

Assignment #1

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1.編譯結果

```
root@DESKTOP-SIDL7N9:~/Neural-Network-framework-using-Backpropagation-in-C# gcc main.c -lm layer.c neuron.c
root@DESKTOP-SIDL7N9:~/Neural-Network-framework-using-Backpropagation-in-C# ./a.out
```

Figure 1: Compile file

2.執行結果

(迭代過程)

```
Mean Absolute Error is: 0.000031
Mean Square Error is: 0.000010
Iteration Times: 19950 Inputs/Outputs: Input: 0.000000
Input: 0.000000
Output: 0

Input: 0.000000
Input: 1.000000
Output: 1

Input: 1.000000
Input: 0.000000
Output: 1

Input: 1.000000
Input: 1.000000
Output: 0
```

Figure 2: Iteration process

(輸入輸出)

```
Enter input to test:
0 0
Output: 0

0 1
Output: 1

Enter input to test:
1 1
Output: 0

Enter input to test:
1 0
Output: 1

Enter input to test:
0 0
Output: 0
```

Figure 3: Compile file

3.分析

經由參考資料，得知有數種計算 loss function 的方法，於是我使用了均方

誤差(Mean square error, MSE) $MSE = \frac{1}{n} \sum_{i=1}^n (y_i - \hat{y}_i)^2$ 和平均絕對值誤差(Mean absolute

error, MAE) $MAE = \frac{1}{n} \sum_{i=1}^n |y_i - \hat{y}_i|$ 兩種方法。在本次的類神經網路學習 XOR 的運算

中，兩者運算後得出的數值沒有明顯差異。由此可知兩者皆可用於此實驗

分析。

MAE	0.489595	MSE	0.447935
MAE	0.391672	MSE	0.354827
MAE	0.326466	MSE	0.292372
MAE	0.279976	MSE	0.247374
MAE	0.245205	MSE	0.21322
MAE	0.218232	MSE	0.18631
MAE	0.196825	MSE	0.164431
MAE	0.179438	MSE	0.146039
MAE	0.165087	MSE	0.130174
MAE	0.153089	MSE	0.116175
MAE	0.142947	MSE	0.103608
MAE	0.134285	MSE	0.092248
MAE	0.126798	MSE	0.082092

Figure4: Data of MAE and MSE

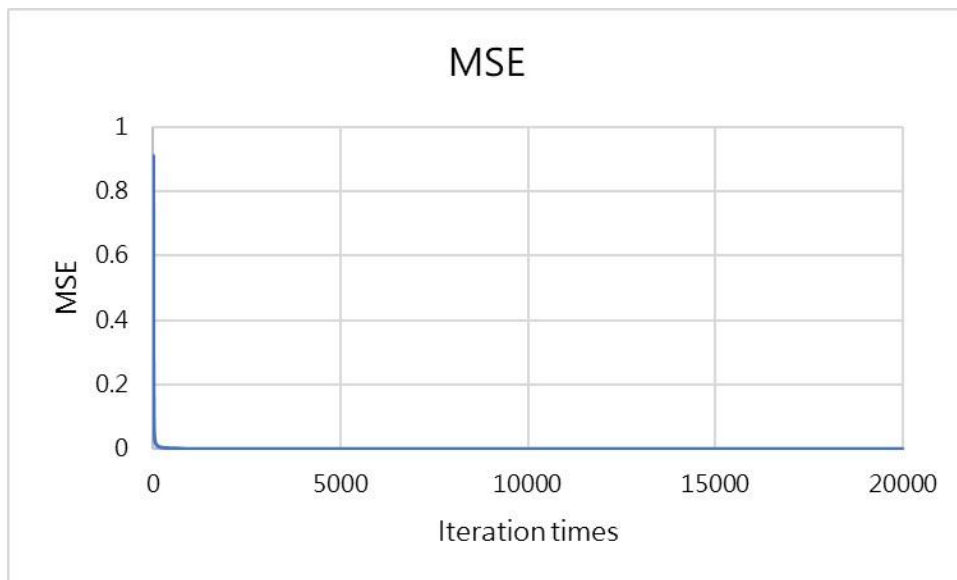


Figure 5: Compile file

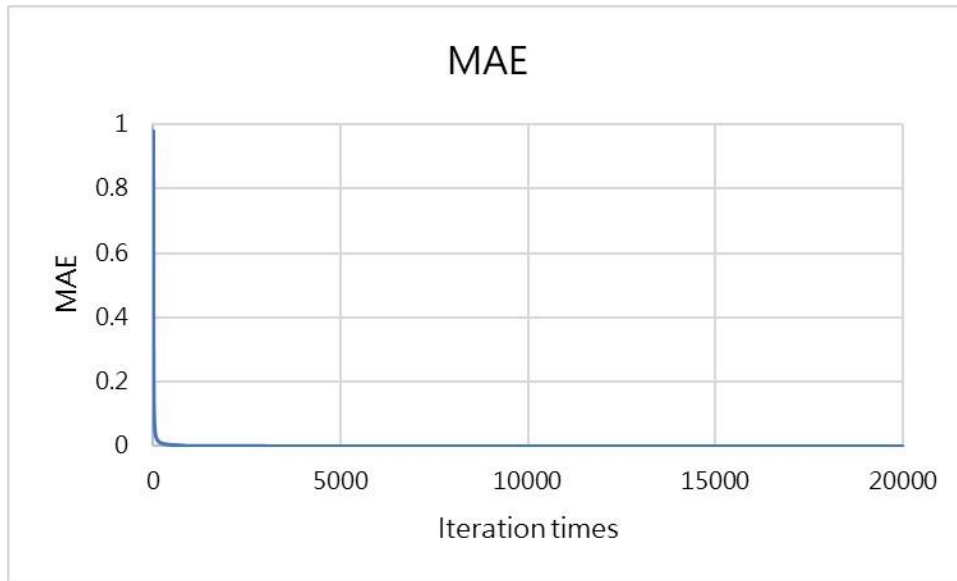


Figure 6: Iteration times

4.參考資料

- (1) [Simple neural network implementation in C | by Santiago Becerra | Towards Data Science](#)
- (2) [Build Neural Network Framework in C Backpropagation | Analytics Vidhya \(medium.com\)](#)
- (3) <https://chih-sheng-huang821.medium.com/%E6%A9%9F%E5%99%A8-%E6%B7%B1%E5%BA%A6%E5%AD%B8%E7%BF%92-%E5%9F%BA%E7%A4%8E%E4%BB%8B%E7%B4%B9-%E6%90%8D%E5%A4%B1%E5%87%BD%E6%95%B8-loss-function-2dcac5ebb6cb>