CptS 540 Artificial Intelligence
Homework 10
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1.

a. $P(BuyJersey) = 7/11$
$P(BuyJersey) = 4/11$

b. $P(Weather = clear \mid BuyJersey = yes) = 3/7$
$P(Weather = cloudy \mid BuyJersey = yes) = 2/7$
$P(Weather = rainy \mid BuyJersey = yes) = 2/7$
$P(Weather = clear \mid BuyJersey = no) = 1/4$
$P(Weather = cloudy \mid BuyJersey = no) = 1/4$
$P(Weather = rainy \mid BuyJersey = no) = 2/4$

c. $P(Uniform = crimson \mid BuyJersey = yes) = 6/7$
$P(Uniform = gray \mid BuyJersey = yes) = 1/7$
$P(Uniform = crimson \mid BuyJersey = no) = 0/4 => (0 + 1)/4 = 1/4$
$P(Uniform = gray \mid BuyJersey = no) = 1$

d. $P(Win = yes \mid BuyJersey = yes) = 4/7$
$P(Win = no \mid BuyJersey = yes) = 3/7$
$P(Win = yes \mid BuyJersey = no) = 1/4$
$P(Win = no \mid BuyJersey = no) = 3/4$

e. $P(BuyJersey = yes \mid Weather = cloudy, Uniform = gray, Win = yes)$
$= \alpha * P(Weather = cloudy, Uniform = gray, Win = yes \mid BuyJersey = yes) * P(BuyJersey = yes)$
$= \alpha * P(Weather = cloudy \mid BuyJersey = yes) * P(Uniform = gray \mid BuyJersey = yes) * P(Win = yes \mid BuyJersey = yes) * P(BuyJersey = yes)$
$= \alpha * \frac{2}{7} * \frac{1}{7} * \frac{4}{7} * \frac{7}{11}$
$= \alpha(0.015)\ from\ \alpha\ below = 0.39$
$P(BuyJersey = no \mid Weather = cloudy, Uniform = gray, Win = yes)$
$= \alpha * P(Weather = cloudy, Uniform = gray, Win = yes \mid BuyJersey = no) * P(BuyJersey = no)$
$= \alpha * P(Weather = cloudy \mid BuyJersey = no) * P(Uniform = gray \mid BuyJersey = no) * P(Win = yes \mid BuyJersey = no) * P(BuyJersey = no)$
$= \alpha * \frac{1}{4} * 1 * \frac{1}{4} * \frac{4}{11}$
$= \alpha(0.023)\ from\ \alpha\ below = 0.61$
$\alpha = 1/(0.015 + 0.023) = 26.32$

f. Since $P(BuyJersey = yes \mid Weather = cloudy, Uniform = gray, Win = yes) < P(BuyJersey = no \mid Weather = cloudy, Uniform = gray, Win = yes)$, Naïve Bayes would classify the new instance as $BuyJersey = no$.

2. Perception
   a. See the table below:

Weather	Uniform	Win	BuyJersey
0	0	1	1
0	0	0	1
0	1	1	1
0	1	0	0
1	0	1	1
1	0	0	1
1	1	0	0
2	0	1	1
2	0	0	1
2	1	1	0
2	1	0	0

   b. New instance <Weather=cloudy, Uniform=gray, Win=yes, BuyJersey=no>

Weather	Uniform	Win	BuyJersey
1	1	1	0

   before any training passes, new instance:
   $w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 * 1 + 1 * 1 + 1 * 1 + 1 * 1 = 4 > 0 \rightarrow 1\ (incorrect)$

   c. Training.

   Pass#1
   Example1:
   $$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 + 0 + 0 + 1 = 2 \geq 0 \rightarrow 1\ (correct)$$
   Exampl2:
   $$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 + 0 + 0 + 0 = 1 \geq 0 \rightarrow 1\ (correct)$$
   Example3:
   $$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 + 0 + 1 + 1 = 3 \geq 0 \rightarrow 1\ (correct)$$
   Example4:
   $$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 + 0 + 1 + 0 = 2 \geq 0 \rightarrow 1\ (incorrect)$$
   $$w_i = w_i + \eta(correct - output)x_i$$
   $$w_0 = 1 + 0.5 * (0 - 1) * 1 = 0.5$$
   $$w_1 = 1 + 0.5 * (0 - 1) * 0 = 1$$
   $$w_2 = 1 + 0.5 * (0 - 1) * 1 = 0.5$$
   $$w_3 = 1 + 0.5 * (0 - 1) * 1 = 1$$
   Example5:
   $$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 + 1 + 0 + 1 = 2.5 \geq 0 \rightarrow 1\ (correct)$$
   Example6:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 + 1 + 0 + 0 = 1.5 \geq 0 \rightarrow 1\ (correct)$$

Example7:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 + 1 + 0.5 + 0 = 2 \geq 0 \rightarrow 1\ (incorrect)$$

$$w_i = w_i + \eta(correct - output)x_i$$
$$w_0 = 0.5 + 0.5 * (0 - 1) * 1 = 0$$
$$w_1 = 1 + 0.5 * (0 - 1) * 1 = 0.5$$
$$w_2 = 0.5 + 0.5 * (0 - 1) * 1 = 0$$
$$w_3 = 1 + 0.5 * (0 - 1) * 0 = 1$$

Example8:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0 + 1 + 0 + 1 = 2 \geq 0 \rightarrow 1\ (correct)$$

Example9:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0 + 1 + 0 + 0 = 1 \geq 0 \rightarrow 1\ (correct)$$

Example10:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0 + 1 + 0 + 1 = 2 \geq 0 \rightarrow 1\ (incorrect)$$

$$w_i = w_i + \eta(correct - output)x_i$$
$$w_0 = 0 + 0.5 * (0 - 1) * 1 = -0.5$$
$$w_1 = 0.5 + 0.5 * (0 - 1) * 2 = -0.5$$
$$w_2 = 0 + 0.5 * (0 - 1) * 1 = -0.5$$
$$w_3 = 1 + 0.5 * (0 - 1) * 1 = 0.5$$

Example11:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = -0.5 - 1 - 0.5 + 0 = -2 < 0 \rightarrow 0\ (correct)$$

d. new instance < Weather=cloudy, Uniform=gray, Win=yes >

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = -0.5 - 0.5 - 0.5 - 0.5 = -2 < 0 \rightarrow 0\ (correct)$$

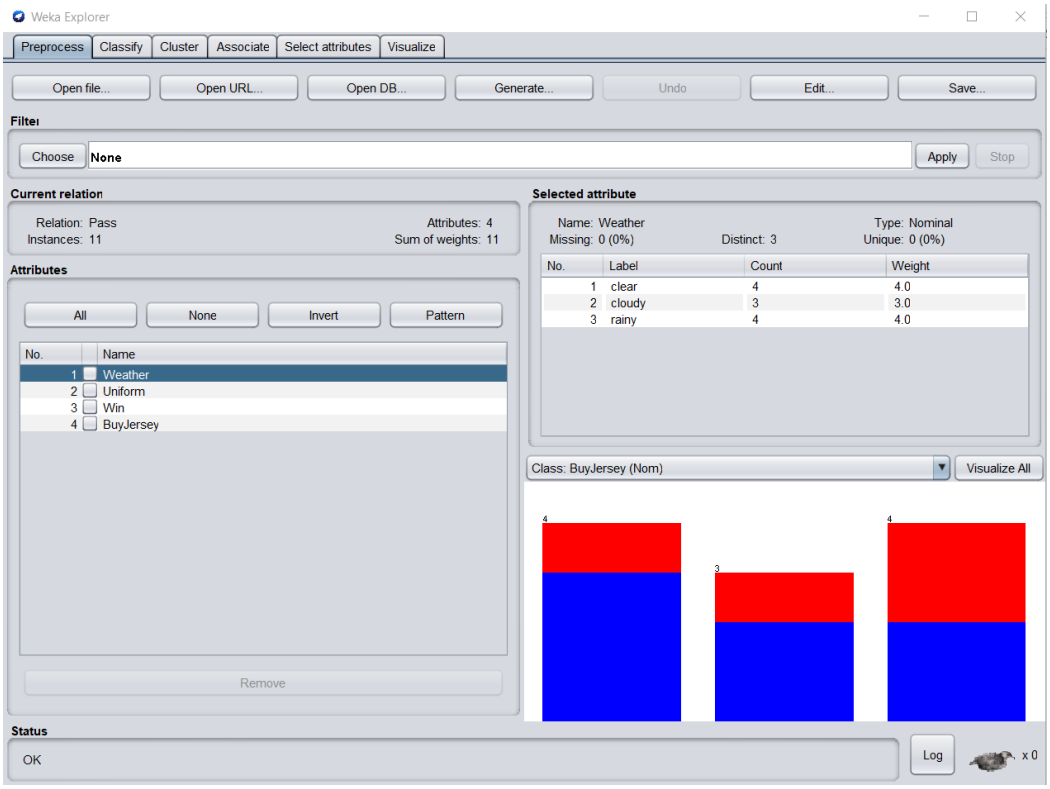
3. Input .arff file:

```
@relation Pass

@attribute Weather{clear,cloudy,rainy}
@attribute Uniform{crimson,gray}
@attribute Win{yes,no}
@attribute BuyJersey{yes,no}

@data
clear,crimson,yes,yes
clear,crimson,no,yes
clear,gray,yes,yes
clear,gray,no,no
cloudy,crimson,yes,yes
cloudy,crimson,no,yes
cloudy,gray,no,no
rainy,crimson,yes,yes
rainy,crimson,no,yes
rainy,gray,yes,no
```

rainy,gray,no,no



Output:

=== Run information ===

Scheme: weka.classifiers.bayes.NaiveBayes
Relation: Pass
Instances: 11
Attributes: 4
Weather
Uniform
Win
BuyJersey
Test mode: evaluate on training data

=== Classifier model (full training set) ===

Naive Bayes Classifier

Class
Attribute yes no
(0.62) (0.38)
==========

Weather

clear	4.0	2.0
cloudy	3.0	2.0
rainy	3.0	3.0
[total]	10.0	7.0

Uniform

crimson	7.0	1.0
gray	2.0	5.0
[total]	9.0	6.0

Win

yes	5.0	2.0
no	4.0	4.0
[total]	9.0	6.0

Time taken to build model: 0 seconds

=== Evaluation on training set ===

Time taken to test model on training data: 0 seconds

=== Summary ===

Correctly Classified Instances	10	90.9091 %
Incorrectly Classified Instances	1	9.0909 %
Kappa statistic	0.8136	
Mean absolute error	0.2047	
Root mean squared error	0.2399	
Relative absolute error	43.6901 %	
Root relative squared error	49.8209 %	
Total Number of Instances	11	

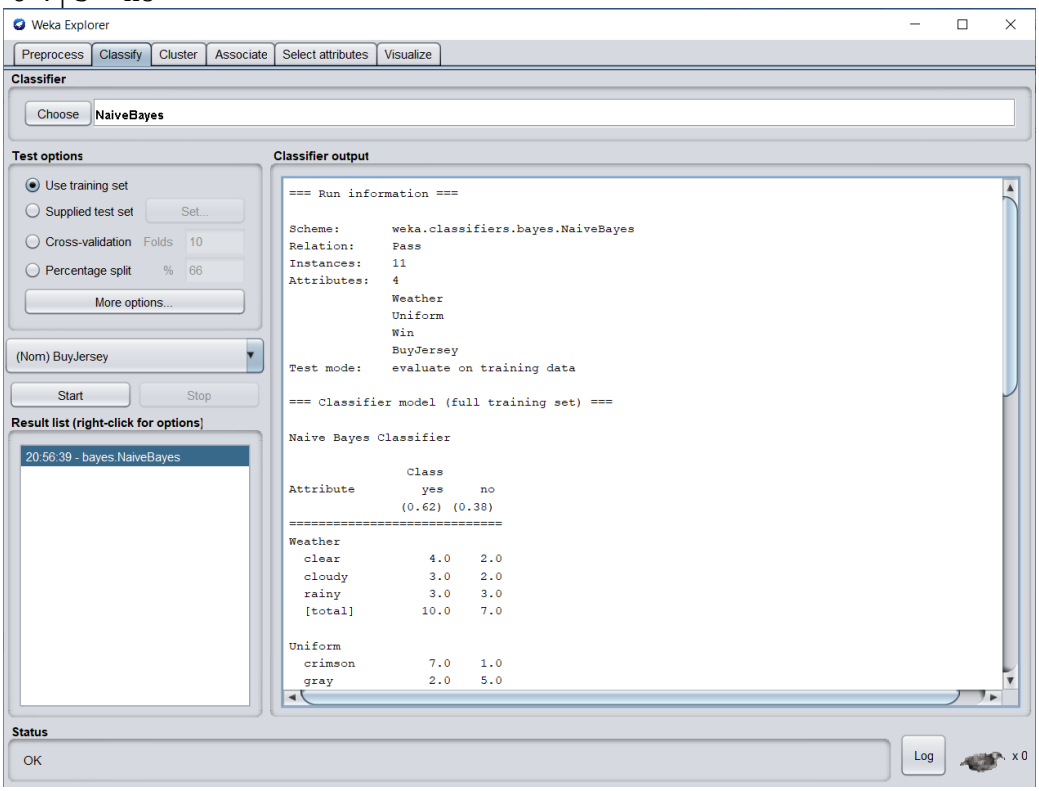
=== Detailed Accuracy By Class ===

	TP Rate	FP Rate	Precision	Recall	F-Measure	MCC	ROC Area	PRC Area	Class
	0.857	0.000	1.000	0.857	0.923	0.828	1.000	1.000	yes
	1.000	0.143	0.800	1.000	0.889	0.828	1.000	1.000	no
Weighted Avg.	0.909	0.052	0.927	0.909	0.911	0.828	1.000	1.000	

=== Confusion Matrix ===

a	b	<-- classified as

6 1 | a = yes
0 4 | b = no



4. Keep training

Pass#2

$$w_0 = -0.5,\ w_1 = -0.5,\ w_2 = -0.5,\ w_3 = 0.5$$

Example1:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = -0.5 + 0 + 0 + 0.5 = 0 \geq 0 \rightarrow 1\ (correct)$$

Example2:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = -0.5 + 0 + 0 + 0 = -0.5 < 0 \rightarrow 0\ (incorrect)$$

$$w_i = w_i + \eta(correct - output)x_i$$

$$w_0 = -0.5 + 0.5 * (1 - 0) * 1 = 0$$

$$w_1 = -0.5 + 0.5 * (1 - 0) * 0 = -0.5$$

$$w_2 = -0.5 + 0.5 * (1 - 0) * 0 = -0.5$$

$$w_3 = 0.5 + 0.5 * (1 - 0) * 0 = 0.5$$

Example3:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0 + 0 - 0.5 + 0.5 = 0 \geq 0 \rightarrow 1\ (correct)$$

Example4:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0 + 0 - 0.5 + 0 = -0.5 < 0 \rightarrow 0\ (correct)$$

Example5:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0 - 0.5 + 0 + 0.5 = 0 \geq 0 \rightarrow 1\ (correct)$$

Example6:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0 - 0.5 + 0 + 0 = -0.5 < 0 \rightarrow 0\ (incorrect)$$

$$w_i = w_i + \eta(correct - output)x_i$$

$$w_0 = 0 + 0.5 * (1 - 0) * 1 = 0.5$$
$$w_1 = -0.5 + 0.5 * (1 - 0) * 1 = 0$$
$$w_2 = -0.5 + 0.5 * (1 - 0) * 0 = -0.5$$
$$w_3 = 0.5 + 0.5 * (1 - 0) * 0 = 0.5$$

Example7:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 + 0 - 0.5 + 0 = 0 \geq 0 \rightarrow 1\ (incorrect)$$
$$w_0 = 0.5 + 0.5 * (0 - 1) * 1 = 0$$
$$w_1 = 0 + 0.5 * (0 - 1) * 1 = -0.5$$
$$w_2 = -0.5 + 0.5 * (0 - 1) * 1 = -1$$
$$w_3 = 0.5 + 0.5 * (0 - 1) * 0 = 0.5$$

Example8:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0 - 1 + 0 + 0.5 = -0.5 < 0 \rightarrow 0\ (incorrect)$$
$$w_0 = 0 + 0.5 * (1 - 0) * 1 = 0.5$$
$$w_1 = -0.5 + 0.5 * (1 - 0) * 2 = 0.5$$
$$w_2 = -1 + 0.5 * (1 - 0) * 0 = -1$$
$$w_3 = 0.5 + 0.5 * (1 - 0) * 1 = 1$$

Example9:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 + 1 + 0 + 0 = 1.5 \geq 0 \rightarrow 1\ (correct)$$

Example10:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 + 1 - 1 + 1 = 1.5 \geq 0 \rightarrow 1\ (incorrect)$$
$$w_i = w_i + \eta(correct - output)x_i$$
$$w_0 = 0.5 + 0.5 * (0 - 1) * 1 = 0$$
$$w_1 = 0.5 + 0.5 * (0 - 1) * 2 = -0.5$$
$$w_2 = -1 + 0.5 * (0 - 1) * 1 = -1.5$$
$$w_3 = 1 + 0.5 * (0 - 1) * 1 = 0.5$$

Example11:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0 - 1 - 1.5 + 0 = -2.5 < 0 \rightarrow 0\ (correct)$$

Pass#3

$$w_0 = 0,\ w_1 = -0.5,\ w_2 = -1.5,\ w_3 = 0.5$$

Example1:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0 + 0 + 0 + 0.5 = 0.5 \geq 0 \rightarrow 1\ (correct)$$

Exampl2:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0 + 0 + 0 + 0 = 0 \geq 0 \rightarrow 1\ (correct)$$

Example3:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0 + 0 - 1.5 + 0.5 = -1 < 0 \rightarrow 0\ (incorrect)$$
$$w_0 = 0 + 0.5 * (1 - 0) * 1 = 0.5$$
$$w_1 = -0.5 + 0.5 * (1 - 0) * 0 = -0.5$$
$$w_2 = -1.5 + 0.5 * (1 - 0) * 1 = -1$$
$$w_3 = 0.5 + 0.5 * (1 - 0) * 1 = 1$$

Example4:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 + 0 - 1 + 0 = -0.5 < 0 \rightarrow 0\ (correct)$$

Example5:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 0.5 + 0 + 1 = 1 \geq 0 \rightarrow 1\ (correct)$$

Example6:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 0.5 + 0 + 0 = 0 \geq 0 \rightarrow 1\ (correct)$$

Example7:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 0.5 - 1 + 0 = -1 < 0 \rightarrow 0\ (correct)$$

Example8:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 1 + 0 + 1 = 0.5 \geq 0 \rightarrow 1\ (correct)$$

Example9:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 1 + 0 + 0 = -0.5 < 0 \rightarrow 0\ (incorrect)$$

$$w_0 = 0.5 + 0.5 * (1 - 0) * 1 = 1$$
$$w_1 = -0.5 + 0.5 * (1 - 0) * 2 = 0.5$$
$$w_2 = -1 + 0.5 * (1 - 0) * 0 = -1$$
$$w_3 = 1 + 0.5 * (1 - 0) * 0 = 1$$

Example10:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 + 1 - 1 + 1 = 2 \geq 0 \rightarrow 1\ (incorrect)$$

$$w_i = w_i + \eta(correct - output)x_i$$
$$w_0 = 1 + 0.5 * (0 - 1) * 1 = 0.5$$
$$w_1 = 0.5 + 0.5 * (0 - 1) * 2 = -0.5$$
$$w_2 = -1 + 0.5 * (0 - 1) * 1 = -1.5$$
$$w_3 = 1 + 0.5 * (0 - 1) * 1 = 0.5$$

Example11:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 1 - 1.5 + 0 = -2 < 0 \rightarrow 0\ (correct)$$

Pass#4

$$w_0 = 0.5,\ w_1 = -0.5,\ w_2 = -1.5,\ w_3 = 0.5$$

Example1:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 + 0 + 0 + 0.5 = 1 \geq 0 \rightarrow 1\ (correct)$$

Exampl2:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 + 0 + 0 + 0 = 0.5 \geq 0 \rightarrow 1\ (correct)$$

Example3:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 + 0 - 1.5 + 0.5 = -0.5 < 0 \rightarrow 0\ (incorrect)$$

$$w_0 = 0.5 + 0.5 * (1 - 0) * 1 = 1$$
$$w_1 = -0.5 + 0.5 * (1 - 0) * 0 = -0.5$$
$$w_2 = -1.5 + 0.5 * (1 - 0) * 1 = -1$$
$$w_3 = 0.5 + 0.5 * (1 - 0) * 1 = 1$$

Example4:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 + 0 - 1 + 0 = 0 \geq 0 \rightarrow 1\ (incorrect)$$

$$w_0 = 1 + 0.5 * (0 - 1) * 1 = 0.5$$
$$w_1 = -0.5 + 0.5 * (0 - 1) * 0 = -0.5$$
$$w_2 = -1 + 0.5 * (0 - 1) * 1 = -1.5$$
$$w_3 = 1 + 0.5 * (0 - 1) * 0 = 1$$

Example5:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 0.5 + 0 + 1 = 1 \geq 0 \rightarrow 1\ (correct)$$

Example6:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 0.5 + 0 + 0 = 0 \geq 0 \rightarrow 1\ (correct)$$

Example7:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 0.5 - 1.5 + 0 = -1.5 < 0 \rightarrow 0\ (correct)$$

Example8:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 1 + 0 + 1 = 0.5 \geq 0 \rightarrow 1\ (correct)$$

Example9:

$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 1 + 0 + 0 = -0.5 < 0 \rightarrow 0\ (incorrect)$

$w_0 = 0.5 + 0.5 * (1 - 0) * 1 = 1$

$w_1 = -0.5 + 0.5 * (1 - 0) * 2 = 0.5$

$w_2 = -1.5 + 0.5 * (1 - 0) * 0 = -1.5$

$w_3 = 1 + 0.5 * (1 - 0) * 0 = 1$

Example10:

$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 + 1 - 1.5 + 1 = 1.5 \geq 0 \rightarrow 1\ (incorrect)$

$w_i = w_i + \eta(correct - output)x_i$

$w_0 = 1 + 0.5 * (0 - 1) * 1 = 0.5$

$w_1 = 0.5 + 0.5 * (0 - 1) * 2 = -0.5$

$w_2 = -1.5 + 0.5 * (0 - 1) * 1 = -2$

$w_3 = 1 + 0.5 * (0 - 1) * 1 = 0.5$

Example11:

$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 1 - 2 + 0 = -2.5 < 0 \rightarrow 0\ (correct)$

Pass#5

$w_0 = 0.5,\ w_1 = -0.5,\ w_2 = -2,\ w_3 = 0.5$

Example1:

$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 + 0 + 0 + 0.5 = 1 \geq 0 \rightarrow 1\ (correct)$

Exampl2:

$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 + 0 + 0 + 0 = 0.5 \geq 0 \rightarrow 1\ (correct)$

Example3:

$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 + 0 - 2 + 0.5 = -1 < 0 \rightarrow 0\ (incorrect)$

$w_0 = 0.5 + 0.5 * (1 - 0) * 1 = 1$

$w_1 = -0.5 + 0.5 * (1 - 0) * 0 = -0.5$

$w_2 = -2 + 0.5 * (1 - 0) * 1 = -1.5$

$w_3 = 0.5 + 0.5 * (1 - 0) * 1 = 1$

Example4:

$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 + 0 - 1.5 + 0 = -0.5 < 0 \rightarrow 0\ (correct)$

Example5:

$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 - 0.5 + 0 + 1 = 1.5 \geq 0 \rightarrow 1\ (correct)$

Example6:

$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 0.5 + 0 + 0 = 0 \geq 0 \rightarrow 1\ (correct)$

Example7:

$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 0.5 - 1.5 + 0 = -1.5 < 0 \rightarrow 0\ (correct)$

Example8:

$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 1 + 0 + 1 = 0.5 \geq 0 \rightarrow 1\ (correct)$

Example9:

$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 - 1 + 0 + 0 = 0 \geq 0 \rightarrow 1\ (correct)$

Example10:

$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 - 1 - 1.5 + 1 = -0.5 < 0 \rightarrow 0\ (correct)$

Example11:

$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 1 - 2 + 0 = -2.5 < 0 \rightarrow 0\ (correct)$

Pass#6

$$w_0 = 1,\ w_1 = -0.5,\ w_2 = -1.5,\ w_3 = 1$$

Example1:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 + 0 + 0 + 1 = 2 \geq 0 \rightarrow 1\ (correct)$$

Exampl2:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 + 0 + 0 + 0 = 1 \geq 0 \rightarrow 1\ (correct)$$

Example3:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 + 0 - 1.5 + 1 = 0.5 \geq 0 \rightarrow 1\ (correct)$$

Example4:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 + 0 - 1.5 + 0 = -0.5 < 0 \rightarrow 0\ (correct)$$

Example5:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 - 0.5 + 0 + 1 = 1.5 \geq 0 \rightarrow 1\ (correct)$$

Example6:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 0.5 + 0 + 0 = 0 \geq 0 \rightarrow 1\ (correct)$$

Example7:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 0.5 - 1.5 + 0 = -1.5 < 0 \rightarrow 0\ (correct)$$

Example8:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 1 + 0 + 1 = 0.5 \geq 0 \rightarrow 1\ (correct)$$

Example9:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 - 1 + 0 + 0 = 0 \geq 0 \rightarrow 1\ (correct)$$

Example10:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 1 - 1 - 1.5 + 1 = -0.5 < 0 \rightarrow 0\ (correct)$$

Example11:

$$w_0x_0 + w_1x_1 + w_2x_2 + w_3x_3 = 0.5 - 1 - 2 + 0 = -2.5 < 0 \rightarrow 0\ (correct)$$

Thus, the final perceptron weights are:

$$w_0 = 1,\ w_1 = -0.5,\ w_2 = -1.5,\ w_3 = 1$$