

Assignment 1: Machine Learning

- 5 For the following decision table:

	Attributes				Decision
	Size	Color	Feel	Material	Attitude
1	big	yellow	soft	fabric	positive
2	small	red	hard	fabric	negative
3	small	yellow	soft	fabric	positive
4	big	yellow	hard	plastic	negative
5	small	red	soft	fabric	positive
6	big	blue	soft	plastic	negative

- (a) determine a decision tree using the ID4 algorithm
 - (b) derive a set of rules from the decision tree
 - (c) simplify the rules using linear (not exponential) dropping conditions.
- 6 As above, but using ID4-hat.
- 7 As above, but using ID5.
- 8 As above, but using ID5-hat.
- 9 As above, but using ASSISTANT.
- 10 For the above table, and assuming that the concepts {1, 3, 5} and {2, 4, 6} were induced by ASSISTANT (i.e., using negative attributes), use condition dropping as necessary to give examples of sets of rules that are
- (a) complete and consistent (i.e., as in 9 above)
 - (b) complete but inconsistent
 - (c) consistent but incomplete
 - (d) incomplete and inconsistent.

In each case, state which examples (citing the reference numbers in the left-hand column of the table) demonstrate incompleteness or inconsistency.

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11 For the following decision table:

	Attributes			Decision
	Size	Color	Feel	Attitude
1	big	yellow	soft	positive
2	big	yellow	hard	negative
3	big	yellow	soft	positive
4	big	blue	hard	positive
5	big	blue	hard	negative
6	big	blue	hard	neutral
7	medium	green	soft	negative
8	medium	blue	soft	neutral

- (a) determine a decision tree using the ID3 (information gain) algorithm and C4.5 pruning based on Binomial probabilities and voting for class membership
- (b) derive a set of rules from the decision tree
- (c) simplify the rules using linear (not exponential) dropping conditions.

Notes: Show all workings and explain every step of the tree-building process.

If attributes are tied at any stage, break ties from left to right (i.e., prefer the left-most)