AI algorithms: Version Spaces

Input:

A list of all labeled (+ or -) examples: E

A hierarchy of concepts H

Two *version spaces* of hypotheses that are valid given the examples:

- G: The set of the most general hypotheses
- S: The set of the most specific hypotheses

Output:

G and S

Algorithm:

$G \leftarrow$ hypothesis that covers everything (top)
$S \leftarrow$ hypothesis that covers nothing (bottom)
while E not empty **do**
  $e \leftarrow$ get (and remove) first example from E
  if e is labeled + **then**
    for all hypothesis h in S that do NOT cover e **do**
      $s \leftarrow$ all minimal generalizations of h according to H
      Remove all hypotheses from s that do not specialize any hypothesis of G
      Remove all hypotheses from s that generalize an hypothesis of S
      Add remaining hypotheses from s to S
    end for
    for all hypothesis h in G that do NOT cover e **do**
      Remove h from G
    end for
  end if
  if e is labeled - **then**
    for all hypothesis h in G that do NOT cover e **do**
      $g \leftarrow$ all minimal specializations of h according to H
      Remove all hypotheses from g that do not generalize any hypothesis of S
      Remove all hypotheses from g that specialize an hypothesis of G
      Add remaining hypotheses from g to G
    end for
    for all hypothesis h in S that do NOT cover e **do**
      Remove h from S
    end for
  end if
  if G empty OR S empty **then**
    Report failure
  end if
end while