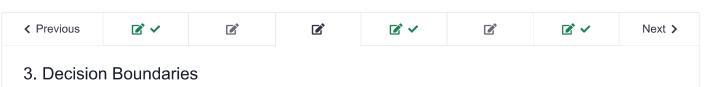
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☆ Course / Unit 1 Linear Classifiers and Generalizations (2 weeks) / Homework 1



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Homework due Sep 30, 2020 05:29 IST Past Due

In this problem, we will investigate the decision boundary of different classifiers.

3. (a)

2/2 points (graded)

Consider the function defined over three binary variables: $f(x_1,x_2,x_3)=(\neg x_1 \wedge \neg x_2 \wedge \neg x_3)$.

We aim to find a heta such that, for any $x=[x_1,x_2,x_3]$, where $x_i\in\{0,1\}$:

$$\theta \cdot x + \theta_0 > 0$$
 when $f(x_1, x_2, x_3) = 1$, and

$$\theta \cdot x + \theta_0 < 0 \text{ when } f(x_1, x_2, x_3) = 0.$$

If $heta_0=0$ (no offset), would it be possible to learn such a heta?

Yes





Would it be possible to learn the pair θ and θ_0 ?

Yes





Solution:

- Since $heta \cdot 0 = 0$, it is impossible to obtain $heta \cdot x + heta_0 > 0$ for f(0,0,0) = 1.
- ullet $heta_1= heta_2= heta_3=-1$ and $heta_0=0.5$ is a valid solution.

Submit

You have used 2 of 3 attempts

• Answers are displayed within the problem

3. (b-1)

1/1 point (graded)

You are given the following labeled data points:

- ullet Positive examples: [-1,1] and [1,-1],
- Negative examples: [1,1] and [2,2].

For each of the following parameterized families of classifiers, identify which parameterized family has a family member that can correctly classify the above data and find the corresponding parameters of a family member that

member that can correctly classify the above data and mid the corresponding parameters of a family member that can correctly classify the above data.

Note: If there is no family member inside the parameterized family that can correctly classify the above data, just enter 0 for all the parameters.

Inside (positive) or outside (negative) of an origin-centered circle with radius r. Enter a scalar for r. If there is no such r, just enter 0.

0 **✓** Answer: 0

Solution:

ullet Any circle that correctly classifies [-1,1] and [1,-1] would incorrectly classify [1,1]

Submit

You have used 1 of 3 attempts

1 Answers are displayed within the problem

3. (b-2)

2/2 points (graded)

Inside (positive) or outside (negative) of an $\left[x,y\right]$ -centered circle with radius r.

[x,y]: [-1,-1] \checkmark Answer: See solution

r: 2.5 ✓ Answer: See solution

Solution:

• A valid solution is [x,y]=[-1,-1] , r=2.1

Submit

You have used 1 of 3 attempts

1 Answers are displayed within the problem

3. (b-3)

1.0/1 point (graded)

Strictly above (positive) or below (negative) a line through the origin with normal θ . Here we define "above" as $\theta \cdot x > 0$, and define "below" similarly. **Note:** Please enter a list for θ as $[\theta_1, \theta_2]$. If there is no solution, enter [0,0]

[0,0] **Answer**: [0, 0]

Solution:

- There is no line through the origin that can simultaneously be strictly below [1,-1] and [-1,1]

Submit You have used 1 of 3 attempts

1 Answers are displayed within the problem

3. (b-4)		
points possible (gr		
	sitive) or below (negative) a line with normal $ heta$ and offset $ heta_0$ nd define "below" similarly. Note: If there is no solution, en	
$\cdot x + v_0 > 0$, a	id define below similarly. Note. If there is no solution, en	ter $\theta = [0, 0]$ and $\theta_0 = 0$.
$[heta_1, heta_2]$:	Answer: See solution	
1, 2,		
<i>9</i> ₀ :	Answer: See solution	
olution:		
A valid solution	n is $[heta_1, heta_2, heta_0]=[-1,-1,0.5]$	
The state of the s	h	
Submit	have used 0 of 3 attempts	
1 Answers are	displayed within the problem	
8. (b-5)		
/1 point (graded)		
Vhich of the belo	w are families of linear classifiers?	
Choose all that a	oply.)	
Inside or ou	side of an origin-centered circle with radius \emph{r} .	
	esta esta for all accessors desired to the contract of	
Inside or ou	side of an $\left[x,y ight]$ -centered circle with radius r .	
Strictly abov	e or below a line through the origin with normal $ heta.$	
Strictly abov	e or below a line with normal $ heta$ and offset $ heta_0$.	
~		
olution:		
• The first two f	amilies are nonlinear (circles), and the last two families are l	linear classifiers (lines).
Cularati	have used 1 of 2 attempts	
Submit You	nave used 1 of 2 attempts	
1 Answers are	displayed within the problem	
Discussion		5.
	ssifiers and Generalizations (2 weeks):Homework 1 / 3. Decision	Hide Discussion
oundaries	, ,	
		Add a Post
Show all posts	,	by recent activity 🕶
why my answ	ers for 3-b4 & 3-b2 was wrong	
	orrect 0 1 & 0 2 but they are marked as wrong. Why? for 3-b2, I have given a cor	rect answer in attempt 2 but still it di
<u>→ Helpful tool for</u>	o <u>r 3-b</u>	
• ———		1