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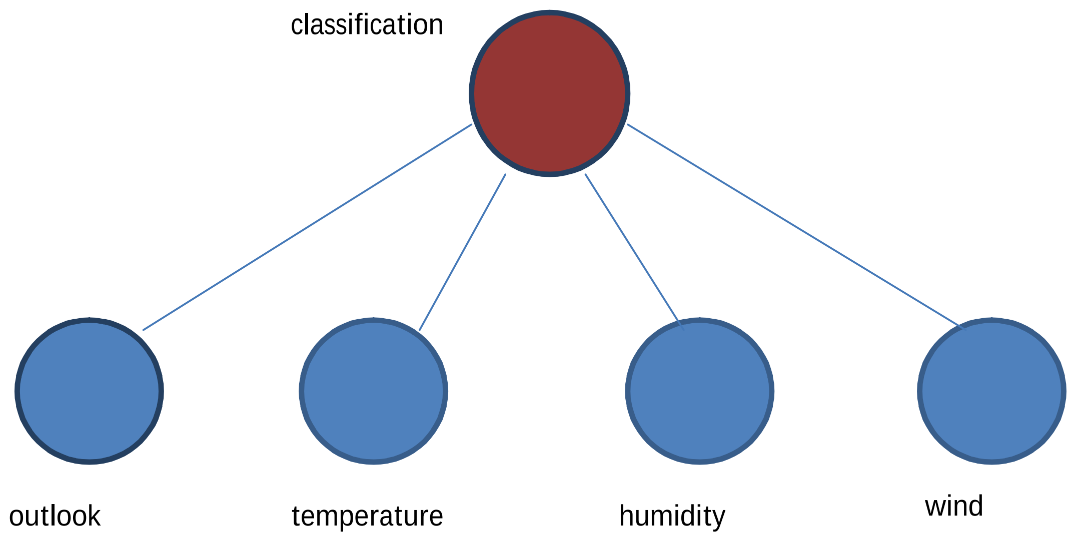
CS 1675 HW 4

Problem 1



The model has a total of 22 parameters, though 9 of these can be expressed as functions of the other 13.

Parameter Values

<u>Classification</u>

Yes	.625
No	.375

<u>Outlook</u>

	yes	no
Sunny	.2	.5
Overcast	.5	.17
rain	.3	.33

<u>Temperature</u>

	yes	No
Hot	.3	.5
Mild	.4	.33
Cold	.3	.17

Humidity

	yes	no
High	.5	.83
Normal	.5	.17

Wind

	yes	no
Strong	0	.5
Weak	1	.5

Test case 1:

Yes: .625*.2*.4*.5*0 = 0

No: .375*.5*.33*.17*.5 = .0053

Classification: No

Test case 2:

Yes: .625*.3*.3*.5*1 = .0281

No: .375*.33*.5*.83*.5 = .0257

Classification: Yes

Problem 2

K1 = (-5.74,2.93)   K2 = (4.91,1.82)
Iteration 1

Point	Distance to K1	Distance to K2
1	1.94	8.77
2	10.20	.98
3	10.06	4.37
4	0	10.71
5	4.37	9.11
6	10.71	0

K1 = (-4.19,3.94) K2 = (4.06,.26)
Iteration 2

Point	Distance to K1	Distance to K2
1	1.42	8.22
2	8.96	.83
3	9.37	2.60
4	1.85	10.16
5	2.67	9.31
6	9.34	1.78

K1 = (-4.19,3.94) K2 = (4.06,.26)

Problem 3

Well, I generated these conditional probabilities from the initial parameters, which could be used to find expected numbers (which would be the parameters for the next iteration), but I don't know how I would find the probability of the actual observed data from them.

ua|red, small	1.00
ua|red, medium	0.93
ua|red, large	1.00
ua|white, small	0.99
ua|white, medium	0.38
ua|white, large	0.90
ua|black, small	0.86
ua|black, medium	0.03
ua|black, large	0.29

ub|red,small	0.00
ub|red,medium	0.07
ub|red, large	0.00
ub|white, small	0.01
ub|white, medium	0.63
ub|white, large	0.10
ub|black, small	0.14
ub|black, medium	0.97
ub|black,large	0.71

Problem 4

Gretel is going to want to be able to predict which village the witch will take Hansel to on the next day. So to do this she might set up a hidden markov model with the beer brand as the observed layer and the village as the hidden layer. She can initialize the probabilities for the beer observed layer to correspond to each village's distribution, which she presumably knows or could find out (failing that, she could make an educated guess). For the hidden layer, the probabilities are going to be dependent upon the village looking back at least one day.

For instance, if today is Tuesday and the witch is in Smurf Village, then on Wednesday (assuming the witch is constantly traveling) we could set Smurf Village's probability to 0. Also, if Greenwich Village is in close spatial proximity to Smurf Village, then its probability for Wednesday might be higher than it would otherwise be. It might also be the case that the witch would be less likely to visit villages she's been to recently, and so, if the model looks back even more days, it can set a village's probability lower or higher based on how recently the witch has visited it.

A naïve bayes model would really only be useful for predicting which village the witch is currently in (based on which beer the witch ordered). This would only be helpful if Gretel is able to reach the village before the witch leaves, which I don't think is likely.