WEEK 7

Task 1: Accident Prediction For the table above, find the probability of the scenario being in an accident (YES or NO).

1. Objective: Calculate P(C1| X = (Rain, Good, Normal, No)). Determine how the Bayes classifier would classify the data instance X = (Rain, Good, Normal, No).

Total instance = 10

YES = 5

NO = 5

P(accident = yes) = 5/10 = 0.5

P(accident = no) = 5/10 = 0.5

Calculating probabilities when accident = yes where X = (rain , good, normal, no)

For rain; P(rain/accident = yes) = 1/5 = 0.2

For good; p(good/accident=yes) = 1/5 =0.2

For normal; ,p(normal/accident=yes) = 1/5 = 0.2

For No; p(no/accident=yes) = 2/5 = 0.4

Calculating probabilities when accident = No where X = (rain , good, normal, no)

For rain; P(rain/accident = no) = 2/5 = 0.4

For good; p(good/accident=yes) = 3/5 =0.6

For normal; ,p(normal/accident=yes) = 2/5 = 0.4

For No; p(no/accident=yes) = 4/5 = 0.8

Calculating probability of X given that accident =yes,

P(X/ accident=yes) = 0.2*0.2*0.2*0.4 = 0.0032

Calculating probability of X given that accident =No, P(X/accident = no) = 0.4*0.6*0.4*0.8 = 0.0768

Now,

P(accident=yes/X) = 0.0032*0.5 = 0.0016

P(accident=no/X) = 0.0768*0.5 = 0.0384

Task 2: Weather-Based Game Prediction In this dataset, there are five categorical attributes: outlook, temperature, humidity, windy, and play. We are interested in building a system to classify whether to play based on weather conditions.

1. Question 1: Calculate P(C1 | X = (sunny, hot, high, false)). How would the Bayes classifier classify the data instance X = (sunny, hot, high, false)?

Total instance = 14,

Yes = 9

No = 5

P(yes) = 9/14 = 0.64

P(no) = 5/14 = 0.36

Calculating probabilities for X (sunny, hot, high, false) given that play = yes

P(sunny/play = yes)= 2/9 = 0.2

P(hot/ play=yes) = 2/9 =0.2

P(high / play=yes) = 3/9 = 0.3

P(false/ play=yes) = 6/9 = 0.67

Calculating probabilities for X (sunny, hot, high, false) given that play = No

P(sunny/play = no)= 3/5 = 0.6

P(hot/ play=no) = 2/5 = 0.4

P(high / play=no) = 4/5 = 0.8

P(false/ play=no) = 2/5 = 0.4

Calculating probability of X given that play =yes and play = no

P(X/play=yes) = 0.2*0.2*0.3*0.67 = 0.00804

P(X/play=no) = 0.6*0.4*0.8*0.4 = 0.0768

Calculating probabilities of play=yes and play=no given that X

P(play=yes/X) = 0.00804*0.64 = 0.0051

P(play=no/X) 0.0768*0.36 = 0.028

2. Question 2: Does this agree with the classification in Table 1 for X = (sunny, hot, high, false)?
=> NO

3. Question 3: Consider a new data instance X'= (overcast, cool, high, true). How would the Bayes classifier classify X'?

Total instance = 14,

Yes = 9

No = 5

P(yes) = 9/14 = 0.64

P(no) = 5/14 = 0.36

Calculating probabilities for X (overcast, cool, high, True) given that play = yes

P(overcast/play = yes)= 4/9 = 0.44

P(cool/ play=yes) = 3/9 =0.0.33

P(high / play=yes) = 3/9 = 0.33

P(true/ play=yes) = 3/9 = 0.33

Calculating probabilities for X (overcast, cool, high, True) given that play = No

P(overcast/play = no)= 0/5 = 0

P(cool/ play=no) = 1/5 = 0.2

P(high / play=no) = 4/5 = 0.8

P(true/ play=no) = 3/5 = 0.6

Calculating probability of X given that play =yes and play = no

P(X/play=yes) =0.44*0.33*0.33*0.33 = 0.0158

P(X/play=no) = 0*0.2*0.8*0.6 = 0

Calculating probabilities of play=yes and play=no given that X

P(play=yes/X) = 0.0158*0.64 = 0.0051

P(play=no/X) = 0*0.36 = 0