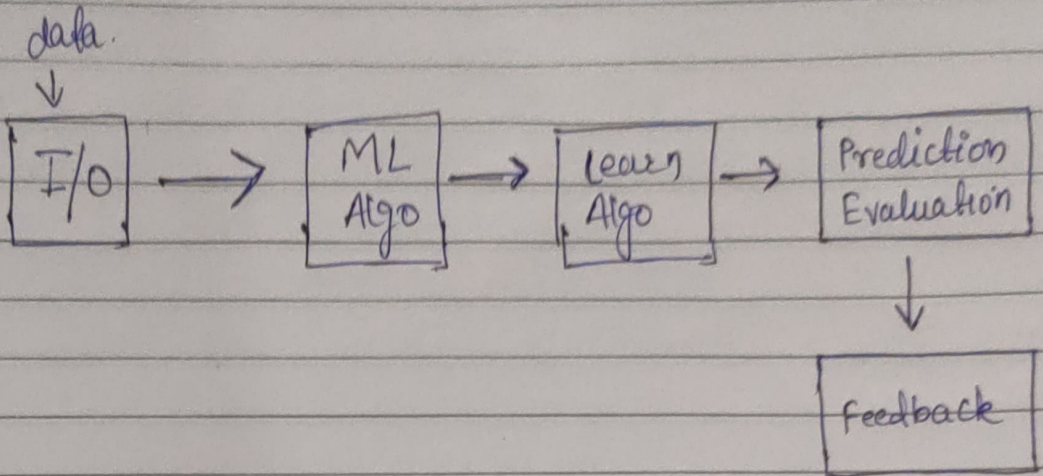


Machine Learning

Date .../.../...

UNIT-1



* Machine Learning

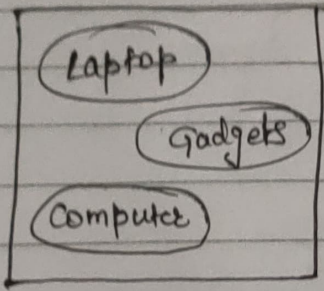
- ML is a subset of AI that focuses on training machines to learn from data and improve their performance over time, without being explicitly programmed.
- Instead of following rigid rules machines are equipped with an algorithm that enables them to analyze vast amounts of data, identify
 - In simple term ML is a technique for teaching machines how to learn from data and improve their performance over time.
 - The primary goal of machine learning is to develop algorithms and models that can
 - Identify patterns
 - learn from past experiences and
 - Generalize to new, unseen data.

31/7

Date / /

* Concept learning

- It involves figuring out a rule which can be either true or false.
- In this we find and tea



Feature	Computer	Laptop
Size -	Large	Small
colour -	Black	Blue
Screen -	Flat	Foldable
Shape -	Square	Rectangle

x_1, x_2, x_3, x_4

Concept $\langle x_1, x_2, x_3, x_4 \rangle$

individual Computer $\langle x_1, x_2, x_3, x_4 \rangle$

$\langle \text{Large, Black, Flat, Square} \rangle$

Laptop $\langle \text{Small, Blue, Foldable, Rectangle} \rangle$

No. of possible instances = 2^d $\because (d = \text{no. of features})$

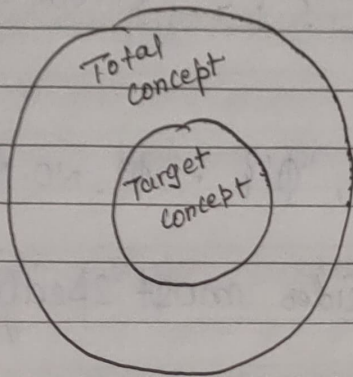
Total possible concept = 2^{2^d} $\because d = \text{no. of features.}$

Feature (d)

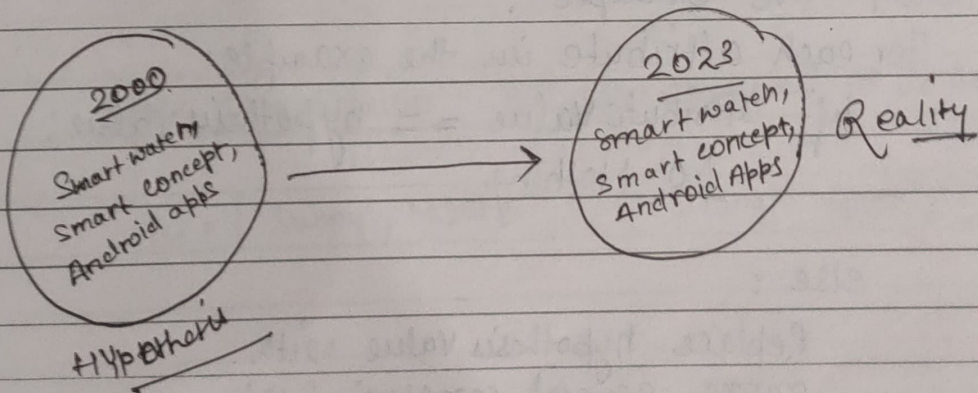
Target Concept

Instances	Feature (d)				Target Concept
	Gender	Age Group	Income	Loan Amt	Approve Loan
{	Male	<18	15000	120	Y
	Female	85-50	2350	200	N
	Female	85-50	4500	500	Y
	Male	18-25	6000	100	N

$$\text{Total Concept} = 2^{2^d} = 2^{2^4} = 2^{16}$$

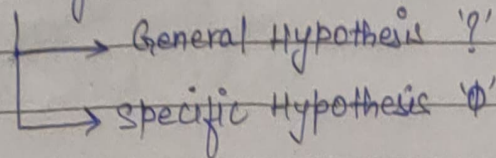


- Target Concept / Hypothesis space.
- Most Generic Hypothesis $\langle \phi, \phi, \phi, \phi \rangle$ Denotes with " ϕ "
Most specific it will reject these instances
Generic
- Most Specific Hypothesis $\langle ?, ?, ?, ? \rangle$ Denotes with " $?$ ".



HW Explain :-

- Find-S
- candidate elimination Algo.

* Find-S AlgorithmConcept Algorithm

$G = \{ '?', '?', '?', '?' \} - \text{'?' NO. of Attributes}$

$S = \{ 'φ', 'φ', 'φ', 'φ' \} - \text{'φ' NO. of Attributes}$

→ Find-S Algorithm considers most specific hypothesis

→ Find-S Algo considers only +ve example.

Algorithm

i) Initialise 'h' to most specific hypothesis.

$h = \{ 'φ', 'φ', 'φ', \dots \}$

ii) For each +ve example,

For each attribute in the example:

if attribute value == hypothesis value:

DO Nothing

else :

Replace hypothesis value with
more general constraint '?'

Dataset

Concept : Days on which person enjoys sport.

SKY	Temp.	Humidity	wind	water	forecast	Enjoy
Sunny	Warm	Normal	Strong	Warm	Same	Yes
Sunny	Warm	High	Strong	Warm	Same	Yes
Rainy	Cold	High	Strong	Warm	Change	No
Sunny	Warm	High	Strong	Warm Cool	Same	Yes

Step 1 - $h = \{\phi, \phi, \phi, \phi, \phi, \phi\}$

$h_0 = \{\text{'Sunny'}, \text{'warm'}, \text{'Normal'}, \text{'Strong'}, \text{'warm'}, \text{'Same'}\}$

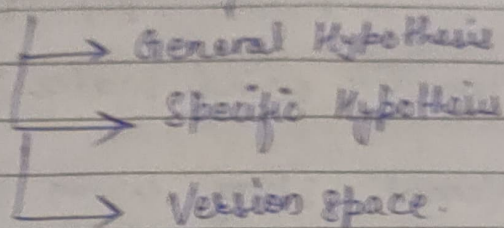
Step 2 - Now compare 'h₀' with second Attribute

After comparison

$h_0 = \{\text{'Sunny'}, \text{'warm'}, \text{'?'}, \text{'Strong'}, \text{'warm'}, \text{'Same'}\}$

After comparison 3rd Row neglected as it was "-ve"

$h_0 = \{\text{'Sunny'}, \text{'warm'}, \text{'?'}, \text{'Strong'}, \text{'warm'}, \text{'?'}, \text{'Same'}\}$

* Candidate Elimination AlgoConcept Learning

(It is intermediate of both GH & SH, It doesn't return one hypothesis instead a set of all possible hypothesis based on the training dataset.)

- Candidate Elimination uses version space.
- Considers both +ve & -ve results.
- We have both specific and general hypothesis.
- for +ve example:
 - We tend to generalize specific hypothesis.
- for a -ve example:
 - We tend to make general hypothesis more specific

Algorithm

- i) Initiate G & S as most general and specific hypothesis.
- ii) For each example, e
 - If e is +ve:
 - make specific hypothesis more general.
 - else:
 - make general hypothesis more specific.

Date .../.../...

Dataset

Sky	Temp.	Humidity	Wind	Water	Forecast	Enjoy
sunny	Warm	Normal	Strong	Warm	same	Yes
Sunny	Warm	High	Strong	Warm	same	Yes
Rainy	cold	High	Strong	Warm	change	no
Sunny	Warm	High	Strong	cool.	change	Yes

step-1 $S_0 = \{ \phi, \phi, \phi, \phi, \phi, \phi \}$ $G = \{ ?, ?, ?, ?, ?, ? \}$

step-2 • $S_1 = \{ \text{Sunny, warm, Normal, Strong, warm, same} \}$
 $G_1 = \{ ?, ?, ?, ?, ?, ? \}$

• $S_2 = \{ \text{Sunny, warm, ?, Strong, warm, same} \}$
 $G_2 = \{ ?, ?, ?, ?, ?, ? \}$

• $S_3 = \{ \text{Sunny, warm, ?, Strong, warm, same} \}$
 $G_3 = \{ ?, ?, ?, ?, ?, ? \}$

• $S_4 = \{ \text{Sunny, warm, ?, Strong, warm, same} \}$
 $G_4 = \{ \langle \text{Sunny, ? ? ? ? ?} \rangle, \langle ?, \text{'warm' ? ? ? ? ?} \rangle, \langle ? ? ? ? ? \text{'same'} \rangle \}$

• $S_5 = \{ \text{Sunny, warm, ?, Strong, ?, ?} \}$
 $G_5 = \{ \langle \text{Sunny, ? ? ? ? ?} \rangle, \langle ?, \text{'Warm' ? ? ? ? ?} \rangle \}$