☞ **Congratulations! You passed!**

Grade received 100%   Latest Submission Grade 100%   **To pass** 80% or higher

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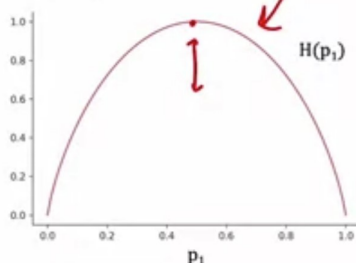
Quiz
Practice quiz: Decision tree learning

✓ Submit your assignment

1.   1 / 1 point

Entropy as a measure of impurity

p_1 = fraction of examples that are cats

$H(p_1)$

$$p_0 = 1 - p_1$$

$$H(p_1) = -p_1 log_2(p_1) - p_0 log_2(p_0)$$
$$= -p_1 log_2(p_1) - (1 - p_1)log_2(1 - p_1)$$

Note: "0 log(0)" = 0

Recall that entropy was defined in lecture as H(p_1) = - p_1 log_2(p_1) - p_0 log_2(p_0), where p_1 is the fraction of positive examples and p_0 the fraction of negative examples.

At a given node of a decision tree, , 6 of 10 examples are cats and 4 of 10 are not cats. Which expression calculates the entropy $H(p_1)$ of this group of 10 animals?

○ $(0.6)log_2(0.6) + (0.4)log_2(0.4)$

◉ $-(0.6)log_2(0.6) - (0.4)log_2(0.4)$

○ $(0.6)log_2(0.6) + (1 - 0.4)log_2(1 - 0.4)$

○ $-(0.6)log_2(0.6) - (1 - 0.4)log_2(1 - 0.4)$

⊘ Correct
Correct. The expression is $-(p_1)log_2(p_1) - (p_0)log_2(p_0)$

2.   1 / 1 point

Information gain

$$= H(p_1^{root}) - \left(w^{left} H\left(p_1^{left}\right) + w^{right} H\left(p_1^{right}\right) \right)$$

Recall that information was defined as follows:

$$H(p_1^{root}) - \left(w^{left} H(p_1^{left}) + w^{right} H(p_1^{right}) \right)$$

Before a split, the entropy of a group of 5 cats and 5 non-cats is $H(5/10)$. After splitting on a particular feature, a group of 7 animals (4 of which are cats) has an entropy of $H(4/7)$. The other group of 3 animals (1 is a cat) and has an entropy of $H(1/3)$. What is the expression for information gain?

○ $H(0.5) - (7 * H(4/7) + 3 * H(1/3))$

○ $H(0.5) - \left(\frac{4}{7} * H(4/7) + \frac{4}{7} * H(1/3)\right)$

◉ $H(0.5) - \left(\frac{7}{10} H(4/7) + \frac{3}{10} H(1/3)\right)$

○ $H(0.5) - (H(4/7) + H(1/3))$

⊘ Correct
Correct. The general expression is $H(p_1^{root}) - \left(w^{left} H(p_1^{left}) + w^{right} H(p_1^{right}) \right)$

3.   1 / 1 point

One hot encoding

Ear shape	Pointy ears	Floppy ears	Oval ears	Face shape	Whiskers	Cat
~~Pointy~~	1	0	0	Round	Present	1
~~Oval~~	0	0	1	Not round	Present	1
~~Oval~~	0	0	1	Round	Absent	0
~~Pointy~~	1	0	0	Not round	Present	0
~~Oval~~	0	0	1	Round	Present	1
~~Pointy~~	1	0	0	Round	Absent	1
~~Floppy~~	0	1	0	Not round	Absent	0
~~Oval~~	0	0	1	Round	Absent	1
~~Floppy~~	0	1	0	Round	Absent	0
~~Floppy~~	0	1	0	Round	Absent	0

To represent 3 possible values for the ear shape, you can define 3 features for ear shape: pointy ears, floppy ears, oval ears. For an animal whose ears are not pointy, not floppy, but are oval, how can you represent this information as a feature vector?

○ $[0, 1, 0]$

◉ $[0, 0, 1]$

○ $[1, 1, 0]$

○ $[1, 0, 0]$

⊘ Correct
Yes! 0 is used to represent the absence of that feature (not pointy, not floppy), and 1 is used to represent the presence of that feature (oval).