Take Test: Concept Learning

Test Information

Description

Instructions

Multiple Attempts This test allows 5 attempts. This is attempt number 2.

Force Completion This test can be saved and resumed later.

Question Completion Status:

QUESTION 1

10 points Saved

Consider a learning problem with n binary-valued attributes. Give a formula for the total number of concepts can be represented using these attributes? (I.e., how big is the full unbiased hypothesis space?)

- (•) 2^n
- ( ) 3^n
- ( ) 2^{n^n}
- ( ) 2^{2^n}

QUESTION 2

10 points Saved

Consider a learning problem with n binary-valued attributes. How many conjunctive hypotheses are there?

- (•) $2n^2+2$
- ( ) 2^n+1
- ( ) 2^{n^n}
- ( ) 3^n+1

QUESTION 3

10 points Saved

Assume a hypothesis space H contains only conjunctive hypotheses over n attributes. Given a training set $\{x_1, ..., x_k\}$ of positive examples, how large can S be? (I.e., what is the maximum number of most specific hypotheses?)

- (•) k
- ( ) n^k
- ( ) 1
- ( ) n

Click Save and Submit to save and submit. Click Save All Answers to save all answers.

Save All Answers Save and Submit

QUESTION 4

10 points Saved

Consider a hypothesis space for representing concepts related to what diseases a tomato plant might have. Plants are represented via four attributes: Leaf-Color, Tomato-Size, Tomato-Taste, and Number-of-Seeds. The possible values of these attributes are as follows:

- Leaf-Color: *normal, yellow, black*
- Tomato-Size: *small, normal*
- Tomato-Skin: *smooth, wrinkled, bumpy*
- Number-of-Seeds: *very-few, few, many, very-many*

Hypotheses are conjunctions of constraints on attribute values, where a constraint can be either an equality constraint (e.g., Leaf-Color=*yellow*) or one of the following set constraints:

- Leaf-Color=*abnormal*
  - Leaf-Color=*yellow* OR Leaf-Color=*black*
- Number-of-Seeds=*less*
  - Number-of-Seeds=*few* OR Number-of-Seeds=*very-few*
- Number-of-Seeds=*more*
  - Number-of-Seeds=*many* OR Number-of-Seeds=*very-many*

What are the minimal generalizations from the hypothesis:

Leaf-Color=*black* AND Tomato-Size=*small* AND Tomato-Skin=*bumpy* AND Number-of-Seeds=*very-few*

- [x] (Leaf-Color=*black* OR Leaf-Color=*yellow)* AND Tomato-Size=*small* AND Tomato-Skin=*bumpy* AND Number-of-Seeds=*very-few*
- [ ] Leaf-Color=*abnormal* AND Number-of-Seeds=*very-few*
- [ ] Leaf-Color=*black* AND Tomato-Size=*small* AND Tomato-Skin=*bumpy*
- [ ] Leaf-Color=*black* AND Tomato-Size=*small* AND Number-of-Seeds=*very-few*
- [ ] Leaf-Color=*black* AND Tomato-Size=*small*
- [ ] Leaf-Color=*abnormal* AND Tomato-Size=*small* AND Tomato-Skin=*bumpy* AND Number-of-Seeds=*very-few*
- [ ] Tomato-Size=*small* AND Tomato-Skin=*bumpy* AND Number-of-Seeds=*very-few*
- [ ] Leaf-Color=*black* AND Tomato-Skin=*bumpy* AND Number-of-Seeds=*very-few*
- [ ] Leaf-Color=*black* AND Tomato-Size=*small* AND Tomato-Skin=*bumpy* AND Number-of-Seeds=*less*

QUESTION 5

10 points Saved

Consider a hypothesis space for representing concepts related to what diseases a tomato plant might have. Plants are represented via four attributes: Leaf-Color, Tomato-Size, Tomato-Taste, and Number-of-Seeds. The possible values of these attributes are as follows:

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- Number-of-Seeds=*more*
  - Number-of-Seeds=*many* OR Number-of-Seeds=*very-many*

Given this hypothesis space and a set of **positive** examples, is there always a single **unique** most specific hypothesis in the version space (i.e., never more than one)?

- (•) True
- ( ) False

QUESTION 6

10 points Saved

Consider the instance space X of points $\mathbf{x} = (x_1, x_2)$ with **integer** coordinates$([0..10], [0..10]) \subset N^2$. The task is to learn a concept $c : X \rightarrow \{0, 1\}$ which can be described as a rectangle $((a, b),(c, d)) \in N^2 \times N^2$ where (a, b) is the lower left corner of the rectangle, (c, d) is the upper right corner. An example is labeled positive if it lies inside the rectangle or on its boundary, and negative, if it lies outside the rectangle.

The hypothesis space H are all rectangles over the instance space X. Note that in this setting, a hypothesis *h*= ((a

The hypothesis space H are all rectangles over the instance space X. Note that in this setting, a hypothesis h= ((a, b),(c, d)) can be generalized by decreasing a or b and/or increasing c or d. Similarly it can be made more specific by increasing a or b or decreasing c or d.

Consider the following training set, where the 0 or 1 is the label of each data point (0 indicates negative examples, and 1 indicates positive examples):

((0, 5), 0)
((4, 5), 1)
((2, 2), 0)
((9, 5), 0)
((6, 3), 1)
((5, 6), 1)
((7, 0), 0)
((5, 8), 0)

For this training set, what rectangles are in the G boundary of the version space?

- [x] ((4, 1), (5, 7))
- [ ] ((3, 0), (6, 7))
- [ ] ((3, 1), (8, 4))
- [ ] ((2, 2), (5, 6))
- [ ] ((1, 3), (8, 7))
- [ ] ((4, 3), (6, 6))
- [ ] ((3, 1), (8, 7))
- [ ] ((3, 1), (6, 8))