深度學習及其應用

深度學習的發展

2016
DL逐漸普及於世界
結合GPU, Spark ...

深度學習工具增加
並運用在商業上

2015

Deep Mind
研發深度增強學習
- AlphGo

2014

Google Brain
將這些 Youtube 截圖分辨出
人臉、身體、貓

2012

Google, 微軟
在語音辨識上降低
錯誤率20-30%

2011

2010

2006

多倫多大學研究出
多層有很強的
特徵學習能力

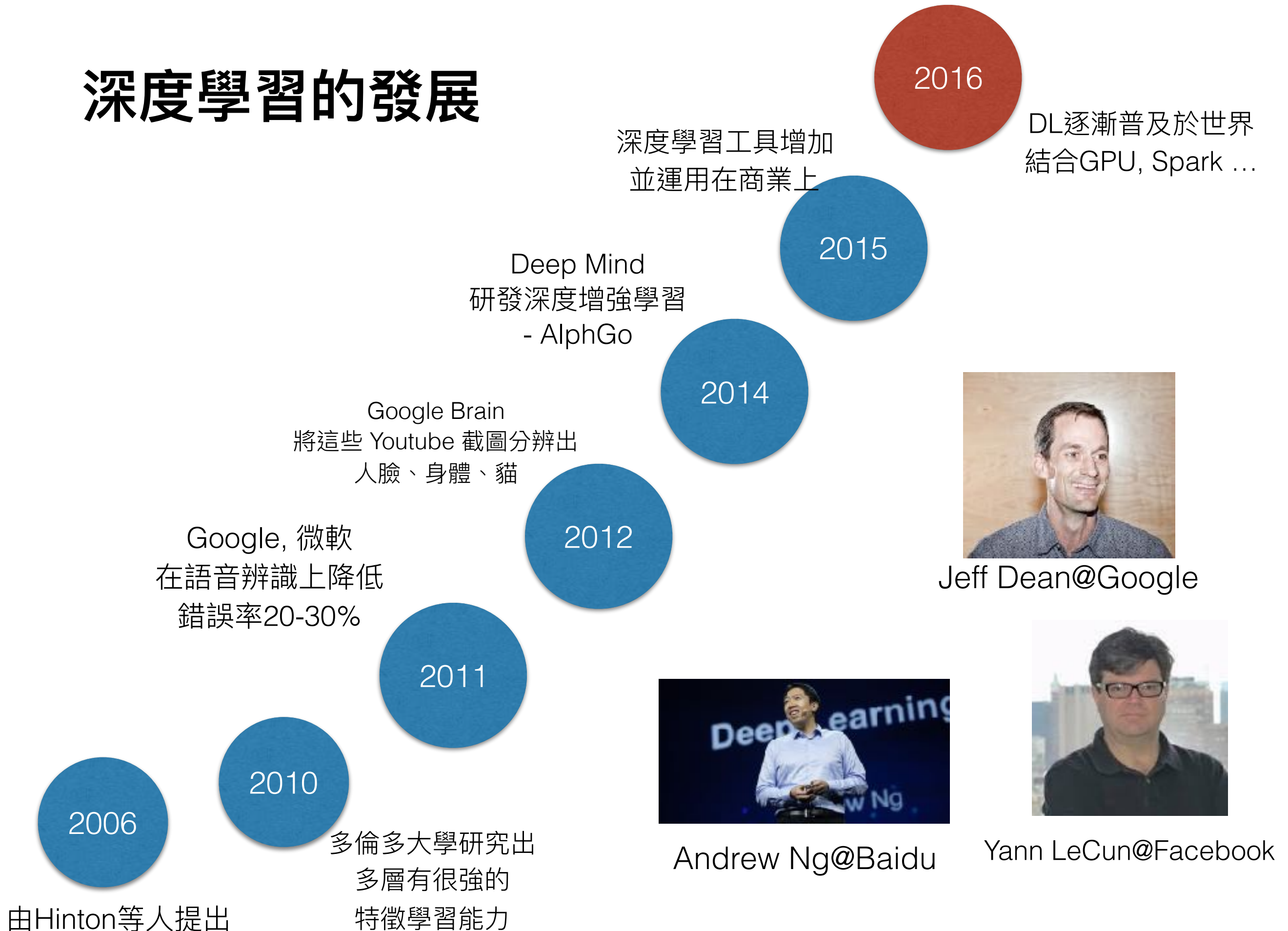由Hinton等人提出
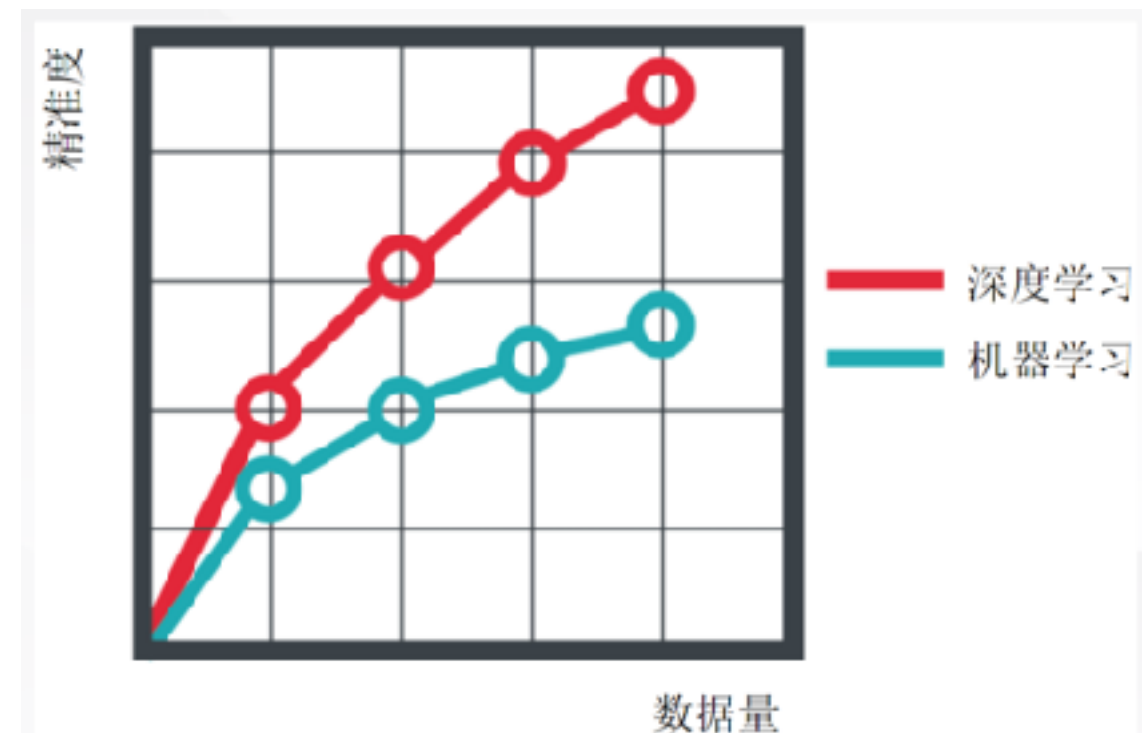

Jeff Dean@Google

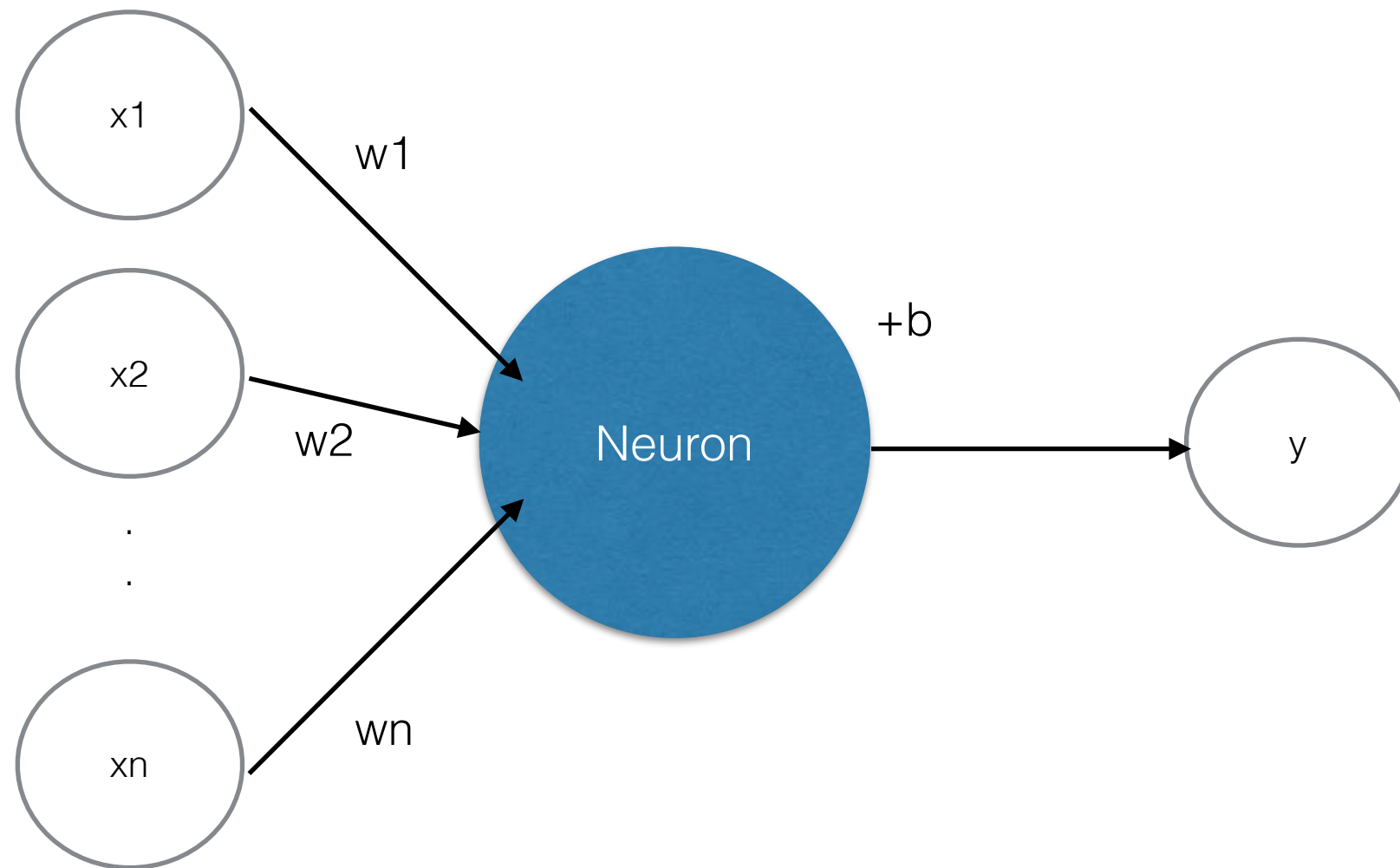Andrew Ng@Baidu

Yann LeCun@Facebook

Deep Learning 優點

- 數據量、特徵量增加, 準確度明顯提昇

- 自動辨識何種特徵對哪些神經元重不重要

- 低層次學到高層次

- 高度客製化

從迴歸到類神經

Linear Regression

從迴歸到類神經

Logistic Regression
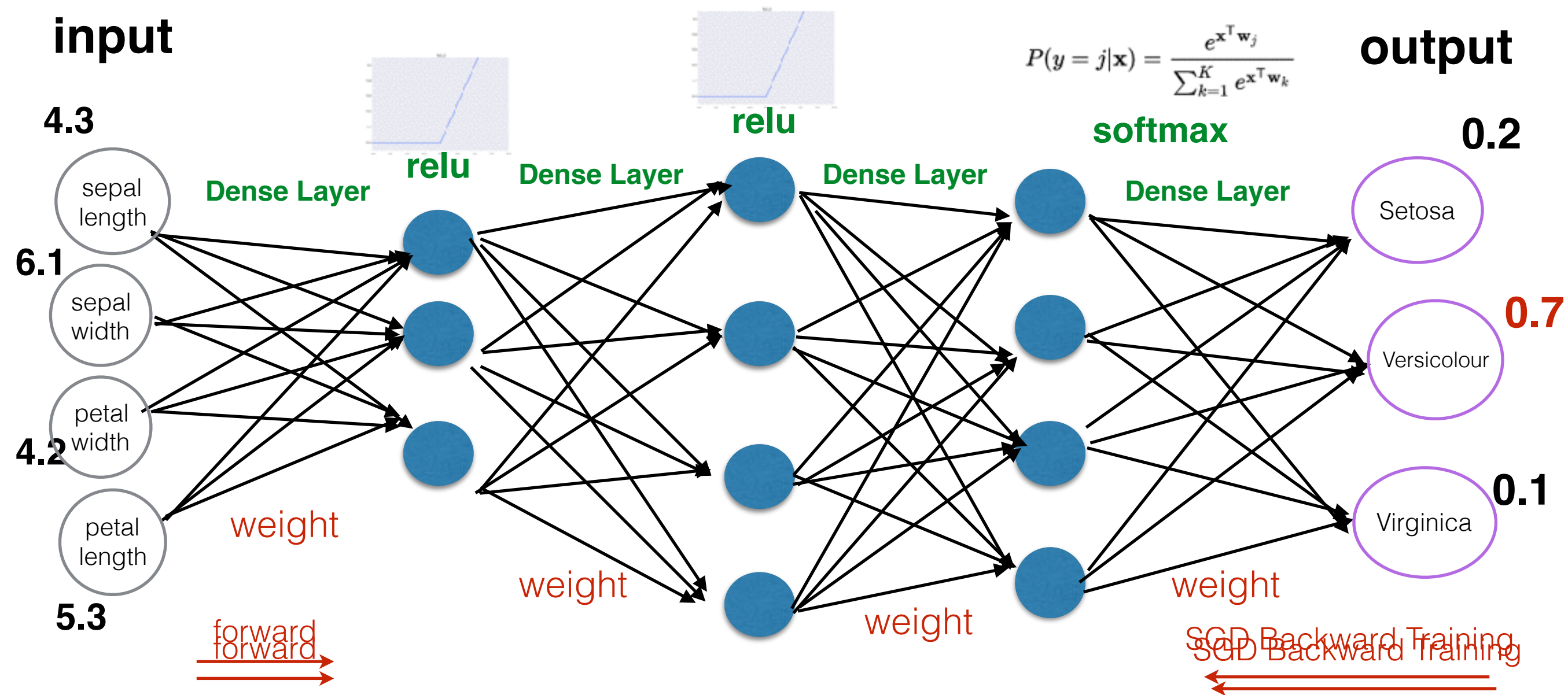
從迴歸到類神經

Fully Connected Layer

SGD training

$$P(y = j | \mathbf{x}) = \frac{e^{\mathbf{x}^T \mathbf{w}_j}}{\sum_{k=1}^{K} e^{\mathbf{x}^T \mathbf{w}_k}}$$

+b

x1

x2

.
.

xn

y1   0.3

y2   0.7
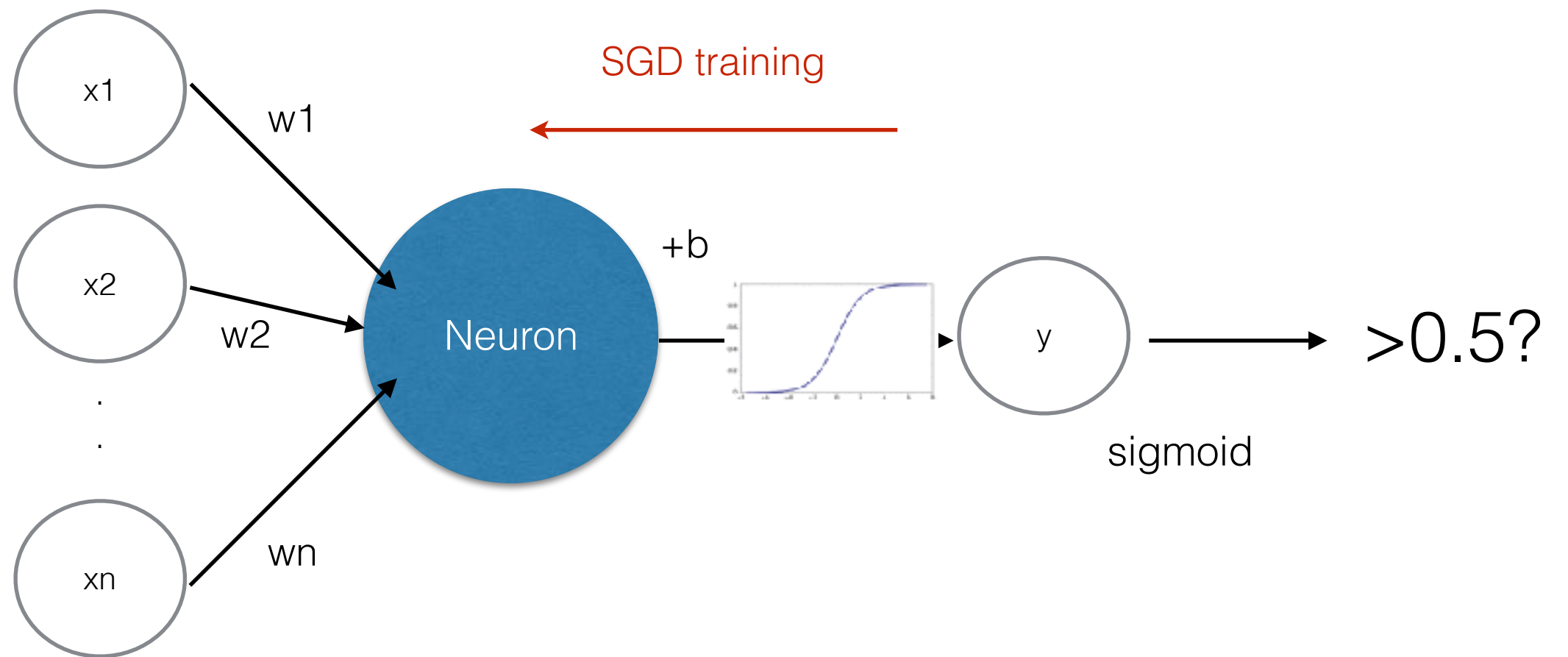
Softmax function
轉成機率
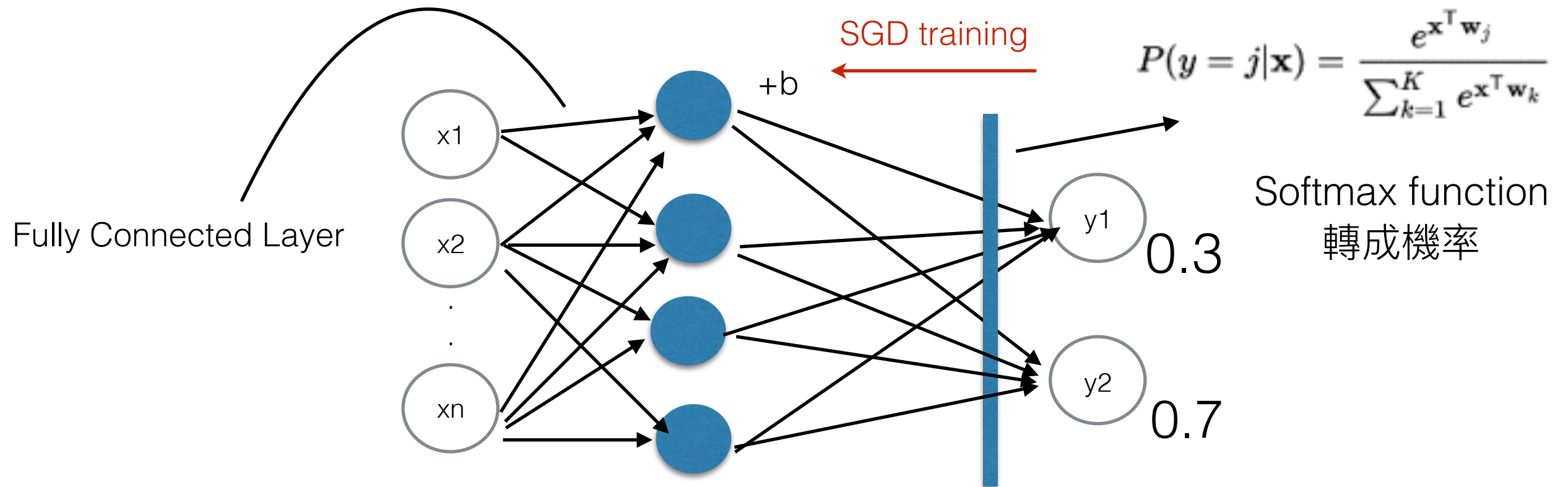
Softmax Neural Network

從類神經到深層類神經？

我們來建模吧！- 多層類神經網路替IRIS分類

input

output

4.3

relu

relu

softmax

0.2

$$P(y=j|\mathbf{x}) = \frac{e^{\mathbf{x}^\top \mathbf{w}_j}}{\sum_{k=1}^{K} e^{\mathbf{x}^\top \mathbf{w}_k}}$$

sepal length

Dense Layer

Dense Layer

Dense Layer

Dense Layer

Setosa

6.1

sepal width

0.7

Versicolour

petal width

4.2

weight

Virginica

0.1

petal length

weight

weight

weight

5.3

forward
forward

SGD Backward Training
SGD Backward Training

loss function to minimize:
cross entropy

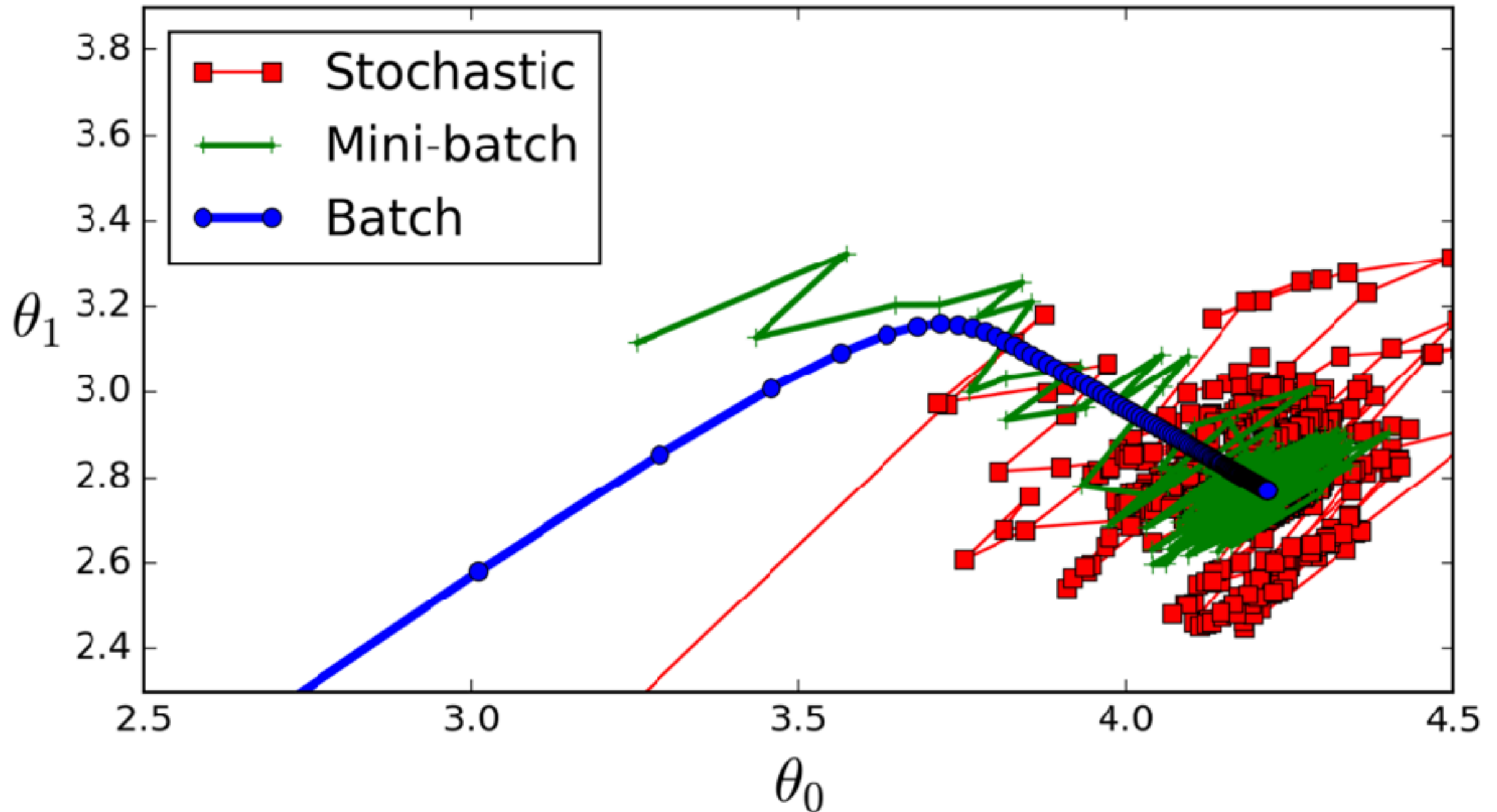Test result: **97%!!**

Gradient Descent
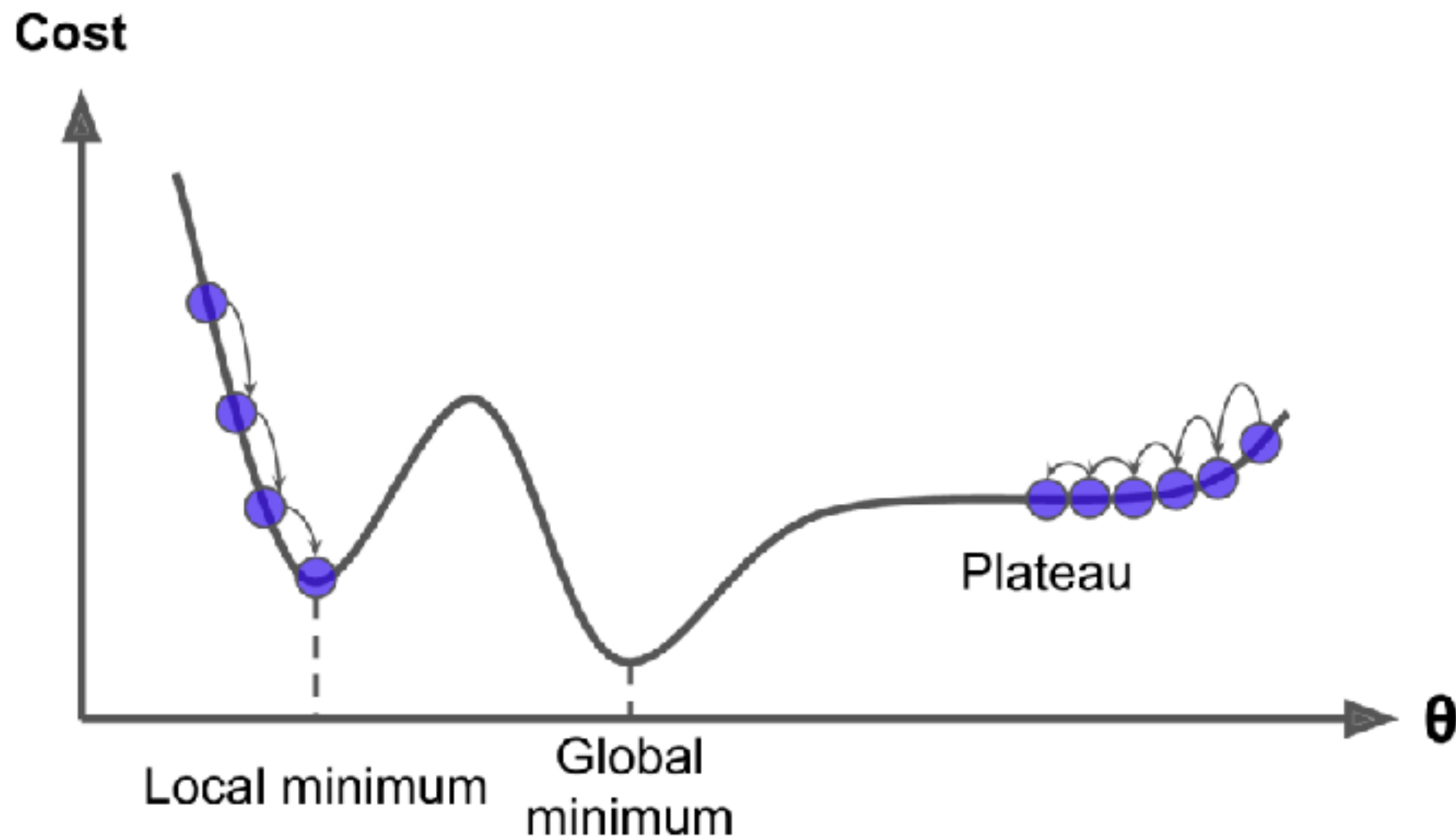
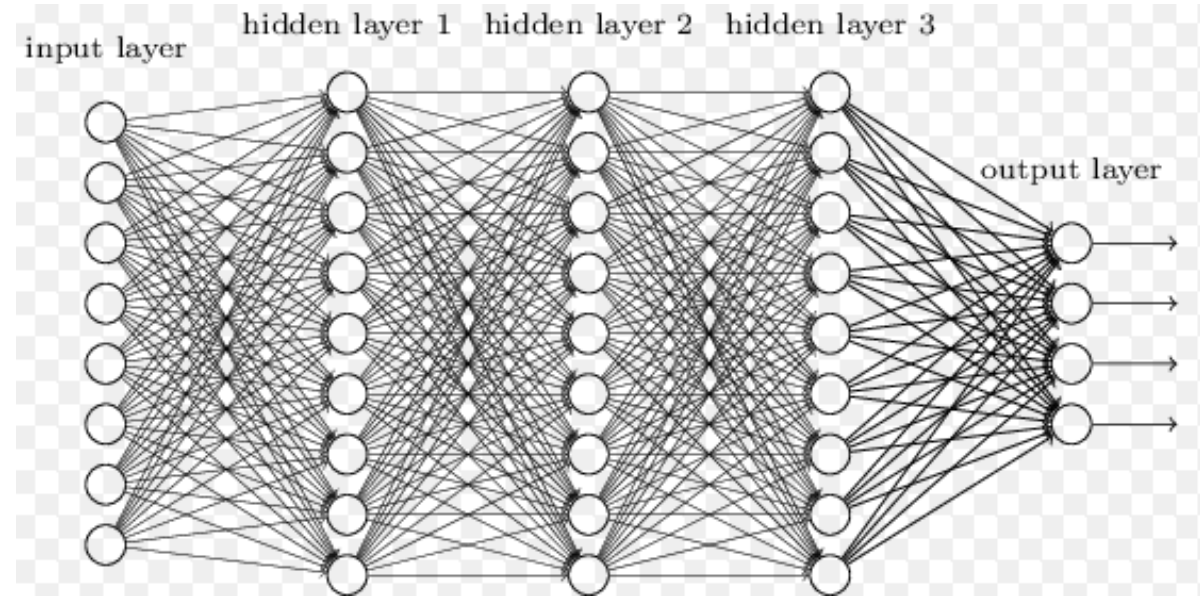Figure 4-5. Gradient Descent pitfalls

Gradient Descent

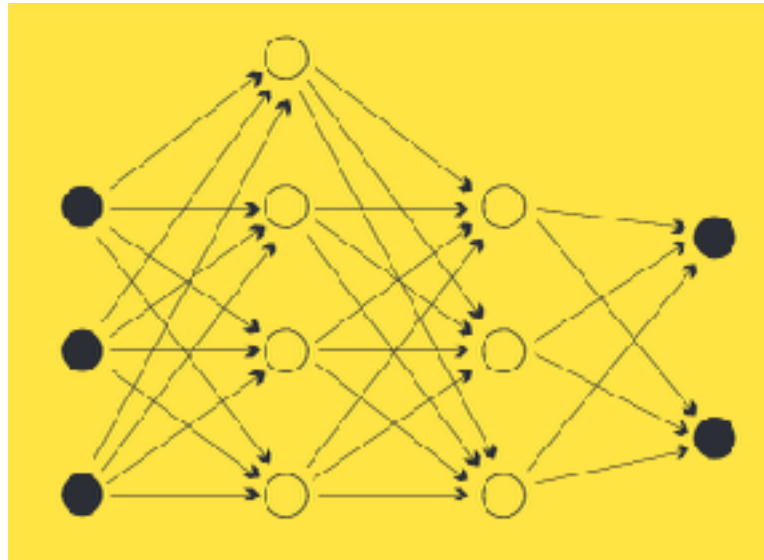# Dropout!

Dropout is a kind of ensemble.

Training of Dropout

minibatch 1   minibatch 2   minibatch 3   minibatch 4

M neurons

↓

2^M possible networks
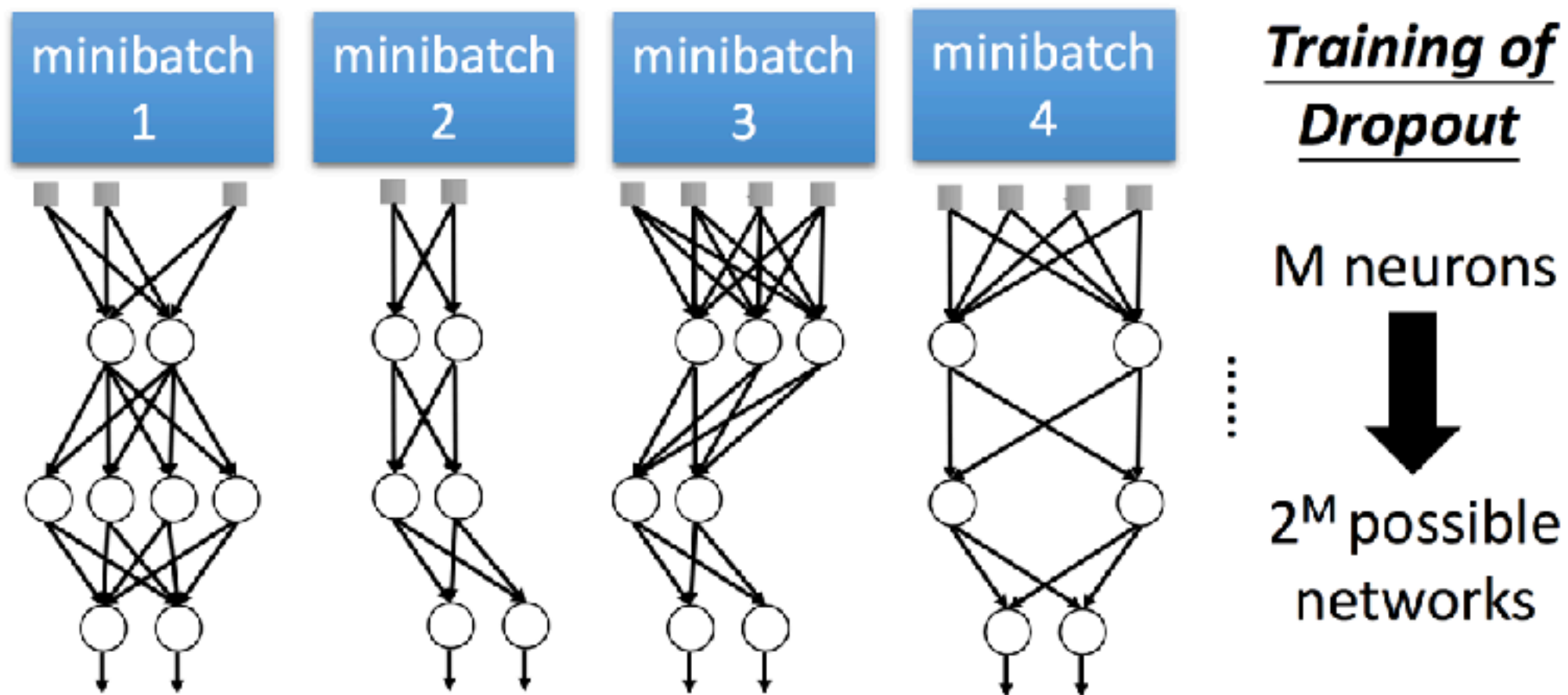
➢ Using one mini-batch to train one network
➢ Some parameters in the network are shared

類神經1號進化 - Deep Neural Network (DNN)

iris classification:
accuracy 83% -> **97%**

ATM location predict:
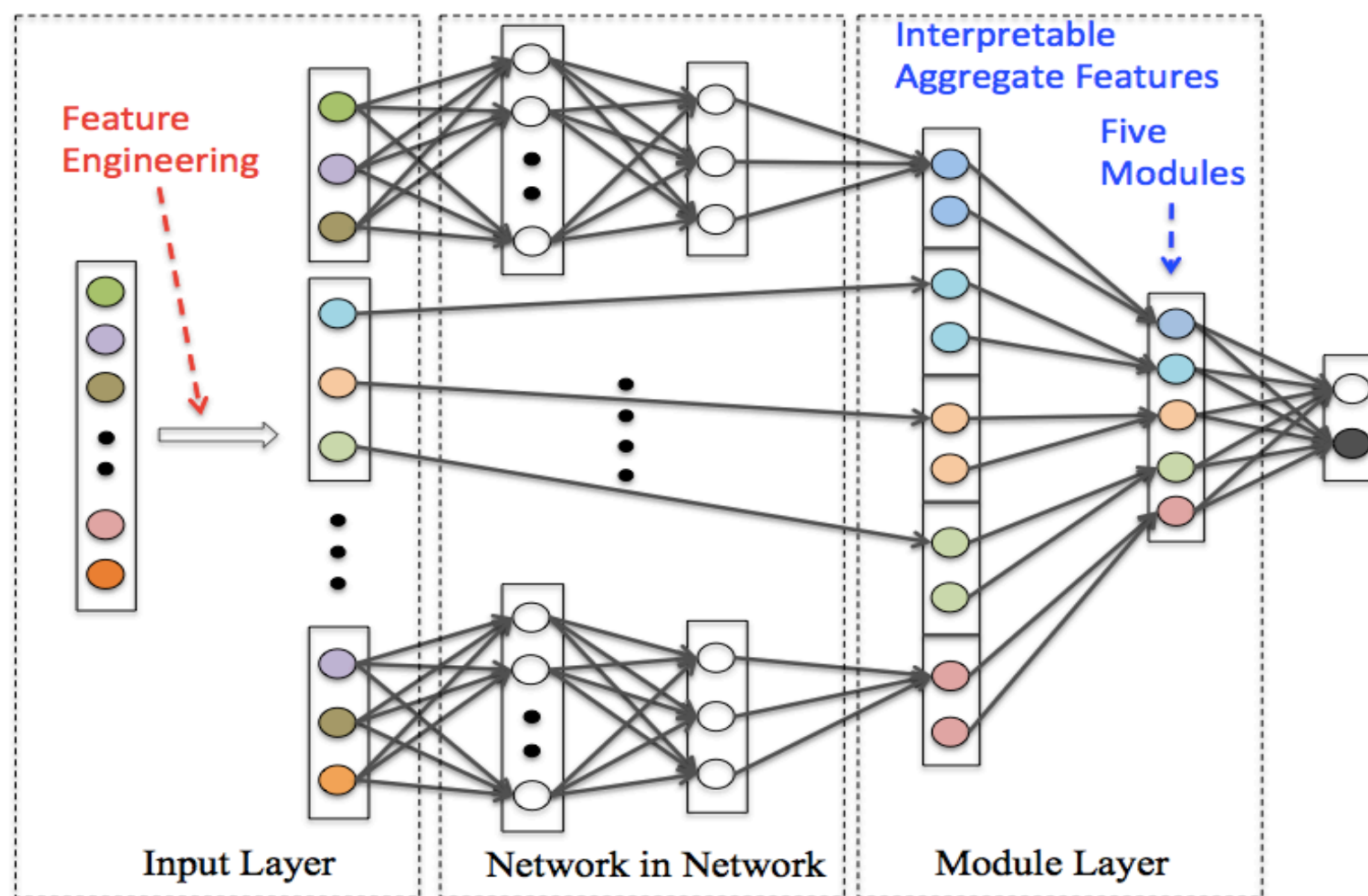error rate from 15% -> **5%**
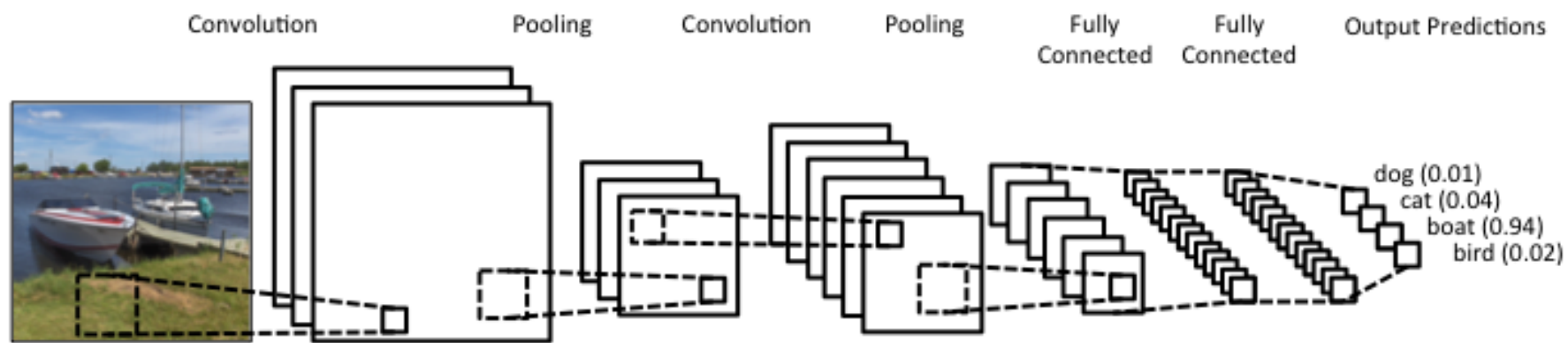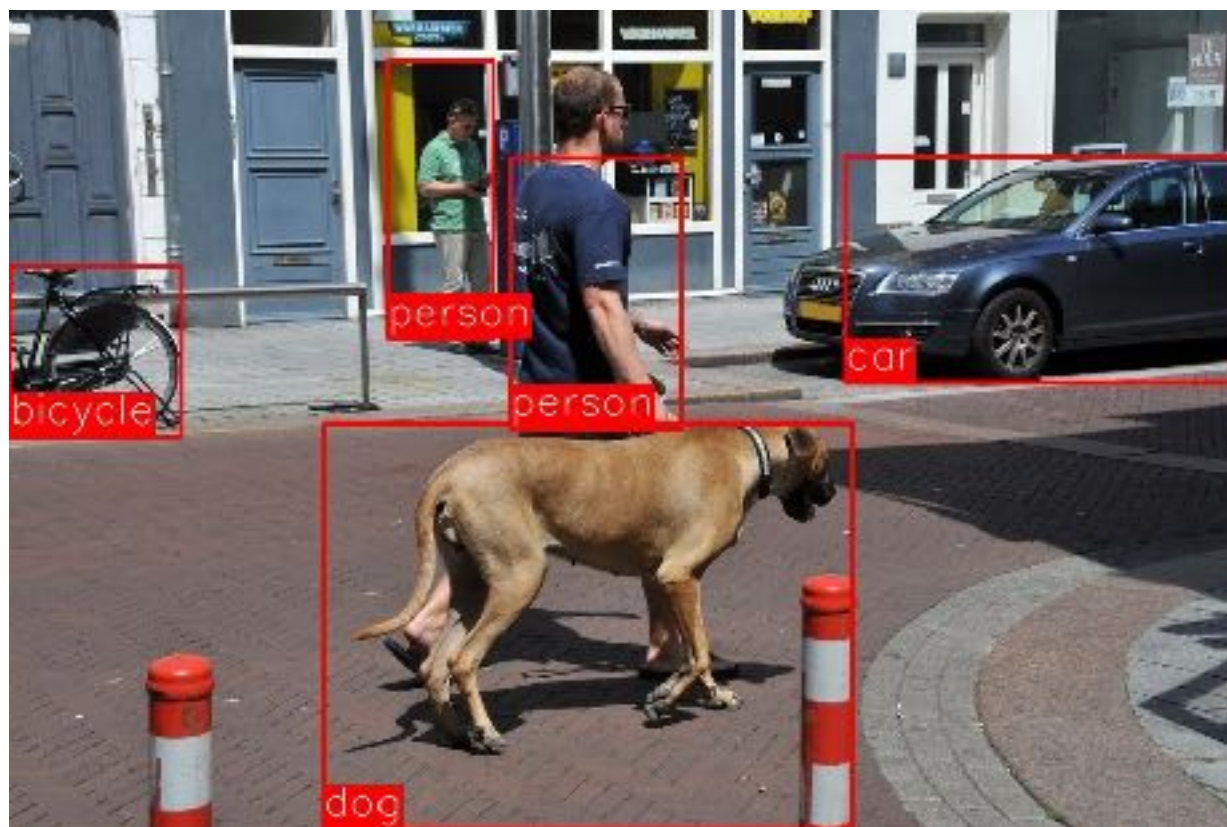
From Logistic Regression to DNN

芝麻信用

用DNN預測違約與信用分數

類神經2號進化 - Convolution Neural Network (CNN)

圖像分類

即時物件偵測
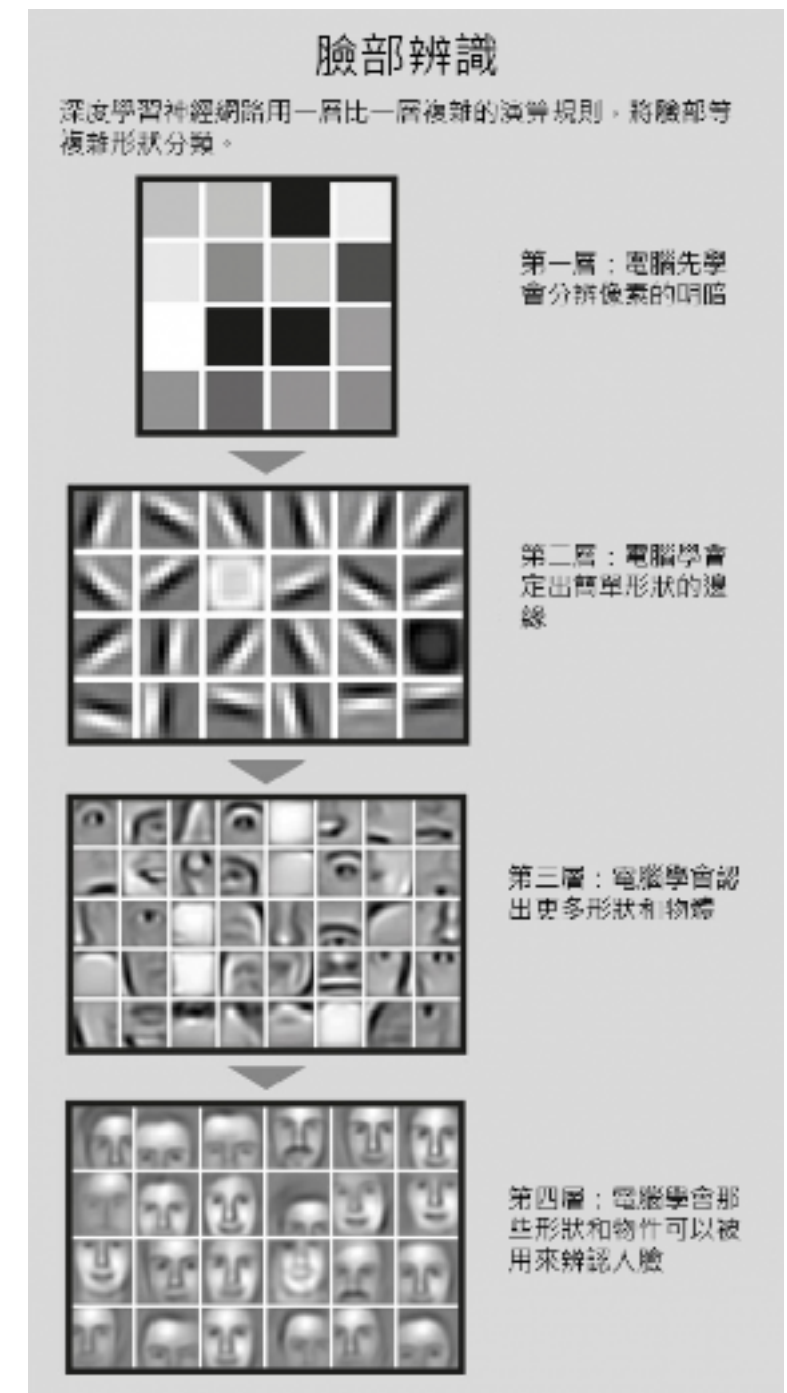
證件智能審核

微笑测信用
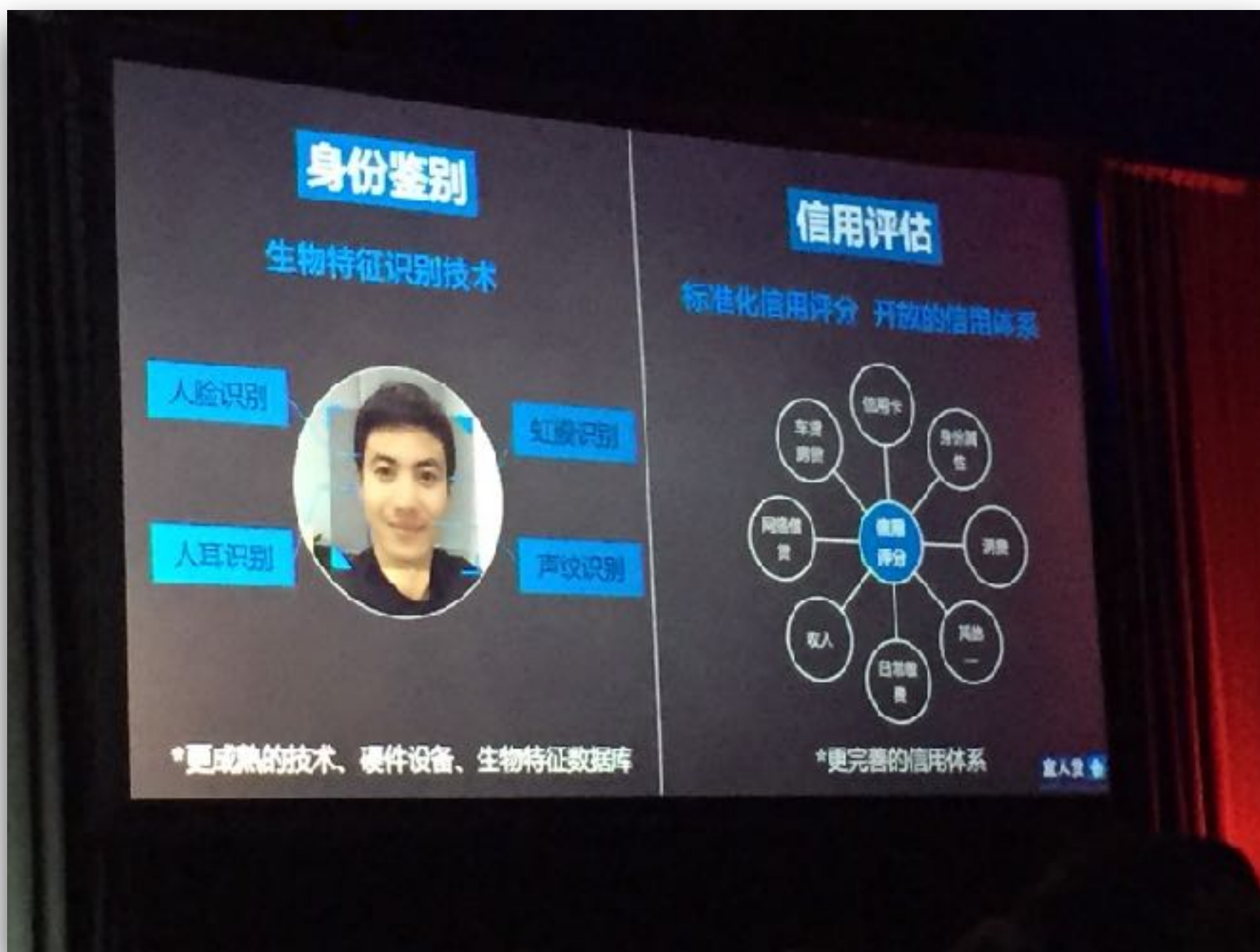
類神經3號進化 - Recurrent Neural Network (RNN)

Output Layer

Hidden Layer

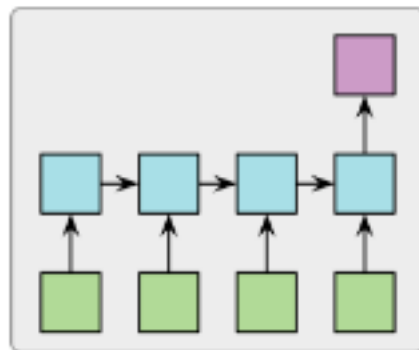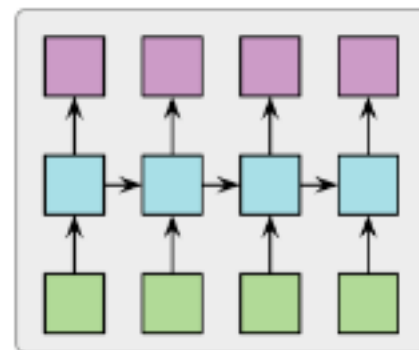Input Layer
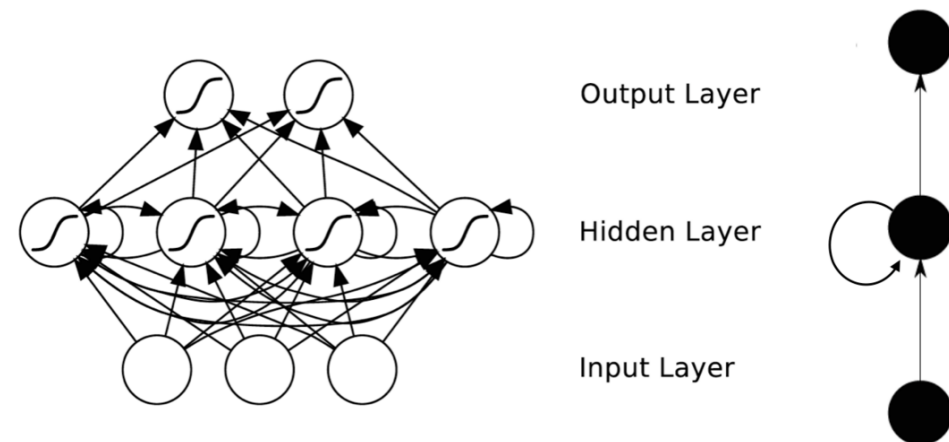
Time series dependent
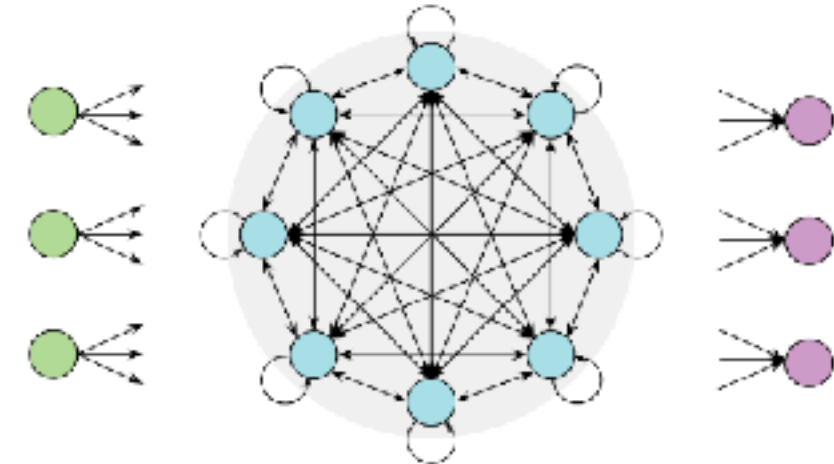
Recurrent Network with Output Projection
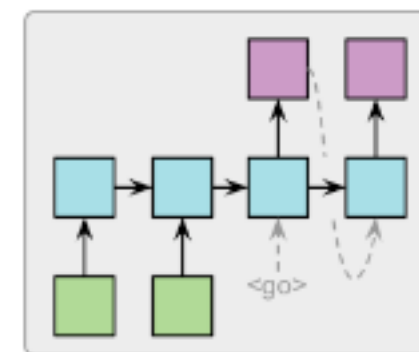
Sequence Classification
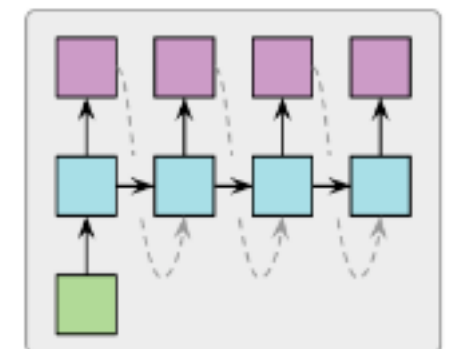
字句、文章、語音分類

Sequence Labelling

影像、語音貼標
詞性、人名等辨識

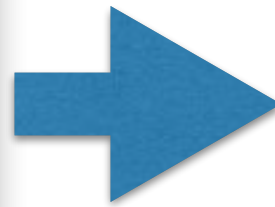Sequence Translation

多國翻譯

\<go\>

Sequence Generation

Story teller

Story teller

Image

We were barely able to **catch the breeze at the beach** , and it felt as if someone stepped out of my mind . She was in love with him for the first time in months , so she had no intention of escaping . **The sun had risen from the ocean** , making her feel more alive than normal . She 's beautiful , but the truth is that I do n't know what to do . The sun was just starting to fade away , leaving people scattered around the **Atlantic Ocean** . I d seen the men in his life , **who guided me at the beach once more .**

Love story

智能客服
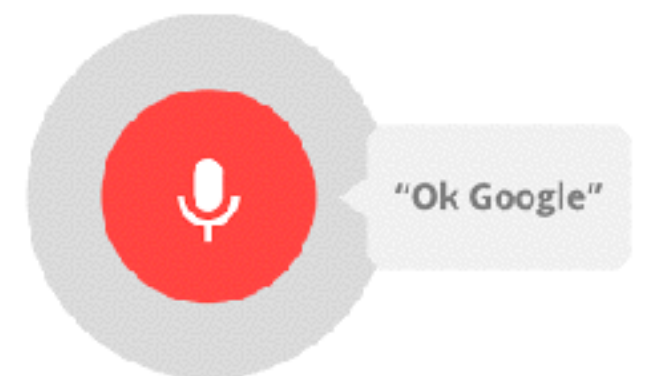
Word Vector (Word2Vec)

Deep Autoencoder

Encoding DBN

Decoding DBN

Input

Output
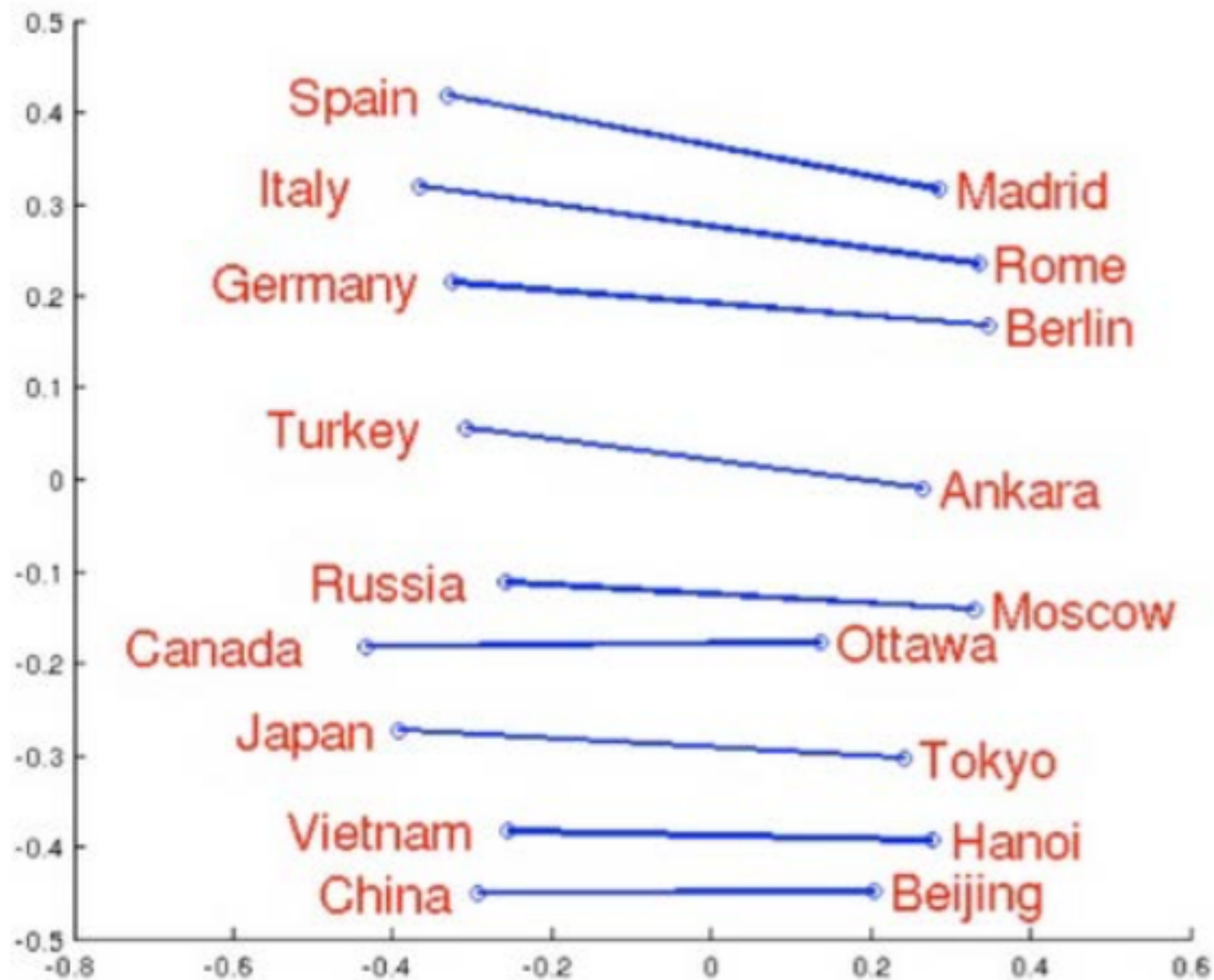
Compressed
Feature Vector
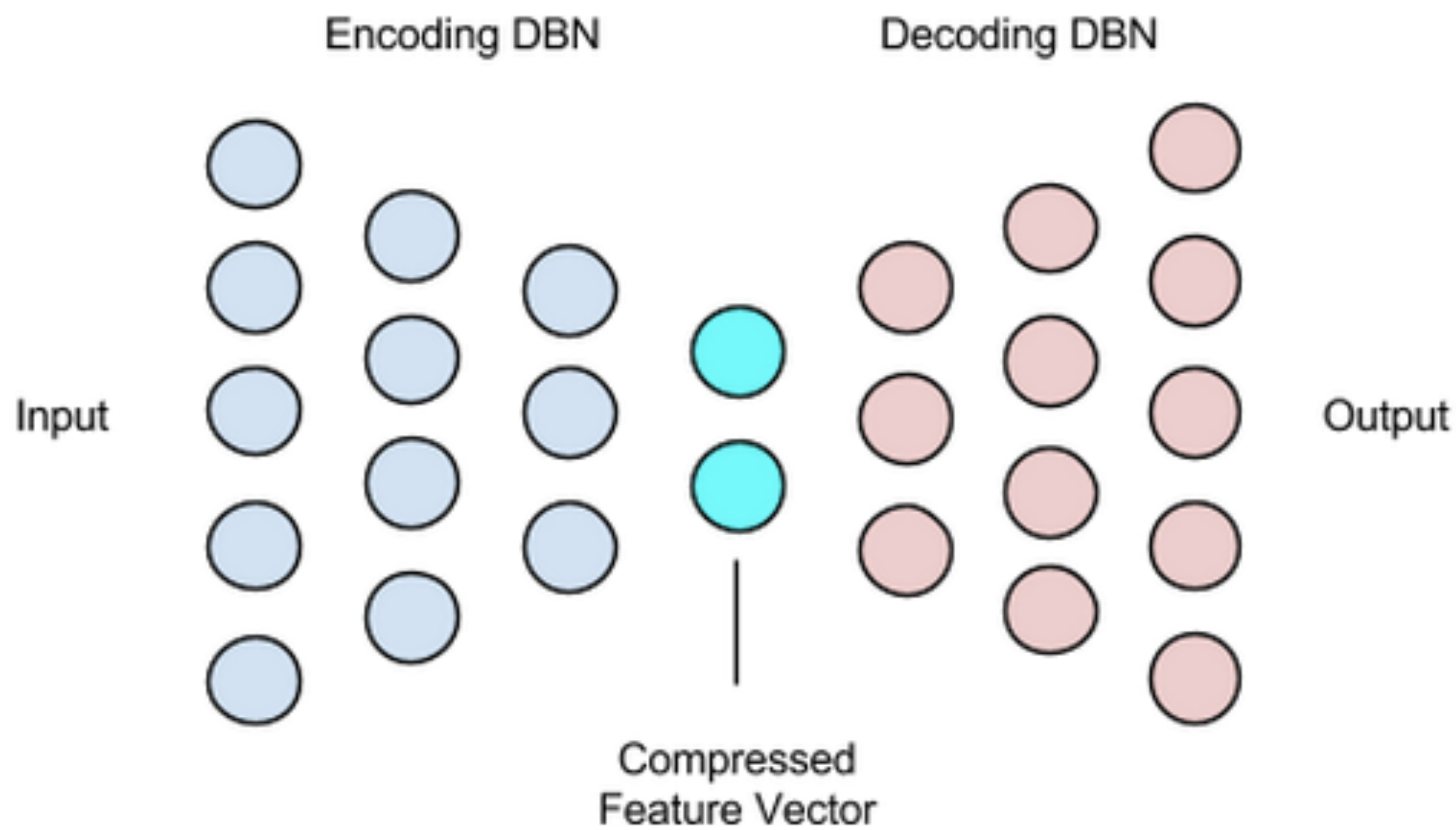
當代最智慧 - Deep Reinforcement Learning (DRL)
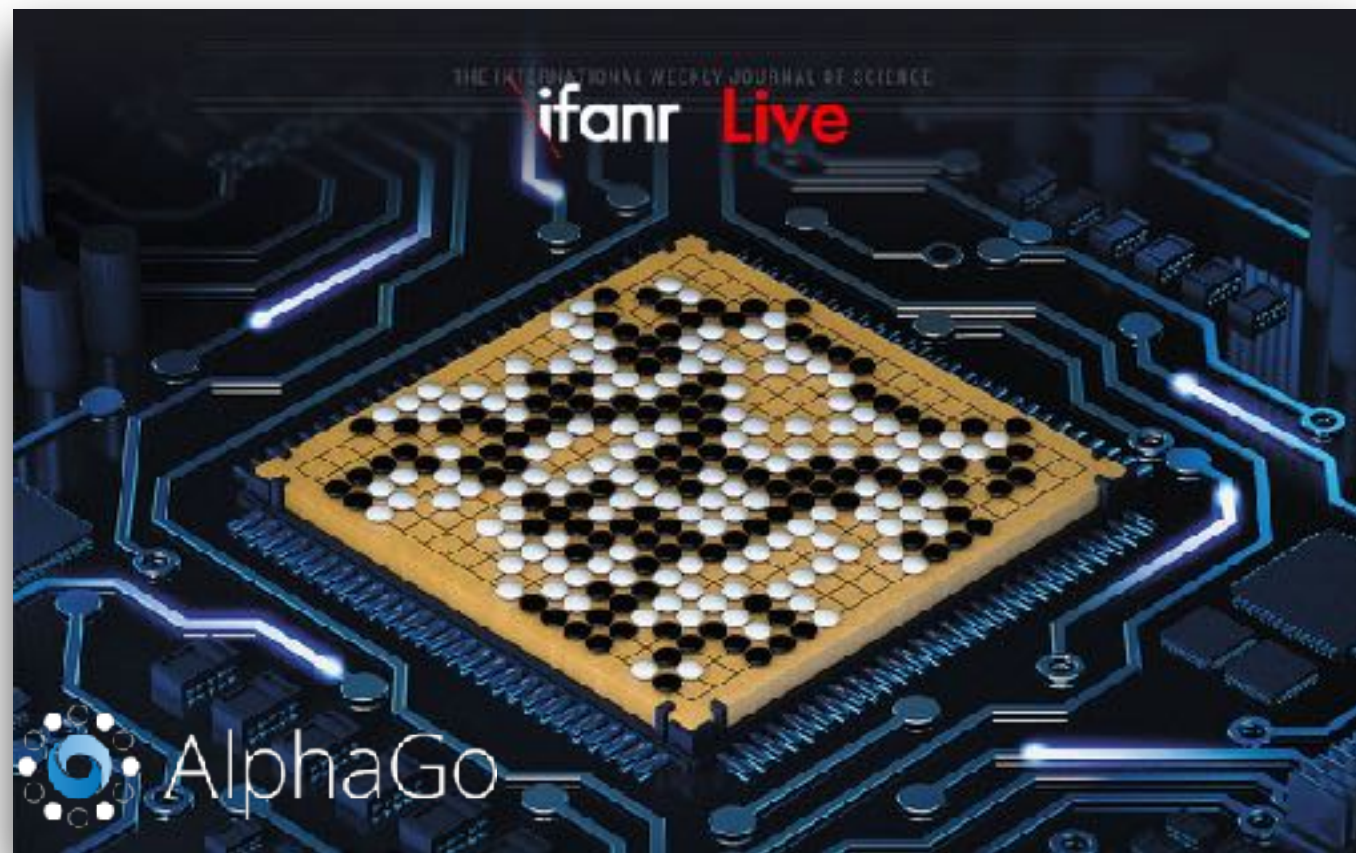
CNN + 增強學習(RL) + 蒙地卡羅決策樹

經由現有**狀態**與**反饋, 模擬**與**預測**
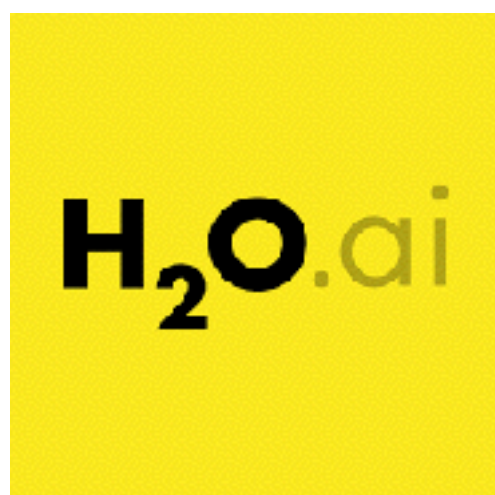下一步可做哪些**動作**來得到**最高分數**

Question

- Can Deep learning use in Regression? How?

- What is different between DNN, CNN, RNN ?

- Any drawback about Deep Learning?

Deep Learning 缺點

- 難訓練

- 特徵難解釋

- 不一定適用所有狀況, 建議先跑過其他模型再來試試看

深度學習相關工具

# 工具安裝

- numpy, pandas, matplotlib, sklearn (conda)

- seaborn: https://github.com/mwaskom/seaborn

- tensorflow: https://www.tensorflow.org/versions/r0.11/get_started/os_setup.html#pip-installation

- Keras: https://keras.io/

DL resources

- 一天搞懂深度學習: https://www.youtube.com/channel/UC9OeZkIwhzfv-_Cb7fCikLQ/videos

- DeepLearning.TV: https://www.youtube.com/channel/UC9OeZkIwhzfv-_Cb7fCikLQ/videos

Github project
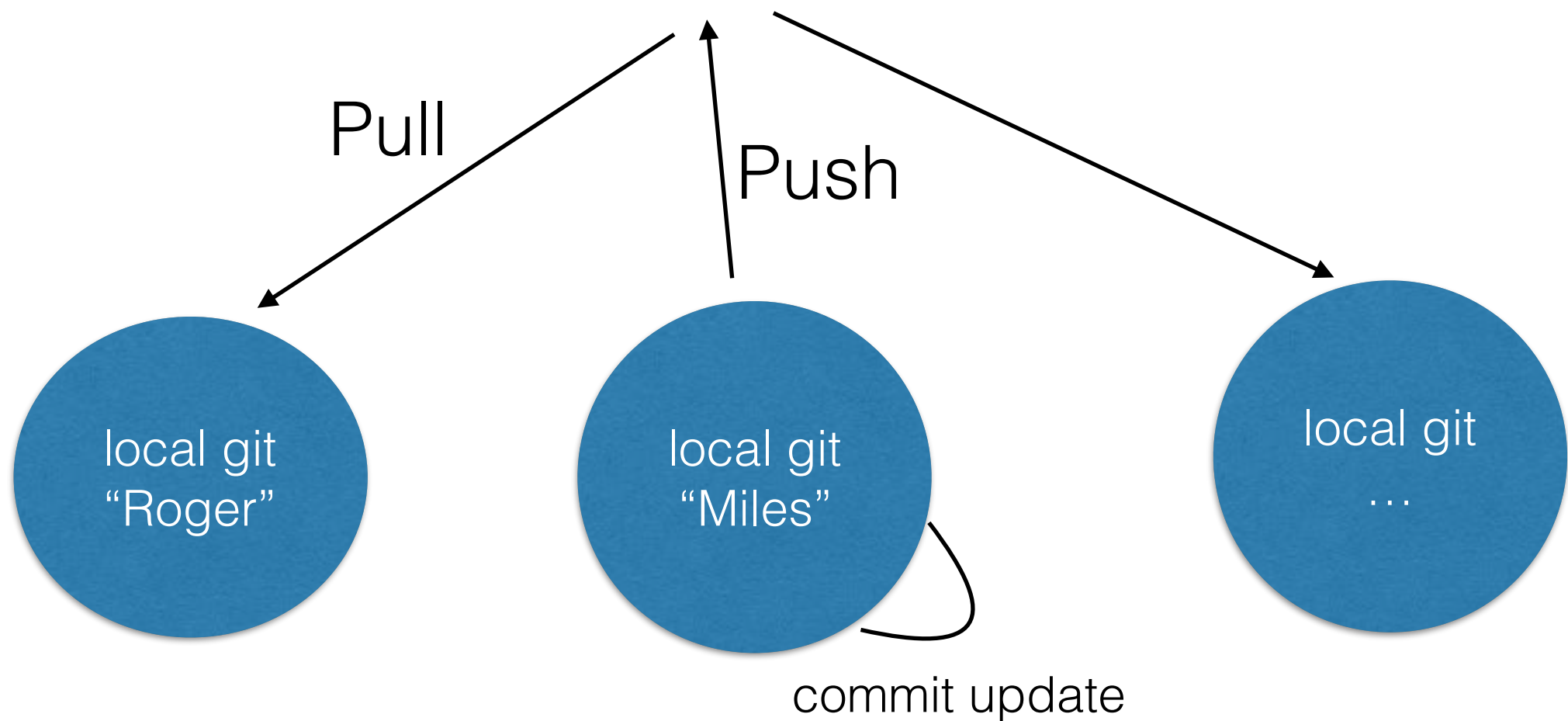
Init git project

- new repository

- git init

- git remote set-url **origin** *xxx*.git

- PS: https://git-for-windows.github.io/ (git for windows)

Git 基本流程

- git add . —all (確定更新的檔案, dev -> staging)

- git commit -m "xxx" (定住此更新的版本)

- git pull —rebase origin master (if co-work with other)

- git push origin master (上傳到遠端管理的repo)