CSE 5693 Machine Learning

HW2 Decision Tree Learning

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Written Assignment

1. **2.4**

**Instance space consist of integer points in x, y plane and H is the set of hypotheses consisting of rectangles. The hypotheses are of the form a ≤ x ≤ b, c ≤ y ≤ d where a, b, c, and d are integers.**

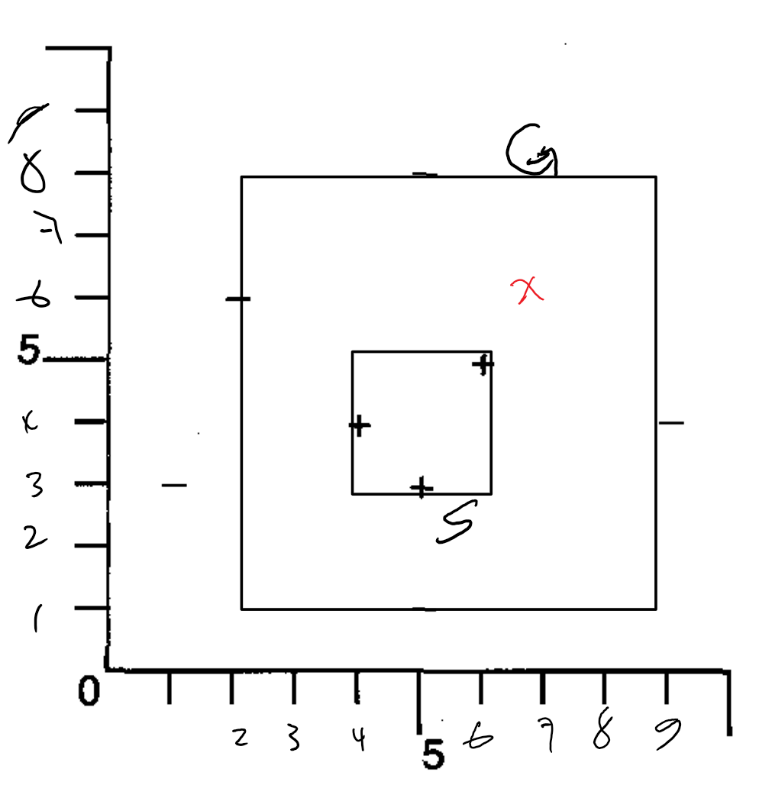
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Figure 1. Drawing of S and G boundaries

* 1. **What is the S boundary of the version space?**

S: 4 ≤ x ≤ 6, 3 ≤ y ≤ 5

See figure 1 for drawing of S

* 1. **What is the G boundary of the version space?**

G: 2 ≤ x ≤ 9, 1 ≤ y ≤ 8

See figure 1. for drawing of G

* 1. **Suggest x, y instance**

P: x = 7, y = 6 is guaranteed to reduce the size of the version space

if P is positive (+), S: 4 ≤ x ≤ 7, 3 ≤ y ≤ 6

if P is negative (-), G: 2 ≤ x ≤ 7, 1 ≤ y ≤ 6

Q: x = 2, y = 1 is not guaranteed to reduce the size of the version space

Since if Q is negative (-), G doesn’t change

* 1. **Teacher**

A minimum, you need 4 training examples, since the rectangle can be described by 2 pairs of points, one pair of positive points and another pair of negative points to set the S and G limits. For example, positive pair {(3,2), (5, 9)} and negative pair {(2,1), (6, 10)} is enough for candidate eliminate to learn target: 3 ≤ x ≤ 5 and 2 ≤ y ≤ 9

1. **2.7**
2. **3.4**
3. **Play Tennis**
4. **Programming assignment discussion**