

Apprendimento Automatico

Fabio Aiolli

www.math.unipd.it/~aiolli

Sito web del corso

www.math.unipd.it/~aiolli/corsi/1516/aa/aa.html

Apprendimento di Concetti (1)

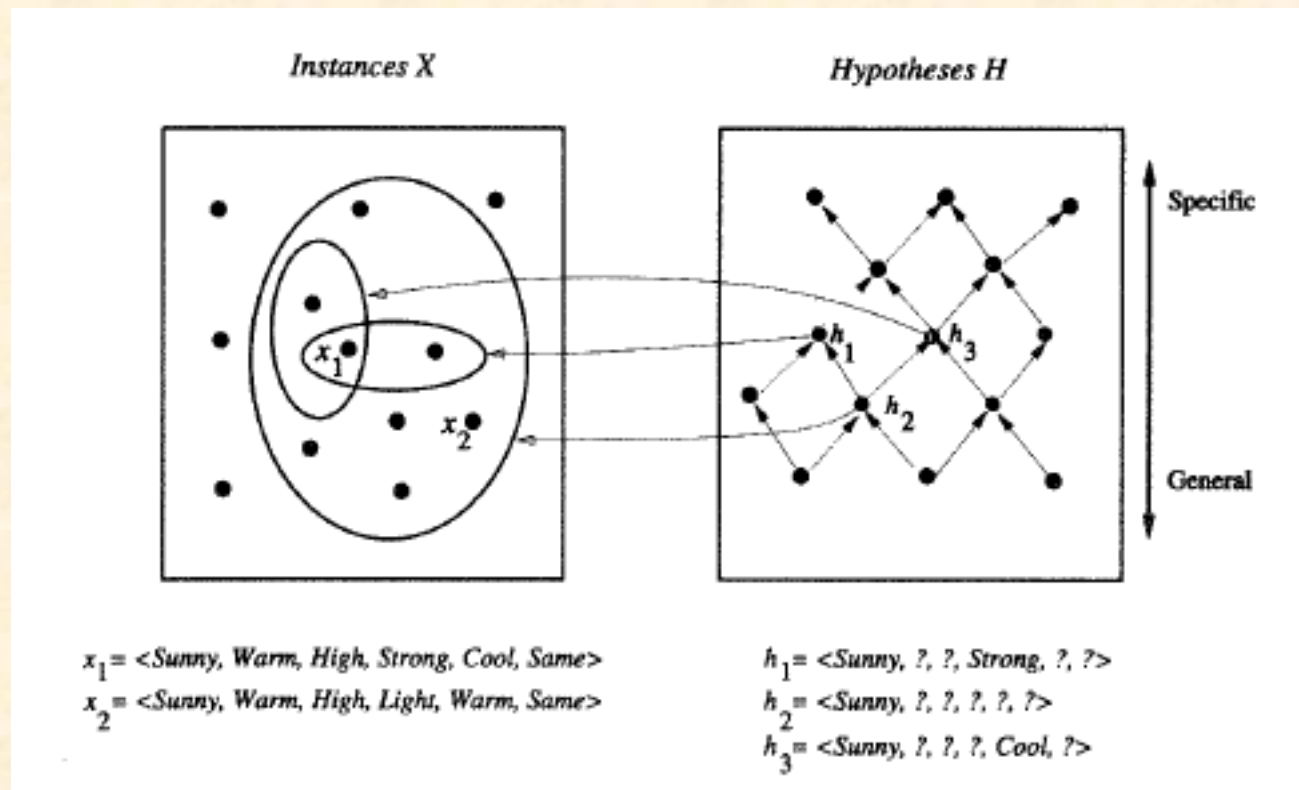
Example	<i>Sky</i>	<i>AirTemp</i>	<i>Humidity</i>	<i>Wind</i>	<i>Water</i>	<i>Forecast</i>	<i>EnjoySport</i>
1	Sunny	Warm	Normal	Strong	Warm	Same	Yes
2	Sunny	Warm	High	Strong	Warm	Same	Yes
3	Rainy	Cold	High	Strong	Warm	Change	No
4	Sunny	Warm	High	Strong	Cool	Change	Yes

- **Given:**
 - Instances X : Possible days, each described by the attributes
 - *Sky* (with possible values *Sunny*, *Cloudy*, and *Rainy*),
 - *AirTemp* (with values *Warm* and *Cold*),
 - *Humidity* (with values *Normal* and *High*),
 - *Wind* (with values *Strong* and *Weak*),
 - *Water* (with values *Warm* and *Cool*), and
 - *Forecast* (with values *Same* and *Change*).
 - Hypotheses H : Each hypothesis is described by a conjunction of constraints on the attributes *Sky*, *AirTemp*, *Humidity*, *Wind*, *Water*, and *Forecast*. The constraints may be "?" (any value is acceptable), "Ø" (no value is acceptable), or a specific value.
 - Target concept c : $EnjoySport : X \rightarrow \{0, 1\}$
 - Training examples D : Positive and negative examples of the target function (see Table 2.1).
- **Determine:**
 - A hypothesis h in H such that $h(x) = c(x)$ for all x in X .

Quante istanze possibili? E quante ipotesi?

Apprendimento di Concetti (2)

Struttura di H

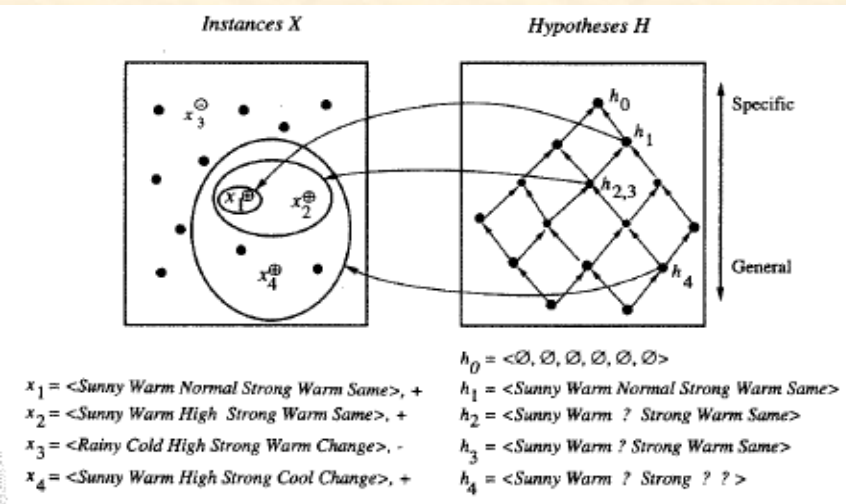


Apprendimento di Concetti (3)

Find-S

1. Initialize h to the most specific hypothesis in H
2. For each positive training instance x
 - For each attribute constraint a_i in h

If the constraint a_i is satisfied by x
Then do nothing
Else replace a_i in h by the next more general constraint that is satisfied by x
3. Output hypothesis h

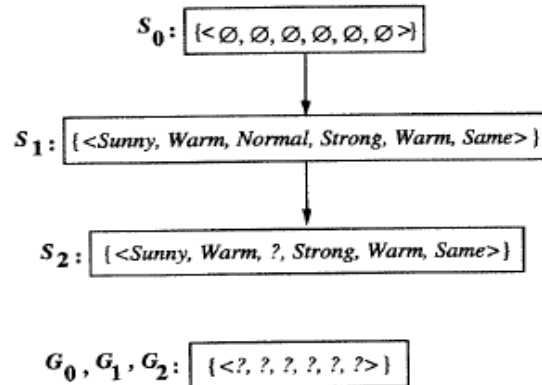


- 0) $h : \langle \emptyset, \emptyset, \emptyset, \emptyset, \emptyset, \emptyset \rangle$
- 1) $h : \langle \text{S, W, N, S, W, S} \rangle$
- 2) $h : \langle \text{S, W, ?, S, W, S} \rangle$
- 3) Nothing
- 4) $h : \langle \text{S, W, ?, S, ?, ?} \rangle$

Example	Sky	AirTemp	Humidity	Wind	Water	Forecast	EnjoySport
1	Sunny	Warm	Normal	Strong	Warm	Same	Yes
2	Sunny	Warm	High	Strong	Warm	Same	Yes
3	Rainy	Cold	High	Strong	Warm	Change	No
4	Sunny	Warm	High	Strong	Cool	Change	Yes

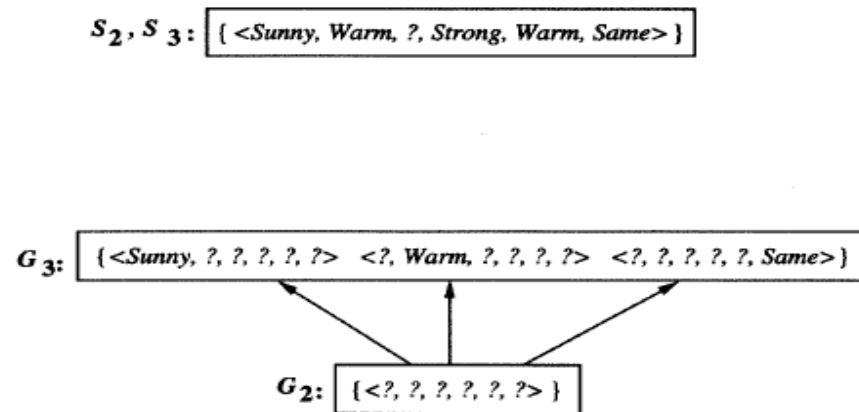
Apprendimento di Concetti (4)

Candidate-Elimination



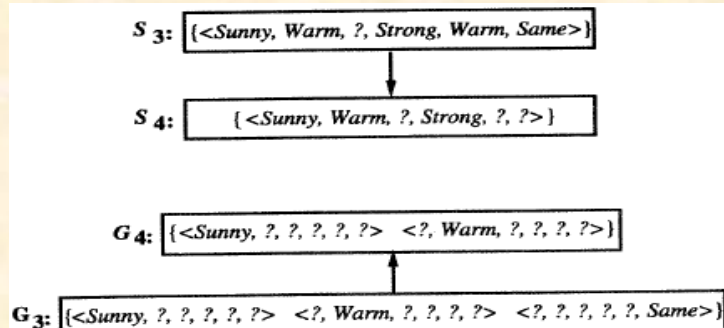
Training examples:

1. $\langle \text{Sunny}, \text{Warm}, \text{Normal}, \text{Strong}, \text{Warm}, \text{Same} \rangle, \text{Enjoy Sport} = \text{Yes}$
2. $\langle \text{Sunny}, \text{Warm}, \text{High}, \text{Strong}, \text{Warm}, \text{Same} \rangle, \text{Enjoy Sport} = \text{Yes}$



Training Example:

3. $\langle \text{Rainy}, \text{Cold}, \text{High}, \text{Strong}, \text{Warm}, \text{Change} \rangle, \text{EnjoySport} = \text{No}$



Training Example:

4. $\langle \text{Sunny}, \text{Warm}, \text{High}, \text{Strong}, \text{Cool}, \text{Change} \rangle, \text{EnjoySport} = \text{Yes}$

