CS 662- AI Programming

**HW7: Various Topics**

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1.

If when K(a,b) is smaller, a and b are more similar.

1-NN classification of x0 K(x0,x2) = 1.5 x2 = 'no'

so x0 = 'no'

3-NN classification of x0 K(x0,x2)=1.5 K(x0,x3)=1.8 K(x0,x6)=1.7

x2 = 'no' x3 = 'yes' x6 = 'yes'

so x0 = 'yes'

2.

P(A) = 5/15 P(B) = 10/15

P(money|A) = 4/21 P(money|B) = 1/46

P(finance|A) = 1/21 P(finance|B) = 20/46

P(loss|A) = 1/10000 P(loss|B) = 20/46

P(stock|A) = 10/21 P(stock|B) = 1/10000

P(gain|A) = 1/10000 P(gain|B) = 5/46

P(average|A) = 1/10000 P(average|B) = 1/10000

P(A|Document)

=P(A)\*P(money|A)\*P(finance|A)\*P(loss|A)\*P(stock|A)\*P(gain|A)\*P(average|A)

=1.439729331e-15

P(B)|Document)

=P(B)\*P(money|B)\*P(finance|B)\*P(loss|B)\*P(stock|B)\*P(gain|B)\*P(average|B)

=2.977881487e-12

So this document should be classified as class B.

3.

##### IntegratedCons.txt #####

accuracy = 87.26%

##### IntegratedPros.txt #####

accuracy = 55.09%

##### IntegratedCons.txt with negation #####

accuracy = 90.02%

##### IntegratedPros.txt with negation #####

accuracy = 55.37%

1. accuracy(Cons) = 87.26% accuracy(Pros) = 55.09%
2. accuracy(Cons) = 90.02% accuracy(Pros) = 55.37%

With negation operations, the accuracy of the IntegratedCons increases 2.76% from 87.26% to 90.02%.

4.

(1)

cost(C1) = 15% \*0.05\*number(spam) + 8% \*1\*number(ham)

cost(C2) = 30% \*0.05\*number(spam) + 2% \*1\*number(ham)

Assume number: ham/total = x

cost(C1) = 15%\*0.05\*1000\*(1-x) + 8%\*1\*1000\*x

= 7.5(1-x) + 80x = 7.5+72.5x

cost(C2) = 30% \*0.05\*1000\*(1-x) + 2% \*1\*1000\*x

= 15(1-x) + 20x = 15+5x

If x = 50%

cost(C1) = 43.75

cost(C2) = 17.5

(2)

EU(apartment) = 0.6\*50000 + 0.4\*30000 = 42000

EU(office) = 0.6\*100000 + 0.4\*(-40000) = 44000

EU(warehouse) = 0.6\*30000 + 0.4\*10000 = 22000

Without knowing the information, I will buy an office building.

After getting the information of the office, if the office building is in good economic conditions, we will buy an office building. If it's in bad economic conditions, we will buy an apartment building.

After knowing the information of the office, the utility will be: 0.6\*100000 + 0.4\*30000 = 72000

The value of knowing the information is 72000-44000 = 28000

5.

(1)

After the first step ‘Up’

|  |  |  |  |
| --- | --- | --- | --- |
| 0 | 0 | 0 | 0 |
| 0.8 | 0 | 0 | 0 |
| 0.1 | 0.1 | 0 | 0 |

After the second step ’Up’

|  |  |  |  |
| --- | --- | --- | --- |
| 0.64 | 0 | 0 | 0 |
| 0.24 | 0 | 0 | 0 |
| 0.02 | 0.09 | 0.01 | 0 |

After the third step ’Right’

|  |  |  |  |
| --- | --- | --- | --- |
| 0.088 | 0.512 | 0 | 0 |
| 0.258 | 0 | 0.001 | 0 |
| 0.026 | 0.035 | 0.073 | 0.008 |

After the 4th step ’Right’

|  |  |  |  |
| --- | --- | --- | --- |
| 0.0346 | 0.1728 | 0.4097 | 0 |
| 0.2178 | 0 | 0.0073 | 0.0016 |
| 0.0284 | 0.0276 | 0.0346 | 0.0656 |

After the 5th step ‘Right’

|  |  |  |  |
| --- | --- | --- | --- |
| 0.02524 | 0.06224 | 0.17994 | 0.32776 |
| 0.18054 | 0 | 0.04443 | 0.014 |
| 0.02462 | 0.02824 | 0.02627 | 0.08672 |

(2)

U(3) = R(s) + γmaxaΣs’P(s'|s,a)U(s')

Assume γ = 0.8, R(s) = -0.04  
  
U(3) = -0.04 + 0.8\*max(  0.8U(2)+0.1U(3)+0.1U(5), #left  
 0.8U(3)+0.1U(2)+0.1U('+1'), #up  
 0.8U('+1')+0.1U(3)+0.1U(5), #right  
 0.8U(5)+0.1U(2)+0.1U('+1') ) #down  
  = -0.04 + 0.8\*max(0.373, 0.655, 0.893, 0.359)  
  = -0.04 + 0.8\*0.893 = 0.6744