智慧型計算#HW1

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比較 Incremental 和 Batch 版本的 Widrow-Hoff 演算法

我這次作業並沒有成功時作出兩個版本的比較。

Learning Rate 對於學習的影響

Learning Rate 的大小會影響到學習的速度。Learning Rate 小則學得慢，Learning Rate 大則學得快。如果 Learning Rate 太小，學習的速度就會比較慢就會在 epochs 的次數限制下結束，那表示訓練的結果並不是你所預期的。但是 Learing Rate 太大也有會有不好的影響。

```
* Learning rate: 0.000010
* total 1000 generations.
Stop training because reach max generation iteration.
This may cause predict not correctly.
Please change learning rate and try again.

* all training set predict:
answer: -1, predict:  1
answer: 1, predict:  1
answer: 1, predict:  1
answer: -1, predict:  1
answer: -1, predict:  1
answer: 1, predict:  1
answer: 1, predict:  1
answer: -1, predict:  1
* accuracy: 4 of 8 correct.

* all test set predict:
answer: -1, predict:  1
answer: 1, predict:  1
answer: -1, predict:  1
answer: 1, predict:  1
* accuracy: 2 of 4 correct.
```

Learning Rate 太小導致提早結束，學習情況不佳。

```
* Learning rate: 0.100000
* total 4 generations.
Stop training because Mean Squared Error(MSE) < 0.000001

* all training set predict:
answer: -1, predict:  -1
answer: 1, predict:  1
answer: 1, predict:  1
answer: -1, predict:  -1
answer: -1, predict:  -1
answer: 1, predict:  1
answer: 1, predict:  1
answer: -1, predict:  -1
* accuracy: 8 of 8 correct.

* all test set predict:
answer: -1, predict:  -1
answer: 1, predict:  1
answer: -1, predict:  -1
answer: 1, predict:  1
* accuracy: 4 of 4 correct.
```

給與一個正常的 Learning Rate 只花了4次就訓練完成，並且全部預測正確。

Training Set 以及 Testing Set 的影響

並未實作。

如何編譯執行這份程式碼

這份程式碼是用 C 語言寫的。如果是在 Mac (Unix)、Linux 的環境下，直接在 Commnad Line 當前目錄下 “make run” 這個指令就會自動把編譯好的程式放到 “/executable/main” 路徑下並自動執行。如果是在 Windows 作業系統下的話，在 “./executable” 裡就有一個 “main.exe” 檔案，直接執行即可。

關於這份程式碼

```
* Show all weights and bias in this trained neuron.
bias: -0.080000
weight 1: 0.786342
weight 2: -0.036165
weight 3: 0.655591
weight 4: -0.000094
weight 5: 1.024648
weight 6: 0.973269
weight 7: 0.777251
weight 8: 1.062321
weight 9: 0.916180
weight 10: 0.915853
weight 11: -0.025418
weight 12: 0.121799
weight 13: 0.868093
weight 14: 0.520688
weight 15: 0.885867
weight 16: 0.001959
weight 17: 0.246843
weight 18: 0.497313
weight 19: 0.827236
weight 20: 0.034612
weight 21: -0.036146
weight 22: 0.809341
weight 23: 0.402511
weight 24: 0.475737
weight 25: 0.383370
weight 26: 0.619100
```

執行時會先列出神經元經過訓練後的權重 (Weight) 和偏移量 (Bias)

接著會顯示該神經元的 Learning Rate、經過了幾個世代，以及預測的結果和準確度。

```
* Learning rate: 0.100000
* total 4 generations.
Stop training because Mean Squared Error(MSE) < 0.000001

* all training set predict:
answer: -1, predict:  -1
answer: 1, predict:  1
answer: 1, predict:  1
answer: -1, predict:  -1
answer: -1, predict:  -1
answer: 1, predict:  1
answer: 1, predict:  1
answer: -1, predict:  -1
* accuracy: 8 of 8 correct.

* all test set predict:
answer: -1, predict:  -1
answer: 1, predict:  1
answer: -1, predict:  -1
answer: 1, predict:  1
* accuracy: 4 of 4 correct.
```