

# 人工智慧概述

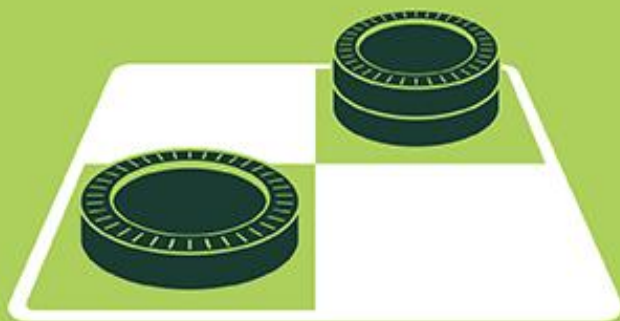
周哲維

2020/09/16



# ARTIFICIAL INTELLIGENCE

Early artificial intelligence stirs excitement.



人類設定好的  
天生本能

人工智慧 目標

## MACHINE LEARNING

Machine learning begins to flourish.



機器學習 手段

## DEEP LEARNING

Deep learning breakthroughs drive AI boom.



深度學習



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.



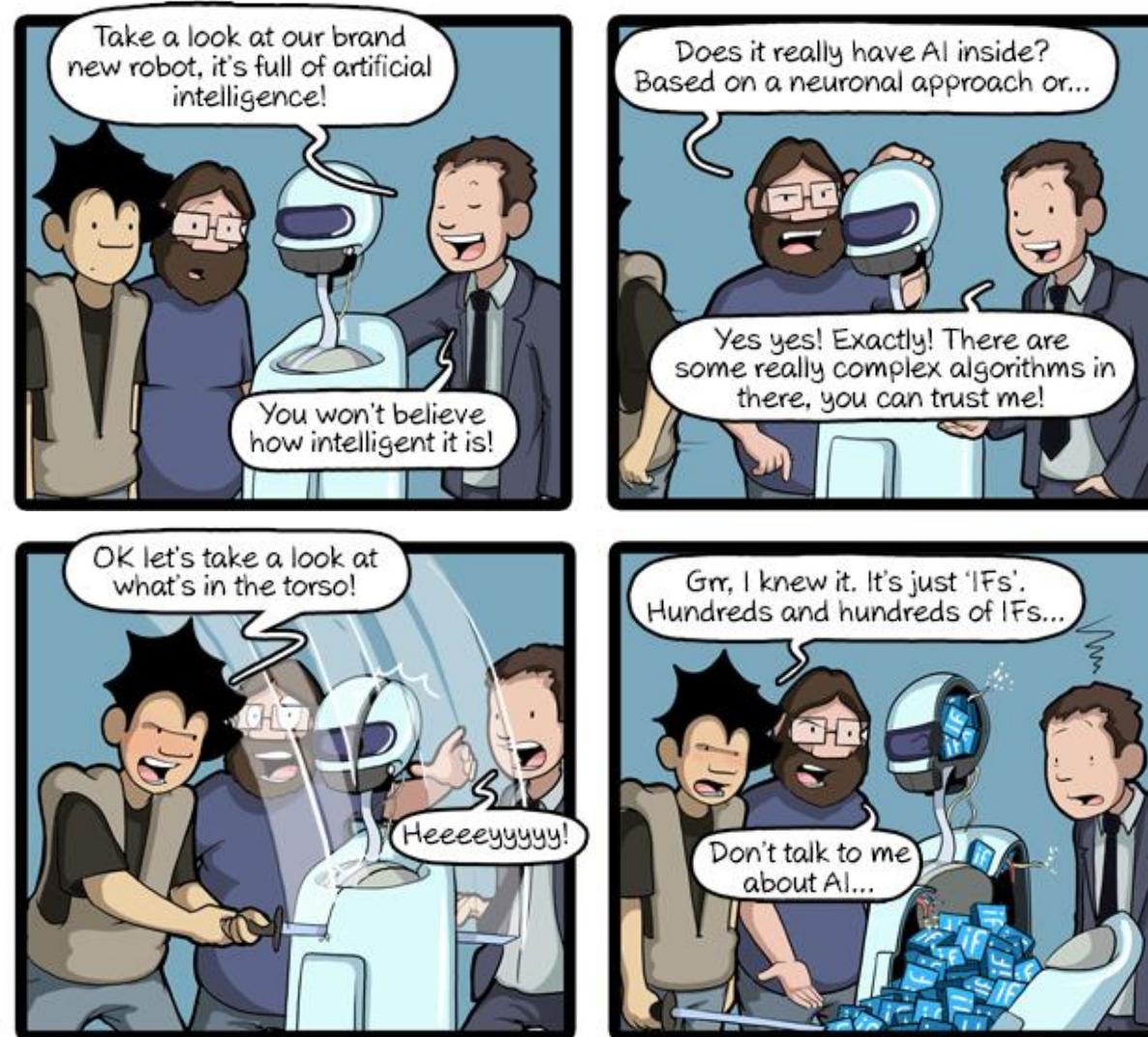
# 人類設定好的天生本能

- e.g. You want to build a Chat-bot....
  - if there is “turn off” in the input, then “turn off the music” (hand-crafted rule)
    - You can say “Please turn off the music” or “Can you turn off the music?”. Smart?
    - What if someone says “Please don’t turn off the music” .....
- Weakness of hand-crafted rules
  - Hard to consider all possibilities
    - 永遠無法超越創造者
  - Lots of human efforts (not suitable for small industry)



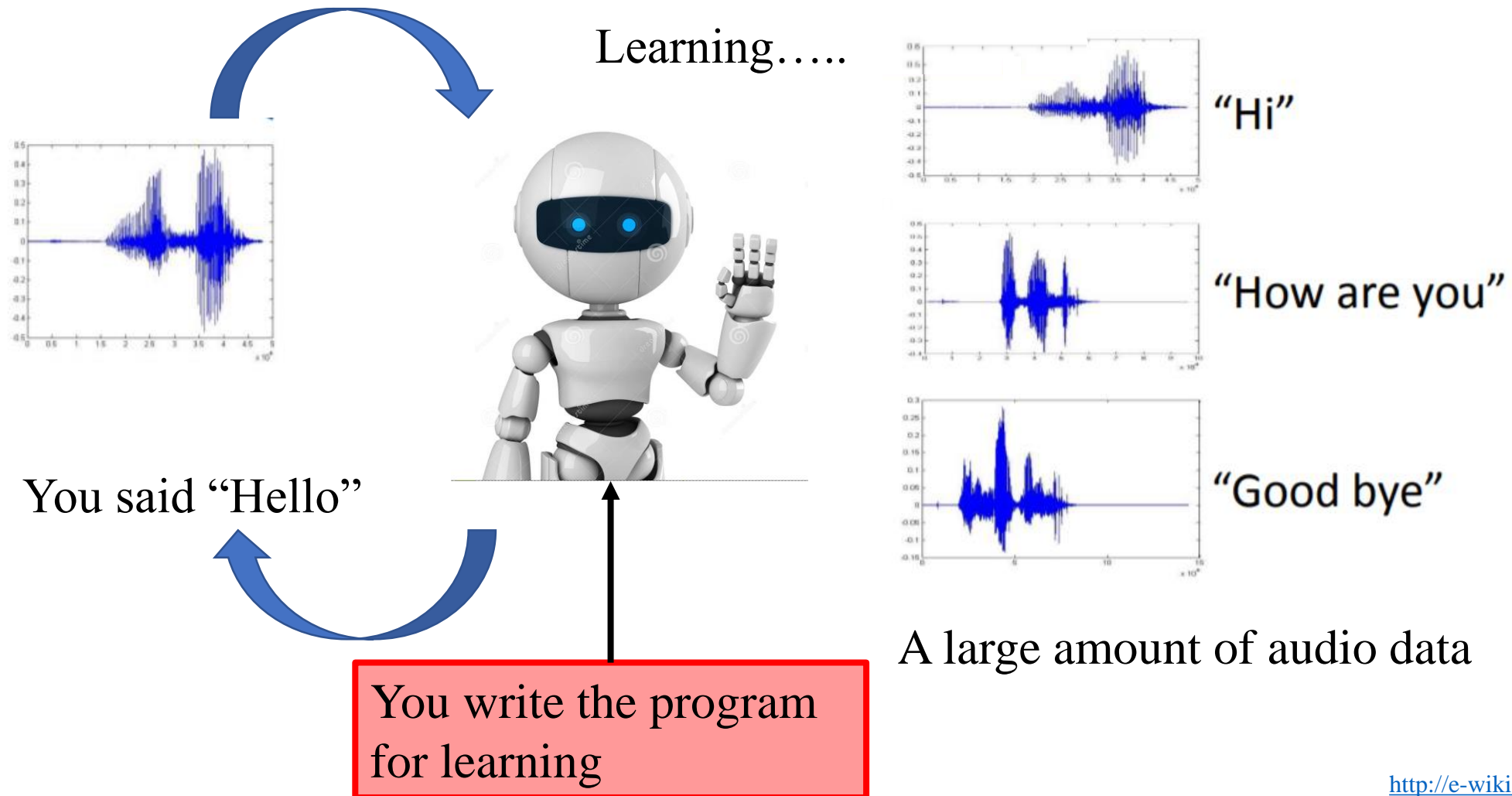
# 人類設定好的天生本能

- AI?



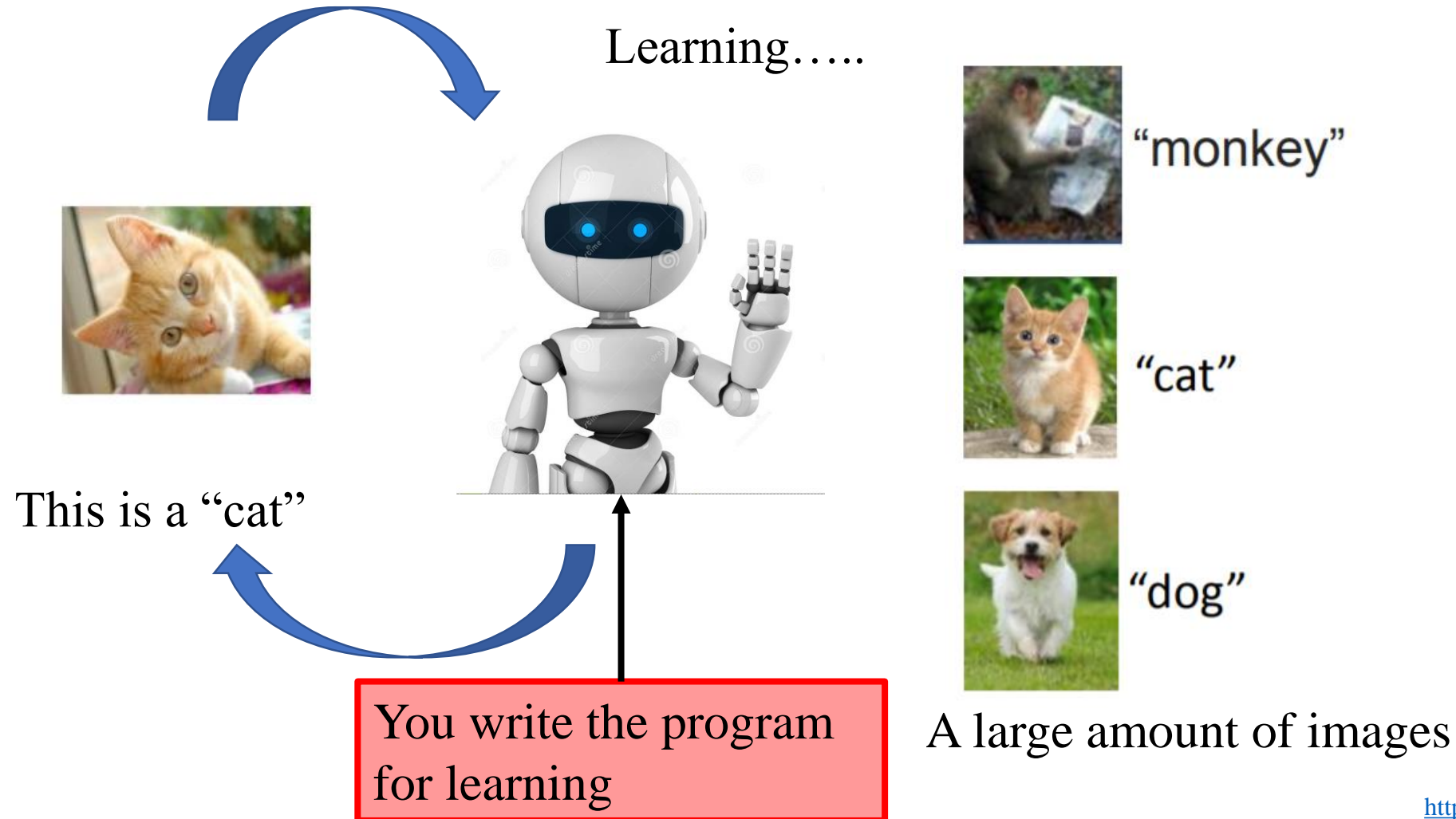


# What is Machine Learning





# What is Machine Learning







# Machine Learning $\approx$ Looking for a Function


- Speech Recognition

$$f(\text{  }) = \text{'How are you'}$$

- Image Recognition

$$f(\text{  }) = \text{'Cat'}$$

- Playing Go

$$f(\text{  }) = \text{'5 - 5'}$$

- Dialogue System

$$f(\text{'Hi'}) = \text{'Hello'}$$

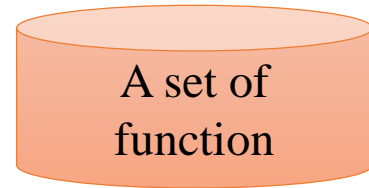


# Framework

Image Recongintion



$$f(\text{Image}) = \text{'Cat'}$$



Model

$f_1, f_2 \dots$

$$f_1(\text{Image}) = \text{'Cat'}$$



$$f_2(\text{Image}) = \text{'monkey'}$$



$$f_1(\text{Image}) = \text{'dog'}$$



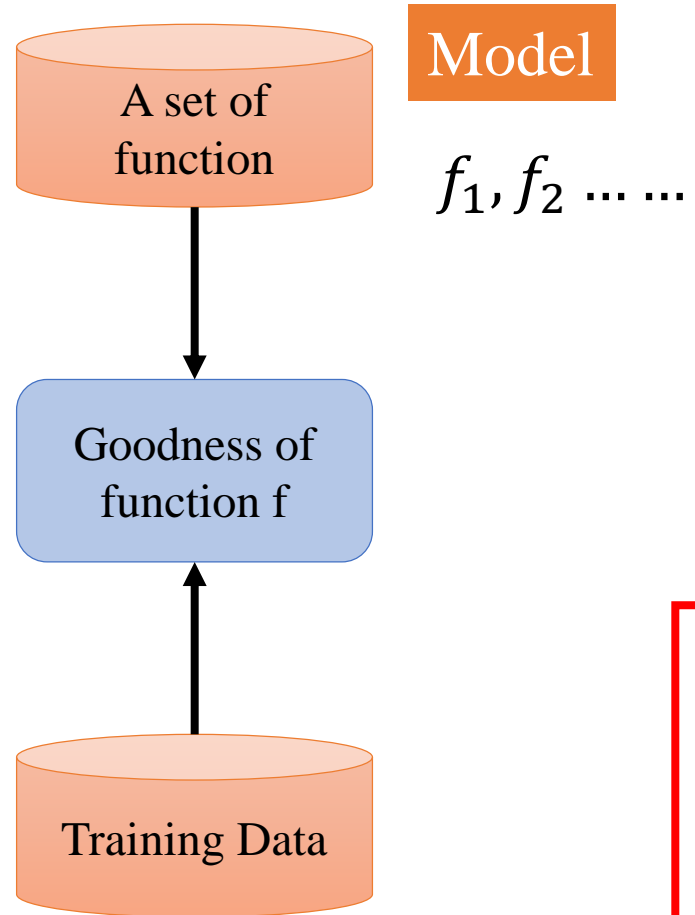
$$f_2(\text{Image}) = \text{'snake'}$$







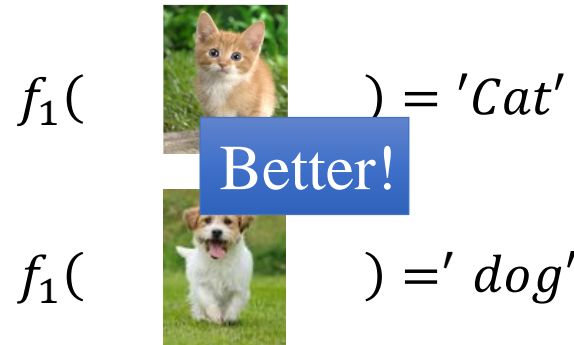
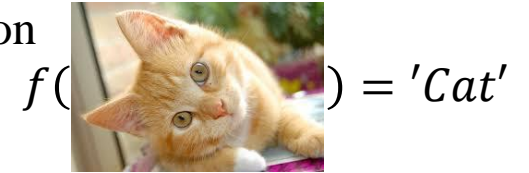
# Framework



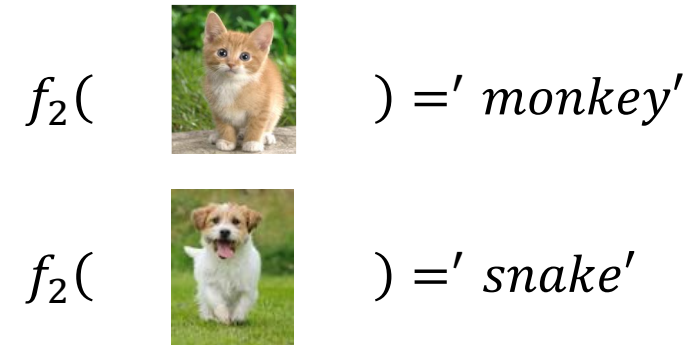
Model

$f_1, f_2 \dots$

Image Recongintion



Better!



function input:

function output: “monkey”



“cat”



“dog”

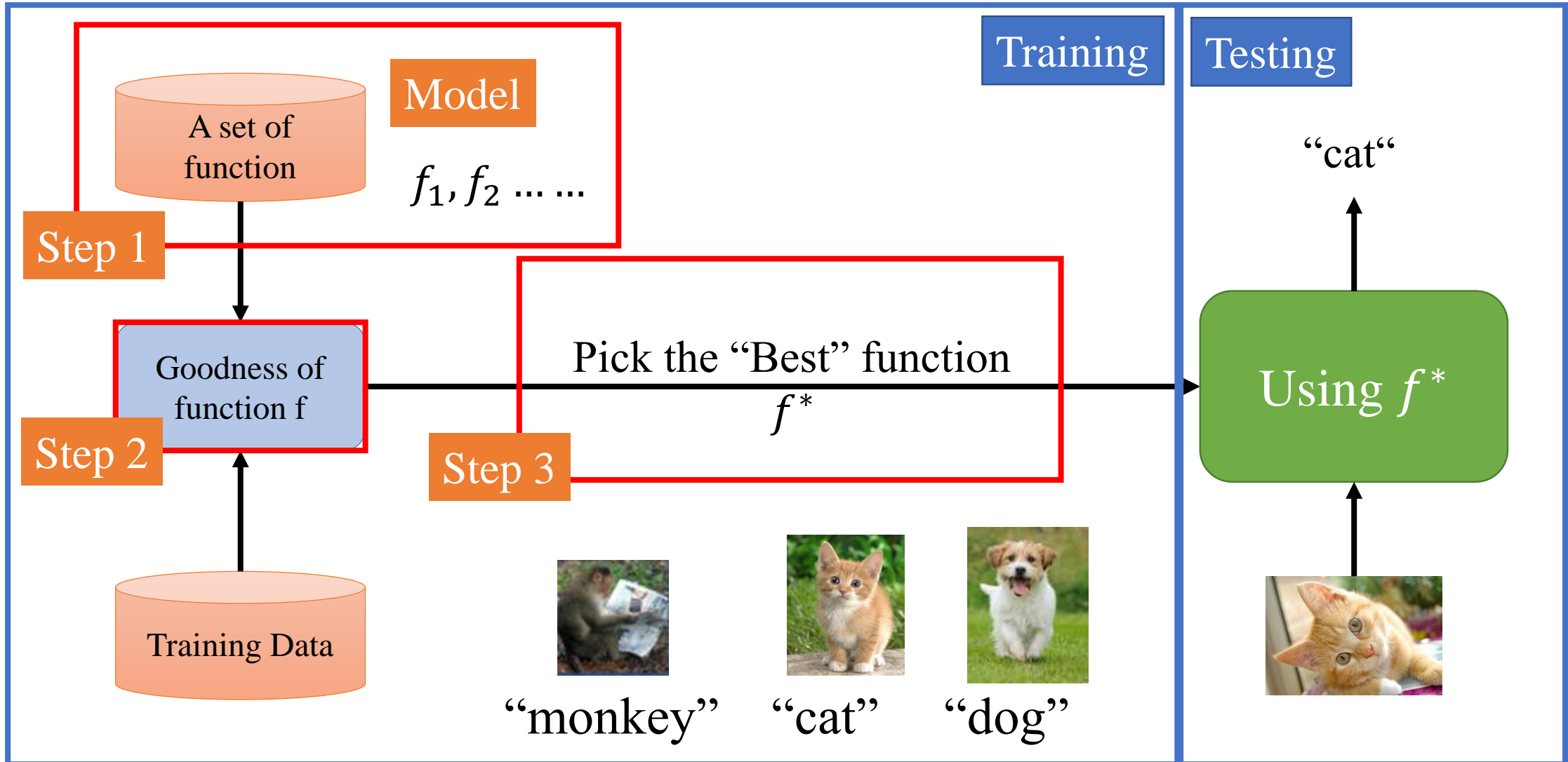


# Framework

Image Recongintion



$$f(\text{image of cat}) = \text{'Cat'}$$

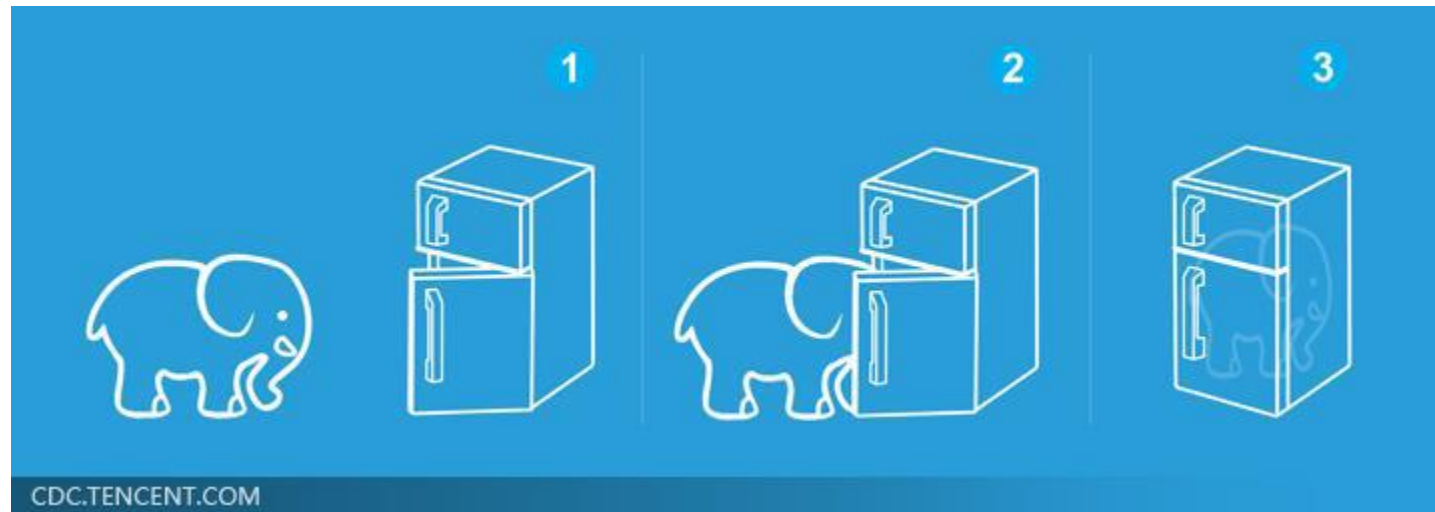




# Machine Learning is so simple.....



就好像把大象放進冰箱.....





# Scenario

Supervised  
Learning

Unsupervised  
Learning

Semi-supervised  
Learning

Reinforcement  
Learning



Regression

Classification

Structured  
Learning

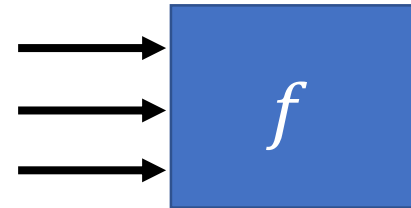


# Task - Regression

The output of the target function  $f$  is a “scalar”

預測  
PM2.5

今天上午 PM2.5  
昨天上午 PM2.5  
.....



明天上午PM2.5  
(scalar)

## Training Data:

input:

09/01 上午 PM2.5 = 63    09/02 上午 PM2.5 = 65

input:

09/12 上午 PM2.5 = 30    09/13 上午 PM2.5 = 25

Output:

09/03 上午 PM2.5 = 100

Output:

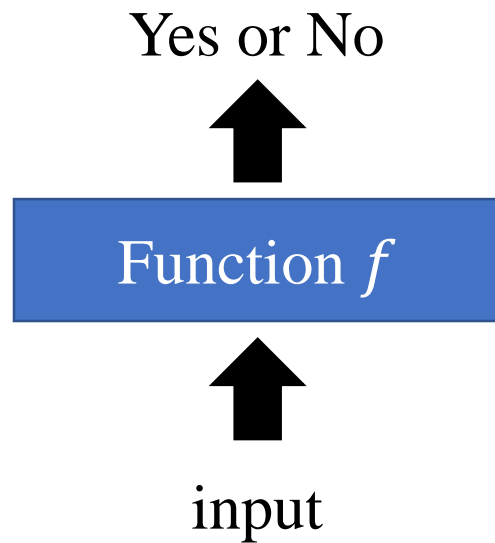
09/14 上午 PM2.5 = 20



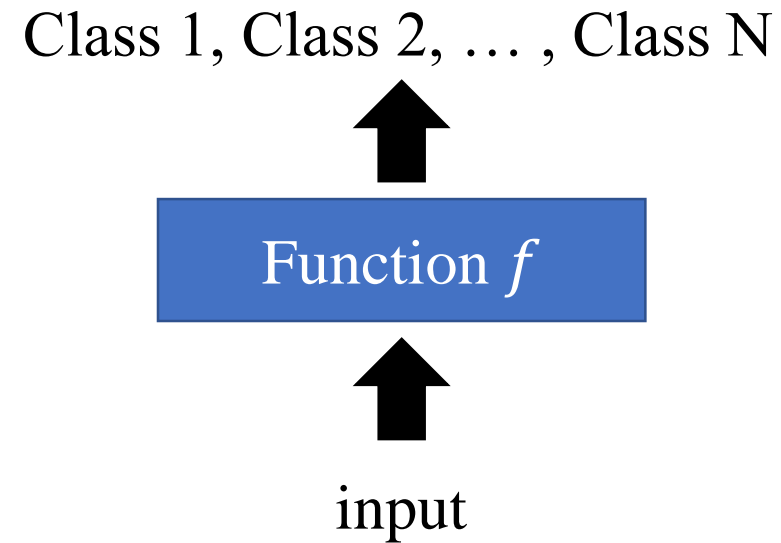


# Task - Classification

## Binary Classification



## Multi-class Classification





# Binary Classification

Spam Filter



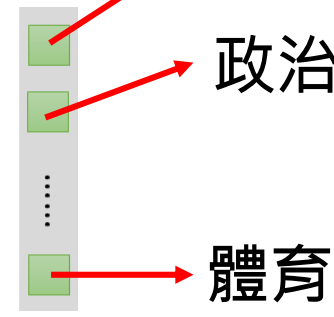


# Multi-class Classification

## Document Classification



Function  $f$



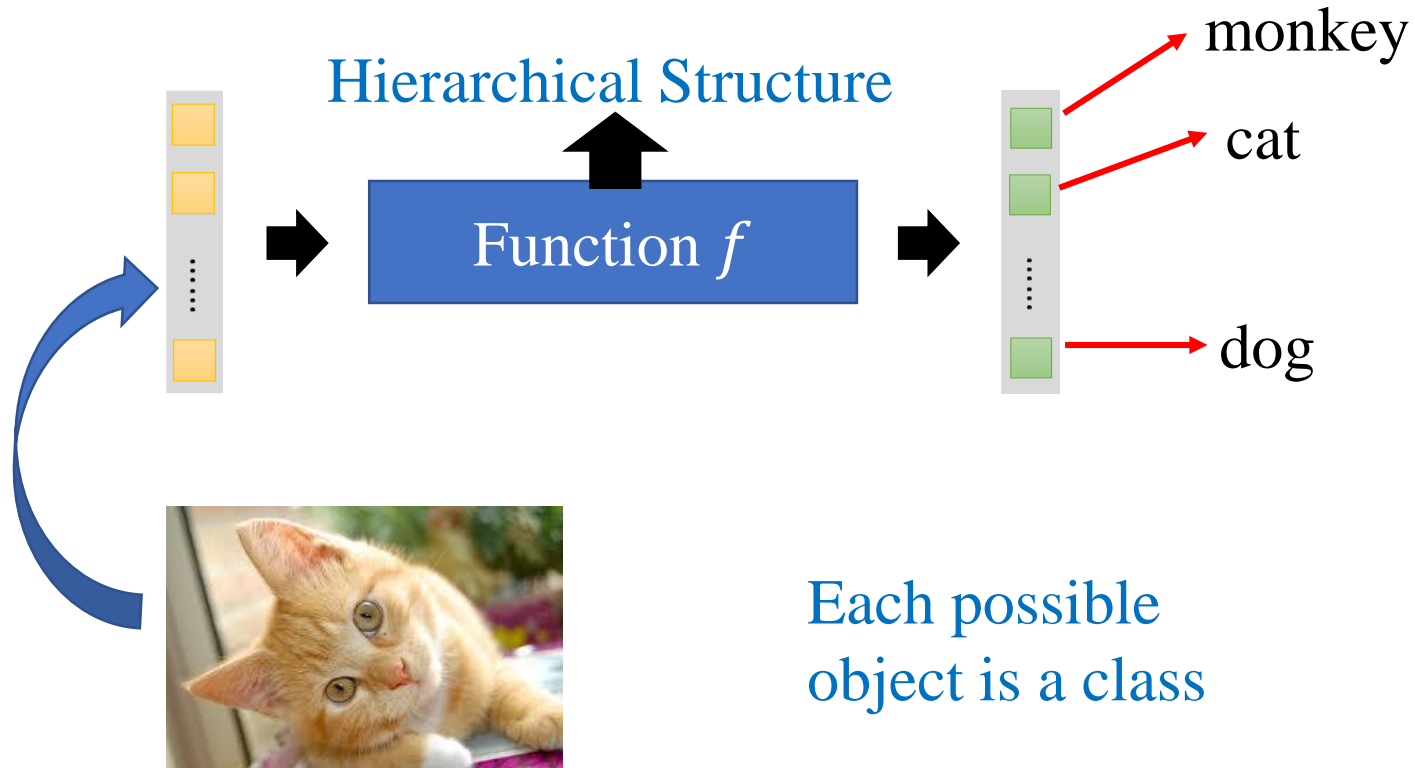
### Training Data

經濟政治體育



# Classification – Deep Learning

## Image Recognition



## Training Data



monkey



cat



dog



# Classification – Deep Learning

Playing Go



Function  $f$

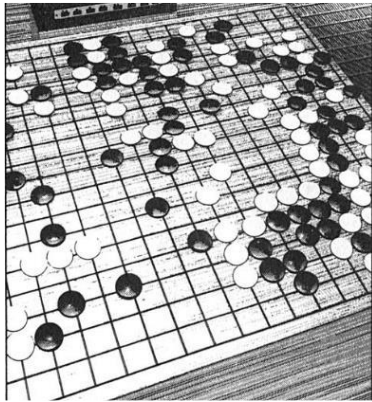


Next move

Each position  
is a class

(19 x 19 classes)

Training Data



一堆棋譜

進藤光 v.s. 社清春

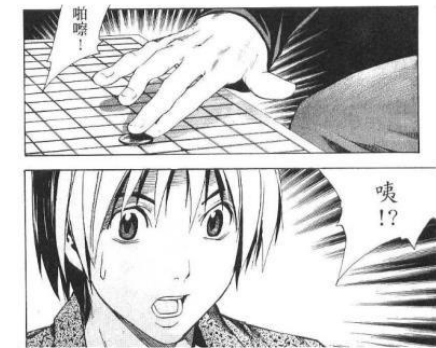
黑：5之五



白：天元



黑：五之5





# Classification – Deep Learning

Playing Go



Function  $f$

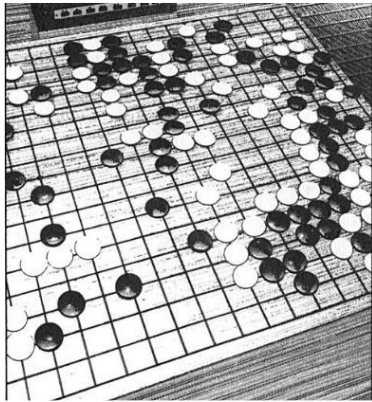


Next move

Each position  
is a class

(19 x 19 classes)

Training Data



一堆棋譜

進藤光 v.s. 社清春

黑 : 5之五 → 白 : 天元 → 黑 : 五之5

input:

黑 : 5之五



output:

天元

input:

黑 : 5之五、白 : 天元



output:

五之5





# Supervised Learning

- Training Data : **input / output pair** of target function
- Function output = label
- Hard to collect a large amount of labelled data



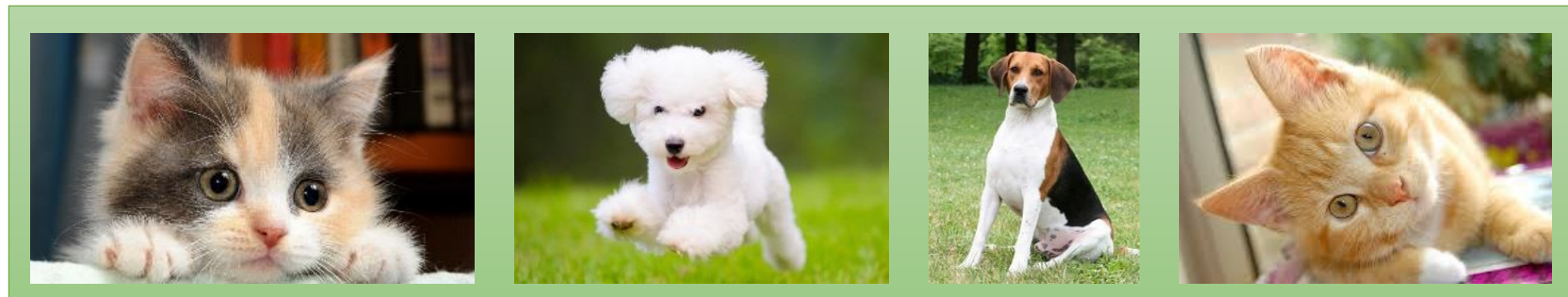
# Semi-supervised Learning

For example, recognizing cats and dogs

labelled data



unlabelled data

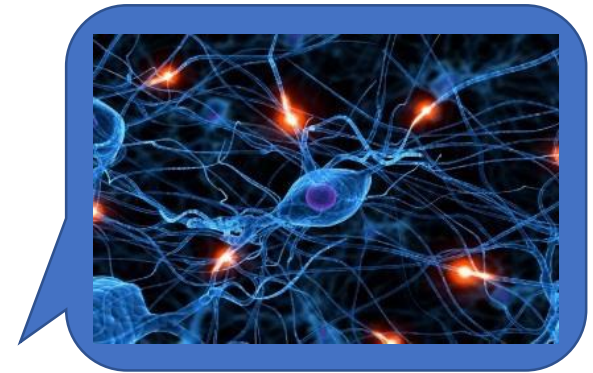
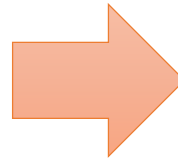


(images of cats and dogs)



# Unsupervised Learning

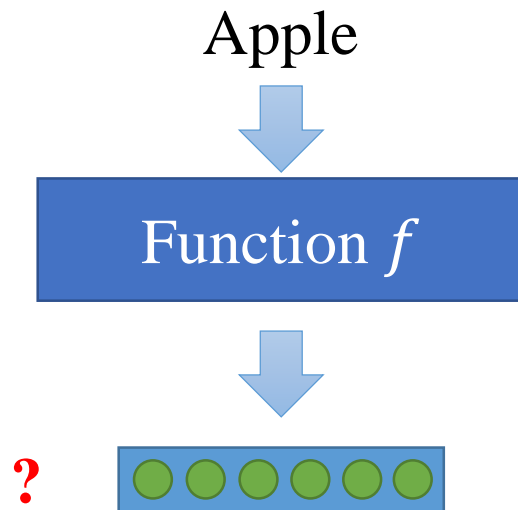
Machine Reading : Machine learns the meaning of words from reading a lot of documents





# Unsupervised Learning

Machine Reading : Machine learns the meaning of words from reading a lot of documents

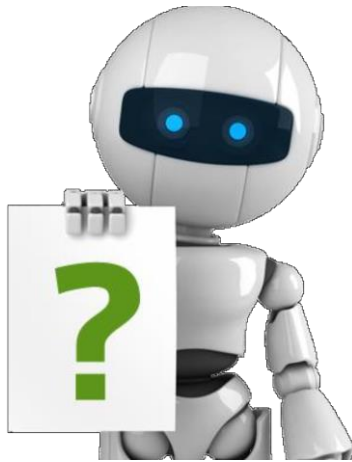


Training data is a lot of text

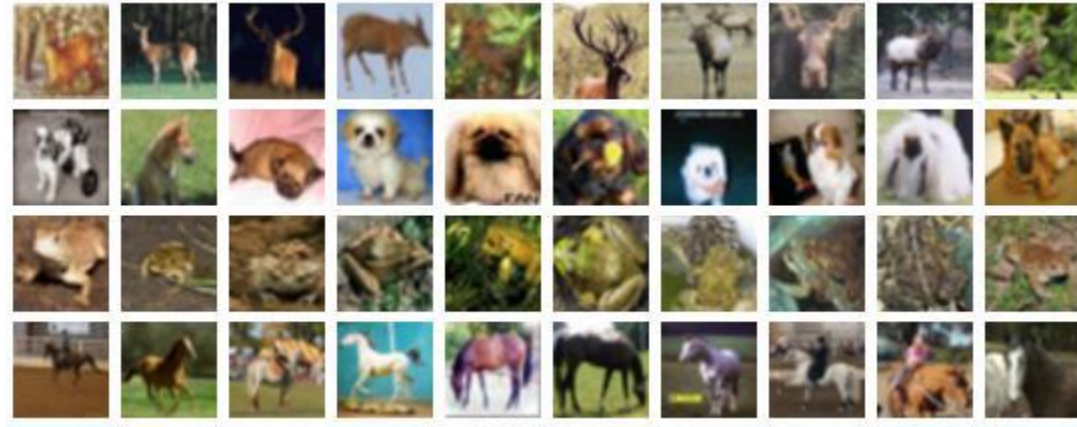




# Unsupervised Learning



Draw something!







# Unsupervised Learning

- Machine Drawing

?



Function  $f$



Training data is a lot of images







# Reinforcement Learning





# Supervised v.s. Reinforcement

## Supervised

Learning from  
teacher



“Hello”

say “Hi”



“Bye Bye”

say “Good bye”

## Reinforcement



.....

Learning from  
critics

Hello 😊

Agent



.....

.....

Agent

.....



Bad



# Supervised v.s. Reinforcement

Supervised



next move:  
“5-5”



next move:  
“3-3”

Reinforcement

First move



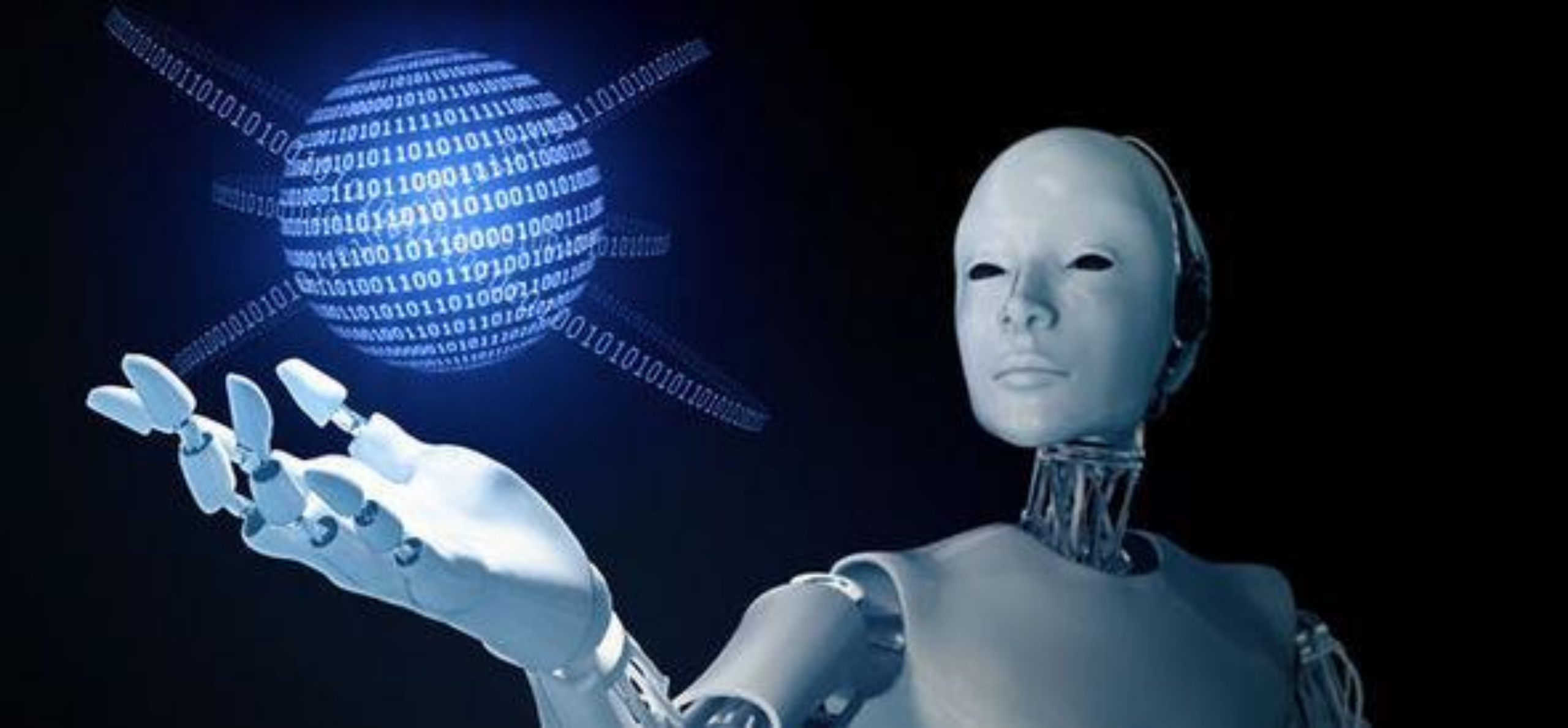
..... many moves .....



Win!

Alpha Go is supervised learning + reinforcement learning.





AI 即將取代部份工作？



# AI 訓練師

機器不是會自己學嗎？  
為什麼需要 AI 訓練師



戰鬥是寶可夢在打  
為什麼需要寶可夢訓練師？







# AI 訓練師

Step 1:  
define a set of  
function



Step 2:  
goodness of  
function



Step 3:  
pick the best  
function

## 寶可夢訓練師

- 要挑選適合的寶可夢來戰鬥
  - 寶可夢有不同屬性

## AI 訓練師

- 要挑選合適的 model 與 loss function
  - 不同的 model 與 loss function 適合解決不同的問題

真的沒有問題嗎



# AI 訓練師

Step 1:  
define a set of  
function



Step 2:  
goodness of  
function



Step 3:  
pick the best  
function

## 寶可夢訓練師

- 要挑選適合的寶可夢來戰鬥
  - 寶可夢有不同屬性
- 召喚出來的寶可夢不一定聽話
  - e.g. 小智的噴火龍
  - 需要有經驗的寶可夢訓練師

## AI 訓練師

- 要挑選合適的 model 與 loss function
  - 不同的 model 與 loss function 適合解決不同的問題
- 不一定能找出 best function
  - e.g. Deep Learning
  - 需要有經驗的 AI 訓練師



Thanks!