

Play tennis example

Day	Outlook	Temperature	Humidity	Wind	PlayTennis
	x_1	x_2	x_3	x_4	y
1	sunny	hot	high	weak	no
2	sunny	hot	high	strong	no
3	overcast	hot	high	weak	yes
4	rain	mild	high	weak	yes
5	rain	cool	normal	weak	yes
6	rain	cool	normal	strong	no
7	overcast	cool	normal	strong	yes
8	sunny	mild	high	weak	no
9	sunny	cool	normal	weak	yes
10	rain	mild	normal	weak	yes
11	sunny	mild	normal	strong	yes
12	overcast	mild	high	strong	yes
13	overcast	hot	normal	weak	yes
14	rain	mild	high	strong	no
15	sunny	mild	normal	weak	?

$$X = (x_1, x_2, x_3, x_4)$$

$$\text{Instance space} = |\{X\}| = 36$$

Concept learning/regression: $f?$, $y = f(X)$

$$f(\text{sunny}, -, \text{normal}, -) = \text{yes}$$

$$f(\text{rain}, -, -, \text{strong}) = \text{no}$$

$$f(\text{rain}, -, -, \text{weak}) = \text{yes}$$

$$f(\text{overcast}, -, -, -) = \text{yes}$$

$$f(\text{sunny}, -, \text{high}, -) = \text{no}$$

$$\text{Error}(f) = \frac{|\{X|f(X) \neq y\}|}{36}$$

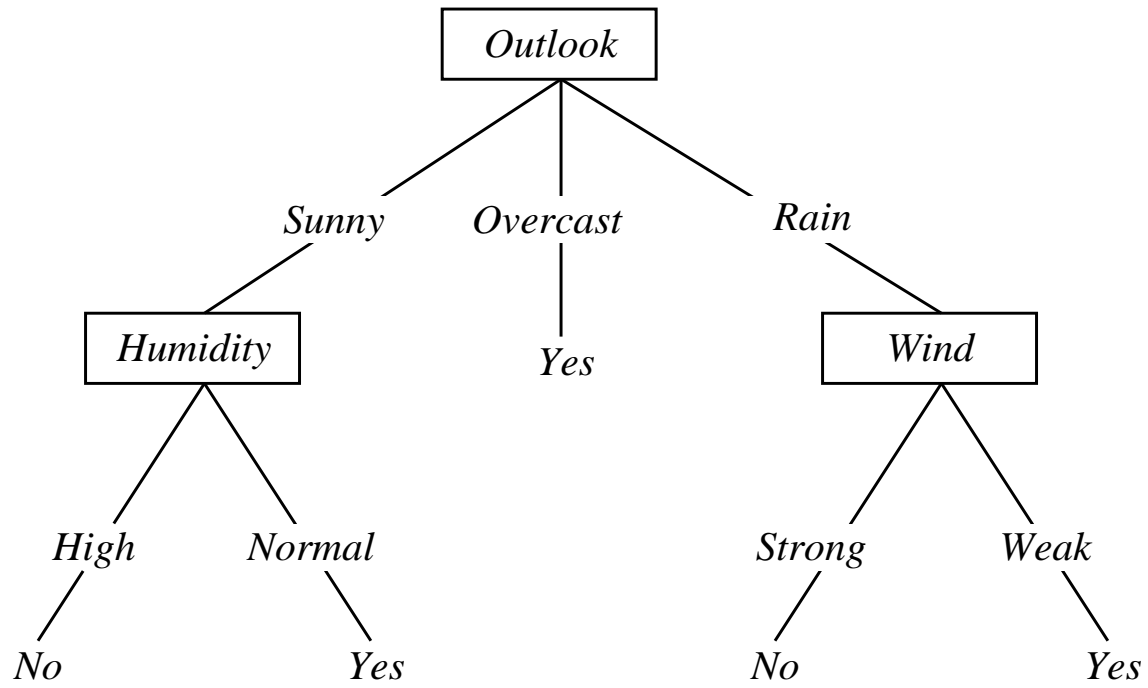
Prediction: $f(\text{sunny}, \text{mild}, \text{normal}, \text{weak}) = ?$

K-Nearest Neighbor (k-NN)

X	8	9	10	11	1	...	14
d(15,X)	1	1	1	1	2	...	3
PlayTennis	no	yes	yes	yes	no	...	no

$$\Rightarrow f(\text{sunny}, \text{mild}, \text{normal}, \text{weak}) = \text{yes}$$

Decision Tree for *PlayTennis*



Conceptual Clustering

No.	covering	milk	homeothermic	habitat	eggs	gills
1	hair	t	t	land	f	f
2	none	t	t	sea	f	f
3	hair	t	t	sea	t	f
4	hair	t	t	air	f	f
5	scales	f	f	sea	t	t
6	scales	f	f	land	t	f
7	scales	f	f	sea	t	f
8	feathers	f	t	air	t	f
9	feathers	f	t	land	t	f
10	none	f	f	land	t	f

[A,B,C,D,E,F]

[A,f,B,C,t,D]

[A,f,B,C,t,f]

[A,f,f,land,t,f]

[scales,f,f,land,t,f]

[none,f,f,land,t,f]

[feathers,f,t,A,t,f]

[feathers,f,t,air,t,f]

[feathers,f,t,land,t,f]

[scales,f,f,sea,t,A]

[scales,f,f,sea,t,t]

[scales,f,f,sea,t,f]

[A,t,t,B,C,f]

[A,t,t,sea,B,f]

[none,t,t,sea,f,f]

[hair,t,t,sea,t,f]

[hair,t,t,A,f,f]

[hair,t,t,land,f,f]

[hair,t,t,air,f,f]

Least General Generalization (lgg, infimum)

