Cpt_S540_hw10

Mengxiao Zhang-11651502

November 12, 2019

1 hw 10

1.1 1

1.1.1 a.

$P(HaveFun = yes) = \frac{6}{11} = 0.5455$
$P(HaveFun = no) = \frac{5}{11} = 0.4545$

1.1.2 b.

$P(Weather = clear|HaveFun = yes) = \frac{3}{6} = 0.5$
$P(Weather = clear|HaveFun = no) = \frac{1}{5} = 0.2$
$P(Weather = cloudy|HaveFun = yes) = \frac{1}{6} = 0.1667$
$P(Weather = cloudy|HaveFun = no) = \frac{2}{5} = 0.4$
$P(Weather = rain|HaveFun = yes) = \frac{2}{6} = 0.3333$
$P(Weather = rain|HaveFun = no) = \frac{2}{5} = 0.4$

1.1.3 c.

$P(AIDone = yes|HaveFun = yes) = \frac{5}{6} = 0.8333$
$P(AIDone = yes|HaveFun = no) = \frac{0}{5} = 0$
$P(AIDone = no|HaveFun = yes) = \frac{1}{6} = 0.1667$
$P(AIDone = no|HaveFun = no) = \frac{5}{5} = 1$

1.1.4 d.

$P(Costume = yes|HaveFun = yes) = \frac{4}{6} = 0.6667$
$P(Costume = no|HaveFun = yes) = \frac{2}{6} = 0.3333$
$P(Costume = yes|HaveFun = no) = \frac{2}{5} = 0.4$
$P(Costume = no|HaveFun = no) = \frac{3}{5} = 0.6$

1.1.5 e.

$$\mathbf{P}(HaveFun|Weather = cloudy, AIDone = yes, Costume = no)$$
$$= \mathbf{P}(Weather = cloudy|HaveFun) * \mathbf{P}(AIDone = yes|HaveFun) *$$

$$\mathbf{P}(Costume = no|HaveFun) * \mathbf{P}(HaveFun)$$
$$= \alpha < 0.1667 * 0.8333 * 0.3333 * 0.5455, 0.4 * 0 * 0.6 * 0.4545 >$$
$$=< 1, 0 > \alpha = 39.5643$$

1.1.6 f.

Naïve Bayes will choose HaveFun=yes.

1.2 2

1.2.1 a.

Weather	AIDone	Costume	HaveFun
1	1	1	1
1	1	0	1
1	0	1	1
1	0	0	0
2	1	1	1
2	0	1	0
2	0	0	0
3	1	1	1
3	1	0	1
3	0	1	0
3	0	0	0

1.2.2 b.

Round 1:
1. $\sum wx = 1 + 1 + 1 + 1 = 4 > 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$
2. $\sum wx = 1 + 1 + 1 + 0 = 3 > 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$
3. $\sum wx = 1 + 1 + 0 + 1 = 3 > 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$
4. $\sum wx = 1 + 1 + 0 + 0 = 2 > 0 \Rightarrow \hat{y} = 1, \hat{y} \neq y, wrong$

Update w, $w_0 = 0.5, w_1 = 0.5, w_2 = 1, w_3 = 1$
5. $\sum wx = 0.5 + 1 + 1 + 1 = 3.5 > 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$
6. $\sum wx = 0.5 + 1 + 0 + 1 = 2.5 > 0 \Rightarrow \hat{y} = 1, \hat{y} \neq y, wrong$

Update w, $w_0 = 0, w_1 = -0.5, w_2 = 1, w_3 = 0.5$
7. $\sum wx = 0 - 1 + 0 + 0 = -1 < 0 \Rightarrow \hat{y} = 0, \hat{y} = y, correct$
8. $\sum wx = 0 - 1.5 + 1 + 0.5 = 0 \geq 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$
9. $\sum wx = 0 - 1.5 + 1 + 0 = -0.5 < 0 \Rightarrow \hat{y} = 0, \hat{y} \neq y, wrong$

Update w, $w_0 = 0.5, w_1 = 1, w_2 = 1.5, w_3 = 0.5$
10. $\sum wx = 0.5 + 3 + 0 + 0.5 = 4 > 0 \Rightarrow \hat{y} = 1, \hat{y} \neq y, wrong$

Update w, $w_0 = 0, w_1 = -0.5, w_2 = 1.5, w_3 = 0$
11. $\sum wx = 0 - 1.5 + 0 + 0 = -1.5 > 0 \Rightarrow \hat{y} = 0, \hat{y} = y, correct$

Round 2:
1. $\sum wx = 0 - 0.5 + 1.5 + 0 = 1 > 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$
2. $\sum wx = 0 - 0.5 + 1.5 + 0 = 1 > 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$

3. $\sum wx = 0 - 0.5 + 0 + 0 = -0.5 < 0 \Rightarrow \hat{y} = 0, \hat{y} \neq y, wrong$
Update w, $w_0 = 0.5, w_1 = 0, w_2 = 1.5, w_3 = 0.5$
4. $\sum wx = 0.5 + 0 + 0 + 0 = 0.5 > 0 \Rightarrow \hat{y} = 1, \hat{y} \neq y, wrong$
Update w, $w_0 = 0, w_1 = -0.5, w_2 = 1.5, w_3 = 0.5$
5. $\sum wx = 0 - 1 + 1.5 + 0.5 = 1 > 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$
6. $\sum wx = 0 - 1 + 0 + 0.5 = -0.5 < 0 \Rightarrow \hat{y} = 0, \hat{y} = y, correct$
7. $\sum wx = 0 - 1 + 0 + 0 = -1 < 0 \Rightarrow \hat{y} = 0, \hat{y} = y, correct$
8. $\sum wx = 0 - 1.5 + 1.5 + 0.5 = 0.5 > 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$
9. $\sum wx = 0 - 1.5 + 1.5 + 0 = 0 \geq 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$
10. $\sum wx = 0 - 1.5 + 0 + 0.5 = -0.5 < 0 \Rightarrow \hat{y} = 0, \hat{y} = y, correct$
11. $\sum wx = 0 - 1.5 + 0 + 0 = -1.5 < 0 \Rightarrow \hat{y} = 0, \hat{y} = y, correct$
Round 3:
1. $\sum wx = 0 - 0.5 + 1.5 + 0.5 = 1.5 > 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$
2. $\sum wx = 0 - 0.5 + 1.5 + 0 = 1 > 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$
3. $\sum wx = 0 - 0.5 + 0 + 0.5 = 0 \neq 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$
4. $\sum wx = 0 - 0.5 + 0 + 0 = -0.5 < 0 \Rightarrow \hat{y} = 0, \hat{y} = y, correct$
5. $\sum wx = 0 - 1 + 1.5 + 0.5 = 1 > 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$
6. $\sum wx = 0 - 1 + 0 + 0.5 = -0.5 < 0 \Rightarrow \hat{y} = 0, \hat{y} = y, correct$
7. $\sum wx = 0 - 1 + 0 + 0 = -1 < 0 \Rightarrow \hat{y} = 0, \hat{y} = y, correct$
8. $\sum wx = 0 - 1.5 + 1.5 + 0.5 = 0.5 > 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$
9. $\sum wx = 0 - 1.5 + 1.5 + 0 = 0 \geq 0 \Rightarrow \hat{y} = 1, \hat{y} = y, correct$
10. $\sum wx = 0 - 1.5 + 0 + 0.5 = -0.5 < 0 \Rightarrow \hat{y} = 0, \hat{y} = y, correct$
11. $\sum wx = 0 - 1.5 + 0 + 0 = -1.5 < 0 \Rightarrow \hat{y} = 0, \hat{y} = y, correct$
Finally, I get the correct classify all 11 examples on the 3^{rd} pass that w={0,-0.5,1.5,0.5}

1.2.3 c.

With$< Weather = cloudy, AIDone = yes, Costume = no >$, we will get the answer $0 - 1 + 1.5 + 0 = 0.5 > 0, \hat{y} = 1$, so we will have fun!

1.3 3

1.3.1 a.

1.3.2 b.