## 3.d.1

If the outlook is sunny is true and humidity is high is true, then not play tennis +1;

If the outlook is sunny is true and humidity is high is false, then play tennis+1;

If the outlook is sunny is false, is overcast is true, then play tennis+1;

If the outlook is sunny is false, is overcast is false, and wind is strong is true, then not play tennis+1;

If the outlook is sunny is false, is overcast is false, and wind is strong is false, then play tennis+1.

## 3.d.2

You can set an n-channel root to n-1 true and anther 1 false question;

# 4.

P(H|X) = P(X|H) \*P(H)/P(X)

### 4.a

P (play = “yes”) = 9/14 = 0.643

P (play = “no”) = 5/14 = 0.357

### 4.b

For outlook:

P (O|yes) = 4/9 = 0.44

P (R|yes) = 3/9 = 0.33

P (S|yes) = 2/9 = 0.22

For temperature:

P (Hot|yes) = 2/9 = 0.22

P (Mild|yes) = 4/9 = 0.44

P (Cool|yes) = 3/9 = 0.33

For humidity:

P (High|yes) = 3/9 = 0.33

P (Normal|yes) = 6/9 = 0.67

For wind:

P (Strong|yes) = 3/9 = 0.33

P (Weak|yes) = 6/9 = 0.57

### 4.C

For outlook:

P (O|no) = 0/5 = 0

P (R|no) = 2/5 = 0.4

P (S|no) = 3/5 = 0.6

For temperature:

P (Hot|no) = 2/5 = 0.4

P (Mild|no) = 2/5 = 0.4

P (Cool|no) = 1/5 = 0.2

For humidity:

P (High|no) = 4/5 = 0.8

P (Normal|no) = 1/5 = 0.2

For wind:

P (Strong|no) = 3/5 = 0.6

P (Weak|no) = 2/5 = 0.4

### 4.d

For x1 = [overcast, hot, high, strong]:

P (x1|yes) = 0.44\*0.22\*0.33\*0.33 = 0.01

p (x1|no) = 0

P (yes|x1) = 0.01\*0.64 = 0.06

P (no|x1) = 0

X1 belongs to yes.

For x2 = [sunny, hot, normal, weak]:

P (x2|yes) = 0.22\*0.22\*0.67\*0.67 = 0.022

p (x2|no) = 0.6\*0.4\*0.2\*0.4 = 0.019

P (yes|x2) = 0.022\*0.64 = 0.014

P (no|x2) = 0.019\*0.36 = 0.007

X2 belongs to yes.

For x3 = [rain, mild, normal, strong]:

P (x3|yes) = 0.33\*0.44\*0.67\*0.33 = 0.032

p (x3|no) = 0.4\*0.4\*0.2\*0.6 = 0.019

P (yes|x3) = 0.032\*0.64 = 0.020

P (no|x3) = 0.019\*0.36 = 0.007

X3 belongs to yes.

For x4 = [overcast, cool, high, strong]:

P (x4|yes) = 0.44\*0.33\*0.33\*0.33 = 0.015

p (x4|no) = 0

P (yes|x4) = 0.015\*0.64 = 0.01

P (no|x4) = 0

X4 belongs to yes.

We can find the result are all “yes” for play tennis.

### 4.e

Confusion matrix:

|  |  |  |
| --- | --- | --- |
| Actual class/ predicted class | Play(predicted) | Not Play(predicted) |
| Play(actual) | 2 | 0 |
| Not Play(actual) | 2 | 0 |

Precision = 2/ (2+2) = 0.5

Recall = 2/ (2+0) = 1

### 4.f

Decision Tree: Pros: Easy to understand Cons: Poor accuracy for unseen samples

Naïve Bayes: Pros: Easy to implement Cons: loss of accuracy