

Question 2

W	R1	R2	0.25
1, 1	1/10	0.25	0.0625
2, 4	1/10	0.0625 (1/16)	
4, 5	1/10	0.0625	
5, 3	1/10	0.0625	
5, 6	1/10	0.0625	
6, 2	1/10	0.25	
7, 6	1/10	0.0625	
8, 3	1/10	0.0625	
8, 8	1/10	0.0625	
10, 5	1/10	0.0625	

if $x > 2$, classify to the left +1 (C_1)

if $x < 2$, classify to the left -1 (C_0)

$E = E_{w_i}$; Pick lowest error, $\alpha = \frac{1}{2} \ln \left(\frac{1-E}{E} \right)$

Weight update = $\begin{cases} 1/2 \cdot 1/E \cdot w_{old} & \text{correct} \\ 1/2 \cdot 1/E \cdot w_{old} & \text{incorrect} \end{cases}$

Pick Boundaries eyeballing it I think $x_1 = 4.5$ $x_2 = 5.5$ and $x_2 = 2.5$ should be the best

	Misses	E
$x_1 > 4.5$	85	1/2
$x_2 > 5.5$	23	3/10
$x_2 > 2.5$	2	2/10
$x_1 < 4.5$	25	1/2
$x_2 < 5.5$	87	7/10
$x_2 < 2.5$	8	8/10

after round 1 pick $h = x_2 > 2.5$, $E = 1/5$, $\alpha = 0.693$

after round 2 pick $h = x_1 > 4.5$, $E = 1/50$, $\alpha = 1.946$

after round 3 pick $h = x_2 > 5.5$, $E = 3/50$, $\alpha = 1.376$

$$H(x_1, x_2) = \text{sign} \left(1.946(h_1(x_1 > 4.5)) + 1.376(h_2(x_2 > 5.5)) + 0.693(h_3(x_2 > 2.5)) \right)$$

Problem 2 Plots

```
clear all
close all

x1 = 0:1:12;
x2 = 0:1:12;

[X1, X2] = meshgrid(x1,x2);

tot = sign(1.946*sign(X1-4.5)+1.376*sign(X2-5.5)+0.693*sign(X2-2.5));

scatter(X1(tot==-1), X2(tot==-1), 'rx')

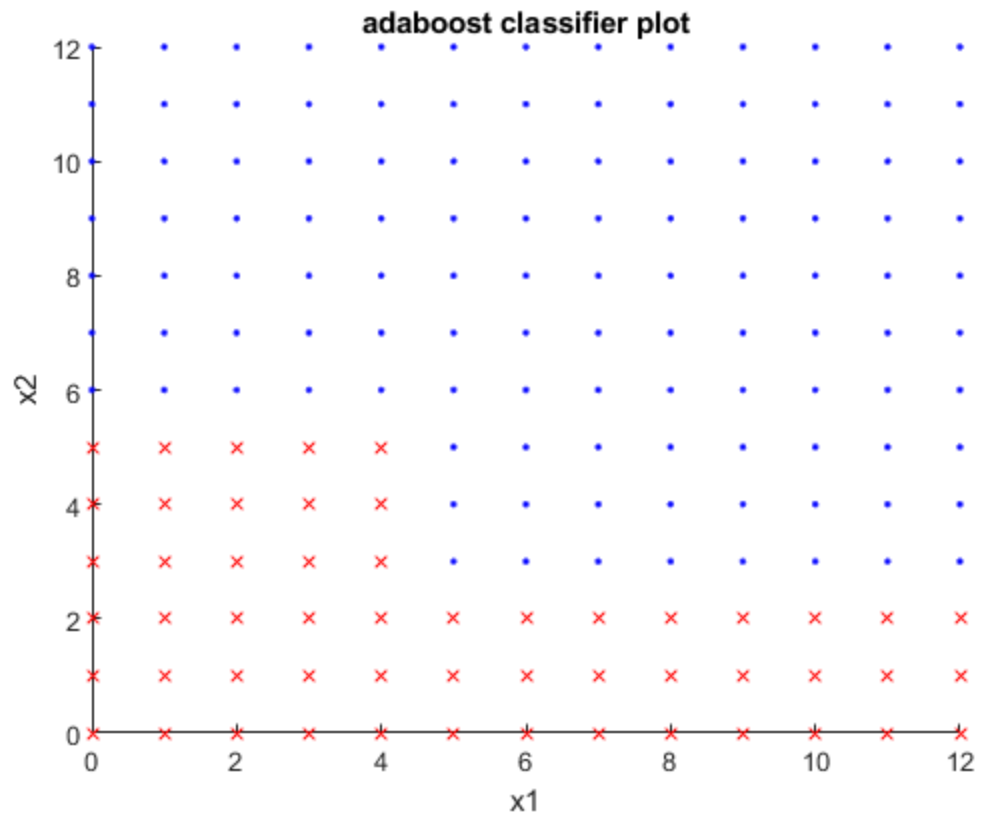
hold on

scatter(X1(tot==+1), X2(tot==+1), 'b.')

title('adaboost classifier plot')
xlabel('x1')
ylabel('x2')

disp('Alpha1 = 1.946, h1 is x1>4.5')
disp('Alpha2 = 1.376, h2 is x2>5.5')
disp('Alpha3 = 0.693, h3 is x2>2.5')

Alpha1 = 1.946, h1 is x1>4.5
Alpha2 = 1.376, h2 is x2>5.5
Alpha3 = 0.693, h3 is x2>2.5
```



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