PadhAI: MP Neuron & Perceptron

One Fourth Labs

Perceptron: Toy Example

Perceptron Learning Algorithm in action

1. Dataset

x_1	x_2	y
-1	-1	0
-5	-2.5	0
-7.5	7.5	0
10	7.5	1
-2.5	12.5	0
5	10	1
5	5	1

2. P ⇒ Green points, N ⇒ Red points
3. Decision boundary line is given by $w_1x_1 + w_2x_2 - b >= 0$
    a. Or $x_2 = -(w_1/w_2)x_1 + (b/w_2)$
    b. Can be rewritten as $x_2 = mx + c$
    c. Where $m = -(w_1/w_2)$ and $c = (b/w_2)$
4. Initialize w randomly
    a. $w_1 = 1.00$, $w_2 = 1.00$, $b = 5.00$ ⇒ $m = -1.00$, $c = 5.00$
5. The line is $x_2 = -x_1 + 5$
6. While !convergence do:
    a. Pick random $x \in P \cup N$
    b. If $x \in P$ and $\Sigma^{n}_{i=0} w_ix_i < 0$ then, $w = w + x$; **end**
    c. If $x \in N$ and $\Sigma^{n}_{i=0} w_ix_i >= 0$ then, $w = w - x$; **end**
    d. Consider $x = [x_0;x_1;x_2]$ and $w = [w_0;w_1;w_2]$, where x_0 bias term is always 1
    e. On the 5th training example, condition c isn't satisfied, so we recalculate $w = w - x$
    f. $w_1 = 3.5$, $w_2 = -11.5$, $b = 4.00$ ⇒ $m = 0.3$, $c = -0.35$
    g. The line changes, causing a new error on the 6th training example, so we calculate $w = w+x$
    h. $w_1 = 8.5$, $w_2 = -1.5$, $b = 5.00$ ⇒ $m = 5.67$, $c = -3.33$
    i. The resulting line predicts all examples perfectly, thus convergence is reached