Assignment 1

1 Case : $y = w \cdot x$

1.1 Generate Data

Generate $(x_1, y_1), (x_2, y_2), ..., (x_n, y_n)$ as follows.
1. Choose a number w^{opt} for w.
2. Generate 1000 random numbers from 0 to 1000. We call this set X.
3. For each $x \in X$, generate $y = w^{opt} \cdot x$. (You may generate the number y like $x \sim N(w^{opt} \cdot x, 1)$.)

1.2 Estimate w

1. Choose a number for η.
2. Find w.
   2-1. Choose a number for w arbitrarily.
   2-2. $w \leftarrow w - \eta \sum_{i=1}^{n} (w \cdot x_i - y_i) \cdot x_i$ until convergence. Let the final w be w^*.
3. Check w^* with w^{opt}.

2 Case : $y = w \cdot x + b$

2.1 Generate Data

Generate $(x_1, y_1), (x_2, y_2), ..., (x_n, y_n)$ as follows.
1. Choose a number w^{opt}, b^{opt} for w, b, repectively.
2. Generate 1000 random numbers from 0 to 1000. We call this set X.
3. For each $x \in X$, generate $y = w^{opt} \cdot x + b^{opt}$. (You may generate the number y like $x \sim N(w^{opt} \cdot x + b^{opt}, 1)$.)

2.2 Estimate w and b

1. Choose numbers for parameters.
   1-1. Choose a number for η_w.
   1-2. Choose a number for η_b.

2. Until convergence,

    2-1. $w \leftarrow w - \eta_w \sum_{i=1}^{n} (w \cdot x_i + b - y_i) \cdot x_i$.

    2-2. $b \leftarrow b - \eta_b \sum_{i=1}^{n} (w \cdot x_i + b - y_i)$.

    2-3. Let the final w, b be w^*, b^*, respectively.

3. Check w^*, b^* with w^{opt}, b^{opt}.

3 Next

Design the online versions of the above batch versions.