# Quiz Submissions - Quiz 1 (optional)

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**Attempt 1**

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**Submission View**

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## Probabilities

**Question 1** **1 / 1 point**

My neighbor has two children. Assuming that the gender of a child is like a coin flip, which one is more likely?

- ✔ my neighbor has one boy and one girl
- my neighbor has two boys
- my neighbor has two girl
- all are equally likely

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Event space is: {B/G}x{B/G}: 1/4. Therefore, probability of B,G or G,B will be 1/2. The other possibilities—two boys or two girls—have probabilities 1/4 and 1/4.

## Question 2 1 / 1 point

Suppose I ask him whether he has any boys, and he says yes. What is the probability that one child is a girl?

- 1/2
- 1/4
- ✔ 2/3
- 1/3

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Let $N_g$ be the number of girls and $N_b$ the number of boys. We have the constraint (side information) that $N_b + N_g = 2$ and $0 \leq N_b, N_g \leq 2$. We are told $N_b \geq 1$ and are asked to compute the probability of the event $N_g = 1$ (i.e., one child is a girl). By Bayes rule we have $P(N_g = 1 | N_b \geq 1) = \frac{P(N_b \geq 1 | N_g = 1) P(N_g = 1)}{P(N_b \geq 1)} = \frac{1 * \frac{1}{2}}{\frac{3}{4}} = \frac{2}{3}$

## Question 3 1 / 1 point

Suppose instead [of asking] that I happen to see one of his children run by, and it is a boy. What is the probability that the other child is a girl?

- 1/4

✔ 1/2

2/3

1/3

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$$P(X = g|Y = b) = \frac{P(Y=b|X=g)P(X=g)}{P(Y=b)} = \frac{\frac{1}{2} * \frac{1}{2}}{\frac{1}{2}} = \frac{1}{2}$$

This seems like a paradox because it seems that in both cases we could condition on the fact that "at least one child is a boy." But that is not correct; you must condition on the event actually observed, not its logical implications. In the first case, the event was "He said yes to my question." In the second case, the event was "One child appeared in front of me." The generating distribution is different for the two events. Probabilities reflect the number of possible ways an event can happen, like the number of roads to a town. Logical implications are further down the road and may be reached in more ways, through different towns. The different number of ways changes the probability.

## KNN

**Question 4** **1 / 1 point**

Which of the following generally improves the performance of KNN?

Adding as many features as possible

- ◯ Increasing the number of neighbors, K
- ✔ ◯ Scaling up to more important feature
- ◯ Using more test data

**Question 5** **1 / 1 point**

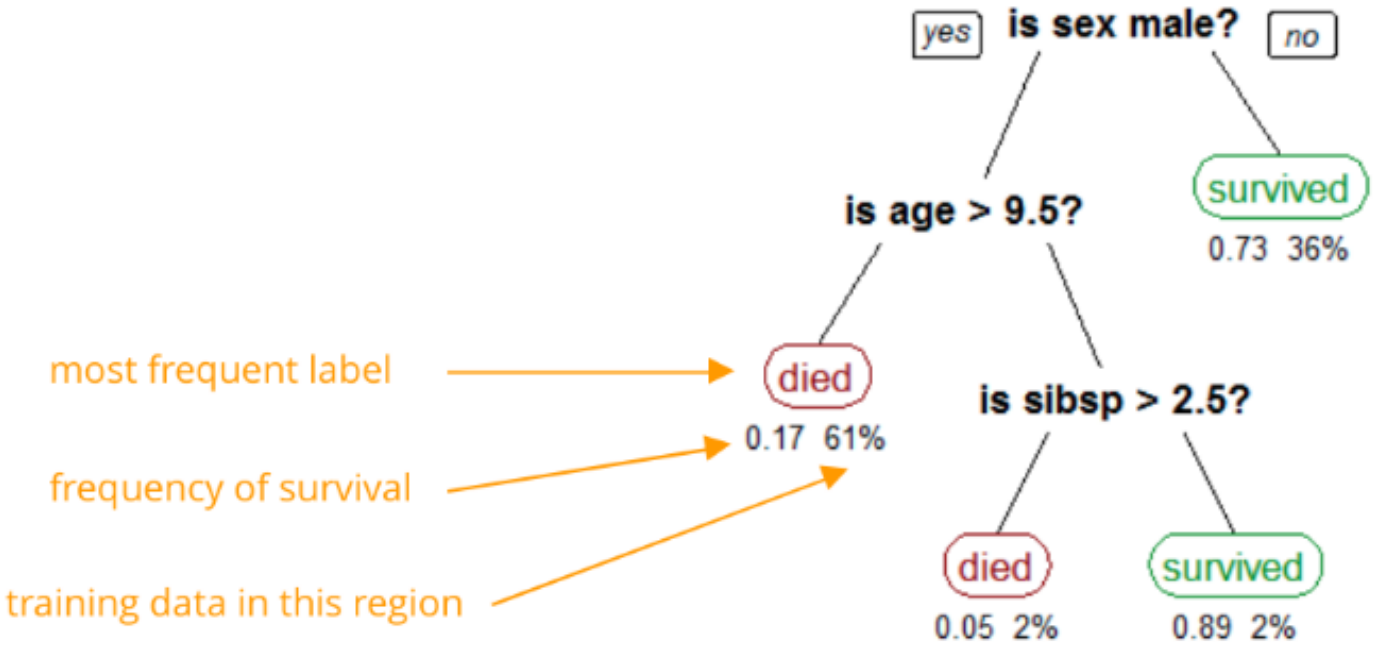
Which of the following statements are true for k-NN classifiers.

- ✔ ◯ k-NN does not require an explicit training step.
- ◯ The classification accuracy is better with larger values of k.
- ◯ The decision boundary is smoother with smaller values of k

## Decision Tree

**Question 6** **0 / 1 point**

What is the total misclassification cost for the below example? Give an answer up to two decimal places.




Answer:

0.63 ✖ **(0.20)**

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**0.61*0.17 + 0.02*0.05 + 0.02*0.11 + 0.36*0.27 = 0.20**

## Entropy Calculation

**Question 7** **1 / 1 point**

Consider the following dataset. Let “Day” and “Weather” be the input features and “GoHiking” is the class labels/output.

| Day | Weather | GoHiking? |
|---|---|---|
| Mon | Sunny | No |
| Tues | Cloudy | No |
| Wed | Rain | No |
| Thurs | Rain | No |
| Fri | Sunny | No |
| Sat | Sunny | No |
| Sun | Sunny | Yes |

**What is the entropy of the distribution of "GoHiking"? Give answer up to 2 decimal precision. Use log base 2 for the calculations.**

Answer:

0.59 ✔

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**-6/7 log(6/7) - 1/7log(1/7) = 0.59**

## Question 8 — 1 / 1 point

How much is the mutual information between the feature "Weather" and the class label "Go Hiking" that is I(Weather, GoHiking)?

| Day | Weather | GoHiking? |
|---|---|---|
| Mon | Sunny | No |
| Tues | Cloudy | No |
| Wed | Rain | No |
| Thurs | Rain | No |
| Fri | Sunny | No |
| Sat | Sunny | No |
| Sun | Sunny | Yes |

Answer:

0.13 ✔

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I(Weather, GoHiking) = H(GoHiking) - H(GoHiking| Weather)

H(GoHiking | Weather) = p(Weather = sunny)H(GoHiking | Weather = sunny) + p(Weather = cloudy)H(GoHiking | Weather = cloudy) + p(Weather = rainy)H(GoHiking | Weather = rainy)

H(GoHiking | Weather = sunny) = -¾ log(¾ ) - ¼ log (¼ )

H(GoHiking | Weather = cloudy) = 0

H(GoHiking | Weather = rainy) = 0

## Question 9 — 1 / 1 point

How much is the mutual information between the feature “Day” and the class label “Go Hiking” that is I(Day, GoHiking)?

| Day | Weather | GoHiking? |
|---|---|---|
| Mon | Sunny | No |
| Tues | Cloudy | No |
| Wed | Rain | No |
| Thurs | Rain | No |
| Fri | Sunny | No |
| Sat | Sunny | No |
| Sun | Sunny | Yes |

Answer:

0.59 ✔

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**H(GoHiking| Day) = 0**

**Attempt Score:** 8 / 9 - 88.89 %

**Overall Grade** (highest attempt): 8 / 9 - 88.89 %

Done