2022 年广东省一类品牌专业建设项目验收佐证材料

5.1.2 关键任务完成情况表之学习和引进境外体系标准和教学资源

（智能光电技术应用专业）

中山火炬职业技术学院

2022 年 4 月

目录

朝陽科技大學與中山火炬職業技術學院
建立長期學術合作關係備忘錄

朝陽科技大學與中山火炬職業技術學院為促進雙方的學術與合作，經過友好協商，達成以下具體內容：

一、雙方可組團互訪，就拓展學術交流與合作的領域及具體項目等問題進行磋商。

二、經雙方商議，安排教師到對方學校進行學術訪問和短期講學等交流活動。

三、雙方將有計畫地研展各種合作研究，並共同承辦有關學術研討活動。

四、雙方互贈各自編輯出版的學術期刊及相關資料。

五、雙方在各自主(承)辦有關學術會議時，將有關資訊通知對方，如對方有意參加，則安排其出(列)席。

六、雙方互派教師至對方學校講學，有關課程、人數及時間根據實際需要另訂之。

七、積極創造條件，互派學生至對方學校交流研修。人數、專業及研修費用由雙方商定。

八、雙方合作期間自簽約日起三年止。其中一方若欲終止本合作備忘錄關係時，應以書面告知對方，以對方收到終止合作通知書之一個月後，正式終止合作關係。

九、本備忘錄乙式二份，雙方各執乙份，自簽字之日起生效；備忘錄到期時，雙方仍有意願合作，可另行簽署延長本合作關係備忘錄三年。

朝陽科技大學	中山火炬職業技術學院
校長　鄭道明	校長　王春旭
鄭道明	王春旭
年　月　日	年　月　日

龙华科技大学和中山火炬职业技术学院
合作交流备忘录

龙华科技大学和中山火炬职业技术学院，商定建立和发展两校交流合作关系，并达成如下学术合作交流事项：

一、 学术交流与科研合作：

联合举办研讨会、学术讲座和交流活动等；在共同感兴趣的领域内进行科研合作，成果共享。

二、 教师交流合作：

鼓励和安排教师到对方学校客座讲学、研究或进修。

三、 学生交流合作与联合培养：

开展学生互换、夏（冬）令营等交流合作活动；开发联合培养的管道。

四、 双方指定各自分管部门和一名协调人，负责上述合作交流活动的管理和开展。

上述备忘录每一条款由双方另行制定实施细则，并根据具体实施细则进行。此合作交流备忘录，在双方代表签字后生效，有效期三年，届满自动更新，任何一方如欲解约，应于六个月前以书面通知对方。

龙华科技大学

校长

年　月　日

中山火炬职业技术学院

校长

年　月　日

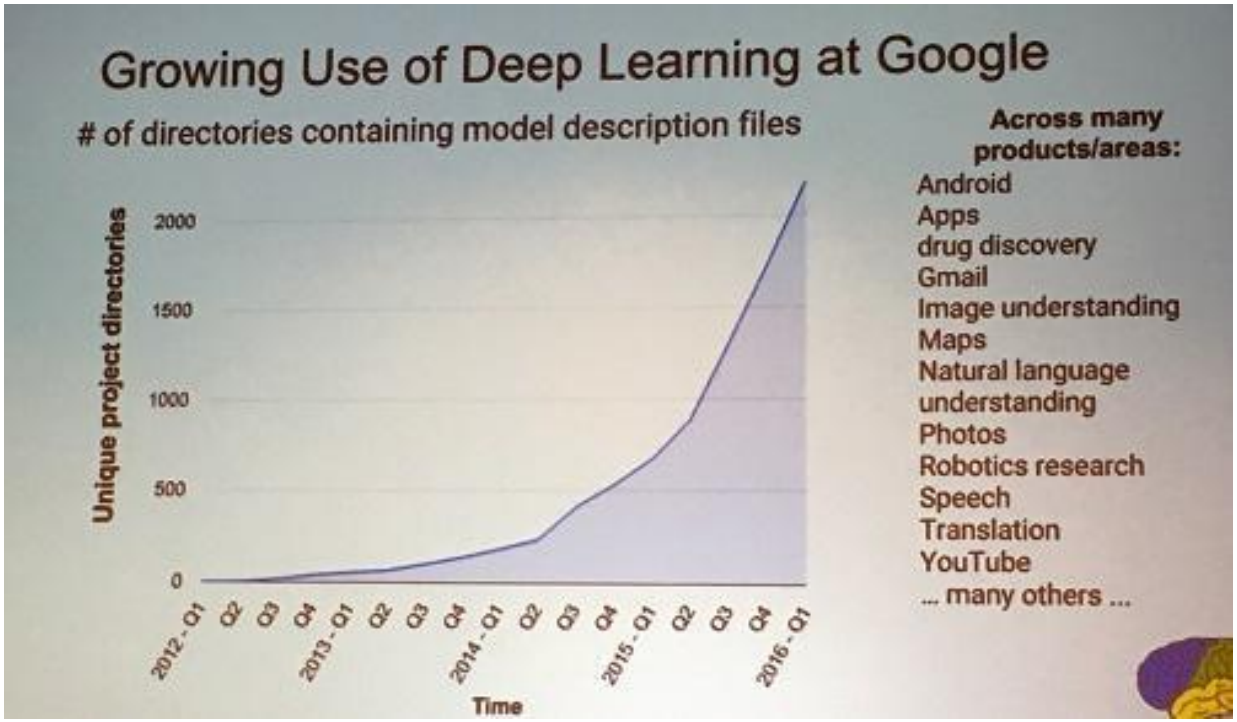
Deep Learning

Hung-yi Lee

李宏毅

Deep learning attracts lots of attention.

- I believe you have seen lots of exciting results before.



Deep learning trends at Google. Source: SIGMOD 2016/Jeff Dean

Ups and downs of Deep Learning

- 1958: Perceptron (linear model)
- 1969: Perceptron has limitation
- 1980s: Multi-layer perceptron
  - Do not have significant difference from DNN today
- 1986: Backpropagation
  - Usually more than 3 hidden layers is not helpful
- 1989: 1 hidden layer is "good enough", why deep?
- 2006: RBM initialization
- 2009: GPU
- 2011: Start to be popular in speech recognition
- 2012: win ILSVRC image competition
- 2015.2: Image recognition surpassing human-level performance
- 2016.3: Alpha GO beats Lee Sedol
- 2016.10: Speech recognition system as good as humans

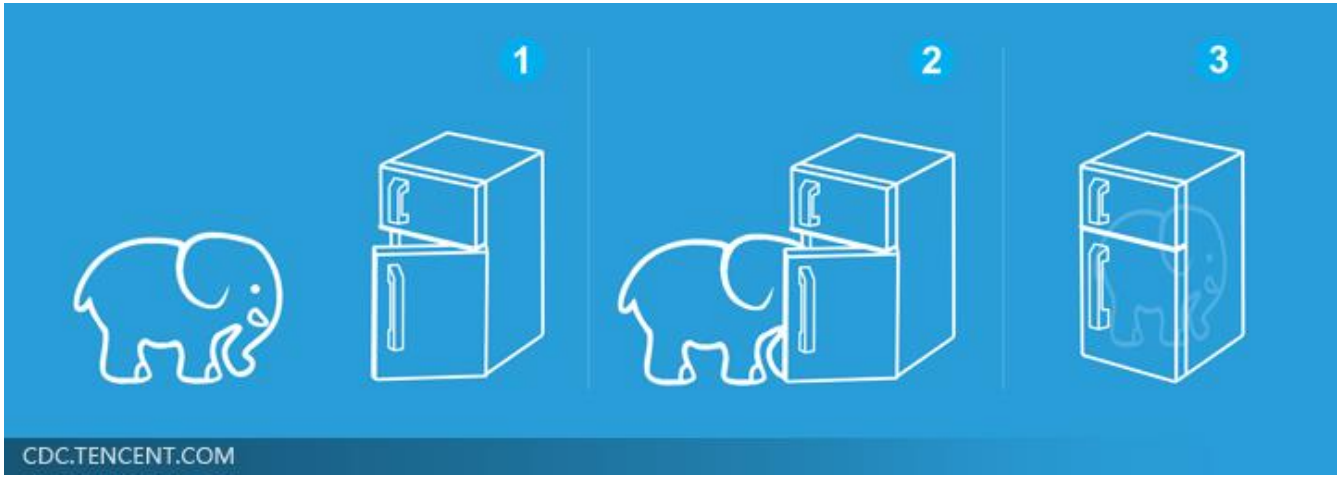
Three Steps for Deep Learning

Step 1:
Neural Network

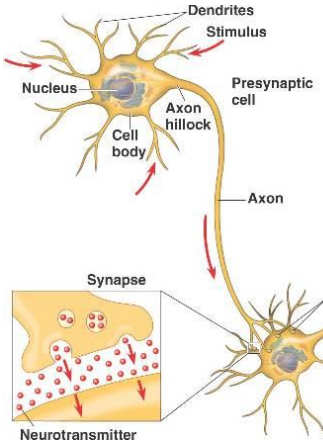
Step 2: goodness of function

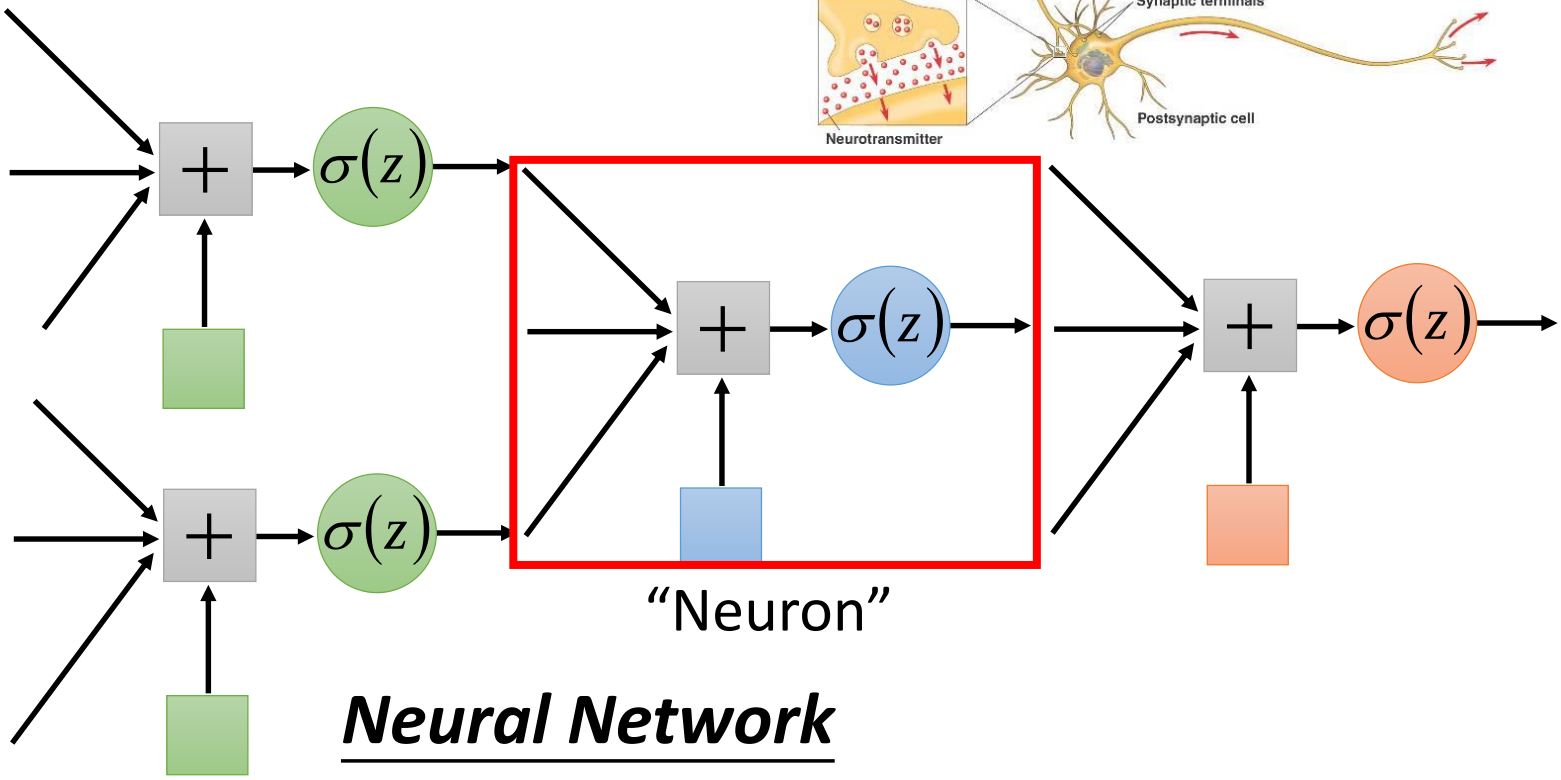
Step 3: pick the best function

Deep Learning is so simple ……



Neural Network





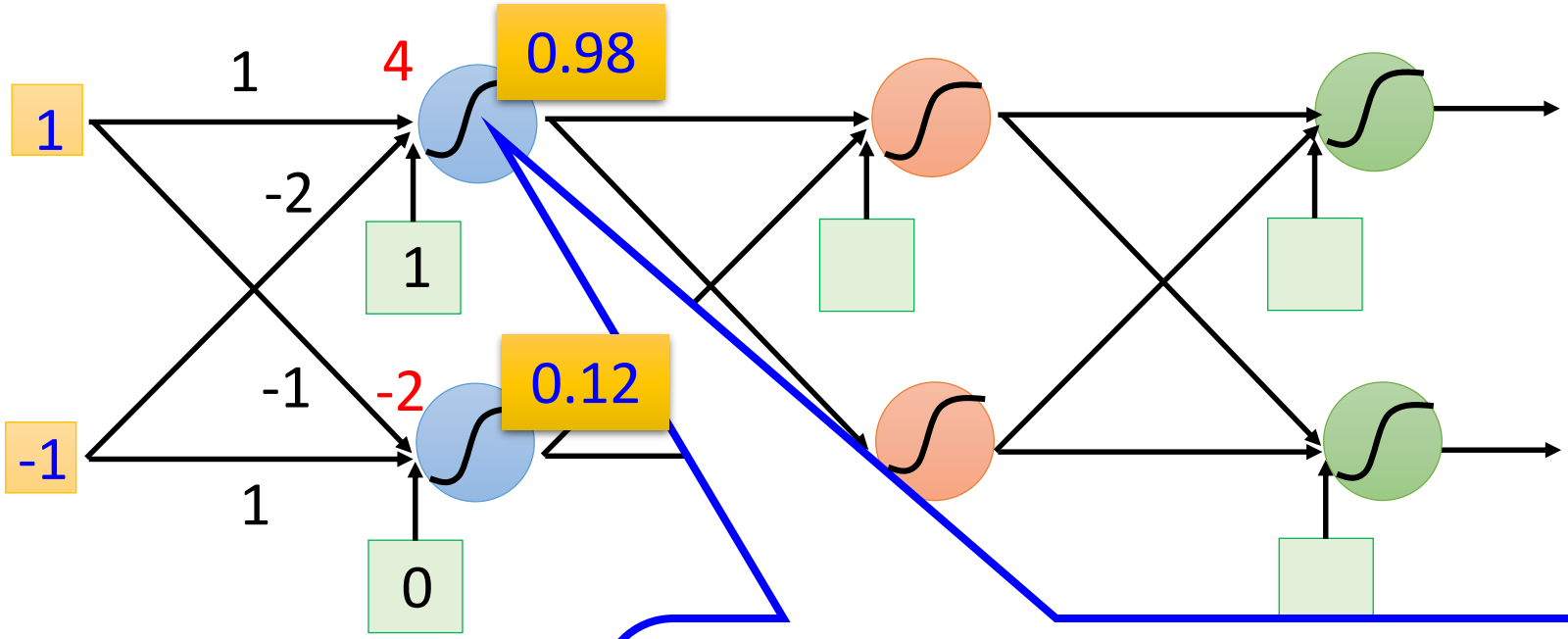
"Neuron"

Neural Network

Different connection leads to different network structures

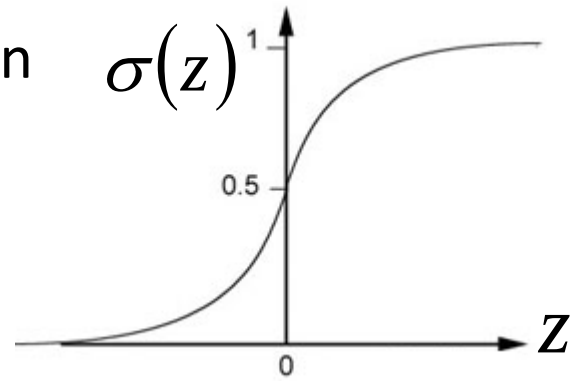
Network parameter θ: all the weights and biases in the "neurons"

Fully Connect Feedforward Network

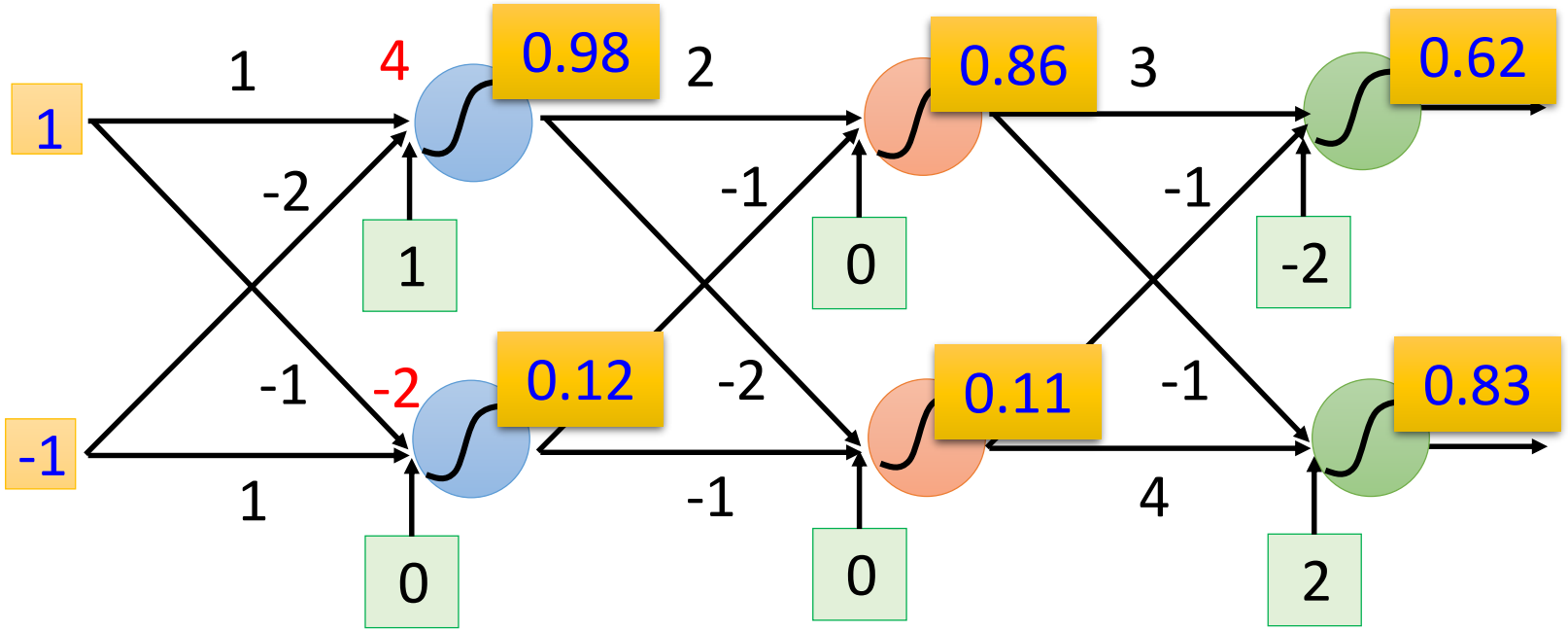


Sigmoid Function

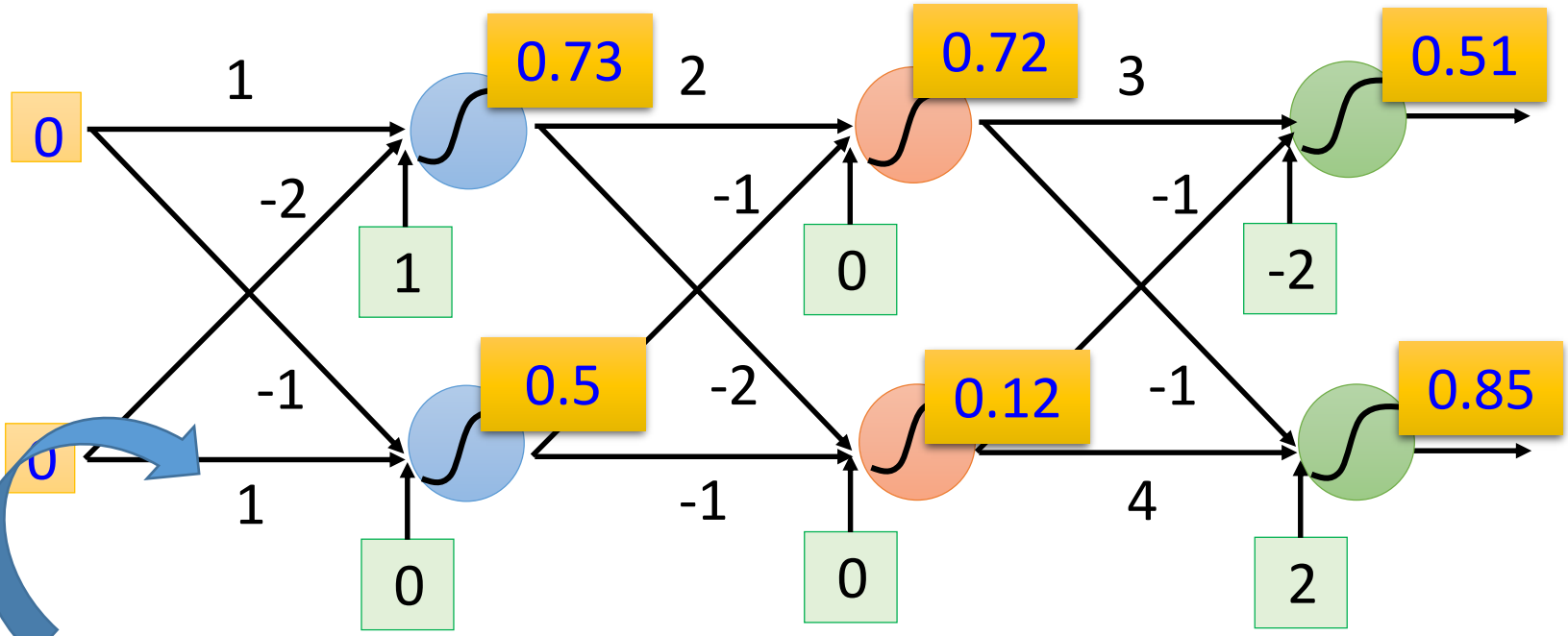
$$\sigma(z) = \frac{1}{1+e^{-z}}$$



Fully Connect Feedforward Network



Fully Connect Feedforward Network



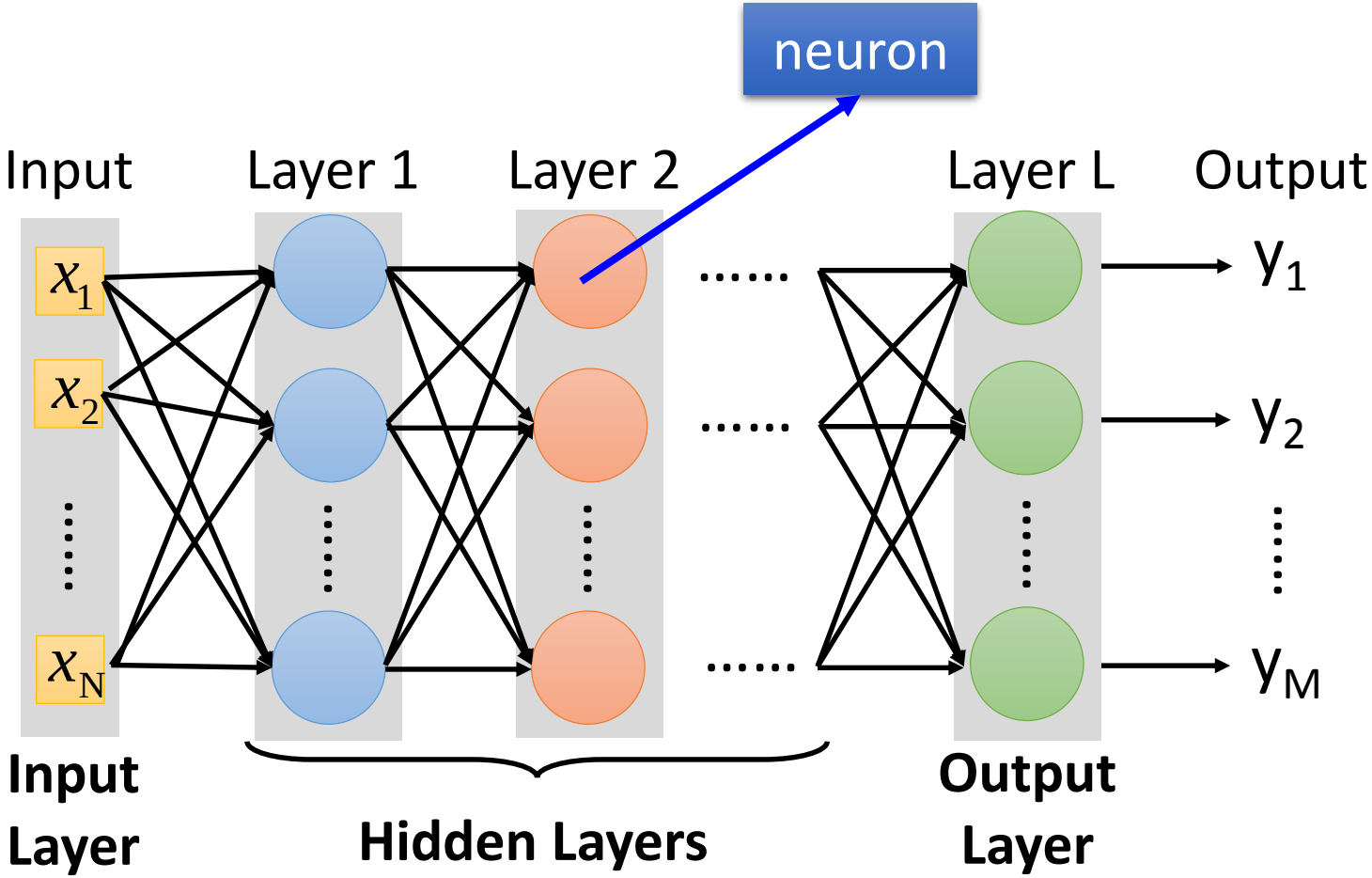
This is a function.

Input vector, output vector

$$f\left(\begin{bmatrix}1\\-1\end{bmatrix}\right)=\begin{bmatrix}0.62\\0.83\end{bmatrix} \quad f\left(\begin{bmatrix}0\\0\end{bmatrix}\right)=\begin{bmatrix}0.51\\0.85\end{bmatrix}$$

Given network structure, define ***a function set***

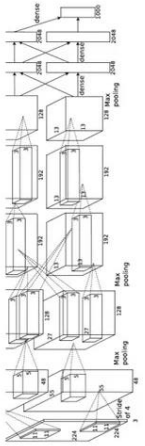
Fully Connect Feedforward Network



Deep = Many hidden layers

http://cs231n.stanford.edu/slides/winter1516_lecture8.pdf

8 layers



16.4%

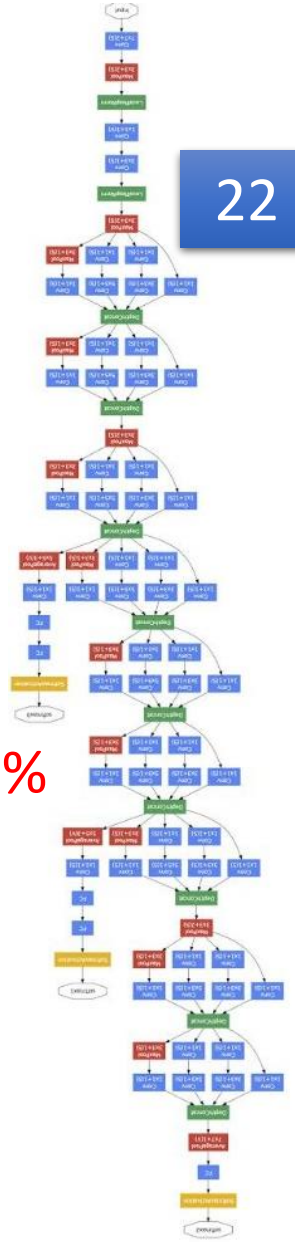
AlexNet (2012)

19 layers

7.3%

VGG (2014)

22 layers



6.7%

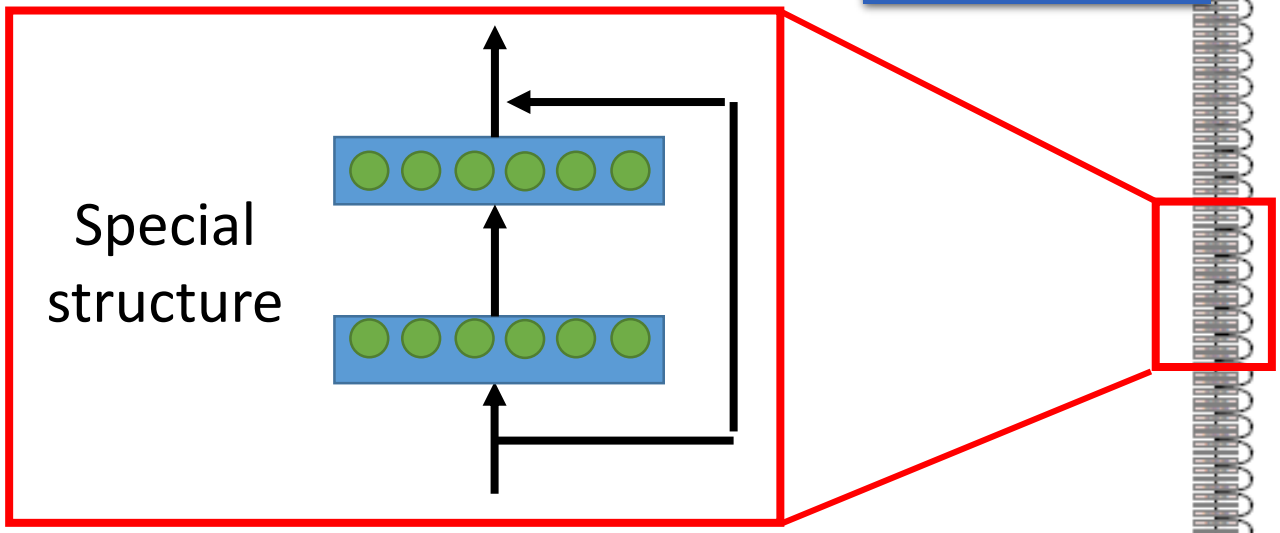
GoogleNet (2014)

Deep = Many hidden layers

152 layers

101 layers

Special structure



Ref:
https://www.youtube.com/watch?v=dxB6299gpvI

3.57%

16.4%

AlexNet (2012)

7.3%

VGG (2014)

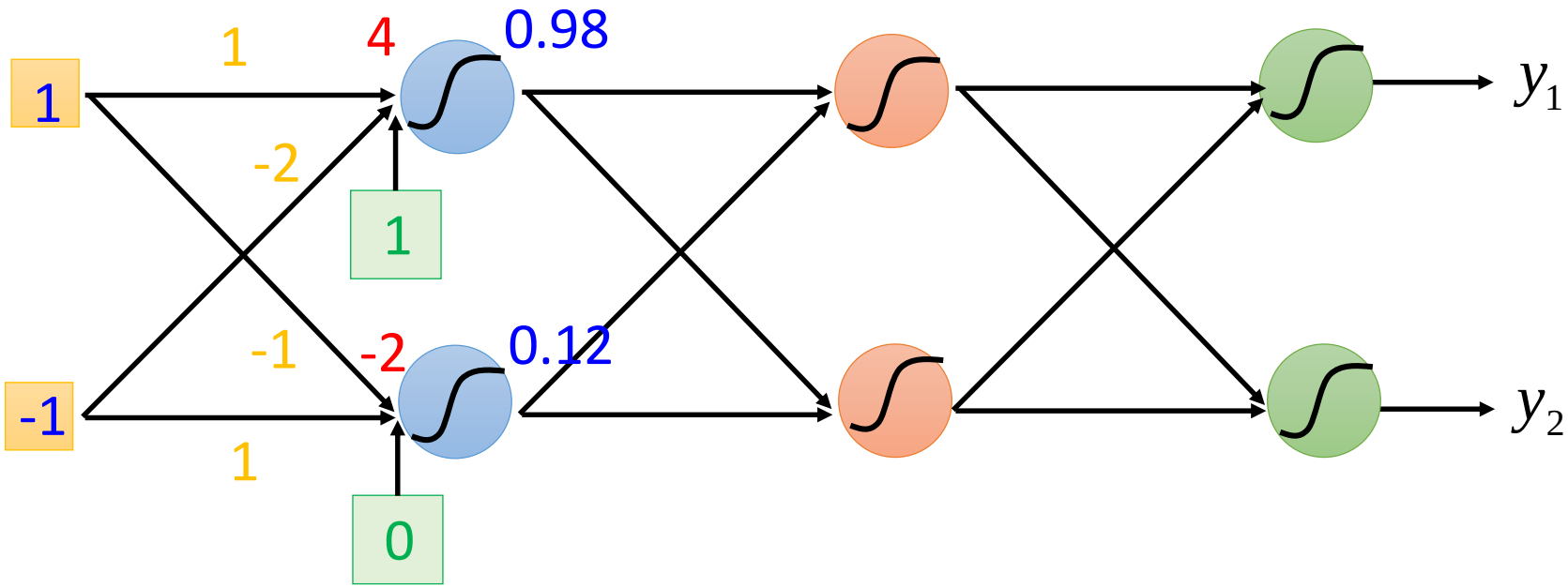
6.7%

GoogleNet (2014)

Residual Net (2015)

Taipei 101

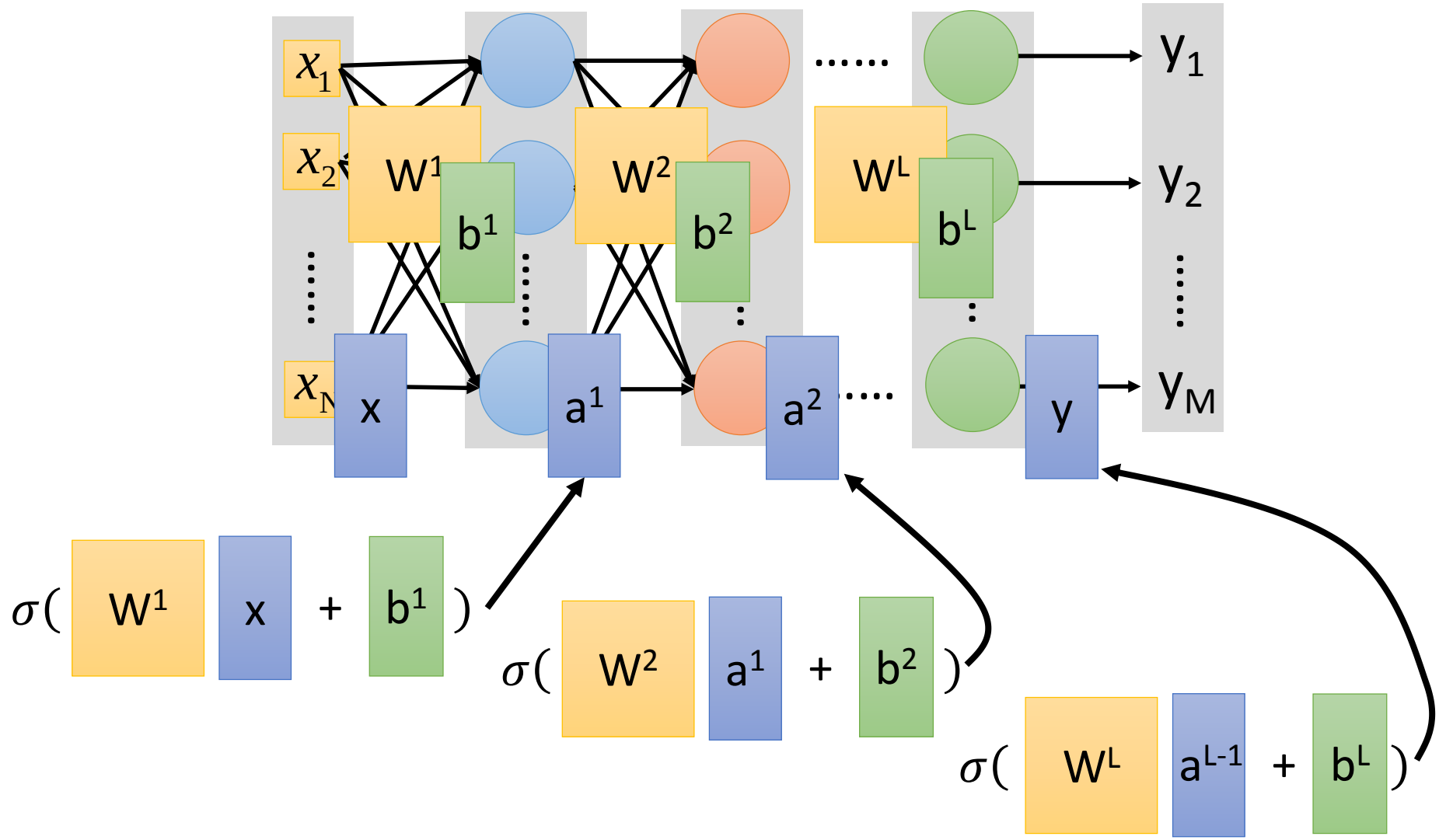
Matrix Operation



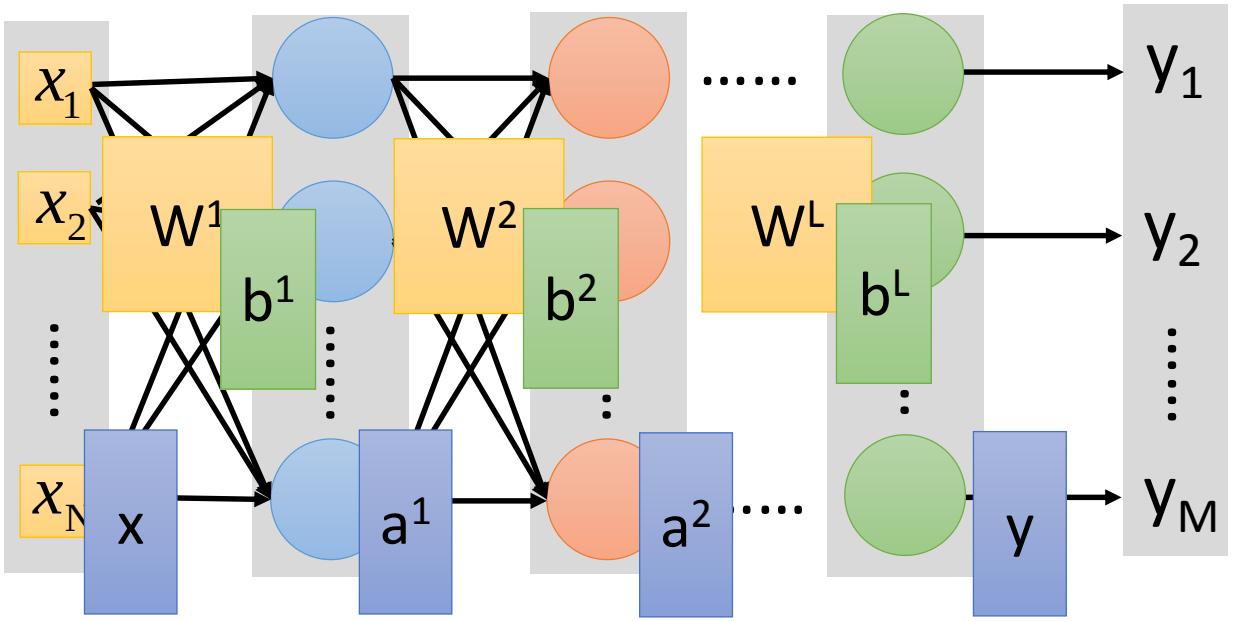
$$\sigma\left(\begin{bmatrix}1 & -2\\ -1 & 1\end{bmatrix}\begin{bmatrix}1\\ -1\end{bmatrix}+\begin{bmatrix}1\\ 0\end{bmatrix}\right)=\begin{bmatrix}0.98\\ 0.12\end{bmatrix}$$

$$\begin{bmatrix}4\\ -2\end{bmatrix}$$

Neural Network



Neural Network

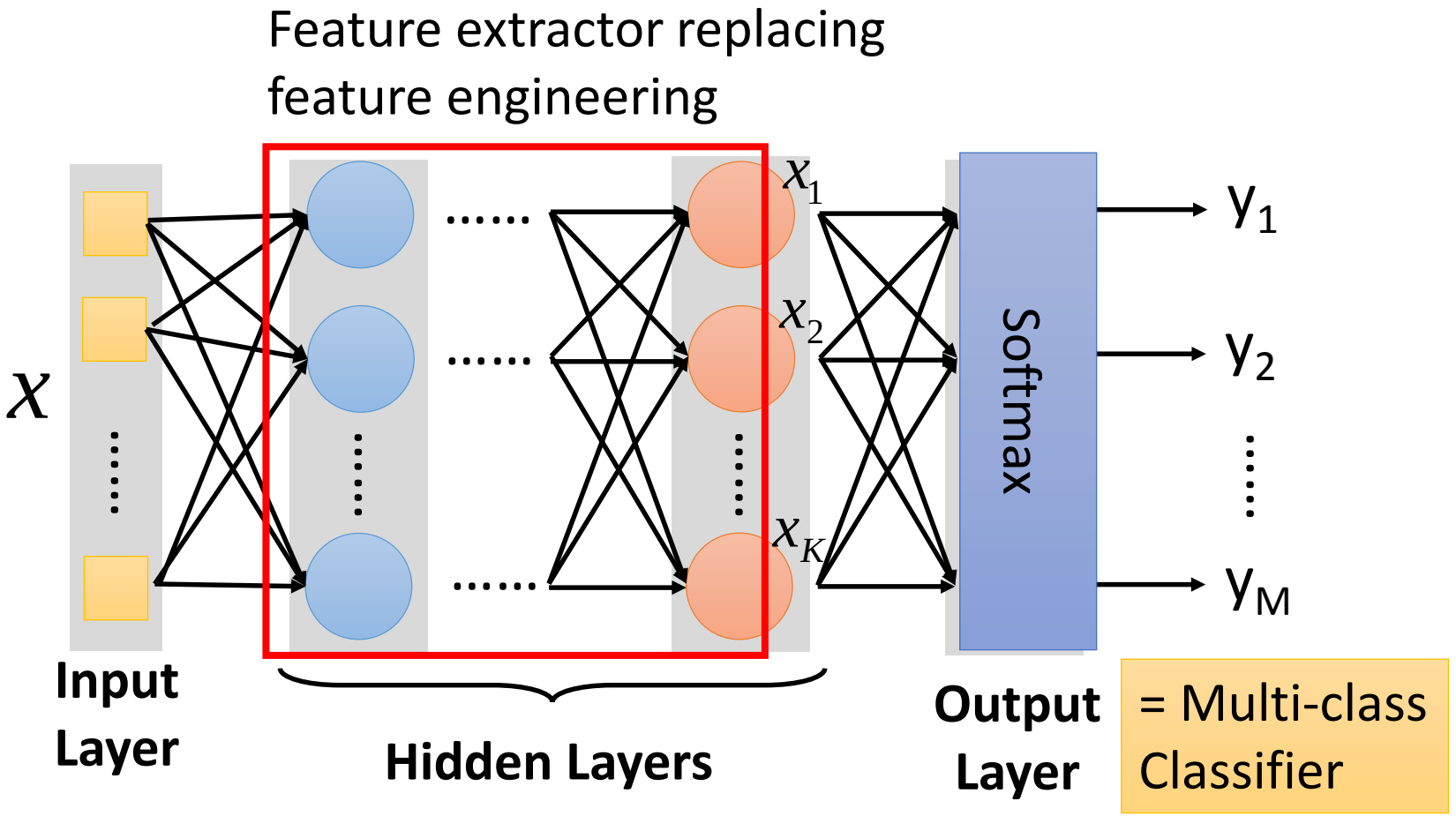


$$\mathbf{y} = f(\mathbf{x})$$

Using parallel computing techniques to speed up matrix operation

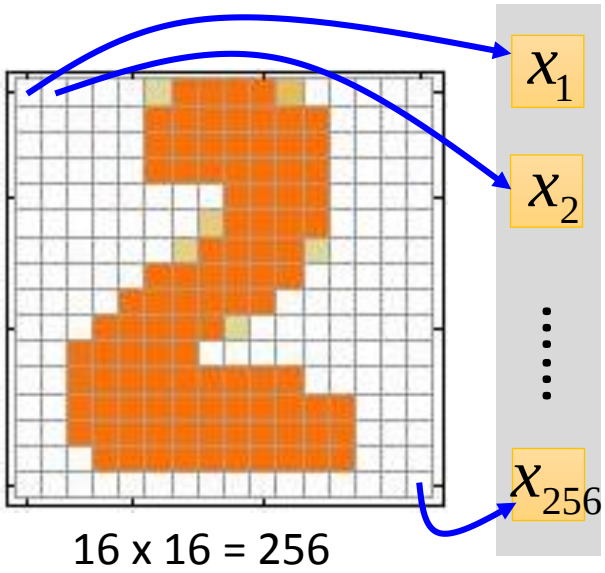
$$= \sigma(\mathbf{W}^L \cdots \sigma(\mathbf{W}^2 \sigma(\mathbf{W}^1 \mathbf{x} + \mathbf{b}^1) + \mathbf{b}^2) \cdots + \mathbf{b}^L)$$

Output Layer as Multi-Class Classifier



Example Application

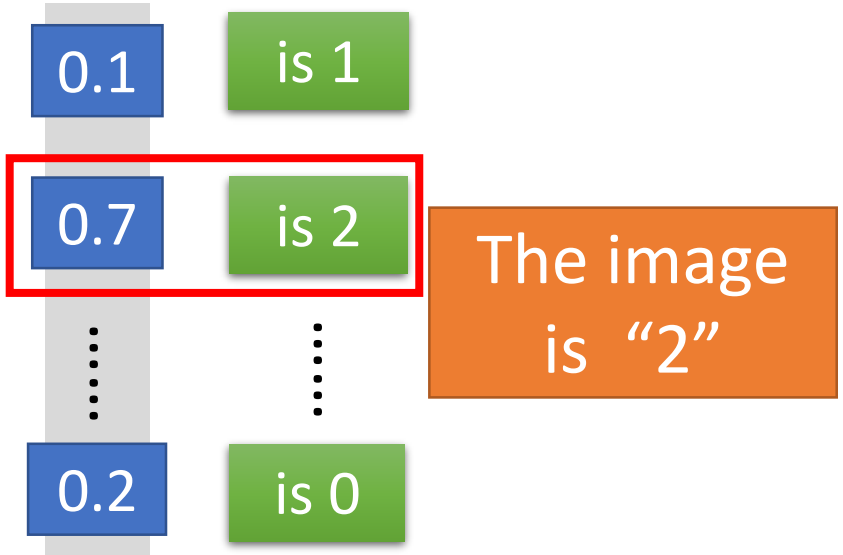
Input



Ink → 1

No ink → 0

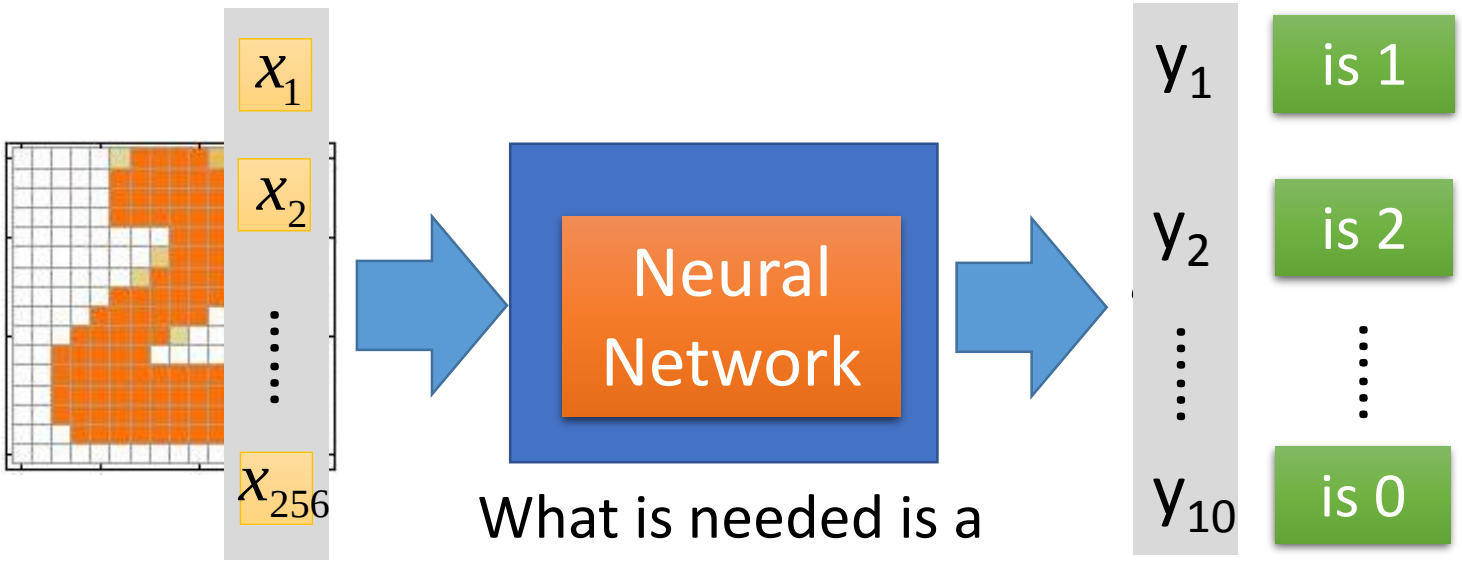
Output



Each dimension represents the confidence of a digit.

Example Application

- Handwriting Digit Recognition

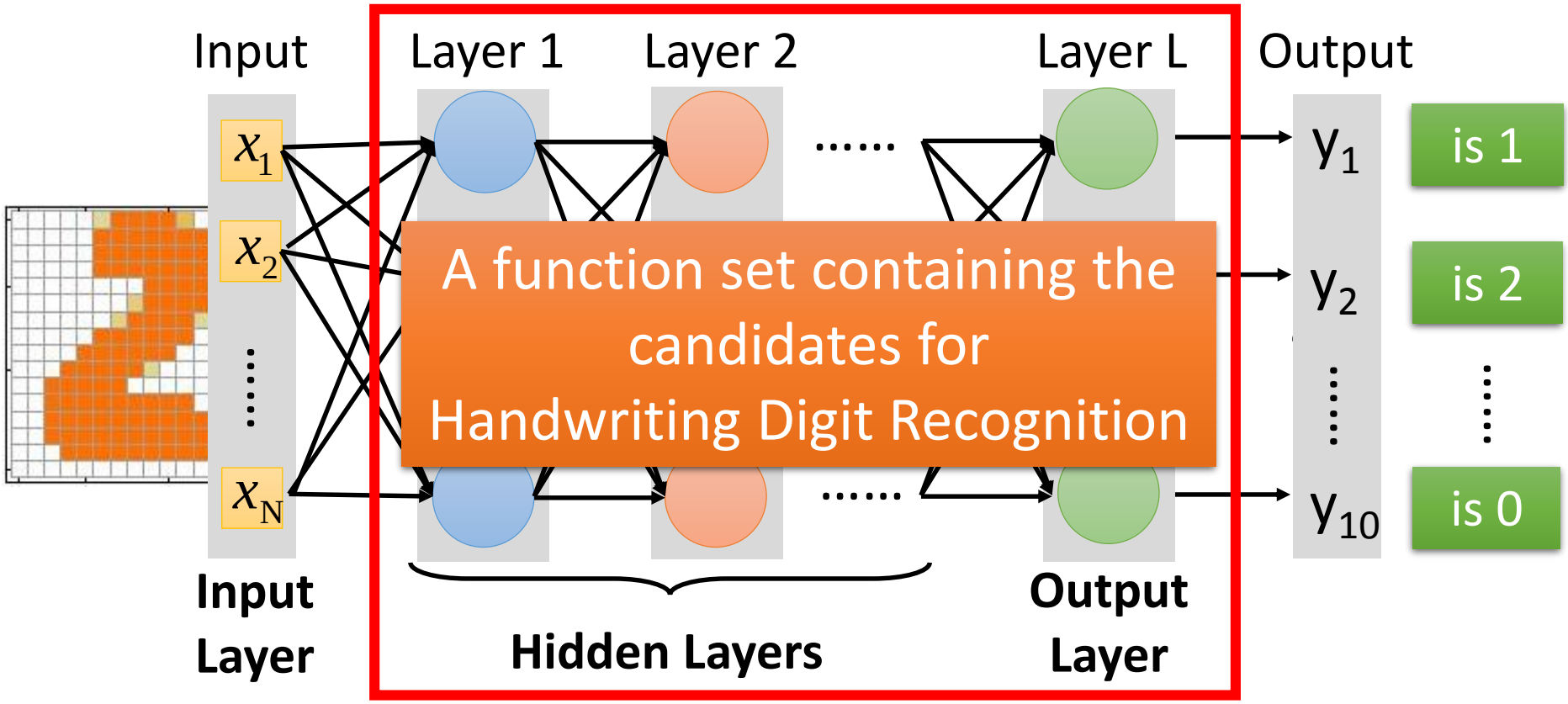


What is needed is a function ……

Input:
256-dim vector

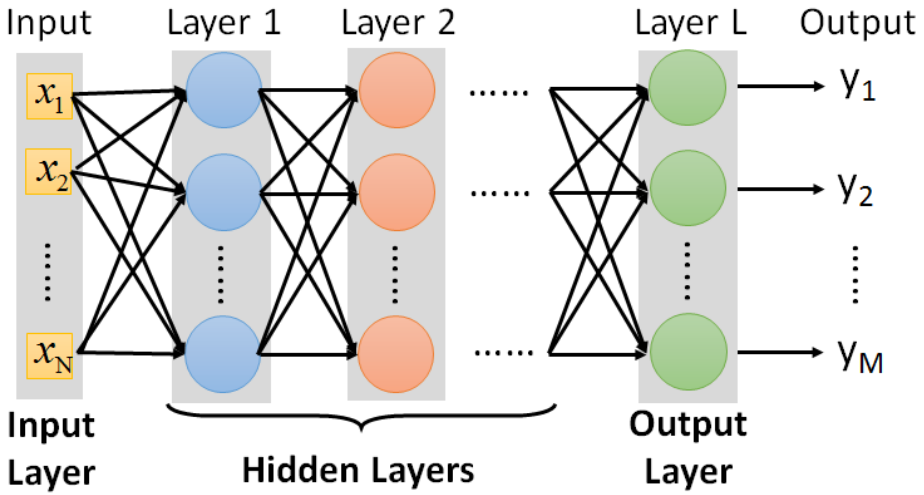
output:
10-dim vector

Example Application



You need to decide the network structure to let a good function in your function set.

FAQ



- Q: How many layers? How many neurons for each layer?

Trial and Error + Intuition

- Q: Can the structure be automatically determined?
  - E.g. Evolutionary Artificial Neural Networks
- Q: Can we design the network structure?

Convolutional Neural Network (CNN)

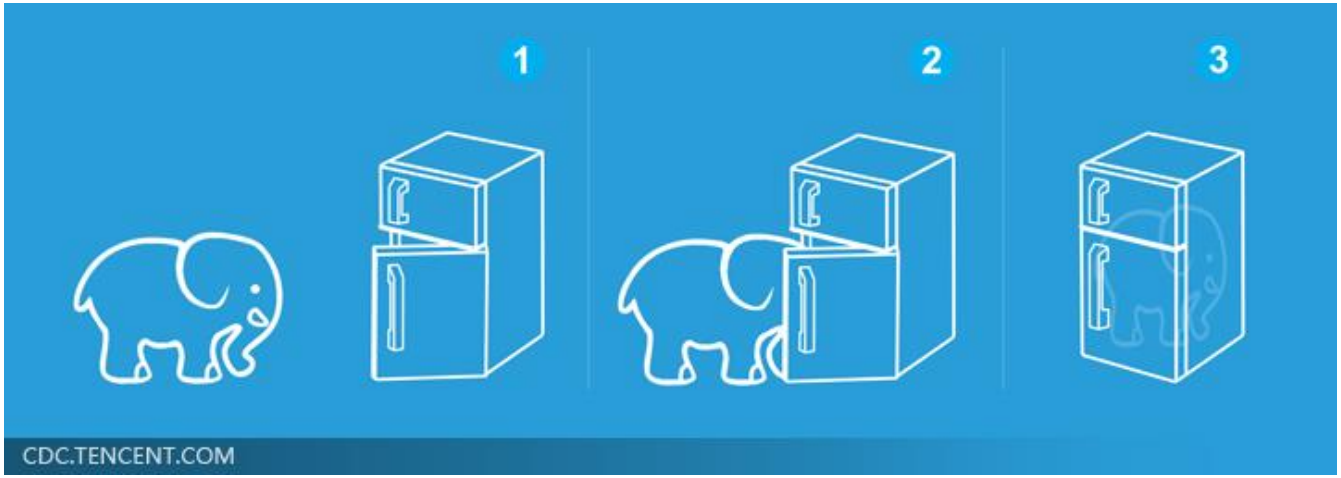
Three Steps for Deep Learning

Step 1: Neural Network

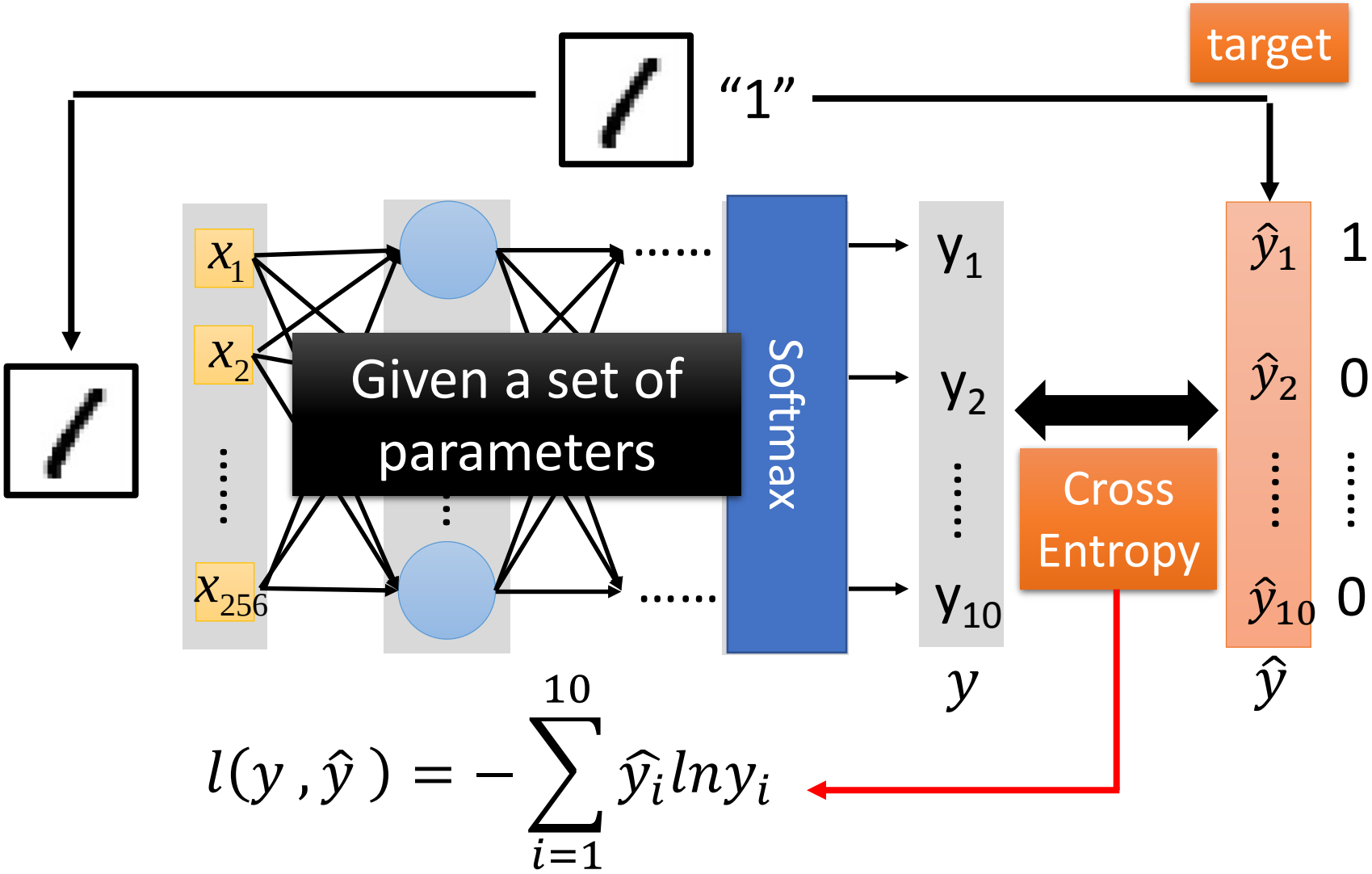
Step 2: goodness of function

Step 3: pick the best function

Deep Learning is so simple ……

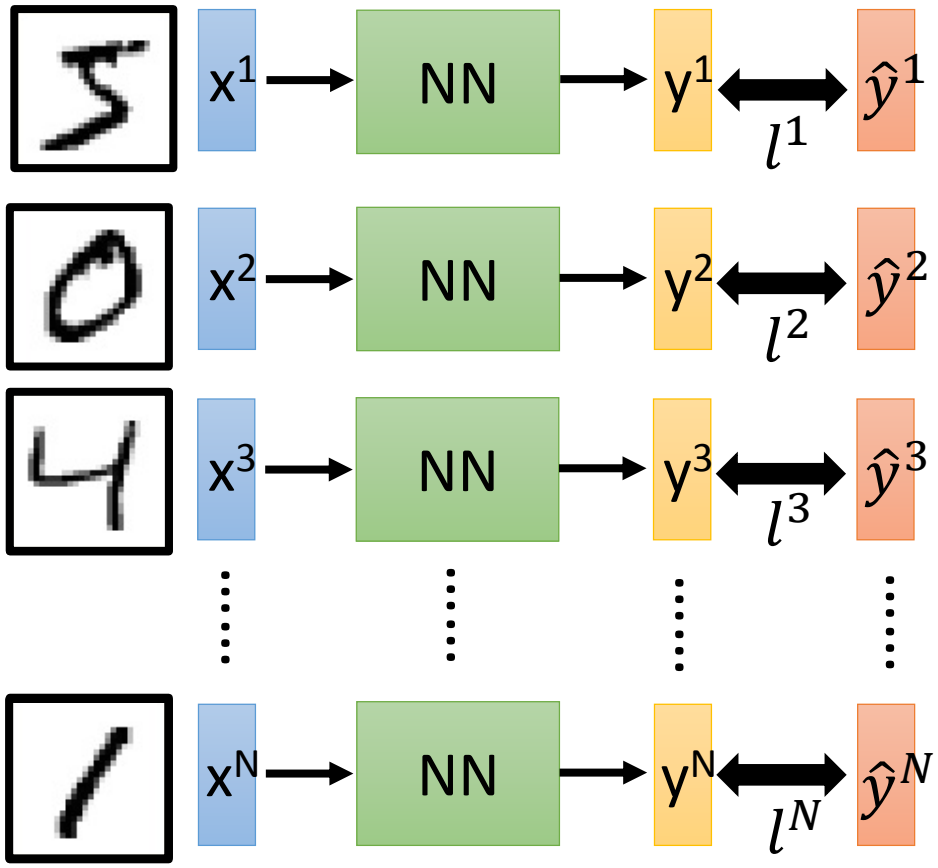


Loss for an Example



Total Loss

For all training data …



Total Loss:

$$L = \sum_{n=1}^{N} l^n$$

Find ***a function in function set*** that minimizes total loss L

Find ***the network parameters*** θ^* that minimize total loss L

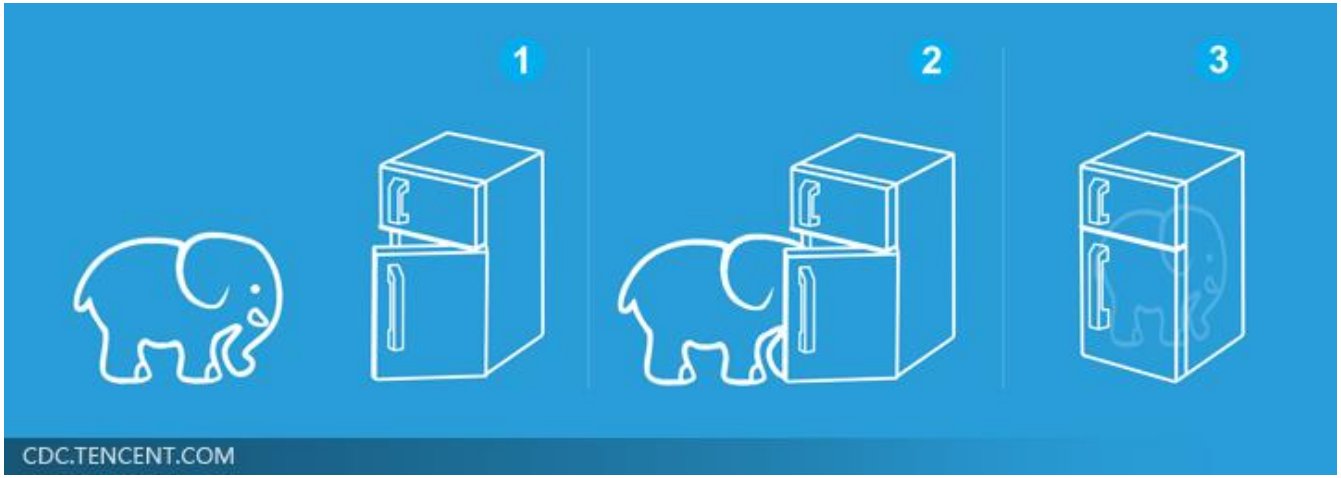
Three Steps for Deep Learning

Step 1: Neural Network

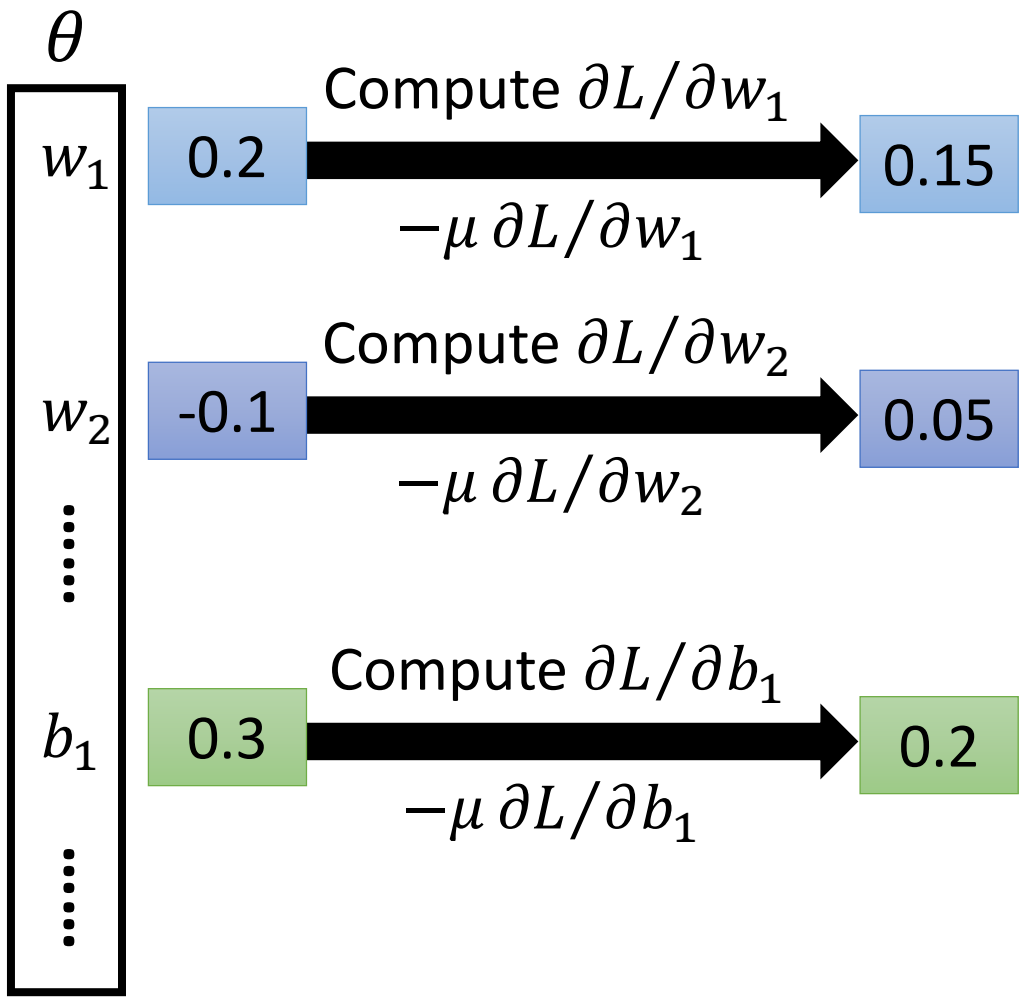
Step 2: goodness of function

Step 3: pick the best function

Deep Learning is so simple ……



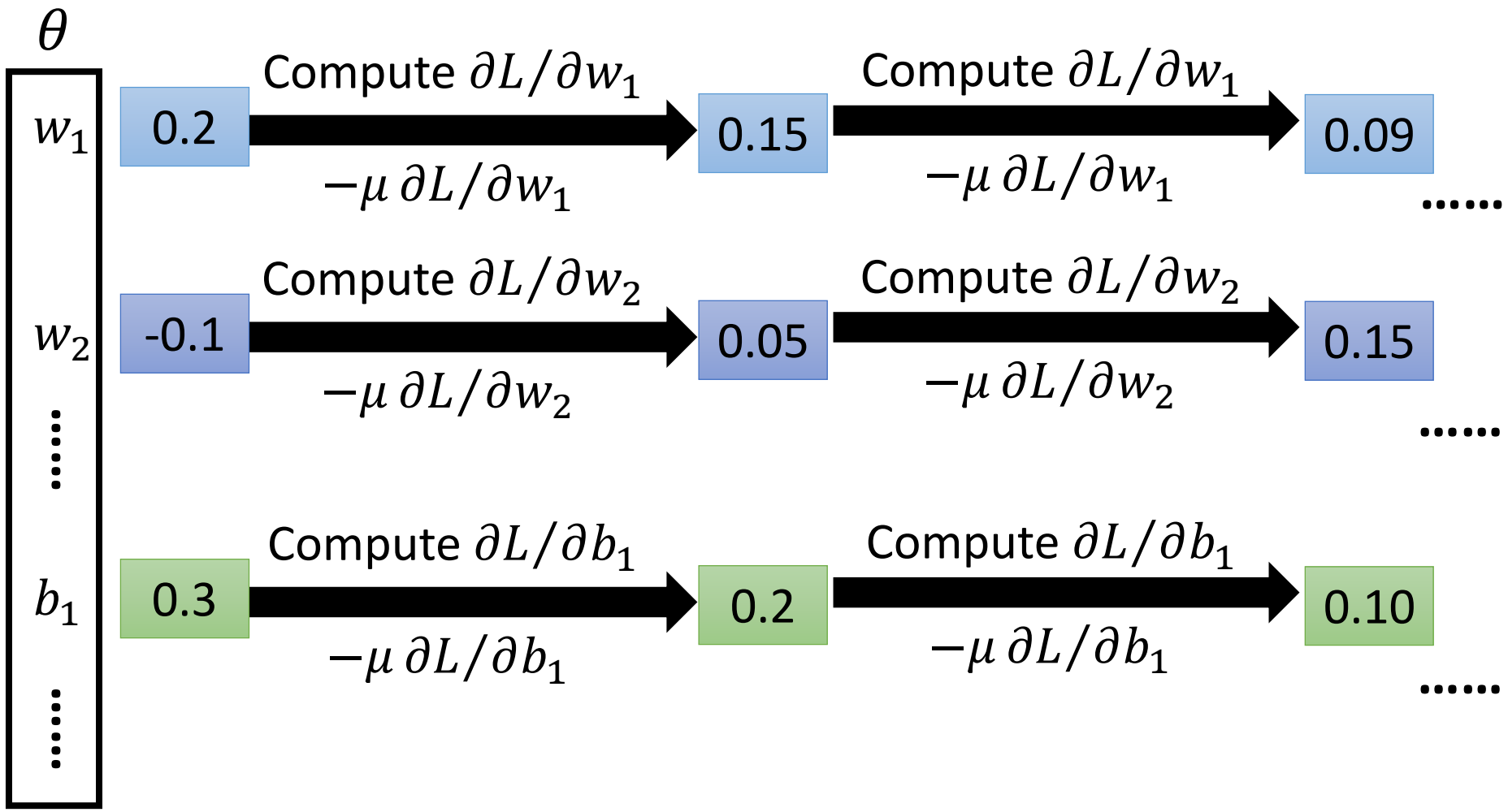
Gradient Descent



$$\nabla L = \begin{bmatrix} \frac{\partial L}{\partial w_1} \\ \frac{\partial L}{\partial w_2} \\ \vdots \\ \frac{\partial L}{\partial b_1} \\ \vdots \end{bmatrix}$$

gradient

Gradient Descent

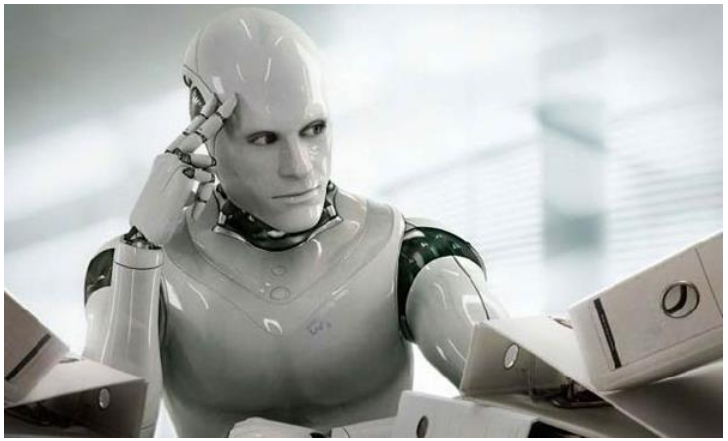


Gradient Descent

This is the “learning” of machines in deep learning ……

➡ Even alpha go using this approach.

People image ……



Actually …..

I hope you are not too disappointed :p

Backpropagation

- Backpropagation: an efficient way to compute $\partial L/\partial w$ in neural network

theano

Caffe

Microsoft
CNTK

Deep Learning library produced by Amazon
DSSTNE

mxnet

libdnn
台大周伯威
同學開發

Ref:
http://speech.ee.ntu.edu.tw/~tlkagk/courses/MLDS_2015_2/Lecture/DNN%20backprop.ecm.mp4/index.html

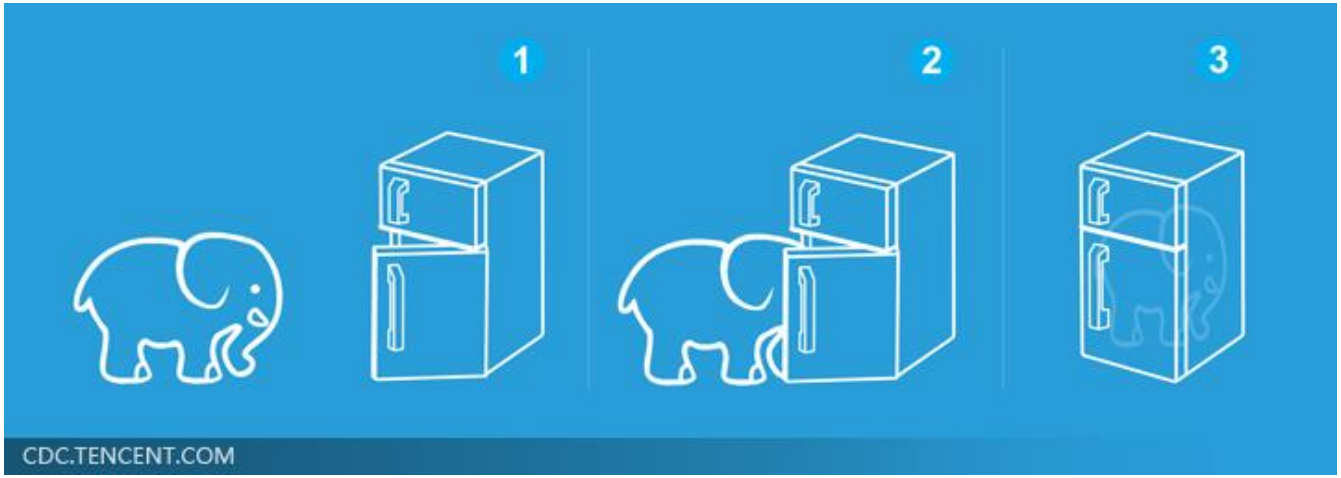
Three Steps for Deep Learning

Step 1: Neural Network

Step 2: goodness of function

Step 3: pick the best function

Deep Learning is so simple ……



Acknowledgment

- 感謝 Victor Chen 發現投影片上的打字錯誤

1.人工智能基础等课程备课中，积极运用国外优质网络资源，以下为下载的基于 BWAPI 的强人工智能研究的示例 AI 文档库资源截图

2、向学生推荐的 bwapi 测试 AI 下载页面截图