

Assignment 1

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編譯&執行結果

```
lyc@lyc-virtual-machine:~$ cd Desktop/DS
lyc@lyc-virtual-machine:~/Desktop/DS$ gcc -o DS.out DS.c -lm
lyc@lyc-virtual-machine:~/Desktop/DS$ ./DS.out
Final Hidden Weights
[ [ 3.672099 3.670897 ] [ 5.874482 5.867946 ] ]
Final Hidden Biases
[ -5.610720 -2.422902 ]
Final Output Weights[ -8.068704 7.450911 ]
Final Output Biases
[ -3.355583 ]
lyc@lyc-virtual-machine:~/Desktop/DS$
```

CSV 輸出每次 train 的 error (MSE)文字

Character set: Unicode (UTF-8)

Language: Default - English (USA)

From row: 1 - +

Separator Options

☐ Fixed width ☒ Separated by

☒ Tab ☒ Comma ☒ Semicolon ☐ Space ☐ Other

☐ Merge delimiters ☐ Trim spaces String delimiter: "

Other Options

☐ Format quoted field as text ☐ Detect special numbers

☐ Evaluate formulas

Fields

Column type:

	Standard	Standard	Standard	Standard	Standard
1	0	0.069637	0.498781	0.555247	0.082072
2	1	0.485179	0.539802	0.088205	0.079496
3	2	0.077994	0.083431	0.482063	0.536309
4	3	0.082477	0.468316	0.091758	0.524996
5	4	0.087001	0.458453	0.509278	0.101183
6	5	0.091539	0.507668	0.439637	0.106086
7	6	0.096110	0.101751	0.443901	0.492520
8	7	0.426315	0.472062	0.118539	0.107772
9	8	0.471515	0.448778	0.408007	0.447445

程式架構

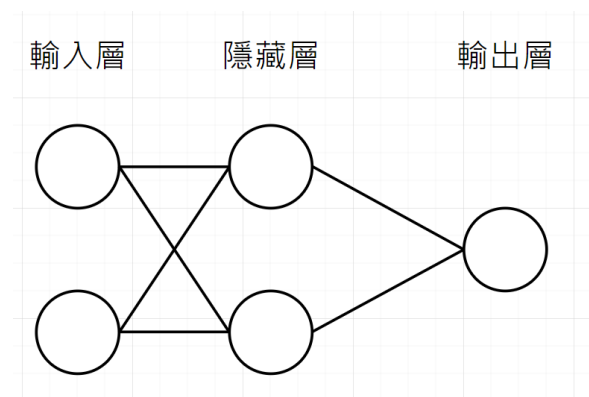
初始化神經網路

- 給予訓練資料&標籤
- 訓練 10000 次，且每次給予不同的訓練資料
- 將最後的權重輸出在螢幕上，並輸出每次訓練的 error

神經網路架構

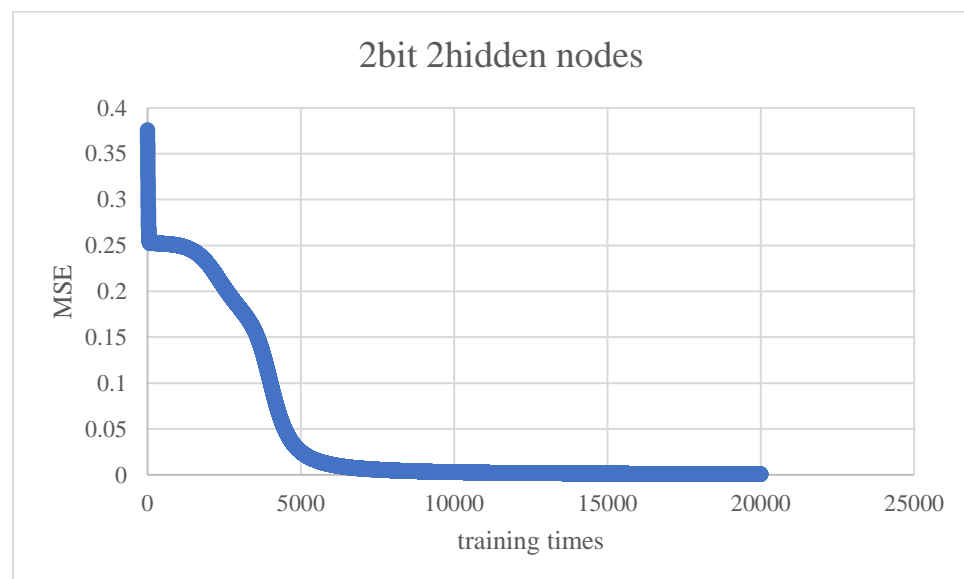
使用 sigmoid 函數來 Forward Pass

使用 dsigmoid 函數來 Backward Pass



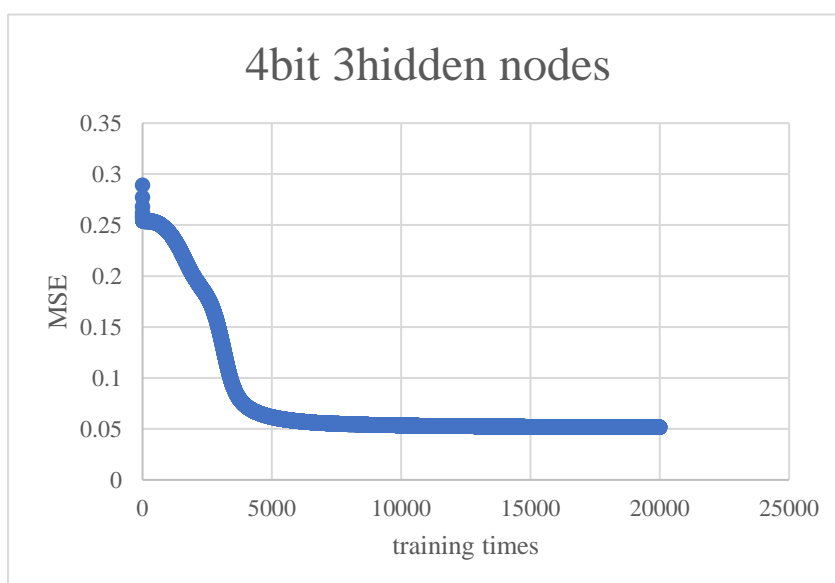
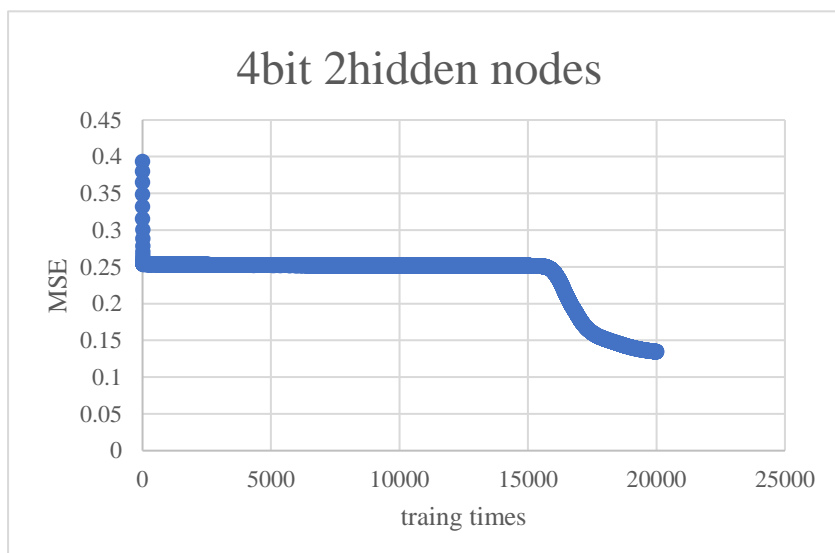
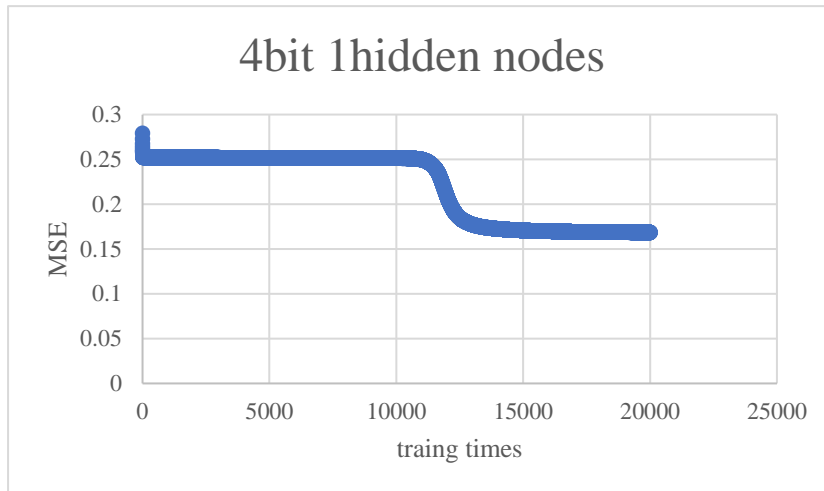
分析

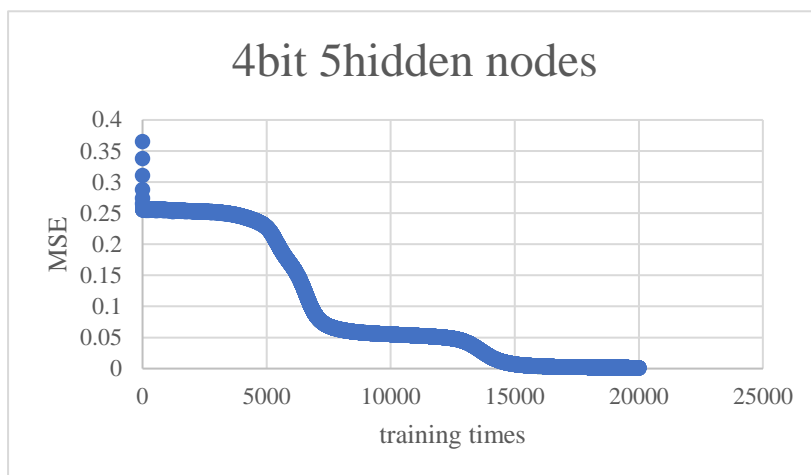
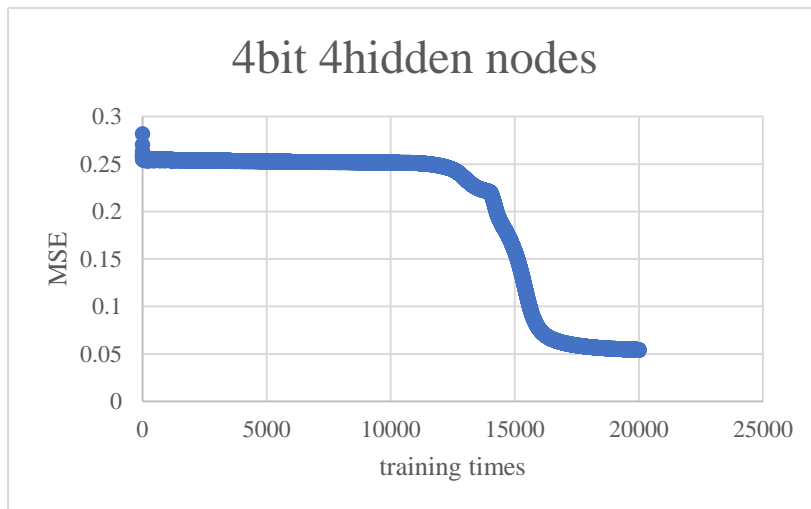
在經過多次訓練後，模型有明顯的 loss convergence



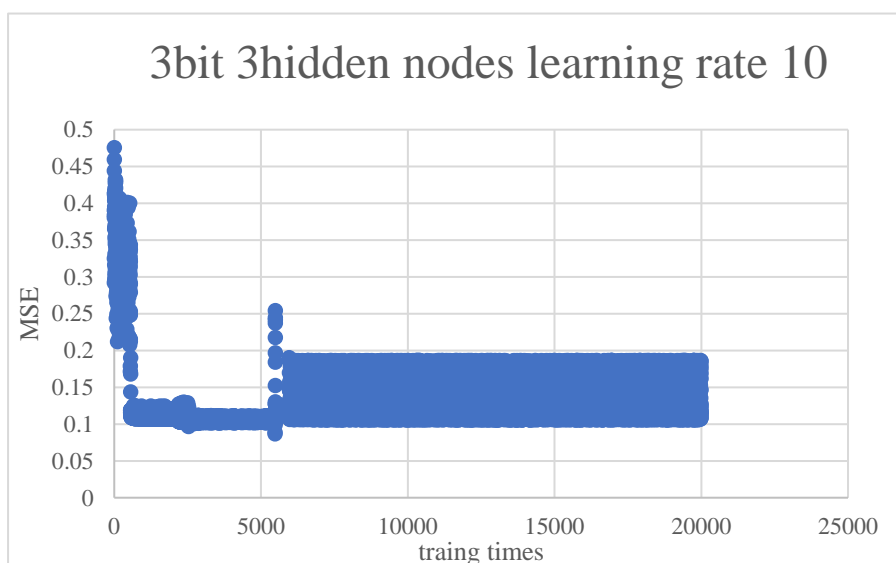
增加 hidden nodes 的數目可以有效減少 error

且 bit 數越多，hidden nodes 的數目不夠多可能導致無法收斂

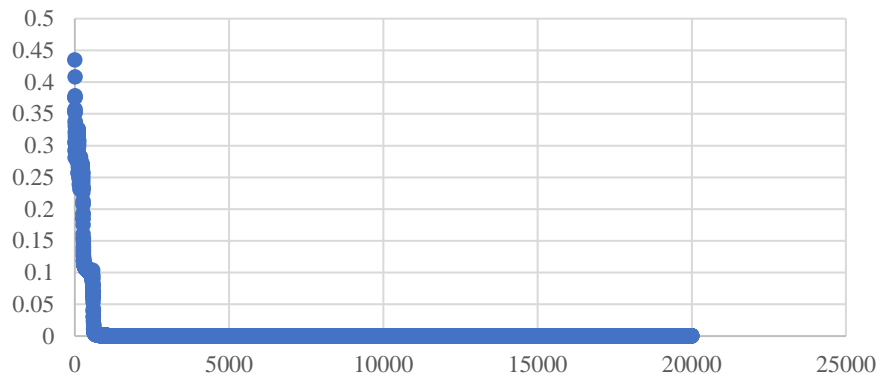




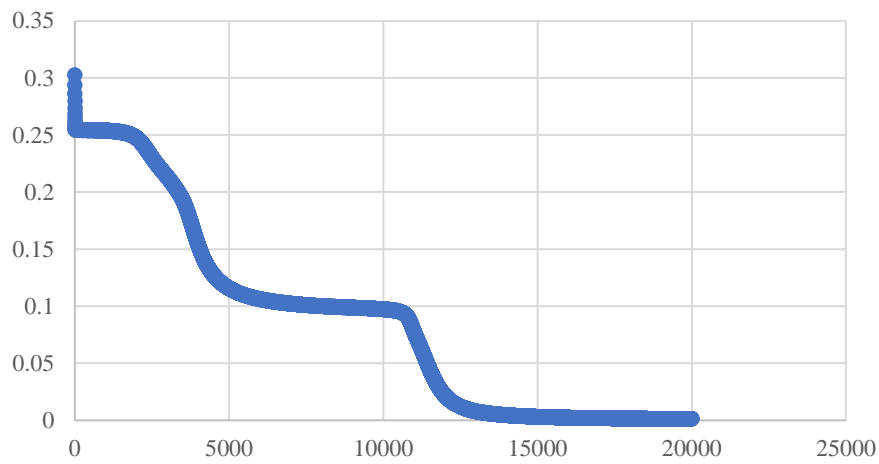
Learning rate 加大可加快訓練速度，但可能導致無法收斂



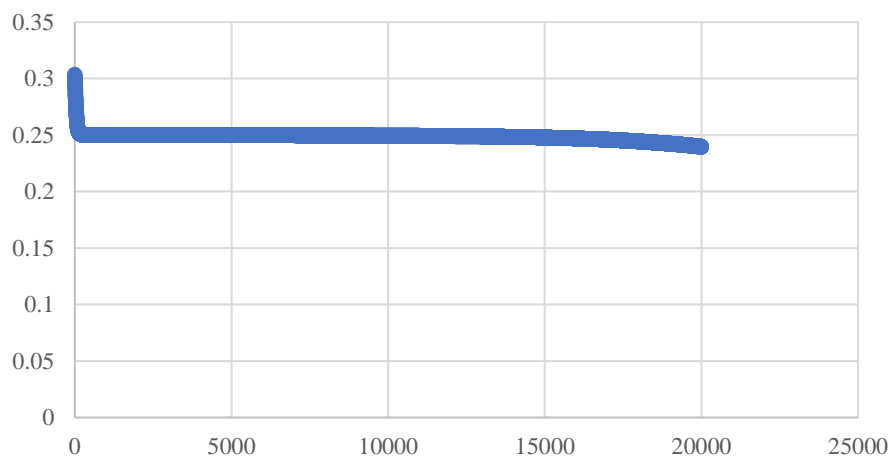
3bit 3hidden nodes learning rate 4



3bit 3hidden nodes learning rate 0.1



3bit 3hidden nodes learning rate 0.01



遇到的問題&解決方法

編譯器 C 語言標準不同→指定 C 語言標準

不同編譯器支援的語法不一樣→根據錯誤訊息修改語法

資料來源

[Simple neural network implementation in C | by Santiago Becerra | Towards Data Science](#)

[Build Neural Network Framework in C Backpropagation | Analytics Vidhya \(medium.com\)](#)

[\[Linux \] \[C++ \] 如何在 Ubuntu 撰寫以及編譯執行 C++ 程式 | Laird Studio](#)

[C compile error: "Variable-sized object may not be initialized" - Stack Overflow](#)
[undefined reference to 'exp' Markwu115 的博客-CSDN 博客](#)