Homework 5, best relaxation for SOR method

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1. 使用 SOR 解 n=40*40 matrix A

   執行結果

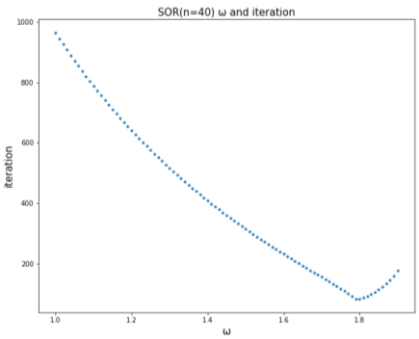
```
w = 1.0: need 964 iterations
w = 1.1: need 788 iterations
w = 1.2: need 641 iterations
w = 1.3: need 516 iterations
w = 1.4: need 409 iterations
w = 1.5: need 316 iterations
w = 1.6: need 233 iterations
w = 1.7: need 157 iterations
w = 1.8: need 85 iterations
w = 1.9: need 177 iterations
best w: 1.8, need 85 iteratrion
```

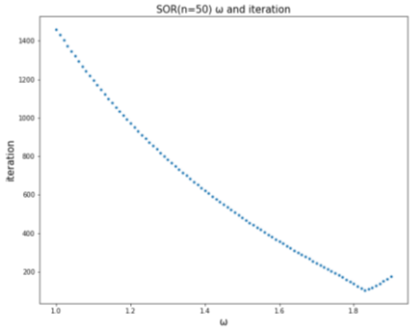
   更精準的:

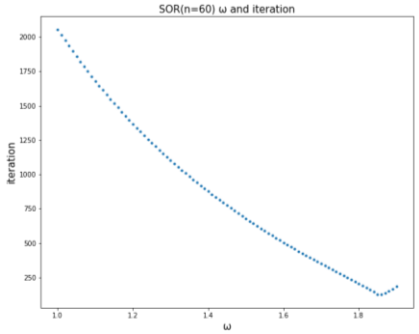
```
best w: 1.79, need 84 iteratrion
best w: 1.791, need 83 iteratrion
```

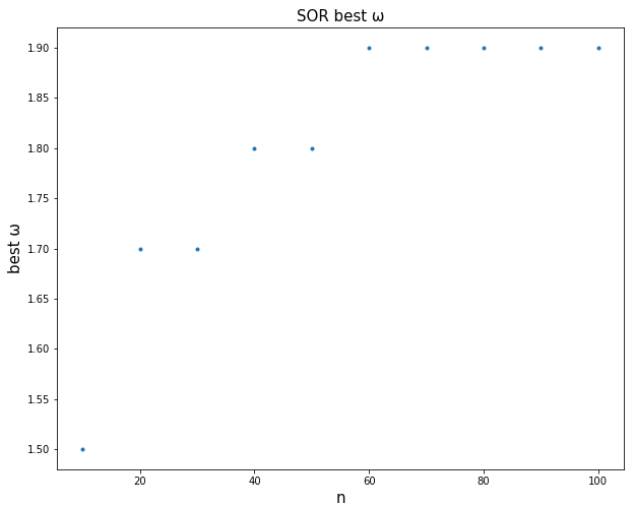
2. 一些執行結果圖

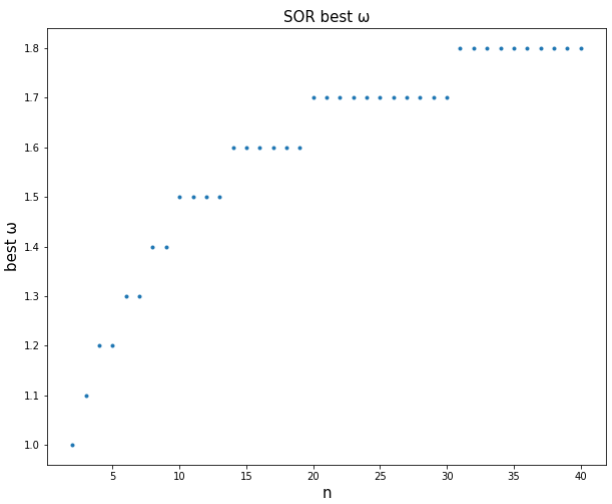
n=40　　n=50　　n=60

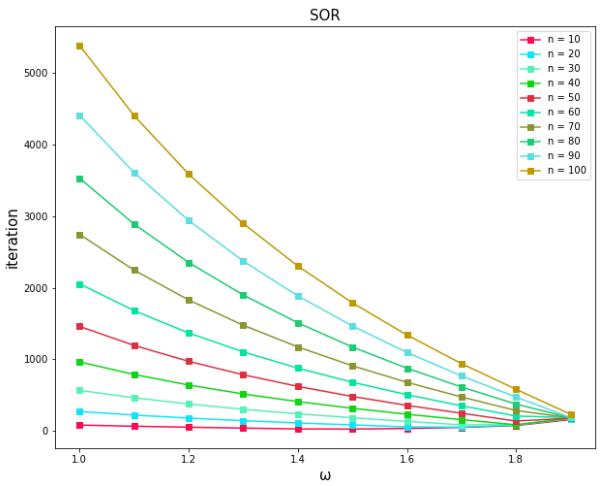


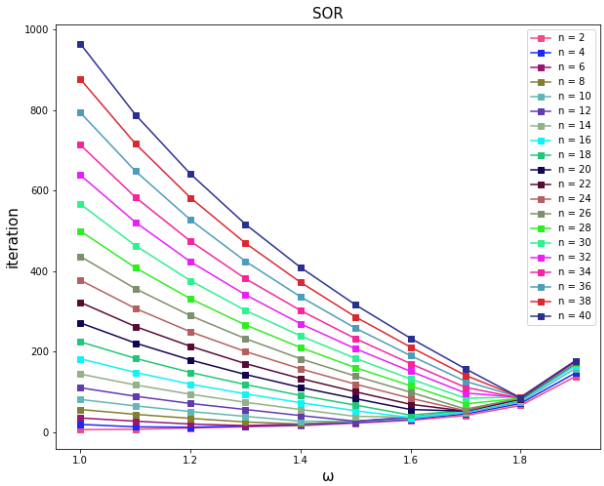












可以看出，n 越大，最佳ω會變大，但大到一個值就不會繼續增加了。

3. 從隨機選擇 initial guess 的結果來看，iteration 的次數並不會變少。
4. 使用 inf norm 計算 n=200~n=800,由於 iteration 次數太多跑不出來更大的 n

```
n=200
1.8 need 1341 iterations
1.9 need 629 iterations
best w: 1.9
n=300
1.8 need 2676 iterations
1.9 need 1265 iterations
best w: 1.9
n=400
1.8 need 4332 iterations
1.9 need 2051 iterations
best w: 1.9
n=500
1.8 need 6255 iterations
1.9 need 2964 iterations
best w: 1.9
n=600
1.8 need 8405 iterations
1.9 need 3983 iterations
best w: 1.9
n=700
1.8 need 10750 iterations
1.9 need 5095 iterations
best w: 1.9
n=800
1.8 need 13262 iterations
1.9 need 6286 iterations
best w: 1.9
```