Started on	Tuesday, January 29, 2019, 6:58 PM
State	Finished
Completed on	Tuesday, January 29, 2019, 8:31 PM
Time taken	1 hour 32 mins
Grade	**25.00** out of 30.00 (**83**%)

Question **1**

Correct

5.00 points out of 5.00

Suppose that a university only includes two Schools: The School of Computer Science and The Schools of Management. The total number of students is 1,100, with 100 students in Computer Science (CS). Based on some prior surveys, you know that about 80% students in the CS department wear jeans, yet only 16% Business students wear jeans.

You met Sam on the campus of this university, wearing jeans. Select the proper matches.

HINT: See slides #9 and 10 in Bayesian Inference Lecture

The knowledge prior odds ratio is	1:10	✓
The likelihood ratio is	80:16	✓
The posterior odds ratio is	1:2	✓
The probability that Sam wearing the jeans is from the Business school is	0.667	✓

Knowledge prior odds ratio:

P(CS) = 100/1100, P(Bus.)=1000/1100

P(CS)/P(Bus.) = 100/1000 = 1:10

Likelihood ratio:

P(Jeans | CS)=0.8 and P(Jeans | Bus.)=0.16

P(Jeans | CS)/P(Jeans | Bus.)=0.8:0.16 = 80:16

Posterior odds ratio:

P(CS | Jeans) ~ likelihood x priors = 0.8 x (100/1100) = 0.8/11

P(Bus. | Jeans) ~ likelihood x priors = 0.16 x (1000/1100) = 1.6/11

P(CS | Jeans):P(Bus. | Jeans) = 0.8:1.6 = 1:2

The probability that Sam wearing the jeans is from the Business school is

P(Bus. | Jeans) = (P(Jeans | Bus.) x P(Bus.))/P(Jeans)

= (0.16 x 1000/1100)/(240/1100)

= 0.667

The correct answer is: The knowledge prior odds ratio is → 1:10, The likelihood ratio is → 80:16, The posterior odds ratio is → 1:2, The probability that Sam wearing the jeans is from the Business school is → 0.667

Question **2**

Correct

3.00 points out of 3.00

Select all that hold true when you apply the chain rule to the joint probability distribution P(A,B,C) of the three random variables:

Select one or more:

☐ a. P(A, B, C) = P(A) * P(B) * P(C)

☑ b. P(A, B, C) = P(A|B,C) * P(B|C) * P(C) ✔

☐ c. P(A, B, C) = P(A|B,C) * P(B|A,C) * P(C|A,B)

☑ d. P(A, B, C) = P(A) * P(B|A) * P(C|A,B) ✔

☐ e. P(A, B, C) = P(B|A,C) * P(C|A) * P(C)

Your answer is correct.

The correct answers are: P(A, B, C) = P(A|B,C) * P(B|C) * P(C), P(A, B, C) = P(A) * P(B|A) * P(C|A,B)

Question **3**

Correct

4.00 points out of 4.00

Suppose that each of the two random variables A and B can only take on two values, 0 or 1.

Given the joint probability distribution P(A,B), select the correct formula for P(B):

Select one:

◉ a. P(B) = P(A=0, B) + P(A=1, B) ✔

○ b. P(B) = P(A) * P(B | A)

○ c. P(B) = P(A, B) * P(A)

Your answer is correct.

The correct answer is: P(B) = P(A=0, B) + P(A=1, B)

Question **4**

Correct

4.00 points out of 4.00

Given the joint probability distribution P(A, B, C) of the three discrete random variables, select the correct formula for P(A):

Select one:

      ○ a. $P(A) = \sum_B \sum_C P(A, B, C)$

      ✔

      ○ b. $P(A) = \sum_B \sum_C P(A|B, C)$

      ○ c. $P(A) = \sum_B P(A|B) + \sum_C P(A|C)$

Your answer is correct.

The correct answer is: $P(A) = \sum_B \sum_C P(A, B, C)$

Question **5**

Correct

4.00 points out of 4.00

Given the data in the Table below, compute P (Evade = NO | Status = Divorced). Round your answer to the two decimal points.

Tid	Refund	Marital Status	Taxable Income	Evade
1	Yes	Single	125K	No
2	No	Married	100K	No
3	No	Single	70K	No
4	Yes	Married	120K	No
5	No	Divorced	95K	Yes
6	No	Married	60K	No
7	Yes	Divorced	220K	No
8	No	Single	85K	Yes
9	No	Married	75K	No
10	No	Single	90K	Yes

Answer: 0.50   ✔

The correct answer is: 0.5

Question **6**

Incorrect

0.00 points out of 5.00

Given the data in the Table below, compute **P (Taxable Income = 95 | Evade = Yes)**. You should treat Taxable Income as Continuous attribute with the Gaussian Distribution.

Round your answer to the third decimal points.

Tid	Refund	Marital Status	Taxable Income	Evade
1	Yes	Single	125K	No
2	No	Married	100K	No
3	No	Single	70K	No
4	Yes	Married	120K	No
5	No	Divorced	95K	Yes
6	No	Married	60K	No
7	Yes	Divorced	220K	No
8	No	Single	85K	Yes
9	No	Married	75K	No
10	No	Single	90K	Yes

Answer: 0.3 ✖

The correct answer is: 0.048

Question **7**

Correct

5.00 points out of 5.00

Given the data in the Table below, and assuming that the attributes follow the Naive Bayes assumption, compute and compare

1. P1 = P (Evade = Yes | Taxable Income = 95) with
2. P2 = P (Evade = NO | Taxable Income = 95)

- Report your answer as the ratio of P1 over P2, i.e., P1 / P2
- You should treat Taxable Income as Continuous attribute with the Gaussian Distribution.
- Round your answer to the first decimal point.
- Do NOT use white-space character to allow for auto-grading

Tid	Refund	Marital Status	Taxable Income	Evade
1	Yes	Single	125K	No
2	No	Married	100K	No
3	No	Single	70K	No
4	Yes	Married	120K	No
5	No	Divorced	95K	Yes
6	No	Married	60K	No
7	Yes	Divorced	220K	No
8	No	Single	85K	Yes
9	No	Married	75K	No
10	No	Single	90K	Yes

Answer: 2.8   ✔

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vec <- c(95, 85, 90)

mean(vec)

sd (vec)

atr <- 95

const <- 1.0 / (sqrt (2*pi) * sd(vec))

```
exp.value <- exp((-((atr - mean(vec))^2) / (2 * sd(vec)^2)))

probability <- const * exp.value

probability

class.prob <- 3.0 / 10

class.pred1 <- probability * class.prob


vec <- c(125, 100, 70, 120, 60, 220, 75)

mean(vec)

sd (vec)

atr <- 95

const <- 1.0 / (sqrt (2*pi) * sd(vec))

exp.value <- exp((-((atr - mean(vec))^2) / (2 * sd(vec)^2)))

probability <- const * exp.value

probability

class.prob <- 7.0 / 10

class.pred2 <- probability * class.prob

class.pred1 / class.pred2
```

The correct answer is: 2.8

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