**Homework 1 Experiment Report**

**Problem 1.**

Experiment with the step size (learning rate).

Learning rate=5

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Learning Rate |  |  |  | 5 |  |  |  |  |
| Non-Normalized Data | Training Error |  |  |  |  |  |  |  |
| Testing Error |  |  |  |  |  |  |  |
| Normalized Data | Training Error |  |  |  |  |  |  |  |
| Testing Error |  |  |  |  |  |  |  |

Without data normalization,

Train Error: 0.23475709162

Test Error: 0.238591916558

After data normalization,

Train Error: 0.0795565699381

Test Error: 0.0938722294654

**Problem 2.**

Learning rate= 0.005

Training Error is 0.314639713075

Training Error is 0.333116036506

(Note: the performance is not stable, since the result is impact the random shuffle of data and stochastic gradient descent process.)