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**Part1 :**

**(1). Language: Python 2.7.11**

**(2). Tool: Mac + IDLE**

**(3). Data structure:**

X: Array[Array[]]

Y: Array[]

W: Array[]

**(4). Logic:**

**Perceptron Learning Algorithm:**

Step1: load data, get w vector

Step2: check all constraints are satisfied or not, if not, go to Step 3, if yes, return w

Step3: if y[i] = +1 and w0\*x0 + w1\*x1 + … < 0: w = w + aierfa \* x

if y[i] = -1 and w0\*x0 + w1\*x1 + … >= 0: w = w - aierfa \* x

Step4: repeat Step2 and Step3

**Pocket Algorithm:**

Step1: load data, get w vector

Step2: check all constraints are satisfied or not, if not, go to Step 3, if yes, return w

Step3: if y[i] = +1 and w0\*x0 + w1\*x1 + … < 0: w = w + aierfa \* x

if y[i] = -1 and w0\*x0 + w1\*x1 + … >= 0: w = w - aierfa \* x

Step4: repeat Step2 and Step3 at most 7000 times

**(5). Optimization:**

The time complexity if fix for this algorithm, in order to save space, I use a variable “hasFalse” to judge whether quit or not.

**(6). Result:**

The result of Perceptron Learning Algorithm of w = [0, 0.09399359, -0.0753947, -0.05631316]

The result of Perceptron Learning Algorithm of w = [1.00000000e-03, 2.81760345e-04, 1.19863056e-03, 5.45141147e-05].

('length of data', 2000)

('Y = +1 but value < 0', 0)

('Y = -1 but value >= 0', 1012)

**Part 2:**

On the github, rasbt create a script of perceptron. <https://github.com/SunchaiA/rasbt-python-machine-learning-book/blob/master/code/ch02/ch02.ipynb>

It is a linear classification algorithm because we know the data set is linear separatable. I input the data and set the parameters, the output is w = [0, 1.87987173, -1.50789408, -1.12626318].

The advantage of the script is: (1) the running time. It runs faster than my script.

Ideas how can I improve my algorithm: the core code of the script is efficient. It can reduce calculation by using “update = self.eta \* (target –self.predict(xi))”

**Part 3:**

When bank have data of credit card violate, they need an algorithm to divide the users into different part, but it is very difficult to find a line between users. Perceptron Learning Algorithm can work on the taining data of linear separable.