

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Find pattern from data set by ANN

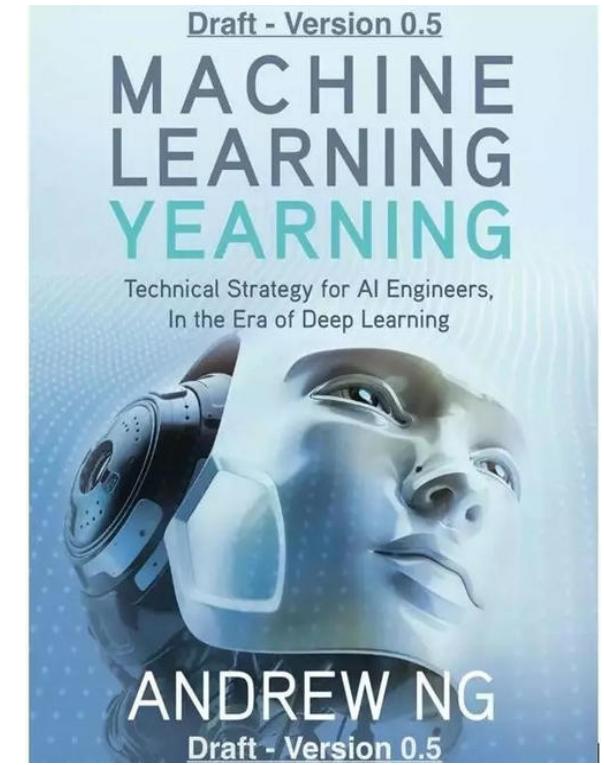
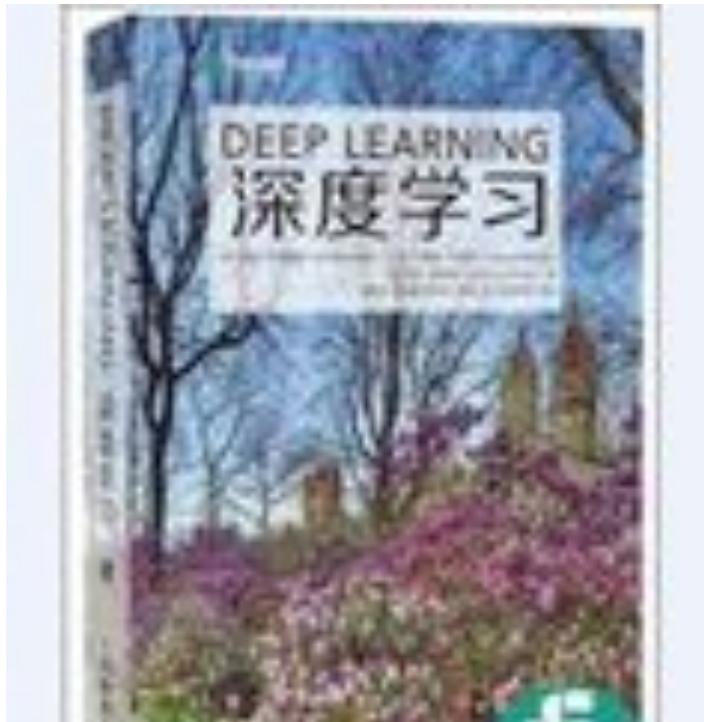
## Demo #2: Find pattern

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demo

# Books

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# Datasets

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- 加大入门数据：<http://archive.ics.uci.edu/ml/dataset.html>
- 天池数据：<https://tianchi.aliyun.com/datalab/index.htm>
- 亚马逊数据：<https://aws.amazon.com/cn/public-datasets/>
- kaggle数据：<https://www.kaggle.com/competition>
- Security：<https://github.com/jivoi/awesome-ml-for-cybersecurity>

# Tools/Env

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anaconda

python

tensorflow

keras

jupyter

opencv

sklearn

numpy

pandas

matplotlib

seaborn

# Summary

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- AI concepts and terms
- Math calculation demonstrate
- Technology roadmap
- Perceptron learning model
- Neural network demonstrate

# Thanks

2019-3-6

