复查测验提交: Homework 6

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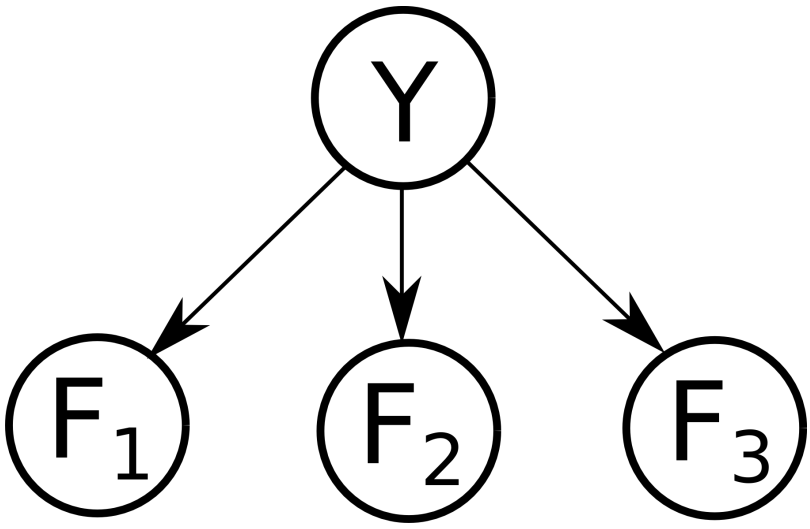
课程	人工智能I
测试	Homework 6
已开始	23-12-28 上午11:39
已提交	23-12-31 上午10:16
截止日期	24-1-3 下午11:59
状态	已完成
尝试分数	得 104 分，满分 104 分
已用时间	70 小时 37 分钟
显示的结果	所有答案, 已提交的答案, 正确答案

问题 1

得 18 分，满分 18 分

In this question, we will train a Naive Bayes classifier to predict class labels Y as a function of input features F_i . (**Keep 3 decimal places**)



We are given the following 15 training points:

F_1	0	1	1	1	0	1	1	1	1	1	1	0	1	1	1
F_2	0	0	1	0	1	0	1	1	1	1	1	1	1	0	1
F_3	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0
Y	A	A	B	B	B	B	B	B	B	B	B	C	C	C	C

What is the maximum likelihood estimate of the prior P(Y)?

Y	P(Y)
A	**[q1.1]**
B	**[q1.2]**
C	**[q1.3]**

What are the maximum likelihood estimates of the conditional probability distributions? Fill in the tables below (the second and third are done for you).

F_1	Y	$P(F_1 \mid Y)$
0	A	**[q1.4]**
1	A	**[q1.5]**
0	B	**[q1.6]**
1	B	**[q1.7]**
0	C	**[q1.8]**
1	C	**[q1.9]**

F_2	Y	$P(F_2 \mid Y)$
0	A	1.000
1	A	0.000
0	B	0.222
1	B	0.778
0	C	0.250
1	C	0.750

F_3	Y	$P(F_3 \mid Y)$
0	A	0.500
1	A	0.500
0	B	0.000
1	B	1.000
0	C	0.500
1	C	0.500

q1.1 的指定答案: 0.133

q1.2 的指定答案: 0.600

q1.3 的指定答案: 0.267

q1.4 的指定答案: 0.500

q1.5 的指定答案: 0.500

q1.6 的指定答案: 0.111

q1.7 的指定答案: 0.889

q1.8 的指定答案: 0.250

q1.9 的指定答案: 0.750

q1.1 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.133	
q1.2 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.6	
完全匹配	0.600	
q1.3 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.267	
q1.4 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.5	
完全匹配	0.500	
q1.5 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.5	
完全匹配	0.500	
q1.6 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.111	
q1.7 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.889	
q1.8 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.25	
完全匹配	0.250	
q1.9 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.75	

完全匹配	0.750	

问题 2

得 14 分，满分 14 分

Following question 1, Now consider a new data point ($F_1 = 0, F_2 = 0, F_3 = 1$). Use your classifier to determine the joint probability of causes Y and this new data point, along with the posterior probability of Y given the new data: (**Keep 3 decimal places**)

Y	$P(Y, F_1 = 0, F_2 = 0, F_3 = 1)$
A	**[q2.1]**
B	**[q2.2]**
C	**[q2.3]**

Y	$P(Y \mid F_1 = 0, F_2 = 0, F_3 = 1)$
A	**[q2.4]**
B	**[q2.5]**
C	**[q2.6]**

What label does your classifier give to the new data point? (Break ties alphabetically). Enter capital letters only

[q2.7]

The training data is repeated here for your convenience:

F_1	0	1	1	1	0	1	1	1	1	1	1	0	1	1	1
F_2	0	0	1	0	1	0	1	1	1	1	1	1	1	0	1
F_3	1	0	1	1	1	1	1	1	1	1	1	1	0	1	0
Y	A	A	B	B	B	B	B	B	B	B	B	C	C	C	C

q2.1 的指定答案: 0.033

q2.2 的指定答案: 0.015

q2.3 的指定答案: 0.008

q2.4 的指定答案: 0.589

q2.5 的指定答案: 0.268

q2.6 的指定答案: 0.143

q2.7 的指定答案: A

q2.1 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.033	
q2.2 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.015	
q2.3 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.008	
q2.4 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.589	
完全匹配	0.59	
完全匹配	0.590	
q2.5 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.268	
完全匹配	0.262	
q2.6 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.143	
完全匹配	0.148	
q2.7 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	A	

问题 3

得 18 分，满分 18 分

Following the previous questions, now use Laplace Smoothing with strength k = 3 to estimate the prior P(Y) for the same data. (**Keep 3 decimal places**)

Y	P(Y)
A	**[q3.1]**
B	**[q3.2]**
C	**[q3.3]**

Use Laplace Smoothing with strength k = 3 to estimate the conditional probability distributions below (again, the second two are done for you).

F_1	Y	$P(F_1 \mid Y)$
0	A	**[q3.4]**
1	A	**[q3.5]**
0	B	**[q3.6]**
1	B	**[q3.7]**
0	C	**[q3.8]**
1	C	**[q3.9]**

F_2	Y	$P(F_2 \mid Y)$
0	A	0.625
1	A	0.375
0	B	0.333
1	B	0.667
0	C	0.400
1	C	0.600

F_3	Y	$P(F_3 \mid Y)$
0	A	0.500
1	A	0.500
0	B	0.200
1	B	0.800
0	C	0.500
1	C	0.500

q3.1 的指定答案: 0.208

q3.2 的指定答案: 0.500

q3.3 的指定答案: 0.292

q3.4 的指定答案: 0.500

q3.5 的指定答案: 0.500

q3.6 的指定答案: 0.267

q3.7 的指定答案: 0.733

q3.8 的指定答案: 0.400

q3.9 的指定答案: 0.600

q3.1 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.208	
q3.2 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.500	
完全匹配	0.5	
q3.3 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.292	
q3.4 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.5	
完全匹配	0.500	
q3.5 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.5	
完全匹配	0.500	
q3.6 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.267	
q3.7 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.733	
q3.8 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.4	
完全匹配	0.400	
q3.9 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.6	
完全匹配	0.600	

问题 4

得 14 分，满分 14 分

Now consider again the new data point $F_1 = 0, F_2 = 0, F_3 = 1$. Use the Laplace-Smoothed version of your classifier to determine the joint probability of causes Y and this new data point, along with the posterior probability of Y given the new data: (**Keep 3 decimal places**)

Y	$P(Y, F_1 = 0, F_2 = 0, F_3 = 1)$
A	**[q4.1]**
B	**[q4.2]**
C	**[q4.3]**

Y	$P(Y \mid F_1 = 0, F_2 = 0, F_3 = 1)$
A	**[q4.4]**
B	**[q4.5]**
C	**[q4.6]**

What label does your (Laplace-Smoothed) classifier give to the new data point? (Break ties alphabetically). Enter a single capital letter.

[q4.7]

q4.1 的指定答案: 0.033

q4.2 的指定答案: 0.036

q4.3 的指定答案: 0.023

q4.4 的指定答案: 0.359

q4.5 的指定答案: 0.391

q4.6 的指定答案: 0.250

q4.7 的指定答案: B

q4.1 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.033	
q4.2 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.036	
q4.3 的正确答案:		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.023	
q4.4 的正确答案:		

评估方式	正确答案	区分大小写
完全匹配	0.359	
完全匹配	0.356	
q4.5 的正确答案：		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.391	
完全匹配	0.389	
q4.6 的正确答案：		
评估方式	**正确答案**	**区分大小写**
完全匹配	0.25	
完全匹配	0.250	
完全匹配	0.255	
q4.7 的正确答案：		
评估方式	**正确答案**	**区分大小写**
完全匹配	B	

问题 5

得 10 分，满分 10 分

Select all correct statements.

所选答案：
- You have a lot of training data, but it is **very noisy and far from** the true data distribution (test data distribution), it is very likely to overfit the training data if you train a model to fit it.
- You have **too** few training samples (but close to the true data distribution), and you train a very expressive model to fit it, it is very likely to overfit.
- You have inadequate training data (and close to the true data distribution) , and you train an expressive model to fit it. Applying regularization techniques will make the model less likely to overfit the training data.

答案：
- You have a lot of training data, but it is **very noisy and far from** the true data distribution (test data distribution), it is very likely to overfit the training data if you train a model to fit it.
- You have **too** few training samples (but close to the true data distribution), and you train a very expressive model to fit it, it is very likely to overfit.
- You have inadequate training data (and close to the true data distribution) , and you train an expressive model to fit it. Applying regularization techniques will make the model less likely to overfit the training data.

问题 6

得 10 分，满分 10 分

Lasso can be interpreted as least-squares linear regression where

所选答案：weights are regularized with the $L1$ norm

答案：weights are regularized with the $L1$ norm

weights are regularized with the $L2$ norm

complex models are encourged

the solution algorithm is simpler

问题 7

得 10 分，满分 10 分

Suppose we are given data comprising points of several different classes. Each class has a different probability distribution from which the sample points are drawn. We do not have the class labels. We use k-means clustering to try to guess the classes. Which of the following circumstances would undermine its effectiveness?

所选答案：
- Each class has the same mean
- You choose $k = n$, the number of sample points

答案：
Some of the classes are not normally distributed

The variance of each distribution is small in all directions

- Each class has the same mean
- You choose $k = n$, the number of sample points

问题 8

得 10 分，满分 10 分

Select all correct statements about EM.

所选答案：
- K-means algorithm can be treated as a special case of EM.
- The estimated parameters after each E-M iteration are always better parameters that increase the marginal likelihood (we marginalize the hidden variables).

答案：
- K-means algorithm can be treated as a special case of EM.

M-step calculates the label distribution of each data point based on current parameters.

E-step computes weighted MLE of parameters given label distributions.

- The estimated parameters after each E-M iteration are always better parameters that increase the marginal likelihood (we marginalize the hidden variables).

2024年1月7日 星期日 下午12时37分10秒 CST

← 确定