

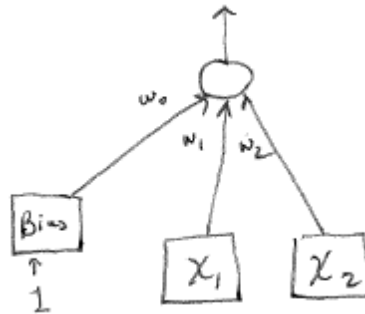
Data Mining, CSCI 347, Fall 2019
Homework 4, Perceptron, due Oct. 21

- Hand execute the first 20 steps of the Perceptron algorithm on the following data. Each time that a new prediction is made, show the line of that prediction, if possible, in order to visualize how the algorithm is working.

Alternatively, program the Perceptron algorithm, outputting the result of each step, and let it run to completion. Show the graph each time that a new prediction is made on the first 20 steps.

x_1	x_2	class
2	4	1
1	5	1
-1	-3	0
5	4	0
-2	6	1
1	2	0
4	2	0
-3	-1	1
-2	2	1
4	1	0
7	2	0

Overall perceptron:



First class is class 0
 Second class is class 1

If prediction > 0 then class = 0 else class = 1.

If prediction is wrong

If actual class = 0, add the instance values to the weight vector

Else, subtract the instance values to the weight vector

Instance	Weights	Prediction	Correct?	Update	Updated Weight
	(0,0,0)	$w_0+w_1*x_1+w_2*x_2$			
1. 2 4 1	(0,0,0)	$0+0*2+0*4 = 0$	Yes	---	(0,0,0)
2. 1 5 1	---	$0+0*1+0*5 = 0$	Yes	---	---
3. -1 -3 0	---	$0+0*-1+0*-3 = 0$	No	+(1,-1,-3)	(1,-1,-3)
4. 5 4 0	(1,-1,-3)	$1+1*5+3*4 = -16$	No	+(1,5,4)	(2,4,1)
5. -2 6 1	(2,4,1)	$2+4*-2+1*6 = 0$	Yes	---	---
6. 1 2 0	---	$2+4*1+1*2 = 8$	Yes	---	---
7. 4 2 0	---	$2+4*4+1*2 = 20$	Yes	---	---
8. -3 -1 1	---	$2+4*-3+1*-1 = -12$	Yes	---	---
9. -2 2 1	---	$2+4*-2+1*2 = -4$	Yes	---	---
10. 4 1 0	---	$2+4*4+1*1 = 19$	Yes	---	---
11. 7 2 0	---	$2+4*7+1*2 = 32$	Yes	---	---
12. 2 4 1	---	$2+4*2+1*4 = 14$	No	-(1,2,4)	(1,2,-3)
13. 1 5 1	(1,2,-3)	$1+2*1+3*5 = -12$	Yes	---	---
14. -1 -3 0	---	$1+2*-1+3*-3 = 10$	Yes	---	---
15. 5 4 0	---	$1+2*5+3*4 = -1$	No	+(1,5,4)	(2,7,1)
16. -2 6 1	(2,7,1)	$2+7*-2+1*6 = -6$	Yes	---	---
17. 1 2 0	---	$2+7*1+1*2 = 11$	Yes	---	---
18. 4 2 0	---	$2+7*4+1*2 = 32$	Yes	---	---
19. -3 -1 1	---	$2+7*-3+1*-1 = -20$	Yes	---	---
20. -2 2 1	---	$2+7*-2+1*2 = -10$	Yes	---	---