DM LAB 10

BY

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2 TYPE OF LEARNING

Supervised Learning

1. Uses a known dataset to make predictions. And it includes input data and response values.

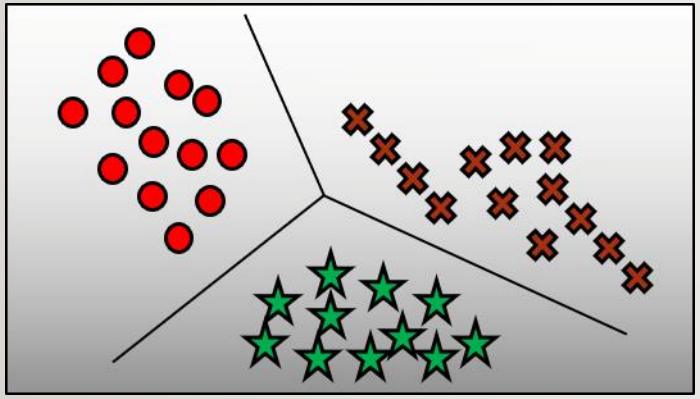
2. From it, the supervised learning algorithm builds a model to make predictions of the response values for a new dataset.

Unsupervised Learning

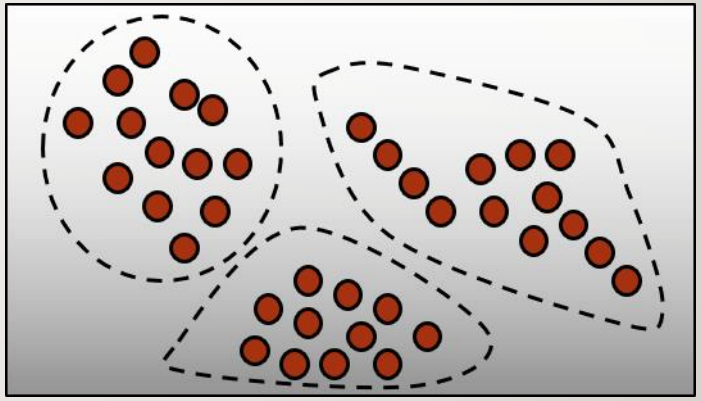
1. Draw inferences from datasets consisting of input data without labeled responses.

2. Used for exploratory data analysis to find hidden patterns or grouping in data

3 TYPE OF LEARNING



Supervised Learning



Unsupervised Learning

4 TYPE OF LEARNING

- Supervised Learning:
  - Classification.
- Unsupervised Learning:
  - Clustering.

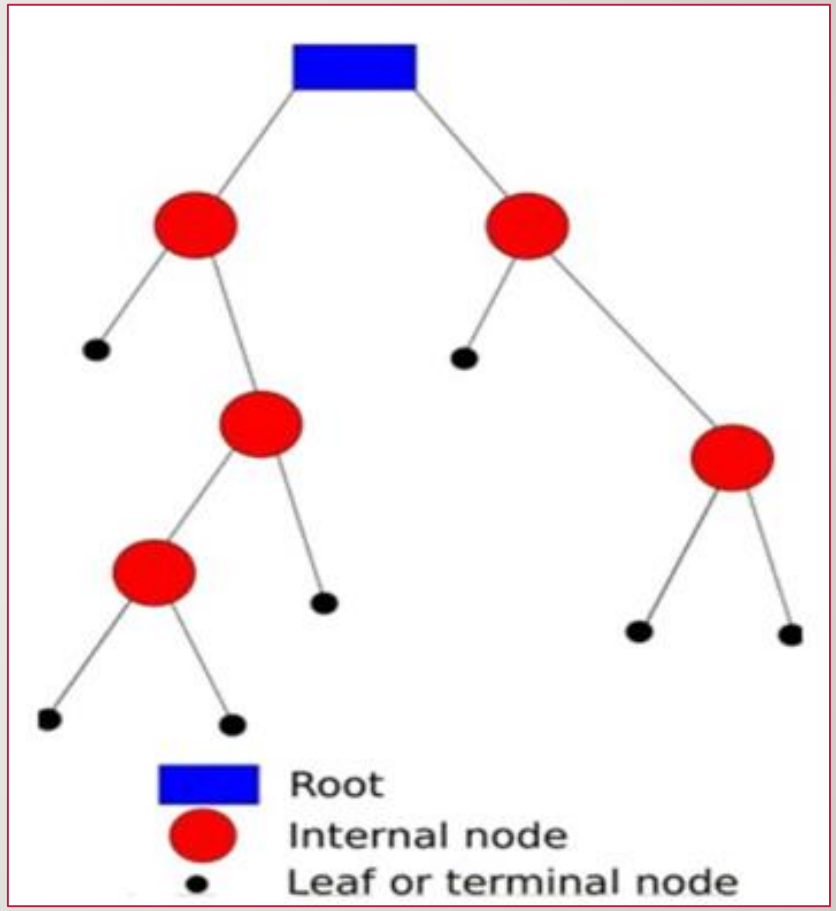
CLASSIFICATION

6 DECISION TREES

- What is Decision Trees?
  - A decision tree is a tree-like structure in which internal node represents test on an attribute, each branch represents outcome of test and each leaf node represents class label (decision taken after computing all attributes).
  - A path from root to leaf represents classification rules.
  - A decision tree consists of 3 types of nodes: (root node, branch node, leaf node).

7 HOW TO BUILD DECISION TREES??

- Uses training data to build model.
- Tree generator determines:
  - Which variable to split at a node and what will be the value of the split.
  - Decision to stop (make a (terminal node) or split again has to be made.
  - Assign terminal nodes to a label.



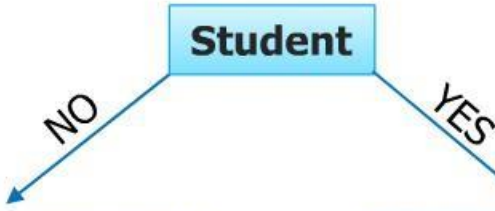
8 DECISION TREE EXAMPLE

Training Data

rec	Age	Income	Student	Credit_rating	Buys_computer
r1	<=30	High	No	Fair	No
r2	<=30	High	No	Excellent	No
r3	31…40	High	No	Fair	Yes
r4	>40	Medium	No	Fair	Yes
r5	>40	Low	Yes	Fair	Yes
r6	>40	Low	Yes	Excellent	No
r7	31…40	Low	Yes	Excellent	Yes
r8	<=30	Medium	No	Fair	No
r9	<=30	Low	Yes	Fair	Yes
r10	>40	Medium	Yes	Fair	Yes
r11	<-=30	Medium	Yes	Excellent	Yes
r12	31…40	Medium	No	Excellent	Yes
r13	31…40	High	Yes	Fair	Yes
r14	>40	Medium	No	Excellent	No

9 DECISION TREE EXAMPLE ROOT "STUDENT"

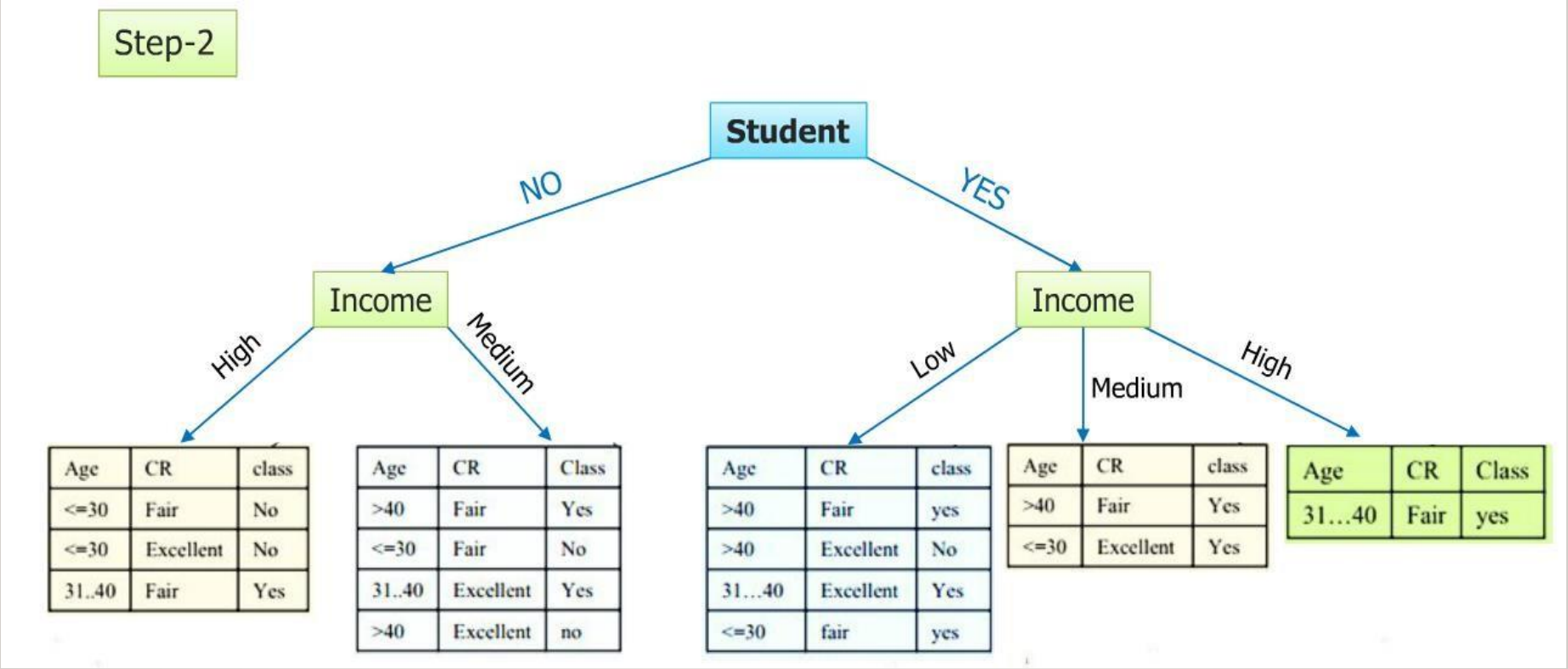
Step-1



Age	income	CR	Class
<=30	High	Fair	No
<=30	High	Excellent	No
30…40	High	Fair	Yes
>40	Medium	Fair	Yes
<=30	Medium	Fair	No
31…40	Medium	Excellent	Yes
>40	Medium	Excellent	no

Age	income	CR	Class
>40	Low	Fair	Yes
>40	Low	excellent	No
31…40	Low	Excellent	Yes
<=30	Low	Fair	Yes
>40	Medium	Fair	Yes
<=30	Medium	Excellent	Yes
31…40	high	fair	yes

DECISION TREE EXAMPLE ROOT "STUDENT"



Age	CR	class
<=30	Fair	No
<=30	Excellent	No
31..40	Fair	Yes

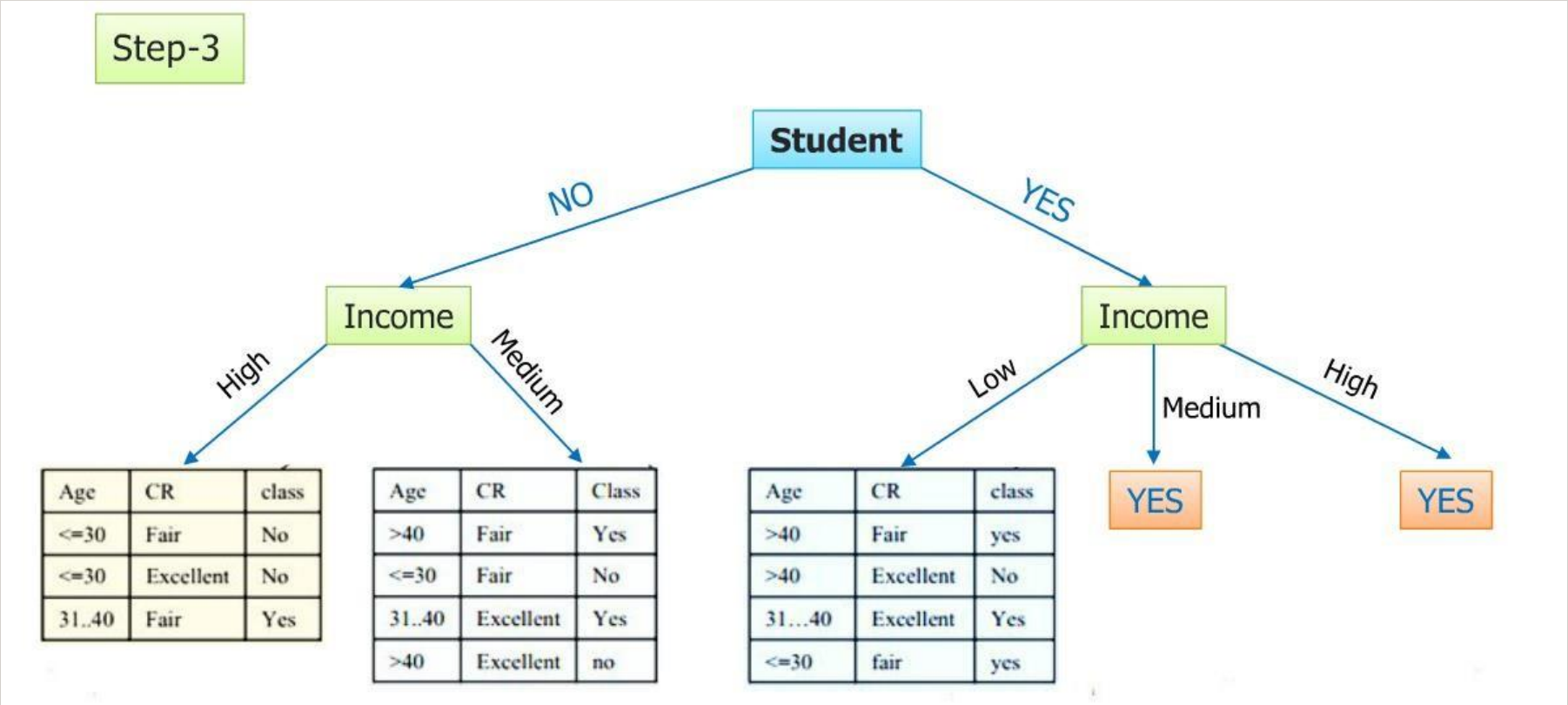
Age	CR	Class
>40	Fair	Yes
<=30	Fair	No
31..40	Excellent	Yes
>40	Excellent	no

Age	CR	class
>40	Fair	yes
>40	Excellent	No
31…40	Excellent	Yes
<=30	fair	yes

Age	CR	class
>40	Fair	Yes
<=30	Excellent	Yes

Age	CR	Class
31…40	Fair	yes

DECISION TREE EXAMPLE ROOT "STUDENT"

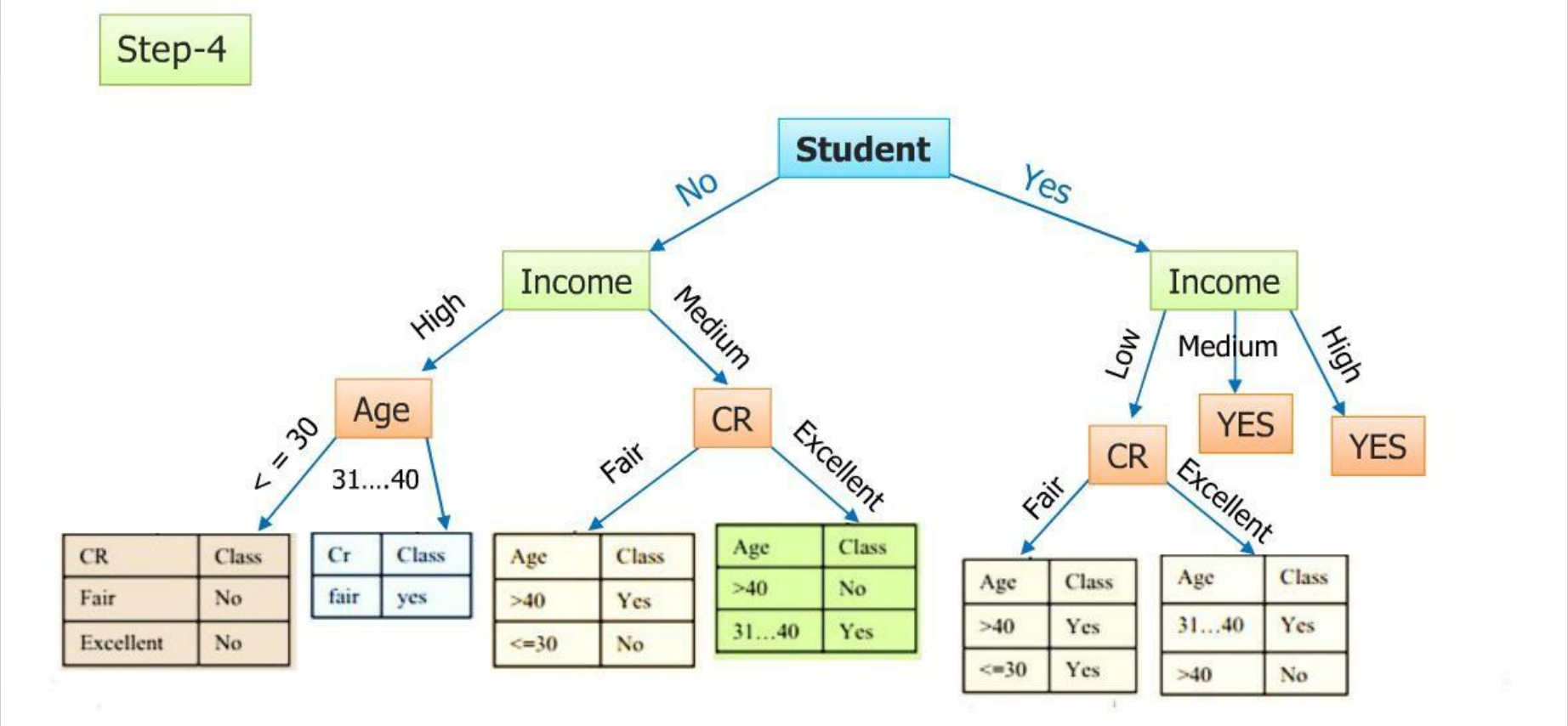


Age	CR	class
<=30	Fair	No
<=30	Excellent	No
31..40	Fair	Yes

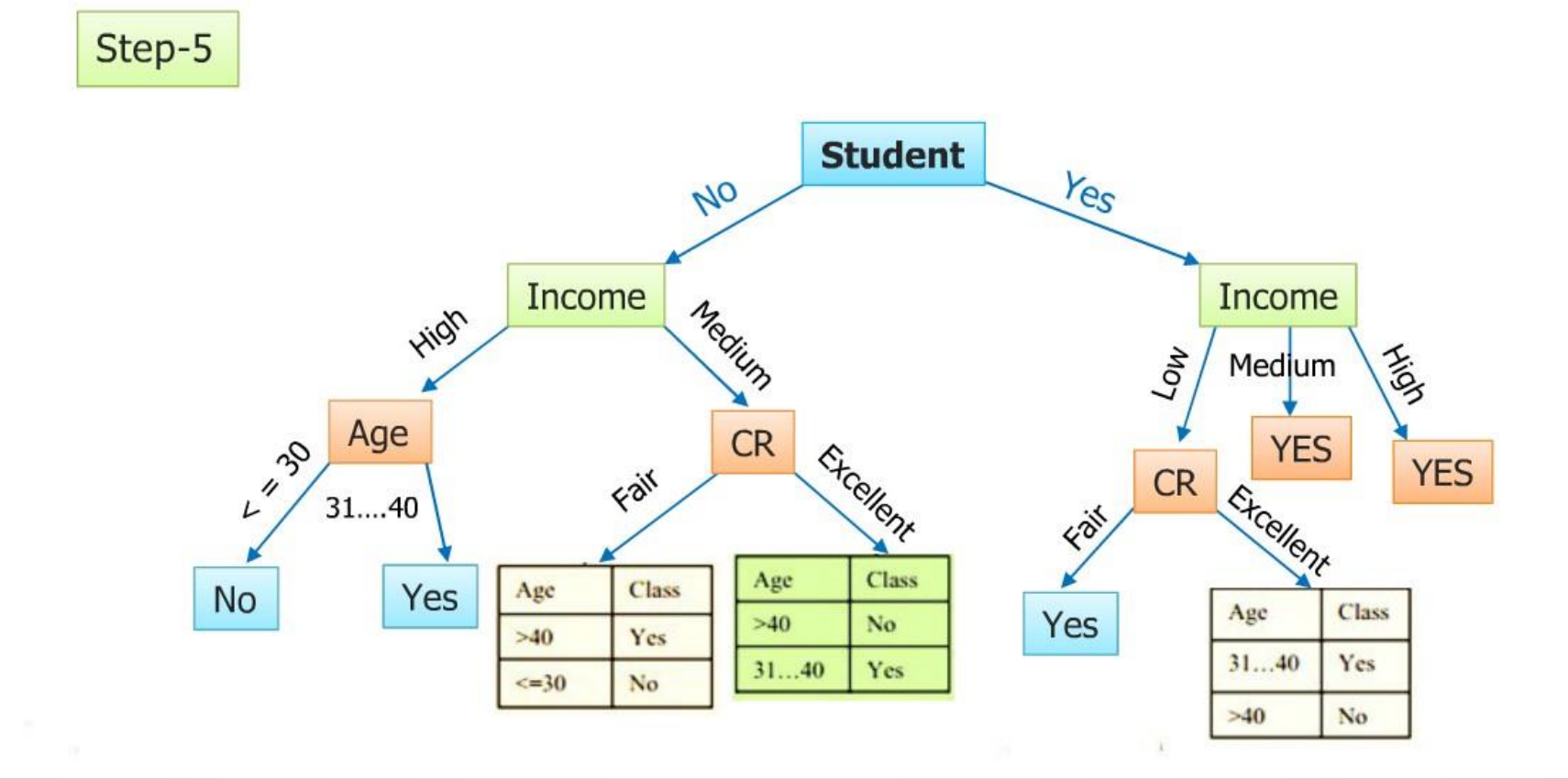
Age	CR	Class
>40	Fair	Yes
<=30	Fair	No
31..40	Excellent	Yes
>40	Excellent	no

Age	CR	class
>40	Fair	yes
>40	Excellent	No
31…40	Excellent	Yes
<=30	fair	yes

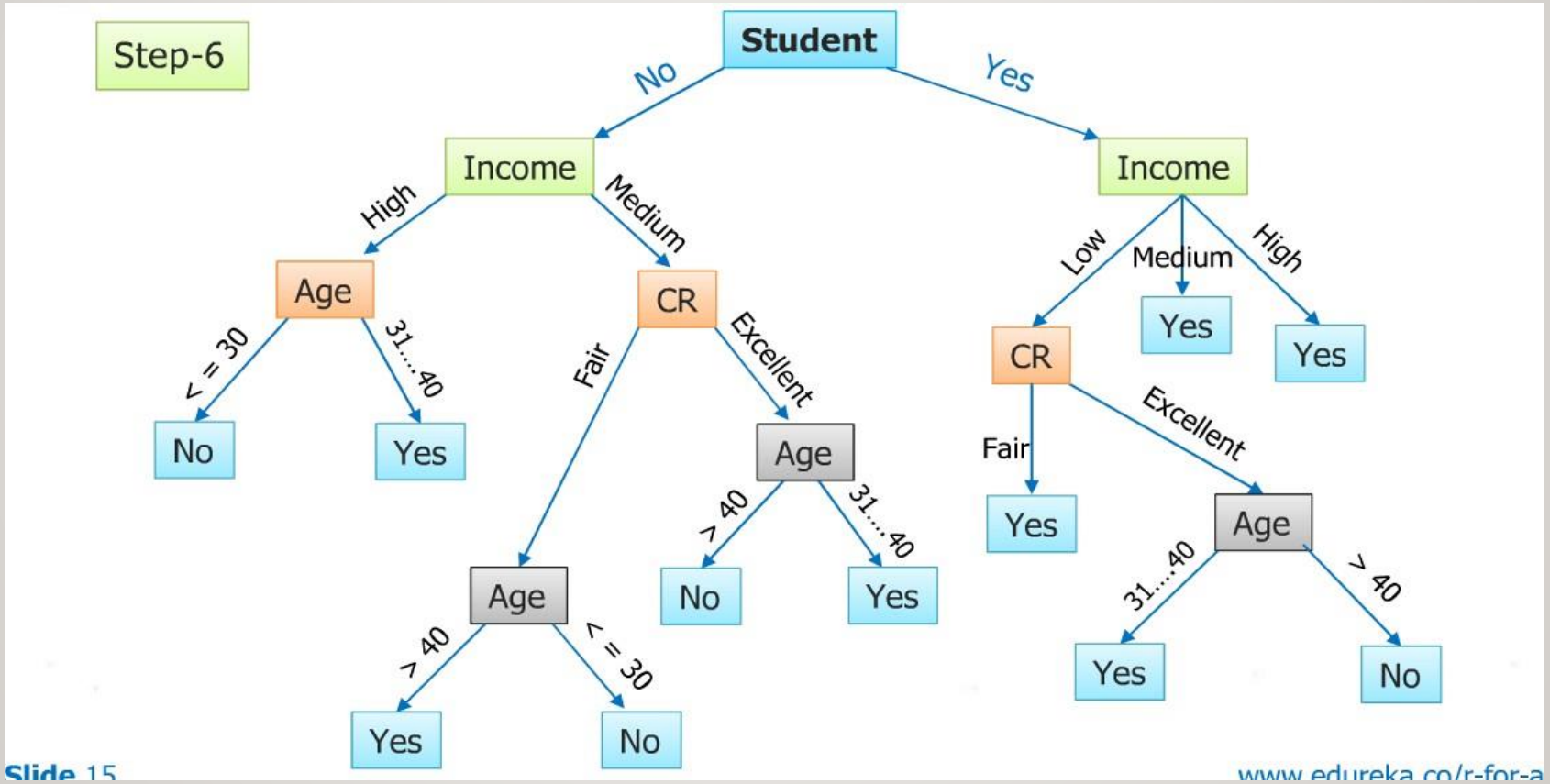
DECISION TREE EXAMPLE ROOT "STUDENT"



DECISION TREE EXAMPLE ROOT "STUDENT"



14 DECISION TREE EXAMPLE ROOT "STUDENT"



DECISION TREE EXAMPLE ROOT "STUDENT"

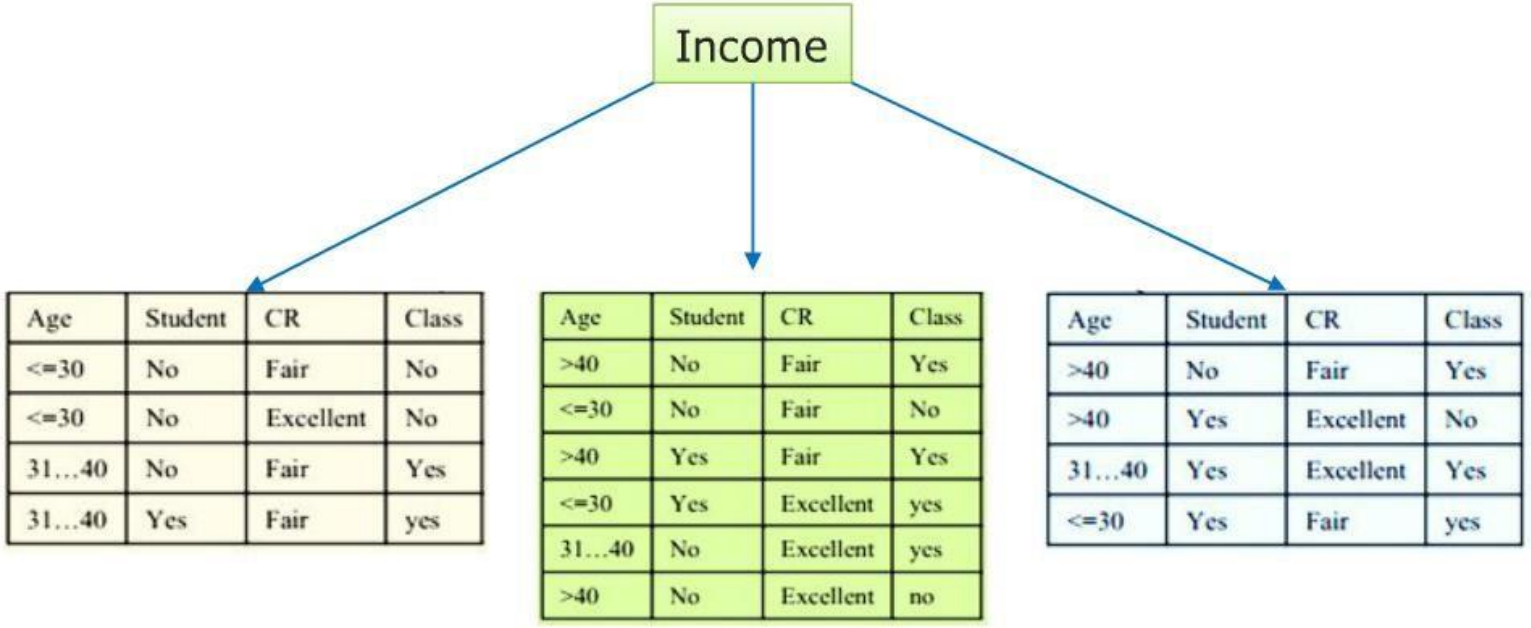
Classification Rules:

→ 1. student(no)^income(high)^age(<=30) => buys_computer(no)
→ 2. student(no)^income(high)^age(31…40) => buys_computer(yes)
→ 3. student(no)^income(medium)^CR(fair)^age(>40) => buys_computer(yes)
→ 4. student(no)^income(medium)^CR(fair)^age(<=30) => buys_computer(no)
→ 5. student(no)^income(medium)^CR(excellent)^age(>40) => buys_computer(no)
→ 6. student(no)^income(medium)^CR(excellent)^age(31..40) =>buys_computer(yes)
→ 7. student(yes)^income(low)^CR(fair) => buys_computer(yes)
→ 8. student(yes)^income(low)^CR(excellent)^age(31..40) => buys_computer(yes)
→ 9. student(yes)^income(low)^CR(excellent)^age(>40) => buys_computer(no)
→ 10. student(yes)^income(medium)=> buys_computer(yes)
→ 11. student(yes)^income(high)=> buys_computer(yes)

DECISION TREE EXAMPLE ROOT "INCOME"

Step-1

Now consider another approach to build the decision tree.
Let's take the attribute: Income

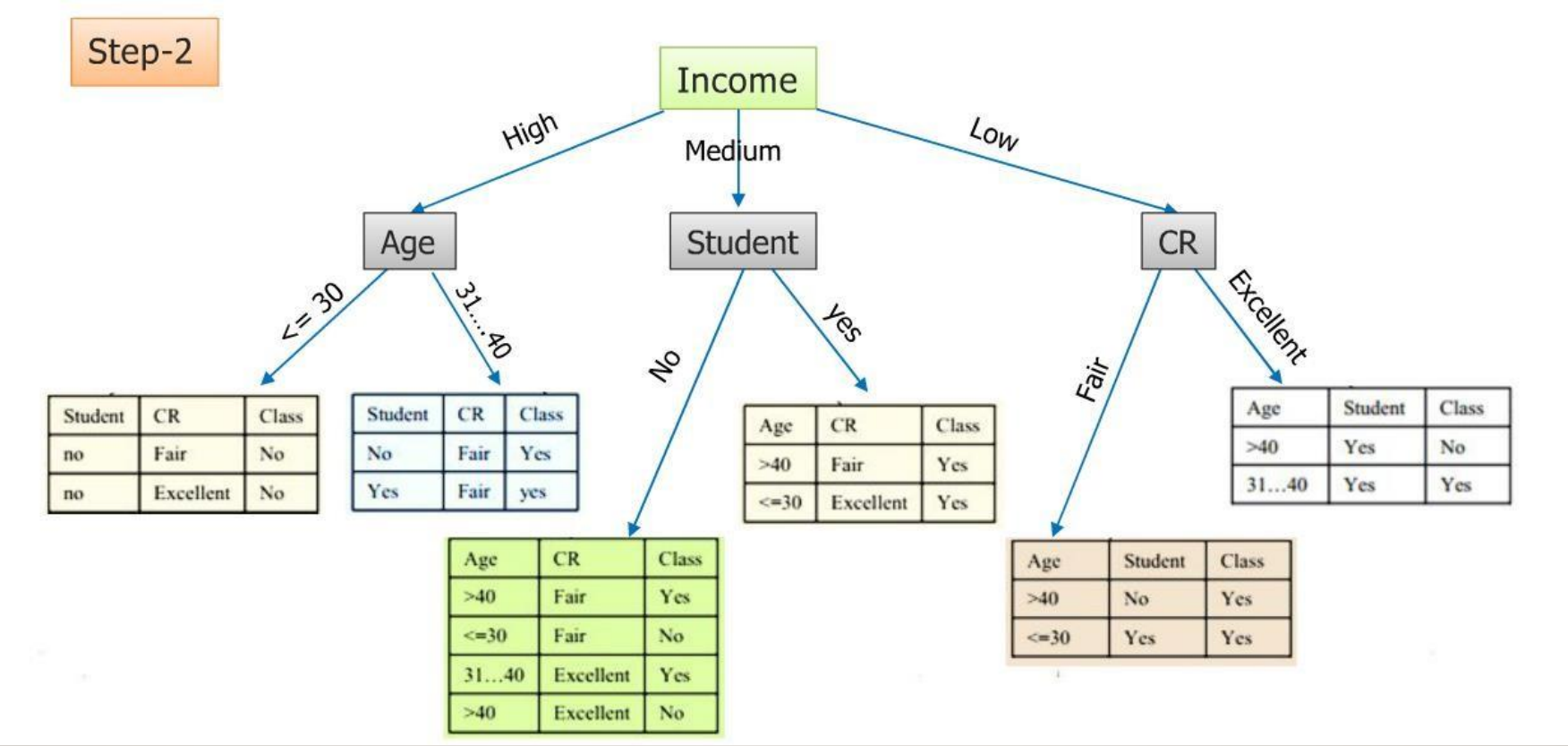


Age	Student	CR	Class
<=30	No	Fair	No
<=30	No	Excellent	No
31…40	No	Fair	Yes
31…40	Yes	Fair	yes

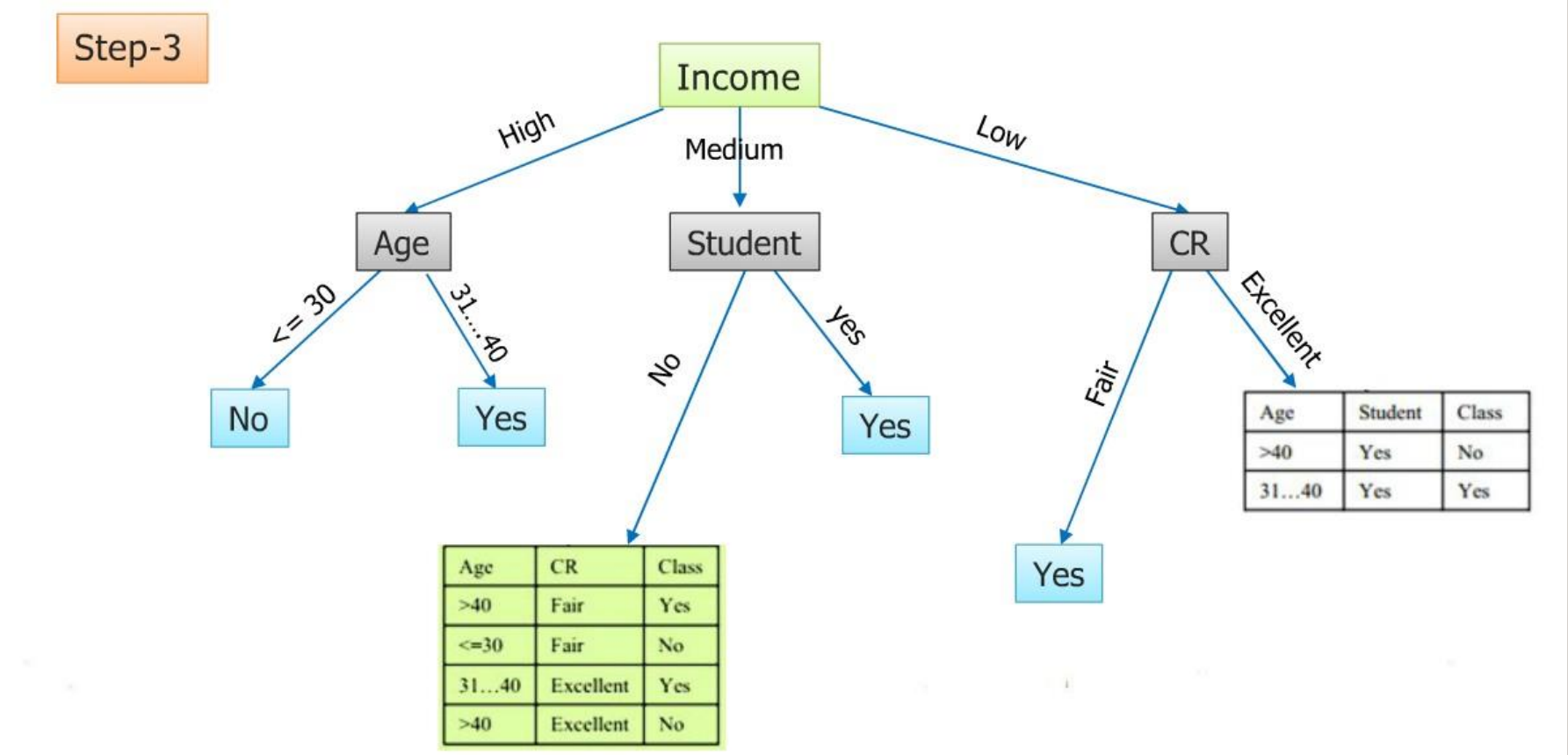
Age	Student	CR	Class
>40	No	Fair	Yes
<=30	No	Fair	No
>40	Yes	Fair	Yes
<=30	Yes	Excellent	yes
31…40	No	Excellent	yes
>40	No	Excellent	no

Age	Student	CR	Class
>40	No	Fair	Yes
>40	Yes	Excellent	No
31…40	Yes	Excellent	Yes
<=30	Yes	Fair	yes

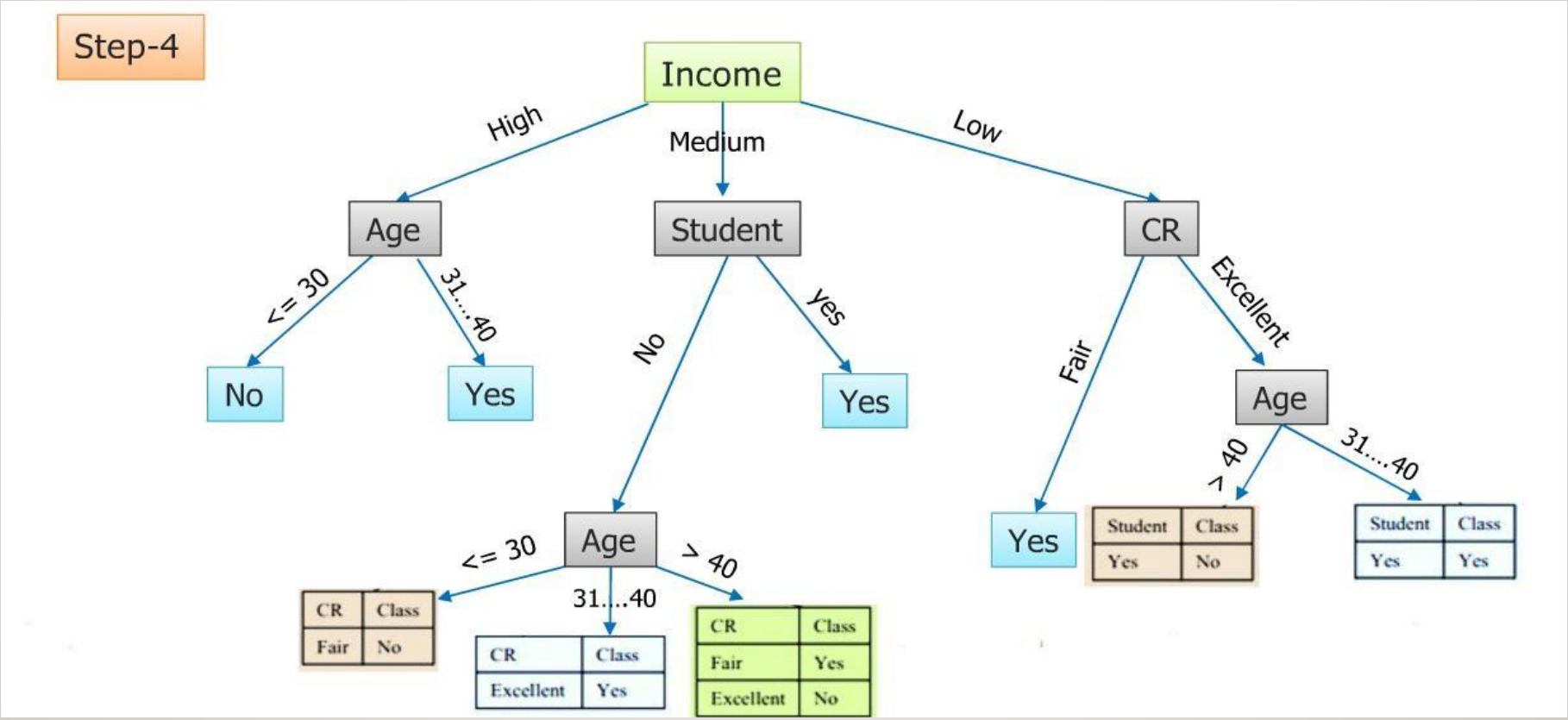
DECISION TREE EXAMPLE ROOT "INCOME"



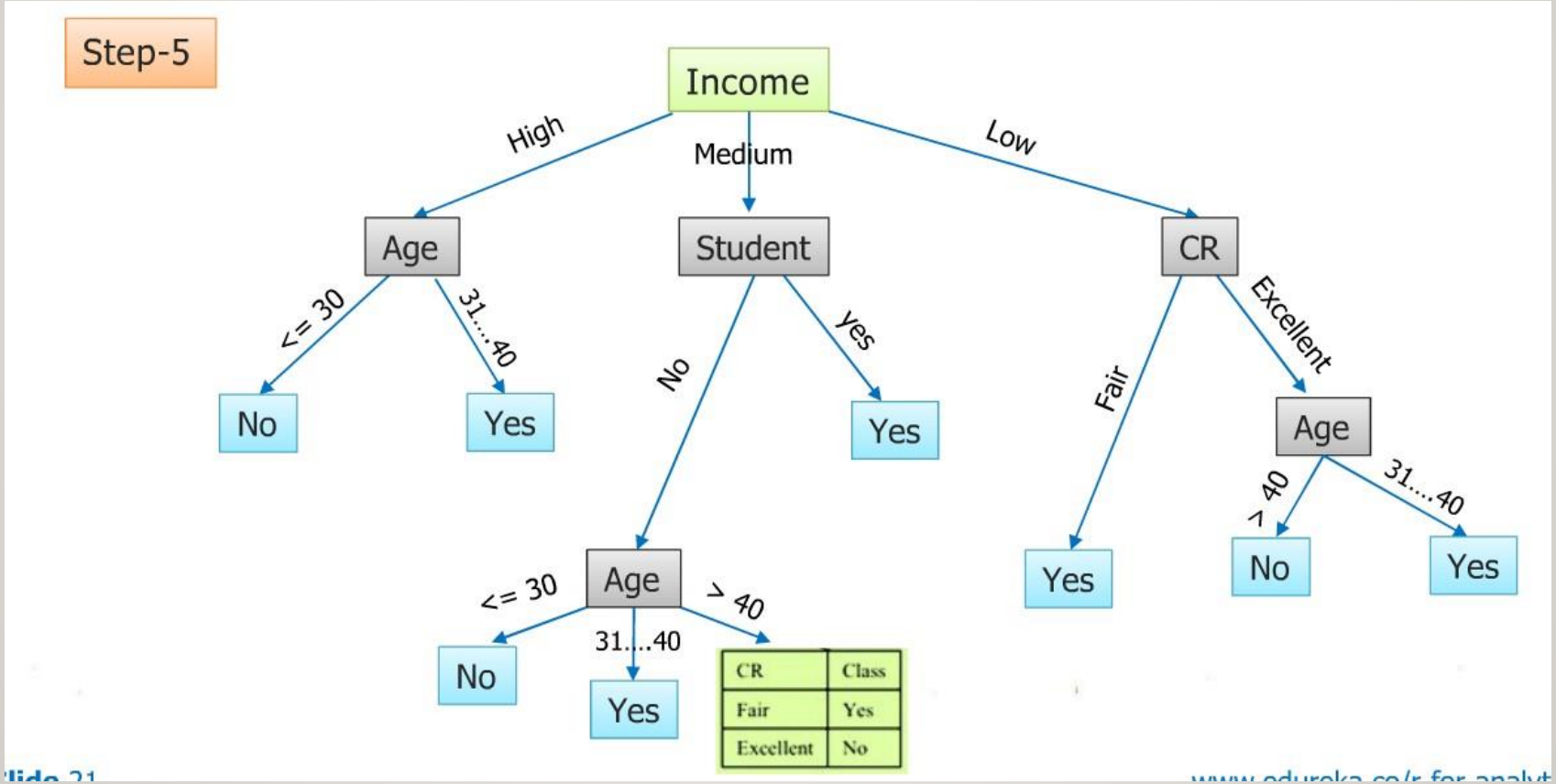
DECISION TREE EXAMPLE ROOT "INCOME"



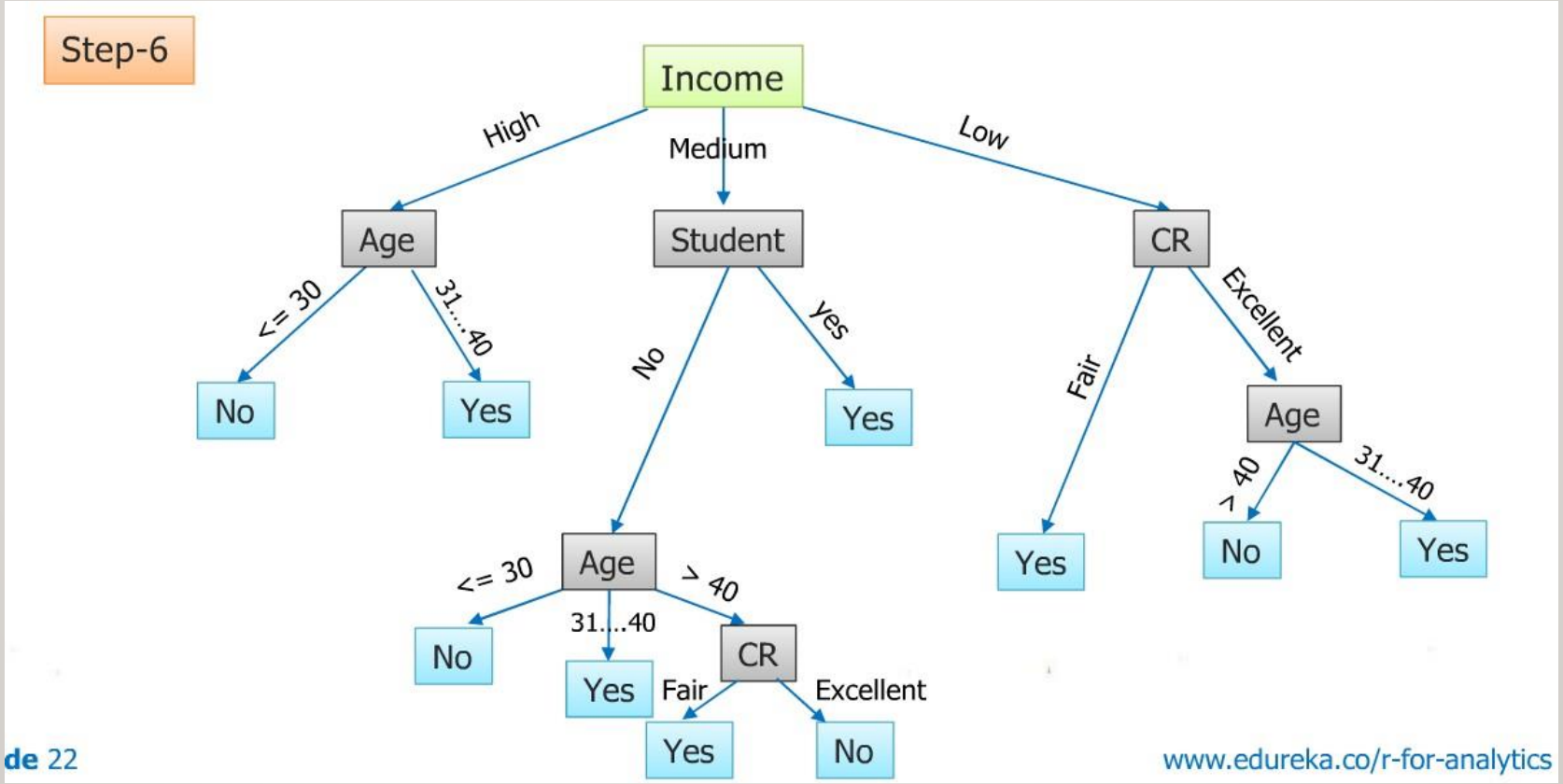
DECISION TREE EXAMPLE ROOT "INCOME"



DECISION TREE EXAMPLE ROOT "INCOME"



21 DECISION TREE EXAMPLE ROOT "INCOME"



DECISION TREE EXAMPLE ROOT "INCOME"

Classification Rules:

→ 1. income(high)^age(<=30) => buys_computer(no)
→ 2. income(high)^age(31…40) => buys_computer(yes)
→ 3. income(medium)^student(no)^age(<=30) => buys_computer(no)
→ 4. income(medium)^student(no)^age(31…40) => buys_computer(yes)
→ 5. income(medium)^student(no)^age(>40)^CR(fair) => buys_computer(yes)
→ 6. income(medium)^student(no)^age(>40)^CR(excellent) => buys_computer(no)
→ 7. income(medium)^student(yes)=> buys_computer(yes)
→ 8. income(medium)^CR(fair)=> buys_computer(yes)
→ 9. income(medium)^ CR(excellent)^age(>40)=> buys_computer(no)
→ 10. income(medium)^ CR(excellent)^age(31…40)=> buys_computer(yes)

RSTUDIO DEMO

24 IRIS DATASET

THE END