Practice of AI

C1: Overview

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Preface

Why AI ?

Generic research

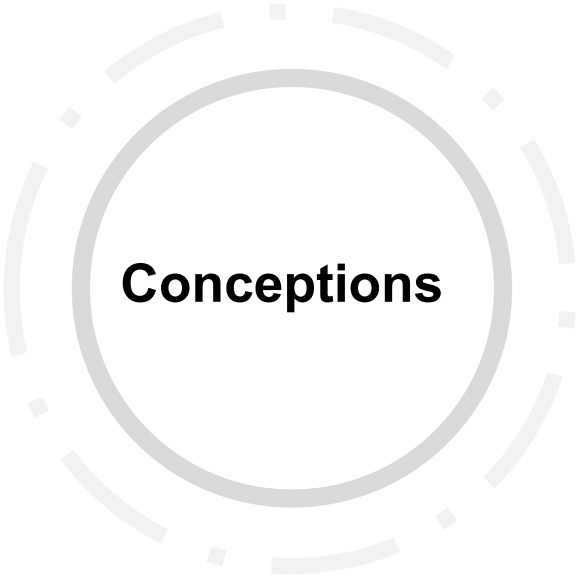
Dedicated model

Applications

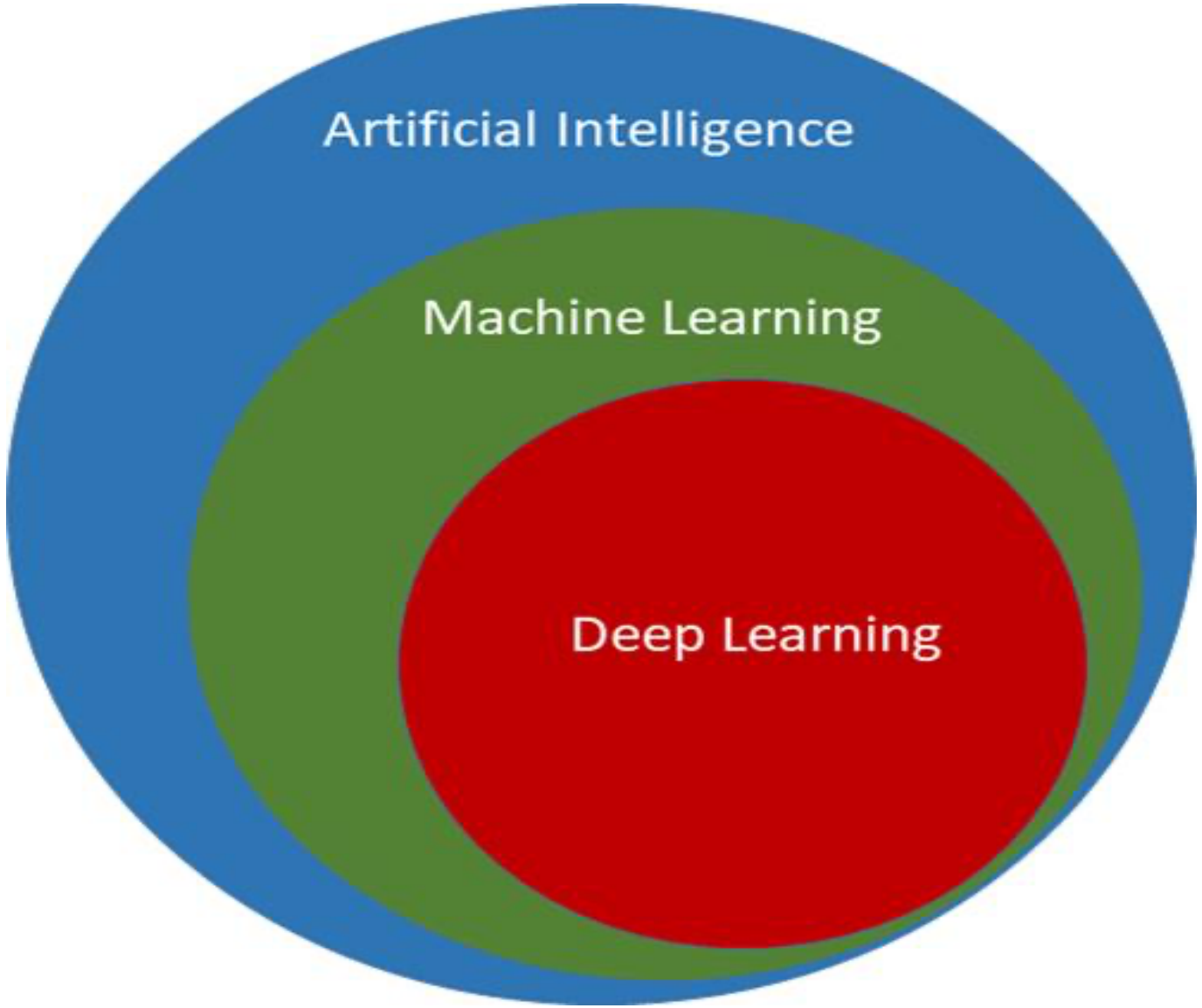
Outline

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

Goal



AI/ML/DL



Output

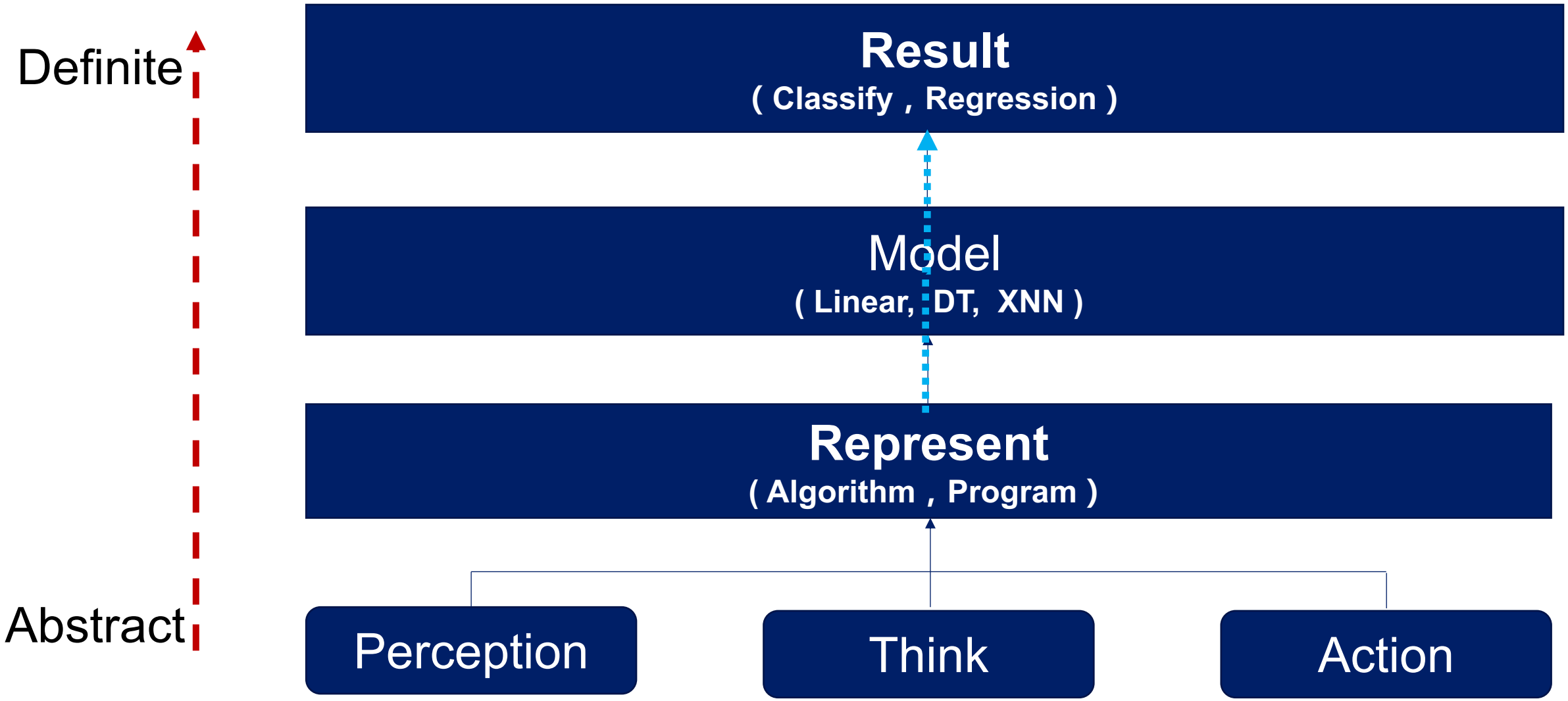
- **Classify**

Cat or Dog?

- **Regression**

How much?

Concepts


Definite
Abstract
Result
(Classify , Regression)
Model
(Linear, DT, XNN)
Represent
(Algorithm , Program)
Perception
Think
Action

Demo #1

Computer learns how to do math calculations

Demo #1

Sample

Y = F(x1,x2)

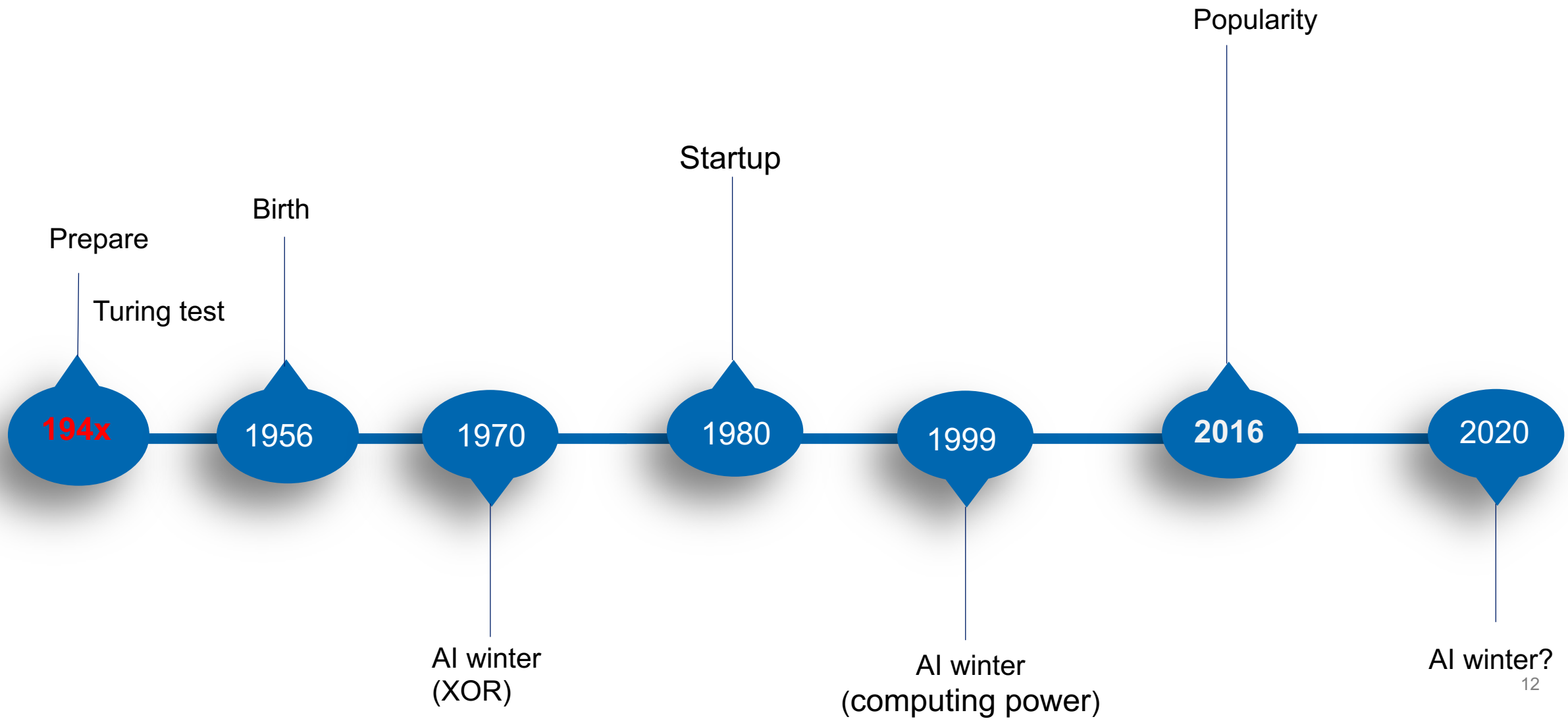
x1		x2		y
18		63		40.5
8		87		47.5
38		95		66.5
48		44		46.0
67		4		35.5
90		76		83.0
19	?	21	=	20.0
67		25		46.0
38		63		50.5
55		10		32.5
77		11		44.0
56		60		58.0
92		89		90.5
50		95		72.5
53		9		31.0

Demo #1:

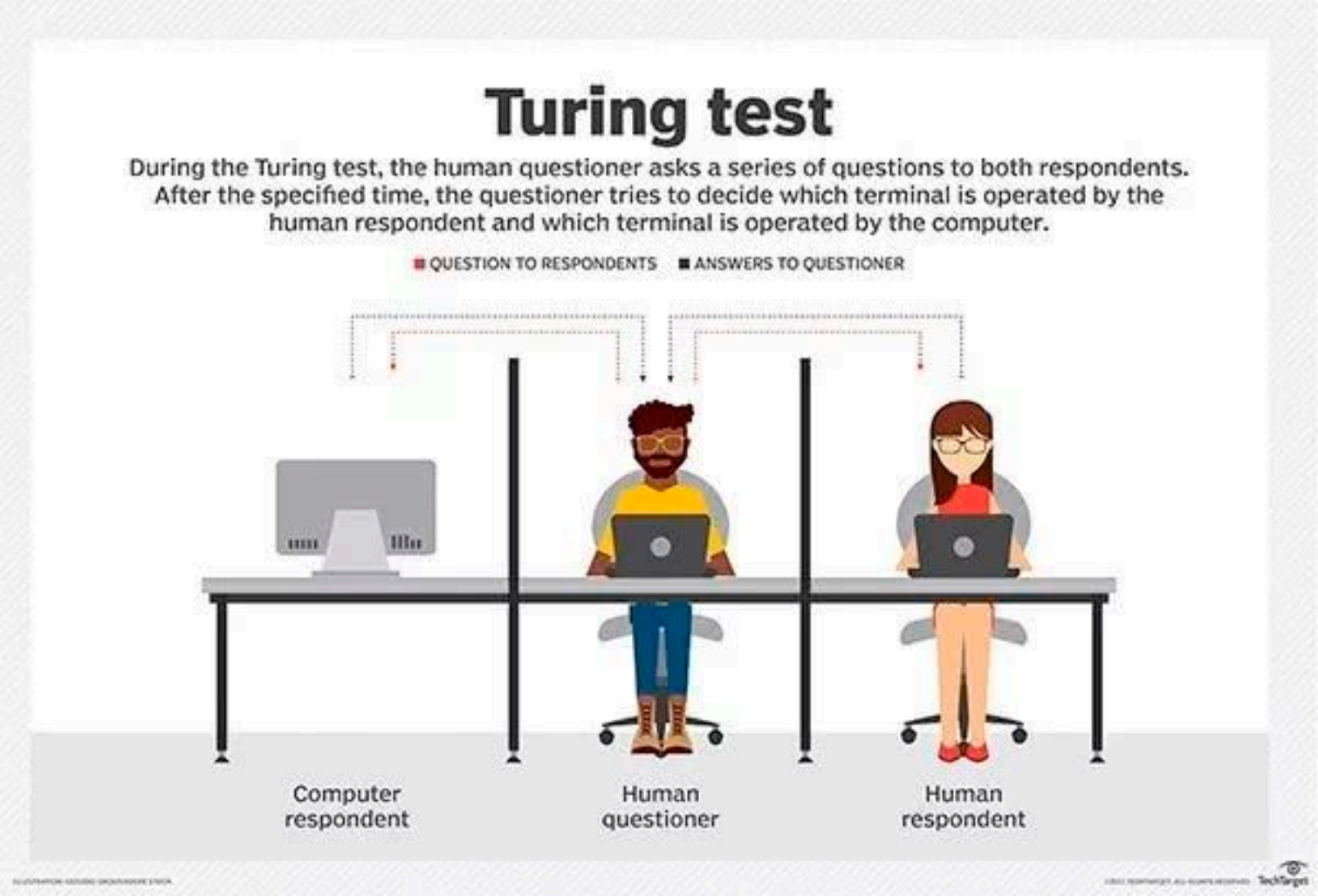
Learn from Demo #1

- ✓ Execute command **VS** Learn from samples
- ✓ Full accurate **VS** ERRORs tolerance;

Time machine



Turing test



Loebner Prize (1991,2008)

Searle Chinese room (1980)

Prepare

/01

1940~~1956

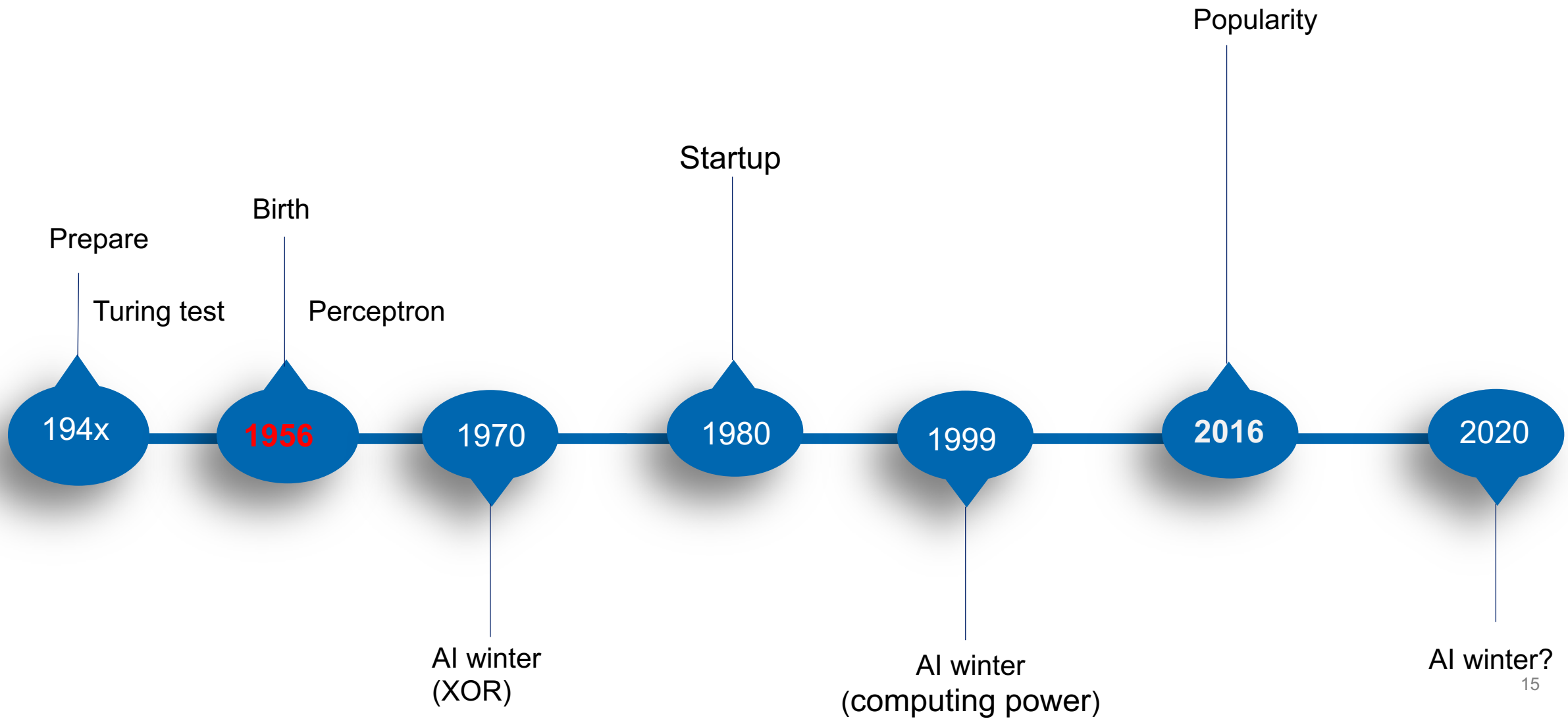
Brain storm

- What is AI
- How to do

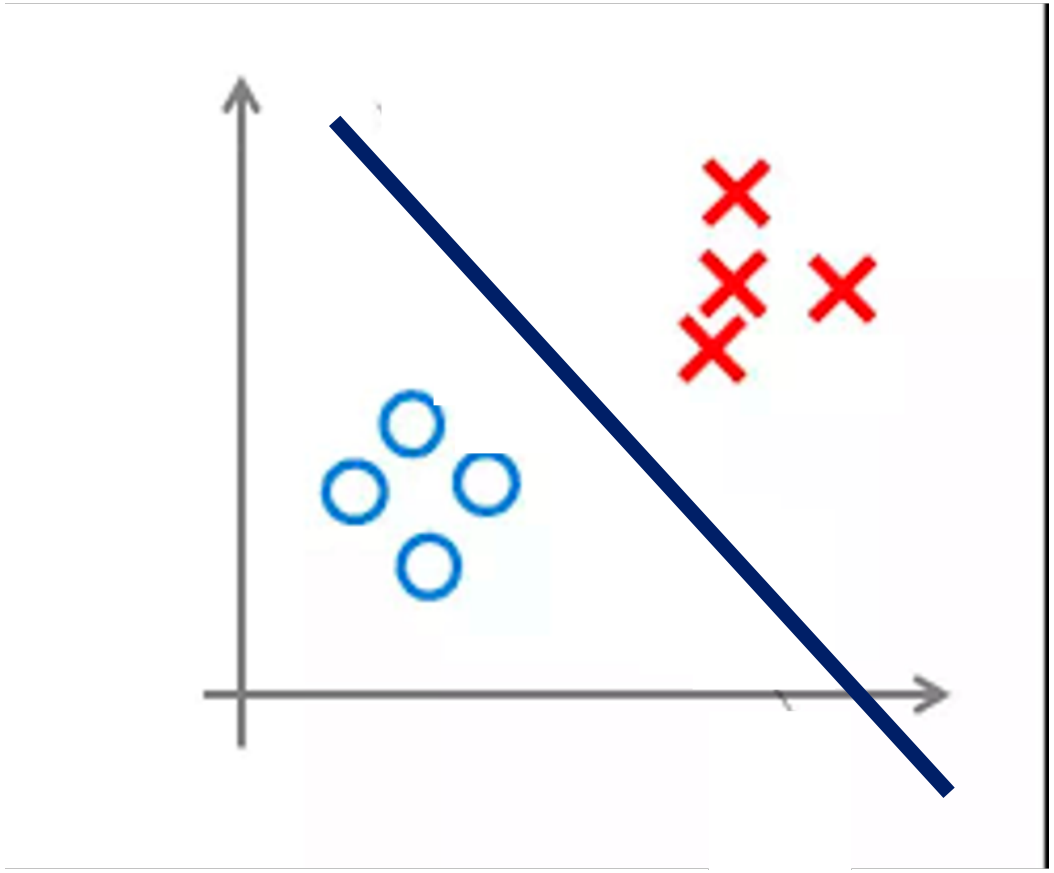
Roadmap

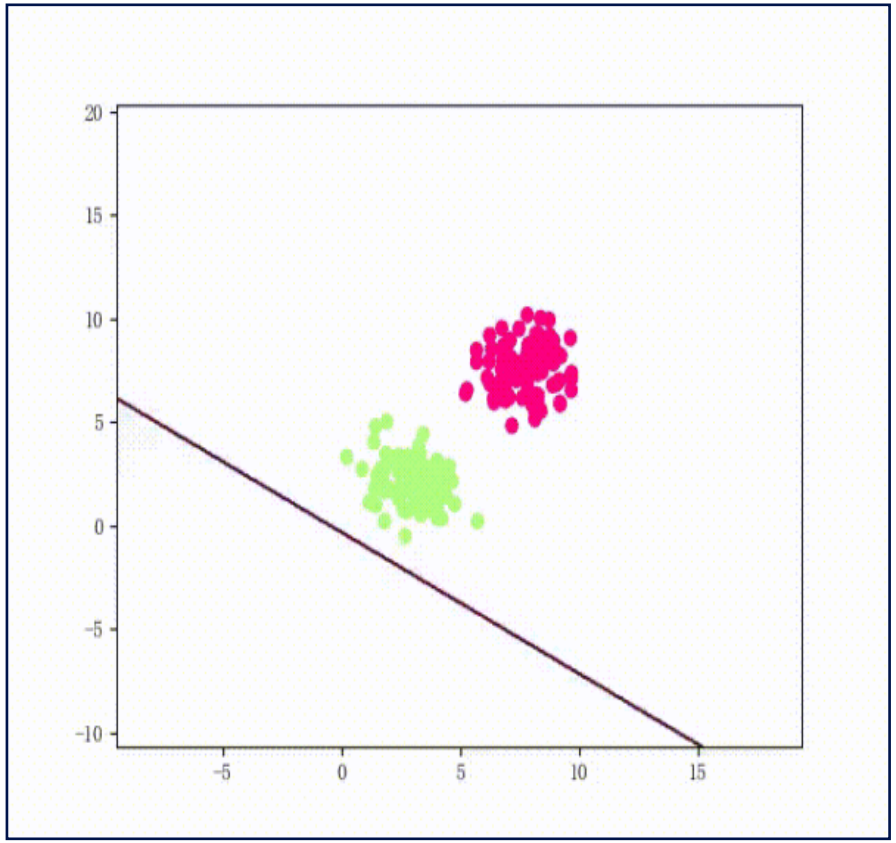
- 符号主义
- 连接主义
- 行为主义

Time machine

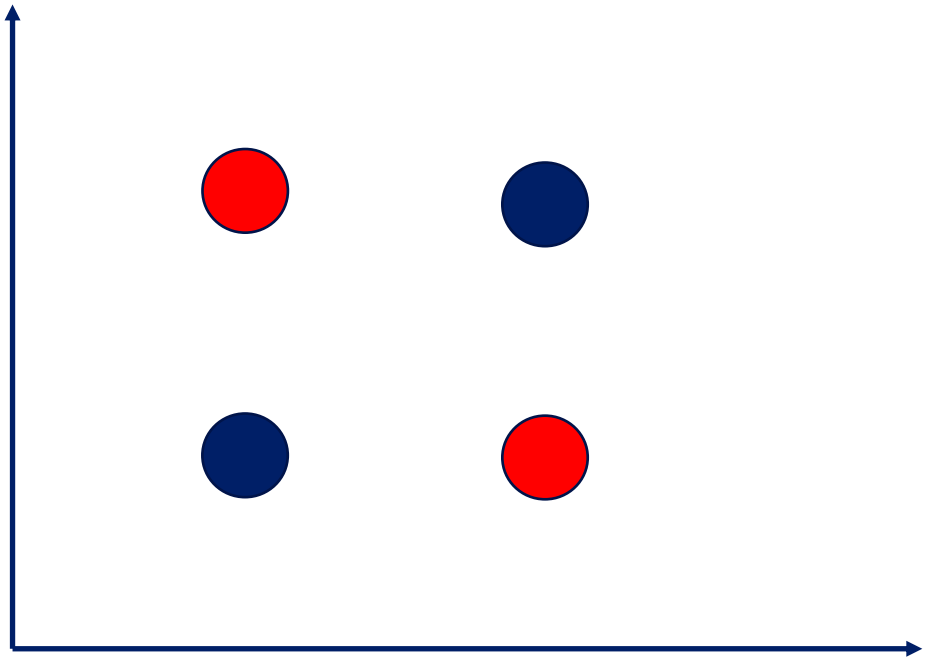


Perceptron





XOR



Birth

/02

1956~~1980

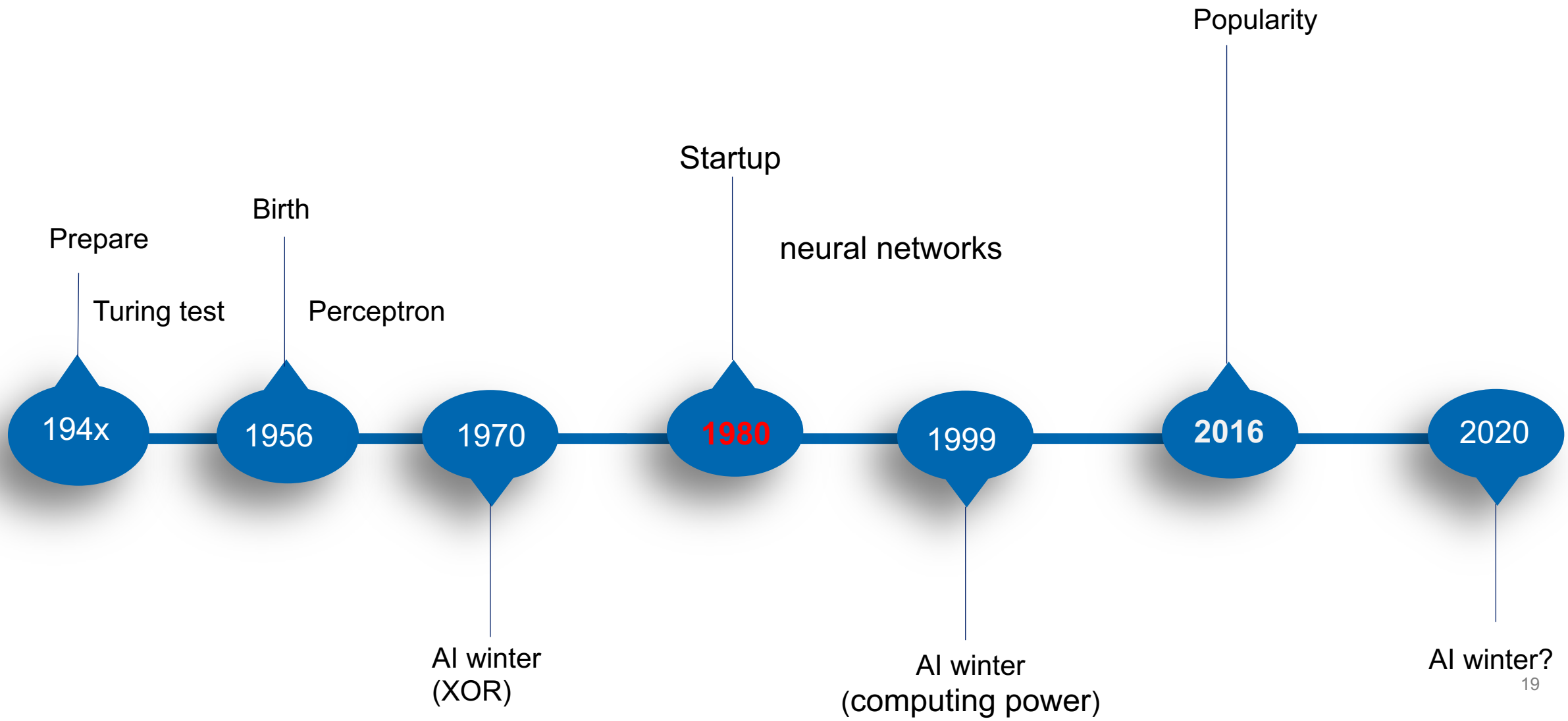
Achievement

- Perceptron
- Algorithms

Challenge

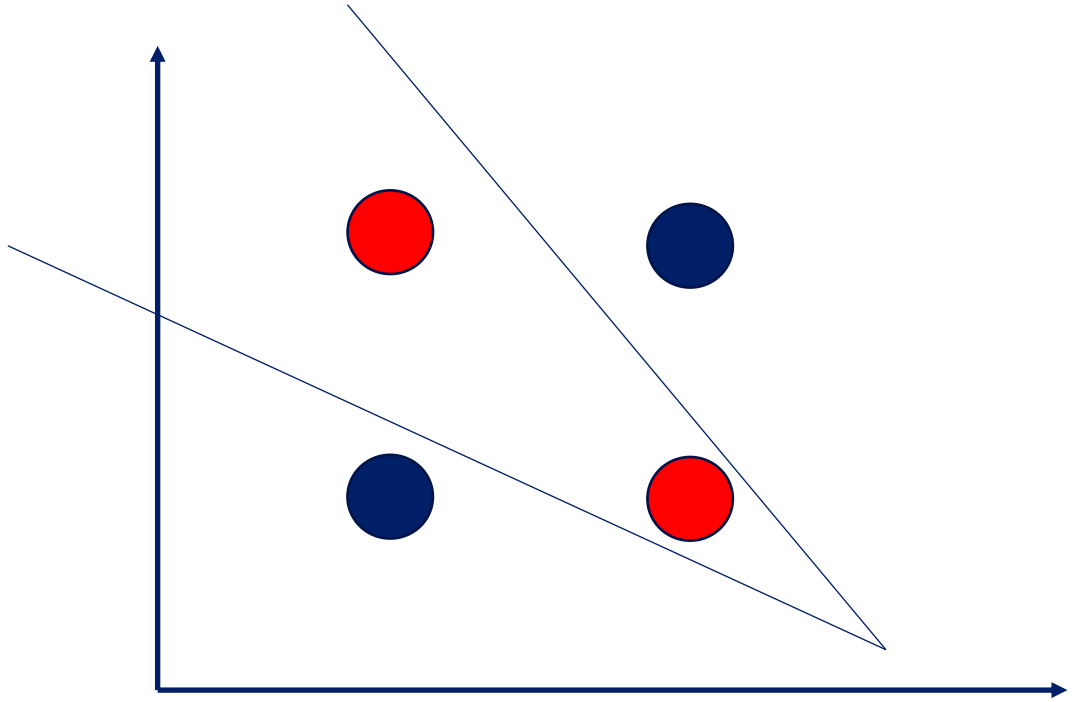
- XOR
- First winter

Time machine



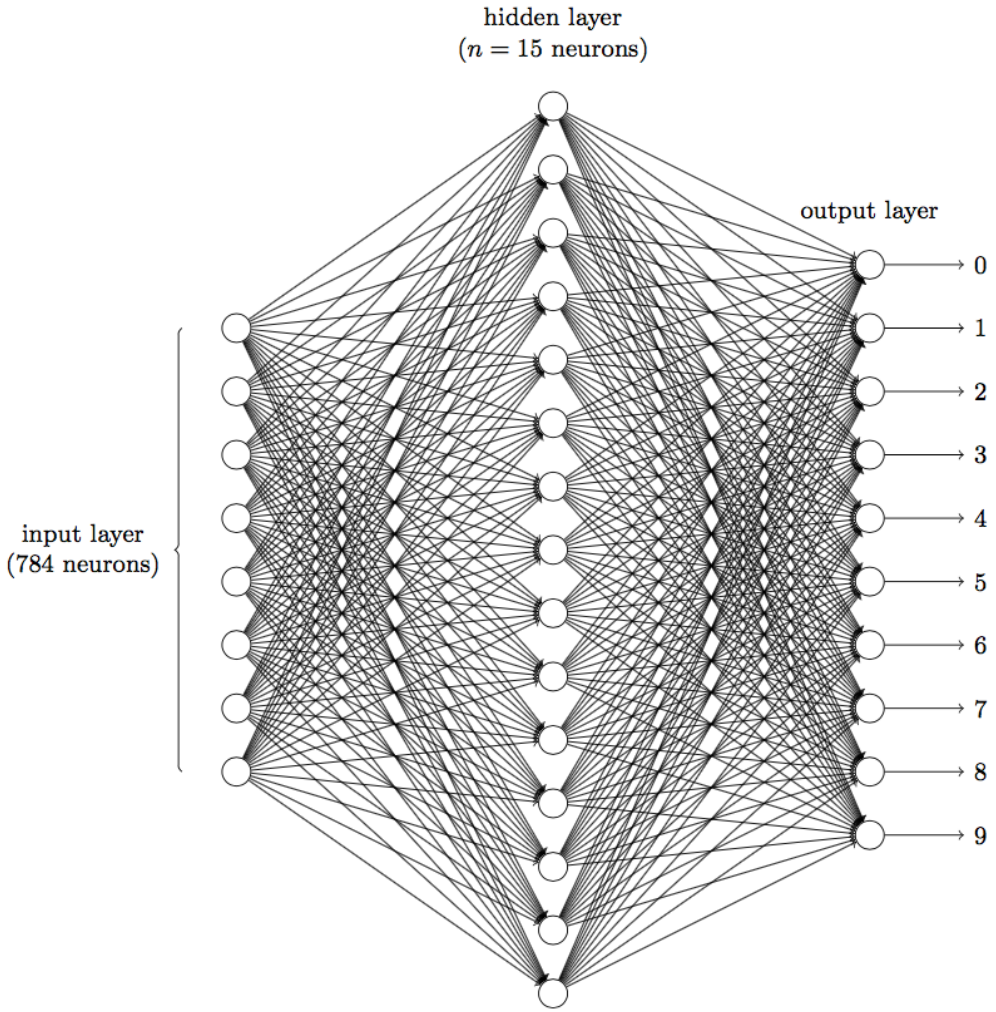
Achievement

1. XOR problem is solved;
2. Functions simulation;
3. Back propagation;



Challenge

- Image： (1024 , 768 , 3)
- Network: (100,1)
- Parameters: 2*1024 *768*3*100+2 > 4 亿



Startup

/03

1980~~1999

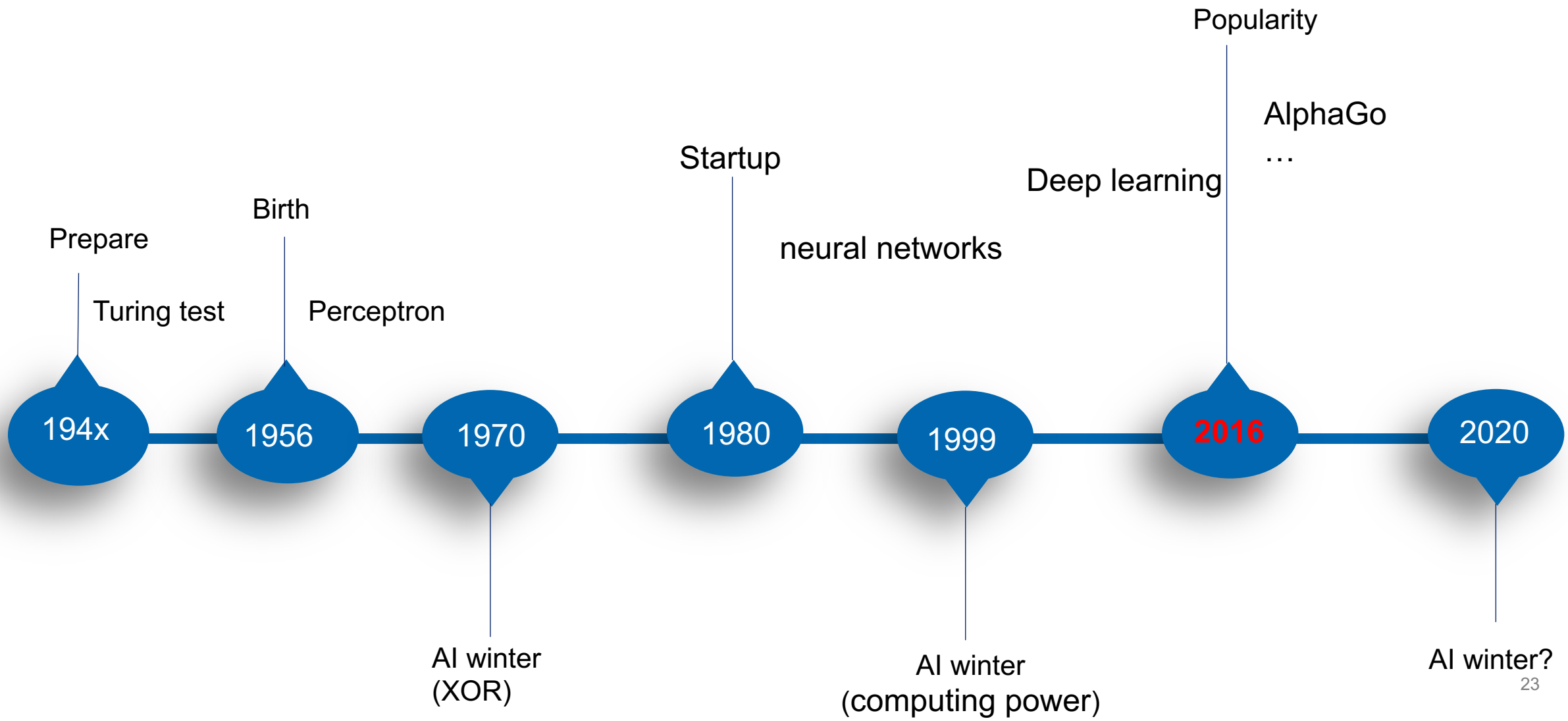
Achievement

- XOR is solved
- ML model
  - SVM
  - ANN
  - Boosting
  - ….

Challenge

- Computing power
- Second winter

Time machine



Popularity

/04

2005~~2020

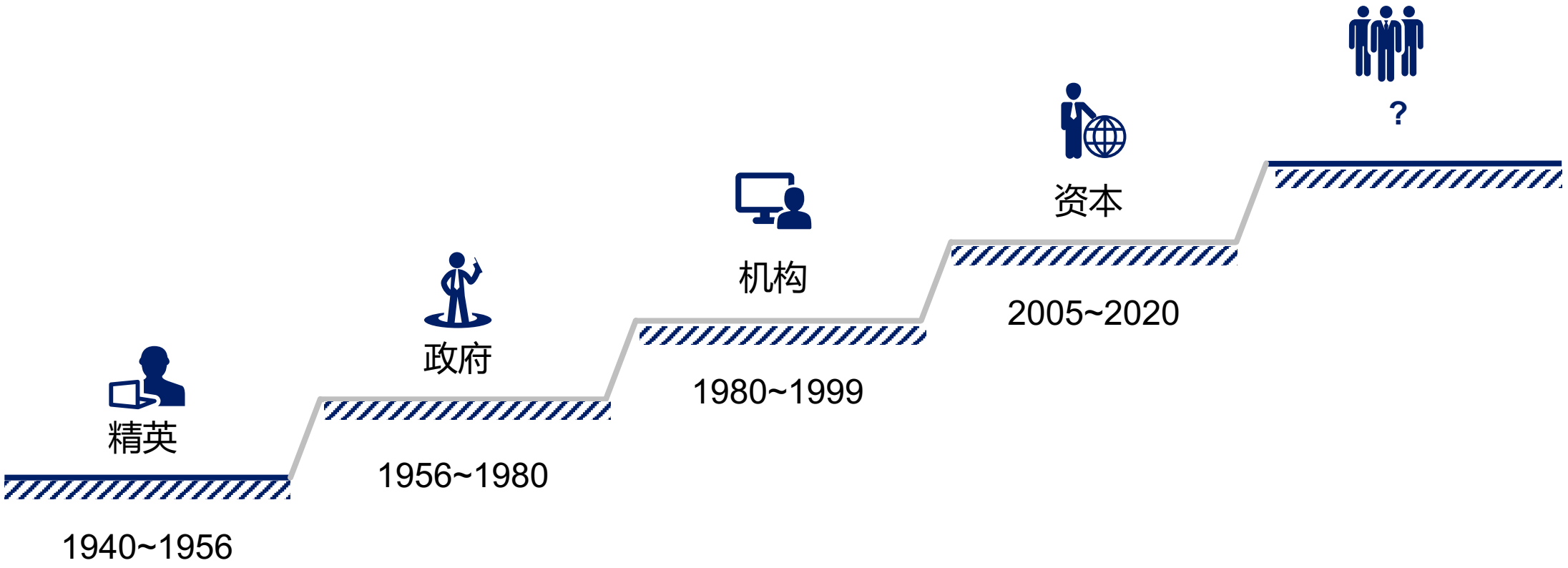
Achievement

- More deep
  - CNN/RNN
  - ResNet/Inception/..
- More popular
  - AlphaGo
  - Tensorflow/pytorch/..
  - Open datasets

Challenge

- Unexplainable
- Bubble & third winter ?

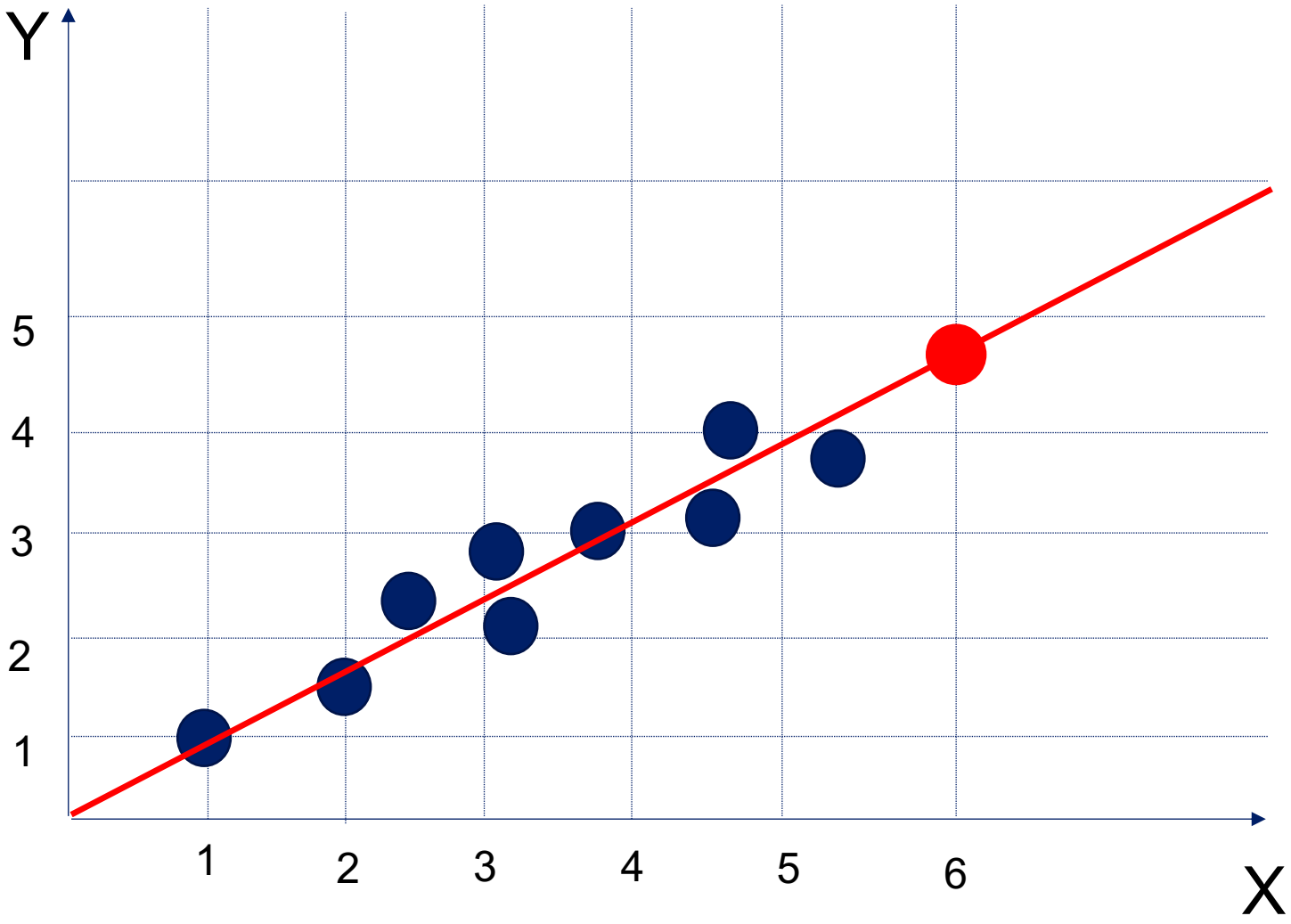
Summary



AI Model

How can computer learn from data ?

Linear #1

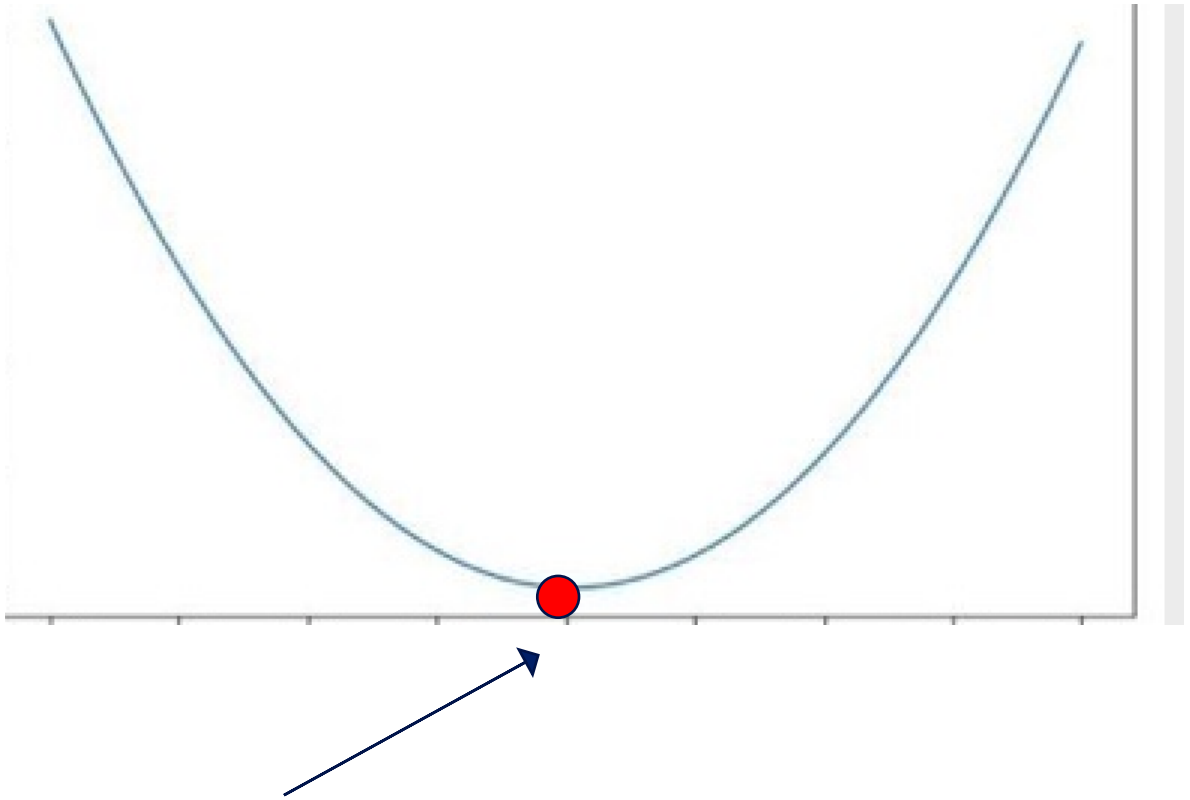


当X=6 时， Y等于几比较合适？

Y = k * x + b

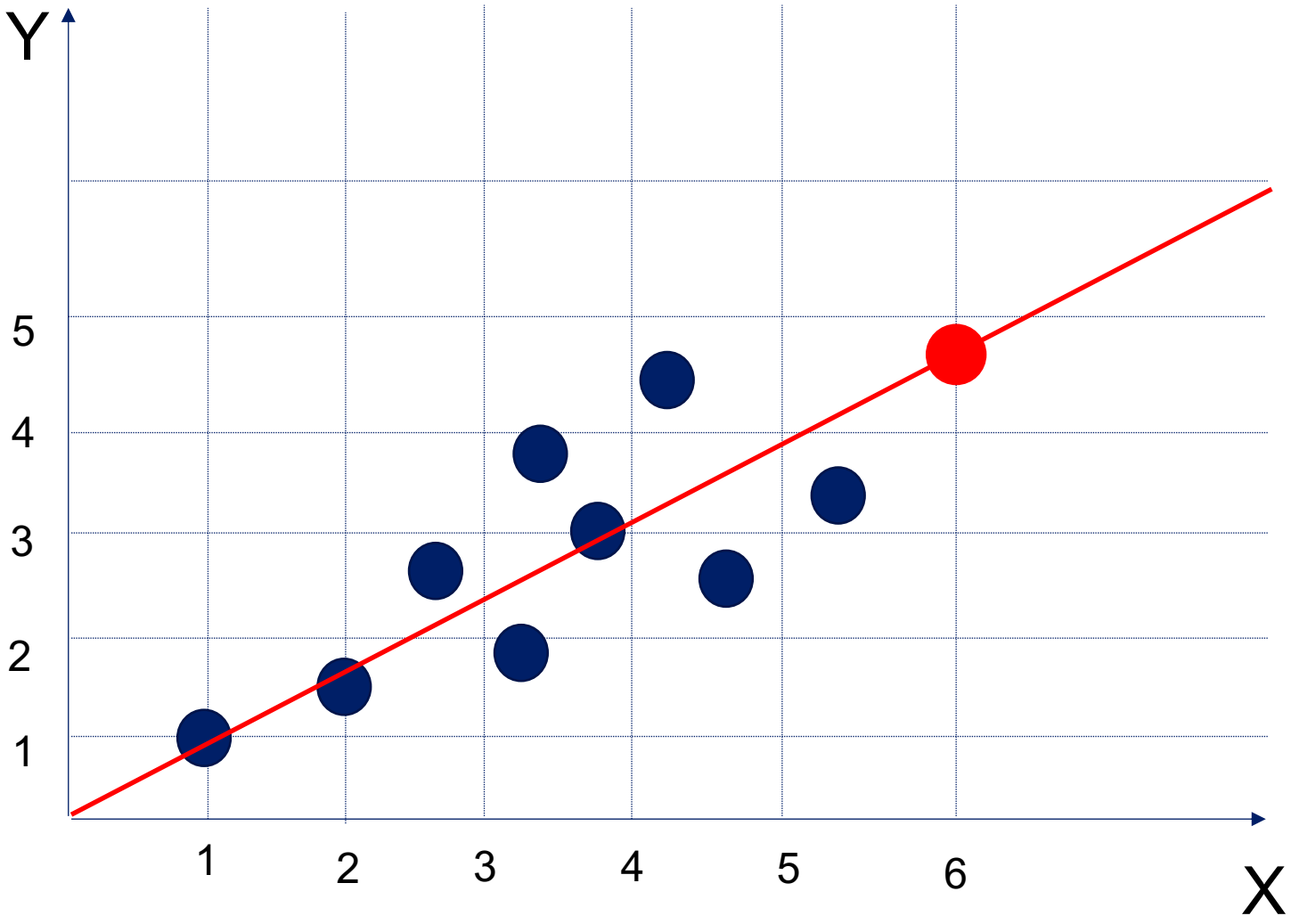
Least square method

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



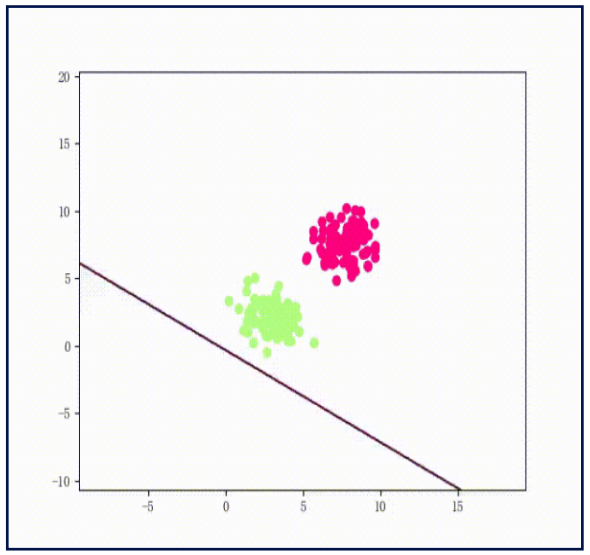
Find k,b value when error is minimum

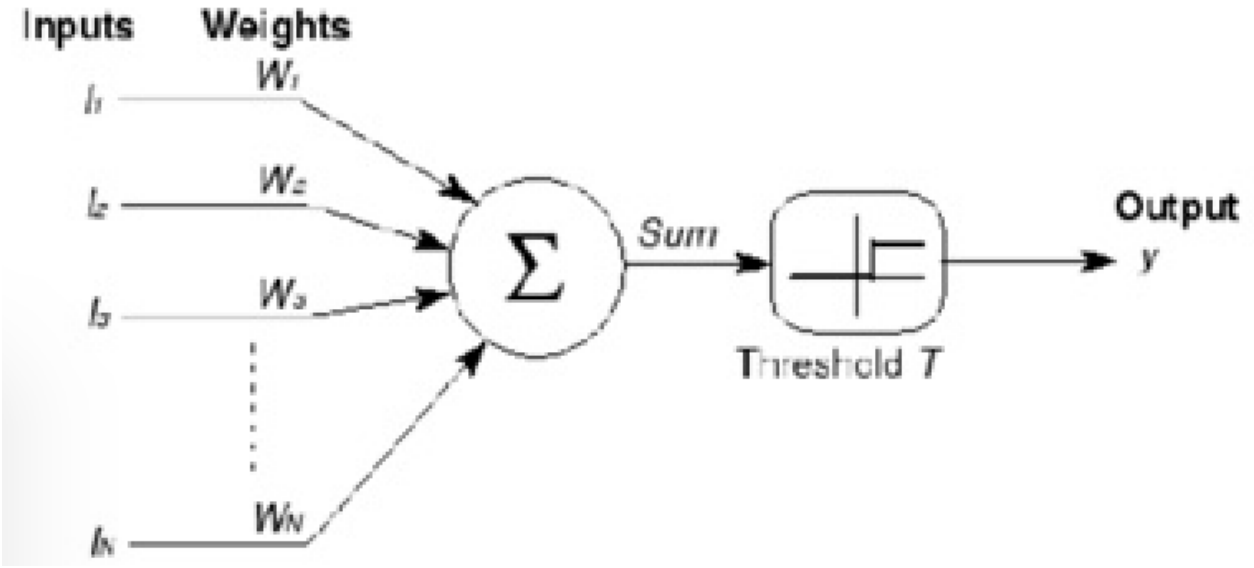
Linear #2



Why 100% when doing add ?

Perceptron #1





$$z = w_0 x_0 + w_1 x_1 + \ldots + w_m x_m = w^T x$$

$$Y = sign(Y_i * W^T X)$$

Perceptron #2

- Transfer function
- Loss function
- Weight adaption

Perceptron : Transfer function

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

Perceptron : Loss function

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

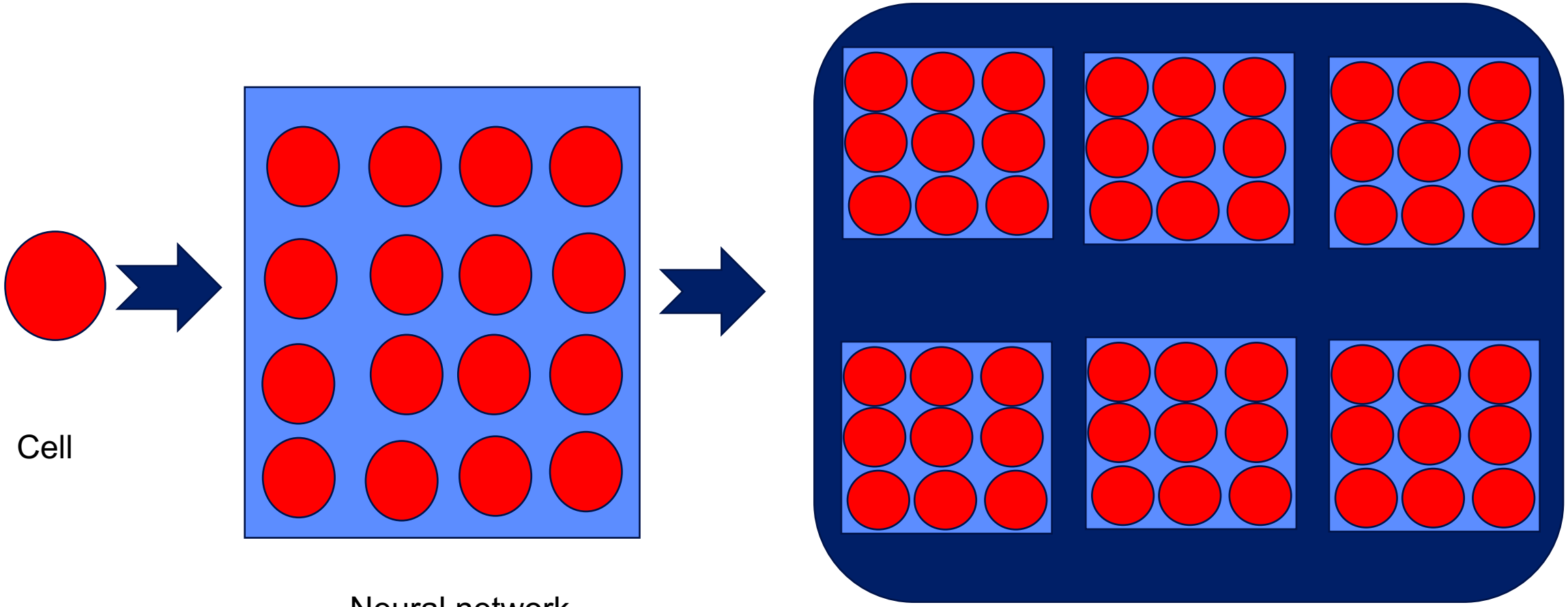
$$J_{(w)} = \sum -(Y_i * W^T X_i)$$

Perceptron : Weight adaption

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

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

Perceptron #3



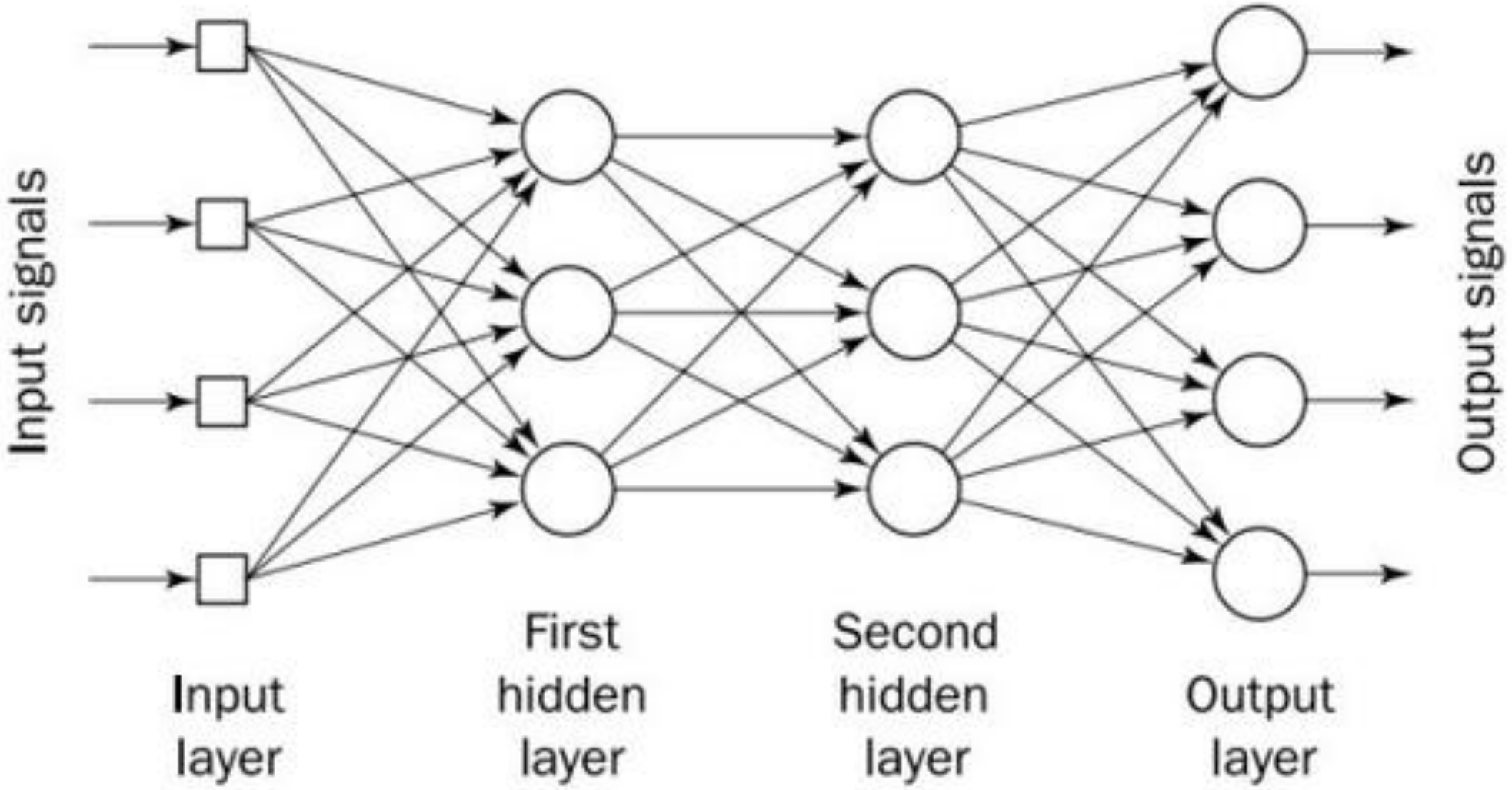
Getting start from Perceptron

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

Artificial neural network

Refer to C3

ANN: Architecture



Demo #2

Find pattern from data set by ANN

Demo #2: Find pattern

Datasets

- 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

anaconda
python
tensorflow
keras
jupyter
opencv
sklearn
numpy
pandas
matplotlib
searborn

Summary

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

Thanks

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