

OKAUBUE FRANCIS

11279373

ON0206

CMPT 317

BONUS ASSIGNMENT

Negative Bias Grading Scheme

For here, the argument that a fairer grade for a raw quiz of 6/12 is approximately 7% instead of 0% can be understood through the concept of Bayes Rule for Conditional Probabilities. The idea here is that we want to determine find the probability of a student knowing the answer given that they circled the correct answer on the sheet and since we cannot read mines, will then need to rely on observable outcome to make an inference about their knowledge.

Using this scheme, the grade of the student is computed as follows where N is the number of correct answers

$$\frac{N-6}{12-6} = \frac{N-6}{6}$$

In right-minus-wrong grading scheme, the total score is computed as follows. This yields the same grade as the negative bias grading scheme above.

$$\frac{N-(12-N)}{12} = \frac{2N-12}{12} = \frac{N-6}{6}$$

The grading is based on the computing the probability of knowing n correct answers given you answered n questions correctly. Let K_n be the event of knowing n answers. Let C_n be the event of getting n correct answers. The grade can be written as a conditional probability.

$$P(K_n | C_n) = \frac{P(K_n, C_n)}{P(C_n)}$$

BONUS ASSIGNMENT (OPTIONAL)

If a person knows the answers of n questions, then the person will get n correct answers and get the rest of the questions correct 50% at a time since the person will randomly select an answer

$$P(K_n, C_n) = 1 \cdot 0.5^{N-n} = 0.5^{N-n}$$

The probability of getting n correct answers can be solved using Binomial distribution where the success rate is 50%

$$P(C_n) = \binom{N}{n} 0.5^n 0.5^{N-n} = \binom{N}{n} 0.5^N$$

And then, substituting these two equations, would get the reasonable grade

$$P(K_n | C_n) = \frac{0.5^{N-n}}{\binom{N}{n} 0.5^N} = \frac{1}{\binom{N}{n} 0.5^n}$$

In this example,

$$P(K_6 | C_6) = \frac{1}{\binom{12}{6} 0.5^6} \approx \underline{6.93\%}$$

So in conclusion, we could say that the intuition that Negative Bias Grading Scheme could be harsh can be supported by applying/wing Bayes Rule for Conditional Probabilities. By considering in terms of knowledge & guessing, can say that a score of 6/12 does not necessarily indicate a lack of understanding but more of a mixture of both of them student knowledge & guessing.