

MACHINE LEARNING

PART 1: SUPERVISED LEARNING METHODS

DECISION TREES AND RULES

LEARNING OF DECISION TREES: ID3

- ID3 (Iterative Dichotomiser, Quinlan, 1980)
- Based on GLS (classification)
 - only binary attributes
 - heuristic to decide what attribute to choose in each node of the tree
- Set of techniques with commercial success
- Generate decision trees from training examples
- Idea: find the simplest tree that best separates the examples
- Use a heuristic based on entropy to choose the attributes

EXAMPLE

Instance	Access point	Out-coverage	Location	Cell proximity	Class
1	0	0	0	Weak	Yes
2	0	0	0	Weak	Yes
3	0	0	0	Weak	Yes
4	0	0	0	Weak	Yes
5	0	0	0	Weak	Yes
6	0	0	0	Weak	Yes
7	0	0	0	Weak	Yes
8	0	0	0	Weak	Yes
9	0	0	0	Weak	Yes
10	0	0	0	Weak	Yes
11	0	0	0	Weak	Yes
12	0	0	0	Weak	Yes
13	0	0	0	Weak	Yes
14	0	0	0	Weak	Yes
15	0	0	0	Weak	Yes
16	0	0	0	Weak	Yes
17	0	0	0	Weak	Yes
18	0	0	0	Weak	Yes
19	0	0	0	Weak	Yes
20	0	0	0	Weak	Yes
21	0	0	0	Weak	Yes
22	0	0	0	Weak	Yes
23	0	0	0	Weak	Yes
24	0	0	0	Weak	Yes
25	0	0	0	Weak	Yes
26	0	0	0	Weak	Yes
27	0	0	0	Weak	Yes
28	0	0	0	Weak	Yes
29	0	0	0	Weak	Yes
30	0	0	0	Weak	Yes
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192	0	0	0	Weak	Yes
193	0	0	0	Weak	Yes
194	0	0	0	Weak	Yes
195	0	0	0	Weak	Yes
196	0	0	0	Weak	Yes
197	0	0	0	Weak	Yes
198	0	0	0	Weak	Yes
199	0	0	0	Weak	Yes
200	0	0	0	Weak	Yes

DECISION TREE EXAMPLE



STRATEGY OF ID3



ALGORITHM

1. Select an attribute A_i that maximises the information gain $G(A_i)$
2. Create a node for such attribute with as many successors as different values the attribute has
3. Distribute the training examples in the successors, using the value for attribute A_i
4. For each successor: if there's only examples of one class C_k , then label the node with C_k ; otherwise, call ID3 with a table made up of the examples of the node, erasing the column of attribute A_i

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Huangqi Zhang



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