BITS F464 (Machine Learning)

Assignment 1: Implementation of Candidate Elimination Algorithm.

Training Data: Zoo Data Set in UCL Repository.

A brief Introduction to Candidate Elimination:

The candidate elimination algorithm incrementally builds the version space given a hypothesis space H and a set D of examples. The examples are added one by one; each example possibly shrinks the version space by removing the hypotheses that are inconsistent with the example. The candidate elimination algorithm does this by updating the general and specific boundary for each new example.

Candidate Elimination Algorithm Steps:

* Initialize G to the set of maximally general hypotheses in H
* Initialize S to the set of maximally specific hypotheses in H
* For each training example d, do
* If d is a positive example

1. Remove from G any hypothesis inconsistent with d
2. For each hypothesis s in S that is not consistent with d
3. Remove s from S
4. Add to S all minimal generalization h of s such that

* h is consistent with d, and some member of G is more general than h

1. Remove from S any hypothesis that is more general than another hypothesis in S

* If d is a negative example

1. Remove from S any hypothesis inconsistent with d

2. For each hypothesis s in G that is not consistent with d

1. Remove g from G

ii. Add to G all minimal generalization h of g such that

* h is consistent with d, and some member of S is more general than h

iii. Remove from G any hypothesis that is more general than another hypothesis in G

Code Description:

Update general(vector<int> instance)

1. Attribute 1 to 11 are Boolean and attribute 12 is numeric with values(2,4,6,8,5) so it is handles separately.
2. The consistent hypotheses are retained and the inconsistent hypothesis are specialized
3. if example is inconsistent with spec border, then it is noise
4. Checks if the new hypothesis is consistent
5. All hypothesis more general than general boundary and more specific than specific boundary are removed.
6. From general all those hypothesis are removed which are more specific than another hypothesis in general boundary.

Update Specific(vector<int> instance)

1. Takes all hypothesis and finds specific boundary.

2.Keeps the consistent hypothesis and generalizes the inconsistent hypothesis.

3. If inconsistent with instance then if value is phi replace it by value of instance else replace by ‘?‘ .

Void addline(string line)

1. Function is used to pre-process data and store it into a vector.
2. The tupules are separated by a ‘, ‘in the data-set and are pushed-back in the vector.

**Results :**

**1 vs All**

**Specific Boundary: ? 0 ? 1 ? ? ? ? 1 1 0 ? ? ? ? ?**

**No. Of General Boundaries: 1**

**General Boundary:? ? ? 1 ? ? ? ? ? ? ? ? ? ? ? ?**

**2 vs All**

**Specific Boundary: 0 1 1 0 ? ? ? 0 1 1 0 0 2 1 ? ?**

**No. Of General Boundaries: 5**

**General Boundary:? ? ? ? ? ? ? 0 ? ? ? ? 2 ? ? ?**

**? ? ? 0 ? ? ? ? ? ? ? ? 2 ? ? ?**

**? ? 1 ? ? ? ? ? ? ? ? ? 2 ? ? ?**

**? 1 ? ? ? ? ? ? ? ? ? ? ? ? ? ?**

**0 ? ? ? ? ? ? ? ? ? ? ? 2 ? ? ?**

**3 vs All**

**Specific Boundary:0 0 ? 0 0 ? ? ? 1 ? ? 0 ? 1 0 ?**

**No. Of General Boundaries: 0**

**General Boundary:None**

**4 vs All**

**Specific Boundary:0 0 1 0 0 1 ? 1 1 0 ? 1 0 1 ? ?**

**No. Of General Boundaries: 9**

**General Boundary:? ? ? ? ? ? ? ? ? 0 ? 1 ? ? ? ?**

**? ? ? 0 ? ? ? ? ? ? ? 1 ? ? ? ?**

**? ? 1 ? ? ? ? ? ? ? ? 1 ? ? ? ?**

**? ? 1 ? ? ? ? ? ? 0 ? ? ? 1 ? ?**

**? ? 1 ? ? ? ? ? 1 0 ? ? ? ? ? ?**

**? ? 1 ? ? ? ? 1 ? 0 ? ? ? ? ? ?**

**? ? 1 ? ? 1 ? ? ? ? ? ? 0 1 ? ?**

**? ? 1 ? ? 1 ? ? 1 ? ? ? 0 ? ? ?**

**? ? 1 ? ? 1 ? 1 ? ? ? ? 0 ? ? ?**

**5 vs All**

**Specific Boundary:0 0 1 0 0 1 ? 1 1 1 ? 0 4 ? 0 0**

**No. of General Boundary:24**

**General Boundary:? ? ? ? ? 1 ? ? ? 1 ? ? 4 ? ? 0**

**? ? ? ? ? 1 ? ? 1 ? ? ? 4 ? ? 0**

**? ? ? ? ? 1 ? 1 ? ? ? ? 4 ? ? 0**

**? ? ? ? ? 1 ? 1 ? 1 ? ? ? ? ? 0**

**? ? ? ? 0 1 ? ? ? 1 ? ? ? ? ? 0**

**? ? ? 0 ? 1 ? ? ? 1 ? ? 4 ? ? ?**

**? ? ? 0 ? 1 ? ? 1 ? ? ? 4 ? ? ?**

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**? ? 1 ? ? 1 ? 1 ? ? ? ? 4 ? ? ?**

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**? 0 1 ? ? 1 ? ? 1 ? ? 0 ? ? ? 0**

**? 0 1 0 ? 1 ? ? 1 ? ? 0 ? ? ? ?**

**0 ? ? ? ? 1 ? ? ? 1 ? ? 4 ? ? ?**

**0 ? ? ? ? 1 ? ? 1 ? ? ? 4 ? ? ?**

**0 ? ? ? ? 1 ? 1 ? ? ? ? 4 ? ? ?**

**0 ? ? ? ? 1 ? 1 ? 1 ? 0 ? ? ? ?**

**0 0 ? ? ? 1 ? ? ? 1 ? 0 ? ? ? ?**

**0 0 1 ? ? 1 ? ? ? 1 ? ? ? ? ? ?**

**0 0 1 ? ? 1 ? ? 1 ? ? 0 ? ? ? ?**

**6 vs All**

**Specific Boundary:? 0 1 0 ? 0 ? 0 0 1 ? 0 6 0 ? 0**

**No. Of General Boundary:2**

**General Boundary: ? ? ? ? ? ? ? ? ? 1 ? ? 6 ? ? ?**

**? ? ? ? ? 0 ? ? ? ? ? ? 6 ? ? ?**

**7 vs All**

**Specific Boundary:0 0 ? 0 0 ? ? 0 0 ? ? 0 ? ? 0 ?**

**No. Of General Boundary:0**

**General Boundary: None**

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