

# Rule based Classification

(1)

Rule Structure :

If condition Then conclusion  
(rule antecedent) (rule consequent)  
(precondition)

Example

R1: If age = Youth and student = yes  
then buys computer = yes.

(or)

R1: (age = youth)  $\wedge$  (student = yes)  $\Rightarrow$   
buys computer = yes.

~~Coverage of~~ Quality of a rule

$$\text{Coverage}(R) = \frac{n_{\text{count}}}{|D|}$$

$$\text{Accuracy}(R) = \frac{n_{\text{count}}}{n_{\text{count}}}$$

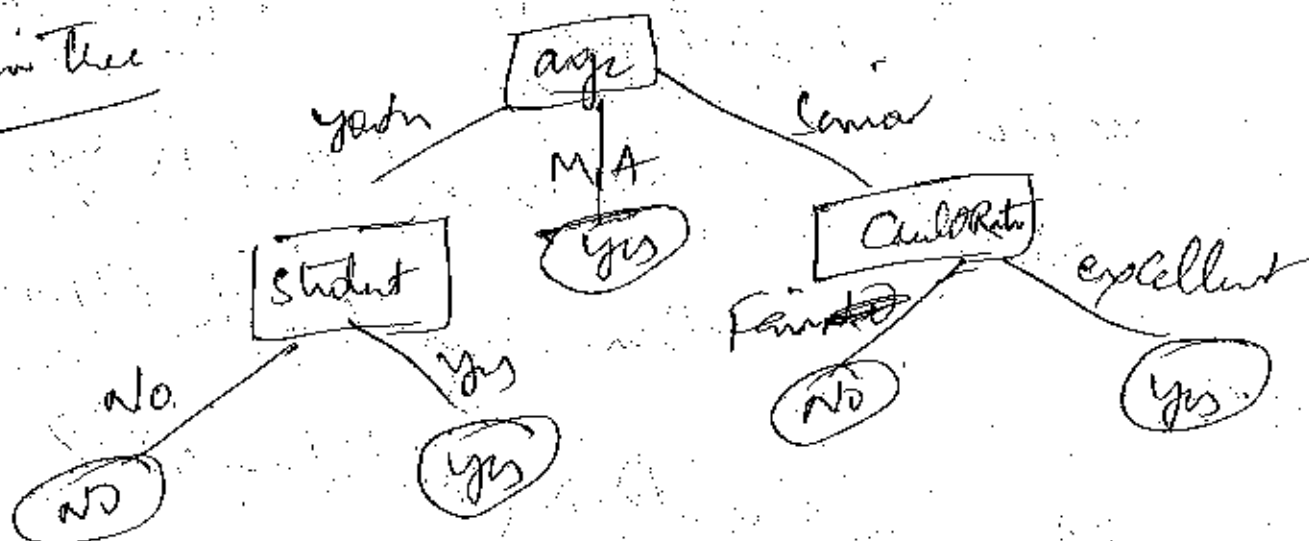
Rule's coverage is the percentage of tuples that are covered by the rule.

$$\text{coverage}(R_1) = \frac{2}{14} = 14.28\%$$

80%<sup>avg</sup> the tuples that it covers and see what percentage of them the rule classifies correctly (2)

$$(R_1) = 2/2 = 100\%$$

Decision Tree



rules extracted

- $R_1$ : If age = youth and student = no then BC = no  
 $R_2$ : If age = youth and student = yes then BC = yes  
 $R_3$ : If age = MA then BC = yes  
 $R_4$ : If age = senior and CR = Fair then BC = no  
 $R_5$ : If age = senior and CR = ~~Fair~~ <sup>excellent</sup> then BC = yes

# How does Rule-based Classifier Work?

R1: (Give Birth = no)  $\wedge$  (Can Fly = yes)  $\rightarrow$  Birds

R2: (Give Birth = no)  $\wedge$  (Live in Water = yes)  $\rightarrow$  Fishes

R3: (Give Birth = yes)  $\wedge$  (Blood Type = warm)  $\rightarrow$  Mammals

R4: (Give Birth = no)  $\wedge$  (Can Fly = no)  $\rightarrow$  Reptiles

R5: (Live in Water = sometimes)  $\rightarrow$  Amphibians

Name	Blood Type	Give Birth	Can Fly	Live in Water	Class
lemur	warm	yes	no	no	?
turtle	cold	no	no	sometimes	?
dogfish shark	cold	yes	no	yes	?

A lemur triggers rule R3, so it is classified as a mammal

A turtle triggers both R4 and R5

A dogfish shark triggers none of the rules

# Characteristics of Rule-Based Classifier

- Mutually exclusive rules
  - Classifier contains mutually exclusive rules if no two rules are triggered by the same record.
  - Every record is covered by at most one rule
- Exhaustive rules
  - Classifier has exhaustive coverage if it accounts for every possible combination of attribute values
  - Each record is covered by at least one rule